CALL NO. 330

CONTRACT ID. 251002

GRAYSON COUNTY

FED/STATE PROJECT NUMBER FD06 043 3155 NEWRT

DESCRIPTION NEW ROUTE- KY-54-KY-259

WORK TYPE GRADE, DRAIN & SURFACE WITH BRIDGE

PRIMARY COMPLETION DATE 225 WORKING DAYS

LETTING DATE: January 23,2025

Sealed Bids will be received electronically through the Bid Express bidding service until 10:00 AM EASTERN STANDARD TIME January 23,2025. Bids will be publicly announced at 10:00 AM EASTERN STANDARD TIME.

PLANS AVAILABLE FOR THIS PROJECT.

REQUIRED BID PROPOSAL GUARANTY: Not less than 5% of the total bid.

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SCOPE OF WORK

ADMINISTRATIVE DISTRICT - 03

CONTRACT ID - 251002

FD06 043 3155 NEWRT

COUNTY - GRAYSON

PCN - DE0430NEW2502
FD06 043 3155 NEWRT

NEW ROUTE- KY-54-KY-259 (MP 12.55) EXTEND THE WILLIAM THOMASON BYWAY FROM THE SOUTHERN INTERSECTION AT KY-259 WESTERLY TO KY-54 (MP 17.25), A DISTANCE OF 01.43 MILES.GRADE, DRAIN & SURFACE WITH BRIDGE SYP NO. 04-08954.00.

GEOGRAPHIC COORDINATES LATITUDE 37:28:23.00 LONGITUDE 86:18:32.00

ADT

COMPLETION DATE(S):

225 WORKING Days	APPLIES TO ENTIRE CONTRACT

CONTRACT NOTES

INSURANCE

Refer to Kentucky Standard Specifications for Road and Bridge Construction, current edition.

PROPOSAL ADDENDA

All addenda to this proposal must be applied when calculating bid and certified in the bid packet submitted to the Kentucky Department of Highways. Failure to use the correct and most recent addenda may result in the bid being rejected.

BID SUBMITTAL

Bidder must use the Department's electronic bidding software. The Bidder must download the bid file located on the Bid Express website (www.bidx.com) to prepare a bid packet for submission to the Department. The bidder must submit electronically using Bid Express.

JOINT VENTURE BIDDING

Joint venture bidding is permissible. All companies in the joint venture must be prequalified in one of the work types in the Qualifications for Bidders for the project. The bidders must get a vendor ID for the joint venture from the Division of Construction Procurement and register the joint venture as a bidder on the project. Also, the joint venture must obtain a digital ID from Bid Express to submit a bid. A joint bid bond of 5% may be submitted for both companies or each company may submit a separate bond of 5%.

UNDERGROUND FACILITY DAMAGE PROTECTION

The contractor shall make every effort to protect underground facilities from damage as prescribed in the Underground Facility Damage Protection Act of 1994, Kentucky Revised Statute KRS 367.4901 to 367.4917. It is the contractor's responsibility to determine and take steps necessary to be in compliance with federal and state damage prevention directives. When prescribed in said directives, the contractor shall submit Excavation Locate Requests to the Kentucky Contact Center (KY811) via web ticket entry. The submission of this request does not relieve the contractor from the responsibility of contacting non-member facility owners, whom shall be contacted through their individual Protection Notification Center. Non-compliance with these directives can result in the enforcement of penalties.

REGISTRATION WITH THE SECRETARY OF STATE BY A FOREIGN ENTITY

Pursuant to KRS 176.085(1)(b), an agency, department, office, or political subdivision of the Commonwealth of Kentucky shall not award a state contract to a person that is a foreign entity required by KRS 14A.9-010 to obtain a certificate of authority to transact business in the Commonwealth ("certificate") from the Secretary of State under KRS 14A.9-030 unless the person produces the certificate within fourteen (14) days of the bid or proposal opening. If the

foreign entity is not required to obtain a certificate as provided in KRS 14A.9-010, the foreign entity should identify the applicable exception. Foreign entity is defined within KRS 14A.1-070.

For all foreign entities required to obtain a certificate of authority to transact business in the Commonwealth, if a copy of the certificate is not received by the contracting agency within the time frame identified above, the foreign entity's solicitation response shall be deemed non-responsive or the awarded contract shall be cancelled.

Businesses can register with the Secretary of State at https://secure.kentucky.gov/sos/ftbr/welcome.aspx .

SPECIAL NOTE FOR PROJECT QUESTIONS DURING ADVERTISEMENT

Questions about projects during the advertisement should be submitted in writing to the Division of Construction Procurement. This may be done by email to kytc.projectquestions@ky.gov. The Department will attempt to answer all submitted questions. The Department reserves the right not to answer if the question is not pertinent or does not aid in clarifying the project intent.

The deadline for posting answers will be 3:00 pm Eastern Daylight Time, the day preceding the Letting. Questions may be submitted until this deadline with the understanding that the later a question is submitted, the less likely an answer will be able to be provided.

The questions and answers will be posted for each Letting under the heading "Questions & Answers" on the Construction Procurement website (www.transportation.ky.gov/construction-procurement). The answers provided shall be considered part of this Special Note and, in case of a discrepancy, will govern over all other bidding documents.

HARDWOOD REMOVAL RESTRICTIONS

The US Department of Agriculture has imposed a quarantine in Kentucky and several surrounding states, to prevent the spread of an invasive insect, the emerald ash borer. Hardwood cut in conjunction with the project may not be removed from the state. Chipping or burning on site is the preferred method of disposal.

INSTRUCTIONS FOR EXCESS MATERIAL SITES AND BORROW SITES

Identification of excess material sites and borrow sites shall be the responsibility of the Contractor. The Contractor shall be responsible for compliance with all applicable state and federal laws and may wish to consult with the US Fish and Wildlife Service to seek protection under Section 10 of the Endangered Species Act for these activities.

ACCESS TO RECORDS

The state agency certifies that it is in compliance with the provisions of KRS 45A.150, "Access to contractor's books, documents, papers, records, or other evidence directly pertinent to the contract." The Contractor, as defined in KRS 45A.030, agrees that the contracting agency, the

Finance and Administration Cabinet, the Auditor of Public Accounts, and the Legislative Research Commission, or their duly authorized representatives, shall have access to any books, documents, papers, records, or other evidence, which are directly pertinent to this agreement for the purpose of financial audit or program review. The Contractor also recognizes that any books, documents, papers, records, or other evidence, received during a financial audit or program review shall be subject to the Kentucky Open Records Act, KRS 61.870 to 61.884. Records and other prequalification information confidentially disclosed as part of the bid process shall not be deemed as directly pertinent to the agreement and shall be exempt from disclosure as provided in KRS 61.878(1)(c).

BOYCOTT PROVISIONS

If applicable, the contractor represents that, pursuant to KRS 45A.607, they are not currently engaged in, and will not for the duration of the contract engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which Kentucky can enjoy open trade. **Note:** The term Boycott does not include actions taken for bona fide business or economic reasons, or actions specifically required by federal or state law.

If applicable, the contractor verifies that, pursuant to KRS 41.480, they do not engage in, and will not for the duration of the contract engage in, in energy company boycotts as defined by KRS 41.472.

LOBBYING PROHIBITIONS

The contractor represents that they, and any subcontractor performing work under the contract, have not violated the agency restrictions contained in KRS 11A.236 during the previous ten (10) years, and pledges to abide by the restrictions set forth in such statute for the duration of the contract awarded.

The contractor further represents that, pursuant to KRS 45A.328, they have not procured an original, subsequent, or similar contract while employing an executive agency lobbyist who was convicted of a crime related to the original, subsequent, or similar contract within five (5) years of the conviction of the lobbyist.

SPECIAL NOTE – BUY AMERICA REQUIREMENTS AND BUILD AMERICA, BUY AMERICA (BABA) ACT 10/26/2023

1.0 BUY AMERICA REQUIREMENT.

Follow the "Buy America" provisions as required by 23 U.S.C. § 313 and 23 C.F.R. § 635.410. Except as expressly provided herein all manufacturing processes of steel or iron materials including but not limited to structural steel, guardrail materials, corrugated steel, culvert pipe, structural plate, prestressing strands, and steel reinforcing bars shall occur in the United States of America, including the application of:

- Coating,
- Galvanizing,
- Painting, and
- Other coating that protects or enhances the value of steel or iron products.

The following are exempt, unless processed or refined to include substantial amounts of steel or iron material, and may be used regardless of source in the domestic manufacturing process for steel or iron material:

- Pig iron,
- Processed, pelletized, and reduced iron ore material, or
- Processed alloys.

The Contractor shall submit a certification stating that all manufacturing processes involved with the production of steel or iron materials occurred in the United States.

Produce, mill, fabricate, and manufacture in the United States of America all aluminum components of bridges, tunnels, and large sign support systems, for which either shop fabrication, shop inspection, or certified mill test reports are required as the basis of acceptance by the Department.

Use foreign materials only under the following conditions:

1) When the materials are not permanently incorporated into the project; or
2) When the delivered cost of such materials used does not exceed 0.1 percent of the total Contract amount or $2,500.00, whichever is greater.

The Contractor shall submit to the Engineer the origin and value of any foreign material used.

2.0 – BUILD AMERICA, BUY AMERICA (BABA)

Contractor shall comply with the Federal Highway Administration (FHWA) Buy America Requirement in 23 C.F.R. § 635.410 and all relevant provisions of the Build America, Buy America Act (BABA), contained within the Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, §§ 70901-52 enacted November 15, 2021. The BABA requires iron, steel, manufactured products, and construction materials used in infrastructure projects funded by federal financial assistance to be produced in the United States. Comply with 2 C.F.R § 184.

BABA permits FHWA participation in the Contract only if domestic steel and iron will be used on the Project. To be considered domestic, all steel and iron used, and all products manufactured from steel and iron must be produced in the United States and all manufacturing processes, including application of a coating, for these materials must occur in the United States. Coating includes all processes that protect or enhance the value of the material to which the coating is applied. This requirement does not preclude a minimal use of foreign steel and iron materials, provided the cost of such materials does not exceed 0.1% of the total contract amount under the Contract or $2,500.00 whichever is greater.

BABA permits FHWA participation in the Contract only if all "construction materials" as defined in the Act are made in the United States. The Buy America preference applies to the following construction materials

incorporated into infrastructure projects: non-ferrous metals; plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); glass (including optic glass); Fiber optic cable; optical fiber; lumber; engineered wood; and drywall. Contractor will be required to use construction materials produced in the United States on this Project. The Contractor shall submit a certification stating that all construction materials are certified to be BABA compliant.

Finally, BABA permits the continuation of FHWA's current general applicability waivers for manufactured products, raw materials, and ferryboat parts, but these waivers are subject to reevaluation, specifically the general applicability waiver for manufactured products.

The Contractor has completed and submitted, or shall complete and submit, to the Cabinet a Buy America/ Build America, Buy America Certificate prior to the Cabinet issuing the notice to proceed, in the format below. After submittal, the Contractor is bound by its original certification.

A false certification is a criminal act in violation of 18 U.S.C. § 1001. The Contractor has the burden of proof to establish that it is in compliance.

At the Contractor's request, the Cabinet may, but is not obligated to, seek a waiver of Buy America requirements if grounds for the waiver exist under 23 C.F.R. § 635.410(c) or will comply with the applicable Buy America requirements if a waiver of those requirements is not available or not pursued by the Cabinet.

Please refer to the Federal Highway Administration's Buy America webpage for more information.

Buy America - Construction Program Guide - Contract Administration - Construction - Federal Highway Administration (dot.gov)

BUY AMERICA / BUILD AMERICA, BUY AMERICA (ACT) MATERIALS CERTIFICATE OF COMPLIANCE

The Contractor hereby certifies that it will comply with all relevant provisions of the Build America, Buy America Act, contained within the Infrastructure Investment and Jobs Act, Pub. L. NO. 117-58, §§ 70901-52, the requirements of 23 U.S.C. § 313, 23 C.F.R. § 635.410 and 2 C.F.R § 184.

Date Submitted:_____

Contractor:_____

Signature:_____

Printed Name:_____

Title:_____

NOTE: THIS CERTIFICATION IS IN ADDITION TO ANY AND ALL REQUIREMENTS OUTLINED IN THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION AND/OR SPECIAL NOTES CONTAINED IN THE PROJECT PROPOSAL.

SPECIAL NOTE FOR RECIPROCAL PREFERENCE

RECIPROCAL PREFERENCE TO BE GIVEN BY PUBLIC AGENCIES TO RESIDENT BIDDERS

By reference, KRS 45A.490 to 45A.494 are incorporated herein and in compliance regarding the bidders residency. Bidders who want to claim resident bidder status should complete the Affidavit for Claiming Resident Bidder Status along with their bid in the electronic bidding software. Submittal of the Affidavit should be done along the bid in Bid Express.

April 30, 2018

ASPHALT MIXTURE

Unless otherwise noted, the Department estimates the rate of application for all asphalt mixtures to be 110 lbs/sy per inch of depth.

INCIDENTAL SURFACING

The Department has included in the quantities of asphalt mixtures established in the proposal estimated quantities required for resurfacing or surfacing mailbox turnouts, farm field entrances, residential and commercial entrances, curve widening, ramp gores and tapers, and road and street approaches, as applicable. Pave these areas to the limits as shown on Standard Drawing RPM-110-06 or as directed by the Engineer. In the event signal detectors are present in the intersecting streets or roads, pave the crossroads to the right of way limit or back of the signal detector, whichever is the farthest back of the mainline. Surface or resurface these areas as directed by the Engineer. The Department will not measure placing and compacting for separate payment but shall be incidental to the Contract unit price for the asphalt mixtures.

ASPHALT PAVEMENT RIDE QUALITY CATEGORY B

The Department will apply Pavement Rideability Requirements on this project in accordance with Section 410, Category B.

FUEL AND ASPHALT PAY ADJUSTMENT

The Department has included the Contract items Asphalt Adjustment and Fuel Adjustment for possible future payments at an established Contract unit price of $1.00. The Department will calculate actual adjustment quantities after work is completed. If existing Contract amount is insufficient to pay all items on the contract with the adjustments, the Department will establish additional monies with a change order.

OPTION A

Be advised that the Department will accept compaction of asphalt mixtures furnished for driving lanes and ramps, at 1 inch (25mm) or greater, on this project according to OPTION A in accordance with Section 402 and Section 403 of the current Standard Specifications. The Department will require joint cores as described in Section 402.03.02 for surface mixtures only. The Department will accept compaction of all other asphalt mixtures according to OPTION B.

MATERIAL TRANSFER VEHICLE (MTV)

Provide and use a MTV in accordance with Sections 403.02.10 and 403.03.05.

SPECIAL NOTE FOR RAILROAD FLAGGING

Unless otherwise noted, Section references herein are to the Department's Standard Specifications for Road and Bridge Construction. All applicable portions of the Department's Standard Specifications apply unless specifically modified herein.

1. DESCRIPTION. It is estimated this project will require 20 days of railroad flagging. Guidelines for determining when flagging protection will be needed are included in the Special Provisions for Protection of Railroad Interest. The Daily Rate for this project will be $1500.

2. DEFINITION OF FLAGGING. The particular Railroad(s) involved in this project will define when flagging is required (see Summary for KYTC Projects That Involve a Railroad and Special Provisions for Protection of Railroad Interest) and the number of flaggers needed. At least 2 weeks notice is required before flagging will be provided, but it could take up to 30 days. It will remain the Contractor's responsibility to schedule work including any down time (such as winter) so as to minimize the use of flagging services. The Department retains no responsibility for coordinating flagging services between the Railroad and the Contractor.

3. REDUCTION AND EXTENSION OF RAILROAD FLAGGING TIME. Based upon the Kentucky Standard Specifications, any changes in contract time for this project will be by change order. If the nature of the work in the change order necessitates additional use of railroad flagging services, then that shall be identified in that change order and the number of calendar days for railroad flagging services shall be increased. By signing the change order, the contractor waives all rights to any future request to change the number of days of railroad flagging associated with the work in that change order. Since the number of days involves the cost to the Department and not the Contractor, the number of days of railroad flagging shall not be reduced.

4. MEASUREMENT. The Department will keep track of calendar days that railroad flagging is performed. This will include any day that any railroad flagger charges a minimum of 5 hours of onsite flagging. Except that from April 1st thru November 30th this will not include days where the Contractor cannot perform at least 5 hours of the work that necessitates railroad flagging due to weather, seasonal, or temperature limitations of the Specifications, or other conditions beyond the control of the Contractor as judged by the Engineer. From Dec 1st thru March 30th any day that any railroad flagger charges a minimum of 5 hours of onsite flagging then a calendar day of railroad flagging will be counted; without regard to weather, seasonal or temperature limitations of the Specifications. The Engineer will furnish the Contractor bi-weekly statements showing the number of railroad flagging days charged for the period. The Contractor acknowledges acceptance of, and agreement with, all bi-weekly statements unless the Contractor submits a written protest containing supporting evidence for a change within 14 calendar days of receiving the bi-weekly statement.

If the number of calendar days of railroad flagging has exceeded 20 days, then the Contractor will be charged for each day that additional flagging is needed multiplied by the Daily Rate. This will be in addition to any liquidated damages or other reimbursements that the contract or the Kentucky Standard Specifications may require. This charge will continue, based upon actual flagging use, until Formal Acceptance.

If upon Formal Acceptance the total number of calendar days that railroad flagging is performed is less than 20 days no additional monies will be given to the Contractor.

SPECIAL NOTE FOR FORMAL PARTNERING - DIGITAL PROJECT DELIVERY PILOT

This Special Note will apply when indicated in the plans or the proposal. Section references herein are to the Department's Current Standard Specifications for Road and Bridge Construction.

1.0 DESCRIPTION. This work consists of coordinating Formal Partnering as documentation described in this Special Note. This project has been identified as a KYTC Digital Project Delivery (DPD) Pilot. The DPD Pilot Program supports KYTC's commitment to provide streamlined digital deliverables from Project Development through Project Delivery.

2.0 MATERIALS AND RESOURCES.

2.1 MEETING FACILITY. Provide a meeting facility sufficient to house project partnering meetings. The Contractor and KYTC Project Engineer should agree upon the meeting location.

2.2 ADMINISTRATIVE STAFFING. Provide administrative staffing to record, produce, distribute meeting minutes, and process revisions. Revisions will be made after an agreed-upon review time by both parties has passed, and comments are received.

3.0 CONSTRUCTION. As soon as practical and before the start of work, the Contractor's on-site project manager and the Department's on-site representative will meet to review the contract documents. They will plan for both an initial Team Building Workshop and regularly scheduled partnering meetings. The Contractor's key on-site staff, subcontractors, the Department's personnel, the project's design consultant, and other stakeholders will be contacted to attend.

3.1 TEAM BUILDING WORKSHOP. The Team Building Workshop shall foster and encourage the partnering process so that the Contractor and the Department are a cohesive unit willing to work together to achieve successful completion of the project. The workshop may be co-facilitated by the Contractor and the Department, or an independent facilitator who is mutually satisfactory to the Contractor and the Department. The workshop will foster a mutually beneficial climate of problem solving so that the partners are equipped to jointly resolve issues that may arise during the execution of the contract.

3.2 REGULAR ON-SITE PROJECT MEETINGS. Schedule on-site project partnering meetings at regular intervals (bi-weekly unless both parties agree to a different schedule) to discuss and resolve issues regarding the project throughout the duration of the contract. The Contractor, subcontractor(s), and Department personnel will attend these meetings. The project's design engineering services consultant will be available and required to attend selected project meetings according to separately held contract terms administered by the Department. Department staff are responsible for coordinating with the project's design engineering services consultant to ensure attendance sufficient to fulfill the contract and support DPD objectives. The Department will organize training for contractors on any necessary software for the pilot project objectives with the support of Digital Project Delivery staff.

3.3 MEETING AGENDA. Prior to the meeting, the Contractor's on-site project manager and the Department's on-site representative will jointly develop an agenda. Agenda items should include Digital Project Delivery objectives for the project, as communicated by the Department's on-site representative with the support of Digital Project Delivery staff. The minutes of each meeting will be recorded and distributed to all partners. The Contractor will be responsible for hosting these meetings and taking and distributing the meeting minutes.

4.0 MEASUREMENT AND PAYMENT. All costs associated with developing and maintaining a Formal Partnership will be agreed to by both parties and shared equally. The Department will pay 50 percent of the costs for Formal Partnering to develop and maintain this partnership. The Department will make the payment under a Supplemental Agreement. The Department will consider payment as full compensation for all work required under this Special Note.

March 2024

SPECIAL NOTE

For Tree Removal

Grayson County
EXTEND THE WILLIAM THOMASON BYWAY (KY 3155) FROM THE SOUTHERN INTERSECTION AT KY 259 WESTERLY TO KY 54
Item No. 4-8954

NO CLEARING OF TREES 5 INCHES OR GREATER (DIAMETER BREAST HEIGHT) FROM MAY 15- JULY 31

If there are any questions regarding this note, please contact Danny Peake, Director, Division of Environmental Analysis, 200 Mero Street, Frankfort, KY 40601, Phone: (502) 564-7250.

SPECIAL NOTE FOR PIPELINE INSPECTION

1.0 DESCRIPTION. The Department will perform visual inspections on all pipe on the project. A video inspection will be required on projects having more than 250 linear feet of storm sewer and/or culvert pipe and on routes with an ADT of greater than 1,000 vehicles. Conduct video inspections on all pipe located under the roadway and 50 percent of the remaining pipe not under the roadway. Storm sewer runs and outfall pipes not under the roadway take precedence over rural entrance pipes. Contractors performing this item of work must be prequalified with the Department in the work type J51 (Video Pipe Inspection and Cleaning). Deflection testing shall be completed using a mandrel in accordance with the procedure outlined below or by physical measurement for pipes greater than 36inches in diameter. Mandrel testing for deflection must be completed prior to the video inspection testing. Unless otherwise noted, Section references herein are to the Department's Standard Specifications for Road and Bridge Construction, current edition.

2.0 VIDEO INSPECTION. Ensure pipe is clear of water, debris or obstructions. Complete the video inspection and any necessary measurement prior to placing the final surface over any pipe. When paving will not be delayed, take measurements 30 days or more after the completion of earthwork to within 1 foot of the finished subgrade. Notify the Engineer a minimum of 24 hours in advance of inspection and notify the Engineer immediately if distresses or locations of improper installation are logged.

2.1 INSPECTION FOR DEFECTS AND DISTRESSES

A) Begin at the outlet end and proceed through to the inlet at a speed less than or equal to 30 ft/minute. Remove blockages that will prohibit a continuous operation.

B) Document locations of all observed defects and distresses including but not limited to: cracking, spalling, slabbing, exposed reinforcing steel, sags, joint offsets, joint separations, deflections, improper joints/connections, blockages, leaks, rips, tears, buckling, deviation from line and grade, damaged coatings/paved inverts, and other anomalies not consistent with a properly installed pipe.

C) During the video inspection provide a continuous 360 degree pan of every pipe joint.

D) Identify and measure all cracks greater than 0.1" and joint separations greater than 0.5".

E) Video Inspections are conducted from junction to junction which defines a pipe run. A junction is defined as a headwall, drop box inlet, curb box inlet, manhole, buried junction, or other structure that disturbs the continuity of the pipe. Multiple pipe inspections may be conducted from a single set up location, but each pipe run must be on a separate video file and all locations are to be referenced from nearest junction relative to that pipe run.

F) Record and submit all data on the TC 64-765 and TC 64-766 forms.

3.0 MANDREL TESTING. Mandrel testing will be used for deflection testing. For use on Corrugated Metal Pipe, High Density Polyethylene Pipe, and Polyvinyl Chloride Pipe, use a mandrel device with an odd number of legs (9 minimum) having a length not less than the outside diameter of the mandrel. The diameter of the mandrel at any point shall not be less than the diameter specified in Section 3.6. Mandrels can be a fixed size or a variable size.

3.1 Use a proving ring or other method recommended by the mandrel manufacturer to verify mandrel diameter prior to inspection. Provide verification documentation for each size mandrel to the Engineer.

3.2 All deflection measurements are to be based off of the AASHTO Nominal Diameters. Refer to the chart in section 3.6.

3.3 Begin by using a mandrel set to the 5.0% deflection limit. Place the mandrel in the inlet end of the pipe and pull through to the outlet end. If resistance is met prior to completing the entire run, record the maximum distance achieved from the inlet side, then remove the mandrel and continue the inspection from the outlet end of the pipe toward the inlet end. Record the maximum distance achieved from the outlet side.

3.4 If no resistance is met at 5.0% then the inspection is complete. If resistance occurred at 5.0% then repeat 3.1 and 3.2 with the mandrel set to the 10.0% deflection limit. If the deflection of entire pipe run cannot be verified with the mandrel then immediately notify the Engineer.

3.5 Care must be taken when using a mandrel in all pipe material types and lining/coating scenarios. Pipe damaged during the mandrel inspection will be video inspected to determine the extent of the damage. If the damaged pipe was video inspected prior to mandrel inspection then a new video inspection is warranted and supersedes the first video inspection. Immediately notify the Engineer of any damages incurred during the mandrel inspection and submit a revised video inspection report.

3.6 AASHTO Nominal Diameters and Maximum Deflection Limits.

Base Pipe Diameter	AASHTO Nominal Diameter	Max. Deflection Limit	
		5.0%	10.0%
(inches)	(inches)	(inches)	
15	14.76	14.02	13.28
18	17.72	16.83	15.95
24	23.62	22.44	21.26
30	29.53	28.05	26.58
36	35.43	33.66	31.89
42	41.34	39.27	37.21
48	47.24	44.88	42.52
54	53.15	50.49	47.84
60	59.06	56.11	53.15

4.0 PHYSICAL MEASUREMENT OF PIPE DEFLECTION. Alternate method for deflection testing when there is available access or the pipe is greater than 36 inches in diameter, as per 4.1. Use a contact or non-contact distance instrument. A leveling device is recommended for establishing or verifying vertical and horizontal control.

4.1 Physical measurements may be taken after installation and compared to the AASHTO Nominal Diameter of the pipe as per Section 3.6. When this method is used, determine the smallest interior diameter of the pipe as measured through the center point of the pipe (D2). All measurements are to be taken from the inside crest of the corrugation. Take the D2 measurements at the most deflected portion of the pipe run in question and at intervals no greater than ten (10) feet through the run. Calculate the deflection as follows:

% Deflection = [(AASHTO Nominal Diameter - D2) / AASHTO Nominal Diameter] x 100%

Note: The Engineer may require that preset monitoring points be established in the culvert prior to backfilling. For these points the pre-installation measured diameter (D1) is measured and recorded. Deflection may then be calculated from the following formula:

$$\% \text{ Deflection} = [(D1 - D2) / D1] (100\%)$$

4.2 Record and submit all data.

5.0 DEDUCTION SCHEDULE. All pipe deductions shall be handled in accordance with the tables shown below.

FLEXIBLE PIPE DEFLECTION	
Amount of Deflection (%)	Payment
0.0 to 5.0	100% of the Unit Bid Price
5.1 to 9.9	50% of the Unit Bid Price [(1)]
10 or greater	Remove and Replace [(2)]

[(1)] Provide Structural Analysis for HDPE and metal pipe. Based on the structural analysis, pipe may be allowed to remain in place at the reduced unit price. [(2)] The Department may allow the pipe to remain in place with no pay to the Contractor in instances where it is in the best interest to the public and where the structural analysis demonstrates that the pipe should function adequately.

RIGID PIPE REMEDIATION TABLE PIPE	
Crack Width (inches)	Payment
≤ 0.1	100% of the Unit Bid Price
Greater than 0.1	Remediate or Replace [(1)]

(1) Provide the Department in writing a method for repairing the observed cracking. Do not begin work until the method has been approved.

6.0 PAYMENT. The Department will measure the quantity in linear feet of pipe to inspect. The Department will make payment for the completed and accepted quantities under the following:

Code	Pay Item	Pay Unit
24814EC	Pipeline Inspection	Linear Foot
10065NS	Pipe Deflection Deduction	Dollars

SPECIAL NOTE FOR ELECTRONIC DELIVERY MANAGEMENT SYSTEM (e-Ticketing)

This Special Note will apply when indicated on the plans or in the proposal. Section references herein are to the Department's Standard Specifications for Road and Bridge Construction current edition.

1.0 DESCRIPTION. Incorporate an e-Ticketing Delivery Software for weighed asphalt material delivered to the project to report loads and provide daily running totals of weighed asphalt material for pay items and incidental work during the construction processes from the point of measurement and loading to the point of incorporation to the project.

2.0 MATERIALS AND EQUIPMENT. Contractor shall supply material data in JavaScript Object Notation (JSON) documents to the KYTC e-Ticketing Delivery Software (KYTC e-Ticketing Portal) via Application Programming Interface (API) or direct connection. Test and verify that ticket data can be shared from the original source no fewer than 30 days prior to material placement activities. An e-Ticketing Delivery Software supplier can provide a qualified representative for on-site technical assistance during the initial setup, pre-construction verifications, and data management and processing as needed during the Project to maintain material data delivery capabilities. Virtual meetings may be hosted in lieu of on-site meetings when deemed appropriate by the Engineer.

Provide e-Ticketing Delivery Software that will meet the following:

1. The e-Ticketing Delivery Software shall be fully integrated with the Contractor's Load Read-Out scale system at the material source location.

2. The e-Ticketing Delivery Software shall provide real-time delivery to KYTC e-Ticketing Portal.

3. Transmit any updates to the ticket data within 5 minutes of a change.

3.0 CONSTRUCTION. Provide the Engineer with the manufacturer's specifications and all required documentation for data access at the pre-construction conference.

A. Construction Requirements

1. Install and operate software in accordance with the manufacturer's specifications.

2. Verify that all pertinent information is provided by the software within the requirements of this Special Note.

B. Data Deliverables

Provide to the Engineer a means in which to gather report summaries by way of iOS apps, web pages, or any other method at the disposal of the Engineer. The Engineer may request data at any time during the project.

1. Asphalt Material

a. **Real-time Continuous Data Items**

Provide the Engineer access to JSON documents capable of being transmitted through the KYTC's e-Ticketing Portal that displays the following information in real-time with a web-based system compatible with iOS and Windows environments.

- Each Truck
  - Supplier Name
  - Supplier Address
  - Supplier Phone
  - Plant location
  - Date
  - Time at source
  - Project Location

- Contract ID#
- Carrier Name
- Unique Truck ID
- Description of Material
- Mix Design Number
- Gross, Tare and Net Weight
- Weighmaster

4.0 MEASUREMENT. The Department will measure the electronic delivery management system as a lump sum item.

5.0 PAYMENT. The Department will make payment for the completed and accepted quantities under the following:

1. Payment is full compensation for all work associated with providing all required equipment, training, and documentation.

2. Payment will be full compensation for costs related to providing the e-Ticketing Delivery Software, including integration with plant load-out systems, and report viewing/exporting process. All quality control procedures including the software representative's technical support and on-site training shall be included in the Contract lump sum price.

Code	Pay Item	Pay Unit
26228EC	ELECTRONIC DELIVERY MGMT SYSTEM	LS

January 2024

SPECIAL NOTE FOR EXPERIMENTAL KYCT AND HAMBURG TESTING

1.0 General

1.1 Description. The KYCT (Kentucky Method for Cracking Test) and the Hamburg test results will help determine if the mixture is susceptible to cracking and rutting. During the experimental phase, data will be gathered and analyzed by the Department to determine the durability of the bituminous mixes. Additionally, the data will help the Department to create future performance-based specifications which will include the KYCT and Hamburg test methods.

2.0 Equipment

2.1 KYCT Testing Equipment. The Department will require a Marshall Test Press with digital recordation capabilities. Other CT testing equipment may be used for testing with prior approval by the Department.

2.2 Water Baths. One or more water baths will be required that can maintain a temperature of 77^{o} +/- 1.8^{o} F with a digital thermometer showing the water bath temperature. Also, one water bath shall have the ability to suspend gyratory specimen fully submerged in water in accordance with AASHTO T-166, current edition.

2.3 Hamburg Wheel Track Testing. The department encourages the use of the PTI APA/Hamburg Jr. test equipment to perform the loaded wheel testing. The Department will allow different equipment for the Hamburg testing, but the testing device must be approved by the Department prior to testing.

2.4 Gyratory Molds. Gyratory molds will be required to assist in the production of gyratory specimens in accordance with AASHTO T-312, current edition.

2.5 Ovens. Adequate (minimum of two ovens) will be required to accommodate the additional molds and asphalt mixture necessary to perform the acceptance testing as outlined in Section 402 of the Kentucky Standard Specifications for Road and Bridge Construction, current edition.

2.6 Department Equipment. The Department will provide gyratory molds, PINE 850 Test Press with digital recordation, and CT testing equipment to assist during this experimental phase so data can be gathered. Hamburg test specimens will be submitted to the Division of Materials for testing on the PTI APA/Hamburg Jr if the asphalt contractor or district materials office does not have an approved Hamburg testing device.

3.0 Testing Requirements

3.1 Acceptance Testing. Perform all acceptance testing and aggregate gradation as according with Section 402 and Section 403 of the Kentucky Standard Specifications for Road and Bridge Construction, current edition.

3.2 KYCT Testing. Perform crack resistance analysis (KYCT) in accordance with the current Kentucky Method for KYCT Index Testing during the mix design phase and during the plant production of all surface mixtures. For mix design approvals, submit KYCT results on the Department MixPack. For Class 4 mixtures, submit ingredient materials to the Division of Materials for verification.

3.2.1 KYCT Frequency. Obtain an adequate sample of hot mix asphalt to ensure the acceptance testing, gradation, and KYCT gyratory samples can be fabricated and is representative of the bituminous mixture. Acceptance specimens shall be fabricated first, then immediately after, fabricate the KYCT samples with the gyratory compactor in accordance with Section 2.4 of this Special Note. Analysis of the KYCT specimens and gradation will be required one per sublot produced from the same asphalt material and at the same time as the acceptance specimen is sampled and tested.

3.2.2 Number of Specimens and Conditioning. Fabricate specimens in accordance with the Kentucky Method for KYCT Index Testing. Contrary to the method, for field specimens, fabricate a minimum of 3 and up to 6 test specimens. The specimens shall be compacted at the temperature in accordance with KM 64-411. KYCT mix design specimens shall be short-term conditioned uncovered for four hours at compaction temperature in accordance with KM 64-411. Contrary to the Kentucky Method, plant produced bituminous material shall be short-term conditioned immediately after sampling for two hours uncovered in the oven at compaction temperature in accordance with KM 64-411. Additionally, fabricated specimens shall be allowed to cool in air (fan is permissible) for 30 minutes +/- 5 minutes and conditioned in a 77 °F water bath for 30 minutes +/- 5 minutes. To ensure confidence and reliability of the test results provided by KYCT testing and Hamburg testing, reheating of the asphalt mixture is prohibited.

3.2.3 Record Times. For each sublot, record the time required between drying aggregates in the plant to KYCT specimen fabrication. The production time may vary due to the time that the bituminous material is held in the silo. Record the preconditioning time when the time exceeds the one-hour specimen cool down time as required in accordance with The Kentucky Method for KYCT Index Testing. The preconditioning time may exceed an hour if the technician is unable to complete the test on the same day or within the specified times as outlined in The Kentucky Method for KYCT Index Testing. The production time and the preconditioning time shall be recorded on the AMAW.

3.2.4 File Name. As according to section 7.12 of The Kentucky Method for KYCT Index Testing, save the filename with the following format: “CID_Approved Mix Number_Lot Number_Sublot Number_ Date”

3.3 Hamburg Testing. Perform the rut resistance analysis (Hamburg) in accordance with AASTHO T-324, not to exceed 20,000 passes for all bituminous mixtures during the mix design phase and production. For mix design approvals, submit Hamburg results on the Department MixPack. For Class 4 mixtures, submit ingredient materials to the Division of Materials for informational verification.

3.3.1 Hamburg Testing Frequency. Perform testing and analysis per lot of material. The plant produced bituminous material sampled for the Hamburg test does not have to be obtained at the same time as the acceptance and KYCT sample. If the Hamburg test sample is not obtained at the same time as the KYCT sample, determine the Maximum Specific Gravity of the KYCT sample in accordance with AASHTO T-209 coinciding with the Hamburg specimens.

3.3.2 Record Times. Record the production time as according to section 3.2.3 in this special note. Also record the time that the specimens were fabricated and the time the Hamburg testing was started. All times shall be recorded on the AMAW.

3.3.3 File Name. Save the Excel spreadsheet with the following file name; "Hamburg_CID_Approved Mix Number_Lot Number_Sublot Number_Date" and upload the file into the AMAW.

4.0 Data

Submit the AMAW and all test data that was obtained for acceptance, gradation, KYCT, and Hamburg testing within five working days once all testing has been completed for a lot to Central Materials Lab and the District Materials Engineer. Also, any data and or comments that the asphalt contractor or district personnel deem informational during this experimental phase, shall also be submitted to the Central Materials Lab and the District Materials Engineer. Any questions or comments regarding any item in this Special Note can be directed to the Central Office, Division of Materials, Asphalt Branch.

5.0 Payment

Any additional labor and testing equipment that is required to fabricate and test the KYCT and Hamburg specimens shall be considered incidental to the asphalt surface line item. The Department will perform the testing for the KYCT and Hamburg specimens if a producer does not possess the proper equipment.

June 15th, 2022

TEAM KENTUCKY TRANSPORTATION CABINET

KENTUCKY TRANSPORTATION CABINET
Department of Highways
DIVISION OF RIGHT OF WAY & UTILITIES

TC 62-226
Rev. 01/2016
Page 1 of 1

RIGHT OF WAY CERTIFICATION

☒ Original	☐ Re-Certification	RIGHT OF WAY CERTIFICATION	
ITEM #	**COUNTY**	**PROJECT # (STATE)**	**PROJECT # (FEDERAL)**
4-8954	Grayson	12F0 FD52 043 93621 01R	STP 5374 (011)
PROJECT DESCRIPTION			
EXTEND THE WILLIAM THOMASON BYWAY (KY 3155) FROM THE SOUTHERN INTERSECTION AT KY 259 WESTERLY TO KY 54			

☐ **No Additional Right of Way Required**

Construction will be within the limits of the existing right of way. The right of way was acquired in accordance to FHWA regulations under the Uniform Relocation Assistance and Real Property Acquisitions Policy Act of 1970, as amended. No additional right of way or relocation assistance were required for this project.

☒ **Condition # 1 (Additional Right of Way Required and Cleared)**

All necessary right of way, including control of access rights when applicable, have been acquired including legal and physical possession. Trial or appeal of cases may be pending in court but legal possession has been obtained. There may be some improvements remaining on the right-of-way, but all occupants have vacated the lands and improvements, and KYTC has physical possession and the rights to remove, salvage, or demolish all improvements and enter on all land. Just Compensation has been paid or deposited with the court. All relocations have been relocated to decent, safe, and sanitary housing or that KYTC has made available to displaced persons adequate replacement housing in accordance with the provisions of the current FHWA directive.

☐ **Condition # 2 (Additional Right of Way Required with Exception)**

The right of way has not been fully acquired, the right to occupy and to use all rights-of-way required for the proper execution of the project has been acquired. Some parcels may be pending in court and on other parcels full legal possession has not been obtained, but right of entry has been obtained, the occupants of all lands and improvements have vacated, and KYTC has physical possession and right to remove, salvage, or demolish all improvements. Just Compensation has been paid or deposited with the court for most parcels. Just Compensation for all pending parcels will be paid or deposited with the court prior to AWARD of construction contract

☐ **Condition # 3 (Additional Right of Way Required with Exception)**

The acquisition or right of occupancy and use of a few remaining parcels are not complete and/or some parcels still have occupants. All remaining occupants have had replacement housing made available to them in accordance with 49 CFR 24.204. KYTC is hereby requesting authorization to advertise this project for bids and to proceed with bid letting even though the necessary right of way will not be fully acquired, and/or some occupants will not be relocated, and/or the just compensation will not be paid or deposited with the court for some parcels until after bid letting. KYTC will fully meet all the requirements outlined in 23 CFR 635.309(c)(3) and 49 CFR 24.102(j) and will expedite completion of all acquisitions, relocations, and full payments after bid letting and prior to AWARD of the construction contract or force account construction.

Total Number of Parcels on Project	49	EXCEPTION (S) Parcel #	ANTICIPATED DATE OF POSSESSION WITH EXPLANATION
Number of Parcels That Have Been Acquired			
Signed Deed	33		
Condemnation	16		
Signed ROE	16		

Notes/ Comments (Text is limited. Use additional sheet if necessary.)

LPA RW Project Manager		Right of Way Supervisor	
Printed Name		Printed Name	Michael H Price
Signature		Signature	Michael H Price
Date		Date	10/26/2023

Right of Way Director		FHWA	
Printed Name		Printed Name	No Signature Required as per FHWA-KYTC Current Stewardship Agreement
Signature	Kelly R. Divine Digitally signed by Kelly Divine Date: 2023.10.27 06:51:44 -05'00'	Signature	
Date		Date	

UTILITIES AND RAIL CERTIFICATION NOTE

Grayson County

FD06 043 3155 NEWRT
Mile point: TO
EXTEND THE WILLIAM THOMASON BYWAY (KY 3155) FROM THE SOUTHERN INTERSECTION AT KY 259 WESTERLY TO KY 54. (16CCN)(18CCN)(2020CCR) (2022CCR)
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PROJECT NOTES ON UTILITIES

The contractor should be aware that there is UTILITY WORK INCLUDED IN THIS ROAD CONSTRUCTION CONTRACT. The Contractor shall review the GENERAL UTILITY NOTES AND INSTRUCTIONS which may include KYTC Utility Bid Item Descriptions, utility owner supplied specifications, plans, list of utility owner preapproved subcontractors, and other instructions. Utility contractors may be added via addendum if KYTC is instructed to do so by the utility owner. Potential contractors must seek prequalification from the utility owner. Any revisions must be sent from the utility owner to KYTC a minimum of one week prior to bid opening.

For all projects under 2000 Linear feet which require a normal excavation locate request pursuant to KRS 367.4901-4917, the awarded contractor shall field mark the proposed excavation or construction boundaries of the project (also called white lining) using the procedure set forth in KRS 367.4909(9)(k). For all projects over 2000 linear feet, which are defined as a “Large Project” in KRS 367.4903(18), the awarded contractor shall initially mark the first 2000 linear feet minimally of proposed excavation or construction boundaries of the project to be worked using the procedure set forth in KRS 367.4909(9)(k). This temporary field locating of the project excavation boundary shall take place prior to submitting an excavation location request to the underground utility protection Kentucky Contact Center. For large projects, the awarded contractor shall work with the impacted utilities to determine when additional white lining of the remainder of the project site will take place. This provision shall not alter or relieve the awarded contractor from complying with requirements of KRS 367.4905 to 367.4917 in their entirety.

Please Note: The information presented in this Utility Note is informational in nature and the information contained herein is not guaranteed.

The contractor will be responsible for contacting all utility facility owners on the subject project to coordinate his activities. The contractor will coordinate his activities to minimize and, where possible, avoid conflicts with utility facilities. Due to the nature of the work proposed, it is unlikely to conflict with the existing utilities beyond minor facility adjustments. Where conflicts with utility facilities are unavoidable, the contractor will coordinate any necessary relocation work with the facility owner and Resident Engineer. The Kentucky Transportation Cabinet maintains the right to remove or alter portions of this contract if a utility conflict occurs. The utility facilities as noted in the previous section(s) have

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FD52 043 9362101U
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been determined using data garnered by varied means and with varying degrees of accuracy: from the facility owners, a result of S.U.E., field inspections, and/or reviews of record drawings. The facilities defined may not be inclusive of all utilities in the project scope and are not Level A quality, unless specified as such. It is the contractor's responsibility to verify all utilities and their respective locations before excavating.

The contractor shall make every effort to protect underground facilities from damage as prescribed in the Underground Facility Damage Protection Act of 1994, Kentucky Revised Statute KRS 367.4901 to 367.4917. It is the contractor's responsibility to determine and take steps necessary to be in compliance with federal and state damage prevention directives. The contractor is instructed to contact KY 811 for the location of existing underground utilities. Contact shall be made a minimum of two (2) and no more than ten (10) business days prior to excavation. The contractor shall submit Excavation Locate Requests to the Kentucky Contact Center (KY 811) via web ticket entry. The submission of this request does not relieve the contractor from the responsibility of contacting non-member facility owners, whom are to be contacted through their individual Protection Notification Center. It may be necessary for the contractor to contact the County Court Clerk to determine what utility companies have facilities in the area. Non-compliance with these directives can result in the enforcement of penalties.

NOTE: DO NOT DISTURB THE FOLLOWING FACILITIES LOCATED WITHIN THE PROJECT DISTURB LIMITS

The Contractor is fully responsible for protection of all utilities listed above

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THE FOLLOWING FACILITY OWNERS ARE RELOCATING/ADJUSTING THEIR FACILITIES WITHIN THE PROJECT LIMITS AND WILL BE COMPLETE PRIOR TO CONSTRUCTION

Windstream Holdings II, LLC Telephone - On Ky 54, the existing facilities run along the existing R/W on the south side and has been relocated to the new pole route construct by WRECC which runs along the proposed R/W on the south side starting at Lt Sta. 39+00 and continues to Lt Sta. 60+00 where it ties into the existing facilities at the existing R/W line. Completed 9/25/24.

Warren Rural Electric Cooperative Corporation – Electric – Has adjusted aerial facilities along; KY 54 on the south side which ran along the existing R/W line to the proposed new R/W from Lt Sta. 39+00 to 60+00 on the south side; new mainline from Rt & Lt Sta 929+65, Rt & Lt Sta 929+75 to Lt Sta 936+00, Rt Sta 938+50 to 941+00, crossing from Rt Sta 943+00 to Lt Sta 945+00, Lt Sta 950+00 to Lt Sta. 979+00, Lt Sta 979+00 to Rt Sta 980+65; US 62 are approximate Lt Sta 36+00 to Lt 58+00 50 with crossing at 40+00, 46+75, 47+25, 51+80; Quarry Road crossing at beginning Lt 68+00 to RT 73+00 & crossing at 73+00; English Street crossing at Sta 49+65; Rhodes Street crossing from Rt Sta. 52+00 to Lt 53+00; Watkins Woods Dr. from Rt 10+00 to 11+40; Watkins Woods approach from RT & LT Sta 53+00 to Rt Sta. 54+50. Completed 8/13/2023.

Warren Rural Electric Cooperative Corporation – Fiber- Has adjusted existing fiber facilities along KY 54 on the south side from the old electric pole route to the new electric pole route from approximately Lt. Station 43+00 to 61+00. They have adjusted facilities along mainline at approximately Lt. Station 68+75 to Rt Station 72+85 and runs off R/W to private property. Complete June 2023.

Kentucky Utilities – Transmission – Has adjusted their aerial facilities that cross the mainline at approximately 914+25. Completed 12/20/23.

Comcast Communications – CATV – Has existing aerial facilities that are on the south side of KY 54 which been moved to the new electric pole route established by Warren Rural Electric Cooperative Corporation starting at Lt Sta. 39+00 to Lt Sta. 60+00. Work was completed 12/31/23.

Grayson County Water District –Water - Phase 1, has an existing 8-inch water line on the north of side of US 62 from station 34+00 to station 58+00. A new water line per this project is being installed from Lt 34+00 to Lt Station 51+00. A new 8-inch water main has been installed on south side of US 62 from Lt.

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Station 51+00 outside of Right of Way to station 58+00 that has three crosses to the north side at station 51+15, 53+15 and 55+33.

THE FOLLOWING FACILITY OWNERS HAVE FACILITIES TO BE RELOCATED/ADJUSTED BY THE OWNER OR THEIR SUBCONTRACTOR AND IS TO BE COORDINATED WITH THE ROAD CONTRACT

Windstream Holdings II, LLC – Telephone – On US 62, the existing aerial lines are on the south side of US 62, fiber & copper facilities from Lt Sta. 35+00 to Lt 38+50 are being buried along existing R/W, from Lt Sta 38+50 to approximately Lt 58+00 going aerial along the proposed R/W to end of project limits. Anticipated completion August 30th, 2025.

Comcast – Cable - has aerial facilities along the south side existing US 62 from approximate Lt. Station 34+00 to station 68+00 that are to be relocated to the new pole route that Windstream has established further south and has an additional relocation to take place along Main Line LT & RT Station 975+28 to LT & Rt station 980+00. This work is anticipated to be completed by August 31, 2025.

Brandenburg Telephone– Telephone - BBTel has aerial facilities along existing US 62 on the south side. These aerial facilities will be relocated to the new Windstream pole route that is further south along US 62 starting at approximately station 35+00 to station 58+00. Anticipated completion August 31, 2025.

THE FOLLOWING FACILITY OWNERS HAVE FACILITIES TO BE RELOCATED/ADJUSTED BY THE ROAD CONTRACTOR AS INCLUDED IN THIS CONTRACT

Grayson County Water District – Water – Phase 2 – Has an existing water line 8-inch water line that is to be abandoned on the north side of US from Rt Station 34+00 to Rt 54+00. A new 8-inch water line is to be constructed on the south side of US 62 from Lt Sta 34+00 to Lt Sta 51+00 with a crossing at Sta 46+75.

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City of Leitchfield – Gas – Has existing 6-inch gas line along the south side of KY 54 Lt Sta. 39+00 to 60+00. One new crossing is be constructed at the following at station 43+50 while two service crossing are to be constructed at Stations 48+00 & 55+00. Relocation of the existing gas line occurs from Station 48+00 to 49+10, crossing mainline Lt Sta. 906+70+00 to Rt Sta. 907+00 to Rt Sta. 906+70.

RAIL COMPANIES HAVE FACILITIES IN CONJUNCTION WITH THIS PROJECT AS NOTED

☐ **No Rail Involvement** ☒ **Rail Involved** ☐ **Rail Adjacent**

Paducah & Louisville Railway – Railroad – Has an existing crossing at station 930+16.59. A new separated grade crossing will be built at Sta 929+21.37.

UTILITIES AND RAIL CERTIFICATION NOTE

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AREA FACILITY OWNER CONTACT LIST

Facility Owner	Address	Contact Name	Phone	Email
Brandenburg Telephone Co. - Telephone	2840 Leitchfield Rd Elizabethtown KY 42702	Kyle Dalton	2709824466	kyle.dalton@brandenburgtel.com

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City of Leitchfield - Natural Gas	314 W. White Oak St., P.O. Box 398 Leitchfield KY 42755	Dwight Embry	2702594034	dwight.embry@leitchfield.org
City of Leitchfield - Sewer	314 W. White Oak St., P.O. Box 398 Leitchfield KY 42755	Dwight Embry	2702594034	dwight.embry@leitchfield.org
City of Leitchfield - Water	314 W. White Oak St., P.O. Box 398 Leitchfield KY 42755	Dwight Embry	2702594034	dwight.embry@leitchfield.org
Comcast Communications - CATV	2919 Ring Rd. Elizabethtown KY 42701	Steve Gaddie	2704011543	stephen_gaddie@comcast.com
Grayson County Water District - Water	21 Shull White Road Leitchfield ky 42754	Jeremy Woosley	2702592917	kshaw@graysonwater.com
Kentucky Utilities - Electric Distrib	820 West Broadway Louisville KY 40202	Caroline Justice	5026273708	caroline.justice@lge-ku.com
Paducah and Louisville Railway - Railroad	200 Clark Street Paducah KY 42003	Floyd Bishop	2704444386	fbishop@palrr.com
Warren Rural Electric Cooperative Corporation - Electric	P.O. Box 1118 Bowling Green KY 42102	Jonathan Lindsey	2708426541	jonathanl@wrecc.com
Windstream Holdings II, LLC - Telephone	111 South Main Street Elizabethtown KY 42701	Steve Johnson	8593576209	steve.johnson@windstream.com

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SPECIAL NOTES FOR PROTECTION OF RAILROAD INTEREST

Paducah and Louisville Railway, Inc.

I. AUTHORITY OF RAILROAD ENGINEER AND STATE ENGINEER:

A. The authorized representative of the Railroad Company, hereinafter referred to as Railroad Engineer, shall have final authority in all matters affecting the safe maintenance of Railroad traffic of his Company including the adequacy of the foundations and structures supporting the Railroad tracks.

B. The authorized representative of the State, hereinafter referred to as the Engineer, shall have authority over all other matters as prescribed herein and in the Project Specifications.

II. NOTICE OF STARTING WORK:

A. The Contractor shall not commence any work on Railroad rights of way until he has complied with the following conditions:

1. Given the Railroad written notice, with copy to the Engineer who has been designated to be in charge of the work, **at least ten (10) days in advance** of the date he proposes to begin work on Railroad rights of way. **If flagging service is required, such notice shall be submitted at least thirty (30) days in advance** of the date scheduled to commence work. The Railroad's Contact information is on the Summary Sheet.

2. Obtain written authorization from the Railroad to begin work on Railroad rights of way, such authorization to include an outline of specific conditions with which he must comply.

3. Obtain written approval from the Railroad of Railroad Protective Insurance Liability coverage as required by paragraph 14 herein.

4. Furnish a schedule for all work within the Railroad rights of way as required by paragraph 7, B, 1.

B. The Railroad's written authorization to proceed with the work shall include the names, addresses, and telephone numbers of the Railroad's representatives who are to be notified as hereinafter required. Where more than one representative is

designated, the area of responsibility of each representative shall be specified.

III. INTERFERENCE WITH RAILROAD OPERATIONS:

A. The Contractor shall so arrange and conduct his work that there will be no interference with Railroad operations, including train, signal, telephone and telegraphic services, or damage to the property of the Railroad Company or to poles, wires, and other facilities of tenants on the rights of way of the Railroad Company. Whenever work is liable to affect the operations or safety of trains, the method of doing such work shall first be submitted to the Railroad Engineer for approval, but such approval shall not relieve the Contractor from liability. Any work to be performed by the Contractor which requires flagging service or inspection service (watchman) shall be deferred by the Contractor until the flagging protection required by the Railroad is available at the job site.

B. Whenever work within Railroad rights of way is of such a nature that impediment to Railroad operations such as use of runaround tracks or necessity for reduced speed is unavoidable, the Contractor shall schedule and conduct his operations so that such impediment is reduced to the absolute minimum.

C. Should conditions arising from, or in connection with the work, require that immediate and unusual provisions be made to protect operations and property of the Railroad, the Contractor shall make such provisions. If in the judgment of the Railroad Engineer, or in his absence, the Engineer, such provisions are insufficient, either may require or provide such provisions, as he deems necessary. In any event, such unusual provisions shall be at the Contractor's expense and without cost and/or time to the Railroad or the State.

IV. TRACK CLEARANCES

A. The minimum track clearances to be maintained by the Contractor during construction are shown on the Project Plans. However, before undertaking any work within Railroad rights of way, or before placing any obstruction over any track, the Contractor shall:

1. Notify the Railroad's representative **at least 72 hours in advance** of the work.

2. Receive assurance from the Railroad's representative that arrangements have been made for flagging service as necessary.

3. Receive permission from the Railroad's representative to proceed with the work.

4. Ascertain that the Engineer has received copies of notice to the Railroad and

of the Railroad's response thereto.

V. CONSTRUCTION PROCEDURES

A. General:

1. Construction work on Railroad property shall be:

   a) Subject to the inspection and approval of the Railroad.

   b) In accord with the Railroad's written outline of specific conditions.

   c) In accord with the Railroad's general rules, regulations and requirements including those relating to safety, fall protection and personal protective equipment.

   d) In accord with all Special Notes, Summaries, and Addendums.

2. The Railroad requires a submission of construction procedure that meets the requirements of these Special Notes and attachments. The Railroad's **submittal review period is thirty (30) days. Resubmissions will be reviewed within 2 weeks.**

B. Excavation and shoring:

1. The sub grade of an operated track shall be **maintained with edge of berm at least 10'0" from centerline of track and not more than 24 inches below top of rail.** Contractor will not be required to make existing section meet this specification if substandard, in which case the existing section will be maintained.

2. The Contractor will be required to take special precaution and care in connection with excavating and shoring pits, and in driving piles, or sheeting for footings adjacent to tracks to provide adequate lateral support for the tracks and the loads which they carry, without disturbance of track alignment and surface, and to avoid obstructing track clearances with working equipment, tools or other material. The procedure for doing such work, including need of and plans for shoring, shall first be approved by the Engineer and the Railroad Engineer, but such approval shall not relieve the Contractor from liability.

3. The Contractor shall submit a detailed procedure for the installing of sheeting/shoring adjacent to Railroad Tracks.

4. Shoring protection shall be provided when excavating adjacent to an active track or railroad facility or as determined by the Railroad. Shoring will be provided in accordance with AREMA *Manual for Railway Engineering*

Chapter 8, part 28; except as noted below.

5. Shoring may not be required if all of the following conditions are satisfied:
   a. Excavation does not encroach upon a 1½ horizontal: 1 vertical theoretical slope line starting 1'-6" below top of rail and at 12'-0" minimum from centerline of the track (live load influence zone).

   b. Track is on level ground or in a cut section and on stable soil.

   c. Excavation does not adversely impact the stability of a Railroad facility (i.e. signal bungalow, drainage facility, undergrade bridge, building, etc.)

   d. Shoring is not required by any governing construction code.

6. When the track is on an embankment, excavating the toe of the embankment without shoring may affect the stability of the embankment. Therefore, excavation of the embankment toe without shoring will not be permitted.

7. Trench boxes are prohibited for use on Railroad property within the theoretical live load influence zone.

8. The required protection is the cofferdam type that completely encloses the excavation. Where dictated by conditions, partial cofferdams with opened sides away from the track may be used. Cofferdams shall be constructed using steel piling, or when approved by the engineer, steel soldier piles with timber lagging. Wales and struts shall be provided and designed as needed. The following shall be considered when designing cofferdams:

   a. Shoring shall be designed to resist a vertical lice load surcharge of 1,880 lbs. per square foot, in addition to active earth pressure. The surcharge shall be assumed to act on a continuous strip, 8'6" wide. Lateral pressures due to surcharge shall be computed using the strip load formula shown in AREMA *Manual for Railway Engineering*, Chapter 8, Part 20.

   b. Allowable stresses in materials shall be in accordance with AREMA *Manual for Railway Engineering,* Chapter 7, 8, and 15.

   c. A construction procedure for temporary shoring shall be shown on the drawing.

   d. All shoring systems on or adjacent to Railroad right-of-way shall be equipped with railings or other approved fall protection.

   e. A minimum horizontal clearance of 10'-0" from centerline of the track to face of nearest point of shoring shall be maintained provided a 12'-0" roadbed is maintained with a temporary walkway and handrail system.

9. The Contractor shall submit the following drawings and calculations (all shall be signed/sealed by a Professional Engineer) for the Railroad's review and approval.

   a. Six (6) sets of detailed drawings of the shoring systems showing sizes of all structural members, details of connections, and distances from centerline of track to face of shoring. Drawing shall show a section showing height of shoring and track elevation in relation to bottom of excavation.

   b. Six (6) sets of calculations of the shoring design. The drawings and calculations shall be prepared by a Licensed Professional Engineer and shall bear the Engineer's seal and signature. Shoring plans shall be approved by the Railroad's construction engineering and inspection representative.

   c. For sheeting and shoring within 18'-0" of the centerline of the track, the live load influence zone, and in sloes, the Contractor shall use interlocked steel sheeting (sheet pile).

   d. Sheet pile installed in slopes or within 18'-0" of the centerline shall not be removed.

   e. Sheet pile shall be cut off a minimum of 3'-0" below the finished grade, ditch line invert, or as directed by the Engineer. The ground shall be backfilled and compacted immediately after sheet pile is cut off.

   f. A procedure for cutting off the sheet pile and restoring the embankment shall be submitted to the Engineer for review and acceptance.

C. Demolition Procedure:

1. Railroad tracks and other railroad property, including signals, structures, and other facilities, must be protected from damage during the procedure. No crane or equipment may be set on the rails or track structure and no material may be dropped on Railroad property.

2. The Contractor is required to submit a plan showing the location of cranes, horizontally and vertically, operating radii, with delivery or disposal locations shown. The location of all tracks and other railroad facilities as well as all obstructions such as wire lines, poles, adjacent structures, etc. must also be shown.

3. Crane rating sheets showing cranes to be adequate for **150% of the actual weight of the pick.** A complete set of crane charts, including crane,

counterweight, and boom nomenclature is to be submitted.

4. Plans and computations showing the weight of the pick must be submitted. Calculations shall be made from plans of the existing and/or proposed structure showing complete and sufficient details with supporting data for the demolition or erection of the structure. If plans do not exist, lifting weights must be calculated from field measurements. If possible, field measurements shall be taken with a Railroad representative present.

5. A data sheet must be submitted listing the types, size, and arrangements of all rigging and connection equipment. The safe working load capacity of all rigging and connecting equipment shall be 150% above the calculated weight of the pick.

6. A complete procedure is to be submitted, including the order of lifts, time required for each lift, and any repositioning or re-hitching of the crane or cranes.

7. All erection or demolition plans, procedures, data sheets, etc. submitted must be prepared, signed and sealed by a Registered Professional Engineer.

8. The Railroad's representative must be present at the site during the entire demolition and erection procedure period.

9. All procedures, plans and calculations shall first be approved by the Engineer and the Railroad Engineer, but such approval does not relieve the Contractor from liability.

10. Loads shall not be supported while any trains are passing if that piece of equipment has the capacity to foul a 50' envelope.

11. The names and experience of the key Contractor personnel involved in the operation shall be included in the Contractor's means and methods submission.

12. Existing, obsolete, bridge piers shall be removed to a minimum of 3'-0" below the finished grade, final ditch line invert, or as directed by the Engineer.

13. A minimum quantity of 25 tons of Railroad approved track ballast may be required to be furnished and stockpiled on site by the Contractor, or as directed by the Engineer.

14. On-track or ground debris shields such as crane mats are prohibited.

15. Overhead Demolition Debris Shield – Shall be installed prior to the

demolition of a bridge deck or other relevant portions of the superstructure.

a. The demolition debris shield shall be erected from the underside of the bridge over the track area to catch all falling debris.

b. The Contractor shall include the demolition debris shield installation/removal means and methods as part of the proposed Controlled Demolition procedure submission.

c. The demolition debris shield shall provide 23'-0" minimum vertical clearance if the existing clearance is less than 23'-0" as approved by the Railroad. Horizontal clearance to the centerline of the track should not be reduced unless approved by the Engineer.

d. The vertical clearance ATR (above top of rail) is measured from the top of rail to the lowest point on the overhead shielding system measured within a distance of 6'-0" out from each side of the track centerline.

e. The demolition debris shield design and supporting calculations, all signed/sealed by a Professional Engineer, shall be submitted for review and acceptance.

f. The demolition debris shield shall have a **minimum** design load of 50 pounds per square foot **plus** the weight of the equipment, debris, personnel, and other loads to be carried.

g. The Contractor shall include the proposed bridge deck removal procedure in its demolition means and methods and shall verify that the size and quantity of the demolition debris generated by the procedure does not exceed the shield design loads.

h. The contractor shall clean the demolition debris shield daily or more frequently as dictated either by the approved design parameters or as directed by the Engineer.

16. Vertical Demolition Shield – This type of shield may be required for substructure removals in close proximity to track and other facilities, as determined by the Engineer.

a. Prior to commencing the demolition activity, the Contractor shall install a ballast protection system consisting of geotextile to keep the railroad ballast from becoming fouled with construction or demolition debris and fines. The geotextile ballast protection system shall be installed and maintained by the Contractor for the project duration in accordance with the attached plan, or with additional

measures as directed by the Engineer.

b. The Contractor shall submit detailed plans, with detailed calculations, prepared and submitted by a Professional Engineer of the protection shield and ballast protection systems for approval prior to the start of demolition.

c. Blasting will not be permitted to demolish a structure over or within Railroad right-of-way.

17. The Controlled Demolition procedure must be approved by the Engineer prior to undertaking work on the project.

18. The Contractor shall provide timely communication to the Engineer when scheduling the demolition related work so that the Engineer may be present during the entire demolition procedure.

19. At any time during demolition activities, the Engineer may require revisions to the previously approved procedures to address weather, site conditions or other circumstances which may create a potential hazard to rail operations or Railroad facilities. Such revisions may require immediate interruption or termination of ongoing activities until such time the issue is resolved to the Engineer's satisfaction. The Railroad shall not be responsible for any additional costs or time claims associated with such revisions.

D. *Erection Procedure:*

The Contractor shall submit a detailed procedure for performing erection on/about Railroad property.

1. The Contractor shall submit six (6) copies of the detailed procedure for erection of the proposed structures over or adjacent to the tracks or right-of-way. This procedure shall include a plan showing the locations of cranes, horizontally and vertically, operating radii, with staging locations shown, including beam placement on ground or truck unloading staging plan. Plan should also include the location of all tracks, other railroad facilities; wires, poles, adjacent structures, or buried utilities that could be affected, showing that the proposed lifts are clear of these obstructions should be shown. No crane or equipment may be set on the rails or track structure.

2. Also included with this submittal the following information:

a. As-Built Bridge Seat Elevations - All as-built bridge seats and top of rail elevations shall be furnished to the Engineer for review and verification at least 30 days in advance of construction or erection, to ensure that minimum vertical clearances as approved in the plans will be achieved.

b. Computations showing weight of picks must be submitted. Computations shall be made from plans of the structure beams being erected and those plans or sections thereof shall also be included in the submittal; the weight shall include the weight of concrete or other materials including lifting rigging.

c. Crane rating sheets showing cranes to be adequate for 150% of the actual weight of the pick. A complete set of crane charts, including crane, counterweight, maximum boom angle, and boom nomenclature is to be submitted. Safety factors that may have been "built in" to the crane charts are not to be considered when determining the 150% Factor of Safety.

d. A data sheet shall be prepared listing the type, size and arrangements of slings, shackles, or other connecting equipment. Include copies of a catalog or information sheets for specialized equipment. All specific components proposed for use shall be clearly identified and highlighted in the submitted documents. The safe working load capacity of the connecting equipment shall be 150% above the calculated weight of the pick.

e. A complete written procedure is to be included that describes the sequence of events, indicating the order of lifts and any repositioning or rehitching of the crane or cranes.

f. A time schedule for each of the various stages must be shown as well as a schedule for the entire lifting procedure. The proposed time frames for all critical sub tasks (i.e., performing aerial splices, installing temporary bracing, etc.) shall be furnished so that the potential impact(s) to Railroad operations may be assessed and eliminated or minimized.

g. The names and experience of the key Contractor personnel involved in the operation shall be included in the Contractor's means and methods submission.

h. Design and supporting calculations prepared by the Professional Engineer for items including the temporary support of components or intermediate stages shall be submitted for review. A guardrail will be required to be installed in a track where a temporary bent is located within twelve (12) feet from the centerline of that track.

3. The proposed Erection procedure must be approved by the Engineer prior to

undertaking work on the project.

4. The Contractor shall provide timely communication to the Engineer when scheduling the erection related work so that the Engineer may be present during the entire erection procedure.

5. At any time during construction activities, the Engineer may require revisions to the previously approved procedures to address weather, site conditions or other circumstances which may create a potential hazard to rail operations or Railroad facilities. Such revisions may require immediate interruption or termination of ongoing activities until such time the issue is resolved to the Engineer's satisfaction. The Railroad shall not be responsible for any additional costs or time claims associated with such revisions.

E. Blasting:

1. The Contractor shall obtain advance approval of the Railroad Engineer and the Engineer for use of explosive on or adjacent to Railroad property. The request for permission to use explosives shall include a detailed blasting plan. If permission for use of explosives is granted, the Contractor will be required to comply with the following:

   a) Blasting shall be done with light charges under the direct supervision of a responsible officer or employee of the Contractor and a licensed blaster.

   b) Electric detonating fuses shall not be used because of the possibility of premature explosions resulting from operation of two-way train radios.

   c) No blasting shall be done without the presence of an authorized representative of the Railroad. **At least 10 days advance notice** to the person designated in the Railroad's notice of authorization to proceed (see paragraph 2B above) will be required to arrange for the presence of an authorized Railroad representative and such flagging as the Railroad may require.

   d) Have at the job site adequate equipment, labor and materials and allow sufficient time to clean up debris resulting from the blasting without delay to trains, as well as correcting at his expense any track misalignment or other damage to Railroad property resulting from the blasting as directed by the Railway's authorized representative. If his actions result in delay of trains, the Contractor shall bear the entire cost thereof.

   e) Explosives shall not be stored on Railroad Property.

   f) At any time during the blasting activities, the Engineer may require

revisions to the previously approved procedures to address weather, site conditions, or other circumstance which may create a potential hazard to rail operations or Railroad facilities. Such revisions may require immediate interruption or termination of ongoing activities until such time the issue is resolved to the Engineer's satisfaction. The Railroad shall not be responsible for any additional costs or time claims associated with such revisions.

2. The Railroad representative will:

   a) Determine the approximate location of trains and advise the Contractor the approximate amount of time available for the blasting operation and clean-up.

   b) Have the authority to order discontinuance of blasting if, in his opinion, blasting is too hazardous or is not in accord with these Special Notes.

F. Track Monitoring:

The Contractor shall submit for Railroad review and approval, a detailed track monitoring program to detect both horizontal and vertaical movement of the track and roadbed, a minimum of 30-days in advance of start of work.

1. For the installation of temporary or permanent shoring systems, including but not limited to soldier piles and lagging, and interlocked steel sheeting on or adjacent to the Railroad's right-of-way, the contractor may be required to submit a detailed track monitoring program for the Railroad's approval prior to performing any work near the Railroad's right-of-way.

2. The program shall specify the survey locations, the distance between the location points, and frequency of monitoring before, during, and after construction. The Railroad reserves the right to modify the survey locations and monitoring frequency as necessary during the project.

3. The survey data shall be collected in accordance with the approved frequency and immediately furnished to the Engineer for analysis.

4. If any movement has occurred as determined by the Engineer, the Railroad will be immediately notified. The Railroad, at its sole discretion, shall have the right to immediately require all contractor operations to be ceased, have the excavated area immediately backfilled and/or determine what corrective action is required. Any corrective action required by the Railroad or performed by the Railroad including monitoring of corrective action of the contractor will be at project expense.

G. Maintenance of Railroad Facilities:

1. The Contractor will be required to maintain all ditches and drainage structures free of silt or other obstructions which may result from his operations and provide and maintain any erosion control measures as required. The Contractor shall provide erosion control measures during construction and use methods that accord with applicable state standard specifications for road and bridge construction, including either (1) silt fence; (2) berm or temporary ditches; (3) sediment basin; (4) aggregate checks; and (5) channel lining. The Contractor will promptly repair eroded areas with Railroad rights of way and to repair any other damage to the property of the Railroad or its tenants at the Contractor's expense.

2. All maintenance and repair of damages due to the Contractor's operations shall be done at the Contractor's expense.

H. Storage of Materials and Equipment:

1. Materials and equipment shall not be stored where they will interfere with Railroad operations, nor on the rights of way of the Railroad Company without first having obtained permission from the Railroad Engineer, and such permission will be with the understanding that the Railroad Company will not be liable for damage to such material and equipment from any cause and that the Railroad Engineer may move or require the Contractor to move, at the Contractor's expense, such material and equipment.

2. All grading or construction machinery that is left parked near the track unattended by a watchman shall be effectively immobilized so that it cannot be moved by unauthorized persons. The Contractor shall protect, defend, indemnify and save Railroad, and any associated, controlled or affiliated corporation, harmless from and against all losses, costs, expenses, claim or liability for loss or damage to property or the loss of life or personal injury, arising out of or incident to the Contractor's failure to immobilize grading or construction machinery.

I. Cleanup:

1. Upon completion of the work, the Contractor shall remove from within the limits of the Railroad rights of way, all machinery, equipment, surplus materials, falsework, rubbish or temporary buildings of the Contractor, and leave said rights of way in a neat condition satisfactory to the Chief Engineer of the Railroad or his authorized representative.

VI. DAMAGES:

A. The Contractor shall assume all liability for any and all damages to his/her work, employees, equipment and materials caused by Railroad traffic.

B. Any cost incurred by the Railroad for repairing damages to its property or to property of its tenants, caused by or resulting from the operations of the Contractor, shall be paid directly to the Railroad by the Contractor.

VII. FLAGGING SERVICES:

A. When Required:

1. Flagging services will not be provided until the contractor's insurance has been reviewed & approved by the Railroad.

2. Under the terms of the agreement between the Department and the Railroad, the **Railroad has sole authority to determine the need for flagging** required to protect its operations. In general, the requirements of such services will be whenever the Contractor's personnel or equipment are likely to be, working on the Railroad's rights of way, or across, over, adjacent to, or under a track, or when such work has disturbed or is likely to disturb a railroad structure or the railroad roadbed or surface and alignment of any track to such extent that the movement of trains must be controlled by flagging. If any element (workers, equipment, tools, scaffolding, etc.) may exist or fall within 25-feet of the edge of track, a flagman is necessary.

3. Normally, the Railroad will assign one flagman to a project; but in some cases, more than one may be necessary, such as yard limits where three- (3) flagmen may be required. However, if the Contractor works within distances that violate instructions given by the Railroad's authorized representative or performs work that has not been scheduled with the Railroad's authorized representative, a flagman or flagmen may be required until the project has been completed.

B. Scheduling and Notification:

1. Not later than the time that approval is initially requested to begin work on Railroad rights of way, Contractor shall furnish to the Railroad and the Department a schedule for all work required to complete the portion of the project within Railroad rights of way and arrange for a job site meeting between the Contractor, the Department, and the Railroad's authorized representative. Flagman or Flagmen may not be provided until the job site meeting has been conducted and the Contractor's work scheduled.

2. The Contractor will be required to give the Railroad representative **at least**

10 working days of advance written notice of intent to begin work within Railroad rights of way. If it is necessary for the Railroad to advertise a flagging job for bid, it **may take up to 90-days to obtain service**. Once begun, when work is suspended at any time for any reason, the Contractor will be required to give the Railroad representative **at least 3 working days of notice** before resuming work on Railroad rights of way. Such notice shall include sufficient details of the proposed work to enable the Railroad representative to determine if flagging will be required. If such notice is in writing, the Contractor shall furnish the Engineer a copy; if notice is given verbally it shall be confirmed in writing with copy to the Engineer. If flagging is required, no work shall be undertaken until the flagman, or flagmen is present at the job site. It **may take up to 30 days to obtain flagging initially** from the Railroad. When flagging begins the flagman is usually assigned by the Railroad to work at the project site on a continual basis until no longer needed and may be unable to be called for on a spot basis. If flagging becomes unnecessary and is suspended, it **may take up to 10 days to again obtain flagging services** from the Railroad. Due to labor agreements, it is necessary to give **5 working days notice before flagging service may be discontinued** and responsibility for payment stopped.

3. If, after the flagman is assigned to the project site, emergencies arise which require the flagman's presence elsewhere, and then the Contractor shall delay work on Railroad rights of way until such time as the flagman is again available. Any additional costs resulting from such delay shall be borne by the Contractor and not the Department or Railroad.

4. When demobilizing, the Contractor shall contact the flagman to avoid unnecessary flagging charges. This communication shall be documented.

C. Payment:

1. **The Cabinet will be responsible for paying the Railroad directly for any and all costs of flagging,** which may be required to accomplish the construction. **The Contractor shall adhere to the Special Note for Railroad Flagging, if applicable, and may be charged for flagging in excess of the allowable days, per said Special Note.**

2. The estimated cost of flagging is listed on the Summary Sheet. The charge to the Cabinet by the Railroad will be the actual cost based on the rate of pay for the Railroad's employees who are available for flagging service at the time the service is required.

3. Railroad work involved in preparing and handling bills will also be charged to the Cabinet. Charges to the Cabinet by the Railroad shall be in accordance with applicable provisions of 23 CRF 140, Subpart I and 23 CRF 646, Subpart B. Flagging costs are subject to change. The above estimates of flagging cost are provided for information only and are not binding in any way.

D. Verification:

1. The Contractor and Department will review and sign the Railroad flagman's time sheet, attesting that the flagman was present during the time recorded. Flagman may be removed by Railroad if form is not signed. If flagman is removed, the Contractor will not be allowed to re-enter the Railroad rights of way until the issue is resolved. Any complaints concerning flagman or flagmen must be resolved in a timely manner. If need for flagman or flagmen is questioned, please contact the Railroad's Representative listed on the Project Summary Sheet. All verbal complaints must be confirmed in writing by the Contractor within 5 working days with copy to the Highway Engineer. All written correspondence should be addressed to the Railroad's Representative listed on the Project Summary Sheet.

2. The Railroad flagman assigned to the project will be responsible for notifying the Project Engineer upon arrival at the job site on the first day (or as soon thereafter as possible) that flagging services begin and on the last day that he performs such services for each separate period that services are provided. The Project Engineer will document such notification in the project records. When requested, the Project Engineer will also sign the flagman's diary showing daily time spent and activity at the project site.

VIII. HAUL ACROSS RAILROAD:

A. Where the plans show or imply that materials of any nature must be hauled across a Railroad, unless the plans clearly show that the State has included arrangements for such haul in its agreement with the Railroad, the Contractor will be required to make all necessary arrangements with the Railroad regarding means of transporting such materials across the Railroad. The Contractor will be required to bear all costs incidental, including flagging, to such crossings whether services are performed by his own forces or by Railroad personnel.

B. *No crossing may be established for use of the Contractor for transporting materials or equipment across the tracks of the Railroad Company unless specific authority for is installation, maintenance, necessary watching and flagging thereof and removal, all at the expense of the Contractor, is first obtained from the Railroad Engineer.* ***The approval process for an agreement normally takes 90-days.***

IX. WORK FOR THE BENEFIT OF THE CONTRACTOR:

A. All temporary or permanent changes in wire lines or other facilities which are considered necessary to the project are shown on the plans; included in the force account agreement between the State and the Railroad or will be covered by appropriate revisions to same which will be initiated and approved by the State and/or the Railroad.

B. Should the Contractor desire any changes in addition to the above, then he shall make separate arrangements with the Railroad for same to be accomplished at the Contractor's expense.

X. COOPERATION AND DELAYS:

A. It shall be the Contractor's responsibility to arrange a schedule with the Railroad for accomplishing stage construction involving work by the Railroad or tenants of the Railroad. In arranging his schedule he shall ascertain, from the Railroad, the lead time required for assembling crews and materials and shall make due allowance therefore.

B. Train schedules cannot be provided to the Contractor. It is the Contractor's responsibility to contact the Railroad in order to arrange "Track Time." This "Track Time" will be an agreed upon prearranged time period that the Railroad will, without undue burden, schedule no train traffic to facilitate the Contractor's work on or near Railroad right-of-way. This track time must be arranged ***at least 48 hours prior to the date of need.***

C. No charge or claims of the Contractor against either the Department or the Railroad will be allowed for hindrance or delay on account of railroad traffic; any work done by the Railroad or other delay incident to or necessary for safe maintenance of Railroad traffic or for any delays due to compliance with these Special Notes.

D. The Contractor shall cooperate with others participating in the construction of the Project to the end that all work may be carried on to the best advantage.

E. The Railroad does not assume any responsibility for work performed by others in connection with the Project. No claims of the Contractor against the Railroad for any inconvenience, delay, or additional cost incurred by the Contractor on account of operations by others.

XI. TRAINMAN'S WALKWAYS:

A. Along the outer side of each exterior track of multiple operated track, and on each side of single operated track, an unobstructed continuous space suitable for

trainman's use in walking along trains, extending to a line not less than 10 feet from centerline of track, shall be maintained. Any temporary impediments to walkways and track drainage encroachments or obstructions allowed during work hours while Railroad's protective service is provided shall be removed before the close of each day. If there is any excavation near the walkway, a handrail, with ***10'-0" minimum clearance from centerline of track,*** *shall be placed.*

XII. GUIDELINES FOR PERSONNEL ON RAILROAD RIGHTS OF WAY:

A. All persons shall wear hard hats. Appropriate eye and hearing protection must be used. Working in shorts is prohibited. Shirts must cover shoulders, back and abdomen. Working in tennis or jogging shoes, sandals, boots with high heels, cowboy and other slip on type boots is prohibited. Hard-sole, lace-up footwear, zippered boots cinched with straps which fit snugly about the ankle are adequate. Safety boots are strongly recommended.

B. No one is allowed within ***25' of the centerline of the track*** *without specific authorization from the flagman.*

C. All persons working near track when train is passing are to look out for dragging bands, chains and protruding or shifting cargo.

D. No one is allowed to cross tracks without specific authorization from the flagman.

E. All welders and cutting torches working within ***25' of track must stop when train is passing.***

F. No steel tape or chain will be allowed to cross or touch rails without permission.

XIII. GUIDELINES FOR EQUIPMENT ON RAILROAD RIGHTS OF WAY:

A. No crane or boom equipment will be allowed to set up to work or park within ***boom distance plus 15' of centerline of track*** *without specific permission from railroad official and flagman.*

B. No crane or boom equipment will be allowed to foul track or lift a load over the track without flag protection and track time.

C. All employees will stay with their machines when crane or boom equipment is pointed toward track.

D. All cranes and boom equipment under load will stop work while a train is passing

(including pile driving).

E. Swinging loads must be secured to prevent movement while train is passing.

F. No loads will be suspended above a moving train.

*G. No equipment will be allowed within **25' of centerline of track** without specific authorization of the flagman.*

H. Trucks, tractors or any equipment will not touch ballast line without specific permission from railroad official and flagman.

*I. No equipment or load movement **within 25' or above a standing train or other equipment** without specific authorization of the flagman.*

*J. All operating equipment within **25' of track must halt operations when a train is passing**. All other operating equipment may be halted by the flagman if the flagman views the operation to be dangerous to the passing train.*

K. All equipment, loads and cables are prohibited from touching rails.

L. While clearing and grubbing, no vegetation will be removed from railroad embankment with heavy equipment without specific permission from the Railroad Engineer and flagman.

M. No equipment or materials will be parked or stored on Railroad's property unless specific permission is granted from the Railroad Engineer.

N. All unattended equipment that is left parked on Railroad property shall be effectively immobilized so that it can not be moved by unauthorized persons.

O. All cranes and boom equipment will be turned away from track after each work day or whenever unattended by an operator.

XIV. INSURANCE:

A. In addition to any other forms of insurance or bonds required under the terms of the contract and specifications, the Contractor will be required to carry insurance of the following kinds:

1. Statutory Workers' Compensation and Employer's Liability insurance.

2. An Occurrence Form Railroad Protective Policy with limits of not less than Five Million ($5,000,000.00) Dollars per occurrence for Bodily Injury Liability, Property Damage Liability and Physical Damage to Property, with Ten Million ($10,000,000.00) Dollars aggregate for the term of the policy with respect to Bodily Injury, Liability, Property Damage Liability and

Physical Damage to Property.

3. Automobile Liability in an amount not less than One Million ($1,000,000.00) Dollars combined single limit.

4. Comprehensive General Liability in an amount not less than Five Million ($5,000,000.00) Dollars combined single limit. In the event the policy is a Claims Made Policy, coverage shall include an aggregate of Ten Million ($10,000,000.00) Dollars. Limits may be accomplished by use of underlying coverage with an umbrella as long as the umbrella follows form.

   Each policy shall name P&L as a named insured and shall provide for not less than ten (10) days prior written notice to P&L of cancellation of, or any material change in the policies. The policies shall not contain any exclusions related to doing business on, near, or adjacent to Railroad facilities.

   Applicant shall provide P&L with a Certificate of Insurance evidencing such coverage and, upon request, shall deliver a certified, true and complete copy of the policy or policies to P&L.

   It is understood that, so long as this Agreement shall remain in force, P&L shall have the right, from time to time, to revise the amount or form of insurance coverage's provided in this exhibit as circumstances or changing economic conditions may require. P&L shall give Applicant written notice of any such requested change at least thirty (30) days prior to the date of expiration of the then existing policy or policies and Applicant shall provide P&L with such revised policy or policies therefore or otherwise agree to modify the Agreement to remove the limitation of indemnification to Applicant’s limits of insurance.

   All insurance provided must be primary and shall not be reduced or limited by any insurance procured by P&L.

XV. FAILURE TO COMPLY:

A. *These Special Notes are supplemental and amendatory to the current edition of the Kentucky Department of Highways' Standard Specifications for Road and Bridge Construction and amendments thereof, and where in conflict therewith, these Special Notes shall govern.*

B. *In the event the Contractor violates or fails to comply with any of the requirements of these Special Notes:*

1. The Railroad Engineer may require that the Contractor vacate Railroad property.

2. The Engineer may withhold all monies due the Contractor on monthly

statements.

3. Any such orders shall remain in effect until the Contractor has remedied the situation to the satisfaction of the Railroad Engineer and the Engineer.

XVI. PAYMENT FOR COST OF COMPLIANCE:

A. No separate payment will be made for any extra cost incurred on account of compliance with these Special Notes. All such cost shall be included in prices bid for other items of the work as specified in the payment items.

Kentucky Transportation Cabinet
Division of Right of Way & Utilities

TC 69-008
Rev. 4-2020
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SUMMARY FOR KYTC PROJECTS THAT INVOLVE A RAILROAD

Date: 12/04/2024 *(enter using mm/dd/yyyy format)*

This project actively involves the below listed railroad company. This Project Summary provides an abbreviated listing of project specific railroad data. The detailed needs of the specified railroad company are included in the Special Notes for Protection of Railroad Interest in the proposal package. By submitting a bid, the contractor attests that they have dutifully considered and accepted the provisions as defined in both documents.

GENERAL ROAD PROJECT INFORMATION *(This section must be provided by KYTC)*

County: Grayson
Federal Number: STP 5374 011
State Number: FD52 043 9362101U
Route: KY 3155
Project Description: Leitchfield Bypass
Item Number: 4 - 8954.00 **Highway Milepost:** New

GENERAL RAIL INFORMATION *(The below sections must be provided by Railroad Company)*

Rail Company Name: Paducah and Louisville Railway
DOT# (if applicable): TBD **Railroad Milepost:** 72.75-73.41
Freight: Train Count (6am to 6pm): 4 **Train Count (6pm to 6am):** 3 **Train Count (24 hr total):** 7 **Max Speed:** 30mph
Passenger: Train Cnt. (6am to 6pm): 0 **Train Cnt. (6pm to 6am):** 0 **Train Cnt. (24 hr total):** 0 **Max Speed:** N/A
(This information is necessary to acquire the necessary insurances when working with Railroad Right of Way)

INSURANCE REQUIREMENTS

The named insured, description of the work and designation of the job site to be shown on the Policy are as follows:

(a) Named Insured: Paducah and Louisville Railway
(b) The project description should be as indicated in the General Road Project Information section.
(c) The designation of the jobsite is the route, Milepost, and AAR-DOT# listed above.

FLAGGING INFORMATION

Flagging Estimate:

KYTC will be responsible for paying all flagging costs. Contractor shall adhere to the Special Note for Railroad Flagging if applicable.

Hourly Rate:

$2268 per based on a hour day effective as of the date of this document.

Work by a flagman in excess of 8 hours per day or 40 hours per week, but not more than 12 hours a day will result in overtime pay at 1 ½ times the appropriate rate. Work by a flagman in excess of 12 hours per day will result in overtime pay at 2 times the appropriate rate. If work is performed on a holiday, the flagging rate is 2 ½ times the normal rate.

Forecasted Rate Increases:

Rates will increase to $ per based on a hour day effective *(enter using M/d/yyyy format)*.

RAILROAD CONTACTS

(*to be provided by Railroad Company)*

General Railroad Contact:

Floyd Bishop, VP and Chief Engineer
200 Clark Street Paducah, KY 42003
(Phone) (270) 444 4386
(Email) fbishop@palrr.com

Regional Representative (Roadmaster):

To Be Provided

(Phone)
(Email)

Insurance contact:

(Phone)
(Email)

Railroad Designer Contact:

Contractor ☐

Wayne Bolen, Project Manager, Rails Division
Alfred Benesch & Company
(Phone) (859) 250 5483
(Email) WBolen@benesch.com

Railroad Construction Contact:

Contractor ☑

Wayne Bolen, Project Manager, Rails Division
Alfred Benesch & Company
(Phone) (859) 250 5483
(Email) WBolen@benesch.com

KENTUCKY TRANSPORTATION CABINET CONTACTS (*to be provided by KYTC)*

KYTC Railroad Coordinator:

Allen Rust, PE
Div. of Right of Way & Utilities
Kentucky Transportation Cabinet
200 Mero Street, 5th Floor East
Frankfort, Kentucky 40622
(Phone) 502-782-4950
(Email) allen.rust@ky.gov

KYTC Construction Procurement Director:

Rachel Mills, Director
Div. of Construction Procurement
Kentucky Transportation Cabinet
200 Mero Street, 3rd Floor West
Frankfort, Kentucky 40622
(Phone) 502-782-5152
(Email) Rachel.Mills@ky.gov

KYTC Construction Director:

Matt Simpson, Director
Div. of Construction
Kentucky Transportation Cabinet
200 Mero Street, 3rd Floor West
Frankfort, Kentucky 40622
(Phone) 502-564-4780
(Email) Matt.Simpson@ky.gov

The project specific information provided herein is valid as of the date indicated. However, the specific information may be subject to change due to the normal business operations of all parties. The terms and conditions defined here, and in the bid proposal in its entirety, are inclusive and constant.

SPECIAL NOTE FOR RAILROAD FLAGGING

Unless otherwise noted, Section references herein are to the Department's Standard Specifications for Road and Bridge Construction. All applicable portions of the Department's Standard Specifications apply unless specifically modified herein.

1. DESCRIPTION. It is estimated this project will require 20 days of railroad flagging. Guidelines for determining when flagging protection will be needed are included in the Special Provisions for Protection of Railroad Interest. The Daily Rate for this project will be $2,000.00

2. DEFINITION OF FLAGGING. The particular Railroad(s) involved in this project will define when flagging is required (see Summary for KYTC Projects That Involve a Railroad and Special Provisions for Protection of Railroad Interest) and the number of flaggers needed. At least 2 weeks notice is required before flagging will be provided, but it could take up to 30 days. It will remain the Contractor's responsibility to schedule work including any down time (such as winter) so as to minimize the use of flagging services. The Department retains no responsibility for coordinating flagging services between the Railroad and the Contractor.

3. REDUCTION AND EXTENSION OF RAILROAD FLAGGING TIME. Based upon the Kentucky Standard Specifications, any changes in contract time for this project will be by change order. If the nature of the work in the change order necessitates additional use of railroad flagging services, then that shall be identified in that change order and the number of calendar days for railroad flagging services shall be increased. By signing the change order, the contractor waives all rights to any future request to change the number of days of railroad flagging associated with the work in that change order. Since the number of days involves the cost to the Department and not the Contractor, the number of days of railroad flagging shall not be reduced.

4. MEASUREMENT. The Department will keep track of calendar days that railroad flagging is performed. This will include any day that any railroad flagger charges a minimum of 5 hours of onsite flagging. Except that from April 1st thru November 30th this will not include days where the Contractor cannot perform at least 5 hours of the work that necessitates railroad flagging due to weather, seasonal, or temperature limitations of the Specifications, or other conditions beyond the control of the Contractor as judged by the Engineer. From Dec 1st thru March 30th any day that any railroad flagger charges a minimum of 5 hours of onsite flagging then a calendar day of railroad flagging will be counted; without regard to weather, seasonal or temperature limitations of the Specifications. The Engineer will furnish the Contractor bi-weekly statements showing the number of railroad flagging days charged for the period. The Contractor acknowledges acceptance of, and agreement with, all bi-weekly statements unless the Contractor submits a written protest containing supporting evidence for a change within 14 calendar days of receiving the bi-weekly statement.

If the number of calendar days of railroad flagging has exceeded 20 days, then the Contractor will be charged for each day that additional flagging is needed multiplied by the Daily Rate. This will be in addition to any liquidated damages or other reimbursements that the contract or the Kentucky Standard Specifications may require. This charge will continue, based upon actual flagging use, until Formal Acceptance.

If upon Formal Acceptance the total number of calendar days that railroad flagging is performed is less than 20 days no additional monies will be given to the Contractor.

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DESIGN AND CONSTRUCTION STANDARD SPECIFICATIONS

VOLUME 1

OFFICE OF:
VICE PRESIDENT - ENGINEERING
JACKSONVILLE, FLORIDA
REVISED: March 1, 2021



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PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall remove miscellaneous debris including but not limited to small structures, weeds, matted leaves and other materials unsuitable for roadbed embankment. ENGINEER will direct CONTRACTOR as to what material constitutes miscellaneous debris.

B. Miscellaneous debris removal shall be placed at an approved disposal site.

1.2 MEASUREMENT AND PAYMENT

A. Specification provided for information only. Measurement and payment shall be included as incidental to the respective grading pay items. No separate payment shall be made for Miscellaneous Debris Removal.

END OF SECTION 020100

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PART 1 - GENERAL

1.1 DESCRIPTION

A. The entire area in which work is to be performed, either by CONTRACTOR, the railroad or both shall be cleared and grubbed under this item.

B. Clearing and Grubbing shall conform to the following:

1. Clearing and grubbing shall include the work of removing from the construction site all trees, brush, and stumps. Stump removal may be omitted in areas that are to receive more than five (5) feet of fill.

2. Clearing shall apply for the entire area of the roadway, stream channels, ditches, yards, station grounds, and other areas within the limits of the project, including borrow pits, if applicable.

3. Trees removed under this item shall become the property of CONTRACTOR, unless otherwise indicated on the plans or stated in the proposal, and the disposal of the trees, cuttings, stumps including the major root system within two feet of the ground surface, and all other items not required for reuse in construction, shall be disposed of by CONTRACTOR outside the limits of CSXT right-of-way where the material will cause no obstruction to the flood channels of streams and will not detract from the appearance of the roadbed. All root mats shall be removed to a depth of not less than two feet below the existing surface.

4. Clearing and grubbing shall progress a sufficient distance in advance of the grading to permit cross-sectioning and setting of slope stakes.

5. All materials accumulated by the clearing and grubbing operation shall be removed from the property of CSXT. Merchantable timber shall become the property of CONTRACTOR unless otherwise specified.

6. In localities having special regulations relative to the removal and disposal of infected trees or other matter, CONTRACTOR shall consult the proper authority and proceed with the removal in the approved manner.

7. The removal and disposal of all materials shall be performed without injury to property of CSXT or others, except as modified in this section.

C. Clearing shall consist of the cutting of all trees stumps, brush, shrubs and other vegetation at a level not more than six (6) inches above the existing ground, as well as the subsequent disposal of all cut material and other fallen timber, fallen branches and other surface litter. Cut off should be horizontal to the ground without leaving sharp edges and spear type remains.

D. All low-hanging and/or unsound branches on trees or shrubs shall be removed. All branches overhanging the railroad roadbed are to be trimmed so as to provide a twenty-three (23) foot vertical clearance above the top of rail at all distances within twenty-five (25) feet from the centerline of proposed track.

E. Where necessary, CONTRACTOR will be responsible for permitting and clearing an area beyond the limits shown on plans so as to provide sufficient room for all trades to perform their work. This work will be at CONTRACTOR's expense and accountability.

F. Grubbing shall consist of the removal and disposal of all stumps, roots, embedded logs and all boulders and debris visible on the surface. Boulders may be disposed of within the railroad right-of-way as designated by ENGINEER.

1.2 MEASUREMENT AND PAYMENT

A. Measurement of the item CLEARING & GRUBBING shall be in acres measured to the nearest tenth which have been actually cleared, grubbed and authorized by the ENGINEER. Measurement shall include all areas of excavation and embankment to ten feet beyond toe of slopes and top of cuts or as shown on the plans and extend to the toe of the ballast. Temporary access and haul roads; Contractor laydown and material areas; and all other areas cleared due to the Contractor's means and methods will not be included in the measurement.

B. Payment for the item CLEARING & GRUBBING shall be at the unit price bid and be full compensation for supplying all labor, materials, equipment, tools, and all else necessary to clear, grub, measure, dispose of materials, and all else necessary.

PART 2 - PRODUCTS

A. Not used.

PART 3 - EXECUTION

3.1 EXECUTION

A. All the material removed under this item becomes the property of CONTRACTOR. This material shall be hauled, at CONTRACTOR's expense, off the railroad's property. If a waste area is established on the railroad's property, CONTRACTOR may waste the material there in a manner satisfactory to ENGINEER and in accordance with all federal, state and local laws.

B. CONTRACTOR may elect to burn combustible material in areas where burning is permitted. After first obtaining all necessary permits, CONTRACTOR may burn combustible material in a manner safe to all concerned. Ashes produced by burning shall be treated as waste material and be disposed of accordingly.

C. Where excavation is required, the site shall be grubbed to a depth equal to a minimum of two (2) feet below the proposed subgrade or slope surfaces except at locations where the depth of excavation precludes the execution of this item.

D. Where fill is required and the proposed embankment subgrade and slopes are less than five (5) feet above the existing ground, the site shall be grubbed to a minimum depth of two (2) feet below the existing ground.

E. Where fill is required and the proposed embankment subgrade and slopes are equal to or more than five (5) feet above the existing ground, CONTRACTOR may forego the grubbing of sound stumps, roots and non-perishable objects. Stumps, roots, and non-perishable objects which are not grubbed must not extend more than six (6) inches above the original ground line.

F. All trees and stumps are to be cut a minimum of six (6) inches below the existing ground line at locations under a proposed embankment or within ten (10) feet of the toe of slope of a proposed embankment

G. Except in areas to be excavated, all depressions and holes created by the removal of stumps, roots and objectionable material shall be backfilled and compacted prior to the placement of fill material.

END OF SECTION 020105

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall furnish all plant, tools, materials, equipment, labor and supervision and perform all tasks to furnish and grade topsoil, furnish and place seed, fertilizer, lime, mulch, and other materials, etc. at the locations as shown on, or required by, the drawings, as specified herein, and/or as directed by ENGINEER.

B. Contractor should follow Local/State DOT specs, however, if state specification is not appropriate, use the following materials.

1.2 MEASUREMENT AND PAYMENT

A. Measurement of item SEEDING & MULCHING shall be by the Acre for which a satisfactory stand of grass has been initiated for all areas directed by the Engineer to be planted for final seeding. Temporary seeding shall be in erosion control section item.

B. Payment for item SEEDING & MULCHING shall be at the unit price bid for the acreage on which a satisfactory stand of grass has been initiated as directed by the Engineer and be full compensation for all labor, equipment , tools, materials, supplies and all else necessary.

PART 2 - MATERIALS

2.1 TOPSOIL

A. Reusable topsoil shall be limited to friable loam, reasonably free of subsoil, clay lumps, brush, roots, weeds or other objectionable vegetation, stones or similar objects larger than one inch in any dimension, litter, or other materials unsuitable or harmful to plant growth, and shall not contain less than 5% nor more than 20% organic matter, as determined by current AASHTO Designation T-194.

B. Furnished topsoil shall conform to the following grade analysis:

Sieve	Minimum Percent Passing
2”	100
No. 4	80
No. 10	60

C. Sand, silt, and clay material passing the No. 10 sieve shall be as defined by current AASHTO Designation M 146 and shall be present within the following ranges:

	Minimum Percent	Maximum Percent
Sand	0	75
Silt	10	95
Clay	5	20

2.2 FERTILIZER AND LIMESTONE

A. Fertilizer shall be 5-20-20 at 800 pounds per acre or 0-20-20 at 800 pounds per acre with an additional 40 pounds per acre of nitrogen derived from organic matter.

B. Lime shall be agricultural limestone (pulverized).

2.3 SEED

A. Seed mixtures shall have the following consistency:

Formula and Species	Percent by Weight (%)	Minimum Percent (%)		Max. Percent Weed Seed (%)
		Purity	Germination	
Creeping Red Fescue	15	98	85	0.15
Timothy	20	98	85	0.15
Alsite Clover	20	97	90	0.10
Perennial Rye Grass	20	98	90	0.15
Birdsfoot Trefoil	15	98	80	0.10
Wild White Clover	10	97	90	0.10

B. CONTRACTOR may also use the governing State's DOT Seed Formula in lieu of the above specified seed mixture.

2.4 MULCH

A. Mulches for seeded areas shall be one or a combination of the following (or as indicated or specified): hay, straw, wood cellulose, rotted manure, or any substance submitted by CONTRACTOR and approved by ENGINEER.

B. Hydro-mulch will be anchored with a plastic base soil adhesive, such as "Soil-Saver" or an approved equal as directed by ENGINEER.

C. Mulching shall be free from mature seed-bearing stalks or roots of prohibited or noxious weeds as defined by the State Department of Agriculture and DOT for which the project is situated.

PART 3 - EXECUTION

3.1 GENERAL

A. Mechanical application of the seed, fertilizer, lime, mulch and mulch anchorage by hydro-seeding is acceptable. Alternative methods of mechanical applications shall be approved by ENGINEER.

B. CONTRACTOR shall be responsible for the maintenance of all seeded and mulched areas until the entire project has been completed and accepted. This shall include the watering of all areas seeded until such time as growth has occurred and acceptance given. Acceptable grass seed growth shall be blade growth of over three inches and a corresponding quantity of root growth very near the ratio of 1 to 1. RAILROAD reserves the right to test this seed growth in a manner that will yield the true grass system growth.

C. All areas outside the grading limits, where the vegetative growth has been disturbed or destroyed by operations of CONTRACTOR, shall be conditioned, limed, fertilized and seeded as required for the project with formulas and rates typical of the project and mulched in accordance with these Specifications. The cost of this treatment will be borne by CONTRACTOR.

3.2 TOPSOIL

A. For slopes and areas possessing sufficient topsoil, scarify and loosen soil surfaces to a depth of six (6) inches lateral to the face of the slope. Loosened topsoil shall be moistened, if dry, immediately prior to placing seed. The area shall be cleared of all stones and/or debris two (2) inches or larger.

B. Slopes and other areas requiring topsoil shall be dressed and shaped to provide for uniform placement of the topsoil. These areas shall be cleared of all stones and/or debris two (2) inches or larger in any dimension and shall be loosened to a depth of two inches. The topsoil shall then be spread over the prepared areas in such quantities as necessary to obtain the four inch depth after natural settlement and compaction and shall be raked free of all material unsuitable for or harmful to plant growth. It shall then be compacted by means of a roller weighing not more than 120 pounds per foot width. Immediately prior to placing of the topsoil, the area shall be wetted thoroughly.

C. Topsoil shall not be placed over frozen ground.

3.3 FERTILIZER AND LIMESTONE

A. Upon completion of the topsoil placement, agricultural pulverized limestone and fertilizer shall be applied uniformly to the soil areas specified to be so treated. On all topsoiled areas, the lime and fertilizer application shall be incorporated into the soil to a depth of at least two inches.

B. Lime shall be applied at a rate of two (2) tons per acre.

C. The soil will have a minimum pH of 6.0. If this is not met by the soil prior to seeding, the soil shall be chemically treated so that the soil pH will be brought above 6.0.

3.4 SEEDING

A. Seed shall be applied at a rate of seventy-five (75) pounds per acre.

B. Seeding shall be performed within the following seeding dates or as approved in writing by ENGINEER:

1. March 1 to June 1
2. August 1 to October 1

C. All seeds proposed to be used shall meet the approval of the state's Department of Agriculture and DOT for the state in which the project is located. RAILROAD reserves the right to test, reject or accept all seed delivered to the project site. All seeds are to be furnished in separate varieties, separately packaged or bagged, and shall be labeled, tagged or marked with identifying characteristics.

D. Once the fertilizer and lime have been worked into place, the seeding shall be done to the quantity and limits as specified herein. Seed shall be uniformly sown on the designated areas and "broomed" into the soil to a depth of 1/8-inch. ENGINEER shall check the quantity and uniformity of application.

E. After the seed has been sown, all soil areas 3:1 and flatter shall be rolled immediately with an approved roller weighing not more than 65 pounds per foot of width.

3.5 MULCHING

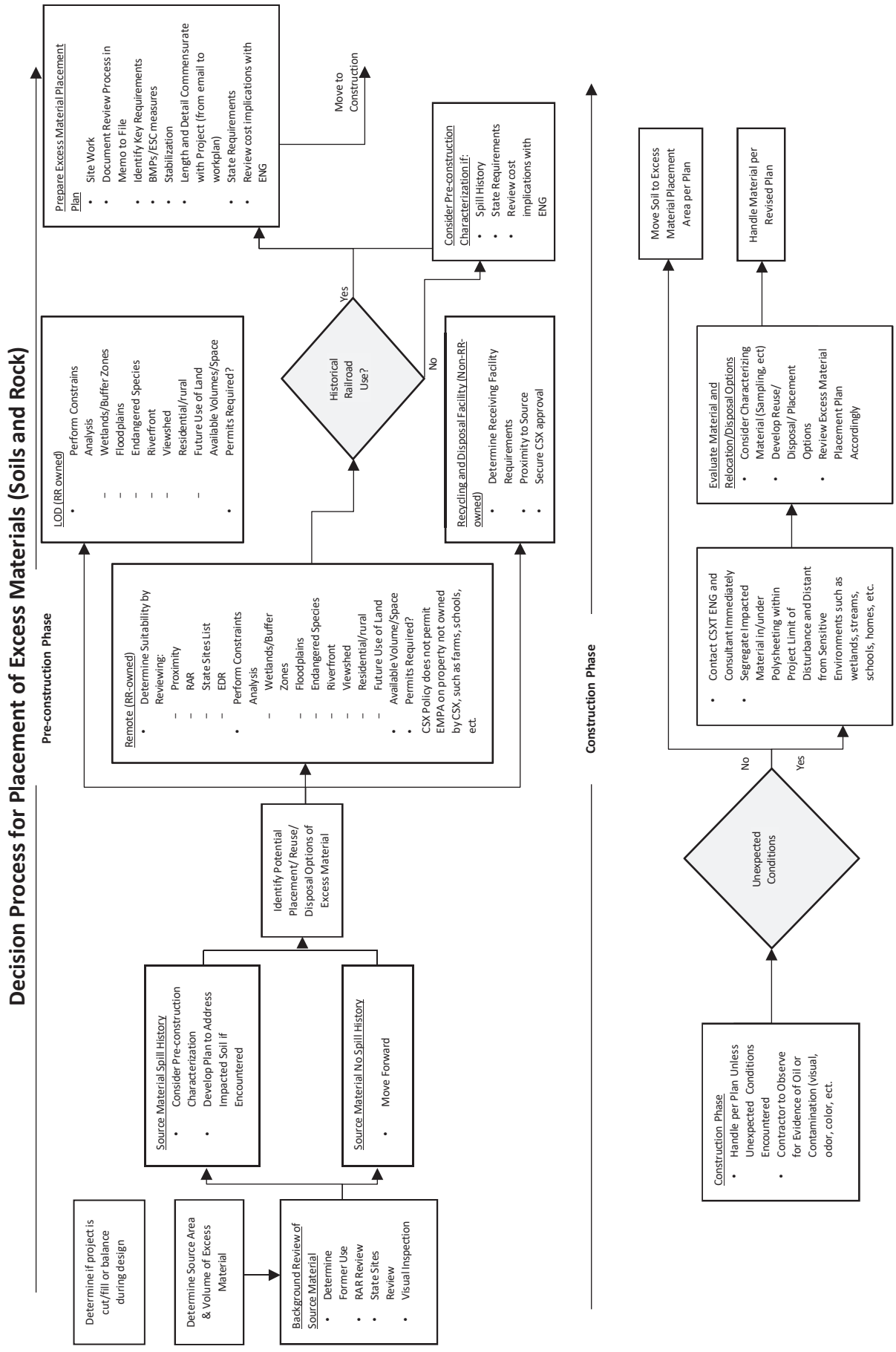
A. Mulch shall be applied at the rate of 3 tons per acre or hydro-mulch as approved by ENGINEER.

B. Mulch shall be placed within 24 hours of seeding. It shall be placed at the thickness and/or rate per Acre as specified or as proposed by CONTRACTOR and approved by the ENGINEER.

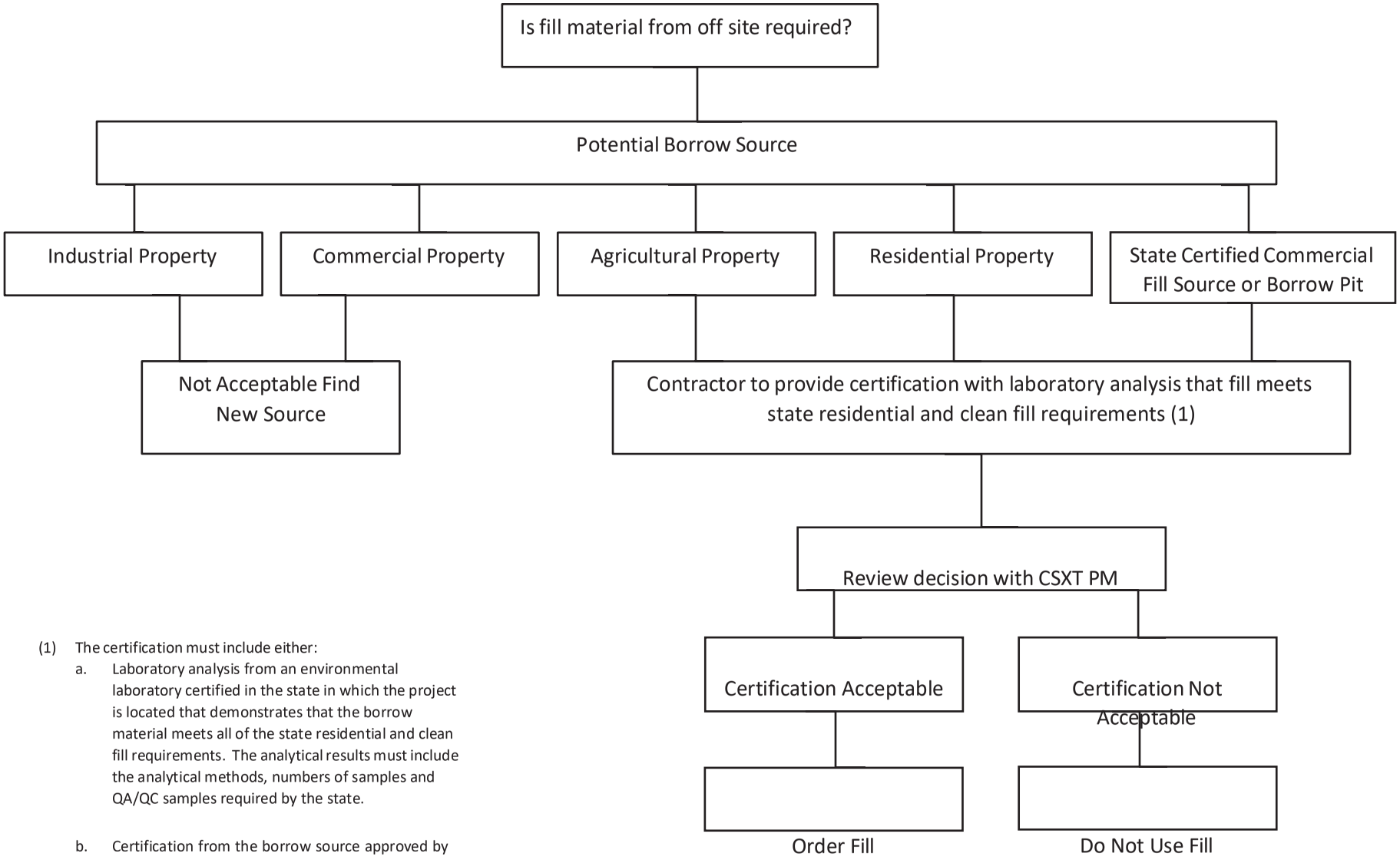
C. Mulches that are removed from the surface by wind or other natural causes as determined by ENGINEER shall be replaced and anchored by a means approved by ENGINEER and at no additional cost to the RAILROAD.

END OF SECTION 020110

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Decision Process for Placement of Excess Materials (Soils and Rock)
Pre-construction Phase
Construction Phase
Determine if project is cut/fill or balance during design
Determine Source Area & Volume of Excess Material
Background Review of Source Material
Determine Former Use
RAR Review
State Sites Review
Visual Inspection
Source Material Spill History
Consider Pre-construction Characterization
Develop Plan to Address Impacted Soil if Encountered
Source Material No Spill History
Move Forward
Identify Potential Placement/ Reuse/ Disposal Options of Excess Material
Remote (RR-owned)
Determine Suitability by Reviewing:
Proximity
RAR
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EDR
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Wetlands/Buffer Zones
Floodplains
Endangered Species
Riverfront
Viewshed
Residential/rural
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Available Volume/Space
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CSX Policy does not permit EMPA on property not owned by CSX, such as farms, schools, ect.
LOD (RR owned)
Perform Constrains Analysis
Wetlands/Buffer Zones
Floodplains
Endangered Species
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Residential/rural
Future Use of Land
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Permits Required?
Historical Railroad Use?
Yes
No
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Determine Receiving Facility Requirements
Proximity to Source
Secure CSX approval
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Spill History
State Requirements
Review cost implications with ENG
Prepare Excess Material Placement Plan
Site Work
Document Review Process in Memo to File
Identify Key Requirements
BMPs/ESC measures
Stabilization
Length and Detail Commensurate with Project (from email to workplan)
State Requirements
Review cost implications with ENG
Move to Construction
Construction Phase
Handle per Plan Unless Unexpected Conditions Encountered
Contractor to Observe for Evidence of Oil or Contamination (visual, odor, color, ect.
Unexpected Conditions
No
Yes
Contact CSXT ENG and Consultant Immediately
Segregate Impacted Material in/under Polysheeting within Project Limit of Disturbance and Distant from Sensitive Environments such as wetlands, streams, schools, homes, etc.
Evaluate Material and Relocation/Disposal Options
Consider Characterizing Material (Sampling, ect)
Develop Reuse/ Disposal/ Placement Options
Review Excess Material Placement Plan Accordingly
Move Soil to Excess Material Placement Area per Plan
Handle Material per Revised Plan

Project Planning -
Clean Fill Selection



(1) The certification must include either:

a. Laboratory analysis from an environmental laboratory certified in the state in which the project is located that demonstrates that the borrow material meets all of the state residential and clean fill requirements. The analytical results must include the analytical methods, numbers of samples and QA/QC samples required by the state.

b. Certification from the borrow source approved by the state that the borrow material meets the state residential and clean fill requirements.

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work includes placement, maintenance, and later removal, of sedimentation, dust, and erosion control facilities that are shown on the plans, permits, and/or are required by federal, state, and local agencies. This includes but is not limited to the following items: construction ingress/egress; water quality monitoring and sampling; temporary ditch checks; and straw bale barriers.

1.2 SUBMITTALS

A. CONTRACTOR must follow the provisions of the approved plan that is included in the plans. Sediment and erosion control plans including, a construction schedule for erosion control, shall be submitted to ENGINEER for review and approval before any work is begun.

1.3 MEASUREMENT AND PAYMENT

A. Measurement for the item EROSION CONTROL shall be by the lump sum.

B. Payment for the item EROSION CONTROL will be made at the lump sum price bid. Payment shall be full compensation for all necessary labor, materials, hardware, excavation, backfill, and incidental expenses.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Rock used for the construction of check dams and rock filters shall be submitted to ENGINEER for approval.

B. Rock used for the facing of the rock filters and sediment traps shall be submitted to ENGINEER for approval.

PART 3 - EXECUTION

3.1 EROSION CONTROL

A. CONTRACTOR shall control erosion by planning and scheduling construction operations carefully.

B. CONTRACTOR shall construct the permanent drainage structures as soon as possible during the progress of the grading work. CONTRACTOR shall coordinate erosion and sedimentation control measures with the final system so as to achieve an economical, continuous and effective erosion and sedimentation control program.

C. Methods and measures of erosion control shall be applied to erodible materials exposed during the progress of the work. Erodible areas where work has been suspended shall be stabilized to protect against erosion until the final erosion control methods and measures have been applied.

D. Methods and measures shall include, but not be limited to, berms, dikes, dams, sediment basins, sediment traps, filters, fiber mats, netting, gravel or crushed stone, mulch, grass, slope drains, seeding, etc.

E. Unless otherwise provided, all roadbed slopes shall be prepared, fertilized, seeded and mulched to produce a stand of erosion protection grass of an annual variety. In addition to permanent seeding and mulching, the contractor will be required to protect temporary or intermediate slopes within 30 days or time period required by the Environmental permitting of exposing the earth, as designated by the ENGINEER, from erosion by temporary seeding or as required by the environmental permitting.

F. All work and materials shall be in accordance with the applicable Specifications of the local State Department of Transportation, for the soil, the area and the planting season. The CONTRACTOR shall confer with the proper Department of Transportation authority on the subject and shall follow its recommendations.

G. The Contractor shall be responsible for the proper maintenance of the seeded areas during the period when the grass is being established and providing a satisfactory cover. The maintenance of grass shall begin immediately upon completion of any portion of the grassing and shall extend until the desired cover is established. A satisfactory stand is defined as a cover of living grass in which gaps larger than 18 inches in diameter do not occur at the time of acceptance by the ENGINEER.

3.2 DUST CONTROL

A. CONTRACTOR shall pay for and apply all the necessary methods to control dust on the job site. Dust control is applicable in all areas of excavation, roadways (temporary and permanent) and all other areas within the limits of the work.

B. CONTRACTOR will be held responsible for all suits or damage arising from dust.

C. Execution: CONTRACTOR shall control dust by sprinkling all dust prone surfaces with water or suitable chemicals and in compliance with all local ordinances.

D. CONTRACTOR will be required to maintain all haul roads, permanent access roads, and all other work areas within or without the project boundaries free from dust which would cause the standards for air pollution applicable to the project area to be exceeded or which would cause a hazard or nuisance to others. Approved temporary methods of stabilization consisting of sprinkling, chemical treatment or similar methods will be permitted to control dust. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and CONTRACTOR must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs. No separate or direct payment will be made for dust control, and the cost thereof shall be considered incidental to and included in the contract prices for excavation and embankments.

3.3 ENVIRONMENTAL PROTECTION

A. The work covered under this subsection consists of furnishing all labor, materials and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under the contract. For the purpose of this specification, environmental pollution is defined as the presence of chemical, physical or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balance of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution requires consideration of air, water and land, and involves noise, solid waste management and management of radiant energy and radioactive materials, as well as other pollutants.

B. In order to prevent and to provide for abatement and control of all environmental pollution arising from the construction activities of CONTRACTOR, CONTRACTOR shall comply with all applicable federal, state and local law, and regulations concerning environmental pollution control and abatement, and all applicable provisions of the Corps of Engineers' manual, EM 385-1-1, entitled General Safety Requirements, in effect on the date of solicitation, as well as the specific requirements stated elsewhere in the contract specifications.

C. ENGINEER will notify CONTRACTOR in writing of all non-compliance with the foregoing provisions and the action to be taken. CONTRACTOR shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to CONTRACTOR or its authorized representative at the site of the work, shall be deemed sufficient for the purpose. If CONTRACTOR fails or refuses to comply promptly, ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made subject of a claim for extension of time or for excess costs or damages by CONTRACTOR unless it was later determined that CONTRACTOR was in compliance.

D. Compliance with the provisions of this section by subcontractors shall be the responsibility of CONTRACTOR.

E. Prior to commencement of the work, CONTRACTOR will:

1. Submit in writing its proposals for implementing this section for environmental pollution control.

2. Meet with ENGINEER to develop mutual understandings relative to compliance with this provision and administration of the environmental pollution control program.

F. Location of Construction Facilities: The location on company property of CONTRACTOR's storage and other construction buildings, required temporarily in the performance of the work, shall require written approval of ENGINEER. The preservation of the landscape shall be an imperative consideration in the selection of the site and in the construction of buildings. Plans showing storage and other construction facilities shall be submitted for the approval of ENGINEER.

G. Protection of water resources:

1. CONTRACTOR shall not pollute any waterway with fuel, oils, bitumen, calcium chloride, acids or harmful materials. It is the responsibility of CONTRACTOR to investigate and comply with all applicable federal, state, county and municipal laws concerning pollution of rivers and streams. All work under this contract shall be performed in such a manner that objectionable conditions will not be created in streams through or adjacent to the project area.

2. At all times of the year, special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides and insecticides, and cement and surface drainage from entering public waters.

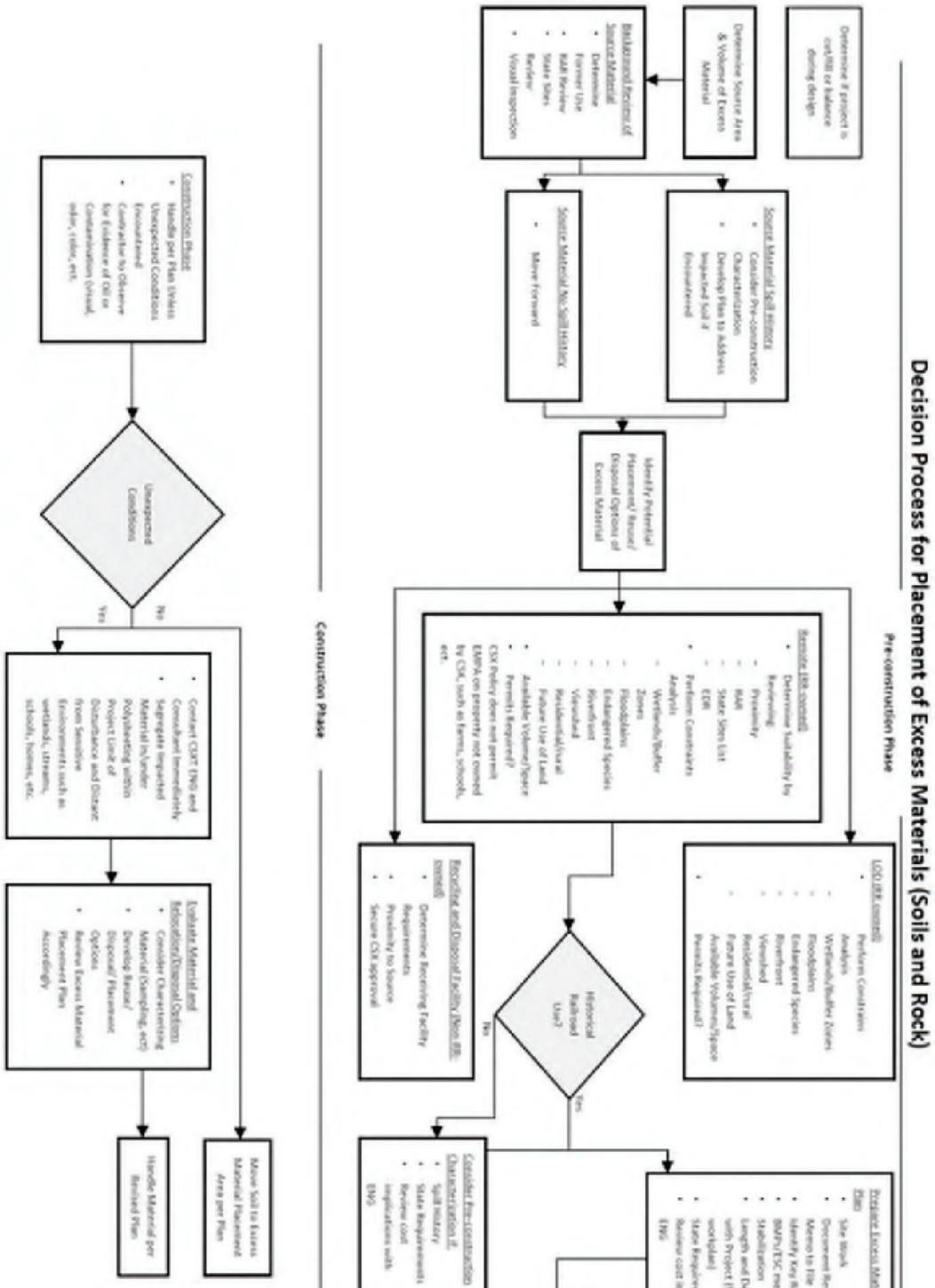
3. Disposal of all materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., in areas adjacent to streams shall be subject to all Federal, state and local guidelines. If any waste material is dumped in unauthorized areas, CONTRACTOR shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed and replaced with suitable fill material, compacted and finished with topsoil, all at the expense of CONTRACTOR.

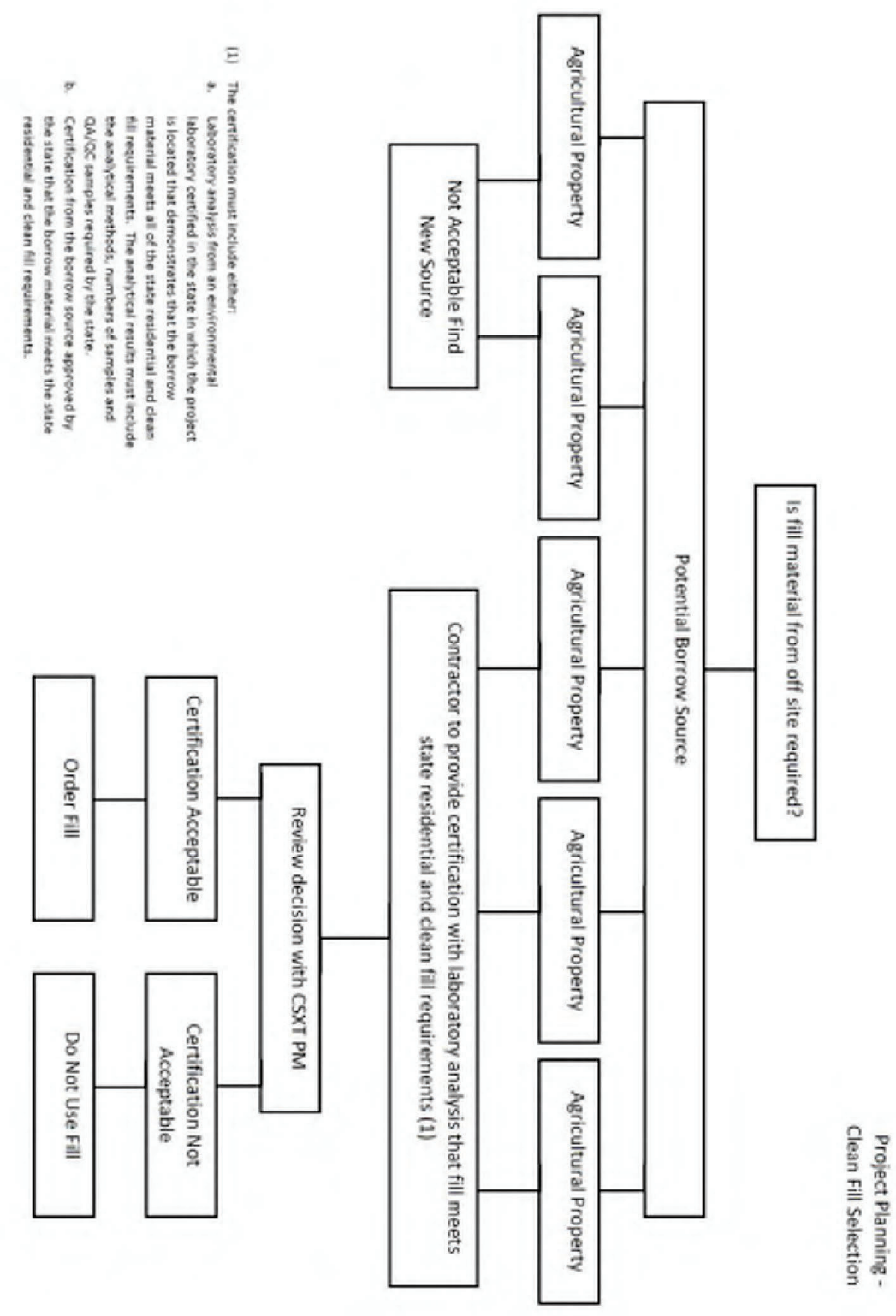
3.4 QUALITY ASSURANCE

A. Structural methods shall conform to the publication "Standards and Specifications for Erosion and Sediment Control in Developing Areas", Soil Conservation Service, U. S. Department of Agriculture.

B. The amount of clearing, grubbing, and grading shall be limited to the amount which can be effectively controlled by CONTRACTOR's proposed erosion control program.

END OF SECTION 020115


Decision Process for Placement of Excess Materials (Soils and Rock)
Pre-construction Phase
Construction Phase
Determine if project is cut/fill or balance during design
Determine Source Area & Volume of Excess Material
Background Review of Source Material
Determine Former Use
RAR Review
State Sites Review
Visual Inspection
Source Material Soil Quality
Consider Pre-construction Characterization
Develop Plan to Address Impacted Soil if Encountered
Source Material No Spill History
Move Forward
Identify Potential Placement/ Reuse/ Disposal Options of Excess Material
Receptor (ER) Location
Determine Suitability by Reviewing:
Proximity
RAR
State Sites List
EDR
Perform Constraints Analysis
Wetlands/Buffer Zones
Floodplains
Endangered Species
Riverfront
Viewshed
Residential/rural
Future Use of Land
Available Volumes/Space
Permits Required?
CSX Policy does not permit EMPA on property not owned by CSX, such as Farms, schools, ect.
LOD (ER Location)
Perform Constraints Analysis
Wetlands/Buffer Zones
Floodplains
Endangered Species
Riverfront
Viewshed
Residential/rural
Future Use of Land
Available Volumes/Space
Permits Required?
Historical Railroad Use?
Yes
No
Recycling and Disposal Facility (Non-ER Location)
Determine Receiving Facility Requirements
Proximity to Source
Secure CSX approval
Consider Pre-construction Characterization if:
Spill History
State Requirements
Review cost implications with ENS
Prepare Excess Material Placement Plan
Site Walk
Document Review Process in Memo to File
Identify Key Requirements
BMPs/ESC measures
Stabilization
Lengths and Detail Commensurate with Project (from email to workplan)
State Requirements
Review cost implications with ENS
Move to Construction
Construction Phase
Handle per Plan (Unless Unexpected Conditions Encountered
Contractor to Observe for Evidence of Oil or Contamination (visual, odor, color, ect.
Unexpected Conditions
Yes
No
Contact CSXT ENS and Consultant Immediately
Segregate Impacted Material In/under Polyblanketing within Project Limit of Disturbance and Distance from Sensitive Environments such as wetlands, streams, schools, homes, etc.
Evaluate Material and Relocation/Disposal Options
Consider Characterizing Material (Sampling, ect)
Develop Reuse/ Disposal/ Placement Options
Review Excess Material Placement Plan Accordingly
Move Soil to Excess Material Placement Area per Plan
Handle Material per Revised Plan


Project Planning -
Clean Fill Selection
Is fill material from off site required?
Potential Borrow Source
Agricultural Property
Agricultural Property
Agricultural Property
Agricultural Property
Agricultural Property
Not Acceptable Find
New Source
Contractor to provide certification with laboratory analysis that fill meets
state residential and clean fill requirements (1)
Review decision with CSXT PM
Certification Acceptable
Certification Not
Acceptable
Order Fill
Do Not Use Fill
(1) The certification must include either:
a. Laboratory analysis from an environmental laboratory certified in the state in which the project is located that demonstrates that the borrow material meets all of the state residential and clean fill requirements. The analytical results must include the analytical methods, numbers of samples and QA/QC samples required by the state.
b. Certification from the borrow source approved by the state that the borrow material meets the state residential and clean fill requirements.

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PART 1 - GENERAL

1.1 DESCRIPTION

A. The work includes furnishing and placing erosion control matting (blankets), all plant, labor, and equipment and performing all operations required for supplying, hauling and placing the matting, complete, at locations shown on the plans or as directed by ENGINEER, and maintaining the matting until seeding has been completed and accepted.

1.2 MEASUREMENT AND PAYMENT

A. Measurement for the pay item, EROSION CONTROL MATTING, shall be in the unit of square yards for the areas actually covered by matting, as shown on the plans, and authorized by the ENGINEER. The method of measurement will not include areas where an overlaps of material have occurred twice.

B. Payment for this item at the unit price bid shall be full compensation for supplying all labor, material, equipment, tools, and all other items of expense to furnish and install the erosion control matting.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The plans will specify the type, thickness, and material composition of the erosion control matting. Generally, one of the following types will be specified:

1. Curlex is a wood machined mat of curled wood excelsior. Both top and bottom of each blanket shall be covered with a photo degradable, extruded plastic mesh.

2. Jute mesh is a 100% biodegradable woven erosion control blanket.

3. Straw blankets are made from 100% agricultural straw, stitched with photo degradable polypropylene thread or stitched to jute netting.

4. Turf blankets are made of polypropylene, coconut matrix materials, or other plastic materials.

PART 3 - EXECUTION

3.1 EXECUTION

A. Before installing the erosion mat furnish the Engineer two copies of the manufacturer information for the product including installation instructions.

B. Install erosion mat of uniform thickness on the prepared soil surface in accordance with these Specifications, the manufacturer's recommendations and in conformity with the lines, grades and dimensions as shown in the plans.

C. Ensure that all joints are shingle lapped such that the bottom of each section fits over the top of the section below to prevent uplift of the ends or edges by water flow. Overlap ends of adjacent edges at 3 to 5 feet intervals with staples as recommended by the manufacturer unless otherwise plans and the manufacturer's installation recommendations.

D. Ensure that after installation there are no protrusions, projections or exposures of the plastic erosion mat. Do not compact the installed erosion mat with any type of equipment employing a foot or grid.

E. The Engineer will reject any material having defects, tears, punctures, flaws, deteriorations or other damage before, during or after installation. Remove and replace all rejected erosion mat at no additional expense3 to the Railroads.

F. Fill all voids in the mat with soils that will enable the establishment of the stand of grass required.

END OF SECTION 020120

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work shall consist of furnishing all plant, material, labor, and equipment and performing all operations required for supplying, hauling and placing the filter fabric, complete, at locations shown on the plans or as directed by ENGINEER, and maintaining until placement of the filter material has been completed and accepted.

1.2 MEASUREMENT AND PAYMENT

A. Measurement of the pay item, SILT FENCE, shall be by the linear feet actually installed and removed and as directed by the ENGINEER.

B. Payment for the item SILT FENCE at the unit price bid shall be full compensation for supplying all labor, material, equipment, tools, supplies and all else necessary to furnish, install, maintain, inspect and remove the silt fence.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The filter fabric shall be governed by the local State's Department of Transportation material specifications.

PART 3 - EXECUTION

3.1 EXECUTION

A. The fabric shall be protected from excessive sunlight, ultra-violet light, high temperatures, dirt and debris at all times prior to its installation.

B. The filter fabric shall be placed at the locations shown on the plans or as directed by ENGINEER.

C. The surface to receive the fabric shall be prepared to a relatively smooth condition, free of obstructions, depressions, debris, and soft or low density pockets of material.

D. The fabric shall be laid smooth and free of tension, stress, folds, wrinkles and creases.

E. When securing pins are necessary in the placement of the fabric, the pins shall be 3/16 inch diameter steel, pointed at one end, and twenty-two inches long.

F. All damage to the fabric during its installation or during placement of the backfill shall be replaced or repaired by CONTRACTOR at no expense to the railroad. All holes, rips, or flaws made in the fabric shall be replaced with a new section of fabric.

G. Where fabric is to be used in the construction of brush barriers, the fabric shall be laid over the fill slope face of the barrier. The bottom of the fabric shall be trenched into the existing ground a minimum of six (6) inches. The top of the fabric shall be tied, stapled, nailed or otherwise securely fastened to the side or top of the brush barrier. Intermediate attachment of the fabric shall be by suitable ties, stables or nails. An 18 inch overlap of fabric for vertical and horizontal piecing shall be maintained. Care must be exercised in securing the fabric to the brush barrier to avoid puncturing by protruding limbs.

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes: topsoil stripping; excavating; removing abandoned pipelines and other abandoned structures; replacing unsuitable soils; placing embankment; and disposal of earthen materials on or off site.

B. The grading and placement of suitable material that establishes the new compacted subgrade shall be to the lines and grades indicated on the drawings. Work shall be done in accordance with the following provisions:

1. Grading -The term "Grading" used in these Specifications covers moving of earth, rock and all other material from cuts, borrow pits, ditches, and channels for waterways, constructing embankments, protecting slopes paving ditches, gutters and channels for waterways, water pollution, soil erosion, siltation control, and all similar work connected with and appertaining to, or necessary for, the construction of main tracks, yard tracks, side tracks, spur tracks, station grounds and specialized terminals, etc.

2. Right of Way - RAILROAD will furnish a right-of-way of sufficient width for the project.

3. Lines, Grade and Cross-sections - All excavations and embankments shall be constructed to the lines, grades, cross-sections, slopes and dimensions called for on contract drawings, or to such modifications or revisions thereof as may be directed in writing by ENGINEER.

4. Sub-surface Conditions - It is the obligation of the CONTRACTOR to make his own investigations of subsoil condition prior to submitting his Proposal. Borings, test excavations and other subsoil investigations, if any, made by ENGINEER prior to the construction of the project, and the records of which are shown on the Plans, are made for design purposes. RAILROAD assumes no responsibility for the correctness of the information nor for the actual subsoil of other conditions which may be found to exist during the progress of construction.

5. Overhaul - No allowance will be made for overhaul. Payment for transportation of all excavated material shall be included in the unit prices bid for the various items generally grouped as EARTHWORK in the Proposal.

6. Temporary Crossing of Railroad Tracks - When CONTRACTOR desires a temporary road crossing of operated railroad tracks and it is considered necessary in the judgment of ENGINEER, the locations and construction of crossing shall be subject to approval by ENGINEER, and all of its requirements shall be fully met. When a crossing is necessary to transport material or equipment across the track or tracks, the location and construction of the crossing must be approved by the ENGINEER. Crossings installed over tracks which are owned by RAILROAD may be installed and removed by RAILROAD forces. Crossings over tracks not owned by RAILROAD shall be installed and removed by the CONTRACTOR. The cost of all temporary crossings whether by RAILROAD or the CONTRACTOR shall be the responsibility of the CONTRACTOR.

7. The crossing shall be maintained and protected to the satisfaction of RAILROAD. The entire cost of construction, maintenance, protection and removal of Temporary Crossings required by CONTRACTOR shall be included in the prices bid for the scheduled items except for the portion of work done by Railroad forces on crossings shown on the Plans. Where crossings of operated railroad tracks are shown on the Plans, RAILROAD will provide railroad traffic protection at CONTRACTOR's expense. Per standard specification 020401, Grade Crossings**.** For steel track equipment crossing one or both rails see standard specification 010540, Safety and Protection.

8. Slopes of cuts, ditches, channels and embankments shall be constructed and dressed to the lines prescribed on the Plans or in the Supplement Specifications. Variations may be required to suit local conditions encountered, but no variation shall be made unless directed or approved by ENGINEER in writing.

9. Slope construction shall include excavation and dressing all terraces, berms, berm ditches, ditches at top and bottom of slopes, and gutters on terraces.

10. CONTRACTOR shall follow all local and state "Call Before You Dig" laws.

C. UNCLASSFIED EXCAVATION

This work shall consist of excavation for all railroad facility subgrades and channels, including the removal of all material encountered not being removed under some other items, disposing of all material excavated whether or not used as fill, and finishing shoulders, slopes and ditches.

1. No classification of the kinds of material encountered in excavation will be made.

2. Disposal of Excavated Material – All suitable materials excavated within the limits of the project shall be used as embankment (fill for roadbed and/or slopes). For detail on suitable material see section F. Where the quantity of excavation exceeds that required to make up embankments to cross-section as shown on the Plans, the suitable surplus material shall be used to widen embankments (roadbed and/or slopes) uniformly along one or both sides, when directed by ENGINEER.

3. Waste areas, for the disposal of excess material unable to use as widen roadbed or unsuitable material, will be disposed of as shown on the Plans. With approval of the ENGINEER in writing an alternative site where as such materials deposited in a manner as will not endanger the roadway maybe requested. The clearing and seeding of the waste site will be included in the unit price for excavation unless otherwise specified.

4. Over Excavation - The toe of slopes in excavation shall in no case be undercut by power shovels, bulldozers, graders, blasting, or in any manner. Excavation shall not be made in excess of the authorized cross-section and such excess excavation will not be included in the measurements for payment. Where slides occur and extend beyond the slope lines, CONTRACTOR will not be paid for the removal of such material unless in the judgment of ENGINEER they are due to causes which are not the fault of CONTRACTOR. In all cases the surplus material shall be removed by CONTRACTOR and the slopes formed to the satisfaction of ENGINEER.

5. Removal of Miscellaneous Materials - The excavation, removal and disposal of minor pavements, timber or concrete foundations, not apparent on the surface or subsurface, rock, boulders, encompassing a volume of less than one cubic yard and all other subsurface materials encountered shall be considered as UNCLASSIFIED EXCAVATION, except as covered under other sections in the specification. Such materials shall be removed to an elevation six inches below final sub-grade as designated on the cross sections within ten (10) feet of the centerline of any proposed track or within five (5) feet of the edge of any roadway. In other areas, all such materials shall be removed to the elevation of final grade.

6. Roadbed Excavation - Roadbed Excavation shall include the excavation to the prescribed lines, grades, and cross-sections, and the removal and satisfactory disposal of all earth, rock, boulders, masonry and all other materials encountered, of whatsoever nature, required for the construction of main tracks, yard tracks, side tracks, spur tracks, station grounds, specialized terminals and similar appurtenant work, construction of embankments of the excavated material in accordance with provisions as specified herein and ditching and channel excavation when these items are not scheduled in the Proposal.

7. Channel Excavation - Channel Excavation shall include the excavation to the prescribed lines, grades and cross-section, and the removal and satisfactory disposal of all materials encountered of whatsoever nature, required for deepening, widening and relocating water channels.

8. Ditch Excavation - Ditch Excavation shall include the excavation to the prescribed lines, grades and cross section, and the removal and satisfactory disposal of all materials encountered of whatsoever nature, required for constructing ditches.

9. Where wet cuts are encountered, the roadbed will be constructed extra wide with ditches of extra depth and width as shown on "Section At Wet Cuts" on current RAILROAD standard drawing 2601, latest revision.

11. Intercepting and berm ditches shall be provided at the top of the cut slopes and the toe of the embankment slopes to divert storm water, which flows toward the roadbed. Roadbed ditches shall be provided as indicated with the outfall ends diverging sufficiently to prevent erosion of the adjoining embankments. All ditches shall be in accordance with RAILROAD Standard Roadbed Section or as approved by the ENGINEER.

12. Should unsuitable material be encountered such as muck, highly plastic clays or silty unstable material, it shall be removed at the direction of the ENGINEER. Unsuitable materials are handled per standard specification 020240, **Unsuitable Soils.**

D. EMBANKMENTS

Embankment construction shall consist of placing and compacting suitable materials in embankment at the required locations to the prescribed lines, grades, cross-sections, and dimensions shown on Plans and as directed or approved for wasting of surplus acceptable material to widen embankments. The CONTRACTOR shall construct embankments to such heights above subgrade and to such increased widths as are necessary to provide for shrinkage, subsidence, and erosion. As the embankments become consolidated, their sides shall be trimmed to the proper dimensions and shapes until the completion and acceptance of the work.

1. Materials used for embankment shall be suitable inorganic soil, granular material, rock or random materials and shall be free from stumps, wood, brush, leaves, roots, sod, rubbish, debris, garbage, frozen material, inflammable material, or any perishable matter. Any materials subject to degradation by weathering, or cinders, will not be acceptable. Suitable material will be as defined herein.

2. The materials used in embankment shall be those available from the various items of Earthwork, or other suitable material delivered by RAILROAD in cars or RAILROAD approved materials brought to the project by CONTRACTOR.

3. Before placing embankment material, the underlying ground surfaces shall be prepared between bottom of slope stakes as provided in CLEARING & GRUBBING AND TOPSOIL STRIPPING, as specified herein, and shall be free of snow and ice. Embankment material shall not be placed on frozen material of either the embankment or foundation.

4. Where the embankment is placed on sloping ground or existing embankments, the existing ground shall be plowed, scarified or benched. The cost of such treatment will be included in the unit price bid for the item UNCLASSIFIED EXCAVATION in the Proposal.

   Benching shall be required where slopes are steeper than 8:1 in any direction. The roadbed will be continuously benched over those areas where it is required as the work is brought up in layers. Benching shall be of sufficient width to permit operation of placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cut. Suitable materials thus cut out, except for topsoil, shall be reused along with the new embankment material.

   Where benching is not required, embankment foundation areas, stripped of topsoil, shall be plowed or scarified to a depth of at least eight inches and then compacted as specified herein or by ENGINEER in the field. This requirement can be waived by ENGINEER in inundated, swampy areas or areas where field conditions warrant. The use of filter fabric may be permitted by ENGINEER to permit the operation of construction equipment over the subgrade.

5. Except as hereinafter provided, embankments shall be formed in horizontal layers, with loose lifts placed no deeper than eight inches, extending across the entire fill.

6. The material shall be leveled to a uniform cross-section and shall be thoroughly compacted to the specified density and moisture content before the next layer is started. When necessary to achieve proper compaction, the moisture content of the material shall be altered to bring its moisture content sufficiently close to optimum, as specified herein. The material may be uniformly wetted by the controlled application of water to in place embankment material; or dried by plowing, discing and aerating, which drying process may be carried out either on the embankment or at the source of the material. Other methods shall be proposed by the CONTRACTOR and reviewed by the ENGINEER.

7. When the amount of embankment material required exceeds the amount of suitable material to be excavated within the limits of the grading section, sufficient suitable material, approved by ENGINEER, shall be obtained by CONTRACTOR from borrow pits furnished by CONTRACTOR located outside of RAILROAD property, except when permission is given, in writing, by ENGINEER to use a borrow pit which may be available on RAILROAD property or permission is given by ENGINEER to widen the roadway excavation to obtain additional material.

8. All topsoil, sod, brush, weeds, roots, and other unsuitable material shall be removed from the surface of borrow pit prior to the removal of any materials. All borrow materials will be measured for payment in place in the embankment. The cost of such removal shall be included in the price bid for Off Site Borrow Material.

9. Trucks, cars or other equipment used for transporting material from borrow pits shall have tight bodies and shall be loaded and covered so that no material will be lost while in transit.

10. The source and quality of borrow material shall be approved by ENGINEER and comply with CSX's EMPA guidelines in section 020215, **Excess Material Placement Area (EMPA)** before excavation of such borrow is made. The CONTRACTOR may be required to obtain at his sole expense, property for borrow from sites other than RAILROAD owned property. Prior to the use of the property, the CONTRACTOR will secure from the owner a written permit or agreement satisfactory to the ENGINEER, for the use of the property.

    Borrow pits will be seeded and mulched as required by permit and unless otherwise specified, clearing, seeding and mulching costs will be included in the unit price for Off Site Borrow Material.

13. If directed by ENGINEER, borrow pits on RAILROAD property shall be connected with ditches and drained to the nearest water course and no material shall be borrowed from a depth that will not permit proper drainage without the approval of ENGINEER. CONTRACTOR shall provide immediate, permanent, or temporary control measures to prevent contamination of adjacent streams or other water courses, lakes, ponds, or other areas of water impoundment. Such work may involve the construction of temporary benches, dikes, dams, sediment basins, slope drains, and the use of temporary mulches, mats, seeding or other control devices or methods necessary to control erosion, as required by Federal, State or local authorities. All borrow pits shall be left in a neat condition. Side slopes on borrow pits on RAILROAD property or adjacent thereto shall be the same as used in the cross-sections of embankments of roadbed. Final condition of all borrow pits must be approved by ENGINEER.

14. A berm of the original unbroken ground not less than ten feet (10) in width shall be left between slope stakes of embankment and edge of borrow pits and a similar berm between outside slope of borrow pits and RAILROAD right-of-way unless otherwise shown on the Plans or approved in writing by ENGINEER.

E. OFF SITE BORROW EXCAVATION

1. Off Site Borrow Material shall include excavation, removal and satisfactory disposal of all material from borrow pits, construction of embankments of the excavated material in accordance with the provisions as specified herein and preparing subgrade in accordance with the provision as specified herein. Refer to section 020235, **Off Site Borrow Material**.

F. EMBANKMENT SOIL AND COMPACTION

1. Soil shall include all durable inorganic earth materials having a maximum particle size of three inches (as determined by current ASTM Designation D 422); a plasticity index between 0 and 35 (as determined by current ASTM Designation D 422); and that can be readily placed and compacted to the required density in loose 8-inch layers.

   Organic soils will not be permitted for use in embankment construction. Fine grained soils which are moisture sensitive may be placed and compacted only during periods of dry weather. Where such soils are used and become wetted, due to natural causes or by fault of CONTRACTOR or by accident, to the extent they exhibit rutting and/or weaving characteristics, when subject to construction traffic, they shall either be removed and replaced with suitable materials or dried as specified herein, as directed by ENGINEER.

   Any such materials removed may be stockpiled and dried to the required moisture content for later placement and compaction. All soil which is placed on embankment foundation to a plane three feet below the subgrade plane, and to the Plan slope limits shall be compacted to at least 95% of its maximum density and within 2% of its optimum moisture content as determined by current ASTM Designation D 1557, Modified Proctor.

   All soil placed from subgrade plane and to a plane three feet below the subgrade plane, shall have less than 20% passing a #200 sieve (as determined by current ASTM Designation D 1140) and shall be compacted to at least 100% of its maximum density or to a relative density of 75% of its maximum, whichever is higher, as determined respectively by current ASTM Designation D 1557 or current ASTM Designation D 2049.

   The in-place density of compacted embankment soils will be determined either by current ASTM Designation D 1556 (Sand Cone Method) or D 2167 (Balloon Method) or D-2922 (Nuclear Method). Any soil layer placed in the embankment and found deficient in required density shall either be brought to specification requirements or removed, as directed by ENGINEER, prior to placing and compacting any subsequent layers.

2. Shale shall include all rock-like materials formed by the natural consolidation of mud, clay, silt and fine sand. Useable shale shall be thinly laminated, comparatively soft and easily split, having a maximum size that can be readily placed and compacted in loose 8-inch layers.

   Shale which consists predominately of fine particles which can be readily tested for compaction in the laboratory and field shall be placed and compacted in accordance with requirements for soil. Shale containing sufficient amounts of large particles to make checking of the compaction impractical shall not be used within design embankment slope limits. When approved by ENGINEER, such materials may be used to flatten embankment slopes under ten feet in height, if approved by ENGINEER.

   No embankment flattening shall be done with this material until such time as approval is granted. Shale that is or becomes unstable in the presence of air and water shall not be used for embankment construction.

3. Rock, other than shale, shall include all igneous, metamorphic, and sedimentary rock which cannot be excavated without blasting or by the use of rippers and all boulders and detached stones having a maximum size that cannot be readily placed and compacted in loose 8-inch layers. The use of any micaceous rock or rock containing degradable sulphur minerals or asbestos will not be permitted.

   Rock shall be placed in uniform loose layers not exceeding in thickness the approximate average size of the larger rock, but limited to a maximum thickness of two feet. Oversize rock shall be reduced in size until it can readily be incorporated into a 2-foot layer. All voids shall be filled by brooming in with spalls and other acceptable filling material and thoroughly wetted and compacted until an unyielding layer is formed.

   Rock shall not be placed against the back slope of side hill fills nor shall an existing embankment be benched for the placement of a rock embankment or rock slope. The top three feet of an embankment must not be made up of rock fill. The compaction program for rock shall be submitted to ENGINEER for approval. No embankment shall be built until such time as approval is granted.

   When rock or other embankment material are excavated at approximately the same time, the rock shall be incorporated into the other slopes of the embankment to a 1 on 1 plane extending from the intersection of the

design slope and subgrade plane from natural ground to a line three feet below the subgrade plane. The inner portion of the embankment adjacent to rock fill shall be held at substantially the same elevation as the rock fill, but always above the rock fill at a height sufficient to avoid incorporating water used to wet the rock fill in such quantities as to cause rutting or weaving of the inner embankment fill under the operations of construction equipment.

4. The top three feet of all embankments shall be formed of granular material or soil, as required herein. Provisions should be made to reserve this material from excavation where available. Should such materials be available and not reserved, it shall be furnished and placed by CONTRACTOR at his expense. In the event granular material or soil having less than 20% passing a #200 sieve is not available on-site, this layer shall be paid for at the unit price in the proposal for OFF SITE BORROW MATIERAL.

5. Embankment material placed in areas inaccessible to compaction equipment used to form the main body of the embankment shall be placed in uniform loose layers not exceeding four inches and be compacted by means of approved mechanical or vibrating compacting equipment to the density requirements specified herein.

6. Where embankment is to be constructed across low swampy ground, open water, or other areas which will not support the weight of trucks or other hauling equipment, dumping of suitable materials, as approved by ENGINEER, shall be used to such an elevation only that will permit the use of compacting equipment and the remainder shall be constructed in layers to conformity with these Specifications or as shown on the Plans. In no case shall end dumping be started until ENGINEER has approved the surface on which embankment is to be constructed.

7. Where end dumping is necessary, the material shall be deposited so that the soft underlying material will be forced to the sides and not to the front of the areas filled. End dumped material shall be properly compacted in a manner satisfactory to ENGINEER.

8. Embankment, other than rock embankment, in areas back of bridge abutments and in areas adjacent to structures under embankments, other than pipe structures, shall be formed of free-draining soil having a maximum size of three inches, and shall be constructed in advance of other embankment sections. Back of bridge abutments, this area shall extend longitudinally for a distance of twice the height of the embankment above the top of the footing or above the natural ground line, if such ground line is above the top of the footing.

   Adjacent to structures under embankment, the soil shall be placed to the height of the structure and in the adjacent area longitudinally for a distance of twice the height of the structure. Shale, rock or plastic soils shall not be used in bridge abutment backfill construction. When filling behind abutments and similar structures, all material shall be placed so that fill height on one side of a wall is never greater than two feet above the material on the other side or as shown on the Plans. The materials shall be deposited in layers of not more than six inches in thickness, carefully tamped and sloped away from the structure.

   Filling over arches, boxes and large pipes shall be deposited uniformly on both sides. Large stones shall not be placed within two (2) feet of the exterior surface of any arch, top and sides of boxes, or outside of large pipes. Any damage to waterproofing shall be repaired by the CONTRACTOR at his sole cost and expense.

   In forming embankments from or about trestles, the material shall be spread uniformly, without depressions between slopes and shall be thoroughly compacted between the trestle bents and around and under all parts of the structure. No part of the trestle shall be left in the embankment with three (3) feet of the sub-grade. Construction trestles for the formation of embankment will not be permitted unless approved by the ENGINEER.

9. CONTRACTOR shall be responsible, until acceptance by RAILROAD, for stability of all existing and new embankments constructed and shall replace all sections which, in the opinion of ENGINEER, have been damaged or displaced due to carelessness or neglect on the part of CONTRACTOR, or due to natural causes, such as storms, etc.

Acceptance will not be given until all required slope protection, i.e., seeding or sodding, etc., is completed.

10. At the close of each day's work, the entire working area shall be graded to drain.

11. At the beginning of each day's work, the embankment should be restored to such a condition that the specifications as herein stated are met. Any changes in moisture content, shape, and density due to natural causes shall be repaired at CONTRACTOR's expense prior to the start of the work of the day. Any frozen soil materials shall be completely removed and wasted on embankment side slopes or as directed by ENGINEER.

12. Fill or backfill material at structures, culverts, pipes, conduit, and direct burial cable shall conform to the quality requirements herein unless otherwise stated herein, or as shown on the Plans. All such material shall be placed in uniform horizontal loose lifts not exceeding six inches and be compacted to 95% of its maximum density and not to exceed 2% of its optimum moisture as determined by current ASTM Designation D1557 (Modified Proctor) or as shown on the Plans. Compaction shall be by means of approved mechanical or vibratory compacting equipment.

13. CONTRACTOR shall be responsible for proper placement and compaction of all materials in the railroad embankment, and for correcting any deficiencies resulting from insufficient or improper compaction and moisture control of such materials throughout the contract period. CONTRACTOR shall provide the type size and weight of compactor best suited to the work at hand; exert proper control over the moisture content of the material, and other details necessary to obtain satisfactory results.

14. Rutting or weaving of a compacted layer under the section of construction equipment shall not necessarily be interpreted as due to faulty compaction or moisture control during compaction, but shall be considered as constituting damage to a compacted lift requiring full repair prior to placing any overlying materials. ENGINEER will prohibit placement of an overlying lift until CONTRACTOR takes effective corrective action.

15. The selection of compaction equipment needed to meet the requirements specified herein is CONTRACTOR's responsibility but shall be subject to approval by ENGINEER. Any equipment not principally manufactured for compaction purposes and equipment which is not in proper working order shall not be approved or used. ENGINEER will also withhold approval of any compactor for which CONTRACTOR cannot furnish manufacturer's specifications covering data not obvious from a visual inspection and necessary to determine its classification. The use of tractors, trucks, scrapers or other equipment designed for purposes other than solely compaction will not be considered as compaction equipment.

16. Sufficient leveling and compacting equipment shall be provided to do the work of spreading and compacting the material promptly after it has been deposited. When, solely in ENGINEER's judgment, such equipment is inadequate to spread and compact the material properly, CONTRACTOR shall reduce the rate of excavation placing of fill to a rate not to exceed the capacity of leveling and compacting equipment or employ additional equipment.

17. CONTRACTOR shall make sufficient passes of the compacting equipment over each loose lift of material to obtain the specified densities. The compacting equipment shall be operated in a systematic manner so that the number of coverage's over all areas can be readily determined and recorded. One pass shall be defined as the complete application of the compaction equipment's rated energy over the entire area to be compacted.

G. SUBGRADE PREPARATION

The bottom of sub ballast for railroad roadbed shall be known as the subgrade and shall be prepared in conformity with the lines as shown on the Plans. Refer to section 020405, **Railroad Subballast**.

1. CONTRACTOR shall prepare the subgrade by proof-rolling to ascertain the uniformity of compaction beneath the subgrade surface, to locate deficiencies requiring correction, and to establish that corrective work

has been effective, all immediately prior to final trimming of the subgrade surface and to the placement of sub ballast.

2. Proof-rolling of subgrade surface will not be required where the subgrade surface is rock cut; where, in the opinion of ENGINEER, proof-rolling would be detrimental to the work; where the proof-roller will approach a culvert, pipe or other conduit closer than five feet in any direction; or where the proof-roller may damage adjacent work due to restrictions in available access and for maneuvering space.

3. The proof-roller shall consist of a loaded off-road dump truck weighing approximately 20 tons or similar. Any deviations to equipment must be supported by geotechnical recommendations and must be approved by ENGINEER.

4. Within the ranges set forth herein before, the load and tire inflation pressure shall be adjusted as required. It is the intent of these Specifications to use a contact pressure as nearly practical to the maximum supporting value of the subgrade. The subgrade shall then be rolled with one or more coverage's of the heavy pneumatic-tired roller, as directed by ENGINEER. One coverage shall be considered to represent two trips of the roller, each trip offset from the other by the width of one tire, to obtain complete area coverage. The equipment shall be operated at the speed directed by ENGINEER but in no case shall the speed exceed five miles per hour, and the normal operating speed shall not be less than 2-1/2 miles per hour.

5. When the railroad embankment thickness provides less than three feet of cover over the embankment foundation, the initial stress level shall be based upon the embankment foundation soil and will be set as directed by ENGINEER.

6. Where the operation of the heavy pneumatic-tired roller shows the subgrade to be unstable or to have non-uniform stability, CONTRACTOR shall correct the unstable areas in accordance with the provisions specified herein.

1.2 JOB CONDITIONS

A. CONTRACTOR shall visit the site and become acquainted with the existing conditions. CONTRACTOR shall accept the site as found prior to submitting the bid to do all excavation as indicated on the plans or as necessary due to existing conditions.

B. CONTRACTOR shall verify the grades and dimensions shown as existing on the plans. If there are discrepancies between the actual field conditions and those shown on the plans, then CONTRACTOR shall notify ENGINEER and request clarification before continuing with the work.

1.3 MEASUREMENT AND PAYMENT

A. Measurement of the item UNCLASSIFIED EXCAVATION shall be in units of cubic yards, actually excavated, placed, compacted and authorized by the ENGINEER. Volumes shall be calculated from the original design, and final cross sections. Excavation in excess of the design cross sections shall not be included in the measurements unless ordered by the ENGINEER in writing. Excavation and embankment for temporary access and haul roads or other excavations not specifically shown on the plans will not be included in the measurements. The quantity of excavation shall be calculated by the average end area method.

For measurement of the item OFF SITE BORROW MATERIAL refer to section 020235, **Off Site Borrow Material**.

For measurement of the item SUBBALLAST refer to section 020405, **Railroad Subballast**.

The CONTRACTOR shall arrange for original cross sections to be taken following clearing and grubbing of an area and before beginning excavation or embankment with cross sections data being obtained at even 100 ft. stations as shown on the plans. CONTRACTOR shall provide data and plots of these original cross sections to ENGINEER. The plots will compare CONTRACTOR's cross sections with the sections shown in the plans. Variances found will be reviewed with the ENGINEER. Excavation and embankment quantities shall be calculated by the CONTRACTOR using CONTRACTOR's original cross sections and plan design cross sections. These quantities

must be approved by ENGINEER prior to beginning any earthwork.

The CONTRACTOR shall also arrange for final cross sections to be taken following completion of all earthwork (both excavation and embankment) with cross section data being obtained at even 100 ft. stations as above. CONTRACTOR shall provide data and plots of final cross sections to ENGINEER. Once data and plots are provided CONTRACTOR is to assist ENGINEER with the as-built.

B. Payment for the item UNCLASSFIED EXCAVATION measured as stated above, will be paid at the contract unit price bid. Said unit price bid will be full compensation for furnishing all labor, material, equipment, tools, supplies, accessories and all other items of expense to excavate, store, drain, maintain, cross section, and dispose of materials in accordance with the plans and specifications and section 020215, **Excess Material Placement Area (EMPA)**.

No allowance will be made for overhaul or train caused delays. Payment for transportation of all excavated material shall be included in the price bid for the scheduled excavation in this proposal.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Topsoil to be placed for use in seeding areas, including all construction slopes, shall conform to the material requirements of RAILROAD specifications herein.

PART 3 - EXECUTION

3.1 EXECUTION

A. No excavation or embankment shall commence until the surface has been cleared and grubbed to the satisfaction of ENGINEER.

B. CONTRACTOR shall maintain all working areas in cuts or fills in a well-drained condition.

C. If CONTRACTOR excavates below the depth required on the plans without approval of ENGINEER, the area shall be brought back to the designated elevation with embankment borrow, properly compacted, at CONTRACTOR's expense.

D. All excavation areas shall be completed as far as is practical before off site borrow materials may be used.

E. If pockets of muck, soft clay or any other unsuitable foundation materials are encountered, they shall be excavated to a firm bedding stratum or treated in other manner as described on the plans or as directed by ENGINEER. If any wet excavation is required, it shall be treated similarly. After the excavation, the hole shall be backfilled with granular material and in a manner as described by ENGINEER, to the lines and grades shown on the plans.

F. ENGINEER shall determine which material is suitable for fill and which is unsuitable and must be disposed of. Suitable material used for fill shall be placed and compacted in the proposed embankment. Surplus and unsuitable material shall become the property of CONTRACTOR and shall either be removed from the site, or transported to a waste area if ENGINEER designates one.

G. Sod and other incidental topsoil removed during stripping shall be stockpiled within the railroad right-of-way as directed by ENGINEER for use on slopes as last placed material for eventual seeding and/or mulching as specified herein.

H. The compaction of the embankment material and subgrade shall be to the limits indicated in RAILROAD specifications herein.

I. If a waste area is established on the site CONTRACTOR must grade all waste spoilage areas to grades that ensure against any pockets of water forming.

J. If CONTRACTOR encounters subsurface conditions at the site differing materially from those indicated on the plans or such subsurface conditions as could not reasonably have been anticipated by CONTRACTOR and were not anticipated by the RAILROAD, which conditions will materially affect the cost of the work to be done under the contract, the attention of ENGINEER shall be called immediately to such conditions before they are disturbed.

K. All active underground utilities shall be braced and shored adequately and shall not be removed. If active piping is to be covered or backfilled, adequate precautions must be taken to prevent damage to the existing service. After the construction has been completed, the active piping shall be left in a condition that will ensure proper function of the service.

L. The grading for this project shall be completed to a tolerance of plus or minus one tenth of a foot (0.1 feet) of the elevations indicated on the plans, checked by ENGINEER.

M. The locations of all underground utilities, shown on the plans, are approximate and shall be verified for location and depth prior to any grading.

END OF SECTION 020200

PART 1 - GENERAL

1.1 DESCRIPTION

A. Rock excavation shall consist of igneous, sedimentary or metamorphic rock which, prior to removal, was an integral part of a bedrock formation.

B. Rock excavation shall also consist of all rocks, boulders, and rock fragments, which cannot be removed using conventional mechanical equipment and be considered as "Site Grading".

C. Rock excavation shall be performed in accordance with the following:

1. When rock is encountered in the excavation, it shall be removed to the cross-section and elevation shown on the Plans. Excavation shall be carried to 1 foot below subgrade in the roadbed, unless otherwise shown on the Plans. The area of rock excavation shall be backfilled with non-cohesive, porous material of washed gravel, crushed stone or equal containing less than 5% passing a number 200 sieve, as determined by current ASTM Designation D-1140, with such material obtained from other on-site excavation or off-site borrow pits approved by ENGINEER. All loose and overhanging rocks shall be removed from slopes.

2. When explosives are used in rock excavation, the drill holes shall be so located, the depths so fixed, and the charges so proportioned that they will not undercut or shatter the rock outside the excavation lines called for on the Plans. Sections requiring line drilling and pre-split blasting will be shown on the Plans or enumerated in the Special Specifications, if required except as amended in this section.

D. Blasting, if permitted, shall be performed only after all other means of excavation have been reviewed with the ENGINEER. All blasting shall be in strict compliance with all federal, state and local ordinances for storage, handling and use of explosives.

E. CONTRACTOR shall submit, to ENGINEER, a detailed blasting program for approval prior to blasting. No blasting will be permitted without such approval. CONTRACTOR's blasting program shall contain the following information:

1. Site plan.
2. Plan of each blast-plan should show hole spacing and delay pattern.
3. Diameter and depth of each hole.
4. Amount of explosives per hole.
5. Total pounds of explosives per delay.
6. Total amount of explosives per blast.
7. Type of non-electric delays to be used.
8. Amount of stemming in each hole.
9. Type of explosives to be used.
10. Soil and rock profile in blast zone.

11. Scaled distance to the nearest structure - scaled distance shall mean the actual distance in feet divided by the square root of the maximum explosive weight in pounds that is detonated per delay period for delay intervals of eight (8) milliseconds or greater; or the total weight of explosive in pounds that is detonated within an interval less than eight (8) milliseconds.

12. Type and location of seismograph to be used.

13. Size of blasting mats to be used.

14. Safety precautions to be followed.

F. CONTRACTOR shall provide for a pre-blast and post-blast survey, including photographs, by competent personnel experienced in this work. Inspection of all nearby structures shall be made to determine any changes that may occur due to blasting operations.

G. CONTRACTOR shall be responsible for obtaining all applicable blasting permits and licenses required.

1.2 MEASUREMENT AND PAYMENT

A. Measurement of the item ROCK EXCAVATION shall be by the cubic yard actually excavated and authorized by the ENGINEER.

The CONTRACTOR shall arrange for original cross sections to be taken before beginning excavation. CONTRACTOR shall provide data and plots of these original cross sections to the ENGINEER. The plots will compare CONTRACTOR'S cross sections with the sections shown in the plans. Variances found will be reviewed with the ENGINEER. Excavation quantities shall be calculated by the CONTRACTOR using CONTRACTOR's original cross sections and plan design cross sections. These quantities must be approved by ENGINEER prior to beginning any rock excavation.

The CONTRACTOR shall also arrange for final cross sections to be taken following completion of all rock excavation. CONTRACTOR shall provide data and plots of final cross sections to ENGINEER.

The cubic yards of ROCK EXCAVATION measurements from cross sections shall be removed from the cubic yards measurements in the cross sections from section 020200, **Earthwork**.

B. Payment for the item ROCK EXCAVATION measured as stated above, will be paid at the contract unit price bid. Said unit price bid shall be full compensation for supplying all the labor, equipment, tools, supplies, and all else necessary all other items of expense to excavate, transport, store, stockpile, maintain, cross section, and dispose of materials in accordance with the plans and specifications and section 020215, **Excess Material Placement Area (EMPA)**.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The blasting agent shall be manufactured by a recognized manufacturer of commercial high explosives and approved by ENGINEER.

PART 3 - EXECUTION

3.1 EXECUTION

A. Rock excavation shall be performed using conventional methods such as "Excavators, Hoe Rams, or other means". If these methods are unsatisfactory, blasting may be considered.

B. CONTRACTOR shall coordinate all blasting with ENGINEER to assure against interference with railroad traffic.

C. CONTRACTOR shall use the utmost care to provide all the necessary safeguards to protect life and property.

D. No explosives shall be stored on railroad property.

E. CONTRACTOR shall provide and use a warning device, such as a siren or horn, which shall be loud enough to be heard by all persons in the vicinity, including persons operating motor vehicles and noisy machinery. The warning device shall be used as follows, or according to other reasonable plan previously agreed upon by ENGINEER:

1. Sound three (3) short blasts of warning device to indicate an explosion will be set off within five (5) minutes.
2. Sound one (1) long blast immediately prior to setting off the explosion.
3. Sound one (1) short blast to indicate completion of explosion and that all is clear.

F. CONTRACTOR shall supply ENGINEER with seismograph readings immediately after each blast and certify that all charges have been detonated. In addition to the readings, the report is to contain the following minimum data:

1. Name of contractor.
2. Location, date and time of blast.
3. Name, signature and license number of blaster in charge.
4. Type of material blasted.
5. Number of holes, burden and spacing.
6. Diameter and depth of holes.
7. Type of explosives used.
8. Total amount of explosives used.
9. Maximum amount of explosives per delay.
10. Method of firing and type of circuit.
11. Direction and distance in feet to nearest dwelling, house, public building, school, church, commercial or institutional building neither owned nor leased by the person conducting the blasting.
12. Weather conditions.
13. Direction of wind.
14. Height or length of stemming.
15. Type of delay, blasting caps used and delay periods used.
16. Peak particle velocity.

G. Maximum vibration allowed at closest railroad structure shall be 1/2 inch per second for peak particle velocity in any direction unless otherwise directed by ENGINEER, in writing.

H. CONTRACTOR shall be held responsible and liable for any damage to property.

I. All material excavated shall become the property of CONTRACTOR and shall be disposed of as unsuitable material, unless otherwise directed by ENGINEER. All excavated rock so reserved shall be stockpiled in a location and in a manner as described by ENGINEER.

END OF SECTION 020205

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PART 1 - GENERAL

1.1 DESCRIPTION

A. Excavation and embankment areas shall be stripped of topsoil.

B. Such preparation in fill areas will generally be confined to areas where the fill height is four (4) feet or less or where slopes to receive fill are one (1) vertical to five (5) horizontal or steeper per AREMA recommendations. Also see Section 020110, **Seeding, Mulching, and Soil Supplements**.

C. Topsoil, which is stockpiled for reuse, shall conform to the following:

1. Reusable topsoil shall be limited to friable loam, reasonably free of subsoil, clay lumps, brush, roots, weeds or other objectionable vegetation, stones or similar objects larger than one inch in any dimension, litter, or other materials unsuitable or harmful to plant growth, and shall not contain less than 5% nor more than 20% organic matter, as determined by current AASHTO Designation T-194.

2. Furnished topsoil shall also meet the following grade analysis:

Sieve	Minimum Percent Passing
2”	100
No. 4	80
No. 10	60

3. Sand, silt, and clay material passing the No. 10 sieve shall be as defined by current AASHTO Designation M 146 and shall be present within the following ranges:

	Minimum Percent	Maximum Percent
Sand	0	75
Silt	10	95
Clay	5	20

1.2 MEASUREMENT AND PAYMENT

A. Specification included as information only. Measurement and Payment for topsoil stripping shall be included as incidental to Section 020200, **Earthwork**.

1.3 REFERENCES

A. AREMA recommendations

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 EXECUTION

A. Stripped material shall be disposed of or stockpiled for reuse as requested by ENGINEER per AREMA recommendations.

B. All stripped material shall be disposed of within the railroad right-of-way as designated by ENGINEER.

C. Sod and other incidental topsoil removed during stripping shall be stockpiled within the railroad right-of-way for use on slopes as last placed material for eventual seeding and/or mulching.

END OF SECTION 020210

PART 1 - GENERAL

1.1 DESCRIPTION

A. Excess material generated onsite will be placed in designated excess material placement areas (EMPA) as shown on the plans or directed by the ENGINEER.

B. Use of this specification does not preclude CONTRACTOR from regulations mandated under Resource Conservation and Recovery Act, or the United States Department of Transportation or other state/federal agencies. CONTRACTOR must obtain and remain in compliance for all required permits during the transport, placement and stabilization of the EMPA.

1.2 MEASURMENT AND PAYMENT

A. Specification included as information only. Measurement for the EMPA shall be included as incidental to Section 020200, **Unclassified Excavation**.

The CONTRACTOR shall arrange for original cross sections to be taken following before embankment is placed with cross sections data being obtained at even 100 ft. stations as shown on the plans. CONTRACTOR shall provide data and plots of these original cross sections to ENGINEER. The plots will compare CONTRACTOR'S cross sections with the sections shown in the plans. Variances found will be reviewed with the ENGINEER. Excavation quantities shall be calculated by the CONTRACTOR using CONTRACTOR's original cross sections and plan design cross sections. These quantities must be approved by ENGINEER prior to beginning any earthwork.

The CONTRACTOR shall also arrange for final cross sections to be taken following completion of all earthwork with cross section data being obtained at even 100 ft. stations as above. CONTRACTOR shall provide data and plots of final cross sections to ENGINEER.

B. No separate payment shall be made for the EMPA. Payment for the EMPA shall be included as incidental to Section 020200, **Unclassified Excavation**.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 EXECUTION

A. Uncontaminated, non-water soluble, non-decomposable, inert, and solid material can be placed in the EMPA. The term includes soil, rock, stone, track bed material, brick, block or concrete for demolition activities that is separate for other waste streams and recognizable as such.

B. No tires, asphalt, rail ties, trees or root balls that have been cleared may be placed in the EMPA. Future decomposition of wood materials may lead to unexpected settlement of the EMPA and make it unstable.

C. If material is determined to be unsuitable for the EMPA it must be managed in accordance with local, state and federal regulation. The excess material may not be handled as clean fill regardless of the laboratory test results and

must be disposed of at a properly permitted facility. This material may not be sold, traded or given to any unauthorized third entities. It must be transported and disposed at a CSXT-approved disposal facility.

D. The EMPA must be on RAILROAD owned property. The selected location must be in close proximity to the source area of the excess material.

E. The EMPA must be constructed in accordance with local, state and federal regulations including final size, height and slope restrictions. These restrictions vary from state to state across the CSXT system. It is the responsibility of the CONTRACTOR to be aware of the requirements for the final EMPA design. Erosion and sediment best management practices (BMPs) must be utilized during construction.

F. During transport of the excess material to the selected/approved EMPA, CONTRACTOR is responsible for proper covering of the material and to ensure that no dirt, mud or other unwanted debris is tracked onto public roadways.

G. Upon final placement of material the EMPA should be covered with appropriate geotextile and soil cap material. The EMPA shall be permanently seeded and stabilized.

3.2 CONSTRUCTION COMPLETION

A. The EMPA shall not be fenced or other barriers put in place unless required by state requirements or directed by the ENGINEER.

B. A brief summary report of the EMPA shall be sent to the ENGINEER to be provided to RAILROAD environmental including photographs, a site location map depicting the EMPA in relation to significant features, latitude and longitude coordinates of at least the four (4) corners decimal degrees to six (6) decimals and a site layout map with an aerial background.

C. Future use of an EMPA, or material contained within, must be approved by RAILROAD Environmental, Law, and Real Property prior to the disturbance or removal of the material.

END OF SECTION 020215

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall furnish granular material for use in bedding corrugated metal (CMP) and reinforced concrete pipes (RCP) at the locations as shown on the plans and at such other locations as may be directed. Densely compacted native backfill material shall be used above the bedding material.

1.2 MEASUREMENT AND PAYMENT

A. The payment for Backfilling (For CMP and RCP) is included in the appropriate drainage item.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Bedding material shall be granular backfill identical to subballast, or a well graded crushed stone or gravel. If crushed stone or gravel is to be used, it shall conform to ASTM designation C-33. Gradation 67. Or approved by geotechnical engineer.

PART 3 - EXECUTION

3.1 EXECUTION

A. This material shall be placed according to the typical section and compacted in layers not exceeding six (6) inches.

B. The layers are to be alternately placed to keep the same elevation on both sides of the culvert at all times.

C. Compaction under the haunches shall be accomplished by utilizing a pole or 2” x 4” timber in the small areas.

D. Hand tampers shall weigh not less than 20 pounds and have a tamping face not larger than 6” x 6”. Mechanical tampers and rollers shall be used in bringing the backfill up to at least 3 feet above the culvert. They shall not strike the culverts while tamping. Smooth rollers will not be allowed in compacting fills around or over culverts.

END OF SECTION 020220

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PART 1 - GENERAL

1.1 DESCRIPTION

A. Offsite borrow material is material obtained off the job site. Off Site Borrow Material shall be used only if the proposed subgrade elevations cannot be obtained using material previously excavated onsite.

B. No special payment will be made for the construction of temporary haul roads. CONTRACTOR shall include the cost of such haul roads in the bid.

1.2 MEASUREMENT AND PAYMENT

A. Measurement of the item OFF SITE BORROW MATERIAL shall be the volume in cubic yards of off-site borrow material compacted in place as determined by calculating the difference between total UNCLASSFIED EXCAVATION placed (onsite material) and the Plan elevation or otherwise directed by the ENGINEER. These quantities will be verified after the CONTRACTOR has taken cross sections following, clearing and grubbing and has calculated earthwork quantities.

B. Payment for item OFF SITE BORROW MATERIAL shall be made at the unit price bid and be full compensation for supplying all labor, material, transportation, excavation, drainage, permitting, tools, and all else necessary to supply and compact the needed off site borrow material.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The embankment shall be composed of soil or granular material as defined below:

1. Embankment Soil and Compaction - Soil shall include all durable inorganic earth materials having a maximum particle size of three inches (as determined by current ASTM Designation D 422); a plasticity index between 0 and 35 (as determined by current ASTM Designation D 422); and that can be readily placed and compacted to the required density in loose 8-inch layers. Organic soils will not be permitted for use in embankment construction. Fine grained soils which are moisture sensitive may be placed and compacted only during periods of dry weather. Where such soils are used and become wetted, due to natural causes or by fault of CONTRACTOR or by accident, to the extent they exhibit rutting and/or weaving characteristics, when subject to construction traffic, they shall either be removed and replaced with suitable materials or dried as approved by ENGINEER. Any such materials removed may be stockpiled and dried to the required moisture content for later placement and compaction. All soil which is placed on embankment foundation to a plane three feet below the subgrade plane, and to the Plan slope limits shall be compacted to at least 95% of its maximum density and within 2% of its optimum moisture content as determined by current ASTM Designation D 1557, Modified Proctor. All soil placed from subgrade plane and to a plane three feet below the subgrade plane, shall have less than 20% passing a #200 sieve (as determined by current ASTM Designation D 1140) and shall be compacted to at least 100% of its maximum density or to a relative density of 75% of its maximum, whichever is higher, as determined respectively by current ASTM Designation D 1557 or current ASTM Designation D 2049. The in-place density of compacted embankment soils will be determined either by current ASTM Designation D 1556 (Sand Cone Method) or D 2167 (Balloon Method) or D-2922 (Nuclear Method). Any soil layer placed in the embankment and found deficient in required density shall either be brought to specification requirements or removed, as directed by ENGINEER, prior to placing and compacting any subsequent layers.

2. Shale shall include all rock-like materials formed by the natural consolidation of mud, clay, silt and fine sand. Useable shale shall be thinly laminated, comparatively soft and easily split, having a maximum size that can be readily placed and compacted in loose 8-inch layers. Shale which consists predominately of fine particles which can be readily tested for compaction in the laboratory and field shall be placed and compacted in accordance with requirements for soil. Shale containing sufficient amounts of large particles to make checking of the compaction impractical shall not be used within design embankment slope limits. When approved by ENGINEER, such materials may be used to flatten embankment slopes under ten feet in height, if approved by ENGINEER. No embankment flattening shall be done with this material until such time as approval is granted. Shale that is or becomes unstable in the presence of air and water shall not be used for embankment construction.

3. Rock, other than shale, shall include all igneous, metamorphic, and sedimentary rock which cannot be excavated without blasting or by the use of rippers and all boulders and detached stones having a maximum size that cannot be readily placed and compacted in loose 8-inch layers. The use of any micaceous rock or rock containing degradable sulphur minerals or asbestos will not be permitted. Rock shall be placed in uniform loose layers not exceeding in thickness the approximate average size of the larger rock, but limited to a maximum thickness of two feet. Oversize rock shall be reduced in size until it can readily be incorporated into a 2-foot layer. All voids shall be filled by brooming in with spalls and other acceptable filling material and thoroughly wetted and compacted until an unyielding layer is formed. Rock shall not be placed against the backslope of side hill fills nor shall an existing embankment be benched for the placement of a rock embankment or rock slope. The top three feet of an embankment must not be made up of rock fill. The compaction program for rock shall be submitted to ENGINEER for approval. No embankment shall be built until such time as approval is granted.

4. When rock or other embankment material are excavated at approximately the same time, the rock shall be incorporated into the other slopes of the embankment to a 1 on 1 plane extending from the intersection of the design slope and subgrade plane from natural ground to a line three feet below the subgrade plane. The inner portion of the embankment adjacent to the rock fill shall be held at substantially the same elevation as the rock fill, but always above the rock fill at a height sufficient to avoid incorporating water used to wet the rock fill in such quantities as to cause rutting or weaving of the inner embankment fill under the operations of construction equipment.

5. The top three feet of all embankments shall be formed of granular material or soil, as required in Section 020200, **Earthwork**. Provisions should be made to reserve this material from excavation where available. Should such materials be available and not reserved, is shall be furnished and placed by CONTRACTOR at his expense. In the event granular material or soil having less than 20% passing a #200 sieve is not available on- site, this layer shall be paid for at the unit price in the proposal for Off Site Borrow Material.

PART 3 - EXECUTION

3.1 EXECUTION

A. The tolerance for embankment construction shall be plus or minus 0.1 feet of the dimension indicated on the plans.

B. Off Site Borrow material shall be obtained as specified herein. The borrow shall be obtained as the specifications indicated below.

1. Off Site Borrow Excavation shall include excavation, removal and satisfactory disposal of all material from borrow pits, construction of embankments of the excavated material in accordance with the provisions of Section 020200, **Earthwork** and preparing subgrade in accordance with the provision of Section 020200, **Earthwork**.

2. When the total amount of embankment material required exceeds the amount of suitable material to be excavated within the limits of the grading section, sufficient suitable material, approved by ENGINEER, shall be obtained by CONTRACTOR from borrow pits furnished by CONTRACTOR located outside of RAILROAD property, except when permission is given, in writing, by ENGINEER to use a borrow pit which may be available on CSXT property or permission is given by ENGINEER to widen the roadway excavation to obtain additional material.

3. CONTRACTOR shall be required to obtain a release from borrow site owner upon completion. A copy of the release shall be provided to the ENGINEER.

4. All topsoil, sod, brush, weeds, roots and other unsuitable material shall be removed from the surface of borrow pit prior to the removal of any materials. The cost of such removal shall be included in the price bid for Off Site Borrow Material.

5. Trucks, cars or other equipment used for transporting material from borrow pits shall have tight bodies and shall be loaded and covered so that no material will be lost while in transit.

6. The source and quality of borrow material shall be approved by ENGINEER before excavation of such borrow is made.

7. A berm of the original unbroken ground not less than ten feet (10) in width shall be left between slope stakes of the embankment and edge of borrow pits and a similar berm between outside slope of borrow pits and CSXT right-of-way unless otherwise shown on the Plans or approved in writing by ENGINEER.

END OF SECTION 020235

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PART 1 - GENERAL

1.1 DESCRIPTION

A. Should unsuitable material be encountered such as muck, highly plastic clays or silty unstable material, it shall be removed at the direction of the ENGINEER. In cut sections, plastic material as defined by the American Association of State Transportation Officials Soil Classification as A-2-6, A-2-7, A-4, A-5, A-6 and A-7 shall be removed to a depth of at least 2 feet below subgrade from ditch line to ditch line. Additional depth may be required at the direction of the ENGINEER. Where organic muck, Classification A-8, is encountered in the fill section, it shall be removed within the limits of the toes of slope of the road bed. Where fill exceeds 10 feet in height, width of the section to be mucked shall be three times the height of the fill or as directed by the ENGINEER.

B. CONTRACTOR shall excavate unstable materials encountered below the line and grade indicated on the plans, which are of such a nature that the use of ordinary dry excavation methods and equipment is impractical.

C. Unsuitable excavated material shall be disposed following CSX's EMPA guidelines in section 020215, **Excess Material Placement Area (EMPA)** as designated by plans or directed by the ENGINEER. When wasting of unsuitable material is ordered, the material shall, if possible, be deposited in low areas of the property but under no circumstances shall the nearest edge of waste bank be within 10 feet of the berm ditch along a cut section. Waste areas shall be leveled or drained as directed by ENGINEER. CONTRACTOR's proposals will be considered for approval by ENGINEER.

1.2 MEASUREMENT AND PAYMENT

A. Measurement of the item UNSUITABLE SOILS shall be by the cubic yard of material excavated as determined by mathematical calculations using cross sections developed before and after the work of this item and such work being authorized by the ENGINEER.

Original and final sections for payment shall be taken by the CONTRACTOR and checked by the ENGINEER.

B. Payment of the item UNSUITABLE SOILS at the unit price bid per cubic yard shall be full compensation for supplying all the labor, materials, equipment, supplies, tools, and all else necessary for removal, draining, storing, transporting and spreading of unsuitable materials.

PART 2 - PRODUCTS

A. Not used.

PART 3 - EXECUTION

3.1 EXECUTION

A. The excavation, grading and placement of suitable material establishing the new compacted subgrade shall be to the lines and grades indicated on the drawings, and work shall be done in accordance with the specifications herein and Section 020200, **Earthwork**.

B. If areas of any unsuitable soils are encountered, they shall be excavated to a firm bedding stratum acceptable to ENGINEER or treated in other manner as described on the plans or as directed by ENGINEER. If any wet excavation is required, it shall be treated similarly. After the excavation, the area shall be backfilled with a suitable material and in a manner as described by ENGINEER, to the lines and grades shown on the plans.

C. After the excavation of any area, all material that enters the excavated area by sloughage, or from any other cause, shall be removed prior to backfilling. Removal of any such sloughage not caused by the operations will be included in this item.

END OF SECTION 020240

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work consists of the excavation of material and if required, disposing of excavated material required for trenches, culverts, manholes, etc. All work shall conform to the requirements of Section 020200, **Earthwork**.

B. Trenches shall be constructed as indicated on the plans and as described under the item for installation of pipe.

C. Work includes the cost for furnishing, placing and removing, when required or used, all bracing, shoring and cofferdams. Work also includes all water pumping which is incidental to the work.

1.2 MEASUREMENT AND PAYMENT

A. CONTRACTOR shall determine when supports are required for trench excavation. Guidelines from the Department of Labor (OSHA) must be strictly adhered to.

PART 2 - PRODUCTS

A. Not used.

PART 3 - EXECUTION

3.1 EXECUTION

A. The trenches shall be excavated to a tolerance of plus or minus 0.1 feet of the invert elevation shown on the plans.

END OF SECTION 020245

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PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall provide all materials for and install in place stone as shot rock as directed by the ENGINEER in conjunction with replacement of unsuitable soils.

1.2 MEASUREMENT AND PAYMENT

A. Measurement for the item SHOT ROCK will be the number of net tons of shot rock transported and compacted in place as calculated from weigh tickets provided to the CONTRACTOR. CONTRACTOR is responsible to retain weigh tickets and provide RAILROAD copies with invoice.

B. The quantity to be paid for shot rock shall be the number of net tons in place at the unit price bid and be full compensation for supplying all labor, material, equipment, tools, supplies and all else necessary to place the shot rock as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Shot Rock shall be a quarried stone of sound quality either shot and/or crushed.

B. The aggregate shall meet the following gradation:

SIEVE SIZE	% PASSING BY WEIGHT
6 in (150mm)	100
2 in (50mm)	25-75
No. 10 (2mm)	15-35

C. Ensure the Shot Rock does not contain soil or decomposed rock.

PART 3 - EXECUTION

3.1 EXECUTION

A. Material shall be placed by dumping the stone into position over the area to be filled. The material must be spread, rolled, and compacted as directed by the ENGINEER.

END OF SECTION 020250

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PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall provide all materials for and install in place stone as rip-rap as shown on the plans for the protection of slopes of earth embankments, dikes, and channels.

1.2 MEASUREMENT AND PAYMENT

A. Measurement for item RIP-RAP shall be the number of net tons of rip-rap transported and compacted in place as calculated from weigh tickets provided to the CONTRACTOR. CONTRACTOR is responsible to retain weigh tickets and provide OWNER copies with invoice.

B. Payment for item RIP-RAP shall be the number of net tons in place at the unit price.

C. Filter fabric shall not be paid for separately but shall be considered incidental to this pay item.

D. Bedding stone shall not be paid for separately but shall be considered incidental to this pay item.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The crushed rock shall be quarried stone of sound quality with 0% passing the six (6) inch sieve.

B. The stone shall be broken stone produced from sound ledge or large boulders with at least three fractured faces on each piece and free from overburden, spoil, shale or organic material.

C. The stone shall have a minimum density of 150 pounds per cubic foot. Stones shall not weigh less than 50 pounds and not more than more than 150 pounds or as required by hydraulic analysis and shall be reasonably well graded with no more than 40 percent weighing more than 100 pounds each.

D. Broken concrete used as rip-rap shall comply with the above specifications and shall be solid, dense, and free from major cracks and flaws.

E. Filter fabric shall be per Section 020265, **Filter Fabric.**

F. Bedding stone shall be quarried stone of sound quality and gradation similar to Railroad Ballast and shall meet standard drawings and project plans requirements

PART 3 - EXECUTION

3.1 EXECUTION

A. The surface of the slope, prior to placement of rip-rap, shall be graded and tamped so that the finished surface will conform to the lines and grades specified on the plans.

B. Material shall be placed by dumping the stone into position over the surface to be protected. A reasonable attempt shall be made to place the larger stones at the bottom of the slope.

C. The finished surface shall be in close conformity to the lines and grades specified on the plans.

END OF SECTION 020255

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work shall consist of furnishing and installing Geogrid, including all labor and equipment for hauling and placing the Geogrid, complete, at locations shown on the plans or as directed by the ENGINEER and maintaining until placement of the stone has been completed and accepted.

B. The Geogrid shall be placed beneath a minimum of 6 inches of subballast stone at the locations specified. The cost of the ballasting is included under other pay items found in Section 020410, **Railroad Ballasting**.

1.2 MEASUREMENT AND PAYMENT

A. Measurement of the item GEOGRID shall be the number of square yards of material in place as approved by the ENGINEER. No allowance will be made for the minimum 12 inches of overlap required.

B. Payment for item GEOGRID shall be full compensation for: furnishing, transporting, placing, and maintaining the GEOGRID.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The GEOGRID shall be as below or equivalent; any equivalent material must be approved by the ENGINEER.

Product Type: Integrally Formed Biaxial Geogrid
Polymer: Polypropylene
Load Transfer Mechanism: Positive Mechanical Interlock
Primary Applications: Spectra System (Base Reinforcement, Subgrade Improvement)

Product Properties

Index Properties	Units	MD Values[1]	XMD Values[1]
• Aperture Dimensions[2]	mm (in)	25 (1.0)	33 (1.3)
• Minimum Rib Thickness[2]	mm (in)	1.27 (0.05)	1.27 (0.05)
• Tensile Strength @ 2% Strain[3]	kN/m (lb/ft)	6.0 (410)	9.0 (620)
• Tensile Strength @ 5% Strain[3]	kN/m (lb/ft)	11.8 (810)	19.6 (1,340)
• Ultimate Tensile Strength[3]	kN/m (lb/ft)	19.2 (1,310)	28.8 (1,970)
Structural Integrity			
• Junction Efficiency[4]	%	93	
• Flexural Stiffness[5]	mg-cm	750,000	
• Aperture Stability[6]	m-N/deg	0.65	
Durability			
• Resistance to Installation Damage[7]	%SC / %SW / %GP	95 / 93 / 90	
• Resistance to Long Term Degradation[8]	%	100	
• Resistance to UV Degradation[9]	%	100	

Dimensions and Delivery
The biaxial geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 3.0 meters (9.8 feet) or 4.0 meters (13.1 feet) in width and 50.0 meters (164 feet) in length. A typical truckload quantity is 160 to 210 rolls.

Notes
1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759-02. Brief descriptions of test procedures are given in the following notes.
2. Nominal dimensions.
3. Determined in accordance with ASTM D6637-10 Method A.
4. Load transfer capability determined in accordance with ASTM D7737-11.
5. Resistance to bending force determined in accordance with ASTM D7748-12, using specimens of width two ribs wide, with transverse ribs cut flush with exterior edges of longitudinal ribs, and of length sufficiently long to enable measurement of the overhang dimension.
6. Resistance to in-plane rotational movement measured by applying a 20 kg-cm (2 m-N) moment to the central junction of a 9 inch x 9 inch specimen restrained at its perimeter in accordance with GRI GG9.
7. Resistance to loss of load capacity or structural integrity when subjected to mechanical installation stress in clayey sand (SC), well graded sand (SW), and crushed stone classified as poorly graded gravel (GP). The geogrid shall be sampled in accordance with ASTM D5818 and load capacity shall be determined in accordance with ASTM D6637.
8. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments in accordance with EPA 9090 immersion testing.
9. Resistance to loss of load capacity or structural integrity when subjected to 500 hours of ultraviolet light and aggressive weathering in accordance with ASTM D4355-05

PART 3 – EXECUTION

3.1 EXECUTION

A. The GEOGRID shall be placed at the locations shown on the plans or as directed by the ENGINEER. The surface to receive the GEOGRID shall be prepared to a relatively smooth condition, free of obstructions, depressions, debris, and soft or low density pockets of material. All holes, rips, or flaws made in the GEOGRID shall be repaired by placing a piece of GEOGRID, which is 1.5 feet larger than the hole in the GEOGRID in all directions, directly over the hole before stone is placed on the GEOGRID. The GEOGRID shall be laid smooth and free of tension, stress, folds, wrinkles or creases. The GEOGRID rolls shall be placed to provide a minimum width of 12 inches of overlap for each fabric joint. The use of securing pins will not be permitted. Overlaps will be secured, if necessary, by placing stone windrows on the overlap section. All damage to the GEOGRID during its installation or during placement of the stone shall be replaced or repaired by the CONTRACTOR at no cost to the railroad. Stone shall be placed on the GEOGRID, as specified herein or as shown on the plans, immediately after GEOGRID placement.

B. No construction traffic will be permitted directly on the GEOGRID. At least six (6) inches of stone material must be placed before traffic will be allowed in areas where GEOGRID has been placed.

END OF SECTION 020260

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work shall consist of furnishing filter fabric, all plant, labor and equipment and performing all operations required for hauling and placing the filter fabric, complete, at locations shown on the plans or as directed by the ENGINEER and maintaining until placement of the subballast has been completed and accepted.

1.2 MEASUREMENT AND PAYMENT

A. Measurement of the item FILTER FABRIC shall be the number of square yards of material in place as approved by the ENGINEER.

B. Payment for item FILTER FABRIC shall be full compensation for: furnishing, transporting, placing, and maintaining the filter fabric.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For Placement on Roadbed: The filter fabric shall be woven or nonwoven needle punched, polyester or polypropylene material conforming to the following minimum average requirements:

Nonwoven Geotextile Fabric

Property	Minimum average requirement	Test
Weight	10.0 ounces / S.Y.	ASTM D 1910
Apparent opening size	70-120 Std. sieve	ASTM D 4751
Grab tensile strength	240 pounds	ASTM D 4632
Mullen Burst strength	400 p.s.i.	ASTM D 3786
Max Elong. @ failure	40 - 65 %	ASTM D 4632
Permittivity	1.11 / second	ASTM D 4491
Trapezoidal tear	100 pounds	ASTM D 4533
Puncture strength	130 pounds	ASTM D 4833

Woven Geotextile fabric

Property	Minimum average requirement	Test
Max Apparent opening size	40 Std. sieve	ASTM D 4751
Grab tensile strength	200 pounds	ASTM D 4632
Max Elong. @ failure	15 %	ASTM D 4632
Permittivity	0.05 / second	ASTM D 4491
Trapezoid Tear Strength	75 pounds	ASTM D 4533
CBR Puncture Strength	700 pounds	ASTM D 4833

B. For Placement under Ballast: The filter fabric shall be woven or nonwoven needle punched, polyester or polypropylene material conforming to the following minimum average requirements in accordance with CSXT's Standard Procedure Bulletin R-16.

Nonwoven Geotextile Fabric

Property	Minimum Average Requirements	Test
Weight	16 ounces per Square Yard	ASTM D 1910
Apparent opening size	70 - 120 Standard Sieve	ASTM D 4751
Grab tensile	350 pounds	ASTM D 4632
Mullen burst strength	620 pounds per square inch	ASTM D 3786
Thickness	100 mils	ASTM D 1777
Elongation	40% - 60%	ASTM D 4632
Permittivity	0.201 / second	ASTM D 4491
Trapezoidal tear	150 pounds	ASTM D 4533
Puncture strength	185 pounds	ASTM D 4833

Woven Geotextile fabric

Property	Minimum average requirement	Test
Max Apparent opening size	40 Std. sieve	ASTM D 4751
Grab tensile strength	315 pounds	ASTM D 4632
Max Elong. @ failure	15 %	ASTM D 4632
Permittivity	0.05 / second	ASTM D 4491
Trapezoid Tear Strength	120 pounds	ASTM D 4533
CBR Puncture Strength	900 pounds	ASTM D 4833

C. For Placement as Slope Protection: The filter fabric shall be non-woven or woven monofilament polypropylene or polyester material conforming to the following minimum average requirements:

Item	Minimum average requirement	Test
Apparent opening size	70 Standard sieve	ASTM D 4751
Grab tensile strength	270 pounds	ASTM D 4632
Mullen Burst strength	500 p.s.i.	ASTM D 3786
Permittivity	1.11 / second	ASTM D 4491
Trapezoidal tear	60 pounds	ASTM D 4533
Puncture strength	140 pounds	ASTM D 4833

D. For Placement with Subgrade Drains: The filter fabric shall be non-woven needle punched polyester or polypropylene material conforming to the following minimum average requirements:

Item	Minimum average requirement	Test
Weight	5.3 ounces per square yard	ASTM D 1910
Apparent opening size	70 Standard sieve	ASTM D 4751
Grab tensile strength	150 pounds	ASTM D 4632
Burst strength	300 p.s.i.	ASTM D 3786
Max. elongation @ failure	40 - 60%	ASTM D 4632
Permeability	0.2 cm / second	ASTM D 4491
Trapezoidal tear	65 pounds	ASTM D 4533
Puncture strength	80 pounds	ASTM D 4833

PART 3 - EXECUTION

3.1 EXECUTION

A. For placement on Roadbed

1. The filter fabric shall be placed at the locations shown on the plans or as directed by the ENGINEER. The surface to receive the fabric shall be prepared to a relatively smooth condition, free of obstructions, depressions, debris, and soft or low density pockets of material. All holes, rips, or flaws made in the fabric shall be repaired by placing a piece of fabric, which is 1.5 feet larger than the hole in the fabric in all directions, directly over the hole before stone is placed on the fabric. The fabric shall be laid smooth and free of tension, stress, folds, wrinkles or creases. The fabric rolls shall be placed to provide a minimum width of 24 inches of overlap for each fabric joint. The use of securing pins will not be permitted. Overlaps will be secured, if necessary, by placing subballast windrows on the overlap section. All damage to the fabric during its installation or during placement of the subballast shall be replaced or repaired by the CONTRACTOR at no cost to the railroad. The fabric shall be protected from sunlight, ultra-violet light, high temperatures, dirt and debris at all times prior to installation. Subballast shall be placed on the fabric, as specified herein or as shown on the plans, immediately after fabric placement.

2. No construction traffic will be permitted directly on the fabric. At least six (6) inches of sub-ballast material must be placed before traffic will be allowed in areas where filter fabric has been placed.

3. The filter fabric shall be placed beneath the subballast on top of the prepared subgrade per the plans or specifications or as directed by the ENGINEER.

4. The CONTRACTOR shall not receive extra compensation for the minimum 24 inches of overlap required.

B. For Placement under Ballast

1. The filter fabric shall be placed at the locations shown on the plans or as directed by ENGINEER. The surface to receive the fabric shall be prepared according to conditions specified under "EARTHWORK." All holes, rips, or flaws in the fabric shall be repaired by placing a piece of fabric, which is 2 feet larger than the hole in the fabric in all directions, directly over the hole before stone is placed on the fabric. The fabric shall be laid smooth and free of tension, stress, folds, wrinkles or creases. The fabric rolls shall be placed to provide a minimum width of 24 inches of overlap for each fabric joint. The use of securing pins will not be permitted. Overlaps will be secured, if necessary, by placing ballast windrows on the overlap section. All damage to the fabric during its installation or during placement of the ballast shall be replaced or repaired by CONTRACTOR at no cost to the railroad. The fabric shall be protected from sunlight, ultra- violet light, high temperatures, dirt and debris at all times prior to installation. Ballast shall be placed on the fabric, as specified herein or as shown on the plans, immediately after fabric placement.

2. No construction traffic will be permitted directly on the fabric. A minimum of eight (8) inches of ballast material must be placed on top of the fabric before any traffic will be permitted in that area. The fabric shall be protected at all times during construction from contamination by surface runoff. All fabric so contaminated shall be removed and replaced with uncontaminated fabric.

3. If it is necessary to overlap rolls or pieces of a geotextile along the longitudinal edge, eighteen (18) inches of overlap shall be used. The CONTRACTOR shall not receive extra compensation for any overlaps. No longitudinal overlaps shall occur between the toes of ballast of any track.

4. At all bridge abutments the geotextile shall be turned down two feet below the finished subgrade against the face of the abutment. As the embankment is replaced against the abutment and the geotextile, the CONTRACTOR shall take special care to ensure that the backfill is adequately compacted to the specified design density. The CONTRACTOR shall also use special care to avoid any damage to the geotextile.

5. The filter fabric shall be placed beneath the subballast on top of the prepared subgrade per the plans or specifications or as directed by the ENGINEER.

C. For Placement as Slope Protection

1. The filter fabric shall be placed at the locations shown on the plans or as directed by ENGINEER. The surface to receive the fabric shall be prepared to a relatively smooth condition, free of obstructions, depressions, debris and soft or low density pockets of material. All holes, rips or flaws made in the fabric shall be repaired by placing a piece of fabric, which is 1.5 feet larger than the hole in the fabric in all directions, directly over the hole before stone is placed on the fabric. The fabric shall be laid smooth and free of tension, stress, folds, wrinkles or creases. The fabric rolls shall be placed to provide a minimum width of 24 inches of overlap for each adjacent strip. When securing pins are necessary in the placement of the fabric, the pins shall be 3/16 inch diameter steel, pointed at one end, and 22 inches long. All damage to the fabric during its installation or during placement of the stone shall be replaced or repaired by CONTRACTOR at no cost to the railroad. The fabric shall be protected from sunlight, ultra-violet light, high temperatures, dirt and debris at all times prior to installation.

2. The fabric shall be laid with the long dimension parallel to the centerline of the channel or shoreline unless otherwise directed by ENGINEER.

3. Securing pins with washers shall be inserted through both strips of the 24" overlapped fabric at not greater than the following intervals along a line through the midpoint of the overlap:

Pin Spacing	Slope
2 feet	Steeper than 3:1
3 feet	3:1 to 4:1
5 feet	Flatter than 4:1

4. Additional pins, regardless of location, shall be installed as necessary to prevent any slippage of the filter fabric.

5. Each securing pin shall be pushed through the fabric until the washer bears against the fabric and secures it firmly to the foundation.

6. The fabric shall be turned down and buried at all exterior limits.

7. The fabric shall be installed so that the upstream strip of fabric will overlap the downstream strip. If ENGINEER directs that the fabric be placed with the long dimension perpendicular to the centerline of the channel or shoreline, the higher strip of the fabric shall overlap the lower strip.

8. The fabric shall be protected at all times during construction from contamination by surface runoff. All fabric so contaminated shall be removed and replaced with uncontaminated fabric.

9. Work shall be scheduled so that the fabric is exposed no more than 5 days prior to the covering of the fabric with stone.

10. Stone shall not be dropped on the fabric. If CONTRACTOR provides a six (6) inch cushioning layer of sand on top of the fabric, before the dumping of stone, a one (1) foot drop shall be permitted. No separate measurement shall be made for the sand cushion layer. All damage to the fabric during the placement of stone shall be repaired or replaced by CONTRACTOR.

D. For Placement with Subgrade Drains

1. The filter fabric shall be placed at the locations shown on the plans or as directed by the ENGINEER. The surface to receive the fabric shall be prepared to a relatively smooth condition, free of obstructions, depressions, debris and soft or low density pockets of material. All holes, rips, or flaws made in the fabric shall be repaired by placing a piece of fabric, which is 1.5 feet larger than the hole in the fabric in all directions, directly over the hole before stone is placed on the fabric. The fabric shall be laid smooth and free of wrinkles, folds, or creases. The use of securing pins will not be permitted. The fabric shall be secured, if necessary, by placing large stones or bags of soil on the fabric section. All damage to the fabric during its installation or during placement of the backfill shall be replaced or repaired by the CONTRACTOR at no cost to the railroad. The fabric shall be protected from sunlight, ultra-violet light,

high temperatures, dirt and debris at all times prior to installation. The filter material shall be placed on the fabric, as specified herein or as shown on the plans, immediately after fabric placement.

2. Initial placement of the fabric shall be at lowest trench grade with the succeeding strips being placed at successively higher grades. Longitudinal overlaps shall be a minimum of 12 inches.

3. Trenches to be lined with fabric shall be graded to obtain smooth side and bottom surfaces so that the fabric will not bridge cavities in the soil or be damaged by projecting rock. The fabric shall be laid flat, but not stretched on the soil, with sides folded back and secured large stones to allow for the placement of stone backfill. The backfill shall be placed and compacted to the depth shown on the plans. The filter fabric sides shall be folded across the top of the backfill with a minimum of 12 inches of overlap.

4. The fabric shall be placed, lining the drain trenches, in accordance with the lines and grades shown on the plans.

END OF SECTION 020265

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall furnish material for and install in place reinforced concrete pipe in the locations and to the elevations shown on the plans.

1.2 MEASUREMENT AND PAYMENT

A. Measurement for item REINFORCED CONCRETE PIPE shall be in linear feet installed from end to end of continuous runs, exclusive of end sections, and passing through the center of included catch basins. Where a run of pipe ends in a catch basin, the pipe shall be measured to the center line of the catch basin.

B. Payment for REINFORCED CONCRETE PIPE will be at the unit price bid per linear foot of pipe in each pipe diameter installed in place shall be full compensation for all labor, material, equipment, tools, supplies and all else necessary to perform all trenching, backfilling, necessary hardware and incidental expenses of installation. All tees and elbows shall be included in the price bid for this item.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforced concrete pipe shall be bell and spigot pipe with “O” ring gasket, or tongue and groove with RAM-NEK type flexible gasket meeting the current ASTM designation: C-76, class V, wall C, unless designated otherwise on the plans.

PART 3 - EXECUTION

3.1 EXECUTION

A. Pipe shall be placed in accordance with AREMA recommendations Installation of Pipe Chapter 1, Part 4, latest version. The pipe shall be placed in class B bedding that entails placing compacted granular backfill material around the pipe as shown on the typical sections and in accordance with Section 020220, **Backfilling (for use with C.M.P. and R.C.P.)**.

B. Where existing pipes are to be extended, connections shall be made to create a watertight connection. Concrete collars may be required to connect the existing pipe to the extension. Connection collar details are shown in the typical plan sections. Connection collars are to be approved by the ENGINEER.

END OF SECTION 020325

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PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall furnish material for and install a precast concrete headwall in the locations and to the elevations shown on the plans.

1.2 MEASUREMENT AND PAYMENT

A. Measurement for item PRECAST CONCRETE HEADWALL shall be by each number of headwalls constructed.

B. Payment for item PRECAST CONCRETE HEADWALL shall be at the unit price of each precast concrete headwall installed in place shall be full compensation for all labor, material, equipment, tools, supplies and all else necessary to perform all trenching, backfilling, necessary hardware and incidental expenses of installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. CONTRACTOR shall provide material per State DOT or AREMA recommendations.

PART 3 - EXECUTION

3.1 EXECUTION

A. CONTRACTOR shall confirm State DOT standard specifications and design or submit detailed structural drawing signed by a registered engineer from the state which the work is being performed for all precast concrete headwall for approval prior to work.

B. CONTRACTOR shall submit detailed foundation and bedding plans required to achieve effect of plan.

C. Precast concrete headwall shall be designed and placed in accordance with AREMA recommendations. Design live load, minimum Cooper E 80 loading.

D. Precast concrete headwall shall be designed consistent with any federal, state, or local permitting requirements.

END OF SECTION 20350

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PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section covers construction requirements, and measurement and payment for the removal of silt or debris from culvert barrels and culvert sloped end sections to restore proper drainage. The culvert barrel is the portion of the culvert excluding the sloped ends.

B. General conditions for this work are in accordance with Division 1 of the CSXT Design and Construction Standard Specifications.

1.2 MEASUREMENT AND PAYMENT

A. Measurement of CLEANING DEBRIS FROM CULVERTS - CULVERT BARRELS, for payment, as specified in this Section and as accepted in the final work, shall be on a per linear foot basis from of the full length of culvert barrel , for a specific range of diameters, regardless of the size or length of blockage.

B. Measurement of CLEANING DEBRIS FROM CULVERTS - SLOPED ENDS, for payment, as specified in this Section and as accepted in the final work, shall be made of the number of sloped ends cleaned, regardless of the diameter of the pipe.

C. Payment will be made at the applicable unit price bid per linear foot for "CLEANING CULVERT BARREL - up to 36 in diameter," or "CLEANING CULVERT BARREL - over 36 in and less than 48 in diameter" and "CLEANING CULVERT BARREL - 48 in and over". This payment will be full compensation for removing and disposing of debris from the culvert barrel, and all labor, materials, equipment, tools and incidentals necessary to complete the Work. When debris is cleaned from the culvert barrel, removing and disposing of that debris from the sloped ends shall be incidental to the Work.

D. Payment will be made at the unit price bid per sloped end for "CLEANING CULVERT ENDS". This payment will be full compensation for removing and disposing of debris from the culvert end, and all labor, material, equipment, tools and incidentals necessary to complete the Work.

E. Payment for specialized equipment, if required, and as determined by the ENGINEER and the CONTRACTOR and approved by CSXT, will be paid as "CLEANING CULVERT – SPECIALIZED EQUIPMENT".

PART 2 - MATERIAL

2.1 GENERAL

A. All materials shall meet the requirements of Division 7, 100 Series of the CSXT Design and Construction Standard Specifications.

B. The culvert barrel and/or culvert ends shall be free of debris and silt, rock or granular material, allowing a normal flow of water as determined by the ENGINEER.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work.

1. Maintenance and execution plan
2. Maintenance equipment information

PART 4 - EXECUTION

4.1 CLEANING CULVERT BARRELS

A. The CONTRACTOR shall remove and dispose of material from the culvert barrel. When the debris blockage has been removed from the culvert barrel, the entire culvert, including the culvert inverts, shall be free of debris, allowing a normal flow of water. Debris is defined as beaver dams, wood, vegetative material, household items and other non-granular materials. Silt is not considered as debris under this specification.

B. If the culvert is blocked by silt, rock, or other granular material, the ENGINEER and the CONTRACTOR will determine the appropriate action including any specialized equipment required for cleaning the culvert.

4.2 CLEANING SLOPED ENDS

A. The CONTRACTOR shall remove and dispose of material from the culvert ends to restore normal water flow. This will require 1 person with hand tools for a period of up to 1 man-hour of labor.

B. If the culvert end is blocked by silt, rock or other granular material requiring more than 1 man-hour of labor, the ENGINEER and the CONTRACTOR will determine the appropriate action and the specialized equipment required for cleaning the culvert ends.

END OF SECTION 020355

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work in this section includes furnishing all labor, equipment, materials, tools, and supplies for the installation of highway grade crossings complete including: flange way materials; detours; signage; barricades; dress grading and clean up.

1.2 MEASUREMENT AND PAYMENT

A. Measurement for the item BARRICADES & DETOURS shall be per each road closing. Measurement will be made once per crossing regardless of the number of times the crossing is closed and re-opened to highway traffic.

B. Payment for the item BARRICADES & DETOURS at the per each price bid shall be full compensation for supplying all labor, materials, tools, equipment, supplies, all other items of expense to close and re-open the crossing.

C. Measurement for the item ASPHALT PAVING shall be per ton of asphalt installed. CONTRACTOR shall supply truck weight tickets from the asphalt supplier.

D. Payment for the item ASPHALT PAVING at the unit price bid shall be full compensation for supplying all labor, materials, equipment, tools and all other items of expense to saw cut existing roadway, remove and dispose of all road materials, prepare sub-grade, install asphalt, final dress grade and clean up road crossing.

E. Measurement of the item CROSSING SURFACE (CONCRETE) and CROSSING SURFACE (TIMBER) shall be by the track foot measured from end to end of the crossing surface installed.

F. Payment for the items CROSSING SURFACE at the unit price bid shall be full compensation for all labor, equipment, tools, and all other items of expense to install crossing surface.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All crossing materials with the exception of the asphalt products; road sub-base; and tack coat for the crossings will be supplied by the RAILROAD. CONTRACTOR shall supply asphalt products and road sub-base.

B. The highway grade crossing shall consist of 6 inches of sub-base, a tack coat, 4-1/2 inches of base course and 1-1/2 inch of wearing surface or as shown on the plans.

C. The sub-base shall be stone, gravel or slag meeting the requirements of the governing State's DOT specifications. The fine grading and surface compaction of the sub-base is a part of this item.

D. The sub-base shall be prepared and a tack coat shall be applied uniformly in conformance with the governing State's DOT specification.

E. The asphalt base shall consist of asphalt binder conforming to the governing State's DOT specifications. The asphalt wearing surface shall be in accordance with the governing State's DOT specifications and approved by the ENGINEER.

PART 3 - EXECUTION

3.1 EXECUTION

A. CONTRACTOR will be responsible for the unloading, inventorying, storing, clean and free from dirt, and protecting the crossing material.

B. The CONTRACTOR shall coordinate with the proper governmental agency or outside party responsible for the crossing. The street and road closures must be coordinated prior to closing. Proper barricades must be placed at all crossings during the time that they are closed to prohibit vehicles from entering the work zone. All state and local regulations must be met in the erection and installation of these barricades.

C. Where ballast has been placed in trackwork, the ballast shall be considered suitable sub-base material within the limits on the typical sections.

D. Any road crossing over the Railroad's track at grade shall be installed in accordance with CSXT Standard Drawings, latest revisions.

E. No splices (rail joints) will be permitted within the confines of the crossing, including road shoulders.

F. Highway and street crossings will be completed in their entirety, including grading, planking, and/or paving in exact accordance with the plans and specifications. Care will be taken to insure the least possible interference with highway or street traffic.

G. The horizontal and vertical geometrics of highway crossings require special attention. It must be remembered that highway crossing areas are usually areas that have multiple ownership and that alignments may be dictated by the governmental organization that controls the highway. Vertical Alignment – It is desirable from the standpoint of sight distance, rideability, braking and acceleration, distances at that the crossing be made as level as practicable. Vertical curves should be of sufficient length to ensure an adequate view of the crossing. In some instances, the roadway vertical alignment may not meet acceptable geometrics for a given design speed because of a restrictive topography or limitations of right-of-way. If practical, the crossing surface should be on the same plane as the top of rail for a distance of 30 inches outside the rails. The surface of the highway should also not be more than 3 inches higher or lower than the top of the nearest rail at a point 30 ft from the rail unless super elevation makes a different level appropriate. Tracks that are super elevated or a roadway approach that is not level, require site specific analysis.

H. Road crossing construction and rehabilitation is resource intensive and disruptive to rail and highway traffic, therefore special care must be taken to ensure that the crossing is properly installed. The entire "Crossing Zone" requires special care and maintenance practices. The "Crossing Zone" is the crossing surface including all new required pavement and the track and right of way approaching the crossing for 50 feet each side of the crossing.

1. DRAINAGE

   a) If the crossing site is well drained and shows no signs of sub-grade problems, extra care must be taken to ensure that drainage facilities are not damaged or improved.

   b) Good drainage must be provided from all four quadrants of the crossing and crossing zone. Ditches, pipes and/or trench drains should be installed, if necessary, to obtain the adequate drainage.

   c) A level granular working area must be provided around highway crossing warning devices. If this area is excavated from drainage, it should be filled with free draining ballast. Provisions must be made to protect buried cables. Normally a level area 6 feet to the front/side and 2 feet to the rear of the mast foundation is required for maintenance of gate or flasher mechanisms. Refer to drawing 2613 for details.

   d) Roadway approaches and ditches should be sloped or diverted away from the crossing.

2. BALLAST

   a) Ballast must be granite or trap rock meeting CSXT Specifications MWI 301, latest revision.

   b) Ballast must be clean and free draining both in cribs and under ties within the crossing.

   c) Ballast within the entire crossing zone must be clean. Ballast that is fouled with mud or debris can degrade the proper operation of crossing warning devices.

   d) Ballast cross section below bottom of tie which supports the track must be compacted solidly before the crossing surface and pavement approaches are placed. Preferred methods of compaction are:

      i. Vibratory roller

      ii. Train Traffic (4 tonnage trains or 20,000 tons accumulated minimum)

      iii. Dynamic Stabilizer with cribs filled with ballast and multiple passes.

   e) The finished ballast cross section in the crossing zone approaching the crossing must comply with Standard Drawing 2602. Care must be taken to ensure that no surplus of ballast is present to impede drainage.

3. CROSSTIES

   a) The old pavement should be saw cut to permit the installation of the track through the roadway. The width of the opening created will vary depending on site conditions and material used (panel installation, 8’-6” vs. 10’-0” ties, etc).

   b) All ties through the entire crossing must be new wood and provide consistent support. Ten foot long wood ties are required for all full width concrete road crossing surfaces.

   c) Crossings in concrete tie territory are to be constructed on 10 foot long wood ties with Positive Restraint Fasteners and Plates. These 10 foot wood ties must extend a minimum of 10 ties beyond each end of crossing as a transition to concrete ties.

   d) During tie installation or track panel construction, the ties will be placed on 19.5 inch centers for rubber interface, timber and concrete crossings. Other manufacturers of crossing surfaces may require ties to be installed at different centers, generally 18 inch.

4. RAIL

   a) No bolted rail joints are allowed in the crossing.

   b) Thermite welds may not be located within the crossing on main tracks and sidings. Thermite welds in the Crossing Zone should be staggered at least 10 feet away from the edge of the crossing.

   c) No bolted rail joints are allowed within the Crossing Zone on main, branch or siding tracks.

   d) Only bonded insulated joints are permitted in the Crossing Zone on main, branch or siding tracks.

   e) Rail anchoring pattern is to be in accordance with MWI 703, latest revision.

5. SURFACING

a) If practicable in multiple track crossings, all tops of rails should be brought to the same plane.

b) Solid tamping is important. The tamper must use double insertions and, if capable, tamp the total length of the tie. Care must be taken to avoid center binding of the tie.

c) When track is tamped, ballast must be compacted before the crossing surface and pavement are placed.

d) The finished ballast cross section in the crossing zone approaching the crossing must comply with Standard Drawing 2602, latest revision with no surplus ballast to impede drainage.

6. TEMPORARY ROADWAY CROSSING

a) Ballast & Cold Mix: The quantity and strength must be sufficient to support the expected road traffic. Cold mix must be removed from the track as soon as it is not needed. Ballast must be standard CSXT specification for main track. Other materials are not permitted.

b) Modular Temporary Crossing: Must be of sufficient size and strength to support the expected road traffic. Modular crossings must be secured with lag screws to prevent movement.

c) For steel track equipment crossing one or both rails see standard specification 010540, Safety and Protection.

7. ASPHALT PAVING

a) Asphalt pavement should be full depth between top of tie and road surface except for farm/residential crossings. Compacted pavement must be thick enough to lock into the rubber interface material.

b) Tack coat must be used where new asphalt meets old pavement. The tack must meet the state DOT specifications for the state in which the crossing is located.

c) Asphalt (bituminous concrete) pavement used must be a dense graded mix, which meets the state DOT specifications for asphalt pavement construction for the state in which the crossing is located. Certificates must be provided to the ENGINEER.

d) Asphalt pavement material must be sufficiently hot (minimum 230 degree F) for proper compaction. Optimal temperature is greater than 250 degrees F.

e) The roller used to compact the asphalt should be a steel wheeled vibratory type. It must be narrow enough to fit between the gage side flangeway interface material and between the outside of the crossing and old pavement. It should exert a minimum force of 12,000 lb/roll at 2400 vpm and operated at a speed of less than 3 ft/sec. normally, a 36 inch vibratory roller will meet these criteria. A roller with equivalent compaction force but less than 26 inch wide must be used between the rails on a Rubber/Asphalt/Timber or Timber/Asphalt type crossing.

f) The roller must be operated parallel to the rail and up against the rubber, concrete or timber surface material to ensure good asphalt compaction. Use caution not to dislodge rubber interface sections or the clamps/spikes that secure the rubber.

g) Asphalt should be compacted to at least 91% of maximum theoretical density (air voids less than 5% in the compacted mix). For quality assurance, asphalt core borings may be taken to verify compliance.

h) Paved road surface should be level with the top of rail for 30 inches from the field side of each rail unless

there is a conflict with State regulations. In case of a conflict, the State regulations will govern. For new construction, highway surface should not be more than 3 inches higher or lower that the top of the near rail 30 feet from the rail along the road centerline, unless track super-elevation dictates otherwise. If practicable, slope the pavement 1 inch in 10 feet to meet existing highway surface. On high speed roads, the surface may have to be even smoother to reduce impacts on the crossing surface.

i) On unpaved roads, the asphalt pavement on the field side of the rail must be of sufficient volume so it does not move or slip away from the rail under the expected roadway traffic. State regulations may require a minimum length apron.

j) The crossing should be closed to highway traffic long enough for the hot asphalt pavement to cool (hand touchable) and stiffen to support loads without rutting.

k) Old pavement, ballast, and surface material must be disposed of in a proper manner complying with CSXT policies by the CONTRACTOR.

END OF SECTION 020401

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PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall furnish and place crushed stone or crushed gravel as shown on CSXT Standard Drawing 2601, latest edition unless otherwise indicated on Project Drawings.

1.2 MEASUREMENT AND PAYMENT

A. Measurement for the item SUBBALLAST will be the number of square yards measured along the surface of the subballast and authorized by the ENGINEER. Subballast installed in excess of the design area shall not be included in the measurement unless authorized by the ENGINEER in writing. Permanent access roads on the plans or as directed by the ENGINEER will be included in the measure. Temporary access roads for the benefit of the CONTRACTOR and construction will not be measured. Note that the CONTRACTOR is to coordinate tolerances of earthwork activities and subballast to obtain a six inch thick layer of subballast. Thicknesses in excess of six inches will not result in increasing the area measurement this item is based on. Obtaining the proper thickness of subballast is a part of this item and critical.

B. Payment at the unit price bid shall be full compensation for all labor, material, equipment, tools, supplies, and all else necessary to supply, transport, unload, haul, properly place and compact the subballast.

C. The cost of supplying and applying water to obtain the specified density shall be included in the Bid price.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Subballast shall be composed of crusher run granite or limestone in conformance with the following gradation requirements:

Screen Size	Percent Passing Graded Aggregate	Weight passing Crusher Run
1 ½”	100%	100%
¾”	60%-100%	
No. 10	30%-55%	15%-45%
No. 60	8%-35%	
No. 200	5%-20%	5%-12%

B. CONTRACTOR may substitute the governing DOT material for subbase with similar qualities to the MWI 301 Specification. Material shall be in conformance with DOT specifications in effect at the time of the project bid.

C. Subballast materials shall be submitted to ENGINEER for approval prior to placing and transporting.

PART 3 - EXECUTION

3.1 EXECUTION

A. All rutting or displacement of the subgrade shall be smoothed and re-compacted by CONTRACTOR before the placement of any subballast. If the subballast is subject to construction equipment traffic causing displacement or excess compaction, CONTRACTOR shall, at no extra cost to OWNER, bring the sub ballast back to the designated density and grade.

B. CONTRACTOR shall not place subballast on a wet, snow covered or icy roadbed.

C. Subballast shall be placed in loose lifts of 3 inches and compacted to not less than 95% of its dry weight density as determined by the Modified Proctor Density Test ASTM D 1557. If additional moisture is required to obtain adequate density, then CONTRACTOR shall use water along with approved mixing, shaping and compaction equipment.

D. The thickness of the finished subballast shall have a tolerance of plus or minus 0.05 ft to the design thickness. Thickness of subballast shall be monitored throughout construction. Thickness found to be less than tolerance must be corrected by adding additional subballast material. Thicknesses found to be greater than the tolerance can be removed by the CONTRACTOR or left in place.

E. The subballast shall be placed with a descending grade of 2% away from the adjacent track in double track territory or away from the centerline in single track territory per standard drawing CSXT 2601, latest revision.

END OF SECTION 020405

PART 1 - GENERAL

1.1 DESCRIPTION

A. RAILROAD shall purchase all ballast for this project, unless otherwise noted.

B. CONTRACTOR shall transport, unload, compact and place pre-ballast pads at locations as directed by the ENGINEER. This ballast shall be known as PREBALLAST.

C. CONTRACTOR shall also transport, unload, and re-handle ballast for turnouts, track shifts, track panels, road crossings, etc. This ballast shall be known as STOCK PILE BALLAST.

D. If used, CONTRACTOR shall also transport, unload, and re-handle ballast for final ballasting of track. This ballast for the final ballasting will be the same source as STOCK PILE BALLAST but shall be known as FINAL STOCK PILE BALLAST.

E. RAILROAD shall furnish and transport by rail car ballast for final ballasting to be unloaded and placed by the CONTRACTOR.

1.2 MEASUREMENT AND PAYMENT

A. Measurement for the item PREBALLAST will be the number of net tons of ballast transported and compacted in place as calculated from weigh tickets provided by CONTRACTOR. CONTRACTOR is responsible to retain weigh tickets and provide ENGINEER copies with invoice.

Measurement for the item STOCKPILE BALLAST will be the number of net tons of ballast transported and placed in stockpiles as calculated from weigh tickets provided by CONTRACTOR. CONTRACTOR is responsible to retain weigh tickets and provide ENGINEER copies with invoice.

Measurement of the item SEPARATION BALLAST & SURFACING shall be measured in track feet where separation is achieved by unloading ballast from railroad cars directly onto sub ballast and raising the track by multiple surfacing passes. This is done in lieu of installation of a pre-ballast pad.

B. Final ballasting, when RAILROAD furnishes ballast by railcars, shall be considered incidental to track construction. No separate payment shall be made for final ballasting.

Final ballasting, when CONTRACTOR uses FINAL STOCK PILE BALLAST, will be the number of net tons of ballast transported and compacted in place as calculated from weigh tickets provided by CONTRACTOR. CONTRACTOR is responsible to retain weigh tickets and provide ENGINEER copies with invoice

C. Payment for the item PREBALLAST at the unit price bid shall be full compensation for supplying all labor, designated transportation, materials other than ballast, equipment, supplies, rehandling and storage and all else necessary to unload, transport, re-handle, store, construct pre-ballast pads ballast.

Payment for the item STOCK PILE BALLAST at the unit price bid shall be full compensation for supplying all labor, designated transportation, materials other than ballast, equipment, supplies, re-handling and storage and all else necessary to unload, transport, re-handle, store, ballast stockpiles.

Payment for the item SEPARATION BALLAST & SURFACING at the unit price bid shall be full compensation for supplying all labor, equipment, materials other than ballast, tools, and all else necessary to unload ballast from rail cars onto track structure and surface track to achieve track separation shown on plans (in other words up to the level prior to final surfacing).

Payment for the item FINAL STOCK PILE BALLAST, if used, at the unit price bid shall be full compensation for supplying all labor, designated transportation, materials other than ballast, equipment, supplies, rehandling and

storage and all else necessary to unload, transport, re-handle, store, construct final ballasting.Part 2 - products

2.1 MATERIALS

A. Ballast shall conform to CSXT's Ballast Specification, MWI-301, latest revision.

B. Slag material will not be accepted as ballast.

PART 3 - EXECUTION

3.1 EXECUTION – PRE-BALLASTING

A. The pre-ballast pad will be installed using a spreader box. The width will be as shown on the plans with the entire width of ballast required being added during pre-ballasting. Any excess ballast that fouls the walkway shall be removed at the contractor's expense.

B. Ballast shall not be spread over snow or ice.

C. All rutting and pocketing of the ballast (subgrade and sub ballast) shall be corrected by restoring the ballast to a smooth surface.

D. The ballast shall be placed in loose lifts which are no thicker than 4 inches, and then compacted.

E. Minimum requirements for ballast compaction are as follows:

1. Compaction equipment shall be a minimum 10 ton vibratory roller capable of generating 1100 to 1500 cycles per minute.

2. Compaction equipment shall be operated as directed by ENGINEER, but in no case shall the speed exceed four (4) feet per second, and the normal operating speed shall be two-and-one-half (2-1/2) feet per second.

3. A minimum of six (6) complete passes with the compaction equipment shall be made over each lift, and each lift shall be compacted until no deformation under load is observed.

3.2 EXECUTION – STOCKPILE BALLAST

A. Stockpile ballast shall be stockpiled as directed the ENGINEER. Care should be taken to minimize the amount of ballast contaminated on the ground by keeping piles as high as practical.

B. Excessive ballast contaminated on the ground will be charged back to the CONTRACTOR.

3.3 EXECUTION - FINAL BALLASTING

A. CONTRACTOR shall place final ballast on the track and uniformly distribute it in sufficient quantities to properly raise the track to the proposed top of rail profile shown on the plans. The ballast shall be placed and the track raised and tamped after the rails are installed, spiked, or clipped in concrete tie sections.

B. To the extent possible, ballast shall be unloaded in position for use with a minimum of redistribution and dressing. Special ballast cars shall be used when available.

C. Ballast must be distributed or immediately dressed so that ample clearance is provided for rolling equipment, and so that switches, guard rails, and road crossing flange ways are unobstructed.

D. When a pre-ballast pad is not installed, the ballasting of track shall be accomplished in not less than four lifts. Each lift shall not exceed four inches in height, except the final lift shall be approximately two inches in height. When a pre-ballast pad is installed, a minimum of two surfacing passes are required.

E. Track cross level shall be maintained, and both rails shall be raised simultaneously when track is being raised.

F. Track surfacing shall be done by methods which will prevent undue bending of the rail or straining of the joints. The amount of track lift shall not endanger the horizontal or vertical stability of the track. The track shall be initially raised so that a final raise of not less than one inch nor more than three inches will be required to bring it to finish surface. All ties that pull loose shall be restored to proper position and shall have full bearing against the rail and be properly secured to the rail.

G. The track shall be placed in proper alignment when initially raised and tamped. The final alignment of track shall be done with a production type tamper capable of meeting the design specifications. The grades and alignments of each complete track shall conform to the design shown on the plans. The grade rail on all curves shall be the inside rail of the curve After the track has been tamped, CONTRACTOR shall neatly dress the ballast and add or remove quantities of ballast as required to conform to CSXT Standard Drawing 2602 unless otherwise indicated on the Project Drawings. Surplus ballast shall be stockpiled at the direction of ENGINEER.

H. Tamping of ballast shall be done with power tamping equipment. Control or cycling of the power tamper shall provide the maximum proper compaction of the ballast uniformly along the track. The ballast shall be thoroughly tamped on both sides of the tie from a point 15 inches inside the rails to the ends of the ties.

I. When the track has been raised to within two inches of the final grade and properly compacted, a finishing lift shall be made by jacking the track to the finish top-of-rail elevations. The ballast shall then be applied under the ties for their entire length and thoroughly driven in place for a space extending from fifteen inches inside either rail to the ends of the ties, by tamping machines, tamping picks, or tamping bars. The ballast under the remainder of the tie bearing shall not be tamped. In making the finishing lift, the spot board and track level board shall be used with care and the track brought to a true surface with the required superelevation of the outer rail on spirals and curves.

J. After the track has been brought to true surface, elevation, and grade, it shall be given a final lining conforming to the established track center. Every effort shall be made to maintain approximate line during preliminary ballast applications.

K. After the track has been finally surfaced and lined, the ballast shall be dressed to conform to the standard sections shown on CSXT Standard Drawings. CONTRACTOR shall provide the necessary templates for shaping the ballast sections. The edge of ballast shall be brought to true line by means of shovels, forks or ballast regulating machine, and the ballast shoulders shall be uniformly formed and compacted. All excess ballast shall be removed and deficiencies of ballast shall be supplied.

L. CONTRACTOR shall neatly dress the ballast and add or remove quantities of ballast as required to provide a uniform appearance that conforms to the typical section or to CSXT standard plan, after the track has been tamped. Surplus ballast shall be stockpiled at the direction of ENGINEER.

M. If CONTRACTOR contaminates the ballast with foreign material, then CONTRACTOR shall replace and re-compact the contaminated ballast. CONTRACTOR shall re-compact all previously compacted ballast which is disturbed.

END OF SECTION 020410

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PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall field survey and stake the proposed horizontal and vertical track alignments. The alignments shall be the same as those shown on the plans.

B. Staking shall be done a minimum of two times: Once after the subballast has been placed to ensure that the subballast has been placed in compliance with the plans; and again after final ballasting to ensure that the track has been placed in compliance with the plans.

1.2 MEASUREMENT AND PAYMENT

A. No measurement or payment item will be provided for work under this section. Work is considered incidental to the construction of the track and roadbed.

PART 3 - EXECUTION

3.1 EXECUTION

A. Track work control points shall be offset and protected by CONTRACTOR. Lost or destroyed survey reference points, bench marks, and control points shall be restored by CONTRACTOR.

B. Field staked points shall be a hard wood hub with a tack, or a center punched iron pin. Stakes shall be driven into the ground or ballast a minimum of 12 inches and shall not be easily disturbed.

C. Tangent track and curves flatter than 5 degrees shall be staked along the centerline of track at intervals of 50 feet or less.

D. Track with curves of 5 degrees or sharper shall be staked along the centerline of track at intervals of 25 feet or less.

E. Tracks with super elevation shall have their profile or vertical alignment follow the low rail. The low rail shall be the inside rail of the curve

F. Superelevation and Spirals shall be governed by CSXT standard procedure MWI 1104, latest revision.

G. All turnouts must be staked on the centerline of track at the point of switch (PS), turnout point of intersection (PI), and half inch point of frog (PF).

H. Crotched turnouts shall be staked as described for all turnouts, and also as described for track on curves.

I. The top of rail elevation shall be set to within 0.01 feet of the designed profile elevation shown on the plans.

J. Horizontal control points shall be set to within 0.01 feet of the coordinates shown on the plans.

K. CONTRACTOR shall station existing track, mark web of rail using paint stick.

END OF SECTION 020415

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PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall make temporary track connections between tracks when requested by ENGINEER or when shown on the plans. Train movements and railroad operations must be possible throughout the duration of the job.

1.2 MEASUREMENT AND PAYMENT

A. Measurement and Payment shall be included as incidental to track construction. No separate payment will be made for Temporary Track Connections.

PART 3 - EXECUTION

3.1 EXECUTION

A. Temporary connections shall be constructed at the direction of the ENGINEER. Temporary connections shall be constructed in accordance with CSXT's **"Maintenance of Way Regulations and Instructions.**"

B. New track will be connected to existing operating tracks by railroad forces.

END OF SECTION 020420

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PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall construct track with continuous welded rail at the locations shown on the plans. All track material will be provided by the RAILROAD unless otherwise specified.

B. CONTRACTOR shall provide labor, equipment, and other miscellaneous services for the unloading of RAILROAD provided cross ties at the track construction site or a pre-determined stock pile location as directed by the ENGINEER.

C. Track bolts, nuts, spring washers and spikes shall be new. Nuts, bolts, and washers shall be as specified in CSXT's "**Maintenance of Way Regulations and Instructions**" Manual.

D. The construction of wood tie track can be used for class of tracks 1-4 only.

E. The construction of turnouts and grade crossings is not included under this item.

F. Connections of new track to existing turnouts will be covered under this section.

G. Compromise bars and rails or transition rails, if required to secure new rail to existing, shall be manufactured to conform to the rail sections used.

H. Connections of new track to new turnouts will be covered under Section 020430, **Construct Timber Tie Turnouts**, of these specifications.

I. This item includes but is not limited to installing rail, rail connections, cross ties, and other track material.

J. Final ballasting, lining, destressing, surfacing, and final dressing of the track to achieve the track alignment and profile in accordance with the plans and specifications is included in this item.

K. The pre-ballast thickness for the assembly of the track shall be 10" (ten inches). The full 12" depth of the ballast section will be achieved by the final surfacing of the track.

L. All welds are included as a part of track construction and covered in section 020440, **Rail Connections**. All welds are required to be tested and certified in accordance with CSXT MWI 801, latest revision. Welds required due to the CONTRACTORS means and methods are at the CONTRACTOR's expense.

1.2 MEASUREMENT AND PAYMENT

A. Measurement of the item CONSTRUCT CWR TRACK – TIMBER TIES shall be the number of feet of track constructed and in place, as measured along the centerline of the track.

B. Payment shall be at the unit price bid and shall be full compensation for all labor, materials not specifically supplied by the RAILROAD, equipment, tools, supplies and all else necessary to construct the track.

PART 2 - PRODUCTS

2.1 MATERIAL

A. RAILROAD shall supply, deliver and unload the welded rail in lengths of 1200-1600 lineal feet on special trains. Electric flash-butt welding shall be in accordance with AREMA recommendation for Fabrication of Continuous Welded Rail.

B. CONTRACTOR shall provide labor, equipment, and other miscellaneous services for the unloading of

RAILROAD provided cross ties at the track construction site or a pre-determined stock pile location as directed by the ENGINEER.

C. Ties used shall be placed on 20 inch centers. Line side of the ties shall be 4'-3" from track centerline.

D. Track spikes, tie plates, and rail anchors shall conform to Section 020445, **Other Track Material**, of these specifications.

E. Rail joints and welds shall conform to Section 020440, **Rail Connections**, of these specifications.

F. Ballast and tamping shall conform to Section 020410, **Railroad Ballasting**, of these specifications.

PART 3 - EXECUTION

3.1 EXECUTION

A. CONTRACTOR shall notify ENGINEER in sufficient time before starting the work so that adequate arrangements can be made to progress the work.

B. CONTRACTOR shall perform the track layout in accordance with Section 020415, **Track Layout**, of these specifications.

C. CONTRACTOR shall place track after the underground utilities are protected and approved by the owning utility company; after the railroad compressed air, oil, water, sewer, signal, and underground electric lines have been placed, protected, and approved; and after ENGINEER has approved the roadbed for placing the track.

D. RAILROAD shall unload the welded rail as promptly as possible to release the rail train.

E. CWR shall be unloaded and placed in such a manner as to avoid damage and excessive bending. Rollers shall be used as necessary. Cut out kinks and bends at no cost to CSXT.

F. CONTRACTOR shall inspect and inventory the rail at the delivery site and shall then assume complete responsibility for the security and condition of the rail.

G. CONTRACTOR shall assemble track on the pre-ballast layer, and shall take care not to disturb the roadbed.

H. CONTRACTOR shall supply rollers, if required, for the unloading and distribution of the welded rail. The type of rollers used and their application must be approved by ENGINEER prior to their use.

I. All rutting and pocketing of the roadbed during track laying operations shall be restored to a smooth surface.

J. CONTRACTOR shall place the welded rail onto the tie plates by use of a machine with a threader or tongs. The rail shall be placed without expansion gaps. Installation of CWR shall be in accordance with CSXT standard procedure MWI 1125, latest revision.

K. Strings of welded rail shall only be pulled into position and not pushed. Bumping welded rail into position shall not be permitted.

L. CONTRACTOR shall perform field welding in accordance with Section 020440, **Rail Connections**, of these specifications. Each weld will be tested ultrasonically by an independent laboratory approved by the ENGINEER at the Contractor's expense.

M. Immediately following final surfacing and lining, CONTRACTOR shall anchor and adjust the welded rail in accordance with CSXT MWI 1125, latest revision.

N. When the ambient temperature is such that the welded rail cannot be placed in its final position, CONTRACTOR

shall place it on the tie plates and spike and anchor it sufficiently to permit operation of work trains and on-track equipment.

O. CONTRACTOR shall gauge track as specified under Section 020445, **Other Track Material,** of these specifications.

P. CONTRACTOR shall place anchors as specified under Section 020445, **Other Track Material,** of these specifications. Anchors shall be placed on the rail immediately after the rail is placed and before ending work for the day. CWR will be box anchored throughout the entire section of CWR and for 234 feet (6 rail lengths) on jointed rail at each end of the CWR. Rail anchors shall be applied in accordance CSXT MWI 703, Rail Anchoring Policy, latest revision. Box anchoring is defined as an anchor on each side of a tie, on both rails, or four anchors applied to one tie. Anchors shall be securely fastened to rail and have a solid bearing against the ties.

Q. Rail connections shall conform to Section 020440, **Rail Connections**, of these specifications.

R. The bottom of the rail, the tie plate, and the bearing surface of the tie shall be clean and free of dirt and other foreign substances when the rail is laid. When laying the opposite rail, the rail shall be spiked to gauge at every fourth tie.

S. The outer shoulder of each tie plate shall have full bearing against the base of the rail.

T. Connection of the new track to existing operating tracks will be done by RAILROAD forces.

U. Bridge timbers shall be protected with planking if rubber tired equipment is not used during rail pulling operations.

V. Ballasting and tamping shall be in accordance with Section 020410, **Railroad Ballasting**, of these specifications. Following assembly of track, sufficient ballast shall be unloaded in the tie cribs and shoulders of the track structure to restrain movement or buckling of track due to temperature changes.

W. The grade and alignment of each complete track shall conform to the design shown on the plans. The grade rail on all curves shall be the inside rail of the curve. The outside rail shall be super-elevated in accordance with MWI 1103, Surfacing Policy, latest revision.

X. Thermally adjust rail for permanent installation of rail anchors as follows:

1. At least two weeks prior to start of any thermal adjustment, submit to the ENGINEER the location and description of the proposed method relieving frictional drag between the rail and the tie plates with any fasteners. Do not proceed without written approval from the ENGINEER.

2. Before adjustment of each string of welded rail, its beginning end shall be joined to the previously anchored or existing string. After the beginning end of the string has been joined to the previous string, it shall be adjusted and immediately thereafter anchored. When a string will close on a fully anchored string, the fully anchored string shall have its anchors removed for 300 feet and shall be readjusted to the specified temperature at the time it is joined. Prior to beginning thermal adjustment, vibrate the rail to overcome any frictional resistance, binding in the rail seats and to relieve internal stresses and remove rail anchors previous installed when rail was not at specified fastening temperature. The vibration shall be accomplished with a mechanical device producing vibrations of 900 to 1000 Hertz with a force of 160ft-lbs per cycle acting on the head of the rail. By-pass the end of the string to which the end of the string being thermally adjusted will be connected. Work from the fixed end toward the by-pass end.

3. If during the adjustment process the rail temperatures are within the required temperature range, the adjustment may proceed without heating.

4. If the rail temperature is below the required temperature, apply heat uniformly through the length of the string to bring the rail to at least the specified temperature as follows:

5. The number of inches each CWR string should be expanded may be determined by computing the difference between the measured rail temperature in degrees F and the specified temperature in degrees F, multiply that difference by the length of the CWR string in feet, and multiply the product by 0.000078.
6. Begin heating the rail at the beginning of the string and apply heat uniformly while moving along the rail toward the next string. Control uniformity of expansion marking each quarter point of the string and introducing expansion as follows:

   ¼ point: ¼ of the total required expansion
   ½ point: ½ of the total required expansion
   ¾ point: ¾ of the total required expansion

7. Quarter points shall be marked on the rail and the tie, so that the amount of expansion can be accurately determined.

8. Should the first half of the heated CWR string not have the required expansion at each quarter point, the heater shall return to the point of beginning without applying heat, and then reheat the rail until the necessary expansion is obtained.

9. Do not thermally adjust any rail unless the ballast section is sufficient to support the track.

10. Make field welds connecting CWR lengths immediately after completion of the thermal adjustment of one of the strings and prior to thermal adjustment of the next string. Welding shall be in accordance with CSXT's Welders Manual, and with the welding material Manufacturer's recommendations. After the rail puller/expander is removed in accordance with the provisions herein, thermal adjustment of the next string may proceed.

Y. Apply rail anchors at the time of thermal adjustments.

Z. The form from CSXT Standard Procedures – Continuous Welded Rail, MWI 1125 shall be completed on a daily basis to cover all strings laid that day.

AA. Each weld will tested ultrasonically by an independent laboratory, approved by CSXT and at the CONTRACTOR's expense.

BB. The CONTRACTOR shall perform field welding in accordance with Section 020440, **Rail Connections**, of these specifications.

END OF SECTION 020425

PART 1 - GENERAL

1.1 DESCRIPTION

A. RAILROAD shall furnish and CONTRACTOR shall install rail connections.

B. Joints required to connect tracks to turnouts will be covered under the item for turnouts and not as a part of any track item.

C. Compromise joints will not be allowed unless approved by ENGINEER.

D. CWR connections shall be made by electric flash butt welding. Other methods not allowed unless approved by ENGINEER

1.2 MEASUREMENT AND PAYMENT

A. Payment shall be included with the track to be constructed. No separate payment shall be made for any connections made using joint bars or transition rails, but payment shall be included in the respective track items.

B. Payment for field welds shall be included as a part and included in the respective track items.

PART 2 - PRODUCTS

2.1 MATERIALS

A. RAILROAD shall furnish joint bars designed for the specified rail section. Six-hole joint bars shall be used with rail sections weighing 100 pounds per yard and greater.

B. Bolted rail joints consist of either head free or head contact standard bars and head contact compromise joint bars held in position by track bolts.

C. Compromise joint bars shall be new.

D. Compromise joints shall adequately connect both sections of rail and provide a smooth rail surface over the top of the joint.

E. Compromise joint bars shall be factory manufactured.

F. Correct compromise bars shall be used as determined by the weight and section of the rail, wear on the rail, whether the joint is designated right hand, left hand, or no hand, and whether the joint bar is gauge side or field side.

G. Joint bars shall be free from all cracks or breaks after installation.

H. Insulated Joints shall be prefabricated factory epoxy bonded joint assemblies, 19.5 feet long that are field welded in place. Insulated joints are considered part of the track and no separate measurement and payment shall be made.

I. All joints in CWR shall be joined using electric flash butt welds per “CSXT Welders Manual” unless noted otherwise on the plans.

J. Only as directed by ENGINEER where field welding of rail is indicated, CONTRACTOR shall furnish all labor, supervision, and equipment to make field flash butt welds in accordance with CSXT’s Welder’s Manual MWI 801, latest revision. Defective welds and rails shall be removed and replaced. Each weld shall be tested ultrasonically by an independent laboratory approved by the ENGINEER at the CONTRACTOR’s expense. Thermite welding should only be used in areas where flash butt welding cannot be performed unless approved by ENGINEER.

K. RAILROAD shall furnish new standard heat-treated carbon steel track bolts, nuts and washers in accordance with AREMA recommendations, and conforming to the type and weight of track materials being used.

L. After inspecting and inventorying received material, CONTRACTOR shall unload, store, provide security for, and move the material. All material must be removed from rail cars within seven (7) days of notification of delivery by CSXT.

PART 3 - EXECUTION

3.1 EXECUTION

A. Where joints in conventional track are required, rails shall be placed so that the joints in each line of rail shall be within the middle half of the opposite rail length.

B. The tops of the heads and the gauge faces of adjoining rails shall match within one eighth (1/8) inch of each other.

C. Abutting rail ends shall be fastened together by bolted standard or compromise joints, transition rails, insulated joints or glued joints, except where butt welded.

D. Holes for bolting of cut rails shall be drilled by an approved type of rail drill. The use of a torch for cutting bolt holes will not be permitted.

E. Bolted joints are to be centered on a tie, and field welded joints are to be centered between ties; glued insulated joints are to be centered on a sound, smooth tie.

F. All rail cut in the field shall be cut squarely with a rail saw. Cutting rail with a torch will not be allowed

G. Permanent joint bars shall be applied with their full number of bolts, nuts and washers.

H. All defective joint bars shall be removed and replaced before work will be accepted.

I. CONTRACTOR shall perform field welding in accordance with the “CSXT Welder’s Manual”, MWI 801, latest revision. Each weld will be tested ultrasonically by an independent laboratory approved by the ENGINEER at the CONTRACTOR’s expense.

J. Defective welds shall be cut out using a power rail saw. Replacement rail shall be welded into the string of rail. The entire rail shall be removed wherever longitudinal defects or transverse defects in non- control cooled rails are involved.

END OF SECTION 020440

`PART 1 - GENERAL

1.1 DESCRIPTION

A. RAILROAD shall supply other track material.

B. CONTRACTOR shall install other track material. Other track material includes spikes, rail anchors, and tie plates both for turnouts and for conventional track.

1.2 MEASUREMENT AND PAYMENT

A. No measurement or payment will be made for this item. Payment will be made under the applicable track or turnout item that requires this work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Tie plates with 8-hole punch and compatible with the approved rail section shall be used on all ties, except in turnouts and track crossings where special plates are required. Double shoulder tie plates with a 1 to 40 cant shall be used.

B. Track spikes shall be high carbon and conform to AREMA recommendations. Track spikes shall be 5/8” square by 6” long, unless otherwise approved by ENGINEER.

C. Rail anchors shall be of approved design conforming to AREMA recommendations. New rail anchors shall be used. Where used with relay rail the anchors must be sized to fit the rail base.

PART 3 - EXECUTION

3.1 EXECUTION

A. Tie plates shall be used on all ties. Care must be taken that canted tie plates incline toward the center of track and that the plates having a different amount of cant or flat plates are not intermixed. Before placing tie plates on the tie, dirt and other substances shall be removed from the bottom of the tie plate and the top of the tie.

B. Rails shall be laid one at a time and the rail ends brought squarely together against suitable rail expansion shims and bolted before spiking.

C. When laying the second rail, the rail shall first be spiked to gauge at every fourth tie. Intervening spikes shall then be driven. The gauge of track is the distance between the heads of rails, measured at right angles thereto, at a point five-eighths (5/8) inch below the top of rail. Standard gage is 4’–8 1/2”. No change in gauge on account of curvature will be permitted without the express permission of ENGINEER. When gauging track, CONTRACTOR must see that gauges are square with the rail and know that length of gauge is correct. Gauging must be done at the time the rail is laid.

D. Track spikes shall fasten the rail to wood ties in accordance with CSXT’s standard drawings 2512, 2513, and 2514, latest revisions. Additional spikes shall be used as required by the spiking patterns shown in MWI 2512, latest revision. The CONTRACTOR is responsible for determining the proper spiking pattern based on the design speed and track geometry of the new track.

E. Rail anchors shall be applied as specified in CSX Standard Drawing MWI 703, latest revision.

F. CONTRACTOR shall give particular attention to spiking track to standard gauge and to tamping each tie with a mechanical tamper after the tie is spiked.

END OF SECTION 020445

100 Series: Material

070105	Concrete	June 11, 2018
070110	Grout	June 11, 2018
070120	Reinforcing, Prestressing and Post-Tensioning Steel	June 11, 2018
070125	Steel	June 11, 2018
~~070130~~	~~Timber~~	June 11, 2018

200 Series: Incidental Construction

070205	Temporary Structure/Falsework	March 1, 2021
070210	Structure Excavation – Cofferdams, Sheeting & Shoring	June 11, 2018
~~070215~~	~~Modify Existing~~ Bridge	June 11, 2018
~~070220~~	~~Demolish and Remove~~ Existing Structure	June 11, 2018
~~070225~~	~~Navigational Fender~~ System	June 11, 2018
~~070230~~	~~Aids to Navigation~~	June 11, 2018
~~070235~~	~~Grouting Existing~~ Structure	June 11, 2018
~~070240~~	~~Tuckpoint Stone~~ Masonry	September 12, 2018
070245	Structural Coating	June 11, 2018
~~070250~~	~~Concrete Repair~~	March 1, 2021
~~070255~~	~~Shotcrete Rehabilitation~~	June 11, 2018
~~070265~~	~~Flowable Fill~~	June 11, 2018

300 Series: Miscellaneous Construction

~~070305~~	~~Retaining Walls~~	June 11, 2018
070325	Concrete ~~Crash~~ Wall for Substructure Protection	June 11, 2018
070330	Crash Beam for Substructure Protection	June 11, 2018
070335	Liner Plate	August 17, 2018
~~070340~~	~~Crane Rental for CSXT Use~~	March 1, 2021
~~070345~~	~~Replace Existing Deck with Steel Ballast Deck~~	March 1, 2021
~~070355~~	~~Fiber Reinforced Polymer Composite System for Concrete Repair~~	June 11, 2018

400 Series: Bridge Substructure

~~070405~~	~~Pile Sockets~~	March 1, 2021
~~070410~~	~~Piling~~	June 11, 2018
~~070415~~	~~Drilled Shafts~~	June 11, 2018
070420	Foundation Soil Conditions	June 11, 2018
070425	Cast-in-Place Concrete Element	March 1, 2021
070430	Cast-in-Place Element	June 11, 2018
~~070435~~	~~Steel Substructure~~	June 11, 2018
~~070440~~	~~Micropiles~~	June 11, 2018
~~070445~~	~~Galvanic Protection Pile~~ Jacket	March 1, 2021

500 Series: Bridge Superstructure

070515	Steel Superstructure	June 11, 2018
070520	Bearing and Anchorage	June 11, 2018
070525	Bridge Waterproofing	June 11, 2018
070530	Water Repellent	June 11, 2018
070535	Bridge Walkway	June 11, 2018
070540	Bridge Handrail	June 11, 2018

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers material specifications for all types of Portland Cement Concrete, fabrication requirements for precast/prestressed concrete, and construction requirements for cast-in-place concrete elements used on CSX Transportation bridge construction projects.

1.2 ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

AASHTO.....American Association of State Highway and Transportation Officials
ACI .....American Concrete Institute
ANSI.....American National Standards Institute
AREMA.....American Railway Engineering and Maintenance of Way Association
ASCC.....American Society of Concrete Contractors
ASCE.....American Society of Civil Engineers
ASTM.....American Society for Testing and Materials International
ESCSI .....Expanded Shale, Clay and Slate Institute
FHWA .....Federal Highway Administration
ISO.....International Standards Organization
LWA .....Lightweight Aggregate
LWC .....Lightweight Concrete
MRE .....Manual of Railway Engineering (Published by AREMA)
NRMCA .....National Ready Mixed Concrete Association
NSSGA.....National Stone, Sand & Gravel Association
PCA .....Portland Cement Association
PCI.....Precast/Prestressed Concrete Institute
SCC.....Self-Consolidating Concrete
USACE.....U.S. Army Corps of Engineers

BUILDER.....Either CSXT company forces or the CONTRACTOR
CONTRACTOR .....The business entity contracted by CSXT for construction of the project
ENGINEER .....The CSXT Assistant Chief Engineer – Structures or designated representative
RAILROAD.....CSX Transportation (CSXT)

PART 2 - MATERIAL

2.1 CEMENT

A. Cement, unless otherwise specified, shall conform to the following:

1. Standard Concrete – Cement shall be Type I, Type IA, or Type II Portland cement, conforming to the requirements of ASTM C150.
2. High Early Strength Concrete – Cement shall be Type III or Type IIIA Portland cement, conforming to the requirements of ASTM C150.
3. Air-Entrained Concrete – Cement shall be Portland cement conforming to the requirements of ASTM C150 and ASTM C595;

The cement shall have an alkali content of 0.6% or less, expressed by percent Na_2O plus 0.685 percent K_2O by mass of the cement. Only one brand of cement may be used in any part of the structure and cements of the same brand from different mills shall not be mixed or used in any part of the structure, except as permitted by the ENGINEER

B. Slag Cement shall not be used. Silica fume and fly ash shall not be used to reduce the quantity of Portland cement. Fly ash (all Classes) is prohibited in concrete for CSXT unless approved by the ENGINEER.

C. All cement shall be inspected and tested by a Testing Laboratory employed by the RAILROAD. Where the CONTRACTOR furnishes the cement, the name and address of the Testing Laboratory will be furnished by the ENGINEER. The CONTRACTOR shall specify in their order to the manufacturer that the cement is to be so inspected and tested, and shall advise of the name and address of the Testing Laboratory. The CONTRACTOR shall also write the Testing Laboratory, stating location of the project, number of barrels of cement involved and the name and location of this mill, sending a copy of that letter to the ENGINEER.

2.2 AGGREGATES

A. Fine Aggregate – Fine aggregate shall consist of coarse, sharp, hard, strong, durable, fine aggregate of natural sand, free from adherent coating, and washed to remove clay, loam, alkali, organic matter or other deleterious substances.

1. Fine Aggregate Grading Requirements - Grading shall be in accordance with AREMA recommendations.
   a. Fine aggregate shall be graded from coarse to fine within the following limits:

Sieve	Percentage Passing
⅜ inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

   SCC should contain a designed percentage of microfine aggregate (powder) to provide adequate workability of the mix. Workability of SCC must be considered and designed for each specific application.

   b. The fine aggregate shall have not more than 45% retained between any two consecutive sieves, and its fineness modulus shall be not less than 2.3 nor more than 3.1. Fineness modulus is the summation of the cumulative percentages retained on standard sieve sizes (Nos. 4, 8, 16, 30, 50 and 100) divided by 100.

   c. If the fineness modulus varies by more than 0.20 from the value assumed in selecting proportions for the concrete, the fine aggregate shall be rejected unless suitable adjustments are made in the concrete proportions to compensate for the difference in grading.

2. Lightweight Fine Aggregate – Lightweight fine aggregate shall consist of crushed lightweight coarse aggregate meeting the size, soundness, reactivity, and other requirements of normal weight fine aggregate.

3. Required Tests and Test Limits – The amount of clay or loam in the fine aggregate shall not exceed 1.5% by weight. Unless otherwise specified, all fine aggregate shall conform to the requirements of ASTM C33. Particular attention is directed to the requirements of testing for:
   a. Organic Impurities – ASTM C40
   b. Soundness – ASTM C88
   c. Reactivity – ASTM C289

4. Deleterious substances shall not be present in excess of the following amounts:

Item	Maximum Percent by Weight of Total Sample
Clay lumps	1.0
Material finer than No. 200 sieve:	
Concrete subject to abrasion	3.0
All other concrete	5.0
Coal and lignite	0.5
The sum of all deleterious	5.0

5. The fine aggregate, when tested in accordance with ASTM C40 and showing a color darker than the standard color, shall be rejected. A fine aggregate failing in the test may be used, provided that, when tested for mortar- making properties, the mortar develops a compressive strength at 7 and 28 days of not less than 95 percent of that developed by a similar mortar made from another portion of the same sample which has been washed in a 3 percent solution of sodium hydroxide followed by thorough rinsing in water. The treatment shall be sufficient to produce a color lighter than standard with the washed material.
6. For SCC, the volume ratio of fine to total aggregates in a mix design must be greater than or equal to 45% unless approved by the ENGINEER.
7. Other – Fine aggregate considered potentially reactive by the ENGINEER shall not be used. Fly ash, if approved by the ENGINEER to supplement fine aggregate, shall meet the requirements of ASTM C618.

B. Coarse Aggregate – Coarse aggregate shall consist of hard, durable, crushed stone or gravel.

1. Coarse Aggregate Grading Requirements – Coarse aggregate shall be graded between the limits specified and conforming ASTM C33 for Coarse Aggregate.

Aggregate Size No.	Amounts Finer than Each Laboratory Sieve, Mass Percent								
	2½ in.	2 in.	1½ in.	1 in.	¾ in.	½ in.	⅜ in.	No. 4	No. 8
357	100	95-100		35-70		10-30		0-5	
467		100	95-100		35-70		10-30	0-5	
57			100	95-100		25-60		0-10	0-5
67				100	90-100		20-55	0-10	0-5

Note: For SCC, the maximum size of the coarse aggregate shall not exceed 1 inch.

2. Lightweight Coarse Aggregate – The nominal size of lightweight coarse aggregate shall be ¾ inch. Lightweight coarse aggregate shall be expanded slate lightweight aggregate (LWA). Lightweight aggregate shall have a minimum absorbed water content of 6% by weight at the time of batching.
3. Required Tests and Test Limits – Sampling and testing shall be in accordance with the following ASTM standards:

Sampling ..... ASTM D75
Sieve Analysis ..... ASTM C136
Weight of Aggregates ..... ASTM C29
Resistance to Abrasion ..... ASTM C131 and C535
Soundness ..... ASTM C8
Material Passing No. 200 Sieve ..... ASTM C117
Organic Impurities ..... ASTM C40
Coal and Lignite ..... ASTM C23
Clay Lumps in Aggregates ..... ASTM C142
Specific Gravity and Absorption of Coarse Aggregate ..... ASTM C127
Potential Alkali Reactivity ..... ASTM C289

4. Deleterious substances shall not be present in excess of the following amounts:

Item	Maximum Percent by Weight of Total Sample
Clay lumps and friable particles	5.0
Chert that will readily disintegrate (soundness tests, five cycles)	5.0
Material finer than No. 200 sieve	1.0
Coal and lignite	0.5
The sum of all deleterious substances	7.0

When the material finer than the No. 200 sieve consists essentially of crusher dust, the maximum amount permitted may be raised to 1.50%

5. Crushed stone or gravel tested for abrasion in the Los Angeles machine in accordance with ASTM C131 and C535 shall have a loss not greater than 50% except that aggregates for pavements shall have a loss not greater than 40%.
    a. The aggregates, when subjected to five alternations of the sodium-sulfate soundness test, shall show an average loss of weight of not more than 8% for fine aggregate and 12% for coarse aggregate. Aggregates having a potential alkali reactivity as determined by ASTM C289 shall not be used.

2.3 WATER

A. General – The water for use with cement in mortar or concrete shall be potable, clean, clear, and free from oil, acid, alkali or organic matter and shall be obtained from a suitable source.

1. Water for mixing or curing concrete shall be fresh, clean, and free from injurious quantities of acid, alkali, silt, oil, organic matter, or other impurities;
2. Water for use in concrete shall not be taken from shallow, muddy or marshy surfaces. Water from suspect sources shall not be used until tested and approved in accordance with ASTM C1602. In cases where sources of supply are relatively shallow, they shall be so enclosed as to exclude silt, mud, grass, etc., and the bottom of such enclosed area shall be maintained not less than 2 feet below the intake of the suction pipe;
3. When required by the ENGINEER, samples of water shall be sent to a Testing Laboratory employed by the Railroad, for analysis to determine the suitability of the water for use in concrete.

2.4 CHEMICAL ADMIXTURES

A. Air-Entraining Admixtures

1. Testing requirements – conform to ASTM C260. Air content of both normal weight concrete and lightweight concrete shall be tested in accordance with ASTM C173.
2. Dosage – Air content can vary from 3% to 7% in concrete for CSXT bridges including SCC. For lightweight concrete, air content shall be between 5% and 7%. For Lightweight Concrete - Concrete shall be air-entrained by the use of an air entraining admixture conforming to requirements of ASTM C260, or by the use of air-entraining Portland cement meeting the requirements of ASTM C150. The concrete shall have an air content of between 5% and 7%.

B. Normal, Mid-Range and High-Range Water Reducing Admixtures

1. Testing requirements – Normal and Mid-Range water reducers shall conform to ASTM C494. High-Range water reducers shall conform to both ASTM C494 and ASTM C1017.
2. Dosage – Normal water reducers can reduce water content by 5% to 10%. Mid-Range water reducers can reduce water content by 6% to 12%. High-Range water reducers (also known as superplasticizers) can reduce water content by 12% to 40%. All SCC shall be formulated with high-range water reducer.

C. Set Accelerating Admixtures

1. Testing requirements – conform to ASTM C494, Type C.
2. Dosage – Set accelerating admixtures incorporating calcium chloride shall not be used in concrete for CSXT bridges. Set acceleration varies with dosage rate. Acceptance tests shall be made with actual job materials under anticipated job conditions before use.

D. Set Retarding Admixtures

1. Testing requirements – conform to ASTM C494.
2. Dosage – Acceptance tests shall be made with actual job materials under anticipated job conditions before use.

E. Hydration Control Admixtures

1. Uses:
    a. Suspending cement hydration – stops hydration for up to 72 hours.
    b. Reactivating cement hydration – reestablishes normal hydration.

2. Testing requirements – no ASTM specification
3. Dosage - Acceptance tests shall be made with actual job materials under anticipated job conditions before use.

F. Concrete Workability Admixtures

1. Testing requirements –Admixtures shall conform to ASTM C494, Type S.
2. Dosage - Acceptance tests shall be made with actual job materials under anticipated job conditions before use.

G. Coloring Admixtures

1. Testing requirements – Admixtures shall conform to ASTM C979.
2. Dosage – less than 6% by weight generally does not affect other concrete properties. Greater than 10% by weight shall not be used in CSXT concrete for bridges.

H. Other Admixtures: The CONTRACTOR may propose other admixtures depending on site conditions and use of the concrete, subject to approval by the ENGINEER.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals: The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records, each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER.

1. Preconstruction Submittals
   a. Concrete mix design, including historical test data or trial batch test data
   b. Concrete test analysis and summary
   c. Material certifications
   d. Admixtures
2. Additional Submittals for Cast-in-Place Concrete: All drawings, details and calculations shall be signed and sealed by a Professional Engineer licensed in the Commonwealth, District, State, or Province where the work is to be performed.
   a. Forms and Falsework design and details
   b. Cold Weather Placement Plan
   c. Hot Weather Placement Plan
   d. Slump Tests – A record of the amount of slump shall be made and furnished to the ENGINEER.
   e. Strength Tests – The test results shall be furnished directly to the ENGINEER in writing, by the Testing Laboratory, on a standard testing report form.
3. Additional Submittals for Precast/Prestressed Concrete: All drawings, details and calculations shall be signed and sealed by a Professional Engineer licensed in the Commonwealth, District, State or Province where the work is to be performed.
   a. Material Submittals for all related components/accessories.
   b. Detailed computations of proposed gauge pressures and elongations (if required).
   c. Permanent records of elongation and pressure readings during stressing operations (if required).
   d. For on-line installation of precast concrete superstructure elements, the CONTRACTOR shall submit a detailed plan with schedule, for review and approval, prior to span change out.
4. Shop Drawings: CONTRACTOR shall furnish one (1) complete electronic copy of detailed shop drawings for approval prior to starting fabrication. By approving and submitting shop drawings, the CONTRACTOR thereby

represents that all field measurements, field construction criteria, materials, catalog numbers and similar data have been determined and verified, and that the shop drawings have been checked and coordinated with the requirements of the work and of the contract documents. After approval of shop drawings, the CONTRACTOR shall supply the RAILROAD one (1) complete electronic set of reproducible approved drawings.

5. Final acceptance report.

B. Submittal Review: Approval by the ENGINEER is only for the purpose of confirming compliance with the contract plans and specifications. Approval shall not relieve the CONTRACTOR from responsibility for correctness, quantity and quality, nor for completeness of Work in accordance with the plans and specifications.

PART 4 - EXECUTION

4.1 CONCRETE STRENGTH, PROPORTIONS AND CLASSES

A. General: The use of fly ash as a substitute for Portland cement is prohibited in all concrete for use in CSXT bridges.

B. Concrete Classes:

Class of Concrete	Min. Comp. Strength at 28 Days (PSI)	Max. Total Water per 94 lb. Sack of Cement (gals.)	Cement Factor: Min. Sacks of Cement per Cubic Yard of Concrete
8.5 (AE)	8,500	*	*
6 (AE)	6,000	*	*
5	5,000	5.0	7.0 Min. 8.0 Max.
5(AE)	5,000	4.0	7.0 Min. 8.0 Max.
4	4,000	6.0	6.0
4(AE)	4,000	5.5	6.0
3	3,000	6.5	5.5
3(AE)	3,000	5.75	5.5

(AE) denotes air-entrained concrete.

* Water and Cement Factors for Class 8.5 and Class 6 shall be proposed by the supplier and subject to approval by the ENGINEER.

4.2 TESTING REQUIREMENTS

A. Pre-construction Testing: The CONTRACTOR shall submit the proposed concrete mix design to the ENGINEER. After receiving approval for the mix design, the CONTRACTOR shall furnish a two (2) CY batch of concrete for the sole purpose of making test specimens. The CONTRACTOR shall make a minimum of eight (8) standard test cylinders and deliver them to an independent laboratory which shall conduct tests at 7, 14, and 28 days. No concrete shall be placed until satisfactory compressive strength for the mix design has been documented through the test results. Substandard shall mean anything less than the minimum compressive strength at 28 days as specified above, for that class of concrete. No reductions or tolerances will be recognized, regardless of ACI or other Association Standards for acceptance.

B. Testing During Fabrication of Precast Elements: For prestressed concrete, eight (8) standard test cylinders shall be made each day for each production line. Two (2) cylinders shall be used to determine the time after placing of concrete when stress may be released. Two (2) cylinders each shall be broken at 7 and 28 days. The two (2) remaining cylinders are to be used for determining stress release in case that the concrete has not attained required strength on the first two cylinders. When steam curing is used, the 7 day test may be omitted. Heavy steel molds with steel bottoms shall be used for the test cylinders and the CONTRACTOR shall furnish the cylinders and the labor to secure the samples.

C. Construction Testing:

1. Slump Testing – Slump shall not exceed 3 inches for cast-in-place concrete. Slump shall not exceed 9 inches for precast concrete elements. At least one (1) slump test shall be made for each concrete element or 15 cubic yards of concrete placed in the structure.
2. Strength Testing – Compression tests will be required as specified in the AREMA recommendations. The CONTRACTOR shall furnish all test materials and test cylinder molds, shall perform all work to make and cure the test cylinders, and after proper curing, shall deliver the test cylinders to an independent testing laboratory where they shall be tested at the CONTRACTOR's expense. Not less than eight (8) test cylinders shall be made for each 20 cubic yards of concrete or for each precast element if such elements are poured on separate days. Two cylinders at each test date of 7, 14, and 28 days shall be delivered to an independent laboratory for testing. Spare cylinders shall be provided.

   No concrete elements shall be placed in the permanent structure until satisfactory compressive strength for the mix design has been documented through the test results. Any concrete placed in the permanent structure for which test cylinders indicate substandard compressive strength shall be removed and replaced at expense of the CONTRACTOR. Substandard shall mean anything less than the minimum compressive strength at 28 days as specified above. No reductions or tolerances will be recognized, regardless of ACI or other Association Standards for acceptance.

D. Testing for Self-Consolidating Concrete (SCC):

1. The following tests shall be performed for SCC at 15 minute intervals following mixing and during placement to monitor the workability of the SCC.
   a. Slump Flow Test: For SCC the slump test shall be replaced by the slump flow test, in accordance with ASTM C1611. For SCC, the slump flow value shall be 27.0 inches with an allowable tolerance of plus or minus 2.5 inches. The T_{50} shall be recorded. T_{50} shall be greater than 2 seconds.
   b. Visual Stability Index (VSI): The VSI rating shall be determined in accordance with ASTM C1611 and shall not exceed 2.0. Perform a second test when the VSI of the first test exceeds a value of 2.0. The proposed mix shall be rejected if the second VSI test exceeds a value of 2.0.
   c. Passing Ability of SCC by J-Ring: The J-Ring test shall be performed in accordance with ASTM C1621. The calculated difference between slump flow and J-Ring flow shall not exceed 2 inches.
   d. Static Segregation of SCC using Column Technique: The maximum allowable static segregations shall be 15% as determined by ASTM C1610.
2. Strength Testing: Modify the consolidation method of the strength tests by placing the concrete in the test molds in one layer without vibration or tamping. SCC shall meet the same requirements for strength as those required for non self-consolidating concrete.
3. Other Tests – All other testing of SCC shall be in accordance with the requirements of this Section for testing of the class of concrete specified for the project. Trial batches of SCC shall be made with the same equipment and materials as those to be used for the project, and under similar conditions.

4.3 MASS CONCRETE

A. Definition – Mass concrete requires measures to be taken to deal with the generation of heat from the hydration of the cement. In mass concrete the temperature differential between the internal concrete temperature and the surface concrete temperature may cause volume changes in the concrete which then cause cracking. Where the minimum cross section dimension exceeds four feet, concrete shall be designated as mass concrete. However, smaller sizes may also be designated as mass concrete depending on factors including: type and quantity of cement, volume-to-surface ratio of the concrete, weather conditions, concrete placing temperatures, degree of restraint to volume changes and the effect of thermal cracking on function, durability and appearance.

B. Designation – Mass concrete placements shall be designated on the project drawings by the designer.

C. Additional Requirements.

1. The maximum temperature in concrete after placement shall not exceed 158° F.

2. The maximum temperature difference between center, or hottest portion of the concrete, and the surface of the placement shall not exceed 35° F, unless thermal modeling is performed to determine a maximum allowable temperature difference such that thermal stresses do not exceed the tensile strength of the concrete. The thermal model shall be signed and sealed by a Professional Engineer licensed in the Commonwealth, District, State or Province where the work is to be performed.
3. The temperature of concrete at point of placement shall not exceed 70° F nor be less than 35° F.
4. ASTM C150 Type III cement is not permitted
5. Accelerating admixtures shall not be used unless specifically permitted by design.
6. Unless otherwise specified, cool the concrete gradually so that the drop in concrete surface temperature during or at the conclusion of the specified curing period does not exceed 20° F in any 24 hour period.

D. Thermal control –Thermal control measures shall be submitted in writing and be approved by the ENGINEER prior to placing mass concrete. Thermal control shall be in accordance with ACI 207.1R.

4.4 FORM AND FALSEWORK PLACEMENT FOR CAST-IN-PLACE CONCRETE

A. Strength: The CONTRACTOR shall provide falsework and forms adequate in strength to support the imposed loads safely and without excessive deformation or settlement. Forms and falsework shall be designed for minimum lateral pressures from a fluid weight of 50 lbs. per square foot. In addition, forms for all substructure units are to be watertight. All formwork for SCC shall be watertight and checked for leaks before placing concrete. Formwork for SCC shall be designed for the full fluid weight of the concrete.

B. Surface: Forms shall be adapted to the kind of surface required on the concrete; shall be substantially and tightly built so as to remain true to line and in position without bulging, sagging or other deformation. Forms shall be maintained in a manner that will prevent the formation of joints due to shrinkage of lumber.

C. Chamfers / Bevels: Chamfers or bevels on concrete members shall be formed by one of two methods. If the Plans call for a bevel having a dimension of the square side greater than four inches, it shall be formed with the same type of form lining used for adjacent forms. However, if the dimension required is less than four inches, the bevel shall be formed with a wooden, triangular 45 degree chamfer strip. The chamfer strip shall be shaped in a planing mill, shall be surfaced on all sides, and shall have uniform dimensions throughout its length. Other materials such as plastic, vinyl or metal may be used, and shall conform to similar surfacing requirements.

D. Edges / Corners: Unless otherwise indicated on the Plans, all exposed concrete edges and corners which are sharper than 90 degrees shall be formed with a wooden chamfer strip, meeting the foregoing requirements, except that the dimensions of the square sides of the chamfer strip shall be not more than one (1) inch or less than ¾ inch.

E. Plywood Forms: Forms for concrete surfaces which will be exposed to view shall be made of plywood not less than 5/8 inch thick or plywood lining on one-inch boards. Plywood forms or plywood-lined forms shall be sanded on the face adjacent to the concrete. Joints in plywood panels shall be carefully fitted to reduce form marks in the concrete to a minimum. Sections of forms to be reused on concrete exposed to view shall be thoroughly repaired, replacing any plywood that has warped or bulged. Offsets at abutting panels shall be eliminated by renailing and planing. Metal plates shall not be used for covering old form rod holes.

F. Metal Forms: Metal forms may be used, provided they are maintained in good condition, free from dents, deformities and misalignment, and provided the finished concrete surface is equivalent in appearance to that obtained through the use of plywood forms. If wood forms are used in combination with metal forms, the wood shall be treated in a manner which will produce a finished surface similar to that produced by the metal forms.

G. Steel Rods: Steel rods shall be used for form ties. Rods may be embedded in the concrete, provided their ends are not closer to the surface than one (1) inch, and the holes left by removal nuts shall be filled and pointed. Mortar for pointing and filling holes shall have the same proportions of cement and sand as the concrete.

H. Plywood Form Sealer: All forms shall be thoroughly drenched with water immediately before the concrete is placed therein. Wooden forms for concrete exposed to view shall be sealed with a copolymer resin “Pre-Form”, which shall meet the following criteria: US Army Corps of Engineers CEGS-03300, Section 10.8 Form Coating, V.O.C. compliant, and 100% biodegradable. Submit technical datasheet to ENGINEER for compliance.

I. Formwork Removal: Before the removal of forms, concrete shall have attained sufficient strength to endure such removal without being damaged. Forms shall be removed carefully so that neither the forms nor the tools used in their

removal will deface the concrete. Unless noted otherwise or as directed by the ENGINEER, falsework shall not be removed until such time as the concrete supported by it is able to sustain itself and any load that is likely to come upon it with absolute safety to the concrete. In general, side forms carrying no loads may be removed after 24 hours. In all cases, the CONTRACTOR is responsible for and must repair at his/her own expense, any damage arising from inadequate forms or falsework, or from the premature removal of same.

4.5 REINFORCING STEEL PLACEMENT

A. CONTRACTOR shall, before proceeding with the work, field check all dimensions, and submit for review a complete set of any necessary shop drawings. No work shall be done until the shop drawing review is completed. In case of correction or rejection, the contractor shall revise and resubmit the drawings until they are acceptable to the engineer and such procedure will not be considered as a cause for delay.

B. Fabrication: Reinforcing bars shall be detailed and fabricated in accordance with AREMA recommendations.

C. Splicing: Reinforcing bars shall be cut to the lengths indicated on the Plans or longer as approved by the ENGINEER. Splices which are permitted, unless otherwise shown on the Plans, shall be designed in accordance with applicable AREMA recommendations. Where practicable, the locations of the laps shall be staggered so the neighboring bars will not have adjacent laps. Mechanical splices are not permitted unless approved by the ENGINEER. If approved, the mechanical splice shall fully develop the strength of the reinforcing bar, and shall be certified by the manufacturer.

D. Placing: Reinforcement shall be placed accurately in the position indicated on the Plans and shall be firmly held in place during the deposition and vibration of the concrete. This shall be accomplished by fastening the bars at all intersections and splices by wires or approved clips, by the use of bars or other suitable spacers, or as otherwise approved by the ENGINEER. Suitable supports of approved number and character shall be used to support and retain the reinforcement in the locations required and at proper distances from the forms. If such supports are to be left in place in the concrete, they shall be of metal and all parts of such metal supports extending to within one inch of what will be an exposed concrete surface shall be galvanized.

E. Grouting: Reinforcing bars grouted into existing concrete and / or masonry as shown on the Plans will be grouted using a 2-compound epoxy. The method of mixing and application shall be as recommended by the manufacturer.

4.6 CAST-IN-PLACE CONCRETE PLACEMENT

A. Minimum strength: Concrete for cast-in-place reinforced concrete shall have a minimum 28-day strength per the project plans.

B. Consistency: The consistency of the concrete shall be kept as uniform as practicable. Concrete shall not be placed until the ENGINEER is satisfied that the rate of producing and placing concrete will be sufficient to complete the proposed pour and the finishing operations within the scheduled time, that experienced concrete finishers will be employed to perform all required finishing work, and that all necessary finishing tools and equipment are on hand at the site of the work and are in satisfactory condition for use.

C. Retarding Admixture: Concrete shall be placed in the forms immediately after each mixing. If concrete cannot be placed in forms within sixty (60) minutes from the time water is first added to the mix, a retarding admixture may be added at time of mixing, provided the ENGINEER approves each such use in advance. The admixture must be used in strict accordance with the manufacturer's instructions. In no case shall concrete be used which does not reach its final position in the forms within ninety (90) minutes after the time that water is first added to the mix. The method and manner of placing shall be such as to avoid the possibility of segregation of the aggregates or the displacement of the reinforcement. Sufficient capacity of placing equipment and manpower shall be provided so that the work may be kept free from cold joints.

D. Conveyance of Wet Concrete:

1. Pumped Concrete: Concrete shall be pumped when chutes, troughs or pipes are impractical, or at the discretion of the CONTRACTOR.
2. Tremie: The tremie method shall be used for placing concrete in pipe piles, under water, deep walls and other locations where concrete would drop greater than six (6) feet. The tremie tube shall have a minimum diameter of 8 inches, and be constructed in sections having water-tight joints. Ensure that the discharge end is entirely immersed in concrete at all times during delivery and keep the tremie tube full until delivery is complete. The tremie tube may be supplied by pumped concrete or the traditional hopper method. If the hopper method is used, ensure

delivery of fresh concrete to the hopper is a consistent, uninterrupted flow. Avoid intermittent large placements into the hopper which would vary the pressure.

E. Continuous placement: Unless otherwise directed by the ENGINEER, placing of concrete shall continue regardless of weather conditions, and the CONTRACTOR shall be prepared to continue operations without cessation through completion.

F. Reinforcing Steel: Reinforcing steel shall meet the requirements of Section 070120 of the CSX Design and Construction Standard Specifications.

G. Layering: Mass concrete or large volume placements shall be placed in horizontal layers, the thickness of which generally shall not exceed ten (10) to twelve (12) inches. The placing of concrete shall be continuous until completion of the substructure unit. Construction joints in addition to those provided on the plans will not be allowed unless authorized by the ENGINEER. When it is necessary by reason of an emergency, to place less than a complete horizontal layer at one operation, such layer shall terminate in a vertical bulkhead. In any given layer, the separate batches shall follow each so closely that each one shall be placed and compacted before the preceding one has taken initial set, in order that the green concrete shall not be injured and that there shall be no line of separation between batches. Each layer of concrete shall have an amplitude of 3/8" to secure efficient bonding with the next layer above. A succeeding layer placed before the underlying layer has become set shall be compacted in a manner that will entirely break up and obliterate the tendency to produce a construction joint between the layers. Layers completing a day's work or placed just prior to temporarily discontinuing operations shall generally be cleaned of all objectionable material as soon as the surface has become sufficiently firm to retain its form. To avoid, as far as possible, visible joints upon exposed faces, the top of the concrete adjacent to the forms shall be finished by being smoothed with a plasterer's trowel. Horizontal layers so located as to produce a construction joint at a location where a "feather edge" might be produced in the succeeding layer, shall be so formed by inset formwork that the succeeding layer will end in a body of concrete having a thickness of not less than six (6) inches. Between levels of extreme low water and extreme high water as determined by the ENGINEER, water shall not come in direct contact with the concrete for a period of not less than 30 days. Water shall not be allowed to come in contact with other concrete that will be in or exposed to water until it is hardened for at least four (4) days. Concrete may be deposited in water only when so approved by the ENGINEER.

H. Compaction: Concrete shall be compacted by continuous working with suitable tools in a manner acceptable to the ENGINEER. All faces shall be well spaded and the mortar shall be flushed to the surface of the forms by continuous working with a concrete spading implement acceptable to the ENGINEER.

I. Vibrators: During placement of all concrete, the CONTRACTOR shall furnish power-driven vibratory tools of an approved character, which shall be thrust into the concrete and operated internally in accordance with the best accepted practice. Vibrators shall not be applied to forms or reinforcing steel. The vibrators shall operate at a minimum frequency of 4,500 impulses per minute. The number of vibrators in operation for the various parts of the structure and extent of operation shall meet the approval of the ENGINEER. Concrete shall be thoroughly and completely vibrated, not merely worked down to a horizontal surface. However, precautions should be taken not to over-vibrate to the point that segregation results.

J. Embedded Steel Plates and Angles, Steel Connectors: Embedded steel plates and angles, and fabricated steel connector assemblies shall conform to the structural steel requirements of Section 070125 of the CSX Design and Construction Standard Specifications. Such metalwork shall be accurately positioned and securely held in place during concrete placement wherever it is required to be built into the concrete. The concrete shall be deposited with care to prevent honeycomb or other defects in the concrete adjacent to the embedment. Where necessary, bolts and other parts shall be supported by accurate templates until the concrete has set.

K. Construction joints: Construction joints shall be placed as indicated on the Plans or as directed by the ENGINEER and shall be formed so as not to impair the strength or appearance of the structure. When the work of placing concrete is delayed until the concrete shall have taken its initial set, the point of stopping shall be deemed a construction joint. The method and manner of placing concrete shall be so regulated as to place all construction joints across regions of low shearing stress and in such location that they will be hidden from view to the greatest possible extent. The method and sequence of placing concrete shall be as specified herein for the particular type of construction involved.

L. Construction joints in pipe pile of other stay in place steel form work, shall require a 2"x2" square window cut in the steel in the direction normal to track or as detailed by the ENGINEER. All latent and /or contaminated materials from

the initial poor shall be purged. These windows shall be covered by a welded plate of same thickness as pile or form material and be secured with 5/16" fillet weld, unless otherwise detailed.

M. Finishing Operations: Concrete shall be placed at such a time that finishing operations can be completed during daylight hours unless adequate lighting facilities are provided by the CONTRACTOR, and the ENGINEER's approval is given.

N. Concrete Finish: The upper surface of the piers and abutments which are not formed shall be given a float surface finish, except as noted below for bearing surfaces. The bearing seats on the caps and abutments shall be thoroughly worked and floated by hand with a wooden float to leave a fine, clean, smooth, sandy texture. Bearing areas shall be ground level. Top surfaces of substructure units, not covered by bearing pads, shall be sloped to drain as shown on the Plans.

O. Concrete Face: Special care shall be taken to work the coarser aggregate back from the face and to force the concrete under and around the reinforcement bars without displacing them. After the concrete has taken its initial set, care shall be exercised to avoid jarring the forms or placing any strain on the ends of projecting reinforcement.

P. Logo, and Date: The CONTRACTOR shall cast the CSX logo and the year of construction in characters, of approved size and style, at an approved location in the face of the element (e.g. abutment, pier, etc.) as directed by the ENGINEER.

Q. Curing Concrete: All concrete, other than concrete below ground surface and not in forms, and except as elsewhere specified, shall be cured by keeping all surfaces continuously wet for a period of at least seven (7) days after pouring by frequent and thorough sprinkling of the concrete and forms. If the forms are removed within seven (7) days, the concrete shall be cured by providing approved protection from the sun with suitable canvas or burlap, or other satisfactory covering and keeping such covering and the concrete wet for the period specified. Whenever placing of concrete is discontinued, the concrete already placed shall be kept continuously wet by adequate sprinkling of the concrete and forms until concreting is resumed. Such sprinkling of the concrete, forms and coverings shall be adequate to keep the parts thoroughly soaked with water. During the curing, no parts of forms, concrete or coverings shall be permitted to become dry. The use of curing water, burlap, canvas, or other materials which discolor the concrete will not be permitted.

R. Surface Repairs: Immediately following the removal of forms, all fins and irregular projections shall be removed from all exposed surfaces. All metal devices used to tie the forms together and hold them in correct alignment and location shall be removed in such a manner that no metal shall remain within one inch of the surface of the concrete. The method of removal of such ties shall not cause injury to the surface of the concrete. The cavities produced by form ties, and all other holes, honeycomb spots, broken edges or corners, and other defects shall be thoroughly cleaned, saturated with water, and carefully pointed and trued with mortar consisting of cement and fine aggregate mixed in the proportions used in the concrete. The mortar used in the pointing shall be not more than one hour old. Surfaces which have been restored in this manner shall be kept moist for a period of 24 hours. A rubbed surface finish will not be required for formed surfaces, provided the concrete has a finished appearance free from honeycomb and surface irregularities. In case any part of the exposed surface is honeycombed, the area affected, and as much more of the exposed surface as will be required to provide satisfactory finish appearance, must then be given a rubbed surface finish so that the rubbed area blends into the adjacent surface. The amount and extent of rubbing required will depend on the character of surface produced by the forms. In no case shall a cement paint or plaster be applied to the surface of the finished concrete.

S. Defective: The operation of depositing and compacting the concrete shall, in general, be conducted so as to form dense, impervious concrete of uniform texture which shall show smooth faces on exposed surfaces. If any section of concrete is found to be defective, it shall be removed or repaired by the Contractor, as directed by the ENGINEER.

4.7 FABRICATION OF PRECAST/PRESTRESSED ELEMENTS

A. General:

1. Prestressing steel shall conform to Section 070120 and prestressing forces shall be in accordance with the project plans;
2. Embedded Steel Plates and Angles, Steel Connectors: Embedded steel plates and angles, and fabricated steel connector assemblies shall conform to the structural steel requirements of Section 070125 of the CSX Design and Construction Standard Specifications. The embedded plates and angles shall be placed at the dimensions shown or

specified on the plans, with a tolerance of ± ⅛ inch along the edge or surface placed; when plate or angle surfaces are shown to be flush, the tolerance shall be + 0 inch out from the surrounding surface, -1/16 inch in from the surrounding surface;

3. Logo and Date: The CONTRACTOR shall cast the CSX logo and the year of construction in characters of approved size and style, at an approved location in the face of substructure elements (e.g. abutment, pier, etc.) as directed by the ENGINEER.
4. Concrete Curing: Concrete shall be protected as required by AREMA recommendation, for a minimum of 7 days. The preferred method of curing normal weight concrete is a wet cure by continuous sprinkling, application of mats or fabric kept continuously wet, or a polyethylene film .004 inch minimum thickness. When polyethylene film is used for curing, all adjoining edges shall be lapped 4 inch and sealed with waterproof tape. Membrane curing compounds are permitted on precast concrete surfaces, except those that will abut other new concrete. Curing of such abutting surfaces shall be by wet curing methods only. Membrane curing compounds shall be compatible with the Water Repellent per Section 070525 of the CSX Design and Construction Standard Specifications, or the membrane curing compound shall be removed to promote penetration and adhesion of the Water Repellent to the concrete.

B. Superstructure Units:

1. Concrete minimum compressive strength of prestressed box beams/girders shall be 8500 PSI, unless indicated otherwise on the plans. Where lightweight concrete is used, the fresh density of the lightweight concrete shall be no more than 115 pcf as determined in accordance with ASTM C138;
2. Formwork: The formwork for precast superstructure elements shall be constructed according to the project plans. The following tolerances are acceptable for the finished element;
   a. Length: +0 inch, - ¼ inch.
   b. Width (overall): ± ¼ inch.
   c. Depth (overall): ± ¼ inch.
   d. Thickness: ± ⅛ inch.
   e. Flatness of surfaces: ± ⅛ inch.
   f. Flatness of mating surfaces or bearing surfaces: +0 inch; -1/16 inch.
   g. Camber Deviation: ± ⅛ inch per 10 feet.
   h. Position of Prestressing Tendons: ± ¼ inch.
   i. Position of stirrup bars: ± 1 inch.

   Note: Additional tolerances may be found in the project plans. Tolerances beyond those listed, unless otherwise stated in the project plans, shall be submitted to the ENGINEER for review
3. Concrete curbs (if integral to the boxes/girders) shall be cast no sooner than 3 days after the prestressing tendons in box beams have been released and the prestress force transferred to the concrete.

C. Substructure Units:

1. Minimum compressive strength of concrete caps, wingwalls and backwalls shall be 5000 PSI at 7 days, unless indicated otherwise on the plans. Concrete shall be air entrained. Where lightweight concrete is used, the fresh density of the lightweight concrete shall be no more than 115 pcf as determined in accordance with ASTM C138;
2. Formwork: The formwork for precast substructure elements shall be constructed to provide the following tolerances to the finished element:
   a. Length and width: ± ⅛ inch.
   b. Thickness: ± ⅛ inch.
   c. Flatness of surfaces: ±⅛ inch.
   d. Flatness of mating surfaces or bearing surfaces: +0 inch; -1/16 in.

D. Concrete Piling:

1. Piles shall be cast monolithically in a horizontal position on slabs of such strength and rigidity that the longitudinal axes of the members shall be truly straight from end to end. Anchorages shall be of such construction as to preclude any appreciable movement under stressing operations.

4.8 COLD WEATHER CONCRETE PLACEMENT

A. General: When the atmosphere temperature is 40º F or lower, or is forecast to drop below that temperature within 24 hours of the time concrete is to be placed, special methods shall be used in producing, placing and protecting the concrete. The exact methods of placing, producing, protecting and curing concrete to be followed during all such cold weather work shall be specifically approved by the ENGINEER for each type of construction before concreting will be permitted to start. Notwithstanding such approval by the ENGINEER, the CONTRACTOR shall assume all risks connected with placing concrete under cold weather conditions. Should the concrete prove unsatisfactory; it will be rejected and shall be removed and replaced with satisfactory concrete. No allowance shall be made for removing and replacing defective concrete. In general, and unless otherwise directed by the ENGINEER, the methods of producing, placing and protecting concrete in cold weather shall meet the requirements of Section 4.4 B through D following. Also, refer to ACI 306.

B. Production: Adequate equipment for heating the concrete materials shall be provided. No ingredient that is frozen or contains ice shall be placed in the mixer. Concrete ingredients shall be heated to produce concrete having a temperature at time of delivery of not less than 50º F nor greater than 70º F. A temperature of 60º F is preferred. Heating shall be accomplished by heating either the aggregates or the mixing water, or both. When the water temperature is above 165º F, the aggregate shall be premixed with the water for at least one (1) minute before cement is added. Cement shall not be mixed with water or aggregates having a temperature above 165º F.

C. Placing and Finishing: Concrete shall not come in contact with forms and equipment containing ice or snow. If required by the ENGINEER, the formed area shall be covered and an air temperature of 50º F maintained for 24 hours on all surfaces against which the concrete is to be placed. During placing and finishing, the temperature of concrete shall be maintained between 50º F and 70º F.

D. Protection: When freezing temperatures are forecast, facilities meeting the approval of the ENGINEER shall be provided, prior to beginning concrete placement, capable of maintaining the ambient air temperature at the surface of the concrete or forms at not less than 50º F for five (5) days or 70º F for three (3) days. Protective measures shall be maintained for at least four (4) days beyond the period specified above. During this period, the concrete temperature shall not be allowed to drop below 40º F. Sudden cooling (in excess of 20º F temperature change in any 24-hour period) of ambient air temperature at the surface of the concrete or forms will not be permitted.

4.9 HOT WEATHER CONCRETE PLACEMENT

A. General: When the atmospheric temperature is 90º F or higher, or is forecast to rise above that temperature within 24 hours of the time concrete is to be placed, special methods shall be used in producing, placing and protecting the concrete. The exact methods of placing, producing, protecting and curing concrete to be followed during all such hot weather work shall be specifically approved by the ENGINEER for each type of construction before concreting will be permitted to start. Notwithstanding such approval by the ENGINEER, the CONTRACTOR shall assume all risks connected with placing concrete under hot weather conditions. Should the concrete prove unsatisfactory; it will be rejected and shall be removed and replaced with satisfactory concrete. No allowance shall be made for removing and replacing defective concrete. In general, and unless otherwise directed by the ENGINEER, the methods of producing, placing and protecting concrete in hot weather shall meet the requirements of Section 4.5 B through D following. Also, refer to ACI 305.

B. Production: Stockpiled aggregates shall be saturated and the surface shall be kept moist by intermittent sprinkling or continuous fog spray. Mixing water shall be kept cool by adequate protection of storage tanks and piping. Supply lines shall be shaded, insulated or buried. When necessary to produce and maintain concrete at an acceptable temperature, chopped or crushed ice shall be added directly into the mixer, up to the limit of 50% by weight of the total water required. Ice shall be added at a rate and in a manner that it will be completely melted during the mixing period. Chilled mixing water will be acceptable in lieu of chopped or crushed ice. Retarding admixtures may be used when and as approved by the ENGINEER.

C. Placing and Finishing: The temperature of concrete when placed shall not exceed 75º F. Forms and reinforcing shall be wet-down immediately before concrete is placed. Wetting down of areas around the work to cool the air and increase humidity is recommended.

D. Protection: If, in the opinion of the ENGINEER, proper protection is not being provided, the ENGINEER may order concrete operations to be suspended until adequate protective measures are provided. Concrete shall be kept cool and moist during the specified curing period. When air temperature exceeds 90º F and soon as practicable, without damage to the surface finish, all exposed concrete shall be kept continuously moist by means of fog sprays, wet burlap, cotton mats or other effective means.

PART 5 – MEASUREMENT AND PAYMENT

NOT USED.

END OF SECTION 070105

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section covers material specifications for GROUT used on CSX Transportation bridge construction projects.

1.2 ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

AASHTO .....American Association of State Highway and Transportation Officials
ANSI .....American National Standards Institute
AREMA .....American Railway Engineering and Maintenance of Way Association
ASCE.....American Society of Civil Engineers
ASTM.....American Society for Testing and Materials International
DOT .....Department of Transportation

PART 2 - MATERIAL

2.1 CEMENTITIOUS GROUT

A. Cementitious grout is a single component compound of hydraulic cement and fine aggregate which is flowable and pumpable. Cementitious grout shall comply with ASTM C1107 and shall be non-shrink, non-metallic type, and shall provide a minimum 7 day compressive strength of 4,000 psi when tested in accordance with ASTM C109.

B. Where small quantities of cementitious grout are required to fill soil voids or other non-structural uses, such grout may be made by mixing 1 part Portland cement and 3 parts clean sand thoroughly, and then adding potable water to form a suitable consistency for the work. The Portland cement and sand (fine aggregate) shall comply with Section 070105 of these CSX Design and Construction Standard Specifications.

2.2 EPOXY GROUT

A. Epoxy grout is a multi-component compound of high-strength epoxy and fine aggregate. Working time is limited by the epoxy, follow the manufacturer's recommendations for the specific epoxy grout used.

B. Epoxy grout shall provide a minimum of 10,000 psi compressive strength, when tested in accordance with ASTM C579, Method B and shrinkage less than 0.05 percent when tested in accordance with ASTM C531.

2.3 HANDLING AND STORING MATERIALS

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Store grout materials in unopened packaging from manufacturer in a clean dry area protected from sunlight. Do not allow grout materials to freeze. Epoxy grout materials should be stored at temperatures as specified by the manufacturer.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Certified copies of the manufacturer's test results, performed as required by the ASTM specifications for each type of material, shall be furnished to the ENGINEER.

B. Additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records, each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER. For additional information regarding each submittal refer to the appropriate section of this specification.

PART 4 - EXECUTION

NOT USED.

PART 5 – MEASUREMENT AND PAYMENT

NOT USED.

END OF SECTION 070110

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers material specifications for reinforcing steel bars, welded wire fabric, and prestressing steel used on CSX Transportation bridge construction projects.

1.2 ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

AASHTO.....American Association of State Highway and Transportation Officials
ANSI .....American National Standards Institute
AREMA .....American Railway Engineering and Maintenance of Way Association
ASCE.....American Society of Civil Engineers
ASTM.....American Society for Testing and Materials International
CRSI.....Concrete Reinforcing Steel Institute
DOT.....Department of Transportation
PCI.....Precast/Prestressed Concrete Institute
PTI.....Post-Tensioning Institute
WRI.....Wire Reinforcement Institute
WWR.....Welded Wire Reinforcement

BUILDER .....Either CSXT company forces or the CONTRACTOR
CONTRACTOR.....The business entity contracted by CSXT for construction of the project
ENGINEER.....The Assistant Chief Engineer – Structures, CSXT or designated representative
RAILROAD .....CSX Transportation (CSXT)

1.3 DISCLAIMER

A. Approval by the ENGINEER is only for the purpose of confirming compliance with the contract plans and specifications. Approval shall not relieve the CONTRACTOR from responsibility for correctness, quantity and quality, nor for completeness of Work in accordance with the plans and specifications.

PART 2 - MATERIAL

2.1 REINFORCING STEEL

A. Reinforcing steel bars shall be deformed bars of new billet steel conforming to the requirements of ASTM A615, Grade 60 or ASTM A706, Grade 60. Galvanized reinforcing steel bars shall conform to the requirements of ASTM A1094.

2.2 WELDED WIRE REINFORCEMENT

A. Welded wire reinforcement (WWR) is a prefabricated reinforcement consisting of parallel series of cold drawn or cold rolled plain or deformed wire welded together in square or rectangular grids. WWR shall conform to the requirements of ASTM A1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

2.3 PRESTRESSING STEEL STRAND AND BARS

A. Prestressing strand shall conform to the requirements of ASTM A416, Grade 270 – Seven-Wire Uncoated Low Relaxation Strand. Prestressing strand or wire shall not be spliced. High-strength steel bars for prestressed concrete or for post-tensioning prestressed concrete shall conform to the requirements of ASTM A722.

2.4 TIE WIRE AND BAR SUPPORTS

A. The reinforcing steel bars shall be connected using wire ties conforming to ASTM A510. Tied connections shall be made in accordance with CRSI Manual of Standard Practice and the CRSI publication "Reinforcing Bar Placing".

B. Supports for reinforcing steel bars and welded wire fabric shall conform to the requirements of ANSI/CRSI RB4.1, Supports for Reinforcement Used in Concrete.

2.5 HANDLING AND STORING MATERIALS

A. Reinforcing steel bars and WWR shall be stored in racks in such a manner as to avoid contact with the ground. If reinforcement is to remain on the site for more than one month, it shall be covered to protect it from weather. If reinforcement accumulates heavy rust, dirt, mud, loose scale, paint, oil, or any other foreign substance during storage, it shall be cleaned before being used. Severe deterioration of this kind may be a basis for rejection.

B. All reinforcement shall be protected as far as practicable from mechanical injury or surface deterioration from rusting or other cause. Before placement of the surrounding concrete, the reinforcement shall be free from dirt, scaly rust, loose mill scale, paint, oil, grease, and other foreign substances.

C. Prestressing steel shall be stored in such a manner as to protect it from moisture or other corrosive environment, and from foreign matter, at all times.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals: The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for reinforcing, prestressing and post-tensioning steel materials, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records, each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER. For additional information regarding each submittal refer to the appropriate section of this specification.

1. Detail drawings
2. Mill test reports

PART 4 - EXECUTION

4.1 TESTING

A. Certified copies of the manufacturer's test results, performed as required by the ASTM specifications for each type of material, shall be furnished the ENGINEER.

4.2 REINFORCING STEEL PLACEMENT FOR CAST-IN-PLACE CONCRETE

A. CONTRACTOR shall, before proceeding with the work, field check all dimensions, and submit for review a complete set of any necessary shop drawings. No work shall be done until the shop drawing review is completed. In case of correction or rejection, the contractor shall revise and resubmit the drawings until they are acceptable to the engineer and such procedure will not be considered as a cause for delay.

B. Fabrication: Reinforcing bars shall be detailed and fabricated in accordance with AREMA recommendations.

C. Splicing: Reinforcing bars shall be cut to the lengths indicated on the Plans or longer as approved by the ENGINEER. Splices which are permitted, unless otherwise shown on the Plans, shall be designed in accordance with applicable AREMA recommendations. Where practicable, the locations of the laps shall be staggered so the neighboring bars will not have adjacent laps.

D. Placing: Reinforcement shall be placed accurately in the position indicated on the Plans and shall be firmly held in place during the deposition and vibration of the concrete. This shall be accomplished by fastening the bars at all intersections and splices by wires or approved clips, by the use of bars or other suitable spacers, or as otherwise approved by the ENGINEER. Suitable supports of approved number and character shall be used to support and retain

the reinforcement in the locations required and at proper distances from the forms. If such supports are to be left in place in the concrete, they shall be of metal and all parts of such metal supports extending to within one inch of what will be an exposed concrete surface shall be galvanized.

E. Grouting: Reinforcing bars grouted into existing concrete and / or masonry as shown on the Plans will be grouted using a 2-compound epoxy mixed with suitable mineral filler. The mineral filler shall be as recommended by the epoxy manufacturer. The method of mixing and application shall be as recommended by the manufacturer.

4.2 PRESTRESSING STEEL AND REINFORCING STEEL PLACEMENT FOR PRECAST CONCRETE

A. Prior to stressing, the CONTRACTOR shall submit to the inspector representing the RAILROAD for his approval the detailed computations of proposed gauge pressures and elongations.

B. The location of the center of gravity of the prestressing steel shall be as indicated on the drawings. Unless tolerances for location of steel are shown, a maximum variation of $\pm 3/16$ inch will be permitted. All wires or strands shall be cleaned to the satisfaction of the inspector representing the RAILROAD and shall be in position before the stressing operation is begun.

C. If wires or strands are stressed individually, the pretensioning force, as measured by the approved elongation, shall be equally applied to the individual wires or strands until the required stress is reached.

D. If wires or strands are stressed as a group, they shall be placed in their proper position in the forms and stressed individually with an initial force equal to 10 percent of tensioning load, but not less than 500 pounds. In any group of wires or strands, the initial load shall not vary by more than 5 percent.

E. The maximum applied stress shall not exceed 175,000 psi.

F. Strands shall not be spliced.

G. The mild steel reinforcing shall not be placed in final position until after the prestressing operation is complete.

H. The pretensioning force shall be determined by measuring elongation on permanently installed gauges and by checking jack pressures. The difference between the stresses thus determined shall not exceed 5 percent. The pressure gauge on the jack shall be calibrated to the inspector's satisfaction to indicate a pressure in the jack within two percent at the pressure corresponding to full prestress tension in the wires or strands.

I. Permanent records shall be made of elongation and pressure readings during stressing operations. The original records shall be presented to the inspector for transmittal to the RAILROAD.

J. The force in the prestressing steel shall be transferred to the concrete smoothly, gradually, and equally from all wires or strands. Release from the anchorage by cutting or burning is strictly prohibited. Between bulkheads, and after the force in the steel is transferred to the concrete, wires or strands may be either cut or burned off symmetrically about the horizontal and vertical axes of the members. Any blocking between bulkheads, which may restrain horizontal movement of the member, shall be removed prior to transfer of stress.

K. Stress shall not be released until the concrete has attained strength of 4000 psi for substructure elements or 5500 psi for superstructure elements, unless indicated otherwise on the plans.

PART 5 – MEASUREMENT AND PAYMENT

NOT USED.

END OF SECTION 070120

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PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers material specifications for all types of Steel used on CSX Transportation bridge construction projects.

PART 2 - MATERIAL

2.1 STRUCTURAL STEEL

A. Structural Steel, unless otherwise specified, shall be in accordance with the current AREMA recommendations and as specified in the Contract Documents, and conform to the following:

1. Rolled Steel and Built-Up Steel members shall be ASTM A709, Grade 50.
   a. Toughness – Shall be T2 for non-fracture critical members or F2 for fracture critical members.
   b. Plate flanges shall not exceed 3 inches thickness.
2. Pile Steel
   a. Pipe Pile steel shall be ASTM A252, Grade 3 (Modified 50 ksi).
   b. H-Pile steel shall be ASTM A690.
   c. Sheet Pile steel shall be ASTM A572, Grade 50.
3. Pile Splices
   a. H-Pile splices shall conform to ASTM A992 or ASTM A572, Grade 50.
   b. Pipe Pile backing rings shall conform to ASTM A109.
4. Pile Tips
   a. H-Pile Points shall be fabricated from cast steel conforming to ASTM A27, Grade 65.
   b. Pipe Pile Conical Points shall conform to ASTM A148 (90/60), with a minimum yield stress of 60 ksi.
   c. Cutting shoes shall be fabricated from cast steel conforming to ASTM A148 (90/60), Grade 60.

B. Other grades of steel, including weathering steel, may be used if approved by the ENGINEER.

2.2 FASTENERS & MISCELLANEOUS STEEL COMPONENTS

A. Bolts / Nuts / Washers

1. High Strength Bolts shall meet the current requirements of ASTM F3125 Specifications, with Grade in accordance with project plans.
2. Nuts shall meet the current requirements of ASTM A563 Specifications.
3. Washers shall meet the current requirements of ASTM F436 Specifications.
4. Swedge anchor bolts shall conform to ASTM F1554 Grade 105.

B. Steel Embeds / Studs / Threaded Rods

1. Embedded steel plate shall be ASTM A36 or A709, Grade 36, or greater.
2. Studs shall be C1015, C1017 or C1020 cold drawn steel conforming to ASTM A108.
3. Threaded Rods/Inserts shall conform to ASTM A706 specifications.

2.3 STRUCTURAL COATINGS

A. Hot Dip Galvanizing, Metalizing and Painting: Refer to Section 070245 of the CSXT Design and Construction Standard Specifications.

2.4 HANDLING AND STORING MATERIALS

1. Handling: All material shall be handled in a manner which will prevent members from being distorted or damaged. Stored material shall be piled securely. Material shall be placed on level platforms, skids, or other supports above the ground and shall be kept clean and properly drained to prevent corrosion. Girders and beams shall be supported on skids placed near enough together to prevent damage from deflection.
2. Fracture Critical Members: For those members designated as fracture critical members (FCMs), the following shall apply:
    a. Extraordinary care shall be taken in the handling of FCMs. Lifting dogs, tongs, grips, chains, cables, or other lifting devices placed in direct contact with the FCM which may gouge, scratch, score, scrape, or otherwise damage the surface, edges or corners of FCMs shall not be used.
    b. Procedures for handling FCMs using lifting straps, timber cushions or other protective devices shall be developed, submitted to the ENGINEER, and receive written approval by the ENGINEER before handling any material for or members designated as FCM.
3. Shipping: All materials shall be carefully loaded so as to avoid damage in transit, and in accordance with the following:
    a. Girders shall be shipped in an upright position and adequately blocked and braced to prevent damage during shipping. The Fabricator shall submit girder loading diagrams to the ENGINEER for approval well in advance of the anticipated shipping date. These diagrams shall include proposed blocking, bracing and tie-down details. CSX shall not be liable for damage to the steel during shipment or any other property during transport.
    b. Members weighing more than 3 tons shall have the weight marked thereon.
    c. All small parts such as rivets, bolts, pins, washers, and small connection plates shall be packed in containers of adequate strength. The contents of each unit shall be plainly marked on the top of each container.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals: The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER. Rejection of a procedure or the correction of shop drawings will not be considered as cause for delay.

1. Preconstruction/Prefabrication Submittals:
    a. Mill Certifications
    b. Fabrication (shop) drawings
    c. Welder certifications
    d. Material Cut Sheets
    e. Fabricator Quality Control Plan
    f. Element Loading diagram
    g. FCM handling procedures
    h. Erection Plan

i. Heat straightening procedures, in accordance with FHWA-IF-99-004, including but not limited to: Identification of heating region for repair, heating patterns and parameters, constraint plan and jacking configuration design, and estimate of number of heating cycles required.

B. Shop Drawings: CONTRACTOR shall furnish one (1) complete electronic copy of detailed shop drawings for approval prior to starting fabrication. By approving and submitting shop drawings, the CONTRACTOR thereby represents that all field measurements, field construction criteria, materials, catalog numbers and similar data have been determined and verified and that the shop drawings have been checked and coordinated with the requirements of the work and of the contract documents. After approval of shop drawings, the CONTRACTOR shall supply the RAILROAD with one (1) complete electronic set of reproducible approved drawings.

C. Submittal Review: Approval by the ENGINEER is only for the purpose of confirming compliance with the contract plans and specifications. Approval shall not relieve the CONTRACTOR from responsibility for correctness, quantity and quality, nor for completeness of Work in accordance with the plans and specifications

D. Schedule: Monthly schedule shall be submitted to the ENGINEER for approval and compliance with fabrication and delivery deadlines specified in the contract.

3.2 CERTIFICATIONS

A. Fabricator shall be certified under the AISC Quality Certification Program as follows:

1. Welded Plate Girders Category III
2. Certified Bridge Fabricator – Intermediate (or) Advanced

PART 4 - EXECUTION

4.1 FABRICATION

A. General:

1. All fabrication shall be in accordance with the current AREMA recommendations and as specified in the Contract Documents, including recommendations for Fracture Control Plan for all members and components designed as fracture critical.
2. The Fabricator shall notify the ENGINEER and its inspector of the scheduled date for beginning fabrication, and shall not begin fabrication until the ENGINEER's Inspector is present, if applicable.
3. The ENGINEER may arrange for inspection by an independent inspection firm under a separate contract. The CONTRACTOR shall submit, to the ENGINEER, a Fabricator's Quality Control Program.

B. Welding:

1. Welds and welding procedures shall be in accordance with the American Welding Society (AWS) Bridge Welding Code, current edition and all addenda to it.
2. Welded Connections:
   a. Only submerged arc welding (SAW), shielded metal arc welding (SMAW), or flux core arc welding (FCAW) may be used. If FCAW is used, it shall be gas shielded with 71-T1 electrodes unless otherwise approved. Any other process must be approved by the ENGINEER.
   b. Welding electrodes for arc welding shall meet the current requirements of the AWS Bridge Welding Code. As noted above, if FCAW is used, the electrodes shall be 71-T1.
3. Critical Repair Welding:
   a. All critical repairs of welds shall be approved by ENGINEER prior to beginning the repair even if the initial repair is deemed critical. Prior to performing any critical repair welding, CONTRACTOR shall submit Written Repair Procedures to ENGINEER for review and approval. The repair procedures shall meet the minimum provisions of AWS D1.5 12.17.6 which includes adequately describing the deficiency and the proposed method of repair. The repair procedures shall detail the location(s) of the discontinuity in the member. The submission shall also include a Welding Procedure Specification (WPS) that shall be based on

AWS D1.5 Section 3 and acceptable Procedure Qualification Record (PQR). The WPS shall include at a minimum the following:

1. Type of material and Weld process
2. Joint detail
3. Position of the weld
4. Filler metal specification AWS
5. Electrode and manufacturer
6. Single or multiple pass

b. ENGINEER shall

1. Approve both repair by welding and the repair WPS prior to start of the welding as per AWS D 1.5
2. Verify the repair weld soundness by Ultrasonic Testing (UT), Magnetic Particle Testing (MT), or other testing as required by the ENGINEER.
3. For 1st weld repair, the TSE will perform UT as 100% of non-critical and critical full penetration welds on all fracture critical weld repairs. The TSE will perform at a minimum 25% MT on all welds.
4. If after the first weld repair an unacceptable weld is still found through testing as noted above and The CONTRACTOR elects to repair said weld, the CONTRACTOR will be required to submit written weld procedures as defined above. A second weld repair will be automatically deemed as a critical repair.
5. If after the second weld repair an unacceptable weld still exists, the CONTRACTOR will be required to
    a. Complete all submissions as noted above. ENGINEER will be required to approve
    b. A third repair (second critical). 100% UT and MT testing will be required. In addition, due to the amount of times the section has been heated, Hardness testing will be required per AWS D1.5 4.10.4.1.
    c. If after a third weld repair, if UT or Hardness testing fail to provide an acceptable result, then said girder shall be rejected and a new girder shall be fabricated.

4.2 SHOP TESTING AND INSPECTION

A. General:

1. Welding inspection shall verify that all welds and welding procedures meet the requirements of the American Welding Society specifications, current edition and all addenda to it.
2. All welds shall be inspected visually and by use of nondestructive testing.
3. All nondestructive testing shall be performed by the Fabricator and witnessed by the ENGINEER's Inspector. Witnessing of weld inspection shall be done in a timely manner without disruption of normal shop operations.
4. Copies of all weld inspections and nondestructive testing reports shall be submitted to the ENGINEER.

B. Non-destructive Testing and Inspection:

The Fabricator shall perform the following weld inspection and testing:

1. All transverse tension groove welds in FCM members, when allowed by the ENGINEER, shall be radiograph tested (RT) and ultrasonically tested (UT) tested 100%. In non-FCM components of FCM's all transverse groove welds shall be RT and UT tested 100%.
2. Butt welds in both girder flanges and girder webs shall be 100% radiographed.
3. 50% of flange to web welds shall be inspected by ultrasonic inspection method.
4. 10% of all other welds shall be inspected by ultrasonic or magnetic particle procedures.
5. Deck plate to floor beam or longitudinal girder welds may be visually inspected.

4.3 ERECTION

A. General:

1. Before starting work, the CONTRACTOR shall submit an erection plan consisting of proposed methods, equipment, etc. which shall be subject to the review and approval of the ENGINEER;

2. The approval of the ENGINEER shall not be considered as relieving the CONTRACTOR of the responsibility for the safety of the method or equipment or from carrying out the work in full accordance with the plans, specifications and supplemental specifications.

B. Field welding:

1. No field welding or flame cutting will be allowed on the steel spans unless shown on the Plans or authorized in writing by the ENGINEER;
2. Tack welding, for the purpose of eliminating field erection bolts or for holding steel parts together while bolting, will not be permitted;

C. Falsework:

1. The CONTRACTOR shall provide the falsework, erecting devices, all tools, and machinery work. Drift pins sufficient to fill at least ¼ of the bolt holes for main field connections shall be provided;
2. The falsework shall be designed by a Professional Engineer, licensed in the Commonwealth, District, State or Province of the work being completed, constructed in accordance with the CONTRACTOR's plans, approved by the ENGINEER, and shall be properly maintained. Equipment for removing falsework shall not be supported on or attached to any portion of the new structure;

D. Placement:

1. All steel beams or girders placed shall be securely tied and/or braced to prevent overturning immediately after erection, and until diaphragms, floor beams or cross frames are permanently in place. The methods to be used shall be submitted on the erection drawing;
2. When railroad or roadway traffic must be maintained beneath girders or beams already placed, traffic shall be protected against falling objects during the erection of any structural members, during the placing of cast-in-place concrete and during the erection and dismantling of forms. The protection shall consist of nets and/or flooring with no larger than 1-inch openings;

E. Protective coatings:

1. Steel construction shall be cleaned and painted in accordance with Section 070245, Structural Coating.

4.4 ASSEMBLING STEEL

A. Accuracy: All parts shall be accurately assembled as shown on the plans and any match marks carefully followed. The material shall be carefully handled so that no parts will be bent, broken or otherwise damaged. Hammering which will damage or distort the members will not be permitted. Drifting done during erection shall be only such as required to bring the parts into position and enlarging the holes or distorting the metal will not be permitted.

B. Bolts: Fitting up bolts shall be $\frac{1}{16}$ inch less in diameter than the hole, and cylindrical erection pins shall be $\frac{1}{32}$ inch less in diameter than the hole.

C. Truss Spans: Unless erected by the cantilever method, truss spans shall be erected on blocking so placed as to give the trusses proper camber until all lower chord splices are fully connected, as called for on the plans, and all other connections are made with pins and fitting up bolts. Trusses erected by the cantilever method shall have all lower chord splices fully connected before the span is swung on intermediate falsework or permanent shoes. If necessary, such as in the case of high falsework subject to settlement, jacks shall be provided under panel points to enable making necessary adjustments to facilitate fitting up without heavy drifting. Splices of butt joints in compression members shall not be fully connected until the span has been swung. Full bearing shall be secured on milled surfaces that are designed to bear.

D. Sole Plates: For non-CSX standard steel girders or beams, where the sole plates have been shop-welded to these elements, the sole plates on beams and girders shall be in full contact with bearings before diaphragm, cross frame, or floor beam connections are made. Connections shall be adjusted as necessary, under the direction of the ENGINEER, to obtain full contact. For CSX standard steel beam sets, the beam or girder flanges shall be in full contact with the sole plates before welding the sole plates to the standard beam sets. Shim plates shall be used, as necessary, to obtain such full contact.

E. Handrails: Bridge handrails shall be erected plumb and in line in accordance with the drawings. Maximum vertical tolerance is ± ¼ inch from plumb line over the full vertical height. Maximum horizontal tolerance is ± ½ inch over the full length of the bridge rail.

4.5 MISFITS AND STRAIGHTENING OF BENT MATERIAL

A. Corrections: The correction of minor misfits involving reaming bolt holes which does not change the slip critical category of the connection, or cutting which does not infringe on bolt edge distance requirements, and the straightening of minor cases of bent bars, plates, and the outstanding legs of angles, etc. which have not fractured, kinked, or yielded, shall be considered a legitimate part of the erection and shall be done by the CONTRACTOR at his expense. However, any error in the shop fabrication, or deformation resulting from handling and transportation which prevents the proper assembling and fitting up of parts by the moderate use of drift pins, or by a moderate amount of reaming, slight chipping or cutting, shall be reported immediately to the ENGINEER who will specify the method of correction to be used by the CONTRACTOR. The correction shall be made in the ENGINEER's presence.

B. Straightening: The straightening of bent materials, when permitted by the ENGINEER, shall be done by methods that will not produce fracture or other damage. Distorted members shall be straightened by mechanical means or, if approved by the ENGINEER, by the carefully planned and supervised application of a limited amount of localized heat in accordance with the guidelines presented in AWS D1.7 Clause 7 - Heat Straightening. Prior to heat straightening operations, the base metal and weld metal in the area shall be inspected for existing cracks or tears that might propagate during the straightening process. Cracks can be removed by grinding, repaired by welding, or the ends of cracks blunted by drilling arresting holes. The temperature of the heated area shall not exceed 1200º F (a dull red which may not be visible in bright sunlight) as controlled by temperature indicating crayons, liquids or bimetal thermometers. Heat straightening procedures shall only be performed under dead load conditions. Parts to be heat straightened shall be substantially free of stress and from external forces, except stresses resulting from mechanical means used in conjunction with the application of heat. After heating and straightening, the metal shall be cooled as slowly as possible. Following the straightening of a bend or buckle, the surface of the metal shall be carefully inspected for evidence of fracture. CONTRACTOR shall coordinate with CSXT representative after the repairs are completed to ensure through additional inspection that no damage to adjacent components has occurred as a result of the repair. A satisfactory report of this inspection is required prior to resuming operations over the structure.

C. Tolerances: The tolerances for heat straightening repairs shall be in accordance with FHWA-IF-99-004 as shown below.

Member Type	Recommended Minimum Tolerance[1,2]	
	English (in)	SI (mm)
Beams, Truss members, or Columns		
overall	½ in over 20 ft	13 mm over 6 meters
at impact point	¾ in over 20 ft	19 mm over 6 meters
Local Web Deviations	d/100 but not less than ¼ in	d/100 but not less than 6 mm
Local Flange Deviations	b/100 but not less than ¼ in	b/100 but not less than 6 mm

[1]Units of member depth, d, and flange width, b, are inches and millimeters, respectively, for English and SI units

[2]Tolerances for curved or cambered members should account for the original shape of the member

4.6 CONNECTIONS

A. Pin Connections: All packing washers, if any, must be in place when the work is assembled. While pins are being driven into place, threads shall be protected by pilot and driving nuts supplied by the CONTRACTOR. After nuts are tightened, the threads adjacent to the nut shall be burred a minimum of two threads at two locations opposite of each other.

B. High Strength Bolted Connections: Connections shall be accurately fitted up before high strength bolts are placed. A sufficient number of the holes at a connection point shall be filled with erection pins to "fair-up" all holes. Light drifting will be permitted, but drifting to match unfair holes will not be permitted. Such holes shall be reamed or drilled under the direction of the ENGINEER. All material within the grip of the bolt shall be steel. There shall be no compressible material such as gaskets or insulation within the grip. Unless otherwise indicated on the plans, bolts oriented vertically shall be installed with the heads on top of the connected pieces.

C. Surface Conditions: All joint surfaces, including those adjacent to the bolt heads, nuts or washers, shall be free of dirt, loose rust, loose scale, burrs and other matter that will prevent solid seating of the parts. Unless otherwise shown on the plans, faying surfaces of all non-galvanized joints, including splice plates, shall be given a blast cleaning, in accordance with the requirements of the Steel Structures Painting Council Specifications SSPC-SP7 Brush-Off Blast Cleaning, and shall be free of loose rust prior to final bolting. Galvanized faying surfaces shall be roughened by hand wire brushing prior to final bolting. When shown on the plans, faying surfaces shall be blast cleaned and coated with a paint that provides the specified mean slip coefficient as determined by the "Test Method to Determine the Slip Coefficient for Coatings Used in Bolted Joints" as adopted by the Research Council on Structural Connections. Coated joints shall not be assembled before the coating has cured for the minimum time used in the qualifying test.

4.7 FASTENERS

A. Handling and storage of bolts and nuts:

1. Bolts and nuts shall be protected from dirt and moisture at the job site. Only as many fasteners as are anticipated to be installed and tightened during a work day shall be taken from protected storage;
2. Fasteners not used shall be returned to protected storage at the end of the day. Fasteners shall not be cleaned of lubricant that is present in the as-delivered condition;
3. Fasteners that show signs of rust or dirt shall be cleaned and lubricated prior to installation. Any additional lubrication required must be applied prior to installing bolts in the holes;
4. Bolts and associated nuts and washers shall be identified by rotational-capacity lot number and stored in a manner that will retain this identification.

B. Installation: Bolt installation shall be in accordance with AREMA recommendations.

PART 5 – MEASUREMENT AND PAYMENT

NOT USED.

END OF SECTION 070125

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers falsework used in construction to support spanning or arched structures in order to hold the component in place until its construction is sufficiently advanced to support itself. It includes falsework designed to hold and support fresh concrete, or to stabilize girders during stages of erection, as well as temporary spans used to support track and carry live load and other applied loads over other portions of the construction. Other temporary structures include temporary work platforms spanning waterways or wetlands adjacent to the permanent construction, as well as crane pads and causeways for access to, or at the Project Site.

B. General conditions for this work are in accordance with Division 1 of the CSX Design and Construction Standard Specifications.

C. CONTRACTOR shall maintain the TEMPORARY STRUCTURE/FALSEWORK in safe working order for its intended use for the duration of the project.

D. Maintenance and repair of the TEMPORARY STRUCTURE/FALSEWORK is the responsibility of the CONTRACTOR. In the event that the TEMPORARY STRUCTURE/FALSEWORK is damaged (including wash out due to a storm event), the CONTRACTOR shall rebuild the TEMPORARY STRUCTURES at no additional cost to CSXT.

PART 2 - MATERIAL

2.1 GENERAL

A. All materials shall be new materials meeting the requirements of Division 7, 100 Series of the CSX Design and Construction Standard Specifications shown below:

Concrete.....070105
Reinforcing 070120
Steel.....070125
Timber 070130

B. Any used material proposed shall be in good condition, free of section loss, or other defects and approved by the ENGINEER.

2.2 HANDLING AND STORING MATERIALS

A. CONTRACTOR shall handle and store materials only in approved areas.

2.3 DISPOSAL

A. All Temporary Structures/Falsework material shall be removed and disposed of by the CONTRACTOR upon completion of the project, including material furnished by the RAILROAD. When specified, steel falsework spans including ties and guard rails, shall be retained by the RAILROAD.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain

correspondence records each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER.

1. Detailed plans and calculations signed and sealed by a licensed Professional Engineer in the Commonwealth, District, State or Province where the TEMPORARY STRUCTURE / FALSEWORK is being constructed.
2. Detailed plans showing storage area, if necessary
3. Support pilings, if necessary
4. Erection diagram
5. Steel or timber material grades and stresses, use of used material must be approved by the ENGINEER prior to erection
6. For modular systems, the method of vertical and horizontal adjustments

B. CONTRACTOR shall furnish one (1) complete electronic copy of detailed shop drawings for approval by the ENGINEER prior to starting fabrication. By submitting shop drawings, the CONTRACTOR thereby represents that all field measurements , field construction criteria, materials, catalog numbers and similar data have been determined and verified, and that the shop drawings have been checked and coordinated with the requirements of the work and of the contract documents. After approval of shop drawings, the CONTRACTOR shall supply the ENGINEER with one (1) complete electronic set of approved reproducible drawings.

PART 4 - EXECUTION

4.1 INSTALLATION

A. Temporary spans shall be anchored to prevent lateral or longitudinal movement.

B. The ground shall be adequately prepared and steps taken to prevent erosion and settlement.

C. Suitable foundation pads or other bases shall be provided by CONTRACTOR and shall be properly leveled.

D. Any foundation pads and load-distributing members laid on a slope shall be adequately prevented from movement.

E. Falsework which cannot be founded on a satisfactory footing shall be supported on piling which shall be spaced, driven and removed in a manner approved by the ENGINEER.

F. TEMPORARY STRUCTURES / FALSEWORK shall be properly maintained and inspected as required by the ENGINEER.

G. TEMPORARY STRUCTURES / FALSEWORK shall be completely removed by the CONTRACTOR, except for steel Falsework spans, including ties and guard rails, when specified.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement for payment of TEMPORARY STRUCTURES / FALSEWORK, as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a LUMP SUM basis as set forth in the Contract Documents.

5.2 PAYMENT

A. Payment for TEMPORARY STRUCTURES / FALSEWORK, measured as stated above, will be at the LUMP SUM price per bid set forth in the Contract Documents. Said price shall be full compensation for furnishing all labor, materials, tools, equipment, forms, supplies, inspections, storage area, accessories, supervision, engineering and all other items of expense to TEMPORARY STRUCTURES / FALSEWORK.

B. Any portion of the work not listed in the bid form shall be deemed to be incidental to the item of work which it is associated with and shall be included in the cost of the LUMP SUM price bid.

C. Where no allowance has been made for TEMPORARY STRUCTURES / FALSEWORK in the prescribed Bid Sheet or CONTRACTOR'S price form this item shall be considered incidental to the work which necessitates it.

END OF SECTION 070205

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PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers design, construction, maintenance and removal of cofferdams for marine construction and/or for structure excavation, along with other types of braced excavation.

B. General conditions for this work are in accordance with Division 1 of the CSX Design and Construction Standard Specifications.

PART 2 - MATERIAL

2.1 GENERAL

A. All materials shall meet the requirements of Division 7, 100 Series of the CSX Design and Construction Standard Specifications shown below:

Concrete..... 070105
Reinforcing 070120
Steel 070125
Timber 070130

B. Any used material proposed shall be in good condition, free of section loss, or other defects and approved by the ENGINEER.

2.2 HANDLING AND STORING MATERIALS

A. Materials shall be handled and stored according to manufacturer's recommendations, in an approved location.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER.

1. Temporary Waterway Diversion Structure, if applicable;
2. Design calculations for the cofferdam and or other braced excavation, and any temporary waterway diversion structure required for the work, signed and sealed by a Professional Engineer licensed in the Commonwealth, District, State or Province where work is to be performed. Shoring for railway Live Load shall be designed to resist a vertical live load surcharge of 1800 lbs. per square foot, in addition to active earth pressure. The surcharge shall be assumed to act on a continuous strip, 8'-6" wide. Lateral pressures due to surcharge shall be computed using the strip load formula shown in the AREMA MRE. Allowable stresses in materials shall be in accordance with AREMA recommendations.
3. Erection drawings and construction procedure detailing the proposed method of cofferdam and/or braced excavation construction and other details not fully shown in the Contract Drawings. Such drawings shall be signed and sealed by a Professional Engineer licensed in the Commonwealth, District, State or Province where work is to be performed, and approved by the ENGINEER before construction is started.

PART 4 - EXECUTION

4.1 INSTALLATION

A. Preferred protection is the cofferdam type that completely encloses the excavation. Where dictated by conditions, partial cofferdams with open sides away from the track may be used. Cofferdams shall be constructed using steel sheet piling or steel soldier beams with timber lagging. Wales and struts shall be provided as needed.

B. Safety railing meeting the requirements of 29 CFR 1910.23 shall be installed when temporary shoring is within 12 feet of track, or depth is greater than 6 feet.

C. A minimum distance of 10 feet from centerline of the track to face of nearest point of shoring shall be maintained.

D. Cofferdams shall be constructed to keep the excavations free from earth, water, ice, or snow, and to permit excavations to be carried to the depths indicated on the plans. Additional bracing may be required to satisfactorily perform excavation, dewatering, and other required construction operations. Permanent sheeting system shall be returned to its intended condition after all cofferdam equipment and material, including any additional bracing, has been removed.

E. Cofferdams shall be designed, inspected daily, and maintained in compliance with the applicable requirements of 29 CFR 1926.651, 1926.652, and 1926.802.

F. Shoring protection shall be provided when excavating adjacent to an active railroad track, except as noted below.

Shoring will not be required if both the following conditions are satisfied:

1. Excavation does not encroach upon a 1 horizontal: 1 vertical theoretical slope line starting at the bottom of the near end of the tie (approximately 4’-3” from centerline of the track).
2. Track is on level ground or in a cut section and on stable soil.

G. Dewatering equipment and any additional bracing shall be of adequate quality and capacity and shall be so arranged as to permit their proper functioning in connection with the cofferdam. Dewatering equipment and bracing shall be so located to permit construction of the structure in accordance with the plans.

H. All damage caused by the failure of a cofferdam to perform its proper functions shall be the responsibility of the CONTRACTOR. It shall also be the CONTRACTOR’s responsibility to protect all stream banks from erosion by reason of restriction of the channel caused by the erection of the cofferdam to limits greater than that shown on the plans for the CONTRACTOR’s own convenience. In that situation, bank restoration shall be at the CONTRACTOR’ own expense. The ENGINEER shall approve all repair methods proposed by the CONTRACTOR prior to the CONTRACTOR beginning any remedial activities for which they are liable.

I. It shall be the CONTRACTOR’s responsibility to place the cofferdam so that it will not interfere with any substructure components.

J. CONTRACTOR shall provide and maintain COFFERDAM access.

K. The CONTRACTOR shall establish and maintain a sediment removal area(s) to retain the discharge for a sufficient period of time using equivalent best management practices as approved by the ENGINEER, in order that any discharge entering the stream will be as clear as the flowing stream.

L. The CONTRACTOR shall fully remove cofferdam installation or the waterway diversion structure, including anchor spuds if used, after such time that it is determined by the ENGINEER to be no longer necessary. The removal shall be sequenced to minimize turbidity and the discharge of materials into the waterway. Additional temporary erosion control measures, as determined by the ENGINEER, may need to be employed to facilitate removal.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement for Payment of COFFERDAM/SHEETING/SHORING - INSTALLATION, MAINTENANCE AND REMOVAL, as shown on the drawings, as specified in this section and as accepted in the final work, shall be on a LUMP SUM basis.

5.2 PAYMENT

A. Payment for COFFERDAM/SHEETING/SHORING - INSTALLATION, MAINTENANCE AND REMOVAL, measured as stated above, will be at the contract LUMP SUM price bid. Said price shall be full compensation for furnishing all labor, materials, tools, equipment, forms, supplies, inspections, storage area, accessories, supervision, engineering and all other items of expense necessary for this item of the work.

B. Any portion of the work not listed in the bid form shall be deemed to be incidental to the item of work which it is associated with and shall be included in the cost of the unit price for that item shown on the bid form.

END OF SECTION 070210

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section covers work for shop surface preparation and shop coating of new structural steel surfaces for bridges. Also included is work for field touch-up repairs, the field coating of surfaces (i.e., field connection surfaces and fasteners) not completely coated in the shop, and the encapsulation of existing lead/asbestos paints. Coatings include paints, penetrating sealers, galvanizing, and metalizing. The CONTRACTOR shall furnish all labor, materials, plant and equipment for the satisfactory completion of the work as specified herein.

1.2 ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

AISC.....American Institute of Steel Construction
ANSI .....American National Standards Institute
ASTM.....American Society for Testing and Materials International
AWS.....American Welding Society
CFR .....Code of Federal Regulations
EPA .....Environmental Protection Agency
MSHA .....Mine Safety and Health Administration
NACE.....National Association of Corrosion Engineers
NIOSH.....National Institute for Occupational Safety and Health
NIST.....National Institute of Standards and Technology (formerly NBS – National Bureau of Standards)
OSHA.....Occupational Safety and Health Administration
QCS.....Quality Control Specialist
SDS .....Safety Data Sheet (formerly MSDS – Material Safety Data Sheet)
SPE.....Sophisticated Paint Endorsement
SSPC .....The Society for Protective Coatings

BUILDER.....Either CSXT company forces or the CONTRACTOR
CONTRACTOR.....The business entity contracted by CSXT for construction of the project
ENGINEER.....The CSXT Assistant Chief Engineer – Structures or designated representative
RAILROAD .....CSX Transportation

1.3 REFERENCE STANDARDS

A. The most current edition of the following reference standards form a part of this Section:

1. American Society of Testing Materials (ASTM)
    a. ASTM A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
    b. ASTM A143, Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel
    c. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Hardware
    d. ASTM A384, Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
    e. ASTM A385, Practice for Providing High Quality Zinc Coatings (Hot-Dip)
    f. ASTM A780, Practice for Repair of Damage and Uncoated Areas of Hot-Dip Galvanized Coatings
    g. ASTM B6, Specification for Zinc
    h. ASTM B833-13, Standard Specification for Zinc and Zinc Alloy Wire for Thermal Spraying (Metalizing) for the Corrosion Protection of Steel
    i. ASTM D522, Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings

j. ASTM D1186, Standard Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base

k. ASTM D4285, Compressed Air Cleanliness

l. ASTM D4417, Standard Test Method for Field Measurement of Surface Profile of Blast Cleaned Steel

m. ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

n. ASTM D6386, Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

2. American Welding Society

a. ANSI/AWS A-5.33 Specification for Alloy Wires, Cores, Wires, and Ceramic Rods for Thermal Spraying

b. ANSI/AWS C2.18 Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites

3. Society of Protective Coatings (SSPC)

a. SSPC-AB 1, Mineral and Slag Abrasives

b. SSPC-AB 2, Cleanliness of Recycled Ferrous Metallic Abrasives

c. SSPC-SP 1, Solvent Cleaning

d. SSPC-SP 2, Hand Tool Cleaning

e. SSPC-SP 3, Power Tool Cleaning

f. SSPC-SP 5, White Metal Blast Cleaning

g. SSPC-SP 10, Near White Blast Cleaning

h. SSPC-SP 11, Power Tool Cleaning to Bare Metal

i. SSPC-PA 1, Shop, Field, and Maintenance Painting of Steel

j. SSPC-PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements

k. SSPC – PA Guide 3 – A Guide to Safety in Paint Application

l. SSPC-QP 3, Certification Standard for Shop Application of Complex Protective Coating Systems

m. SSPC-Vis 1 – Visual Standard for Abrasive Blast Cleaned Steel

B. Warranty: The CONTRACTOR will be required to guarantee work against defective workmanship or the use of defective materials for a period of one (1) year from the completion of the contract.

PART 2 – MATERIAL

2.1 GENERAL

A. Material:

1. Paint Systems: The coating system to be applied shall be in accordance with Part 4 of this Section. The products of one coating system from a single manufacturer shall be used for shop and field coating work. Do not mix coating systems or products of different manufacturers.
2. Hot-Dip Galvanizing: The zinc for Hot-Dip Galvanizing shall be High Grade (HG), conforming to ASTM B6, Specification for Zinc. More pure grades of zinc may be used at the CONTRACTORS expense.
3. Spray Metalizing: Certified alloy wire composed of 85% zinc and 15% aluminum by weight, meeting requirements of ASTM B833 shall be used.

B. Color for Paint Systems: The color of the topcoat shall be Federal Standard 595 Color - FS16473 Aircraft Gray.

C. Shop Coating - Paint System: Inorganic Zinc-Rich Primer/Epoxy Intermediate/Urethane Finish Coating System.

1. This system shall be shop applied to all bridge surfaces designated for coating with the exception that contact surfaces of field connections shall be shop primed with inorganic zinc rich primer only. After all bridge surfaces have been primed with one coat of inorganic zinc rich primer, all field connection surfaces shall be masked off. A full coat of the epoxy intermediate shall then be applied followed by a stripe coat of that same epoxy intermediate coating to all edges, crevices, and other irregularly shaped surfaces. Following the full and stripe coats of epoxy intermediate, a full urethane finish coat shall be applied.
2. After bridge erection is complete, field coating using this system shall be performed on all damaged areas, all field connections, all fasteners and any other areas not coated in the shop.
3. One of the following coating systems shall be selected and applied:

MANUFACTURER	FIRST COAT (DFT)	SECOND COAT (DFT)	THIRD COAT (DFT)
Carboline Company	Carbozinc 11 HS (2.0 to 3.0 mils)	Carboguard 893 (3.0 to 5.0 mils)	Carbothane 134 HG (2.0 to 3 mils)
Carboline Company	** Carbomastic 615 (5.0 to 10.0 mils)		
International	Interzinc 22 HS (2.0 to 3.0 mils)	Intergard 475 HS (4.0 to 6.0 mils)	Interthane 990 HS (2.0 to 3.0 mils)
PPG-Protective and Marine Coatings	Dimetcote 9 (2.0 to 4.0 mils)	Amercoat 385 (4.0 to 6.0 mils)	Amercoat 450H (2.0 to 3.0 mils)
Sherwin-Williams	Zinc Clad II Plus B69VZ12/B69BZ13/ B69D11 (2.0 to 4.0 mils)	Recoatable Epoxy B67A5/B67V5 (4.0 to 6.0 mils)	Hi-Solids Polyurethane B65 300/B60V30 (3.0 to 4.0 mils)

** Carboline Carbomastic 615 may be used for field lead/asbestos paint encapsulation and other miscellaneous steel applications as approved by the ENGINEER

2.2 HANDLING AND STORING MATERIALS

A. Packaging and Shipping: All coating materials shall be received at the point of use in original containers and carefully stored. All coatings to be used shall be freshly mixed and shall be ordered only a sufficient length of time in advance of its use to insure an adequate supply being on hand at all times so as not to delay the work. Coatings shipped to the job shall arrive in sealed containers clearly marked with the type of coating and specifications controlling its manufacture. Surface damaged during shipment and handling shall be repaired using the same coating system as applied in the shop except that the Prime coat shall be repaired using an ***Organic Zinc Primer*** when the Primer Coat is repaired in the field.

MANUFACTURER	Organic Zinc Primer (DFT)
Carboline Company	Carbozinc 585 (3.0 to 5.0 mils per coat)
Carboline Company	Carbozinc 859 (3.0 to 5.0 mils per coat)
International	Interzinc 52 (2.0 to 3.0 mils per coat)
PPG – Protective and Marine Coatings	Amercoat 68 HS VOC (2.0 to 5.0 mils per coat)
Sherwin-Williams	Zinc Clad III HS (3.0 to 5.0 mils per coat)

B. Modification: There shall be no modification of the coating except upon, and in accordance with, express written stipulation by an authorized representative of the coating manufacturer and with specific approval of the ENGINEER.

C. Storage: The coatings shall be stored at temperatures between 40º F and 110º F or the manufacturer's recommended limits, whichever are more restrictive. A permanent, automated record of storage temperatures shall be maintained and be available for CSXT review.

D. Mixing of Coatings: Coatings shall be thoroughly mixed in accordance with the manufacturer's recommendations.

E. Thinning: Thinning will be permitted when required for proper application. The type of thinner used and the amount used shall be as recommended by the coating manufacturer for the ambient conditions. Any thinner additions (quantity and type) shall be documented on the record for each batch of coating. The manufacturer's recommended pot life times shall not be exceeded. Coating materials exceeding the pot life shall be discarded and any coatings applied after that limit shall be removed.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals: A minimum of 30 days prior to shop coating, the CONTRACTOR shall submit the following for the CSXT review and acceptance. Coating application shall not commence until the submittals are accepted in writing by CSXT.

1. Shop Qualifications
2. Quality Control (QC) Personnel Qualifications
3. QC Program
4. Surface Preparation/Coating Plan
5. Field Touch-up Surface Preparation
6. Technical Data for Thermal Spray Wire used for Metalizing
7. SSPC-QP3/AISC (SPE) Certification
8. Work Schedule – Provide initial planned schedule and submit updated schedule monthly
9. Lead Safe Work Permit prior to commencing work based on the Railroad's latest lead control program

PART 4 - EXECUTION

4.1 EXECUTION

A. Prior to initiating work to remove or repair damaged or defective coatings, a lead and asbestos survey must be performed. To schedule or verify a survey has been completed, email Bridge_Lead@csx.com. Contractor to request the latest Lead Control Program document for additional details

B. Environmental Conditions: Coatings shall be applied in accordance with the environmental condition (air and surface temperature, relative humidity, and dew point) limits specified by the coating manufacturer's product data sheet. The surface of the steel shall be dry when the coating is applied. The relative humidity and ambient temperature ranges specified by the coating manufacturer for coating application shall be maintained for at least ten hours where steel is stored after coating application is complete, or longer if stipulated by the manufacturer.

1. If the relative humidity required for inorganic zinc-rich primer cannot be maintained above the manufacturer's recommended lower limit due to ambient conditions, alternate methods of ensuring proper cure may be proposed for CSXT's consideration.

C. Shop Surface Preparation: After fabrication and before coating, all steel surfaces scheduled for coating shall be prepared and cleaned as follows.

1. Weld Spatter, Sharp Edges, Flame Cut Steel and Holes: Prior to blast cleaning, remove slag, flux deposits, and weld spatter from steel surfaces. Grind any resulting burrs, fins, or deformations smooth.
2. Solvent Cleaning: Prior to blast cleaning, all dirt, oil, grease and other contaminants shall be removed in accordance with SSPC-SP 1, Solvent Cleaning.
3. Abrasive Blast Cleaning: Blast cleaning of all surfaces scheduled for coating shall be performed in accordance with SSPC-SP 10, Near-White Blast Cleaning.

a. Compressed Air Cleanliness: Use clean, dry compressed air for abrasive blast cleaning and any other operations where the compressed air supply may contact the surface being coated or the coating materials. Conduct blotter test(s) in accordance with ASTM D4285.

b. Abrasives: Use recycled or non-recycled (single time use) abrasives that are clean, dry and properly sized to produce the surface profile depth as specified. If recycled abrasives are used, confirm the cleanliness of the recycled abrasive on a daily basis in accordance with SSPC-AB 2, Cleanliness of Recycled Ferrous Metallic Abrasives. Non-recycled abrasives shall be selected in accordance with SSPC-AB 1, Mineral and Slag Abrasives. The abrasive used shall produce a dense, uniform surface profile depth of 1.5 to 3.5 mils. Grind any steel surface laminations or scabs raised by the blasting operation to a flush surface and re-clean the ground area to obtain the specified surface profile depth.

4. Field Connections, Faying, and Contact Surfaces: All faying surfaces of field connections shall be masked off after priming and shall not receive the intermediate or finish coats in the shop. The intermediate and finish coats shall be applied to the uncoated areas of field connections after field fastening is complete.

5. Application: Coatings shall be applied by either airless or conventional spray methods, except areas inaccessible to spray and small touch-up areas may be coated by brush, roller, or dauber. The inorganic zinc-rich primer shall be kept under constant agitation with a power mixer to avoid settling. The applicable recommendations of the coating and spray equipment manufacturers as well as those of SSPC-PA 1 shall be followed for all shop coating. Apply all metalized coatings using electric arc equipment acceptable to the manufacturer and in accordance with SSPC-CS 23. Equipment shall be consistent with environmental constraints, and provide a finish that is in compliance with the Contract Documents. When compressed air is used, provide suitable traps or separators to exclude oil and water from the air. Conduct blotter test(s) in accordance with ASTM D4285 before the start of each production shift for each compressor system in use to verify that the air supply is clean and dry. Conduct the tests in the presence of the CSXT Inspector.

6. Extension of Time of Application for Metalizing: In low-humidity environments or in enclosed spaces using industrial dehumidification equipment, it will be possible to retard the oxidation of the steel and hold the surface finish for more than six hours. The metalizing applicator, with the approval of CSX, can validate a holding period greater than six hours by determining the acceptable temperature-humidity envelope for the work enclosure by spraying and analyzing bend coupons and tensile-bond coupons. A l mil to 2 mil flash coat of the metalizing may be applied within six hours of completing surface preparation to extend the holding period for up to four further hours beyond the complete application of the flash coat. The final metalizing thickness, however, shall be applied within four hours of the completion of the application of the flash coat provided the metalizing can be maintained free of contamination.

7. Validate the use of the flash TSC holding period with a tensile-bond measurement and a bend test. The following information shall be submitted prior to contract approval and at least 10 days prior to Contract Pre-Award Evaluation, Demonstration, and Validation to be performed in the shop. Information shall include the planned date for demonstration and validation so that the ENGINEER or a representative of CSXT can be on site for inspection during the demonstration and validation.

a. Clean and abrasive blast a representative job area and three bend-test coupons.
b. Apply a flash metalizing to the representative job area and the three bend coupons.
c. Wait the delay period in representative environmental conditions and apply the final metalizing thickness.
d. Perform adhesion test and bend test on coupons.
e. Flash metalizing and holding period are acceptable if the tensile bond and the bend test are satisfactory.

D. Thickness of Coatings: The dry film thickness of each paint coat shall be measured according to SSPC-PA 2, and comply with the ranges specified in this Section. Apply metalizing to a total thickness of 8 to 10 mils (above the surface profile). On faying surfaces, apply the metalizing to the thickness as certified for the Class B slip coefficient. Provide certification of the metalizing meeting the Class B slip coefficient.

1. Thickness: Areas of insufficient thickness shall receive additional coating. Excessive coating thickness shall be removed and repaired according to the manufacturer's written instructions. If the thickness of the metalizing exceeds the specified maximum, advise CSXT, and as directed, remove and replace the metalizing in the non- conforming area. Methods proposed for the repair of insufficient or excessive thickness shall be accepted by CSXT prior to implementation.

2. The dry film thickness of the epoxy stripe coat shall not be measured.

E. Film Continuity: The applied coating shall be smooth and free of skips, misses, shadow-through, overspray, dry spray, runs, sags, and other film defects. Defective areas shall be repaired in accordance with this Section.

F. Removal / Repair of Damaged or Defective Coatings: Remove defective coating and repair and recoat damaged or defective areas. This Section part provides for the repair of damaged or defective coatings prior to loading and shipment from the shop and also the repair of all damaged coatings after field erection of the structure has been completed.

1. Bare steel: When the damage or defect exposes bare steel, clean the surface by blast cleaning in accordance with SSPC-SP 10 or power tool cleaning in accordance with SSPC-SP 11.
2. When the damage or defective coating system does not expose the underlying steel, clean the surface in accordance with SSPC-SP 3 to remove the defective material and loose paint and re-apply the affected coats. Proper work practices and controls should be used when disturbing potential lead based paint or ACM
3. For all repairs, roughen the existing coating in the overcoat area around the perimeter of the repair to ensure good adhesion of the repair material to the underlying coating system. Feather the surrounding coating system to expose a minimum of ½ inch of each coat and to provide a smooth transition from the repair area to the existing coating.
4. After cleaning is complete, solvent clean all areas in accordance with SSPC-SP 1 prior to coating. Ensure proper disposal of solvent rags in accordance with all applicable federal, state and local regulations

G. Field Touch-up Repair of Damaged Coating System: The CONTRACTOR shall repair all areas of damaged coating after field erection of the structure is complete using the same coating system as was applied in the shop. All field surface preparation and touch-up shall be performed in accordance with this Part. Coating Application to Repair Areas shall be in accordance with this Section and as shown below:

1. When the bare substrate is exposed in the repair area, apply Organic Zinc-Rich Primer from the same manufacturer as the shop coat system, then apply the intermediate and final coats of the system to the specified thickness;
2. When the damage does not extend to the bare substrate, apply only the affected coats;
3. Maintain the thickness of the system in overlap areas within the specified total thickness tolerances.

H. Field Cleaning and Coating of Connection Areas: After field erection is complete, the CONTRACTOR shall field clean and coat all connection areas or any other surfaces, that for any reason, were not shop coated.

1. Spot Repair of Rust or Damaged Coating System: Prior to field coating of connections, all areas of rust or damaged coat shall be cleaned in accordance with this Part. Fasteners added in the field shall be hand and/or power wire brush cleaned in accordance with SSPC-SP 2 or 3, respectively. All repaired areas and fasteners shall then be spot coated with the intermediate epoxy coat of the coating system specified in this Section;
2. Surface Cleaning: After spot coating repairs are completed and properly dry, proceed with cleaning to remove dirt, chalk, grease, oil, and any other contaminants from the entire surface to be field coated by pressure water cleaning with clean, potable water at pressures of 3,500 to 5,000 psi. Use detergents, as required, in order to thoroughly clean the surface. Use appropriate fan angle tips on the pressure washer nozzle to preclude damage to the existing coatings. Note that it may be necessary to supplement these methods with mechanical cleaning such as scraping and wire or stiff bristle brushing in order to dislodge surface contaminants. Thoroughly rinse and allow to dry prior to coating;
3. Roughening of Existing Coating at Tie-In Areas: Roughen and feather the existing shop applied coating in the tie-in area by sanding with a finely graded abrasive paper to ensure good adhesion of field applied coats. Expose a minimum of ½ inch of each coat to provide a smooth transition from the connection area to the existing coating;
4. Coating Application: Apply the epoxy intermediate coat and urethane finish coat to all areas in accordance with the requirements of this section.

I. Field Encapsulation of Existing Lead/Asbestos Paint Systems:

1. 2021 Progress Rail annual inspection reportOnly qualified, trained personnel should handle lead paint and asbestos. Contact Bridge_Lead@csx.com to schedule an abatement by a qualified Contractor. Prior to initiating work that will generate lead-containing waste, the Environmental Department should be contacted to ensure applicable environmental regulations and waste disposal policies are met. Email Bridge_Lead@csx.com for assistance with managing waste.

2. Hand tool clean the surface in accordance with SSPC-SP 2 to remove all loose coating and rust. All coating material removed from the bridge shall be collected and properly disposed of in accordance with all applicable regulations.
3. Solvent clean the steel in accordance with SSPC-SP1, using Plastite Thinner #70 or approved equal to clean, degrease, remove salts and all foreign matter. Cleaning rags shall be frequently changed and properly disposed of in accordance with all applicable regulations.
4. Stripe Coat – Apply Carbomastic 615 to all bolts and metal edges, and any other areas that require cutting in.
5. Full Coat – Apply Carbomastic 615 to the dry film thickness specified in this Section.

J. Hot-Dip Galvanizing: Hot-dip galvanizing, where shown on the plans, shall meet the requirements of the following ASTM specifications:

1. ASTM A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
2. ASTM A143, Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel
3. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Hardware
4. ASTM A384, Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
5. ASTM A385, Practice for Providing High Quality Zinc Coatings (Hot-Dip)
6. ASTM A780, Practice for Repair of Damage and Uncoated Areas of Hot-Dip Galvanized Coatings

K. Bridge Stenciling: After the final coat has dried, the CONTRACTOR shall stencil the following information on the outside face of the fascia girder at both ends of the structure. The stencil coating shall be a urethane finish coat of a contrasting color with the bridge finish color and in uniform block lettering 2 to 3 inches high.

1. The bridge identification number (prefix and milepost)
2. The month and year of completion
3. The specification identity of the cleaning method (SSPC-SP 10)
4. Identification of the coating system, such as IOZ/E/U, (Inorganic Zinc, Epoxy, Urethane)

4.2 SHOP INSPECTION & TESTING

A. Shop Qualifications: The shop performing the surface preparation and coating work shall possess AISC Sophisticated Paint Endorsement or SSPC-QP 3 certification. Evidence of current qualifications shall be provided. Metalizers shall have completed a minimum of three structural steel metalizing projects.

B. Quality Control (QC) Personnel Qualifications:

1. Shop QC Manager: Personnel managing the shop Quality Control program(s) for this work shall possess a minimum classification of SSPC BCI certified, or NACE Coating Inspector Level 2-Certified, or shall provide evidence of successful inspection of three projects of similar or greater complexity and scope that have been completed in the last two years. Copies of the certification and/or experience shall be provided;
2. Shop QC Inspector: The personnel performing the QC testing and inspection shall be trained in coatings inspection and the use of the testing instruments. Documentation of training shall be provided. The QC personnel shall not perform any hands-on surface preparation or coating activities. For metalizing, the CONTRACTOR shall provide an on-site Independent Quality Control Specialist (QCS) who shall function as a metalizing inspector. The QCS shall have a minimum of five years of metalizing experience and SSPC BCI Level 1or NACE Certified Level 3, or other related certification as accepted by CSXT. The QCS shall not be a foreman or member of the CONTRACTOR's production staff.
3. Metalizing Applicators: Each applicator must complete a practical test designed to demonstrate the ability to set up and operate the equipment, to apply the material to the specified thicknesses to a minimum of 10 square feet of representative steel surfaces, and to successfully pass the surface preparation, adhesion, bend, and cut tests specified herein. The results of the qualification testing shall be documented in writing and bend test coupons retained for the duration of the project. Provide CSXT a minimum of 14 days advance notice prior to qualification testing. Notice shall include the date, time and location of the qualification test.

C. Quality Control Program shall provide a list and description of instrumentation that will be used, a description and frequency of the QC tests and inspections that will be performed (including those required for field touch-up work), procedures for correcting unacceptable work, and quality control documentations form(s) that will be completed daily.

1. Galvanizing – Inspection and testing of hot-dip galvanized coatings shall be done in accordance with the guidelines provided in the American Galvanizers Association publication *Inspection of Products Hot-Dip Galvanized After Fabrication.* Testing shall include visual examination and tests in accordance with ASTM A123 and ASTM A153 as applicable, to determine the thickness of the zinc coating on the metal surface. The galvanizer shall furnish a notarized Certificate of Compliance with the ASTM standards listed in this Section. The Certificate must be signed by the galvanizer and contain a detailed description of the material processed and information as to the ASTM standard used for the coating.
2. Metalizing – the QCS shall perform all quality control inspection necessary to assure that all work is performed in compliance with Contract Documents and the manufacturer's written instructions. The QC inspector shall coordinate all inspections, tests, and quality control work with CSX's Inspector. The required inspections include:
   a. Ambient conditions/compressed air cleanliness
   b. Suitability of protectivecoverings
   c. Surface cleanliness and profile
   d. Material storage, mixing, and application
   e. Thickness and continuity of metalizing including adhesion, bend, and cut tests
   f. Touch-up and repair of damaged or defective metalizing.
   g. Final inspection after final power washing

D. Surface Preparation / Coating Plan: The surface preparation/coating plan shall include the methods of surface preparation and type of equipment to be utilized for shop surface preparation and shop coating and field touch-up surface preparation and coating. The plan shall include the manufacturer's product data sheets and Safety Data Sheets (SDS) for the products to be applied.

E. The Company may arrange for inspection by an independent inspection firm under a separate contract. This inspection will be in addition to the Fabricator's Quality Control Program.

F. Bend Testing, Adhesion Testing, and Cut Testing for Evaluation of the Metalizing: Conduct bends tests of the metalized coating prior to application of the metalizing each day. Conduct tensile adhesion and cut tests on the production workprior to beginning theproduction application ofthesealcoat

1. Bend Testing: Unless otherwise directed by CSX, each day that metalizing will be applied, conduct bend testing before beginning the production work. For each metalizing applicator, blast clean five carbon steel coupons measuring 0.050 inches in thickness, 2 inches width, and between 5 and 8 inches in length. Use the same equipment and abrasive used forthe production work. Have each applicator apply the metalizing to five coupons in accordance with the requirements of the Contract Documents to a dry film thickness between 8 and 12 mils. Conduct 180°bend testing on all five coupons using a 13mm mandrel in accordance with the requirements and acceptance criteria of SSPC-CS 23. Minor cracks that cannot be lifted from the substrate with a knife blade are acceptable. If lifting on any of the coupons is possible, modify the surface preparation/ metalizing process until acceptable results are achieved before proceeding with the production work.
2. Tensile Adhesion:
   a. Evaluate the tensile adhesion of the metalizing in accordance with the test procedures and frequencies outlined in SSPC-CS 23 (one test for every 500 square feet of surface area). Use a self-aligning adhesion tester in accordance with ASTM D4541. Select an epoxy adhesive that will cure in sufficient time to allow the testing to be performed without exceeding the maximum time that the metalizing can remain uncoated.
   b. Comply with the acceptance criteria provided in SSPC-CS 23 and the Contract Documents (500 psi minimum for zinc, 1000 psi minimum for aluminum). If the results are less than the specified values, remove the metalizing by blast cleaning and replace it. No tensile adhesion strength less than the specified strength will be accepted.

c. Reapplication: If the test removes the metalizing to the steel in excess of the acceptance criteria and the steel is not rusted, reapply the metalizing. If the steel is rusted, spot blast the test area to the specified cleanliness before applying the metalizing. If the test separates the metalizing in excess of the minimum specified bond strength, remove all loose material and proceed with the application of the seal coat. If the test separates at the epoxy adhesive in excess of the minimum specified bond strength, completely remove the adhesive and apply the seal coat.

3. Cut Test: Conduct a minimum of one cut test for every 500 square feet of surface metalized. Use a hammer and sharp chisel at a low angle to make a single 1½inches long cut through to the substrate. The bond of the metalizing is considered unsatisfactory if any part of the metalizing liftsfromthesubstrate. Removeunsatisfactorymetalizingby blastcleaningandreplacing it.

G. Shipping of Shop Coated Steel: Fabricated steel shall not be loaded for shipment to the job-site until the shop coating is cured for handling and the steel and coating has been inspected and approved by CSXT. All coating work shall be completed before the steel has been loaded for shipment.

1. Extreme care shall be exercised in handling the steel in the shop and in preparation for shipping. Coated steel shall not be moved or handled in the shop until sufficient drying and curing time has elapsed to prevent handling damage. During shipping, the steel shall be insulated from binding chains by softeners approved by CSXT. Hooks and slings used to hoist the steel shall be padded. Steel shall be stacked and spaced in such a way that no rubbing will occur during shipment that could damage the coating system.

H. Workmanship and Finish

1. Appearance: Surface finish shall be smooth, free from runs and uniform in appearance. Metalized or thermal spray coatings shall be adherent, continuous and reasonably smooth. It shall be free from imperfections such as blisters, cracks, or uncoated areas, substrate burnishment or black spots adhering to the coating, or other imperfections not consistent with good commercial Thermal Spray practice.
2. Warranty: The CONTRACTOR will be required to guarantee their work against defective workmanship or the use of defective materials for a period of one (1) year from the completion of the contract.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement of STRUCTURAL COATING (PAINTING and/or METALIZING, or ENCAPSULATION), as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a SQUARE FOOT basis. GALVANIZING shall be incidental to the item of work which requires such coating.

5.2 PAYMENT

A. Payment: The payment for STRUCTURAL COATING, measured as stated above, will be made at the contract unit price bid for SQUARE FEET of STRUCTURAL COATING and shall be full compensation for furnishing all labor, tools, materials, equipment, quality control testing, disposal of all wastes, and all other expenses necessary for STRUCTURAL COATING as detailed in the plans.

END OF SECTION 070245

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PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers work necessary to prepare soils for foundation bearing pressures. It includes preparation of the excavated soil strata to receive spread footings, cast-in-place culverts, precast culverts and pipes and other soil areas for which bearing capacity must be evaluated to determine potential settlement under proposed man-made loading conditions.

PART 2 - MATERIAL

2.1 GENERAL

A. Foundation conditioning materials may include but are not limited to fine aggregates, large aggregates, injectable grouts, pozzolans and other cementitious materials and geotextiles. The Project Geotechnical Engineer will provide a detailed list of recommended materials to accomplish the required increase in soil bearing capacity.

2.2 HANDLING AND STORING MATERIALS

A. Handle, store, and ship foundation conditioning materials in a manner to prevent contamination or degradation due to exposure.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals: The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER..

1. Material specifications and or certifications
2. Installation plan

B. Alternate Plans: CONTRACTOR shall furnish one (1) complete electronic copy of detailed alternate plans including construction sequence prepared by a geotechnical engineer, licensed in the state where the Project is located, for approval prior to starting installation. By approving and submitting alternate plans, the CONTRACTOR thereby represents that all field measurements, field construction criteria, materials, catalog numbers and similar data have been determined and verified, and that the alternate plans have been checked and coordinated with the requirements of the work and of the contract documents. After approval of alternate plans, the CONTRACTOR shall supply the RAILROAD with one (1) complete electronic set of reproducible approved drawings.

PART 4 - EXECUTION

4.1 INSTALLATION

A. The CONTRACTOR shall install the foundation soil conditioning materials in accordance with the plans and sequence of construction provided with the Contract Documents or the approved alternate plans.

B. The CONTRACTOR shall employ a geotechnical Professional Engineer licensed in the Commonwealth, District, State, or Province where the work is to be performed to monitor the installation and provide certified As-Built plans

indicating the installation was performed in accordance with the approved construction plans. The cost of such monitoring shall be incidental to the work.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement for payment, FOUNDATION SOIL CONDITIONING, as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a SQUARE YARD basis.

5.2 PAYMENT

A. Payment for FOUNDATION SOIL CONDITIONING, measured as stated above, will be at the contract unit price per SQUARE YARD bid. Said unit price shall be full compensation for furnishing all labor, materials, tools, equipment, forms, supplies, accessories, supervision, engineering and all other items of expense for FOUNDATION SOIL CONDITIONING. If the Contract Documents do not contain a pay item for FOUNDATION SOIL CONDITIONING, the work required to prepare the foundation soils for the proposed loaded condition shall be considered incidental to the cost of the associated item.

END OF SECTION 070420

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers construction requirements, and measurement and payment for CAST-IN-PLACE CONCRETE ELEMENTS used in bridge substructures and structure foundations on CSX Transportation construction projects. Included are pier, bent and abutment elements which are formed and cast in place.

B. General conditions for this work are in accordance with Division 1 of the CSX Design and Construction Standard Specifications.

PART 2 - MATERIAL

2.1 GENERAL

A. All materials shall meet the requirements of Division 7, 100 Series of the CSX Design and Construction Standard Specifications shown below:

Concrete.....070105
Reinforcing/Prestressing 070120

2.2 HANDLING AND STORING MATERIALS

A. Reinforcement shall be stored in racks in such a manner as to avoid contact with the ground. If reinforcement is to remain on the site for more than one month, it shall be covered to protect it from weather. If reinforcement accumulates heavy rust, dirt, mud, loose scale, paint, oil, or any other foreign substance during storage, it shall be cleaned before being used. Severe deterioration of this kind may be a basis for rejection.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals shall be in accordance with Section 070105 of the CSX Design and Construction Standard Specifications.

PART 4 - EXECUTION

4.1 GENERAL

A. Execution shall be in accordance with Section 070105 of the CSX Design and Construction Standard Specifications.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement:

1. Measurement of CAST-IN-PLACE CONCRETE, as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a CUBIC YARD basis. This measurement shall be based on the volume to the nearest one-tenth (1/10) CUBIC YARD in place, computed from the neat line dimensions and within the payment limits shown on the Plans. The volume of the embedment of solid piles will be deducted. No deductions will be made for rounded or beveled edges or volume occupied by reinforcing bars, anchor bolts or other

embedded metal. The cost of formwork and falsework, and embedded metal plates and/or shapes shall be incidental.

2. Measurement of REINFORCING STEEL, as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a per POUND basis. Where reinforcing bars are to be grouted into concrete and/or masonry, the cost of grouting materials and cost of installation shall be incidental to this item.
3. Measurement of CAST-IN-PLACE CONCRETE, MASS CONCRETE, as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a CUBIC YARD basis. This measurement shall be based on the volume to the nearest one-tenth (1/10) CUBIC YARD in place, computed from the neat line dimensions and within the payment limits shown on the Plans. The volume of the embedment of solid piles will be deducted. No deductions will be made for rounded or beveled edges or volume occupied by reinforcing bars, anchor bolts or other embedded metal. The cost of formwork and falsework, and embedded metal plates and/or shapes shall be incidental.

5.2 PAYMENT

A. Payment will be at the contract unit price bid as shown below. Said unit price shall be full compensation for furnishing all labor, materials, tools, equipment, forms, supplies, accessories, supervision, engineering and all other items of expense to furnish and place the work.

1. Payment for CAST-IN-PLACE CONCRETE, measured as stated above, will be at the contract unit price per CUBIC YARD bid;
2. Payment for REINFORCING STEEL, measured as stated above, will be at the contract unit price per POUND bid.
3. Payment for CAST-IN-PLACE CONCRETE, MASS CONCRETE, measured as stated above, will be at the contract unit price per CUBIC YARD bid.

END OF SECTION 070425

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section covers fabrication, furnishing, and installation of precast concrete elements, used on CSX Transportation construction projects. Precast concrete elements include both substructure elements such as bent caps, wingwalls and backwalls, and superstructure elements such as box beam spans and deck panels,

B. General conditions for this work are in accordance with Division 1 of the CSX Design and Construction Standard Specifications.

PART 2 - MATERIAL

2.1 GENERAL

A. All materials shall meet the requirements of Division 7, 100 Series of the CSX Design and Construction Standard Specifications shown below:

Concrete.....070105
Reinforcing/Prestressing 070120
Steel 070125

2.2 HANDLING AND STORING MATERIALS

A. Surface condition: If the finished concrete surfaces are chipped or marred, or the mating surfaces of CCS cones (where used) are marred, due to shipping or due to the CONTRACTOR's actions, the repairs shall be made by the CONTRACTOR at their expense and to the satisfaction of the CSXT project manager or authorized representative.

B. All precast elements shall be lifted into their storage position using the wire loops cast into the element and neither dragged nor pushed.

C. Superstructure elements, neoprene bearing pads and drainage gratings, and all other associated material shall be handled and stored according to manufacturer's recommendations.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals shall be in accordance with Section 070105.

PART 4 - EXECUTION

4.1 FABRICATION

A. Fabrication shall be in accordance with Section 070105.

1. The CSXT preferred fabricator for Prestressed Concrete Box Beams (PCBB units) is Forterra. Standard Drawings 2820 and 2825 shall apply.
2. The CSXT preferred fabricator for all other precast elements is Conech Bridge & Engineering.

4.2 FURNISHING

A. The CONTRACTOR shall coordinate with the RAILROAD to ship the fully fabricated precast substructure elements and incidental items. The precast substructure elements and incidental items shall be handled so as to assure delivery to the CSXT designated Project Site in sound, undamaged condition.

4.3 INSTALLATION

A. Precast concrete bent caps are intended to be installed with the existing superstructure in place. The builder shall set the precast caps in place on top of the piles as shown on the Project Plans and secure the caps. The cap to pile connection shall be completed as shown on the Project Plans, specific to the type of bent cap and the type of pile for each installation.

B. At end bents, wingwalls and backwalls shall be installed as shown on the plans. Wingwalls shall be installed prior to backwall installation.

C. CCS CONE CONNECTORS: Where used, the CCS cone connector system for connecting piles to bent caps shall be manufactured and furnished by ENCON Solutions, LLC of Jacksonville, FL and installed as shown on the plans. The manufacturer's specifications apply.

D. Neoprene bearing pads for Precast Concrete Box Beams shall be bonded to the concrete bent caps using an approved epoxy adhesive that will be compatible with the neoprene bearing pad material. Concrete curing compound shall be removed from the bonding areas, and water repellent material shall not be applied to the bonding areas. Furnishing adhesive and bonding neoprene bearing pads to the bent caps and slabs shall be considered incidental to this item.

E. Installation of walkway brackets, handrail posts, grating, cable, etc., if specified on the Project Plans, shall be considered incidental to this item.

F. CONTRACTOR shall furnish and place preformed expansion joint filler material, asphalt mastic and any other miscellaneous material necessary to properly set the concrete superstructure in place, etc.

G. Any temporary blocking under existing stringers and blocking under ties to adjust any elevation differential during the placement of superstructure shall be considered incidental to this item.

H. Track on the concrete superstructure prior to the placement of ballast shall be temporarily strutted to the ballast curbs and pinned to temporary elevation blocking, if required, to maintain proper track alignment and profile, as directed by the ENGINEER.

I. On-line installation of PRECAST CONCRETE SUPERSTRUCTURE and bearing pads shall be coordinated with the RAILROAD.

J. When the new superstructure is complete, RAILROAD will furnish and place stone ballast, surface and line track to the final profile and alignment on the bridge and approaches. The CONTRACTOR shall remove and dispose of temporary alignment struts and elevation runners when directed by the ENGINEER.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement for payment of precast concrete elements, as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a per EACH basis for each individual precast element. There shall be a separate per EACH unit price for each element furnished to the site, and a per EACH unit price for that element to be installed in the structure, as shown on the plans.

B. Fixed costs to furnish each precast element, including but not limited to shipping, unloading, and handling, shall be included in the per EACH unit prices to furnish each element. Fixed costs to install each precast element, including but not limited to handling and placing, shall be included in the per EACH unit prices to install each element.

C. Steel Connectors, embedded steel plates and angles, expansion material, water repellant and other miscellaneous items included in the project plans for precast substructure elements shall be incidental to this item, and included in the fixed costs.

D. As required for the Project, the pay items may further be described as FURNISH, INSTALL, LIGHTWEIGHT, and/or STANDARD.

5.2 PAYMENT

A. Payment for precast concrete substructure elements, measured as stated above, will be at the contract unit price per EACH bid. Said unit price shall be full compensation for furnishing all labor, materials, tools, equipment, forms, supplies, accessories, supervision, engineering and all other items of expense to precast concrete substructure elements. Pay items may include:

1. PRECAST CONCRETE BENT CAP
2. PRECAST CONCRETE WINGWALL
3. PRECAST CONCRETE BACKWALL
4. PRESTRESSED CONCRETE BOX BEAM (PCBB)
5. PRESTRESSED CONCRETE GIRDER
6. PRECAST CONCRETE DECK PANEL

As required for the Project, the pay items may further be described as FURNISH, INSTALL, LIGHTWEIGHT, and/or STANDARD

END OF SECTION 070430

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers fabrication, transportation, preparation, assembly, erection, welding, and all other construction requirements associated with Steel Superstructures.

PART 2 - MATERIAL

2.1 GENERAL

A. All steel material shall be in accordance with CSX Design and Construction Specification Section 070125.

PART 3 - SUBMITTALS

3.1 GENERAL

A. All submittals for bridge steel shall be in accordance with CSX Design and Construction Specification Section 070125.

PART 4 – EXECUTION

4.1 GENERAL

A. Execution for bridge steel shall be in accordance with CSX Design and Construction Specification Section 070125, except as specified in this Part.

4.2 BEARINGS AND ANCHORAGE

A. Bearing Surfaces: Bearing surfaces shall be cleaned of all dirt, loose rust and mill scale, grease, and paint just before the members are assembled. Wire brushes, scalers, solvents or flame shall be used to clean the surfaces under the direction of the ENGINEER. The area of concrete under bearings shall be bush-hammered, or ground if necessary to provide a full and even bearing at the correct elevation. When the bridge seat is more than ⅛ inch below plan elevation, the bearings shall be raised to grade on steel plate of the same size as the bearing. The plates shall be provided by the CONTRACTOR at CONTRACTOR's expense and attached to the bearings in a manner satisfactory to the ENGINEER.

B. Setting: Epoxy grout shall be spread over the bush-hammered or ground areas just before the bearings are set. No more than ½" thickness of epoxy grout shall be placed, with no intent of raising the bearings. Bearings shall be set level in exact position and shall have full and even bearing upon the bridge seat areas. All bearings shall be set so as to be at the proper location when the ambient temperature of the span is at 60º F and the span is under full dead load. At this temperature and loading, rockers shall be vertical, bearings shall be centered under the structure center line of bearing, and sliding plates shall be centered on the bearing plates. If the ambient temperature of the span deviates from 60°F, follow the setting chart provided in the Project plans or request direction from the ENGINEER. Finished surfaces of bearings in moving contact shall be cleaned and greased when the bearings are placed.

C. Anchor Bolts: Holes for anchor bolts shall be drilled in the bridge seat of cast-in place or existing substructure elements in exact locations shown on the plans. Precast elements shall have anchor bolt holes cast during fabrication, as shown on the CSX standard drawings or in the project plans. Holes shall be of a diameter approximately twice the diameter of the anchor bolt plus ½ inch. Epoxy grout, as shown on the plans shall be used to set the anchor bolts. Before placing the bolts, the holes shall be cleaned of all dust and loose material by flushing with water, after which holes shall be blown dry. After all steel is in place and the bearings are set, the anchor bolts shall be set accurately with

sufficient epoxy grout placed in the bottom of the holes so that after a bolt is inserted, the hole will be completely filled. The bolts shall not be disturbed in any way for at least 24 hours, or until the epoxy grout is set. Mixing and use of epoxy grout shall be as recommended by the manufacturer of the grout. If the CONTRACTOR has an alternative method, CONTRACTOR shall submit the complete procedure to the ENGINEER for approval.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement of STEEL SUPERSTRUCTURE shall be as shown on the plans based on POUNDS of steel as fabricated and installed in the final structure. All fasteners/anchor bolts are incidental to this item.

B. Measurement of STEEL GIRDER STRAIGHTENING AND CRACK REPAIR, IN-PLACE as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a LUMP SUM basis.

5.2 PAYMENT

A. Payment of STEEL SUPERSTRUCTURE, measured as stated above, will be at the contract unit price per POUND of steel bid. Unit price shall be full compensation for furnishing all labor, material, equipment, supplies, and other expenses to furnish, unload, store, erect and assemble as required for STEEL SUPERSTRUCTURE.

B. Payment shall be at the unit price bid and shall be full compensation for all labor, materials not specifically supplied by the RAILROAD, equipment, tools, supplies and all else necessary to construct the STEEL SUPERSTRUCTURE.

C. Payment for STEEL GIRDER STRAIGHTENING AND CRACK REPAIR, IN-PLACE, measured as stated above, will be made at the contract unit price LUMP SUM bid. Said price shall be full compensation for furnishing all tools, materials, equipment, quality control testing, disposal of all wastes, shop drawings, all labor necessary for fabrication and erecting, and all other expenses necessary for STEEL GIRDER STRAIGHTENING AND CRACK REPAIR, IN-PLACE.

END OF SECTION 070515

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers construction requirements, and measurement and payment for BEARINGS AND ANCHORAGE components used in bridge structures on CSX Transportation construction projects.

B. General conditions for this work are in accordance with Division 1 of the CSX Design and Construction Standard Specifications.

PART 2 - MATERIAL

2.1 GENERAL

A. All bearing and anchorage device material shall be in accordance with AREMA Chapter 15, Part 5.

2.2 HANDLING AND STORING MATERIALS

A. All materials shall be handled and stored according to fabricator's recommendation.

B. Any bearing / anchorage device that has been damaged, according to the ENGINEER, shall be replaced at the expense of the CONTRACTOR.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals: The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER..

1. Mill Certifications
2. Fabrication Drawings
3. Welder Certifications
4. Material Cut Sheets
5. Fabricator Quality Control Plan

B. Shop Drawings: CONTRACTOR shall furnish one (1) complete electronic copy of detailed shop drawings for approval prior to starting fabrication. By approving and submitting shop drawings, the CONTRACTOR thereby represents that all field measurements, field construction criteria, materials, catalog numbers and similar data have been determined and verified, and that the shop drawings have been checked and coordinated with the requirements of the work and of the contract documents. After approval of shop drawings, the CONTRACTOR shall supply the RAILROAD with one (1) electronic complete set of reproducible approved drawings.

C. Submittal Review: Approval by the ENGINEER is only for the purpose of confirming compliance with the contract plan and specifications. Approval shall not relieve the CONTRACTOR from responsibility for correctness, quantity and quality, nor for completeness of Work in accordance with the plans and specifications.

PART 4 - EXECUTION

4.1 GENERAL

A. Selection of bearing type, design, fabrication and installation of bearings and anchorage devices shall be in accordance with all applicable AREMA recommendations and CSX Design and Construction Specifications.

B. Bearing stresses in concrete shall not exceed applicable AREMA recommendations.

C. Pot-type multi-rotational bearings shall NOT be used on CSX bridges.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement of Payment, BEARINGS AND ANCHORAGE, as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a LUMP SUM basis.

5.2 PAYMENT

A. Payment for BEARINGS AND ANCHORAGE, measured as stated above, will be at the contract LUMP SUM price bid. Said unit price shall be full compensation for furnishing all labor, materials, tools, equipment, forms, supplies, accessories, supervision, engineering and all other items of expense for FURNISHING AND INSTALLING BEARINGS AND ANCHORAGE.

END OF SECTION 070520

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers material, preparation, assembly, and all other construction requirements associated with BRIDGE WATERPROOFING.

B. General conditions for this work are in accordance with Division 1 of the CSX Design and Construction Standard Specifications.

PART 2 - MATERIAL

2.1 GENERAL

A. Waterproofing systems shall be comprised of compatible materials. CONTRACTOR shall verify compatibility prior to installation.

2.2 PRIMERS AND SEALANTS

A. All primers and sealants shall be compatible with the substrate and membrane material, per the manufacturer.

2.3 MEMBRANE

A. Waterproofing membrane shall be in accordance with AREMA Chapter 8, Part 29, Cold Liquid-Applied Elastomeric Membranes. thickness

B. Waterproofing material shall be a two-component, sprayable polyurea, 100% solids elastomeric coating. TuffGrip HP11-90, manufactured by Rhino Linings is the preferred material or equal alterative. thickness

C. Coating shall have extended working time and be highly abrasion resistant, possess high elongation, resist abrasion, corrosion, and chemicals.

2.4 UNDERLAYMENT

A. Where an underlayment is necessary to achieve proper transverse and/or longitudinal deck slopes for drainage, Portland cement concrete with welded wire fabric may be used. The concrete shall be in accordance with AREMA Chapter 8, Part 29.

2.5 HANDLING AND STORING MATERIALS

A. All materials shall be handled and stored according to manufacturer’s recommendation.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals: The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER.

1. Product data
2. Product specifications
3. Product certifications

B. Submittal Review: Approval by the ENGINEER is only for the purpose of confirming compliance with the contract plan and specifications. Approval shall not relieve the CONTRACTOR from responsibility for correctness, quantity and quality, nor for completeness of Work in accordance with the plans and specifications.

PART 4 - EXECUTION

4.1 GENERAL

A. Waterproofing material shall be installed in accordance with manufacturer's recommendations, and to the extent shown in the project plans.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement of Payment, BRIDGE WATERPROOFING, as shown on the drawings, as specified in this Section and as accepted in the final work, including all primers and sealers, membrane and underlayment, shall be on a per SQUARE FOOT basis.

5.2 PAYMENT

A. Payment for BRIDGE WATERPROOFING, measured as stated above, will be at the contract unit price per SQUARE FOOT bid. Said unit price shall be full compensation for furnishing all labor, materials, tools, equipment, forms, supplies, accessories, supervision, engineering and all other items of expense to BRIDGE WATERPROOFING.

END OF SECTION 070525

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers material, preparation, application, and all other construction requirements associated with WATER REPELLENT for concrete surfaces.

B. General conditions for this work are in accordance with Division 1 of the CSX Design and Construction Standard Specifications.

PART 2 - MATERIAL

2.1 GENERAL

A. Water repellent material shall consist of a silane based, one part liquid penetrating sealer, in accordance with AREMA Chapter 8, Part 1 and in conformance with applicable ASTM designations.

2.2 HANDLING AND STORING MATERIALS

A. Material shall be handled and stored according to manufacturer's recommendations.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals: The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER..

1. Water Repellent application process
2. Water Repellent certifications

B. Submittal Review: Approval by the ENGINEER is only for the purpose of confirming compliance with the contract plan and specifications. Approval shall not relieve the CONTRACTOR from responsibility for correctness, quantity and quality, nor for completeness of Work in accordance with the plans and specifications.

PART 4 - EXECUTION

4.1 APPLICATION

A. Surface preparation and application shall be in accordance with AREMA Chapter 8, Part 1.

B. Water repellent shall be applied to the top of the deck, curbs and sides of all deck slabs prior to installation, as well as concrete bent caps and top and sides of wing walls. In the case that slabs are set prior to concrete curing, water repellent will be applied to only those areas accessible after 28 days.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement of Payment, WATER REPELLENT, as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a LUMP SUM basis.

5.2 PAYMENT

A. Payment for WATER REPELLENT, measured as stated above, will be at the contract LUMP SUM price bid. Said price shall be full compensation for furnishing all labor, materials, tools, equipment, forms, supplies, accessories, supervision, engineering and all other items of expense to WATER REPELLENT.

END OF SECTION 070530

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers fabrication, construction requirements, measurement and payment for BRIDGE WALKWAY used on CSX Transportation bridge construction projects.

B. General conditions for this work are in accordance with Division 1 of the CSX Design and Construction Standard Specifications.

PART 2 - MATERIAL

2.1 GENERAL

A. Walkway grating shall be rectangular welded grating made of ASTM A1011 steel, hot-dip galvanized after fabrication. Bearing bars shall be 1½ inches by $\frac{3}{16}$ inch at $1\frac{3}{16}$ inches centers and twisted square bars at 4 inch centers, or as specified in the contract plans.

B. Other walkway material shall meet all applicable ASTM, AREMA recommendations, and CSX Design and Construction Standard Specifications.

2.2 HANDLING AND STORING MATERIALS

A. All materials shall be handled and stored according to fabricator's recommendation.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. Submittals: The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER..

1. Material certifications
2. Installation procedures
3. Epoxy specifications, if applicable

B. Shop Drawings: CONTRACTOR shall furnish one (1) complete electronic copy of detailed shop drawings for approval prior to starting fabrication. By approving and submitting shop drawings, the CONTRACTOR thereby represents that all field measurements, field construction criteria, materials, catalog numbers and similar data have been determined and verified, and that the shop drawings have been checked and coordinated with the requirements of the work and of the contract documents. After approval of shop drawings, the CONTRACTOR shall supply the RAILROAD with one (1) complete electronic set of reproducible approved drawings.

C. Submittal Review: Approval by the ENGINEER is only for the purpose of confirming compliance with the contract plan and specifications. Approval shall not relieve the CONTRACTOR from responsibility for correctness, quantity and quality, nor for completeness of Work in accordance with the plans and specifications.

PART 4 - EXECUTION

4.1 DESIGN

A. Design of walkways shall be in accordance with the clearances, minimum dimensions and loads as recommended in AREMA Chapter 15, Part 8. Materials shall be as stated above.

B. Special situations such as a movable span, through truss, lengthy multiple-span bridge, partial reconstruction, partial deck replacement, etc. may be constructed in a manner that prohibits the practical use of typical walkway details. Custom walkway design details or requests for exceptions to this standard shall be requested by the ENGINEER.

C. Single-track bridges are to have a minimum of one walkway that shall be located to provide the greatest benefit to personnel working in the area. This walkway shall be located as follows:

1. The same side as that of an adjacent switch stand or signal
2. The same side as that of adjacent bridges within a typical train length for the particular territory
3. Where it does not conflict with the criteria described in items one or two above, the downstream side to allow for drift removal.

D. Multiple-track bridges shall have walkways between all adjacent active tracks. In locations where a switch stand or signal is adjacent to a multiple-track bridge, that bridge shall also have a walkway on the same side as that of the switch stand or signal.

E. Ballasted or solid deck bridges, with parapets extending at least three and one half feet (3’-6”) above the top of tie, and with walking space extending at least four feet (4’) beyond the end of tie, do not require additional walkways.

F. Handrails: All walkways shall have handrails, except those between adjacent active tracks. Handrails shall be in accordance with Section 070540.

G. Walkway Grating: The length of grating sections should be maximized and shall not be less than 12 feet where applicable.

H. Access hatches in walkways shall be painted yellow and equipped with a RAILROAD lock for security.

4.2 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.

B. Fabricate components with joints tightly fitted and secured. Provide mechanical fittings to accommodate site assembly and installation.

C. Provide anchors, brackets, and all other fastener components required for mounting and anchoring walkways.

4.3 INSTALLATION

A. Install walkway in accordance with manufacturer’s instructions.

B. Install components plumb and level, straight and true, accurately fitted, free from distortion or defects.

C. Assemble with mechanical fasteners for secure installation.

D. Existing walkway which has loosened, or which has had one or more supports removed shall be considered ineffective, treated as if non-existent and shall be removed. Remove all loosened or unsupported pieces of walkway material (grating, boards, etc.) to clear the work area. Make the hole or defective area obvious. Place cones or other barriers at least 6 feet beyond either side of the hole or defective area and ensure fall protection, where required, is utilized.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement of Payment, BRIDGE WALKWAY, as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a LINEAR FOOT basis.

5.2 PAYMENT

A. Payment for BRIDGE WALKWAY, measured as stated above, will be at the contract price per LINEAR FOOT bid. Said price shall be full compensation for furnishing all labor, materials, tools, equipment, forms, supplies, accessories, supervision, engineering and all other items of expense to BRIDGE WALKWAY.

END OF SECTION 070535

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PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers fabrication, construction requirements, and measurement and payment for BRIDGE HANDRAIL used on CSX Transportation bridge construction projects.

B. General conditions for this work are in accordance with Division 1 of the CSX Design and Construction Standard Specifications.

PART 2 - MATERIAL

2.1 GENERAL

A. Rails:

1. 1½ inch diameter, Schedule 40, ASTM (either 53 or 500) steel pipe. Splice connectors for railings shall be Schedule 40 pipe of the diameter shown on the plans.
2. ⅜ inch messenger cable.

B. Posts: L 4 x 4 x ½ steel angles, ASTM A36 conforming to Section 070125 of these Specifications, or as shown on the plans.

C. Fittings: Elbows, T-shapes, wall brackets, escutcheons shall be ASTM A36 steel conforming to Section 070125 of these Specifications, or as shown on the plans.

D. Mounting: brackets, base flanges for horizontal surfaces, and angled base flanges for stair stringers and ramps shall be ASTM A36 steel conforming to Section 070125 of these Specifications, or as shown on the plans.

E. Hardware: Hardware shall conform to Section 070125 of these Specifications, or as shown on the plans. No pop rivets, sheet metal screws, or self-tapping screws permitted. No glued or welded connections permitted.

F. All Handrail materials shall be hot-dip galvanized after fabrication.

2.2 HANDLING AND STORING MATERIALS

A. All materials shall be handled and stored according to fabricator's recommendation.

PART 3 - SUBMITTALS

3.1 SUBMITTALS

A. The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER.

1. Product data
2. Product specifications
3. Material Certifications
4. Plans showing location of handrail required with all necessary dimensions, and detail drawings showing standard handrail elevations, typical connections, anchoring systems, and expansion joints.

B. Shop Drawings: CONTRACTOR shall furnish one (1) complete electronic copy of detailed shop drawings for approval prior to starting fabrication. By approving and submitting shop drawings, the CONTRACTOR thereby represents that all field measurements, field construction criteria, materials, catalog numbers and similar data have been determined and verified, and that the shop drawings have been checked and coordinated with the requirements of the work and of the contract documents. After approval of shop drawings, the CONTRACTOR shall supply the RAILROAD with one (1) complete electronic set of reproducible approved drawings.

C. Submittal Review: Approval by the ENGINEER is only for the purpose of confirming compliance with the contract plan and specifications. Approval shall not relieve the CONTRACTOR from responsibility for correctness, quantity and quality, nor for completeness of Work in accordance with the plans and specifications.

PART 4 - EXECUTION

4.1 DESIGN

Design of handrails shall be in accordance with the clearances, minimum dimensions and loads as recommended in AREMA Chapter 15, Part 8. Materials shall be as stated above.

4.2 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.

B. Fabricate components with joints tightly fitted and secured. Provide mechanical fittings to accommodate site assembly and installation.

C. Provide anchors, brackets, and base flanges required for mounting and anchoring railings.

D. Exterior components – drill condensation drainage holes at bottom and low point of members at locations that will not encourage water intrusion.

E. Make exposed joints butt-tight, flush, and hairline. Ease exposed edges to small uniform radius.

F. Accommodate for expansion and contraction of members without damage to connections or members.

G. Galvanizing shall be in accordance with Section 070245.

4.3 INSTALLATION:

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, straight and true, accurately fitted, free from distortion or defects.

C. Assemble with mechanical fittings to accommodate tight joints and secure installation.

D. Repair any damage to galvanized coating as directed by the ENGINEER, in accordance with plans and specifications.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

A. Measurement of Payment, BRIDGE HANDRAIL, as shown on the drawings, as specified in this Section and as accepted in the final work, shall be on a LINEAR FOOT basis.

5.2 PAYMENT

A. Payment for BRIDGE HANDRAIL, measured as stated above, will be at the contract unit price per LINEAR FOOT bid. Said unit price shall be full compensation for furnishing all labor, materials, tools, equipment, forms, supplies, accessories, supervision, engineering and all other items of expense to design and install BRIDGE HANDRAIL.

END OF SECTION 070540

MWI 301-04
Ballast and Sub-Ballast Specification

Issued: 12/16/96 Revised: 8/01/12

PURPOSE:	To provide uniform Ballast and Sub-ballast Specifications.
SAFETY:	Observe all applicable Safety, and Operating Rules and Regulations; and Safe Job Procedures.
LOCATION:	All CSXT tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State and Local environmental rules and regulations.

I. DISCUSSION

The CSXT Specifications for Prepared Railroad Track Ballast and Sub-ballast were developed by a multi-departmental team from the Purchasing & Materials, Quality Assurance, and Engineering Departments.

II. PROCEDURE

A. The detailed specifications follow:

B. These specifications will be used for the purchase of all Track Ballast and Sub-ballast installed on CSXT.

Prepared by: L. D. Kreisel

Reviewed: _____
Director Engineering Standards

Approved: _____
Assistant Vice President Engineering

Office of the Vice President - Engineering
Jacksonville, Florida

C S X

T R A N S P O R T A T I O N

SPECIFICATIONS FOR

PREPARED RAILROAD

TRACK BALLAST and SUB-BALLAST

Approved August 1, 2012

C S X TRANSPORTATION, INC.

SPECIFICATIONS FOR PREPARED RAILROAD TRACK BALLAST AND SUB-BALLAST

(1) SCOPE:

These specifications cover the requirement for grading and other significant physical properties of mineral aggregates for prepared track ballast and sub-ballast. The suppliers governed by this specification, shall have or establish a quality system that complies with DOT, AAR Specification for Quality Assurance, M1003 (AAR M-1003), or International Quality Standard ANSI 9000 Series (ISO 9001).

(2) TYPES OF BALLAST:

Quarried Granite, Trap Rock, and Dolomite Limestone, produced in a crushing-screening plant designed to satisfy the specifications listed herein.

(3) GENERAL REQUIREMENTS:

The type and sizes of prepared ballast shall be designated by the Railroad in conformance to approved standards. The mineral aggregate shall be clean, hard, durable, free from any frozen lumps, deleterious matter and harmful adherent coatings. No materials subject to regulation as hazardous wastes as defined in the administrative code of the state where the material will be used shall be allowed.

(4) HANDLING:

Processed ballast shall be handled at the producing plant in such a manner that it is kept free from segregation. It shall be loaded only into cars which are clean and free from rubbish or any substance that would foul or damage the ballast. The producer should not make repeated passes of equipment over the same levels in stock piled ballast.

Track ballast shall be washed prior to loading in railcars.

(5) INSPECTION:

The Railroad reserves the right to reject any car of ballast arriving at the site for unloading that does not conform to the specification as determined by methods of test.

If material loaded does not conform to these specifications, the Railroad must notify the supplier to stop loading until the fault has been corrected and to dispose of all defective material without cost to the Railroad.

(6) TESTING:

(A) Determinations of deleterious substances resistance to abrasion and soundness shall be made at a testing laboratory approved by the Railroad. These tests will be conducted when adding a new supplier, renewing contract, opening a new quarry or strata, and at least annually. It is the supplier's responsibility to furnish copies of the annual test results and AAR M-1003, ISO 9001, or DOT certification to CSXT Purchasing & Materials for distribution to CSXT Engineering Standards and Supplier Quality.

(B) Visual inspections and gradation test shall be made at the place of production prior to shipment as often as considered necessary. (Minimum of 1 sample per 1000 tons of ballast produced but may be reduced if material consistently meets specification.) Gradation test results will be transmitted by e-mail to CSX Director Quality Assurance for validation. The reports shall be forwarded in a consolidated monthly summary of tests in an electronic format such as Excel. The supplier shall retain the details of gradation for a minimum of one year after the test is performed.

(C) CSX retains the right to conduct on-site inspection for compliance to this specification. Deviation from these requirements will require the supplier to utilize a CSXT prescribed five step corrective action process designed to identify and permanently eliminate the root cause(s) of the problem.

- Define the problem.
- Fix the problem.
- Identify the root cause of the problem.
- Implement corrective action to eliminate the root cause.
- Establish a follow-up plan to assess effectiveness and permanence.

Ineffective corrective action plans can result in the supplier being removed from the CSXT approved supplier list.

(D) Samples of the finished product for all tests shall be representative and of sufficient weight for testing.

(7) QUALITY REQUIREMENTS:

(A) Deleterious substances shall not be present in prepared ballast in excess of the following amounts:

Material finer than No. 200 sieve (Track ballast only) = 1%

Clay lumps and Soft or Friable pieces = 0.5%

(If clay lumps and soft or friable pieces exceeds 0.5%, the supplier must test and certify that clay lumps do not exceed 0.5% and soft or friable pieces do not exceed 2%. Action plan must be submitted to reduce this material.)

(B) The percentage of wear of prepared ballast tested in the Los Angeles Machine shall not be greater than:

Granite	=	32%
Dolomite	=	28%

Except as otherwise specified by Railroad

(C) Granite ballast is predominately considered the CSX Standard. Any deviation must be approved by the Vice President, Engineering. The following guidelines should be followed in determining the type of ballast application for each territorial location:

1. Granite ballast should be used on lines having tonnage in excess of 10 MGT annually.

2. Dolomite Limestone will not be used on CSXT owned tracks without a deviation approved by the Vice President, Engineering. Dolomite Limestone ballast with maximum 28% loss (L.A. abrasion) can be used on lines having less than 10 MGT annually.

3.

Dolomite = $MgCo^3$ More Than 36%	-	Approved
Dolomite Limestone = $MgCo^3$ 28-36%	-	Approved
Limestone = $MgCo^3$ Less Than 28%	-	Not Approved
Slag Ballast	-	Not Approved

It is the Division's responsibility to evaluate annual tonnage application when ordering weekly ballast requirements (based on the above guidelines). The Chief Engineer's office will determine the best solution to be administered.

(D) The soundness of prepared ballast for use in regions where freezing temperatures are expected shall be such that when tested:

1. in the sodium sulfate soundness test, the weighted average loss shall not be in excess of 7% after 5 cycles.

   or

2. in the magnesium sulfate soundness test, the weighted average loss shall not be in excess of 11% after 5 cycles.

(8) SUB-BALLAST REQUIREMENTS:

Sub-ballast shall be crusher-run stone or general aggregate base (dense graded aggregate), granite or limestone material that shall meet the requirements as set out in Chapter 1, Part 2, Article 2.11, "SUB-BALLAST SPECIFICATIONS" of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering and relevant sections of this CSX specification.

(A) Testing: For new materials and new quarries not previously approved by CSX, testing shall be accomplished to meet the requirements as set out in Chapter 1, Part 2, Article 2.11, Paragraph 2.11.3 "Testing" and Table 1-2-4 of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering. Properties testing limits shall be the same as the testing limits for base aggregates as governed by the state or province the project is in. Test results shall be submitted to CSX Director Supplier Quality and Director Engineering Standards.

(9) GRADING REQUIREMENTS:

The grading of prepared track ballast and sub-ballast shall be determined by test with laboratory sieves having square openings and conforming to current ASTM Specifications, Designation E-11.

(10) PREPARED RAILROAD TRACK BALLAST AND SUB-BALLAST FOR CSX SHALL CONFORM TO THE FOLLOWING GRADING REQUIREMENTS:

			SUB BALLAST	
SCREEN SIZE	**MAIN LINE AREMA #4A**	**YARD AREMA #5**	**GA BASE**	**CRUSHER RUN**
2-1/2"	100%			
2"	90 - 100%			
1-1/2"	60 - 90%	100%	100%	100%
1"	10 - 30%	90 - 100%		
3/4"	0 - 10%	40 - 75%	60 - 100%	
1/2"		15 - 35%		
3/8"	0 - 2%	0 - 15%		
NO. 4		0 - 5%		
NO. 8				
NO. 10			30 - 55%	15 - 45%
NO. 60			8 - 35%	
NO. 200			5 - 12%	5 - 12%

(11) METHODS OF TEST:

The supplier shall certify the ballast delivered to the Railroad is typical of that upon which specified tests have been made.

Samples shall be secured in accordance with the current ASTM methods of sampling. Designation D-75.

Sieve analysis shall be made in accordance with current ASTM method of test. Designation C-136.

Material finer than the No. 200 sieve shall be determined in accordance with the current ASTM of test. Designation C-117.

The percentage of clay lumps and soft particles shall be determined in accordance with the current ASTM method of test. Designation C-142.

The resistance to abrasion shall be determined in accordance with the current ASTM method of test. Designation C-131, or C-535, using the standard grading most nearly representative of the size of ballast specified.

Soundness test shall be made in accordance with the current ASTM method of test. Designation C-88.

The weight per cubic foot shall be determined in accordance with the current ASTM method of test. Designation C-29.

MWI 703-07
Rail Anchoring Policy
Issued: 7/28/97 Revised: 8/10/11
Page 1 of 10

PURPOSE:	To provide uniform instructions for anchoring the track structure.
SAFETY:	Observe all applicable Safety, and Operating Rules and Regulations; and Safe Job Procedures
LOCATION:	All CSXT tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State and Local environmental rules and regulations.

I. DISCUSSION

A. Rail anchors are essential in achieving a stable track structure. They are designed to prevent longitudinal movement of the rail and work together with the other components of the track structure to prevent buckling.

B. Rail anchors are required on both jointed and continuously welded rail tracks. They will be applied before the track is returned to service.

C. All tracks, which are not in compliance with this rail anchoring policy, will be brought up to standard during the next System Team Rail Laying, Curve Patch, or Bridge Timbering operation. During System Timbering operations, missing anchors will be replaced to match the pattern currently in track. Tracks, that have a history of buckling or excessive rail movement, will be reviewed by the Division Engineer on a case-by-case basis to establish a date for compliance. If the next System Team cycle is too far away, a schedule for compliance will be prepared by the Division Engineer and approved by the Chief Engineer - Maintenance of Way.

D. New rail anchors will be manufactured from mill certified steel.

E. Relay rail anchors will not be used on main tracks or passing sidings when laying new rail by system rail teams. Rail anchors removed to perform other maintenance activities may be reinstalled if effective.

II. PROCEDURE

A. All Track

1. To avoid tie skewing, anchors should be applied against the same tie on opposite rails. (Opposite rails should be anchored the same)

2. Definition: Box Anchor – Anchors applied against both sides of the tie on opposite rails to restrain longitudinal rail movement in both directions. [Four (4) rail anchors per tie.]

B. Jointed Rail Territory

The track will have 16 rail anchors per 39 ft. rail. Box anchor 8 ties per rail length spaced in accordance with Rail Anchor Pattern Sketch shown on page 5, where practical.

C. Continuous Welded Rail Territory

1. Definition: Continuous Welded Rail (CWR) – A number of rails welded together into lengths exceeding 400 feet.

2. When laying continuous welded rail (CWR), it will be box anchored on every other tie throughout the entire section of CWR. Additional rail anchors are required at the following locations:

   a. Joints installed in CWR will be box anchored on every tie for 130 consecutive ties in each direction within 60 days except ties supporting rail joints.
   b. Curves 3 degrees and greater on main track and sidings – CWR being installed will be anchored on every tie. (Anchors applied against both sides of each tie.)
   c. Turnouts - CWR will be box anchored on every tie for 130 consecutive ties in each direction from the long ties of the turnout.
   d. Railroad Crossings - CWR will be box anchored on every tie for 130 consecutive ties in each direction from the railroad crossing.
   e. Road Crossings - CWR will not be anchored within the road crossing unless required by the design of the road crossing surface material. If the road crossing is 50 ft. wide or greater, CWR will be box anchored on every tie for 130 consecutive ties in each direction from the road crossing.
   f. All Open Deck Bridge Approaches - CWR will be box anchored on every tie for 130 consecutive ties in each direction from the backwall of the bridge.
   g. Epoxy Bonded Insulated Joints - Structurally sound epoxy bonded insulated joints do not require additional anchors.

3. CWR laid across bridges will be anchored as follows:

   a. Ballast Deck Bridges - CWR will use the standard anchor pattern as described in paragraph II.C.2.

b. Open Deck Bridges with total length 100 ft or less - CWR will be box anchored on every tie that is fastened to the bridge span.
c. Open Deck Bridges with total length between 100 ft. and 500 ft. with an alignment of 2 degrees or less:

    1) CWR will be box anchored on every tie that is fastened to the bridge span, throughout all spans less than 100 ft.
    2) CWR will be box anchored on every tie that is fastened to the bridge span, for the first 100 ft. from the fixed end of individual spans with length greater than 100 ft.

d. Rail anchor pattern will be specified by the Asst. Chief Engineer – Structures when any of the following conditions exist:

    1) Open Deck Bridges with a total length greater than 500 feet
    2) Alignment is greater than 2 degrees
    3) Bridges with existing rail expansion joints
    4) Other special situations

4. Turnouts within CWR territory will have every tie box anchored, where anchors can be applied, on both the straight side and diverging side of the turnout. Care must be taken to ensure that anchors do not interfere with the movable portion of the switch. Ensure that the requirements in paragraph II.C.2.d. are met. Ties with positive restraint rail fasteners are considered to be anchored.

5. Ties that have a positive restraint fastener on one end only should be box anchored on the other end. MWI 701, *Use of Premium Rail Fasteners in CWR*, details the use of these fasteners.

6. At some locations, there may be two or more of the above situations present. In that case the requirements will be additive.

    For example: A turnout located 100 ft. from an open deck bridge (75 ft. long). In this example, the CWR will be box anchored on every tie between the backwall at the end of the bridge and the turnout. The turnout will be box anchored on every tie, where anchors can be applied, on both the straight side and diverging side of the turnout. The CWR will be box anchored on every tie for 130 ties beyond long ties of the turnout.

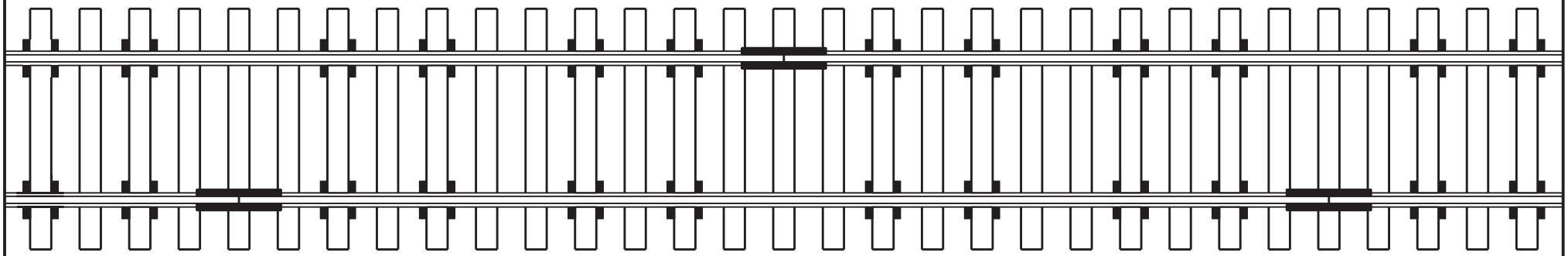
7. Rail Anchor Patterns are illustrated on attached plans.

Prepared by: Mark E. Austin
Engineer Standards II

Reviewed: _____
Director – Engineering Standards

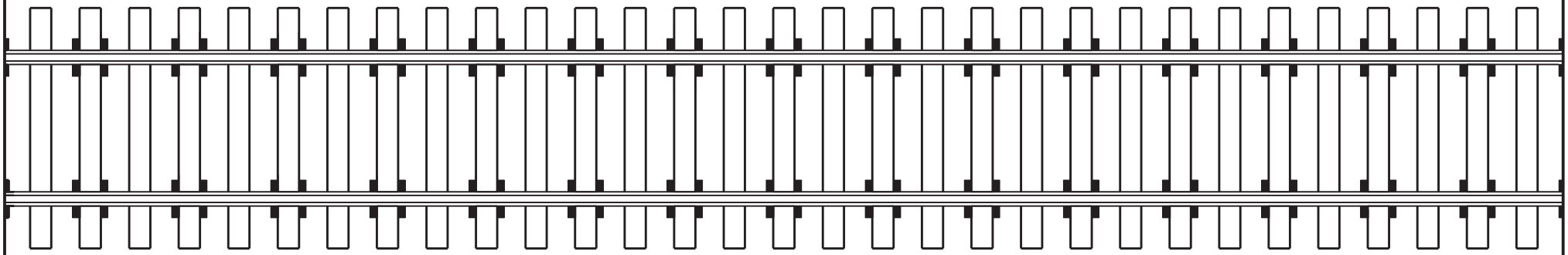
Approved: _____
Assistant Vice President – Engineering

Office of the Vice President, Engineering
Jacksonville, Florida



JOINTED RAIL - 16 ANCHORS PER 39 FOOT RAIL, BOX ANCHOR 8 TIES.

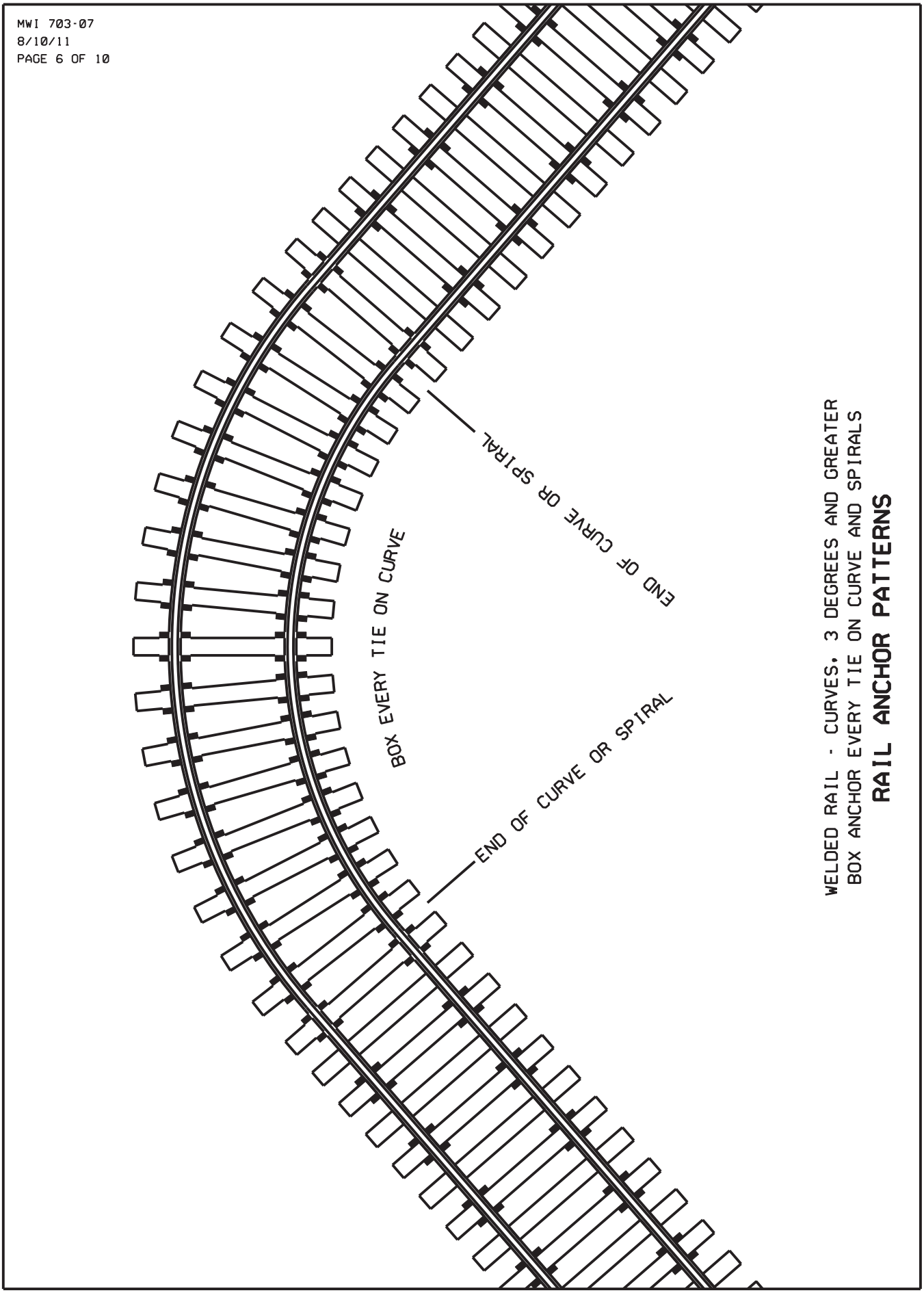
RAIL ANCHOR PATTERNS



WELDED RAIL - TANGENTS AND CURVES LESS THAN 3 DEGREES - BOX ANCHOR EVERY OTHER TIE.
SAME PATTERN FOR BALLAST DECK BRIDGES.

RAIL ANCHOR PATTERNS

MWI 703-07
8/10/11
PAGE 6 OF 10

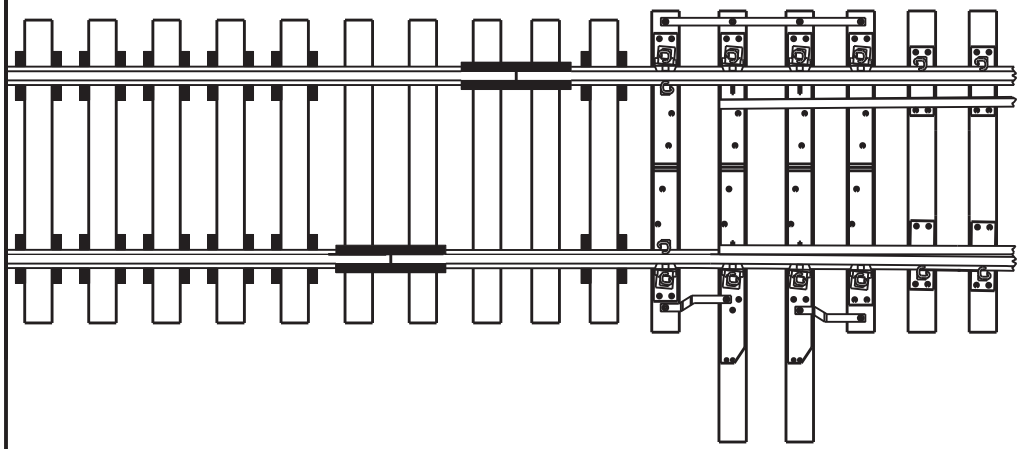


WELDED RAIL - CURVES, 3 DEGREES AND GREATER
BOX ANCHOR EVERY TIE ON CURVE AND SPIRALS

RAIL ANCHOR PATTERNS

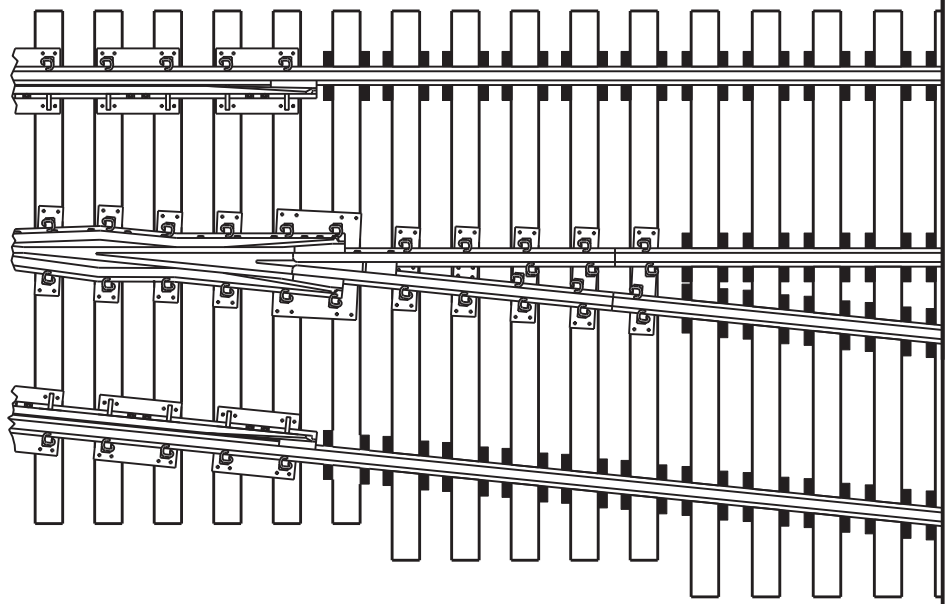
AHEAD OF SWITCH POINT :

- BOX ANCHOR EVERY TIE FOR 130 TIES. COUNT FROM FURTHEST JOINT FROM SWITCH POINT OR FROM TIE AHEAD OF BRACE PLATES IF STOCK RAILS ARE WELDED INTO TRACK.
- IF JOINT BARS ARE PERMANENT, DO NOT APPLY ANCHORS OPPOSITE BARS



BEHIND HEEL OF FROG :

- BOX ANCHOR EVERY TIE FOR 130 TIES ON BOTH THE THROUGH TRACK AND TURNOUT TRACK. COUNT FROM THE LAST LONG TIE.
- BOX ANCHOR EVERY TIE TO END OF GUARD RAIL.



- BETWEEN SWITCH HEEL AND TOE OF FROG, BOX ANCHOR EVERY TIE THAT CAN BE ANCHORED ON AS MANY RAILS AS POSSIBLE. (REFER TO APPLICABLE STANDARD DRAWINGS)

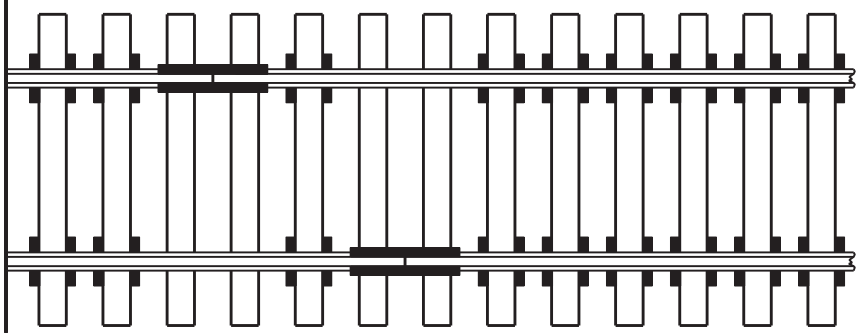
WELDED RAIL ANCHOR PATTERN ADDITIONS

BOTH SIDES OF RAIL JOINTS :

- BOX ANCHOR EVERY TIE FOR 130 TIES.

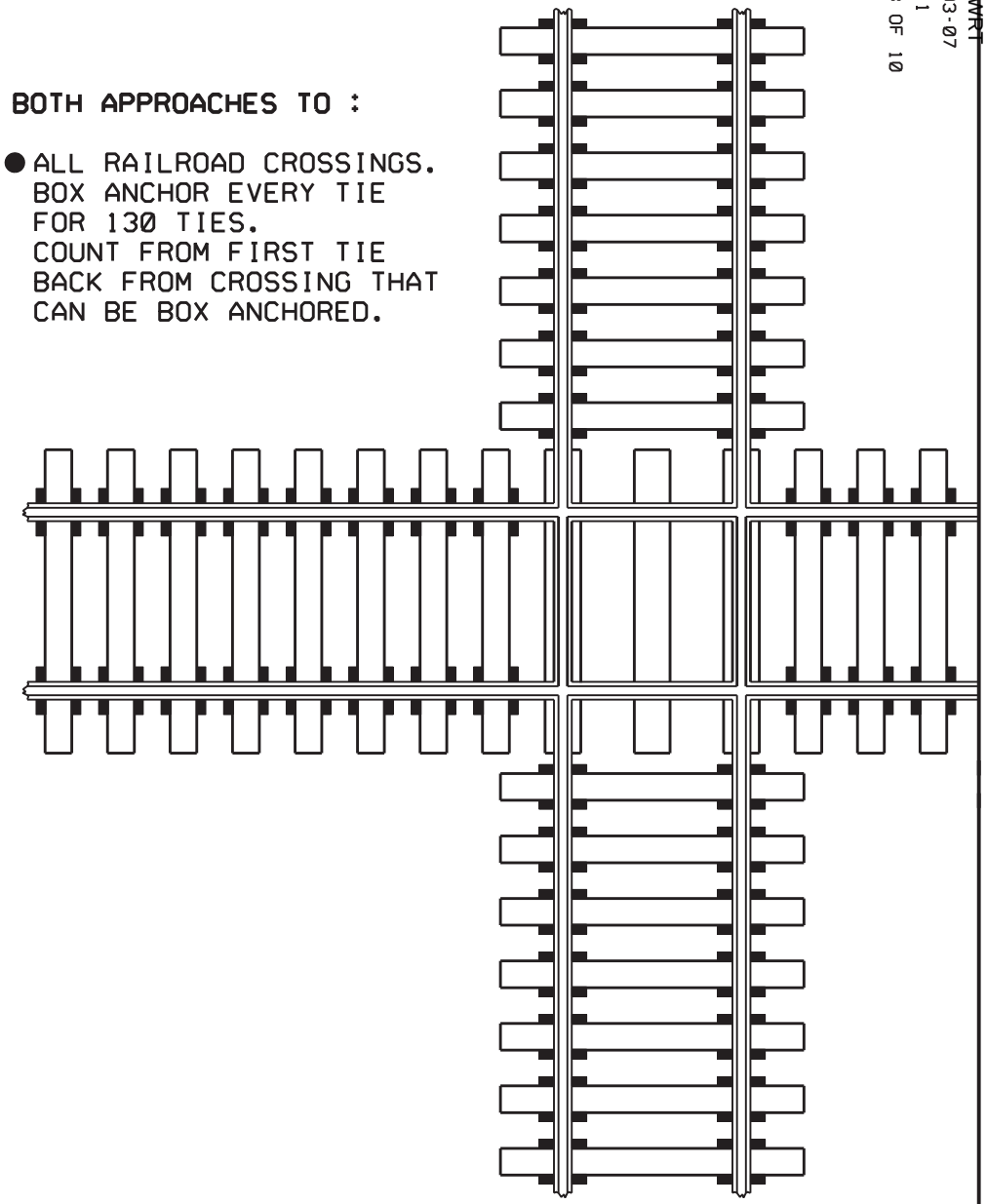
USE NORMAL ANCHOR PATTERN FOR :

- EPOXY GLUED INSULATED JOINTS.
- JOINTS WHICH ARE TO BE WELDED AS THE RAIL IS BEING LAID OR IMMEDIATELY AFTER IT IS LAID.



BOTH APPROACHES TO :

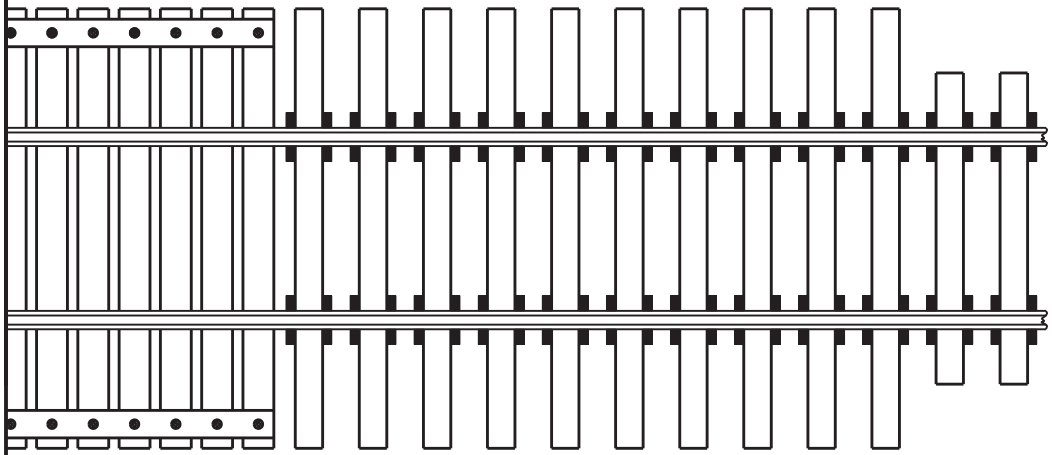
- ALL RAILROAD CROSSINGS. BOX ANCHOR EVERY TIE FOR 130 TIES. COUNT FROM FIRST TIE BACK FROM CROSSING THAT CAN BE BOX ANCHORED.



WELDED RAIL ANCHOR PATTERN ADDITIONS

BOTH APPROACHES TO :

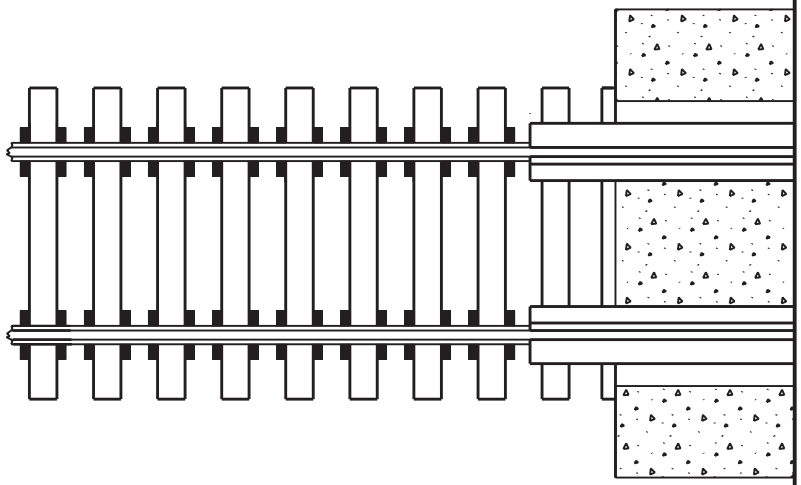
- ALL OPEN DECK BRIDGES.
  BOX ANCHOR EVERY TIE FOR 130 TIES.



COUNT FROM BACKWALL OF BRIDGE.

BOTH APPROACHES TO :

- ROAD CROSSINGS 50 FOOT OR GREATER.
  BOX ANCHOR EVERY TIE FOR 130 TIES.
- ROAD CROSSINGS UNDER 50 FOOT.
  USE NORMAL ANCHOR PATTERN.

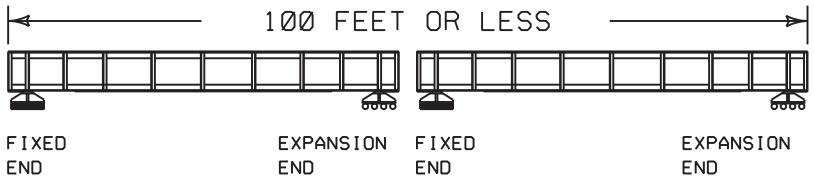


COUNT FROM FIRST TIE BACK
FROM END OF CROSSING OR FROM
JOINTS FOR CROSSING WARNING
IF NOT EPOXY GLUED JOINTS.

WELDED RAIL ANCHOR PATTERN ADDITIONS

OPEN DECK BRIDGES WITH A TOTAL LENGTH OF 100 FEET OR LESS :

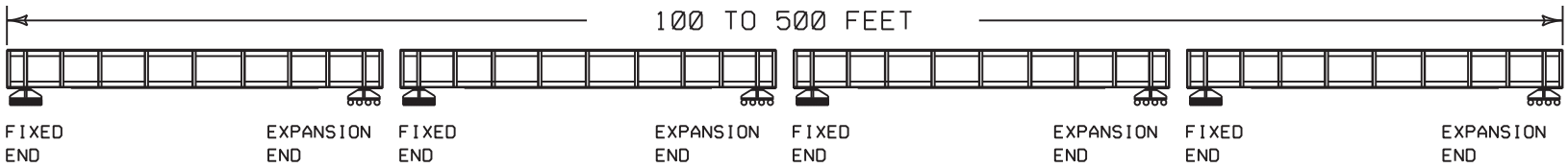
- RAIL ANCHORS WILL BE APPLIED ON ALL TIES FASTENED TO THE BRIDGE SPAN.



OPEN DECK BRIDGES WITH TOTAL LENGTH BETWEEN 100 FEET AND 500 FEET :

RAIL ANCHORS WILL BE APPLIED WITHIN THE LENGTH DESIGNATED ON ALL TIES FASTENED TO THE BRIDGE SPAN.

- RAIL ANCHORS WILL BE APPLIED THROUGHTOUT ALL SPANS LESS THAN 100 FEET.
- RAIL ANCHORS WILL BE APPLIED FOR THE FIRST 100 FEET MEASURED FROM THE FIXED END FOR INDIVIDUAL SPANS WITH LENGTH GREATER THAN 100 FEET.



WELDED RAIL ANCHORING ON OPEN DECK BRIDGES

MWI 801-10
CSX Welding Manual
Issued: 1/27/97 Revised: 7/1/20
Page 1 of 2

PURPOSE: To establish uniform procedures for all welders performing work for the Engineering Department on track appliances, buildings, bridges or other structures using the thermite, oxy-propane, or electric-arc methods of welding.

SAFETY: Observe all applicable Safety, Operating Rules and Regulations; and Safe Job Procedures.

LOCATION: All CSXT tracks and property.

ENVIRONMENTAL: Observe all applicable Federal, State and Local environmental rules and regulations.

I. DISCUSSION

A. The *Welding Manual* is prepared and issued to you for your benefit. It is your duty to study and understand it and perform your work in accordance with these instructions.

B. This manual should always be considered jointly with the other Rules, Regulations, and Instructions affecting the employees of the Engineering Department.

II. PROCEDURE

The *Welding Manual* follows:

Prepared by: Chris S. Moale
Engineer Standards II

Reviewed: _____
Director Engineering Standards

Approved: _____
AVP Engineering

Office of the Vice President - Engineering
Jacksonville, Florida



Maintenance of Way

Welding Manual

ISSUED: March 21, 2007
Revised: July 1, 2020

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A. SAFETY

GENERAL

1. Safety is of the first importance in the discharge of duty. This section is intended to supplement the *CSX Safe Way*, not replace it.

2. The title Welder, as used in this Manual, is intended to include Welding Forman, Welder, Welder Helper, and those individuals specifically qualified by the Welding Manager to operate a burning torch.

3. A minimum of two (2) employees must be present in order to perform any kind of welding work with at least one of the employees being qualified.

4. The Welder is responsible for compliance with the *CSX Safe Way*, this *Welding Manual*, and all other CSX policies. If the meaning of a rule or policy is uncertain or any conflicts between rules or policies exist, it must be brought to the attention of the Welding Manager for explanation and resolution.

5. Job Briefings that cover welding, cutting, and grinding activities must include a fire prevention and response plan. Before stepping off the ballast line, check area for plants that may cause an allergic reaction and have insect spray applied.

6. Welding, cutting, and grinding will be done only by or under the direct supervision of a qualified employee. There are several categories of welding used by the Engineering Department. Employees must not do or supervise work in any category that the Welding Manager has not qualified them for.

7. Protective clothing, shoes, and gloves, which will give the **full body protection**, must be worn during all welding, cutting, and grinding operations.

    a. Approved welding leggings **that fully wrap around and cover the entire pant leg** must be worn for surface grinding with plate mounted or cup wheels. When combination leggings (welding leggings) are available, they may be used for all grinding, sawing, and torch cutting procedures. (360.8312222.1). Leather leggings need to be used with protective inserts (360.0328172.1). Leggings must be used for other grinding work.
    b. Clothing must be kept free of grease, oil, and other flammable materials. When performing these operations, employees must keep shirt sleeves rolled down and collar fastened. Caution must be exercised at all times to keep sparks or slag from being caught in cuffs, pockets, sleeves, under gloves, and out of shoes, eyes, and ears. Frayed clothing must never be worn. **Synthetic fabrics that are readily combustible must never be worn.**
    c. While performing hot work welding gloves must be worn during any welding or grinding procedure.

8. Safety glasses must be worn at all times. Employees engaged in performing any grinding, welding, or cutting operations must wear necessary approved face shields, helmets, goggles with approved lenses, and cover glasses. (See *Safe Way* eyewear chart)

9. All welding PPE and materials will be purchased through Oracle to ensure only CSX APPROVED PPE and materials are used.

10. When possible, welding and/or cutting should not be done near combustible material. Either the work or the combustible material should be moved to a safe place.

11. The use of cutting or welding equipment to perform maintenance work on or in a structure without authorization by or without the knowledge of the person in charge of the structure is prohibited.

12. When welding or cutting close to hazmat cars, wooden beams, partitions, flooring, or scaffolding, a guard of sheet metal or other non-combustible material must be used. Fire resistant guard curtains (not tarpaulins) should be large enough, tight, and weighted down to prevent sparks rolling underneath or through openings. Every precaution must be taken to provide suitable protection against flying sparks. Before work is started, all surfaces in the area should be carefully cleaned of any readily ignitable material, and combustible surfaces, such as floors, partitions, etc., should be wetted down before the operation is started, and constantly wetted while the work is going on.

13. An employee should be assigned as a "fire watch" to extinguish fires started by sparks, molten metal, or hot slag. A careful inspection of the area, where hot work has been performed, must be made before leaving the work area to detect and extinguish any live sparks or smoldering fires.

14. Suitable fire extinguishers, readily accessible, in ample numbers in close proximity of where the equipment is being used, to provide a quick response. Before beginning grinding, if a water hose is provided, off track area must be dampened with plain water and have hose at the ready for possible pop up fires. Beware of smoke and avoid being in line of smoke so as not to breathe it in. If available on the welding truck in use, the 12 volt pump sprayer must be kept in good working order. If the 12 volt pump sprayer is not available, the 5 gallon Indian pump water sprayer (015.3104271.1) is the best substitute. Always spray from the ballast line when possible.

15. The use of cutting and/or welding equipment, in the performance of maintenance work in structures containing combustible materials, should be avoided. Where the use of welding or cutting equipment is permitted in these facilities, every precaution must be taken to minimize the risk of fire. The CSX supervisor or manager will be contacted to assign someone to patrol the area for several hours after the hot work ceases as a "fire watch."

16. Welding equipment must be positioned so that flames and sparks do not fall on cylinders, hoses, electric welding cables, hydraulic hoses, and other equipment.

17. Welders working on bridges, scaffolds, platforms, and other such work areas higher than the surrounding ground will comply with FRA and other governmental regulations in the use of lifelines, safety belts, or other safeguards as protection against falling.

18. Welding or cutting must not be done from any platform suspended by rope subject to burning or damage by fire.

19. Welding or cutting in "confined spaces" as described in the CSX Restricted Access and Confined Space Program may only be performed by employees qualified to enter confined spaces.

    a. Welding or cutting in a closed or confined space rapidly burns up breathable oxygen. Adequate ventilation must be provided when working in closed or confined spaces. Equipment must be tested for leaks prior to entering confined area. A person must be in position to see the Welder and near welding equipment to turn it off in case of emergency. Oxygen, propane, or other fuel tanks must not be taken into a confined space.
    b. When the welder must enter a confined space through a small opening such as a manhole, a lifeline and safety belt are required. The welder is to adjust the lifeline and safety belt in such a manner that will allow the welder to be pulled from the confined area without having the welder's body jam in the opening.
    c. One cannot enter a confined space without a trained rescue team. A life line and safety belt alone is not a suitable extraction plan.

20. Adequate ventilation must be provided when welding or cutting certain metals or using certain welding rods or fluxes as toxic fumes may be produced. Among the metals or items that may produce toxic fumes are beryllium, brass, bronze, cadmium, chromium, fluxes containing fluorides, galvanized iron, lead, lead based paint, manganese, mercury, and zinc. It is mandatory when welding or grinding on manganese to use a power blower, (360.8851055.1.) If electricity is available, a power blower is **mandatory** for any welding or grinding operation. If adequate ventilation cannot be provided, a suitable metal fume or HEPA filter respirator must be used.

21. When necessary to obstruct the track(s), the welder must first **know** that full protection is provided in accordance with Operating Rules.

22. The Welder is to report equipment defects or safety hazards to their Roadmaster and Welding Manager. The equipment should not be used until it has been checked for safety. Only qualified personnel will make repairs to welding equipment.

23. Hands, whether gloved or otherwise, must not be used to brush slag or metal from material being welded or cut.

OXY-PROPANE WELDING AND CUTTING

1. Refer to propane as “propane” not “gas”. The word “gas” is a general term and confusion is dangerous.

2. Neither Acetylene nor Propylene are approved for use by engineering department employees.

3. Welding and cutting equipment must be kept clean, free of oil and grease, and in good condition. This equipment will be equipped with flash back arrestors and reverse flow check valves to ensure that the gasses mix at the torch. Exception: If using a Victor HD310C torch handle, add on reverse flow check valves must **not** be used, as they are built in this torch handle.

4. Daily inspection must be made on all equipment. Leaky cylinders, hoses, or connections must not be used. Any odor must be traced and all precautions taken against sparks.

5. For optimum performance of grinding cups/stones and saw blades, ensure they are rotating per the manufacturer’s rating. Use the Daily RPM Check Log located on the Engineering Standards website under the 800 series of documents. Hydraulic tool RPM’s must be checked monthly. Gas and electric powered RPM’s must be checked prior to usage.

6. The use of SNOOP (470.1663000.1) is the preferred method and the only approved liquid for locating leaks. Where SNOOP is not available the following pressure loss method may be used to detect leaks:

    a. Connect equipment.
    b. Open cylinder valves, set pressures, and purge hoses.
    c. Close torch and cylinder valves.
    d. Watch gauges for approximately one minute.
    e. If the pressure indicated by the gauges remains the same, there are no leaks.
    f. If the gauge indicating tank pressure shows a drop, there is a leak between the cylinder and the regulator.
    g. If the gauge indicating hose pressure shows a drop, there is a leak between the torch and the regulator.
    h. If a leak is indicated, check the fittings and hose in the appropriate area.

7. Keep oil and grease away from cylinders, cylinder valves, and hoses. Grease and oxygen is a highly explosive mixture.

8. Open cylinder valves slowly.

9. Purge oxygen and propane lines and hoses before lighting the torch.

10. Cylinders must not be roughly handled and must never be handled with a magnet. Cylinders

must be transported, stored, and used in a vertical position. A special cradle can be used to ensure proper cylinder positioning.

11. Never use a cylinder or its contents for other than their intended purpose.

12. Protect cylinder valves from bumps, falls, falling objects, heat, and the weather. Use cylinder safety caps when moving any cylinder.
13. It is a CSX, OSHA, and DOT requirement that all compressed gas cylinders **MUST** have safety caps protecting the valves when they are transported over public roadways. The APPROVED protector cylinder valve caps will fulfill this requirement and the regulators may be left on the cylinders. Some state and local laws may vary so always follow the most restrictive laws. If the protective valve caps are not available, the solid safety cap must to be used. Propane cylinders must have a screw-in safety plug in the valve outlet when being transported unless the solid safety cap design does not provide adequate room to accommodate the safety plug.

Description	Item Number
Protector Cylinder Valve Cap – Oxygen	280.5201951.1
Protector Cylinder Valve Cap – Propane	280.5201955.1
Safety Plug – Propane	280.0000005.1

14. Before moving the cylinders, purge the hoses by closing the cylinder valves, opening the torch valves to release pressure on the gauges, and release the regulator valve screw.

15. **Gauges or hoses must be removed from the cylinder at the end of <u>every</u> work day.**

16. Mark empty cylinders ‘empty’ or ‘M.T.’ with a removable material, such as chalk or crayon. Do not place marking on top of numbers stamped into or stenciled onto cylinders.

17. Send empty cylinders back to supplier promptly. Never attempt to refill any cylinders.

18. Storage of cylinders.

    a. Cylinders shall be kept away from radiators and other sources of heat.
    b. Inside of buildings, cylinders shall be stored in a well protected, well ventilated, dry location, at least 20 feet from highly combustible materials. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage places shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons. Cylinders shall not be kept in unventilated enclosures such as lockers and cupboards.
    c. Inside a building, cylinders except those in actual use or attached ready for use shall be limited to a total gas capacity of 2,000 cubic feet or 300 pounds of liquefied petroleum gas.

    d. Oxygen cylinders in **storage** shall be separated from propane cylinders or

combustible materials (especially oil or grease), a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire resistance rating of at least one-half hour.

e. In vehicles, if the cylinders are kept in a locker or cabinet, the locker or cabinet must be ventilated. Openings both top and bottom must be provided or the locker or cabinet fitted with a louvered door that will permit any oxygen or propane leaking from a cylinder to disperse freely.

19. Keep valves closed on empty cylinders.

20. Use only approved wrenches for opening cylinder valves not equipped with handles.

21. Never use oxygen for any purpose other than welding. Oxygen is not a substitute for compressed air and should never be used to blow off clothing.

22. Cylinders must be fitted with twin Grade "T" hoses for propane and oxygen with an inside diameter of ¼" (280.0864145.1) or 3/8" (280.0864164.1). Hoses with an inside diameter of 3/8" must be used to preheat the rail ends when making field welds with a length not to exceed 100'.

23. Flashback arrestors must be used between the tank gauges and the hose (Propane 280.0000015.1, Oxygen 280.0000017.1) and reverse flow check valves must be used between the torch gauges and the torch handle except the Victor HD310C (Propane 280.0000010.1, Oxygen 280.0000011.1). Arrestors and check valves must be replaced annually.

    a. Gauges for Propane and Oxygen must have a Flashback Arrestor installed between the Gauge and the T Grade hose.

    b. Hoses for propane and oxygen will be fitted with reverse flow check valves at the torch end, unless using a Victor HD310C torch handle. Note that the placement of additional external reverse flow check valves on the Victor HD310C torch handle can cause fuel starvation and a possible blowout of the mixer assembly.

    c. Flashback arrestors and reverse flow check valves must be inspected in accordance with manufacturer's instructions at least every six months unless required more often by the manufacturer.
        i. In the absence of manufacturer's instructions for testing flashback arrestors and reverse flow check vales, the following procedure must be followed.
        ii. Turn off both regulator adjusting valves. Remove the reverse flow valves from the torch and the flashback arrestors from the regulators.
        iii. Attach the reverse flow valves onto the regulators. Pay particular attention to attach the oxygen valve to the oxygen regulator and the propane valve to the propane regulator.
        iv. Turn on each cylinder with the "T" handle until the pressure reaches 65

psi for oxygen and 15 psi for propane. If either valve allows their respective gases to flow, the valves are defective and must be immediately replaced before proceeding.

v. Remove the reverse flow valves from the regulators and attach only the hoses to the regulators.
vi. Attach the flashback arrestor to the torch end of the hose (with the torch not attached). Pay particular attention to attach the oxygen flashback arrestor to the oxygen hose and the fuel gas flashback arrestor to the fuel gas hose.
vii. Turn on each cylinder with the "T" handle until the pressure reaches 65 psi for oxygen and 15 psi for propane. If either flashback arrestor allows their respective gases to flow the flashback arrestor is defective and must be immediately replaced before proceeding.

d. Victor HD310C torch handles will be checked for reverse flow using the following procedure.

i. Turn off both regulator adjusting valves.
ii. Disconnect one hose from one of the regulators.
iii. Open all torch control valves.
iv. Plug the tip end.
v. Turn on the regulator that is NOT DISCONNECTED until a 2 to 5 psi reading appears.
vi. Put the end of the hose that is DISCONNECTED from the regulator under water or cover the end of the hose with an approved leak detector solution such as SNOOP.
vii. Bubbles will appear if the check valve is leaking. There should be no more than two bubbles in 10 seconds.
viii. If the check valve leaks, reconnect the hose to the regulator and unplug the cutting tip. Flush for 3 to 5 seconds with 10 psi of propane or 30 psi of oxygen (depending on the valve being tested).
ix. Retest the check valve using steps i. thru vii. above. If there is still a leak, replace or repair the torch before proceeding.
x. Reconnect the hose that was disconnected for the first test. Repeat steps i. through ix. with the other hose.
xi. After both check valves test good, purge both the oxygen and propane lines before lighting the torch. Test all hose connections for leaks.

24. Quick disconnect hose couplings are **not** to be used.

25. Repair hoses and connections **only** with crimp style welding hose repair kit (280.0010000.1) and perform Snoop test prior to use. **This is a temporary repair until hose is replaced.**

a. Never attempt to repair hoses with friction tape, hose clamps or other types of tape or with wire.
b. Do not use Teflon tape or pipe dope on any of the system's compression fittings. (eg.

Regulator to cylinder valve, flashback arrestors, reverse flow check valves, test gauges, hose connections, etc.)

26. Before cutting through sheet metal, plate, or other material, employees must be certain that no persons are in a position to be burned or injured from falling material.

27. Do not use wooden or flammable material to support work for welding and cutting.

28. Only approved vendors will perform other than routine adjustments and maintenance to regulators.

Welders Torch set up & Procedures in order





Two Stage Regulators
(Welding Mandatory)



Arrestors **(Mandatory)**



3/8 T Grade Oxy-propane hose **(Welding Mandatory)**
¼ T Grade Oxy-propane hose. (Section, Track Insp, Bridge dept, Signals)



Check Valves conect to hose **(Mandatory)**



In line Gauges **(Mandatory)** **Welders only**



Torch Handle



Pre Heater for the heating of Thermite Welds



Cutting Attachment



One piece cutting torch
(Section, Track Insp, Bridge dept, Signals).

Safety & Lighting of Torch using Propane & Oxygen

1. Torch Pressures for CSX Welding teams – Propane – 15psi
   Oxy – 65psi
   Other employees not on welding truck Propane pressures should be 2 to 4psi more than their cutting tip – Example #5 tip, Propane pressure will only be 7 to 9psi. Oxygen will be 50 to 55psi.
2. All torch equipment must be clean, free of oils or grease, and checked for leaks by using only two approved methods – (approved snoop liquid or the pressure lost method procedure that is found in the Welding Manual MWI 801-09 page A4 line 5). **All torch equipment on CSX is Parts Manufacturer specific – Harris to Harris, Victor to Victor, Concoa to Concoa or Smith to Smith. Parts are NOT Interchangeable.** If for any reason a new tank or any part of the torch equipment is changed, checking for leaks must be done again. All Regulators or lines to the Oxy – Propane tanks must be released of pressure and all gauges read **ZERO** and removed at the end of every work day. When re-attaching Regulators or lines you must check for leaks.
3. Before lighting any torch, PPE must be worn (Hardhat – Clear Face shield W/ Shade 5 glasses or Shade 5 face shield and clear glasses, ear protection, welding sleeves – welding jacket or long cotton sleeve shirt, welding gloves and leggings). All clothing and PPE must be free of any oil or grease, **no tears, holes or frays are allowed**. Equipment must fit tight and not cross threaded.
4. Steady the torch equipment being able to direct the direction of flame safely.
5. **Purging lines** – Before Lighting Open propane and purge line for 5 to 10 sec. 50ft hose. Open Oxygen and do the same then close.
6. **Lighting** – open propane 1/2 to3/4 turn on the oxygen 1/8 to ¼ turn to stabilize flame in the windy conditions.

7. Torch can only be lit with a CSX approved striker. No butane lighters are allowed.
8. When torch is lit adjust of flame when using the Thermite pre-heat attachment by turning each knob (propane – oxygen) a little at a time until edge of tip with the white flame reaches 7/8th in length and the oxygen knob can be open fully.
9. When using a cutting attachment or cutting torch the white part of the flame, at the tip, must be well defined (sharp not feathered) for the torch to cut properly.
10. Never hit flame or tip on what you are cutting.
11. Verifying that the pressure on the Inline gauges at the torch handle read 15 – propane and 65 oxygen for making a Thermite weld. Fine adjustments might be needed after torch is placed in molds. **Now follow the Thermite Welding procedures in section I of the manual**

Procedures & Safety for shutting off Flame on Torch

When **cutting or heating** with Propane. Propane is to be shut off first then the Oxygen to keep from having a floating flame which is hard to control in windy conditions.
Flashback Arresters (Regulator) and Check Valves (torch handle) are to be inspected six months after install. Both, Flashback Arresters and Check Valves are to be replaced annually.

Definitions & understanding when to remove a torch from service

There are now through AWS three definitions we should be concerned about with our torch equipment.

1. **Backfire** – A momentary absence of the flame at the torch tip followed by immediate reappearance of a flame or the extinguishment of the flame and then a loud report (pop). Adjustment at torch handle might be needed and then relight.
2. **Flashback –** An absence of the flame into or back of the mixing chamber of the torch, into the hoses burning to the Regulators then the cylinders. Can cause an explosion. **(Thus Flashback Arresters at Regulators) (Mandatory)**
3. **Sustained Backfire –** An absence of the flame at the tip but recesses back into the torch body with continuing burning characterized by an initial report (popping) sound followed by a squealing or hissing sound, potentially burning through the torch body or attachment.
4. **Reverse Flow Check Valve –** Does not allow fuel gases (Oxy-Pro) to flow backwards into the hoses. **(Mandatory)**
5. **Flashback Arresters –** To prevent a Flashback to move back and reach the tanks through the Regulator. **(Mandatory)**

- **It is very important to understand these definitions to keep all torch operators safe. You can have a Backfire and per the definition the torch equipment is still safe to use. Remembering an operator of any torch must be aware of this tool like any other at CSX. If for some reason this torch consistently has a backfire issue. A Welding MGR**

must be called to trouble shoot the torch, retrain operator or replace the equipment.

- **If a Backfire happens per definition builds to a Sustained Backfire. An absence of the flame at the tip but recesses back into the torch body with continuing burning characterized by an initial popping sound followed by a squealing or hissing sound, potentially burning through the torch body or attachment. <u>OXYGEN MUST BE TURNED OFF FIRST</u> then PROPANE must be shut off. Valves on Oxygen and Propane Cylinders must be closed in the same order and the Roadmaster & Welding MGR must be called <u>IMMEDIATELY.</u>**
- **At this moment this Torch Equipment is out of service.**

ELECTRIC ARC WELDING

Mandatory use of wire feeder.
Any welding repair to frogs, switch points, engine burns, rail ends, etc. that require more than a 30 minute repair (minor repair) will be done with a wire feeder,
All welding teams, other than a dedicated thermite Welding Team, that have a wire feeder are required to use it. If a team does not have a wire feeder, or it is broke down, the Welding Manager for that area is to be contacted and he will handle accordingly. The wire and gun must be removed at the end of each day's use.

This instruction applies to sections:

C. Repair of Engine Burns
D. Repair of Rail Ends
E. Repair of Rail Ends for Glued Bonded Insulated Joints
F. Repair of Switch Points
G. Repair of Frogs and Railroad Crossings

1. Avoidance of electric shock is largely within the control of the Welder. Most welding voltages are not high enough to cause severe injury by electric shock; however, a mild shock from normal working voltages may cause involuntary muscular action that might cause a person to lose balance. Wet clothing reduces the resistance of cloth and increases the effect of a normally small shock. Notwithstanding, under certain conditions, the voltages produced by an electric welder can be dangerous to one's life.

2. Live metal parts of an electrode holder must not be allowed to touch bare skin or wet clothing.

3. An electrode holder must not be permitted to touch any metal that contacts the welding ground. This will cause a dead short circuit on the welding generator resulting in damage to the equipment.

4. The jaws of the electrode holder must be kept clean and protected.

5. Welding Cables:

    a. Cable capacity must be matched to the welding machine.
    b. The standard length of cables connected to the welding machine is 50 feet. Shorter or longer lengths may be used with permission of the Welding Manager.
    c. On territories where track access is limited by terrain, an additional 50 feet of cable may be added using insulated cable connectors (280.5101425.1).

6. Always be sure that the cables are in good condition and all cable connections are tight.

7. Cable splices must be 10 feet or greater from the electrode holder.

8. Cable is to be uncoiled before welding. It should be strung out on the ground without crossing itself. Do not leave cable coiled up and hanging from a hook or coiled up one layer upon another while welding.

9. Do not coil or loop electrode cable around the body while welding.

10. All ground connections must be mechanically strong, close to the work, and of adequate size electrically. Never attach ground clamp to the rail base. Use of a magnetic ground clamp that attaches to the ball of the rail is recommended. (280.0859924.1)

11. Never operate a gasoline or diesel powered welder in a confined space or without adequate ventilation.

12. Never strike an arc on, or touch an electrode against oxygen, propane, or other cylinders used for the storage of compressed gas.

13. Electrodes must be removed from holders when not in use. Electrode stubs should be disposed of into a metal container.

14. Other than routine maintenance, only qualified individuals or vendors will make repairs to welding machines.

15. Where practical, the work should be enclosed with a fire proof screen to protect the eyes of others from the glare of welding rays. Welders working along the line of road must take precautions to protect the public and others employees not involved in the welding process from glare.

16. When the use of a wire feeder is complete, both the 15 feet welding gun and the roll of wire must be removed from the feeder.

17. Remove the wire and gun from the mig box at the end of each day’s use to allow for proper storage of the mig gun and to lighten the weight of the mig itself for proper storage.

18. Ensure when inserting the mig gun into the mig box, the gun is pushed all the way into the brass bushing and secured with the thumb screw. (**at this time inspect the brass bushing for tightness and for any loose bolts).**

ELECTRIC ARC WELDING IN TRACK CIRCUIT TERRITORY

1. High amperage current (100 to 300 amperes) used for welder operation, which flows through a section of rail during the arc welding process, has a tendency to leak to earth and unbalance the track circuit.

2. Stray electrical current could damage sensitive signal equipment that is used for train operation and active grade crossing warning devices.

3. Unbalancing of the track circuit may affect the operation of track relays resulting in signal interruptions.

4. Sufficient stray current could flow through the track relay to hold it energized with the track circuit occupied if the return current of the welding outfit is allowed to flow through only a short section of rail.

5. Operation of the electric arc welder on bridge guard rails, or on non-bonded tracks, such as sidings or non-signaled running tracks, running parallel to or in close proximity to main tracks equipped with track circuits, will also affect the proper operation of the track circuit. The following instructions must be followed when using electric arc welding equipment on any track or guard rail in track circuited territory.

6. Before proceeding with the use of an electric welder on tracks in track circuited territory, the Signal Maintainer must be notified a sufficient time in advance to install circuit fuses to protect signal equipment.

7. The location of insulated joints must be ascertained before any work is undertaken. If there is a question as to the limits of any track circuit, a signal employee must identify the limits prior to the start of work.

8. Electric arc welders (generators) must be properly insulated, and insulation kept in good condition.

    a. All electrical equipment must be grounded at the source, and all connections must be clean and tight.
    b. The ground clamp must be clean, fit well, and make full contact without any current resistance. Use of a magnetic ground clamp is recommended.

9. Do not disturb the ground clamp while welding. Welders equipped with mechanical ground bars must not be moved during welding, nor stopped with the ground spanning an insulated joint.

10. Care must be exercised to see that the ground plates are never allowed to touch the opposite rail of the track on which welding is performed as this will cause serious damage to signal apparatus.

11. The welding electrode and ground plates must never be dropped in the ballast or be permitted to come in contact with the ground while the generator is running. When the welder is not in operation, they should be carefully laid on the end of a tie.

12. At points where the wires are run under or over the rails of any track, additional protection of the insulation must be provided by sliding a short section of rubber hose or placing an insulating mat between the wire and rail.

13. When performing electric arc welding operations on or about bridge structures, the use of guard rails or bridge members for completing the "Hot" side of the circuit between generator and welding electrode must be avoided. An insulated cable conductor must be used for this purpose. When welding guard rails or bridge members, extreme care must be taken to prevent tools, tie plates, or other metallic objects from making contact between main track rails and the member on which welding is performed.

14. Equipment such as grinders, slotters, push cars, and hi-rail vehicles must be properly insulated to prevent shorting the track circuit.

15. In track circuit territory, multiple operator welding systems where two or more welding circuits are connected electrically to the same source must not be operated.

16. No more than two single arc-welding machines may be operated within the limits of any track circuit. This applies to territory having one or multiple tracks.

17. Automatic and semi-automatic wire feed systems must be fully insulated from the unit frame.

18. For the welding of conventional insulated joints, standard joint bars shall be applied on only one joint at a time. (When the insulated joint is on the closure rail, the installation of standard joint bars may short the track circuit.)

19. Protect bond wires during preheating, post heating, welding heat, surface grinding, and cross slotting.

20. The polarity switch must be in the “OFF” position while traveling or when removing the welding machine from the track. Some welding machines do not have a polarity switch with an “OFF” position. These welding units must be turned off while traveling or when removing the machine from the track.

THERMITE WELDING

1. Daily inspection must be made of all equipment to ensure that the equipment is kept clean and in good condition.

2. All equipment and personnel, not directly involved in making the weld, will be moved to a safe distance of 20 feet (30 feet if snow on the track) during the weld reaction and pour, as well as during the grinding operations. In particular, equipment will be far enough from the work to ensure that it is not showered with sparks from these operations.

3. The slag basin shall have 3/4" of dry sand placed in the bottom of the basin during the preheat process.

4. For the best quality product, no batter on either rail end is preferred. However, if batter is present, only one rail end may contain batter not to exceed 1/8" (approximately 0.125") and grinding must be complete per CSX standards on rail run off. *See Section I Finish Grinding of Thermite Welds, Part 2 Section E.

5. At any time the ballast or surface under a field weld is wet, a safety pan will be placed directly under the weld. The safety pan is a metal container approximately 8" x 18" x 6" with 3" of dry sand in the bottom (280.8033120.1) as illustrated in Sketch A-1.

6. When a weld must be made on an open deck bridge: A safety pan will be placed directly under the weld. The safety pan is a metal container approximately 10" x 26" x 6" with 3" of dry sand in the bottom (280.8033140.1) as illustrated in Sketch A-2.

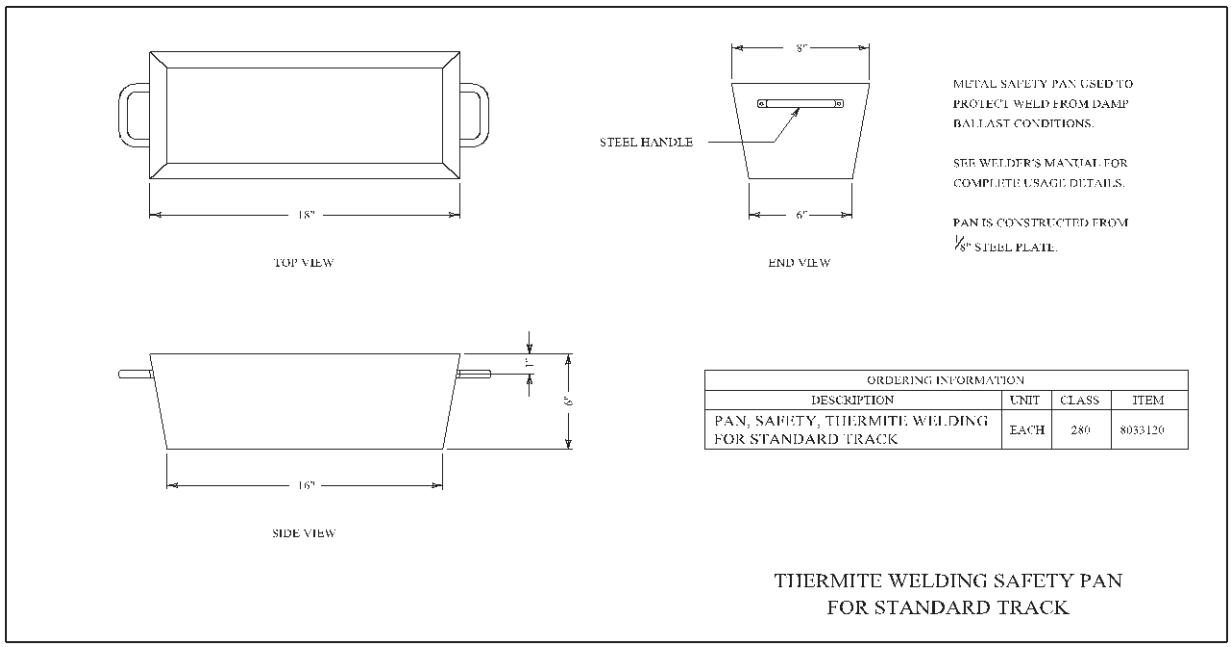
7. A full face shield, welding gloves and long sleeves are required when handling hot slag basins and during the tear down process of a poured weld. This face shield and welding gloves are required during the shearing process.

8. **Do not remove the slag basins until five minutes (six minutes for wide gap welds)** have passed since the pour. After five minutes, move the slag basin at least fifteen feet (eight to ten ties) and place on level ballast. **After twenty minutes have passed, empty slag basin in designated location.**

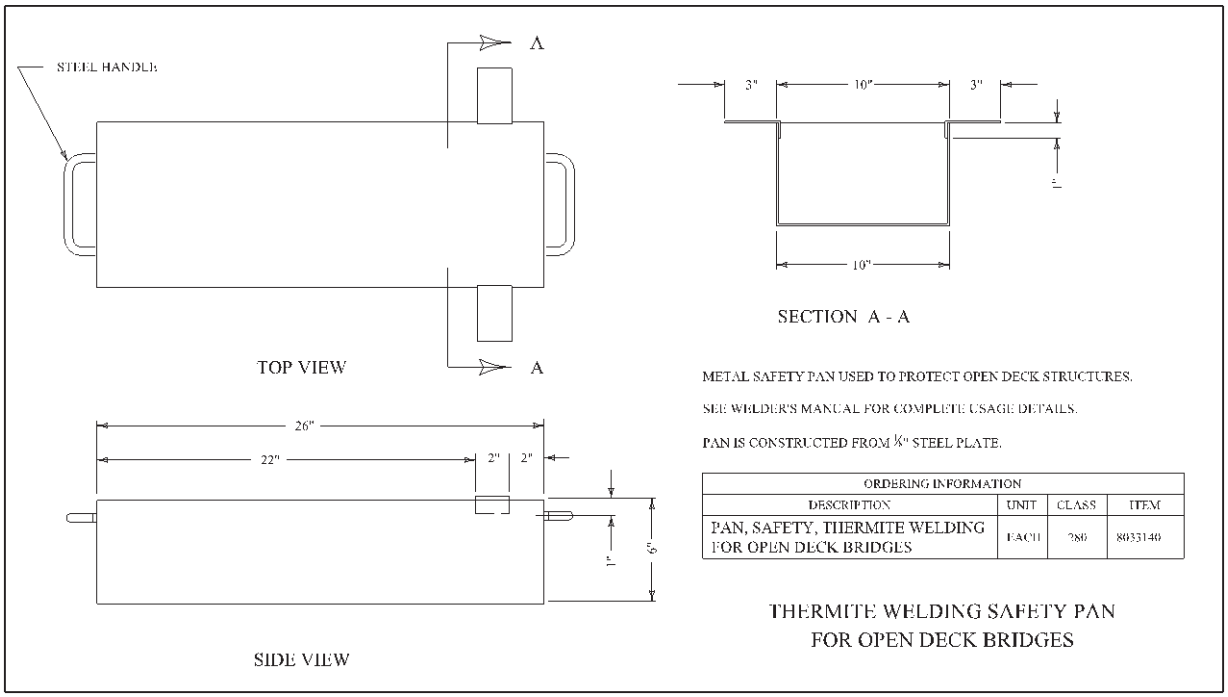
9. Never throw hot metal or slag into water, snow, or ice because an explosion may occur.

10. The contents in the slag basin(s) and safety pans should be dumped only after they have completely solidified, and in a dry place where it will not cause a fire or personal injury.

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7/1/20



Sketch A-1



Sketch A-2

11. One method for removing weld risers is the weld riser removal tool (015.0003150 for Boutet welds and 015.0003160 for Orgo-Thermite welds). Insert the tool vertically with the large opening over the riser and the notch toward the weld. Pull the end of the tool smoothly to the desired angle in accordance with the welding procedure. When breaking of a riser, completely insert the tool onto the riser and use the tool defensively due to the snapping effect. After breaking off a riser, the riser may be handled with the tool and placed in the disposal area.

12. If using a sledge hammer or hot cut chisel to remove the weld risers or sand, a full face shield and welding leggings must be worn. Always stand on the opposite side of the rail from the riser that is being struck. A hot cut chisel can be used to gently remove the sand mold from around the base of the risers to allow for cooling. Use care and ensure the hot cut chisel **DOES NOT** strike the rail or the weld causing gouges into the parent metal or weld. The risers should not be removed until approximately 25 minutes after the end of the pour. Be sure to clear the "red zone" before lightly tapping the risers and use only light taps with the hammer. See photos A-1 thru A-4.

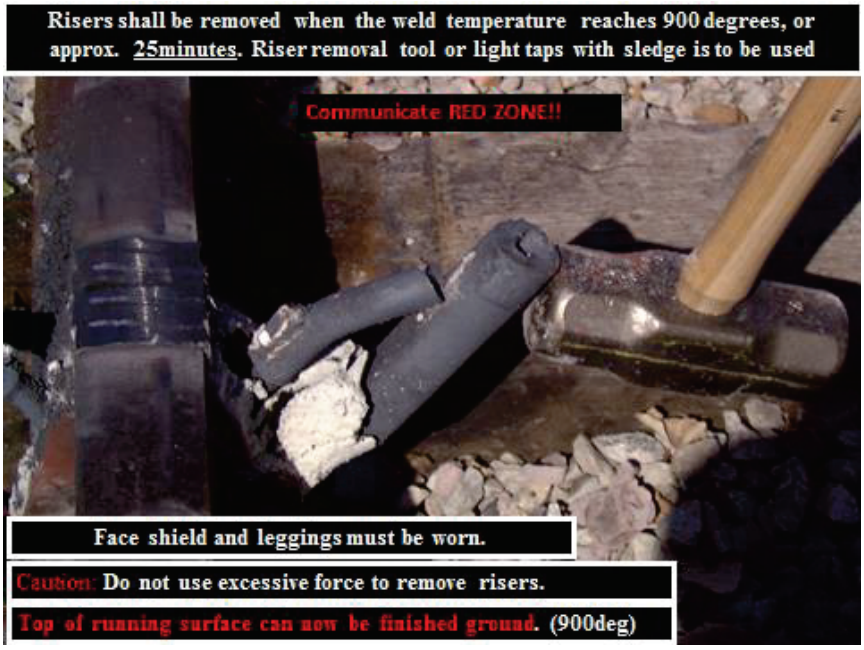


Photo A-1



Photo A-2



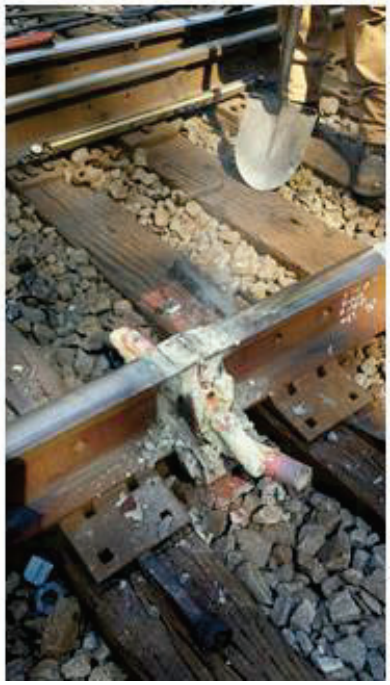


Photo A-3





Photo A-4

HAND TOOLS

Using Hot Cut Chisel:

1. Hot cut chisel may be used for clean up of sand mold debris around base risers and side of weld areas, but will not be struck doing this clean up task. Employee must stand on opposite side of rail to be cleaned and with light downward strokes, remove sand away from risers. When done cleaning on first side, step over the rail to clean other side of rail. All required PPE is stated below. Use care and ensure the hot cut chisel **DOES NOT** strike the rail or the weld causing gouges into the metal. Hot cut chisel MUST not be used as a sledgehammer.

2. In case of emergency, such as weld shear failure, the hot cut chisel will be used to cut risers from side of ball and clean up top of ball after torching off head. This will be done only after the hot cut chisel has been inspected as explained below.

3. Hot cut chisel handle will be inspected for cracks, the chip protector will be removed, and head of hot cut chisel will be inspected for cracks, overflow, or missing pieces.

4. The tool will be ground if not found in compliance and if pieces are missing, the hot cut chisel will be removed from service.

5. After the head of the hot cut chisel has been inspected and corrected, the chip protector will be put back in place.
6. The cutting edge of the hot cut chisel is to be properly sharpened using the procedure outlined in MWI 1702.

   Chip Protector – 3 lbs. Hot Cut Chisel (015.0003010.1)
   Chip Protector – 5 lbs. Hot Cut Chisel (015.0003005.1)
   Hot cut handle – 36” long (015.0001852.1)

Note: When using a hot cut chisel to cut away excess metal from the sides of the railhead, the following procedure must be followed:

1. Head of the hot cut chisel must be turned to a perpendicular angle between 10 to 15 degrees away from vertical in relation to the ball of rail. See photo A-5.

2. Cutting point of chisel must not strike risers squarely rather at an angle. See photo A-6.

3. Head of chisel must be hit squarely and MUST NOT be used as a hammer. See photo A-7.

4. Chip protector is correctly sized. See photo A-8.



Photo A-5



Photo A-6



Photo A-7



Photo A-8

Required PPE:

If the hot cut chisel does have to be used due to weld shear failure, the following PPE will be worn by both holder and striker:

- Hardhat,
- Safety Glasses,
- Face Shield with chin guard,
- Welder's Gloves and,
- Metal Leggings (360.8312222.1)

• Leather/Metal Metatarsal Leggings (360.8312227.1)

1. Handles must be maintained tight on all hammers, sledges, mauls, chisels, etc.

2. Ensure everyone is standing clear of the red zone before swinging any wide arching sledge or maul.

3. All burrs, chips, and battered metal must be ground off all hand hammer driven tools, such as sledges, spike mauls, hot cut chisels, wedges, drift pins, etc.
   The use of a dead blow hammer (451.1100250.1) or dead blow sledge (015.1409374.1) is required when striking alignment wedges to crown rail ends for welding.
   The SCN's for the striking end of the dead blow hammers can be found in the back of the manual. Two are needed for each hammer.

4. When striking and struck tools are repaired, they must be ground to an approved contour, checked with an approved template (015.0002277.1) and fitted with a chip protector. See MWI 1702 for more information on repairing hand tools.

5. The *CSX Safe Way* and applicable Safe Job Procedures contain additional precautions concerning tool use.

CUTTING RAIL AND TRACK BOLTS AT DERAILMENT SITES

1. Do not use welding or cutting equipment at the scene of a derailment until the person in charge of re-railing operations advises that it is safe to do so. Material leaking from damaged cars may be explosive or highly flammable and the use of open flames must be controlled.

2. Twisted and bent rails may shift to a new position with little or no warning when cut. Before making the cut, all personnel not involved in making the cut shall be clear of the Red Zone. Use heavy equipment to stabilize the rail before cutting and during the entire cut. The torch must be at least 36 inches or longer (Harris 1003400 36" torch 280.5001640.1 or Harris 1003481 48" torch 280.5001476.1). Welders must be positioned properly so they won't become caught between the rail and other objects if the rail does shift.

3. Joint bars on twisted and bent rails may be propelled a considerable distance when the bolts are cut. A chain loosely wrapped several times around the joint will restrain the joint bars when the bolts are cut. If the bolts are under pressure, they may also fly when cut. If in doubt, cut the rail first and then remove the joint bars.

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B. QUALIFICATIONS FOR CSXT ENGINEERING DEPARTMENT WELDERS

GENERAL:

1. All Welders and Welder Helpers performing work for the Engineering Department on track appliances, buildings, bridges, or other structures using the Thermite, Oxy-propane, or Electric-arc methods of welding must be qualified by a Welding Instructor or Welding Manager. Employees that have not welded for one year or more, must attend the Railroad Education & Development Institute (REDI) welding class within 30 days of their award.

2. The qualification test will consist of actual welding and grinding, as well as a written or oral examination on safety precautions and welding procedures. The test will be specified by the Chief Engineer–Maintenance of Way and administered by a Welding Instructor or Welding Manager.

3. New bid in Welders and Welder Helpers or Employees that have not welded for one year or more, must attend the Railroad Education & Development Institute (REDI) welding class within 30 days of their award. Employees that have not welded for one year or more, must attend the Railroad Education & Development Institute (REDI) welding class within 30 days of their award.

4. The Welding Manager will maintain a record of each person who qualifies as Welder and supply a copy of this record to the appropriate Division Engineer. The record will indicate:

    a. The welding category(s) in which an individual is qualified,
    b. The date each qualification was granted,
    c. Qualification as a Welder, and
    d. The person who qualified the individual

5. No person will perform any welding without being qualified. **Exception:** Persons in training to become Welders may perform work specified by a Welding Instructor or Welding Manager under the direct supervision of a qualified Welder.

6. It is understood that when an employee accepts the position of Welder Helper, they will progress toward becoming qualified as a Welder. In the absence of the Welder, the Welder Helper should progress to advancing their skills to acquire track time and be proficient in thermite welding, electric arc welding, and other welding activities.

QUALIFICATIONS CATEGORIES:

1. Welding work performed for the Engineering Department will be divided into the following categories:

    a. Structural; Electric-Arc Method
    b. Track Appliance; Electric-Arc Method; Using Electrodes
        1) Repair engine burns

2) Repair battered rail ends, regular and insulated joints
3) Repair switch points
4) Repair frogs and crossings

c. Track Appliance; Electric-Arc Method; Using Wire Feed
   1) Repair engine burns
   2) Repair battered rail ends, regular and insulated joints
   3) Repair switch points
   4) Repair frogs and crossings
d. Field Welding of Rail Ends; Thermite Method
   1) 1" Gap Welds
      a) Boutet
      b) Orgo-Thermit
   2) 2 ¾" Gap Welds
      a) Boutet
      b) Orgo-Thermit
e. Rail piling; Electric-Arc Method Welding
f. Air arc metal removal
g. In track electric flash-butt welding of joints
h. Slice
i. Basic cutting with burning torch

ACCEPTABLE TRAINING INCLUDES:

1. Work under a qualified CSXT Welder.

2. Class room training directed by a Welding Instructor or Welding Manager.

3. Railroad Education & Development Institute (REDI) Center or Commercial Trade School.

4. A representative from our welding suppliers (Pandrol, Lincoln Electric) can also be used.

AWARDING OF WELDER POSITIONS:

1. To be awarded a bid position of welder, a person must qualify under these rules prior to the expiration of qualification time as called for in the appropriate Labor Agreement.

QUALIFICATION REQUIREMENTS:
KNOWLEDGE AND UNDERSTANDING RAILROAD RULES

1. A person must obtain a copy of the Engineering Department *Welding Manual* and must demonstrate to a Welding Instructor or Welding Manager a general knowledge of its contents.

2. A person must obtain a copy of the *CSX MofW Field Manual* and demonstrate to the Engineer-Track, or designee, a general knowledge of the rules.

3. A person must obtain a copy of the *CSX Operating Rules* and must be examined and

qualified as required by these rules.

4. A person must obtain a copy of *The CSX Safeway* and demonstrate knowledge of the rules to the proper company officer.

5. A person must obtain a copy of the *FRA Track Safety Standards* and become qualified in accordance with §213.7.

6. A person must submit a welding report on the Engineering Gateway at the completion of each work day.

QUALIFICATION REQUIREMENTS: DEMONSTRATION OF WELDING SKILLS

1. The qualification will be based on actual work performed under the personal observation of a Welding Instructor or Welding Manager for all track appliances and structural welding. Qualification for bridge welding will also comply with American Welding Society Bridge Welding Code (AWS D1.5).

2. Certain welding procedures require that test samples, made in accordance with American Welding Society specifications, be prepared for qualification. Test material will be mild steel plate 1" thick (150.0011061.1 or 150.0011062.1). A test sample will qualify a person only for the welding process used to make the test sample.

3. Test samples may be required in the flat position for track application on a 1" flat plate. For structural welding, the person will be required to have vertical and overhead weld samples.

4. The Welding Instructor or Welding Manager may require qualified Welders in structural or track appliance to make additional test samples if steel plate 1" thick, or high strength steel are required. Test samples will be made with the welding process and the type and thickness of steel to be used. The Welding Instructor or Welding Manager will specify the welding positions.

5. The Welding Instructor or Welding Manager may require qualified Welders who have not performed welding for the Railroad for a period of one (1) year or longer to make test samples in one or more positions to demonstrate that they have retained their welding skills.

6. The Welding Instructor or Welding Manager will provide materials for the test samples and see that the samples are tested in accordance with American Welding Society's Specification for Compliance (Structural D1.1, Bridge D1.5), maintain records of results, and maintain a list of qualified Welders by welding categories.

7. The Welding Instructor or Welding Manager will observe the person requesting qualification under actual work conditions to verify the welder's work habits and methods are consistent with safe welding practices. Proper welding procedure is a requirement for qualification.

8. The Welding Instructor or Welding Manager will examine welds for durability made by a person requesting qualification after they have been subjected to service for a period of time;

however, the period of time must not exceed the time referred to in Labor Agreements. Durable welds are a requirement for qualification.

9. Persons that have successfully completed a commercial trade school course in welding which required the preparation and examination of test welds in accordance with American Welding Society's Specification may be relieved by a Welding Instructor or Welding Manager from making similar test samples for the Railroad, provided the following conditions are met:
   a. The person desiring to be qualified has a written statement from the instructor of the course stating the welds met proper standards.
   b. A copy of the laboratory examination of the test samples showing they met American Welding Society's specifications.
   c. Not over one (1) year has passed since the samples were made and tested.

C. REPAIR OF ENGINE BURNS.

GENERAL

1. Engine burns in carbon steel rails will be repaired through the use of the electric-arc welding process with the mandatory use of either heating blocks or a Teleweld heater.

2. Engine burns in alloy rail will not be repaired. For description of alloy rail, see page H-2.

3. Engine burns should be repaired as soon as practicable. The impact of wheels on the defect will increase the metal flow, secondary batter, and thermal cracking.

4. The size and number of engine burns, that may be repaired in a given rail, depend upon the weight and condition of rail to be repaired and the availability of replacement rails. Generally, defects, which will be deeper than 3/8" after grinding, should not be repaired (See Sketch C-1). Also, engine burns requiring a weld longer than 10" should not be repaired.

5. Engine burns will not be repaired:
   - In a rail with shelly spots in the burn area.
   - In a switch point.
   - In a stock rail.
   - In the guardrail area of a turnout.
   - Within three (3) feet of a plant or thermite weld.

6. When repairs are necessary in cold weather, the heated area must be protected to prevent rapid cooling, as follows.

Rail Temperature	*Weather Conditions*	
	Clear	*Wind, light rain, or snow*
40°F or greater	• Air Cool • Weld Cooling Cover is not required	• Apply Weld Cooling Cover immediately after shearing. • Leave cover in place until weld is cooled below 800°F (about 35 minutes).
Between 40°F and 0°F	• Prior to installation of molds, preheat railhead and base to 100°F (hand hot) for a distance of 3 feet on both sides of the weld gap. • Complete weld and unmold normally. • Apply Weld Cooling Cover immediately after shearing. • Leave cover in place until weld is cooled below 800°F (about 35 minutes).	
0°F and less	• Welding is not recommended	

7. The Signal Maintainer will be notified in advance whenever welding is to be performed in track circuit territory.

8. See *Section "A", Safety*, for instructions for electric arc welding in track circuit territory.

PROCEDURE FOR REPAIRING ENGINE BURNS:

1. Check to see if rail can be repaired with a weld less than 10” long.

2. Before welding, three (3) ties on each side of the repair area will be inspected to determine if the rail can expand during the repair. Nip spikes and remove rail anchors if necessary.

3. Shim rail with a crown of 1/8” at the center of the engine burn using a 36” straight edge. See sketch in Section “I”, Thermite Welding.

4. Mark the limits of the repair. The repair limits should be marked at an angle across the railhead so that the length of repair on the gage side will be approximately one inch (1”) longer than on the field side on each side of the repair.

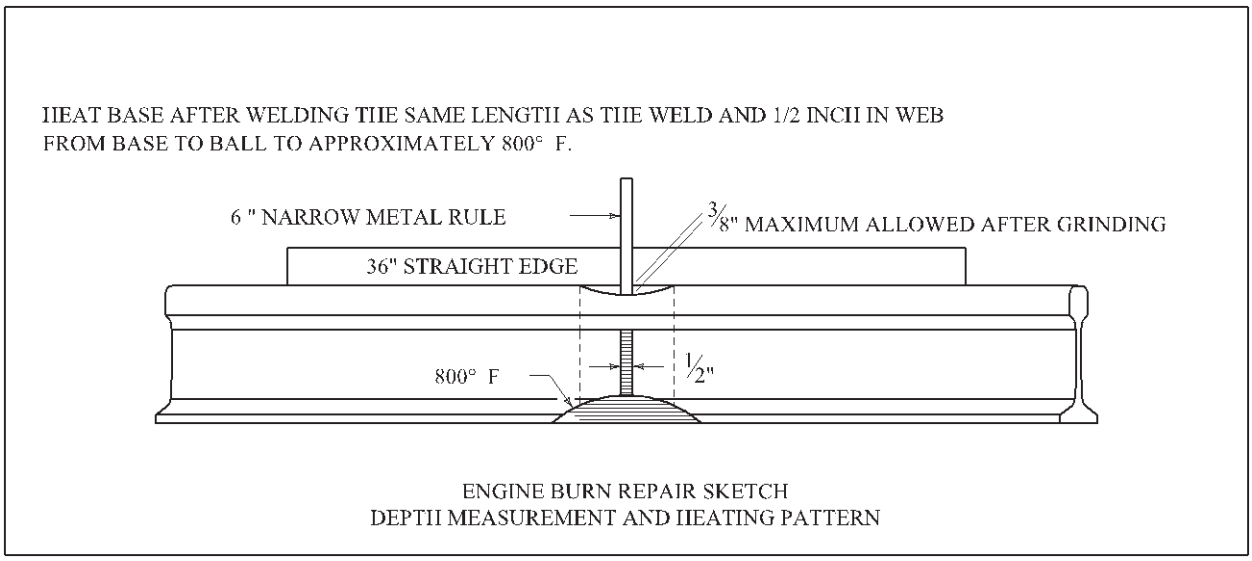
5. Grind out all damaged metal down to sound, clean parent metal. The removal shall not be accomplished through the use of a torch. Special care must be used to remove enough metal to eliminate all shatter cracks.

6. If during the repair work, it is found that the rail requires removal of more than 3/8 inch in depth of damaged metal by grinding; it will be repaired, protected by joint bars, and removed from track as soon as possible.

7. Preheating

   a. Orgo-Thermit Heating Blocks - Before welding, the heating blocks are to be secured on each side of the rail in the web area and ignited. After the rail is heated to 800°F, carefully examine the rail for cracks. Cracks will appear as dark hair lines in the heated area. If cracks are present, further grinding is required. Heating blocks must remain in place until the repair has been completed.

      1) Heat block for 90# to 119# rail 280.8033000.1
      2) Heat block for 122# to 140# rail 280.8033020.1



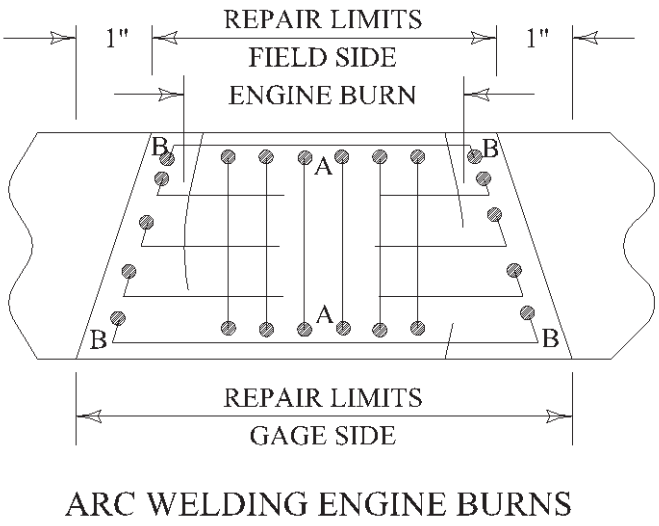
Sketch C-1

b. Other Heating Devices – An approved heater must be used to heat the rail to 800°F. The temperature will be verified using a Tempilstick or digital thermometer. Position the heater so that the pre-heated area includes the repair and four inches (4”) to both sides of the repair. One approved heater is the Teleweld Single Propane heater. (453.0347257.1)

8. Repair of the engine burn must start immediately after the ground out area has been inspected for cracks and must continue without stopping until all weld material has been deposited. When welding with approved wire or stick, welded area must be post heated to 800°F before grinding.

9. Approved welding rods and wires for the electric-arc process are listed on page N-2.

10. Welding of engine burns should start on the gage side (not gage corner) and proceed to the field side in beads deposited lengthwise according to Sketch C-2.



ARC WELDING ENGINE BURNS

A. First few beads are 90° across the rail head to fill the deepest area ground.

B. All finish beads are run length wise with the rail between repair limits.

Sketch C-2

11. Each bead must be peened while the deposit is hot to relieve welding stresses that can cause cracking. Enough weld material should be deposited so that the un-ground surface will be higher than the rail and that the grinding will eliminate the visible welding marks and seams.

12. The weld area must be protected against rain, snow, etc., and be allowed to cool as slowly as possible. Leave heating blocks in place until rail temperature is below 500°F. Verify by using a digital thermometer or a Tempilstick.

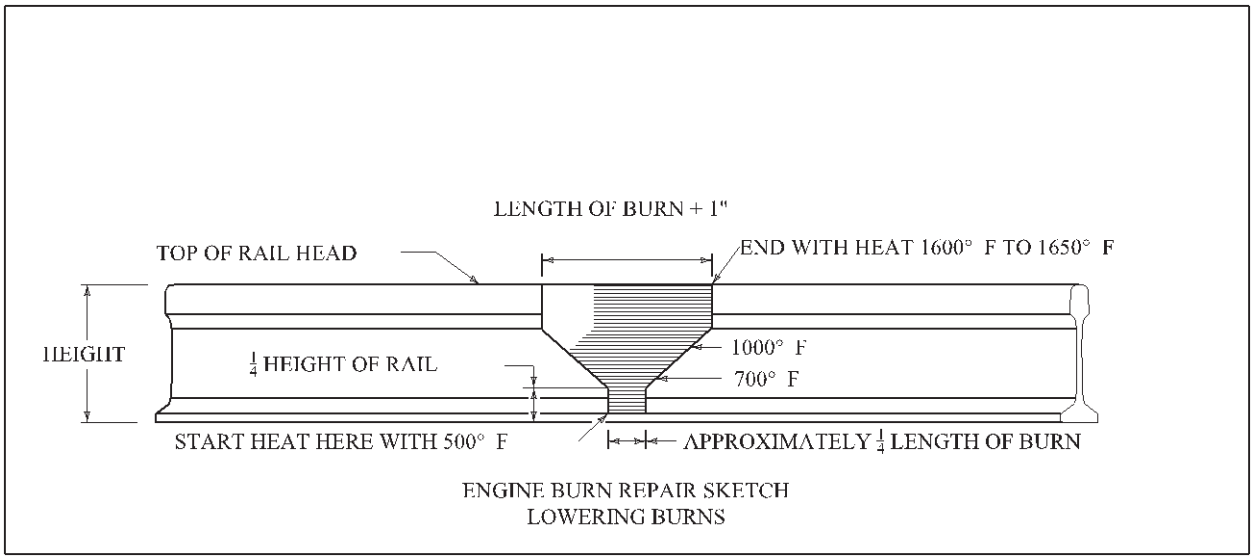
13. Use the surface grinding attachment to grind the weld area to a smooth surface and true rail contour.

14. After the welds are made and allowed to cool, an inspection must be made to determine the straightness of the running surface of the rail. Use an approved 36” straightedge. Surface tolerance is – 0” / + 0.030” (crown).

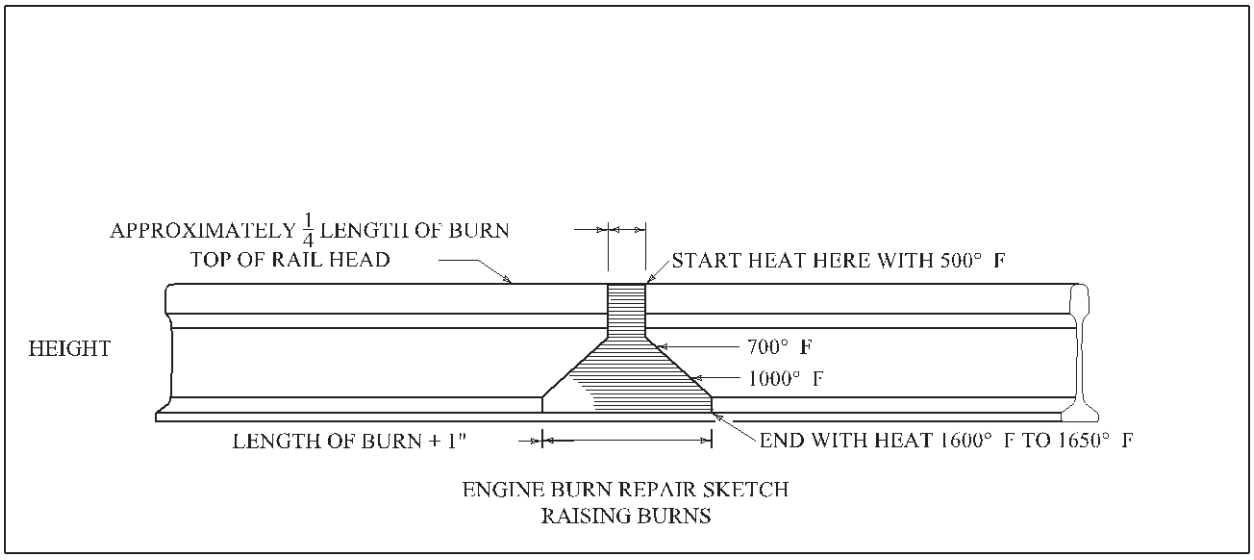
15. Remove shims from one tie and tamp that tie before removing the shims from the next tie. Replace any rail anchors that were removed.

CORRECTING VERTICAL DISTORTION:

If the repair has caused a dip, the rail alignment can be corrected by heating the rail as shown in the Sketches C-3 and C-4. Allow the repair area to cool slowly.



Sketch C-3



Sketch C-4

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D. REPAIR OF RAIL ENDS

GENERAL

1. Rail end batter in carbon steel rails will be repaired through the use of the electric-arc welding process.

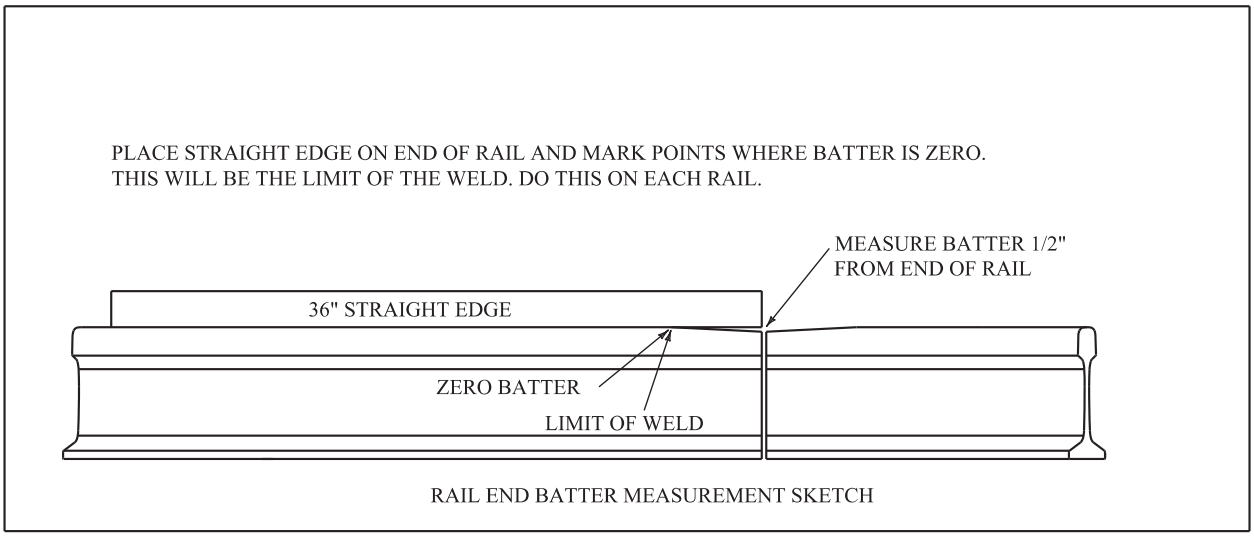
2. Rail ends that have been repaired by welding will not be thermite welded until the rail end has been cropped to remove the entire previously repaired area.

3. Rail ends, that are battered, chipped or spalled, should be repaired to prevent further damage to the rail ends and accelerated deterioration of the other track components.

4. Rail end repairs should be made when the batter reaches the limits as listed below:

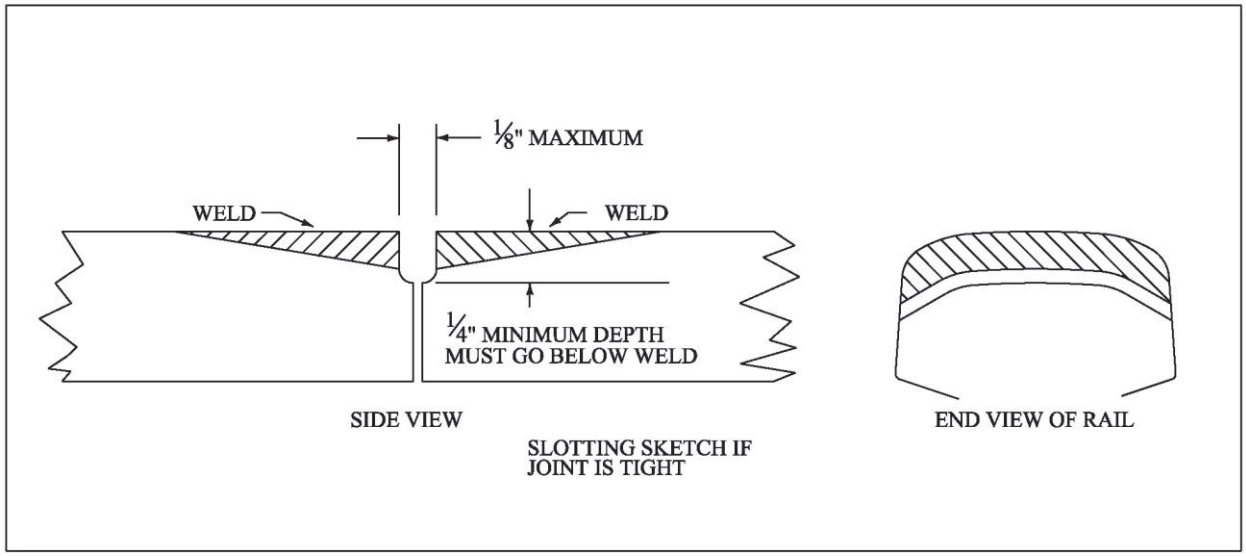
   1/8 inch (0.125”) where freight train speed exceeds 60 MPH
   1/4 inch (0.250”) where freight train speed exceeds 40 MPH
   3/8 inch (0.375”) where freight train speed exceeds 10 MPH
   1/2 inch (0.500”) where freight train speed is 10 MPH or on excepted track.

5. Batter is the distance, measured in thousandths of an inch, between an approved 36” straightedge and the top of rail 1/2 inch in from the end of the rail as shown in Sketch D-1.

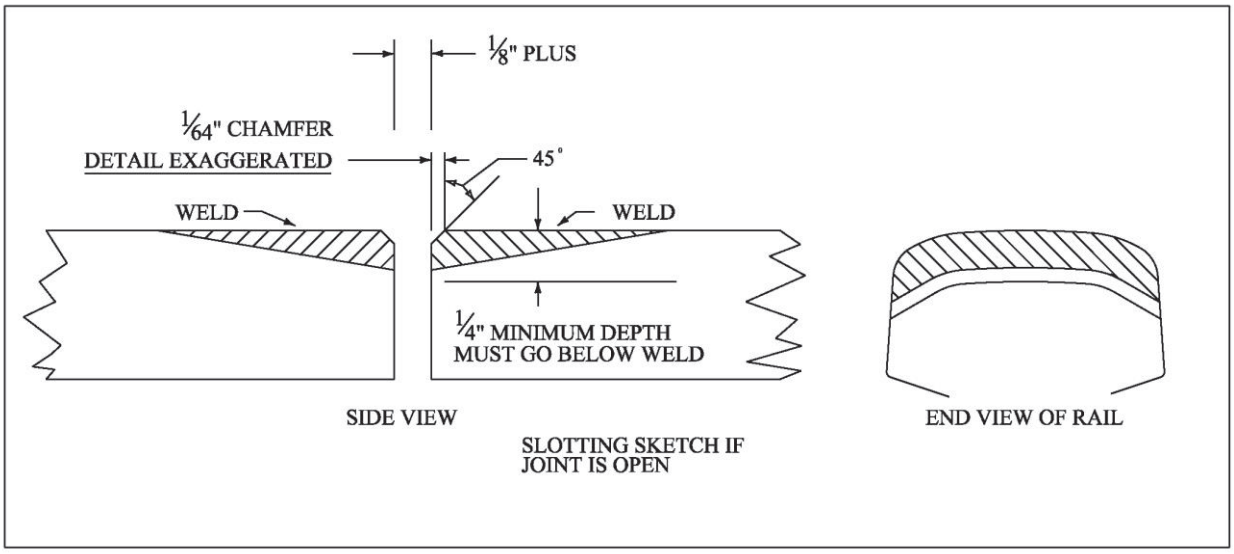


Sketch D-1

6. Rail ends will be slotted by grinding to prevent chipping due to overflow. For rail gaps of 1/8" or less see Sketch D-2. For rail gaps greater than 1/8" see Sketch D-2A.



Sketch D-2



Sketch D-2A

7. Before repairing the rail ends, the track near the repair should be inspected for excessive expansion at the rail ends, joint bar condition, ties in the joint area, ballast in the joint area and surface. Tamp the joint as necessary.

8. The Signal Maintainer will be notified in advance whenever welding is to be performed in track circuit territory.

9. See *Section "A", Safety*, for instructions for electric arc welding in track circuit territory.

PRELIMINARY WORK

1. Use an approved 36” straightedge to mark the limits of the repair. The repair limits should be marked at an angle across the top of rail so that the length of the repair on the gage side will be approximately one inch (1”) longer than on the field side.

2. Rail ends to be repaired must be clean, free from dirt, dust, oil, grease or other foreign substance. Grind out all damaged metal down to sound and clean parent metal. The removal will not be accomplished through the use of a torch.

3. Before welding, preheat the ground railhead to approximately 800°F for a distance of 8” beyond the weld area in each rail requiring repair. Carefully examine it for cracks. Cracks will appear as dark hairlines in the heated area. If cracks are present, further grinding is required.

4. During welding, excessive heat must be avoided, especially near manganese castings. Heat in excess of 500°F could be transferred to and damage manganese castings.

PROCEDURE FOR REPAIRING RAIL ENDS:

ELECTRIC ARC PROCESS

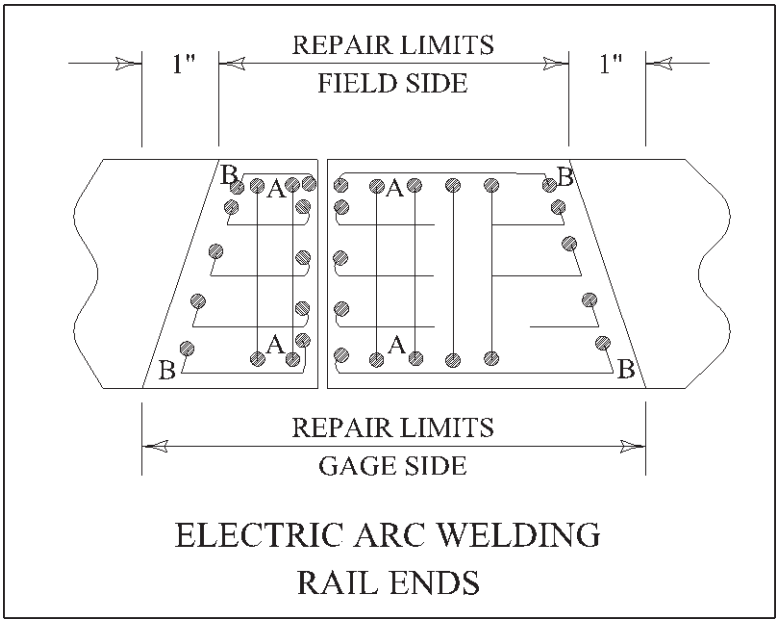
1. Approved welding rods and wires for welding of rail ends are shown on page N-2.

2. Welding must begin immediately after preheating and the 800°F preheat maintained in the area surrounding the repair.

3. First welds are to be made across the railhead until level and then lengthwise from the gage to field side. See Sketch D-3.

4. The welding should proceed lengthwise with the railhead.

5. Each pass must be peened while the deposit is hot to relieve welding stresses. The weld should be extended beyond the rail end and the excess metal removed by slotting after the weld is completed.



A. First few beads are 90° across the rail head to fill the deepest area ground.

B. All finish beads are run length wise with the rail between repair limits.

Sketch D-3

6. Enough weld material should be deposited so that the unground surface will be higher than the rail and that the grinding will eliminate the visible welding marks and seams.

7. With carbon steel rail, post-heat the welded area to approximately 800°F immediately after the welding operations. After post-heating, the weld area must be allowed to cool as slowly as possible and protected against rain, snow, etc.

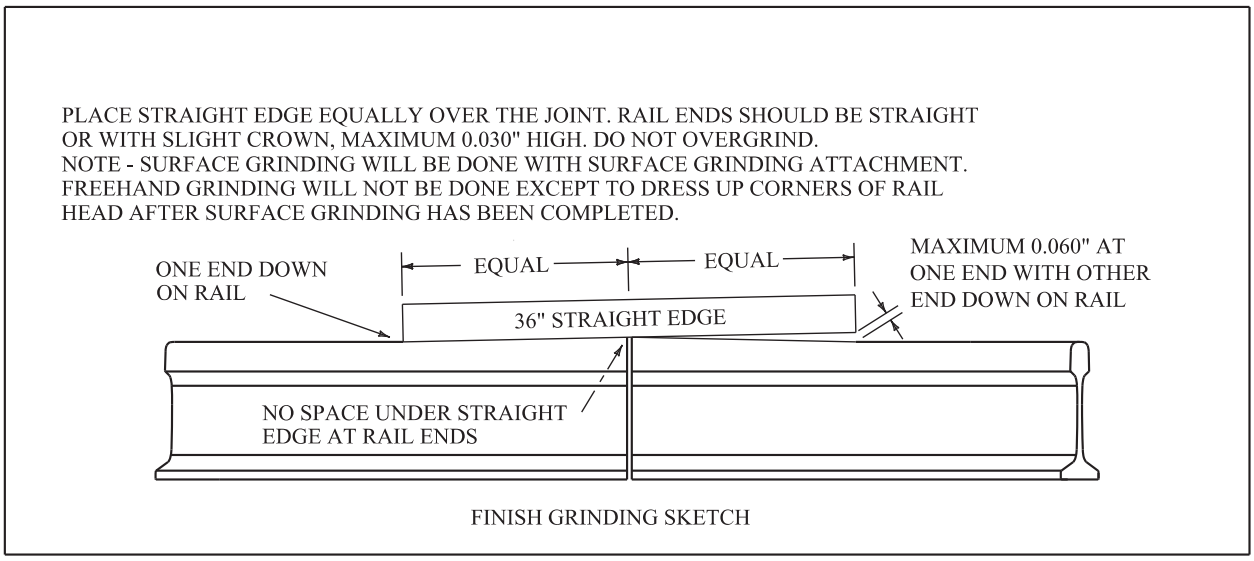
8. With fully heat treated and head hardened rails, post-heat the welded area to approximately 800°F immediately after the welding operations. After post-heating, it is most important that the rail cool slowly to 200°F. It may be necessary to protect the weld area with insulation, such as an insulated blanket (stock # 360.4830250.1) to obtain the desired slow cooling and against rain, snow, etc.

9. **It is very important that preheating and post-heating be diligently performed to obtain a quality repair weld**.

GRINDING

1. Use the surface grinding attachment to grind the weld area to a smooth surface and true rail contour.

2. After the welds are made and allowed to cool, an inspection must be made to determine the straightness of the rail. Use an approved 36”straightedge. Surface tolerance is -0 IN./+0.030 IN. See Sketch D-4.



Sketch D-4

3. If the rail ends are of different heights and are being built up to match surfaces, there should be a 10 inch runoff from each 1/4 inch difference in height but the runoff must not extend beyond the furthest bolt hole from end of rail.

   Note: It is preferable to build up the low rail end in a permanent joint, instead of grinding the high rail end, unless a thermite weld is to be made.

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E. REPAIR OF RAIL ENDS IN GLUE-BONDED INSULATED JOINTS

GENERAL

1. Glue-bonded insulated joints will be repaired through the use of the electric-arc welding process.

2. Before repairing the rail ends, the track near the repair should be inspected for ties in the joint area, ballast in the joint area and surface. Tamp the joint as necessary.

3. Glue-bonded insulated joints are structural units that are composed of rail, insulated bars, end post, bolts, and adhesive. As a structural unit, they must be treated differently from individual rail ends. Therefore, some differences exist between these techniques and those used for rail ends.

4. Approved welding rods and wires for the repair of glue-bonded insulated joints are listed on page N-2.

5. Care must be taken to ensure that the welding ground cable clamp is securely grounded to the running surface of the rail being repaired. Use of a magnetic ground clamp is recommended.

6. The Signal Maintainer will be notified in advance whenever welding is to be performed on glued-bonded insulated joints.

7. See *Section "A", Safety*, for instructions for electric arc welding in track circuit territory.

PROCEDURE FOR REPAIRING GLUE-BONDED INSULATED JOINTS

1. Use an approved 36" straightedge to mark the limits of the repair. The repair limits should be marked at an angle across the top of rail so that the length of the repair on the gage side will be approximately one inch (1") longer than on the field side.

2. Rail ends to be repaired must be clean, free from dirt, dust, oil, grease, or other foreign substance. Grind out all damaged metal down to sound and clean parent metal. The removal will not be accomplished through the use of a torch.

3. Before welding, preheat the rail end not to exceed 150°F. The preheat torch flame should be applied in a uniform circular motion on the rail end, beginning at a point two inches (2") from the rail end and proceeding to a point two inches (2") beyond the repair limits. Welding must commence immediately after preheating. If welding is interrupted, allow the rail to cool, then preheat must be repeated.

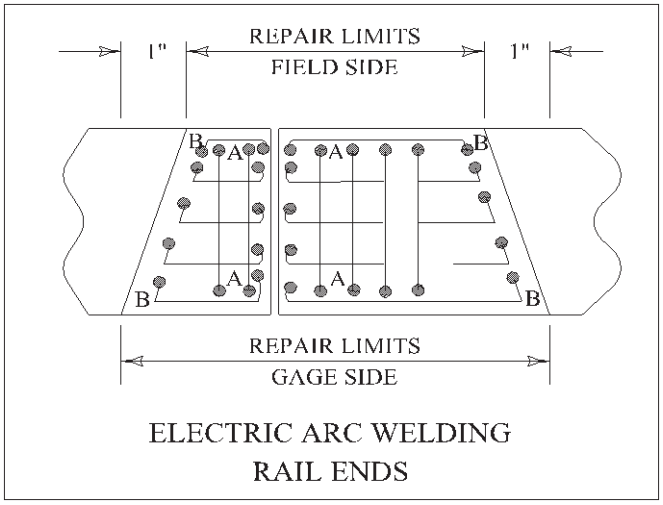
4. The area to be repaired should be welded in multiple layers. Each welding bead must be peened and enough time allowed between beads to keep the rail end within the allowable

maximum temperature of 300°F degrees in the glue-bonded insulated area. A Tempilstik or other approved temperature measuring device must be used on both sides of the railhead to check the temperature.

5. The final layer of welded material will be deposited as follows:

   a. Start the weld bead on the field side one inch (1") from the rail end.
   b. Progress the weld to the rail end and across the end of the rail to the gage side.
   c. Continue to bead parallel to the gage line to a point one inch (1") beyond the visible end hardened area.
   d. Turn diagonally and return toward the field, slightly overlapping the first bead.
   e. Continue this pattern, diagonally turning each bead just short of the previous bead at the weld limit, with as many beads as necessary to cover the welded area of the railhead.

6. When the weld is completed, the arc should be broken by crossing back into the welded surface.



A. First few beads are 90° across the rail head to fill the deepest area ground.

B. All finish beads are run length wise with the rail between repair limits.

Sketch E-1

7. The completed weld pattern should be such that it will provide a gradual transition for the car wheels from the parent metal to the welded surface.

8. Grind the repaired area to a smooth surface and a true rail contour immediately after completing the weld. Use an approved 36" straightedge to check the surface. The tolerance is - 0 IN /+ 0.030 IN (See Sketch D-4 for reference).

9. The rail ends should be slotted and cleaned of all charred end post material and grinding dust. Then the gap between the rails filled with a clear 100% silicone caulking. Use 020.0053870.1.

F. REPAIR OF SWITCH POINTS:

GENERAL

1. Switch points will be maintained and repaired through the use of grinding and the electric-arc welding process.

2. **Main track switch points are not to be repaired by any welding process.** In the event that it becomes necessary to repair a switch point in an emergency situation, a 10 MPH temporary speed restriction must be placed on the turnout with speed boards posted until the point is replaced. The speed restriction will only pertain to the route affected by the repaired point.

3. Switch points are made from either carbon steel rails or fully heat treated steel rails (former standard with many still in use), deep head hardened steel rails (current standard), or may have manganese steel tips installed on the point. A magnet or magnetic rail thermometer may be used to differentiate between steel rails and manganese insofar as the magnet will not stick to manganese.

4. New switch points and stock rails should be inspected frequently in the first few months after installation. When the metal flow starts to form a lip, it should be removed by grinding. This grinding must be done several times until the top surface has work hardened to the maximum hardness and flowing has stopped. The time to reach maximum hardness depends on the tonnage passing over the track component.

5. The wearing and mating surfaces of switch points and stock rails **must be ground periodically** to remove flowed metal which may cause the switch point to chip or cause an improper fit between the switch point and stock rail.

6. **Before** beginning repairs to the switch point, the stock rail must be inspected to ensure that the undercut or recess is correct, that there is no overflow material present and the switch is adjusted properly. **If any item is out of tolerance, it must be corrected.**

7. **Arc or torch cutting is not permitted**.

8. Generally yard and non-mainline switch points should not be repaired in the field by welding if the repair would be greater than about 24” in length. Switch points requiring more repair should be replaced and sent to the designated location for repair if the switch point is not scrap. The availability of replacement points will influence the decision also. If no replacements are available, the point may be repaired but arrangement should be made to replace the repaired point in a reasonable time period.

9. Any knife blade switch that has not been recessed into the stock rail will be recessed prior to repairing the switch point.

10. Sketches F-1 through F-5 (located at the end of this section) depict details of the switch

point, stock rail, and stock rail recess for both Samson and knife type switch points.

11. Approved welding rods and wires for rail steel switch point repairs are on Page N-2 and manganese steel tip insert repairs are on Page N-1.

12. The Signal Maintainer will be notified in advance whenever welding is to be performed in track circuit territory.

13. See *Section "A", Safety*, for instructions for electric arc welding in track circuit territory.

PRELIMINARY WORK

1. Inspect condition of complete switch.

    a. Check to see that switch stand is firmly fastened to ties; a loose stand may allow points to move into the path of the wheel flange and be chipped.
    b. Check condition of connecting rods, switch rods, rod bolts, and other switch parts for wear that could cause play in the switch points. Make sure that moving parts do not bind on switch ties. All bolts designed for cotter pins must have cotter pins in place.
    c. Check heel block for missing or worn bolts and thimbles, worn bolt holes, and condition of switch ties. Vertical play of the switch heel could allow the switch point to rock under traffic exposing the point end to contact with the wheel flange.
    d. Check to see that the base of the stock rail is seated in the switch plates and wedges are tight.
    e. Check to see that the switch point is not twisted and rests flat on the switch plates.

2. All cracked, chipped, work hardened, spongy, fatigued, spalled, or otherwise defective metal will be removed by grinding to clean parent metal. Special care must be taken to ensure that all cracks and breaks are removed.

3. **Both Stock Rails are to have all overflow removed by grinding prior to beginning the repair.**

PROCEDURE FOR REPAIRING SWITCH POINTS:

1. Preheat and maintain the weld zone for at least 8" beyond the weld area to a temperature of 800°F as determined by a Tempilstik or other approved device.

    Exception: Do not preheat switch points with manganese steel tip inserts.

2. When working on switch points, use a wood chock or other physical obstruction to block the switch point in the open position before welding. Weld all switch points in the open position, starting at the point and working toward the heel. A copper plate (1/8" thickness 280.1809000.1 or 1/4" thickness 280.1809005.1) and or carbon block (280.1800550.1) may be placed behind the switch point, if needed, to help protect against overflow. The use of C

clamps or C clamp vice grips can be used to hold the copper plates or carbon blocks in the weld position to hold weld metals. This copper backing plate and or carbon block must be 1/16" off of the point to allow sufficient weld for grinding in order to eliminate seams.

3. The contour of the weld should be kept uniform. The switch point should be built up slightly in excess of the dimensions required by the standard plans, then ground to final size and shape. Do not leave any seams between the welding beads and the parent metal.

4. After the weld repair is completed but before grinding, post heat the repaired area to a temperature of approximately 800°F for 8" beyond the welded area. Heat the base and back of the point an equal amount to prevent the point from warping.

   Exception: Do not post heat switch points with manganese steel tip inserts.

5. Grinding procedures.

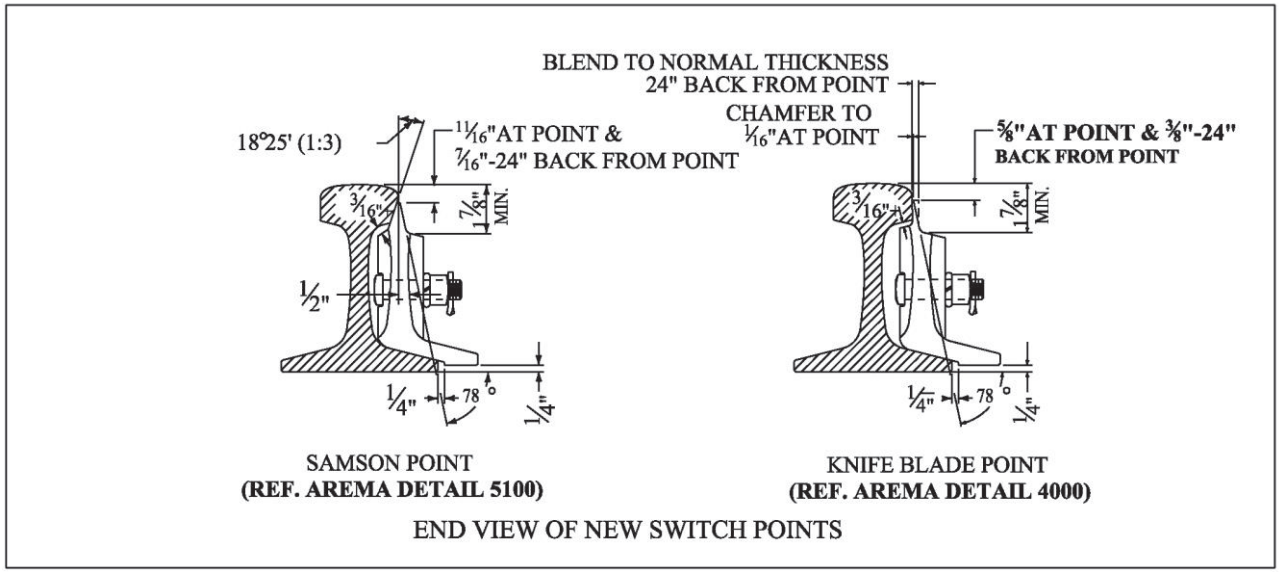
   a. First, grind the back side of the point. Check with a 36" straightedge after grinding. Check for proper fit with the stock rail by throwing the switch.
   b. Second, grind the gage face of the point. Check with a 36" straightedge after grinding.
   c. Third, grind the top of the point. Check with a 36" straightedge after grinding. The end of the switch point should be ground to a thin edge 5/8" lower than the top of the stock rail. See Sketch F-1.
   d. Fourth, finish grind at the end of the switch point. At the point, all sharp edges should be slightly rounded toward the stock rail. There should be a radius of about 5/8" between the top and gage face of the point starting where the point becomes 5/8" thick.
   e. Fifth, check the gage face alignment. **With the switch point closed, place 36" straightedge on the gage face of the stock rail sliding the straight edge towards the point verifying clearance of switch point. Check to see that the point is <u>not</u> sticking out and hitting straight edge straight on. See Photo F-1 below.**



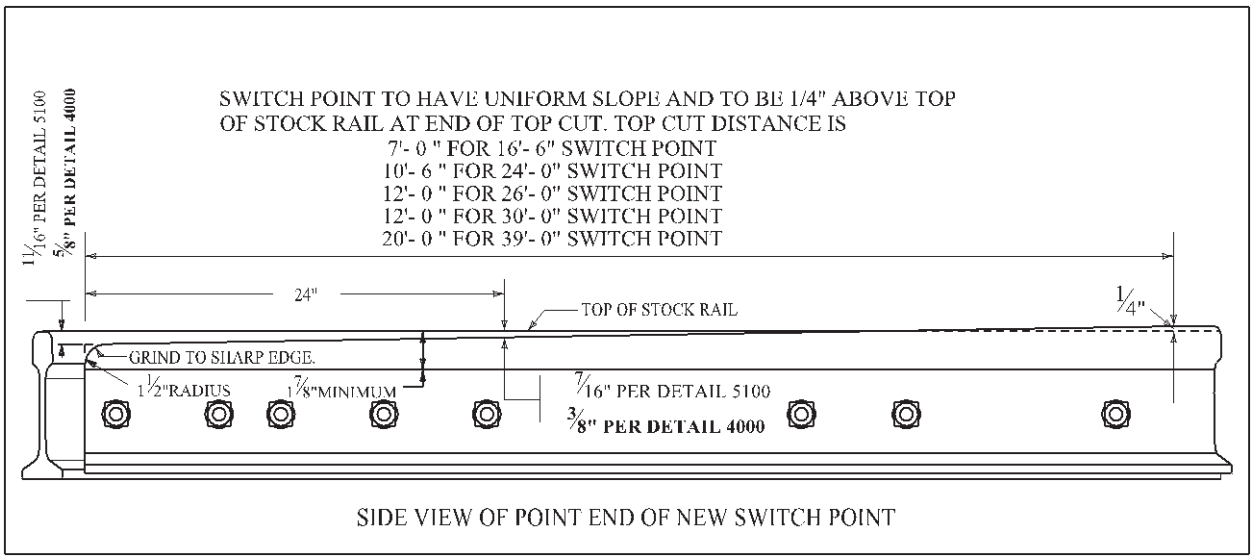
Photo F-1

6. Protect the point from cooling too rapidly.

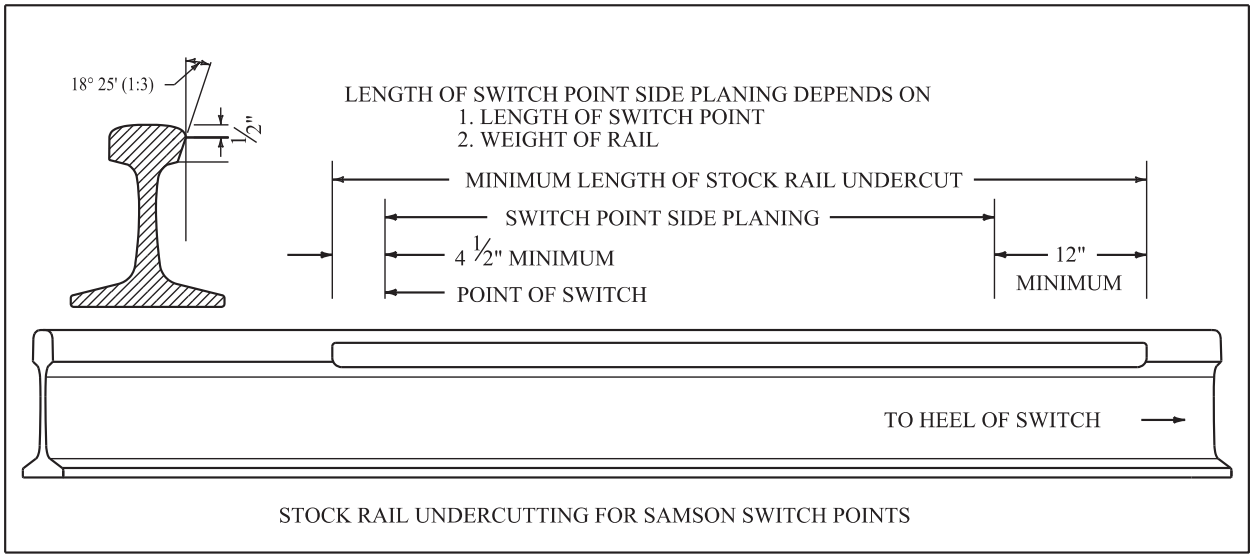
7. Traffic must not be allowed to use the switch until the switch point temperature is below 200°F.



Sketch F-1

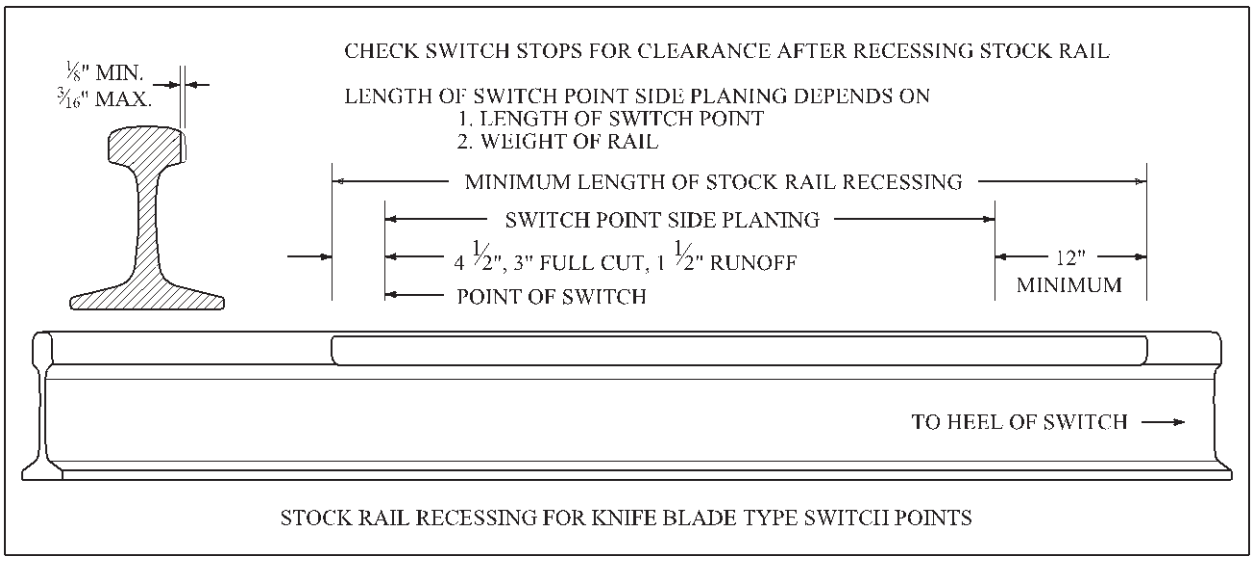


Sketch F-2

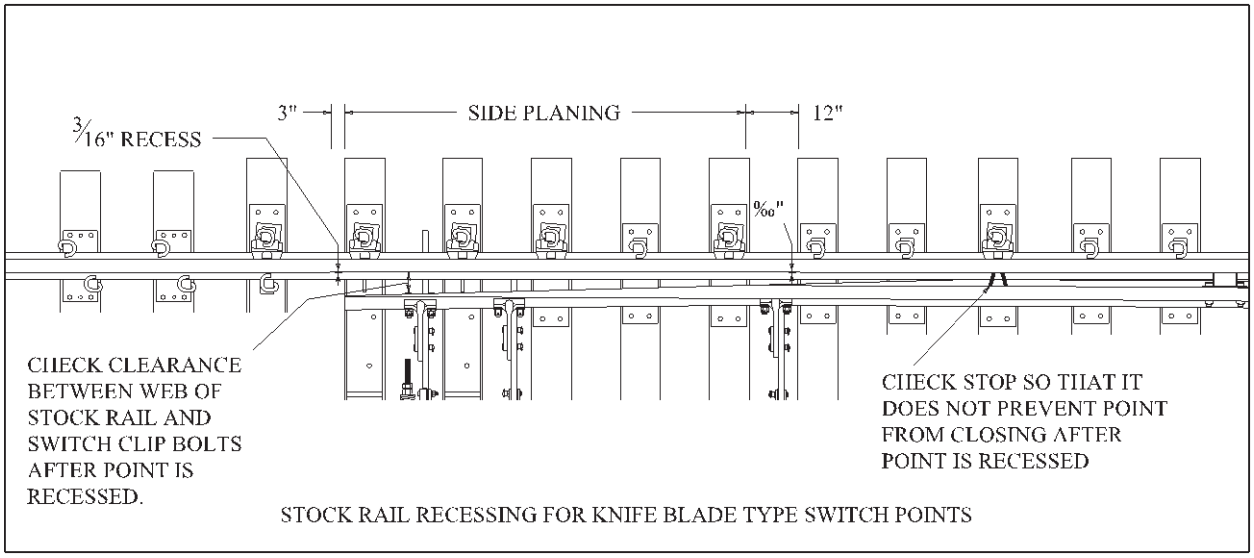


Sketch F-3

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Sketch F-4



Sketch F-5

G. REPAIR AND MAINTENANCE GRINDING OF FROGS AND RAILROAD CROSSINGS:

TECHNICAL NOTES ABOUT MANGANESE CASTINGS

1. Manganese steel track components are comparatively soft (approximately 200 - 220 Brinell) when produced. Most items including frog castings are hardened (approximately 380 Brinell) before being placed in service. Other items are allowed to work harden.

2. Manganese steel work hardens by plastic flow of the metal grain structure under rolling wheel loads and impacts. This flow or deformation of the relatively soft metal results in a bead or ridge forming on the top edges of the frog points and wings usually on both sides of the flangeway and on the gage side of the flangeway in railroad crossings. The flow or deformation will slow as the hardness of the top surface increases by cold rolling under traffic.

3. Formation of this bead or ridge may narrow the flangeway opening. If this bead is allowed to form to the maximum, it can cause the frog to fail. The bead will become extremely hard. The wheel flanges will cause the bead to chip or spall, often very deeply into the casting. This is the reason all frogs, crossings, and other track components **must be ground to prevent premature cracking and welding.**



Photo G-1

4. New manganese track components should be inspected frequently in the first few months after installation. **New manganese track components must have maintenance grinding performed weekly as needed for a period of one month. Newly repaired manganese components should be maintenance ground at least once per week as needed for a period of three weeks**. When the bead or flow of metal starts to form, it should be removed by grinding. This grinding must be done several times until the top surface has work hardened to the maximum hardness and flowing has stopped. The time to reach maximum hardness depends on the tonnage passing over the track component.



Photo G-2

5. Grinding should be confined to the top edges where overflow has occurred. No grinding should be done on the top surface, other than what is necessary to correct a mismatch or dress temporary wear ramp pads, as this will remove work hardened material.

6. A radius of 3/8" to 5/8" between the top and gage face should be ground on the wings and point. There should be no sharp edges. Sharp edges become hard and brittle under wheel loads and may spall, crack, or chip when contacted by the wheel flange.



Photo G-3

7. Welding should not be done on practically new castings except to correct conditions that cannot be eliminated by grinding.

8. A thorough examination should be made of an older frog before a decision is made to weld the frog as **grinding can correct many problems**. Excessive heat can reduce the strength of manganese steel.

9. Slot grinding should be done at regular intervals to reduce chipping and spalling. The areas to be ground are those where the manganese casting is in rigid contact with wing and heel rails, the heel of the frog casting, and rail joints if the frog is not welded into track.

GENERAL



Photo G-4

1. The manganese steel components of frogs and railroad crossings will be repaired through the use of the electric-arc welding process. Should the repair require more than thirty minutes, a wire feeder must be used. The rail components will be repaired using the techniques described in the appropriate rail repair section.

2. In the repair of manganese steel castings, it is of great importance to keep the heat build up caused by the welding process as low as possible. Manganese steel castings are heat treated at the foundry. Lack of attention to heat build-up will permanently destroy this heat treatment and will cause the casting to become brittle. The area of the casting being repaired must be kept less than **450°F** at all times.

3. Where compressed air is available, it is to be used to cool the area worked on manganese steel castings.

4. Water-cooling is also an acceptable option for cooling the area worked on manganese steel. If water cooling techniques are employed, remove the carbon block if used, clean, peen, and then use a spray bottle (like a garden sprayer) or a bottle with a hole in its top to douse the weld with water until the water stops boiling on the weld. Use compressed air or a wire brush to remove excess water from the flangeway. The flangeway may be left damp, but the carbon block should never be applied in freestanding water. (Note: Only water (no additive) is to be used for the purpose of water-cooling. If an additive (windshield washer fluid, RV anti-freeze, etc.) is used in the water storage system to prevent freezing, this treated water CANNOT be used to control the heat build up in manganese steel.

5. When it becomes necessary to weld frogs there are certain practices that must be followed. These are:
    a. **Weld only on clean, sound, non-work-hardened metal (NOT THIS)**.



Photo G-5

    b. Apply minimum heat to the base metal.
    c. Use welding procedures that produce the minimum thermal stress in the weld deposit.
    d. Use of a power blower is mandatory when welding or grinding manganese.
    e. Respirator use is mandatory if blower is broke or not available.
    f. Power blower 360.8851055.1 (Photo G-6)



Photo G-6

USE OF AIR CIRCULATER FAN

DO'S

a. Fan may be used by Thermite (field) Welding Team while make field welds to circulate air for cooling personnel in warm or hot temperatures.

b. Fan should be placed far enough from ongoing work as not to cause a tripping hazard, (suggested 10'), never in the foul of any track and should be placed on a level surface as not to turn over.
c. Fan must be plugged into a Ground Fault Circuit Interrupter (GFCI) receptacle or a portable GFCI must be used if power source doesn't have one provided (250.0001570.1).

d. Fan should be used in fair weather conditions.

e. When storing fan, it should be covered with a tarp, or some type of covering as to keep dry as much as possible. (Some teams have used grill covers to suffice for this).

f. Fan also may be used to blow smoke fumes away while welding on manganese frogs, or any type of weld repair.

DONT'S

a. Fan will not to be used in inclement weather conditions, such as rain, snow, sleet, etc.

b. Fan is not to be placed in a wet location or puddles, even if the weather conditions are dry, such as a mud location in track. Move to a dry area.

c. Fan will not be used if any portion of the grilling, cord or safety guard area is damaged or missing. Authorized repairs must be made or the fan replaced.

d. If an extension cord is used for powering the fan, it must be rated to match or exceed that of the fan.

e. If the fan is placed in track, the power cord is to either be run under rail in center of check not touching any metal portion of rail, rail anchor or tie plate. If it isn't run under the rail, it must have a rubber pad or some type insulator between power cord and rail. (A round pipe insulator works well for this application).

f. The fan must not blow directly on weld arc. Doing this will blow away the shielding gas which causes porosity holes.

6. There are usually three reasons that a frog must be welded.
    a. Cracks have developed to the point where a weld repair is necessary to make the frog safe and prevent further damage.
    b. The point needs to be built up because of wear or depression.
    c. Large sections have broken out, or deep sections are to be removed to correct spalling, chipping, or cracking.

7. Turnout and railroad crossing frogs must be rebuilt before the point is chipped, broken, or worn more than 5/8" down and 6" back, which is the FRA 10 MPH Slow Order Limit (FRA §213.137 (B)).

8. Turnout and railroad crossing frogs should be rebuilt when the tread surface has worn ¼" below the original surface, but must be rebuilt before the tread wear exceeds 3/8", which is the FRA 10 MPH Slow Order Limit (FRA §213.137 (C)).

9. Self-guarded frogs should be rebuilt when the raised guard has worn ¼" from the original contour, but must be rebuilt before the wear exceeds 3/8" (FRA §213.141 (A).

10. Conformal frogs with RBM and boltless conformal frogs must be repaired before the point is chipped, broken, or worn more than 5/8" down and 6" back, which is the FRA 10 MPH Slow Order Limit (FRA 213.137 (B). The notched straight edge gauge designed to determine the depth of wear or damage on conformal frogs must be used. The correct notched gauge for measurement is dependent on the type of conformal frog being inspected.

11. Approved welding rods and wires for manganese steel frog repairs are on page N-1.

12. The Signal Maintainer will be notified in advance whenever welding is to be performed in track circuit territory.

13. See *Section "A", Safety*, for instructions for electric arc welding in track circuit territory.

PRELIMINARY WORK

1. Prior to welding, frogs and railroad crossings must be inspected in the following areas and corrections made as required.

a. Good surface and crosslevel from ahead of the toe joint to past the heel joint. Defective ties should be replaced and tamped.
b. Measure guard check gage and guard face gage and correct, if necessary.
c. Check and tighten frog, guardrail, and joint bolts. Torque bolts in compliance with MWI 707 to equalize wear on bolts.

2. The running surface of the casting usually has areas that are not greatly worn. By using a 36" straight edge in these areas, low spots and the amount of build up can be determined. Lightly grind the entire running surface of the casting and inspect for cracks. More grinding will be required at high impact points which are at the frog point, the wings next to the point, and at the rail joints.



Photo G-7

3. Manganese steel work hardens under impact. Arc gouge or grind out all loose, deteriorated, cracked, and work hardened material to clean parent metal. All cracks must be "veed" their full length and depth. Cracks will be sealed and a buffer pad of 2 layers of an approved stainless rod will be applied. Do not deposit any stainless closer than **3/4"** to a running surface. Care must be taken to ensure that all defective material is removed. **NEVER** use a torch to prepare manganese steel components. A grinding depth of 1/8" is usually sufficient but 3/16" may be required in high impact areas. Sharp edges along the flangeway are to be removed.

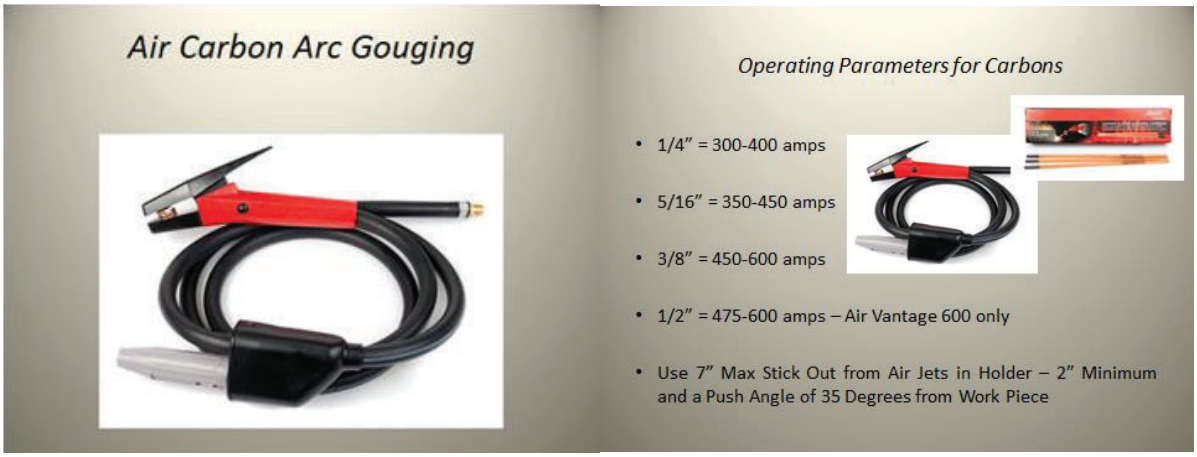


Photo G-8

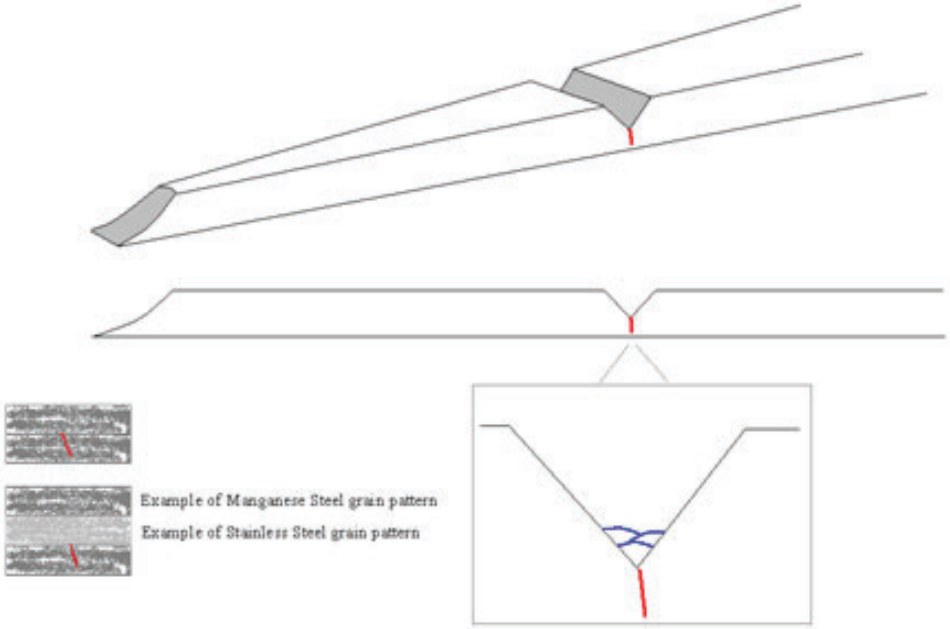


Photo G-9



Photo G-10

4. If the Welder has been specifically trained in the use of air-arc metal removal it must be used. Air or water may be used to assist in cooling the manganese steel casting, following the manufacturer's recommendations.

The Welder must monitor the temperature of the casting during the repair by using an approved thermometer or a 450°F Tempilstik. To use the Tempilstik, mark the component approximately ½" below the surface on which the weld metal will be deposited. If the Tempilstik mark melts during the welding process, the welding must be stopped. Welding at another location on the component is advisable, while the original location is allowed to cool.

If stainless material is used to seal cracks, the first two frog manganese passes will be at the lowest speed allowed by material specification (175 IPM). This is done to not dilute or dig out the seal.

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PROCEDURE FOR REPAIRING RAILBOUND MANGANESE FROGS AND RAILROAD CROSSINGS

1. Be sure that the ground connection is securely attached to the component.



Photo G-11

2. Use an approved wire or 3/16” welding rod for the electric-arc process. The type electrode to be used depends on the depth of the metal that must be laid down.

3. Use a standard flangeway gauge (See Sketch G-3 015.0001750.1) to check the flangeway opening and riser slope as welding progresses.

4. **Never** preheat manganese steel. If below 32° F, take the chill out of the casting. Only use a torch to warm up rail (100°) and remove moisture.

5. Proper voltage or amperage is required by the work being done and the size and type of wire or rod being applied will be used. Make the weld at such a rate that the bead will not be wider than 5/8” nor higher than 3/16”.

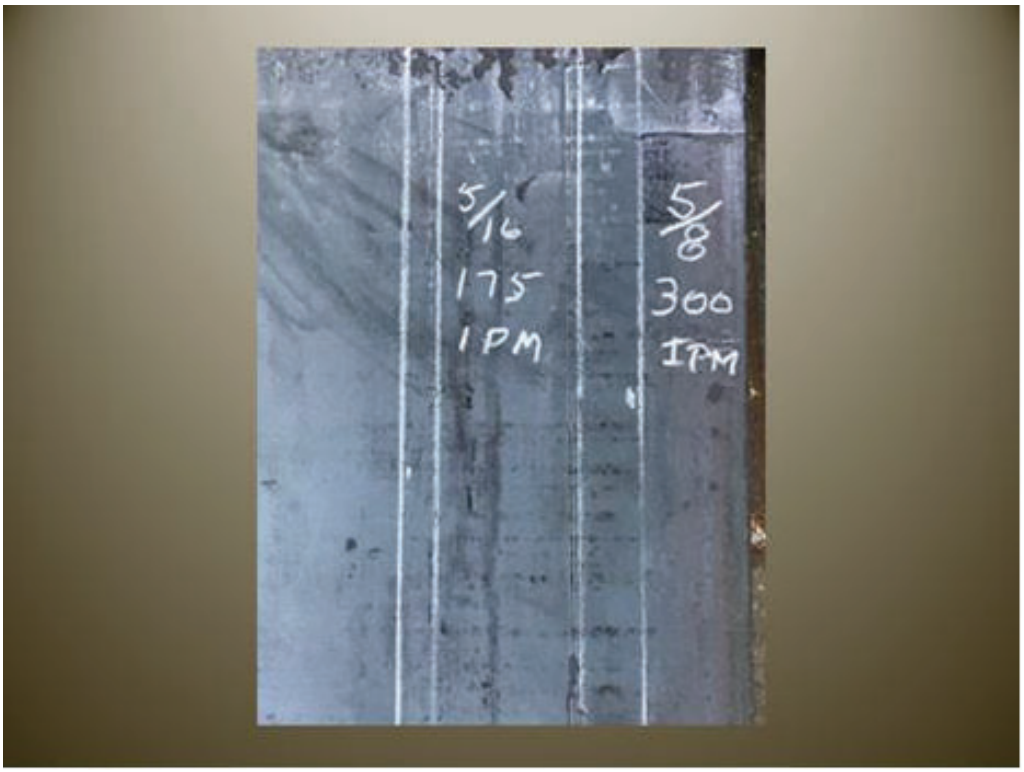


Photo G-12

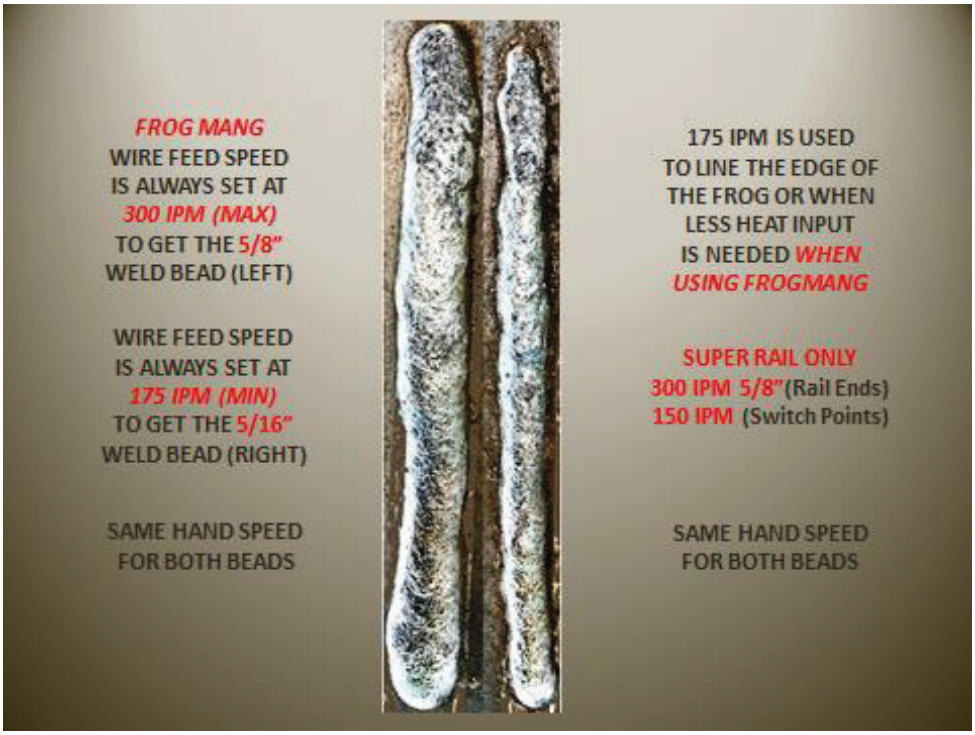


Photo G-13

6. **Skip weld whenever possible.**

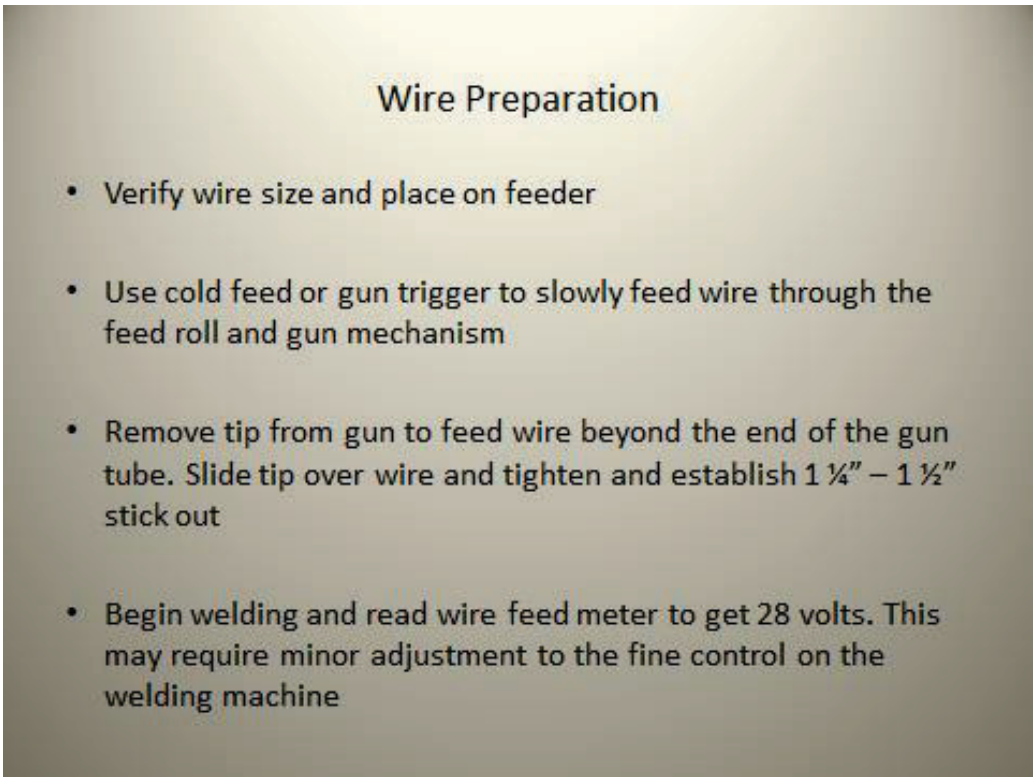


Photo G-14

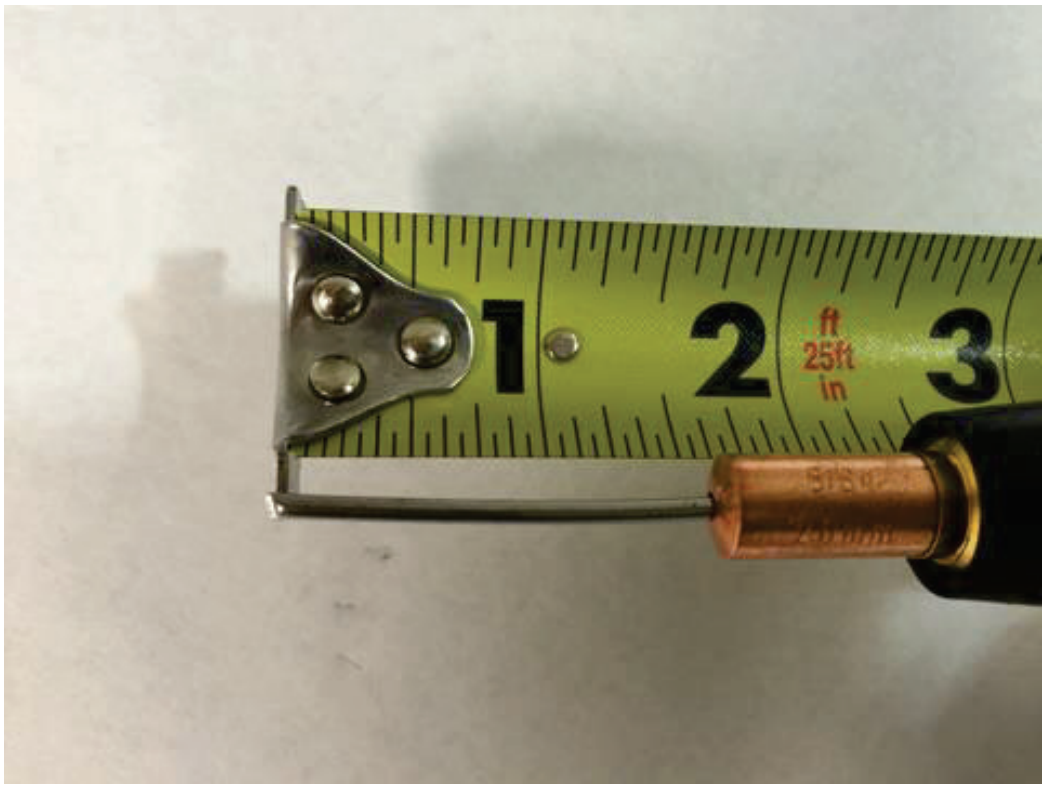


Photo G-15

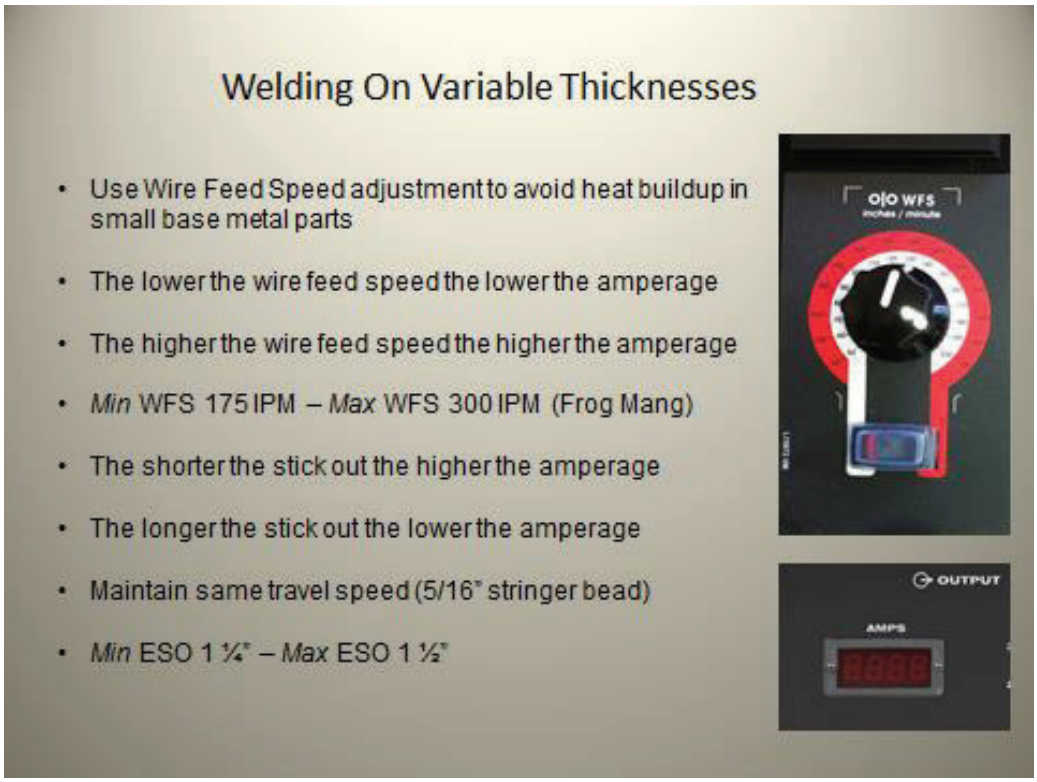


Photo G-16



Photo G-17

7. Beads should not start or stop at the edge of the casting.

8. Every bead must be cleaned and peened to relieve stresses before depositing the next bead. NOTE: Weld beads making up the stainless buffer pad should NOT be peened.



Photo G-18

9. The final deposits should be built up high enough, so that when the grinding is completed, there will be no welding marks or seams visible and the finished surface will be smooth. In the wheel transition area of the frog, **the point and the wing rails must be finished to the same level, even if the repair is not completed at this time**. Plans must be made to return and complete the repair.

10. The built-up casting should be carefully ground and contoured. Special attention must be given to restoring a smooth and even running surface and to restoring the corner radii. Do not leave sharp corners. Use the flangeway gauge and 36" straight edge often during grinding to check openings, flat running surface (no waves) and radii.



Photo G-19



Photo G-20

11. After grinding, the welder will check the casting using a 36” straightedge and frog flangeway gauge. The surface tolerance is 0” low and 0.030” high. The top of the frog point will be low at the point and taper up to zero, as shown on Sketches G-1 and G-2. The flangeway will conform with the flangeway gauge, as shown on Sketch G-3.

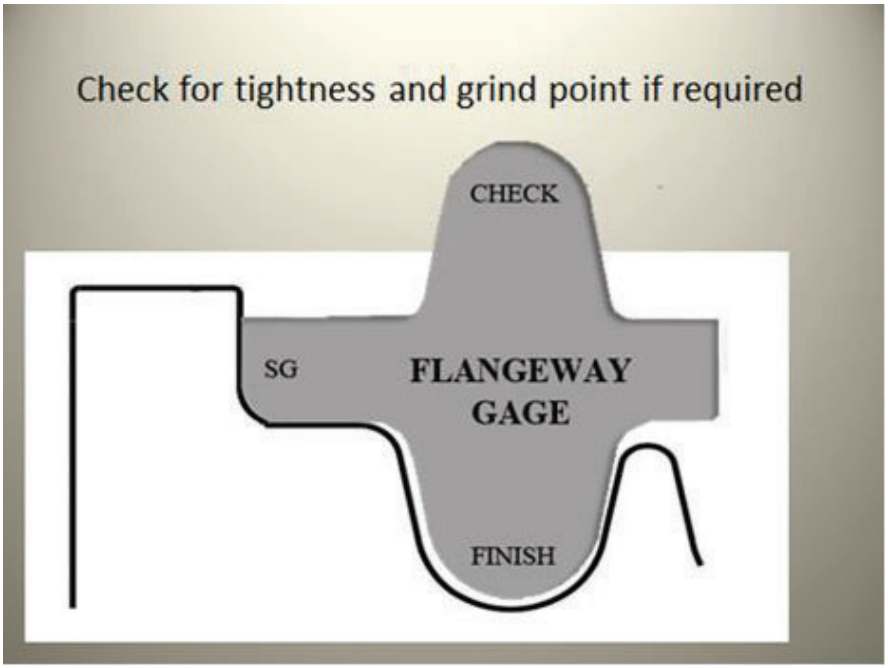
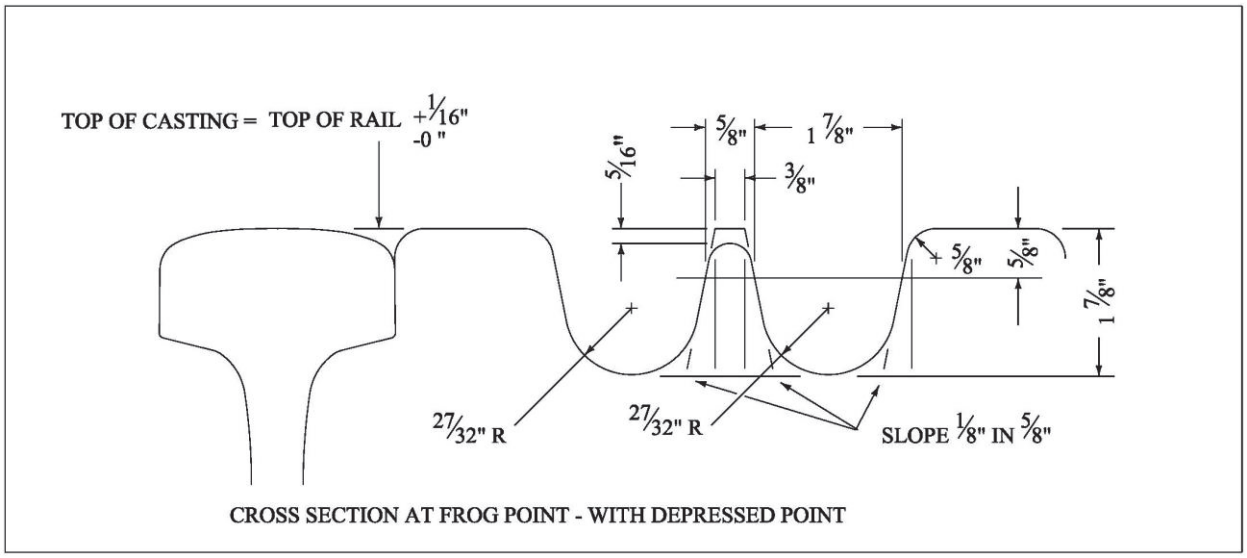


Photo G-21

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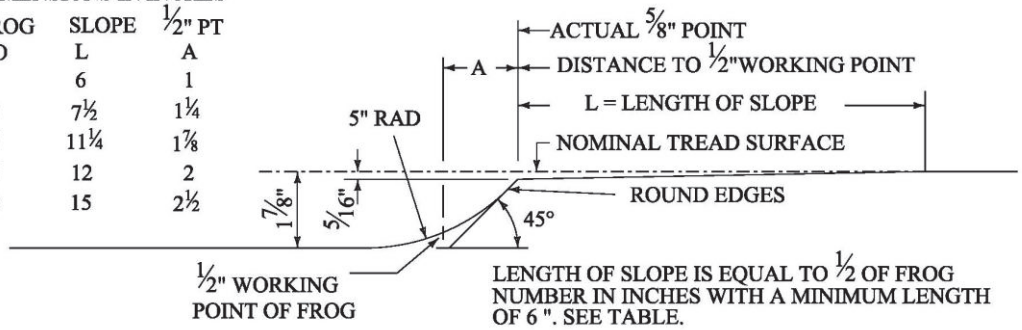


CROSS SECTION AT FROG POINT - WITH DEPRESSED POINT

Sketch G-1

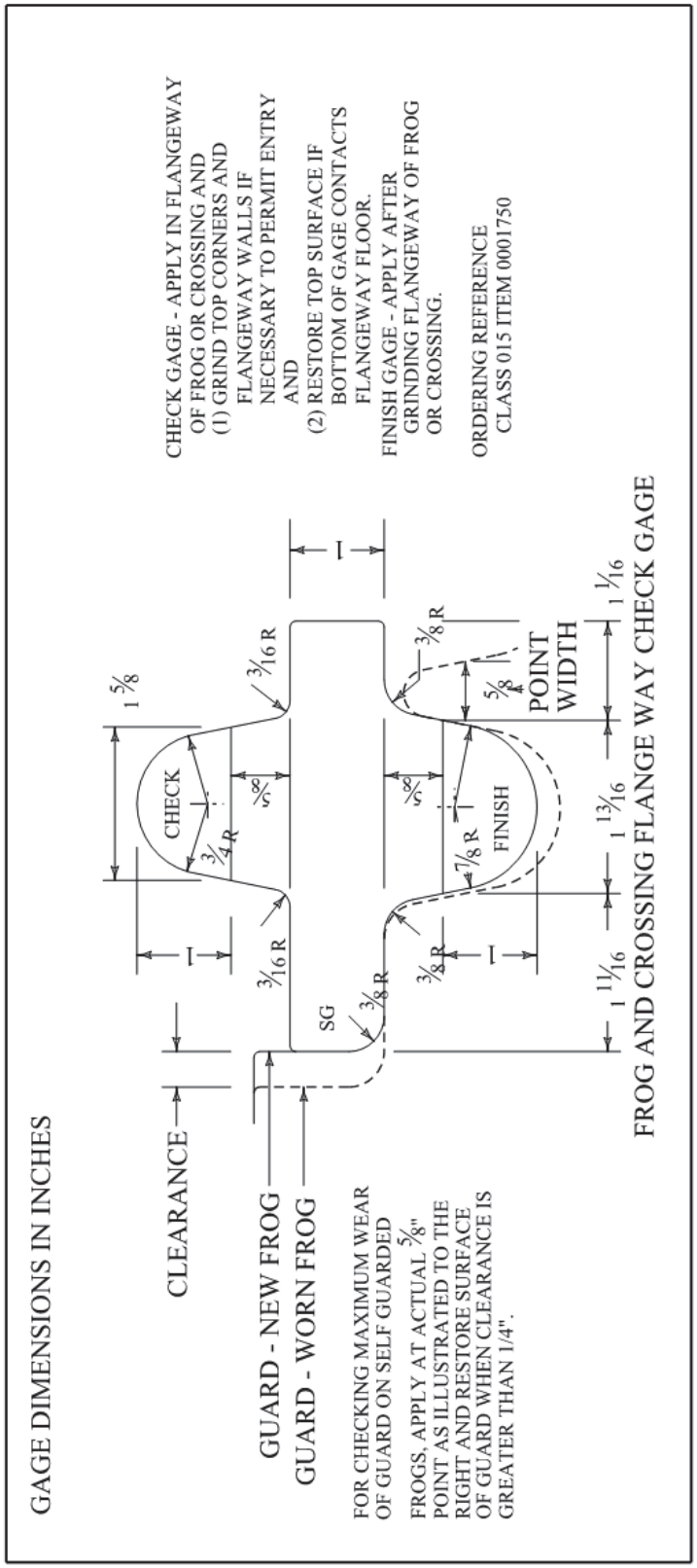
DIMENSIONS IN INCHES

FROG NO	SLOPE L	1/2" PT A
8	6	1
10	7½	1¼
15	11¼	1⅞
16	12	2
20	15	2½



SIDE VIEW OF FROG POINT WITH DEPRESSED POINT

Sketch G-2


GAGE DIMENSIONS IN INCHES
CLEARANCE
GUARD - NEW FROG
GUARD - WORN FROG
FOR CHECKING MAXIMUM WEAR OF GUARD ON SELF GUARDED FROGS, APPLY AT ACTUAL 5/8" POINT AS ILLUSTRATED TO THE RIGHT AND RESTORE SURFACE OF GUARD WHEN CLEARANCE IS GREATER THAN 1/4".
CHECK GAGE - APPLY IN FLANGEWAY OF FROG OR CROSSING AND (1) GRIND TOP CORNERS AND FLANGEWAY WALLS IF NECESSARY TO PERMIT ENTRY AND (2) RESTORE TOP SURFACE IF BOTTOM OF GAGE CONTACTS FLANGEWAY FLOOR.
FINISH GAGE - APPLY AFTER GRINDING FLANGEWAY OF FROG OR CROSSING.
ORDERING REFERENCE CLASS 015 ITEM 0001750
1 5/8
CHECK
3/4 R
3/16 R
SG
3/8 R
7/8 R
FINISH
5/8
POINT WIDTH
1 1/16
1 11/16
1 13/16
FROG AND CROSSING FLANGE WAY CHECK GAGE

Sketch G-3

The junction between the castings and rail components will be slotted 1/8" wide and ¼" deep to prevent chipping and spalling of the metal.

12. Measure the guard check gage and the guard face gage after grinding is completed to be sure it has not been changed (See Sketches G-45 and G-56).

13. For OWLS crossings, ensure excessive metal flow is removed on both the manganese casting and on the main line continuous running rail. Only remove metal flow and do not remove parent metal. Grooving on the main line continuous running rail is to be expected.

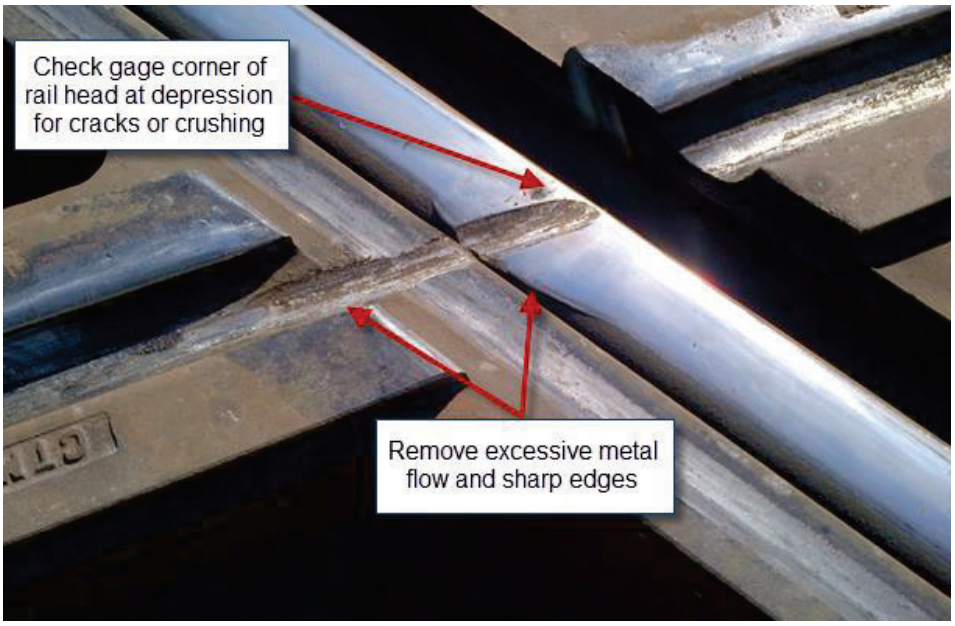
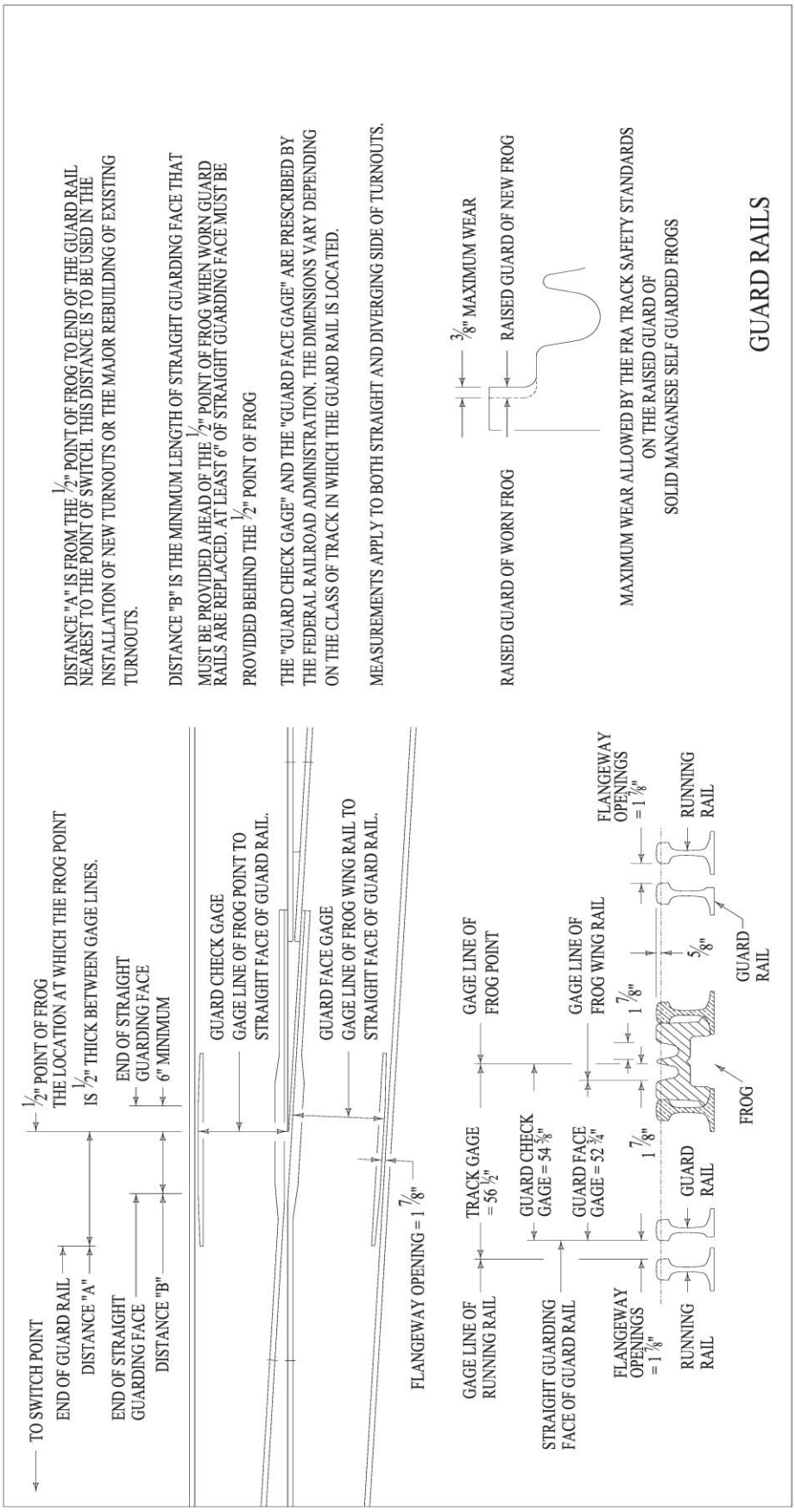


Photo G-22

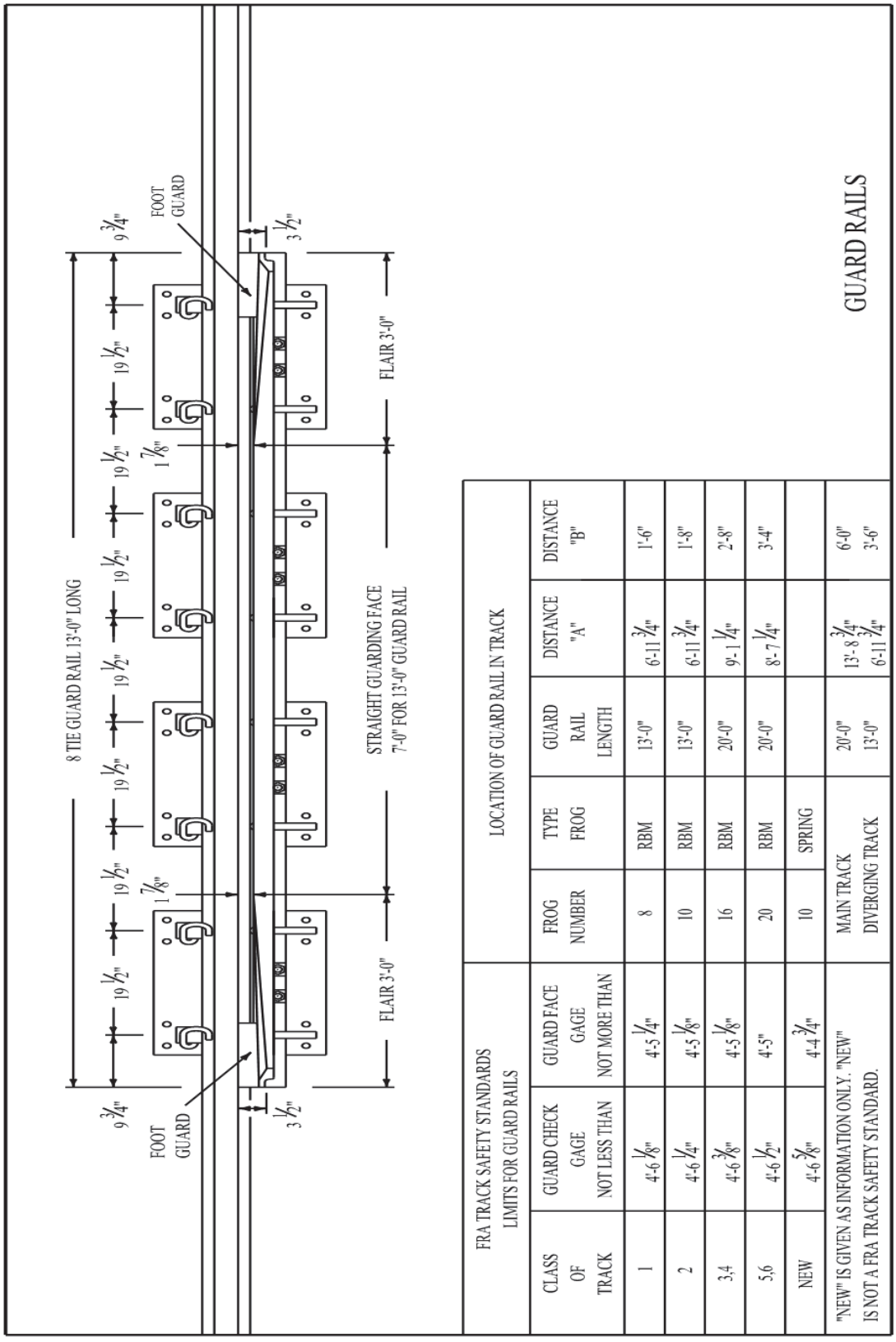


Photo G-23


TO SWITCH POINT
END OF GUARD RAIL
DISTANCE "A"
END OF STRAIGHT GUARDING FACE
DISTANCE "B"
½" POINT OF FROG
THE LOCATION AT WHICH THE FROG POINT IS ½" THICK BETWEEN GAGE LINES.
END OF STRAIGHT GUARDING FACE
6" MINIMUM
GUARD CHECK GAGE
GAGE LINE OF FROG POINT TO STRAIGHT FACE OF GUARD RAIL.
GUARD FACE GAGE
GAGE LINE OF FROG WING RAIL TO STRAIGHT FACE OF GUARD RAIL.
FLANGEWAY OPENING = 1 7/8"
GAGE LINE OF RUNNING RAIL
TRACK GAGE = 56 ½"
GAGE LINE OF FROG POINT
STRAIGHT GUARDING FACE OF GUARD RAIL
GUARD CHECK GAGE = 54 ⅜"
GUARD FACE GAGE = 52 ¾"
GAGE LINE OF FROG WING RAIL
FLANGEWAY OPENINGS = 1 ⅛"
1 7/8"
1 7/8"
5/8"
RUNNING RAIL
GUARD RAIL
GUARD RAIL
FROG
RUNNING RAIL
FLANGEWAY OPENINGS = 1 ⅛"
DISTANCE "A" IS FROM THE ½" POINT OF FROG TO END OF THE GUARD RAIL NEAREST TO THE POINT OF SWITCH. THIS DISTANCE IS TO BE USED IN THE INSTALLATION OF NEW TURNOUTS OR THE MAJOR REBUILDING OF EXISTING TURNOUTS.
DISTANCE "B" IS THE MINIMUM LENGTH OF STRAIGHT GUARDING FACE THAT MUST BE PROVIDED AHEAD OF THE ½" POINT OF FROG WHEN WORN GUARD RAILS ARE REPLACED. AT LEAST 6" OF STRAIGHT GUARDING FACE MUST BE PROVIDED BEHIND THE ½" POINT OF FROG
THE "GUARD CHECK GAGE" AND THE "GUARD FACE GAGE" ARE PRESCRIBED BY THE FEDERAL RAILROAD ADMINISTRATION. THE DIMENSIONS VARY DEPENDING ON THE CLASS OF TRACK IN WHICH THE GUARD RAIL IS LOCATED.
MEASUREMENTS APPLY TO BOTH STRAIGHT AND DIVERGING SIDE OF TURNOUTS.
3/8" MAXIMUM WEAR
RAISED GUARD OF NEW FROG
RAISED GUARD OF WORN FROG
MAXIMUM WEAR ALLOWED BY THE FRA TRACK SAFETY STANDARDS ON THE RAISED GUARD OF SOLID MANGANESE SELF GUARDED FROGS
GUARD RAILS

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Sketch G-4



GUARD RAILS

FRA TRACK SAFETY STANDARDS LIMITS FOR GUARD RAILS			LOCATION OF GUARD RAIL IN TRACK				
CLASS OF TRACK	GUARD CHECK GAGE NOT LESS THAN	GUARD FACE GAGE NOT MORE THAN	FROG NUMBER	TYPE FROG	GUARD RAIL LENGTH	DISTANCE "A"	DISTANCE "B"
1	4'-6 1/8"	4'-5 1/4"	8	RBM	13'-0"	6-11 3/4"	1'-6"
2	4'-6 1/4"	4'-5 1/8"	10	RBM	13'-0"	6'-11 3/4"	1'-8"
3,4	4'-6 3/8"	4'-5 1/8"	16	RBM	20'-0"	9'- 1 1/4"	2'-8"
5,6	4'-6 1/2"	4'-5"	20	RBM	20'-0"	8'- 7 1/4"	3'-4"
NEW	4'-6 5/8"	4'-4 3/4"	10	SPRING			
"NEW" IS GIVEN AS INFORMATION ONLY. "NEW" IS NOT A FRA TRACK SAFETY STANDARD.			MAIN TRACK		20'-0"	13'- 8 3/4"	6'-0"
			DIVERGING TRACK		13'-0"	6'-11 3/4"	3'-6"

Sketch G-5

PROCEDURE FOR REPAIRING SELF-GUARDED MANGANESE STEEL FROGS

1. The procedures specified for railbound manganese steel frogs are to be used for self guarded frogs.

2. Additional requirements for self-guarded frogs:

   a. The guards on self-guarded frogs must be welded and ground to contour prior to welding the point and wings of the frog.
   b. Check the amount of wear on the raised guard by placing the gauge in the flangeway at the actual point (5/8" Point). It may necessary to remove the flow from the flangeway to permit entry of the gauge. If the clearance between the "SG" end of the gauge is more than ¼", the guarding face should be repaired. It must be repaired before the clearance exceeds 3/8".
   c. To repair the guarding face of a frog under traffic, first place a ¼" bead at the top of the guard to ensure that the frog point is protected. Then begin at the bottom and build toward the top. After all welds have been made and ground, use the gauge to check the work.
   d. Check the point, wings and flangeway of the frog by placing the gauge, "check" side down, into the flangeway. If the gauge contacts the flangeway floor, the running surface of the frog must be built up and ground to a true surface using the same repair techniques employed on other manganese steel frogs and railroad crossings.
   e. Build up the point if required.
   f. After the point, wings and flangeway repairs are completed recheck the guard by using the gauge. If the clearance between the gauge and the guard is too tight, further grinding should be done on the point, not the guard, to provide the correct clearance.

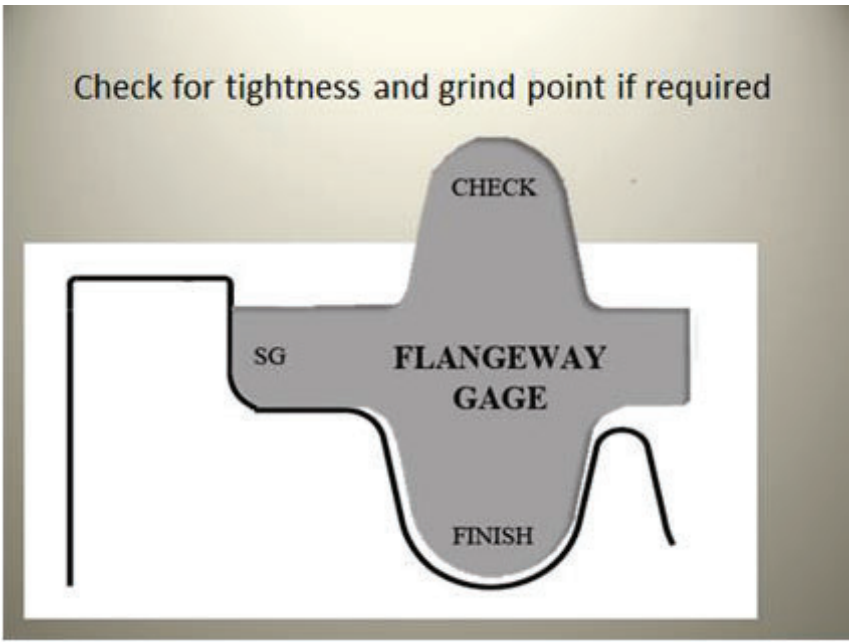


Photo G-24

PROCEDURE FOR REPAIRING SPRING FROGS

1. Inspect frog for rail flow, broken bolts, proper clearance between horns and housing, welds or bolts securing housing to plates, spring tension for wing rail, chipping or other damage to point and other frog parts. See MWI 609 Inspections and Maintenance of Spring Frogs.

2. Rail ends on frogs will be repaired using the appropriate techniques for repairing fully heat-treated rail or head hardened rail described in this manual. Any additional welding repairs on spring frogs will not be made until the welding manager is contacted.

PROCEDURE FOR REPAIRING BOLTED RAIL FROGS AND RAILROAD CROSSINGS

General

1. Rail end batter in fully heat treated rails, head hardened rails and rails in contact with manganese steel castings will be repaired through the use of the electric-arc welding process.

2. Rail ends, that are battered, chipped or spalled, should be repaired to prevent further damage to the rail ends and accelerated deterioration of the other track components.

3. Rail end repairs should be made when the batter reaches the limits as listed below:
   1/8 inch (0.125”) where freight train speed exceeds 60 MPH
   1/4 inch (0.250”) where freight train speed exceeds 40 MPH
   3/8 inch (0.375”) where freight train speed exceeds 10 MPH
   1/2 inch (0.500”) where freight train speed is 10 MPH or on excepted track.

4. Batter is the distance, measured in thousandths of an inch, between an approved 36” straightedge and the top of rail 1/2 inch in from the end of the rail as shown in Sketch D-1.

5. Slot grinding to prevent chipping due to overflow will performed on rail ends and the area between parallel rails.

Preliminary Work

Prior to welding, frogs and railroad crossings must be inspected in the following areas and corrections made as required.

1. Good surface and cross level from ahead of the toe joint to past the heel joint. Defective ties should be replaced and tamped.

2. Measure guard check gage and guard face gage and correct, if necessary.

PROCEDURE FOR REPAIRING BOLTED RAIL FROGS AND RAILROAD CROSSINGS

1. Be sure that the ground connection is securely attached to the component. Use of a magnetic ground clamp is recommended.

2. Approved welding rods and wire for welding the rail ends of frogs are listed on Page N-2.

3. Use a flangeway gauge to check the flangeway opening as welding progresses (See Sketch G-3).

4. Use an approved 36” straightedge to mark the limits of the repair. The repair limits should be marked at an angle across the top of rail so that the length of the repair on the gage side will be approximately one inch (1”) longer than on the field side.

5. Rail ends to be repaired must be clean, free from dirt, dust, oil, grease or other foreign substance. Grind out all damaged metal down to sound and clean parent metal. The removal must not be accomplished through the use of a torch.

6. Before welding, preheat the ground railhead to approximately 800°F for a distance of 8” beyond the weld area in each rail requiring repair. Carefully examine it for cracks. Cracks will appear as dark hair lines in the heated area. If cracks are present, further grinding is required.

7. Welding must begin immediately after preheating and the 800°F preheat maintained in the area surrounding the repair.

8. The welding should proceed as beads across the railhead. Each bead must be peened while the deposit is hot to relieve welding stresses. The weld should be extended beyond the rail end and the excess metal removed by slotting after the weld is completed.

9. Enough weld material should be deposited so that the unground surface will be higher than the rail and that grinding will eliminate the visible welding marks and seams.

10. With fully heat treated and head hardened rails, post-heat the welded area to approximately 800°F immediately after the welding operations. After post-heating, it is most important that the rail cool slowly to 200°F. It may be necessary to protect the weld area with a welding blanket (280.2350200.1) to obtain the desired slow cooling and against rain, snow, etc.

11. It is very important that preheating and post-heating be diligently performed to obtain a quality repair weld.

12. Use the surface grinding attachment to grind the weld area to a smooth surface and true rail contour.

13. After the welds are made and allowed to cool, an inspection must be made to determine the straightness of the rail. Use an approved 36” straightedge. Surface tolerance is -0.000 inch/ +0.030 inch

PROCEDURE FOR REPAIRING CONFORMAL FROGS

Conformal frogs have been in use on CSX since 2008. The conformal frog design protects the frog point and permits longer life before the first weld repair is required as compared to older standard rail bound manganese (RBM) and boltless (WBM/FBW) flat frogs. To ensure the correct methodology of inspecting and repairing of conformal frogs is used, the following procedure is adopted.

The current CSX frog designs are:

- No 8 and No 10 frogs, the point is contoured at a 1:20 ratio of slope (3 degrees) as well as the wing portion of the casting to meet the contour of new wheels on the trucks. It is normal for a wear pattern to form in a conformal frog on the wing tread portion. See photos G-26.
- No 15 and No 20 frogs, the point is contoured at a 1:20 ratio of slope (3 degrees) with a 5/16” point slope, yet the wing portion of the casting is flat. Photo G-27

This section addresses the maintenance and repair of all frog types and the weld repairs are the same. The gauge set for checking wear can be used for both the conformal frog RBM and boltless.



Photo G-25

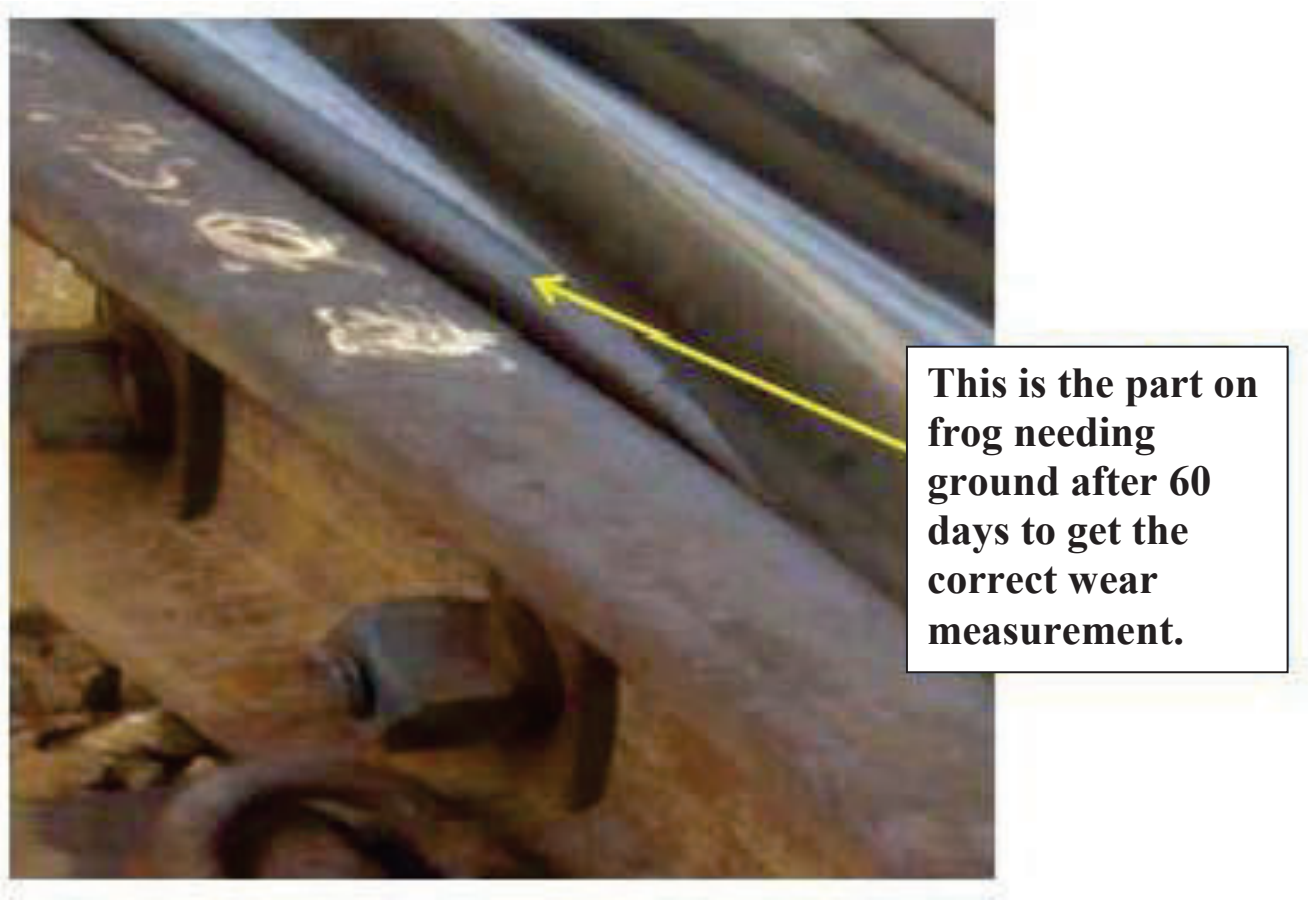
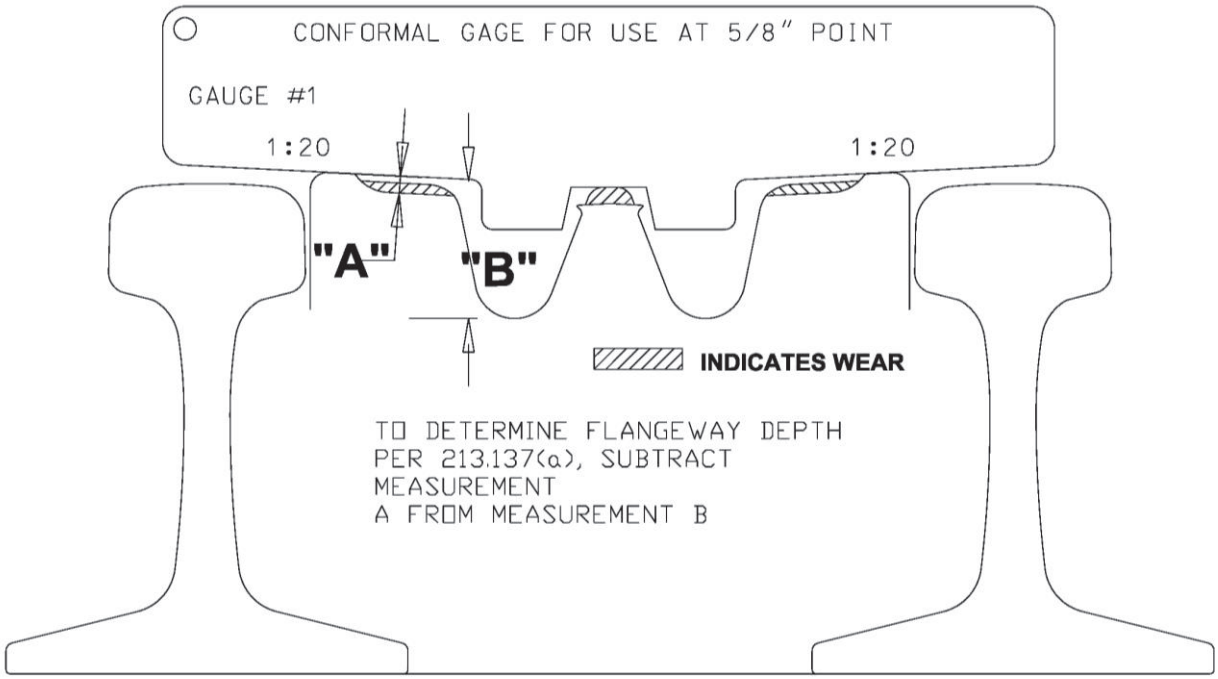


Photo G-26

After the frog has been in service for a period of 60 days, the manganese material build up metal left on the wing portion of the frog should be removed by grinding from the point of where the second gauge (shown later) is placed on the frog to a height level with a straight edge. It is to get a correct measurement of wear. The humped up metal is caused by excess metal flow. The location of the second gauge is dependent on the frog size. See Table 1 in this section for the proper location of the second gauge. This will help determine true wear on the frog. A welding manager should be contacted to help ensure this is done correctly.

During routine inspections, place the conformal frog gauge #1 along the top of the casting. The outer edge of the casting does not have tread wear and can be used to support the conformal frog gauge. See Sketch G-6 below on the following page. If the tread wear exceeds 3/8" below the original contour it must be repaired or slow order to 10 mph.

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CONFORMAL GAUGE FOR CHECKING TREAD WEAR AND FLANGEWAY DEPTH AT POINT

Sketch G-6



Photo G-27 – Full Conformal Design

The wing tread portion of the casting must be repaired when the wear exceeds 3/8" below the original contour when using the conformal frog gauge #2.

TREAD REPAIR: If repairs are required on the wing tread portion of the casting the repair area should be repaired back to flat with wear contour after finish grinding is complete. The repair must be checked using a conformal frog gauge #2 for both frogs with RBM and for boltless frogs and taper gauge (015.1001700.1). Flip over to flat edge to confirm proper flat repair as in photos G-26 & G-27 below.

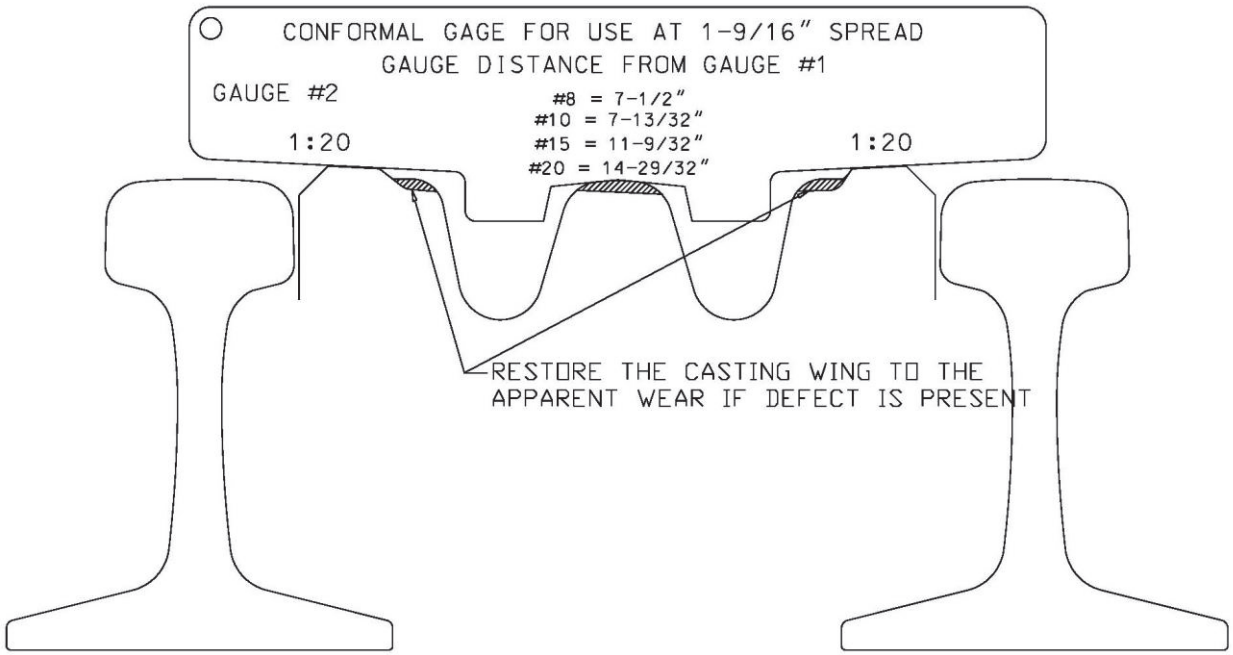


Photo G-28 – Flat Top Design

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Photo G-29 – Flat Top Design



CONFORMAL GAUGE FOR WELD REPAIR OF THE WING AND POINT AT 1 9/16" SPREAD

Sketch G-7



Photo G-30

Note: The height of the wing tread in the original casting on a full conformal frog is 3/16" greater than the height of the top surface of the wrap rail. See Photo G-30. Table 1 below gives the proper distance to place the #2 conformal frog gauge from the 5/8" frog point (actual point).

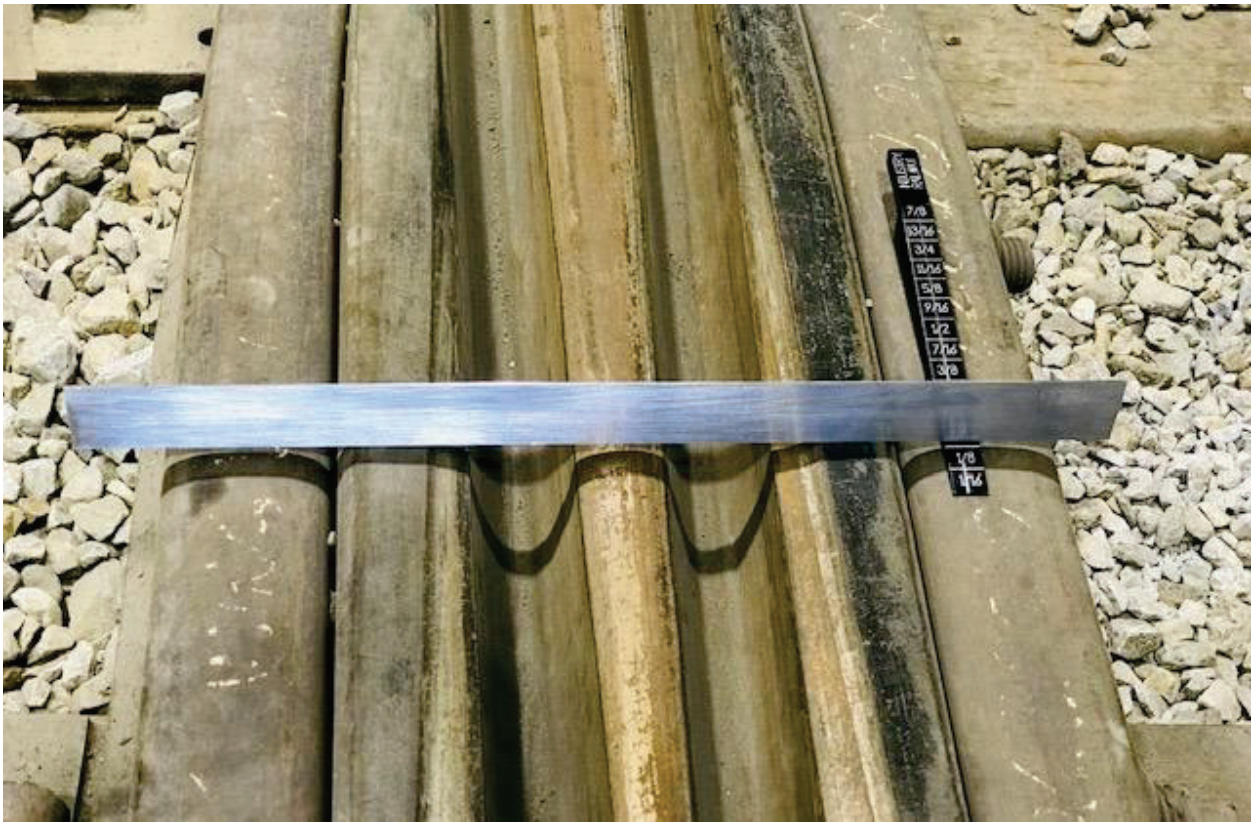


Photo G-31

Frog No.	Distance from #01 gauge
8	7 – ½”
10	7 - 13/32"
15	11 – 9/32"
20	14 - 29/32"

Table 1 – For RBM and Boltless (Conformal & Flat Top Designs)

POINT REPAIR: To check the frog point, use gauge #1 for both frog types. If the frog point is worn, broken, or chipped down more than 5/8” and back 6 inches (point area), the frog point must be repaired or slow order to 10 mph. (Sketch G-8 & Photo G-31). Photo G-32 provides an example of the boltless conformal frog with gauges on a #20 frog and Photo G-33 provides an example of a RBM. Conformal frogs have a 0” point slope. Flat top frogs have a 5/16” point slope length per Table 1 above.



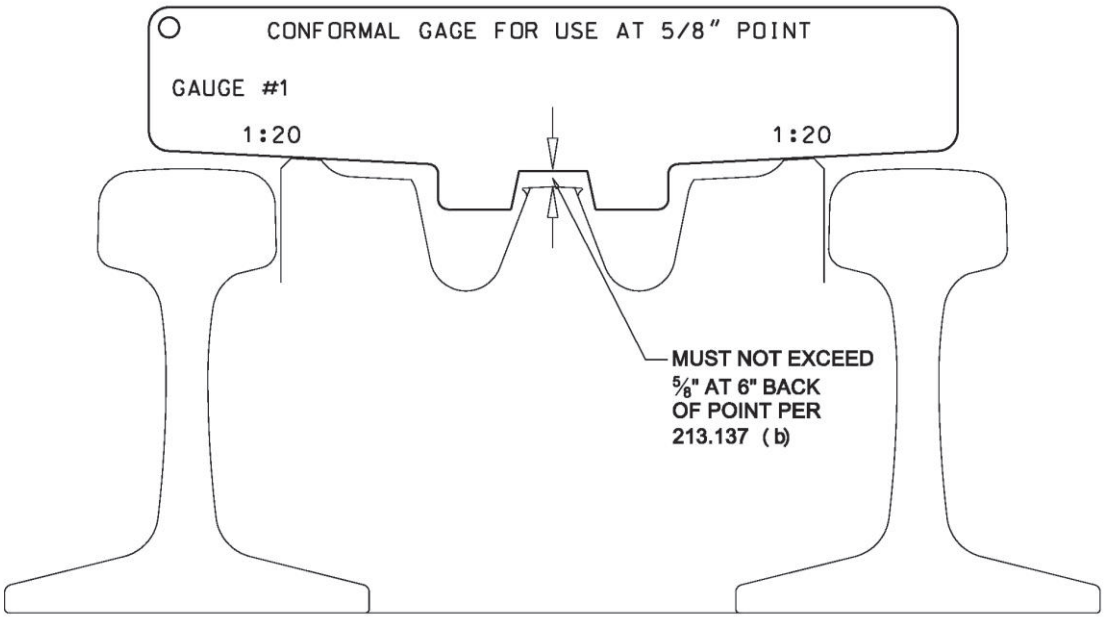
Photo G-32



Photo G-33 – Boltless



Photo G-34 – RBM



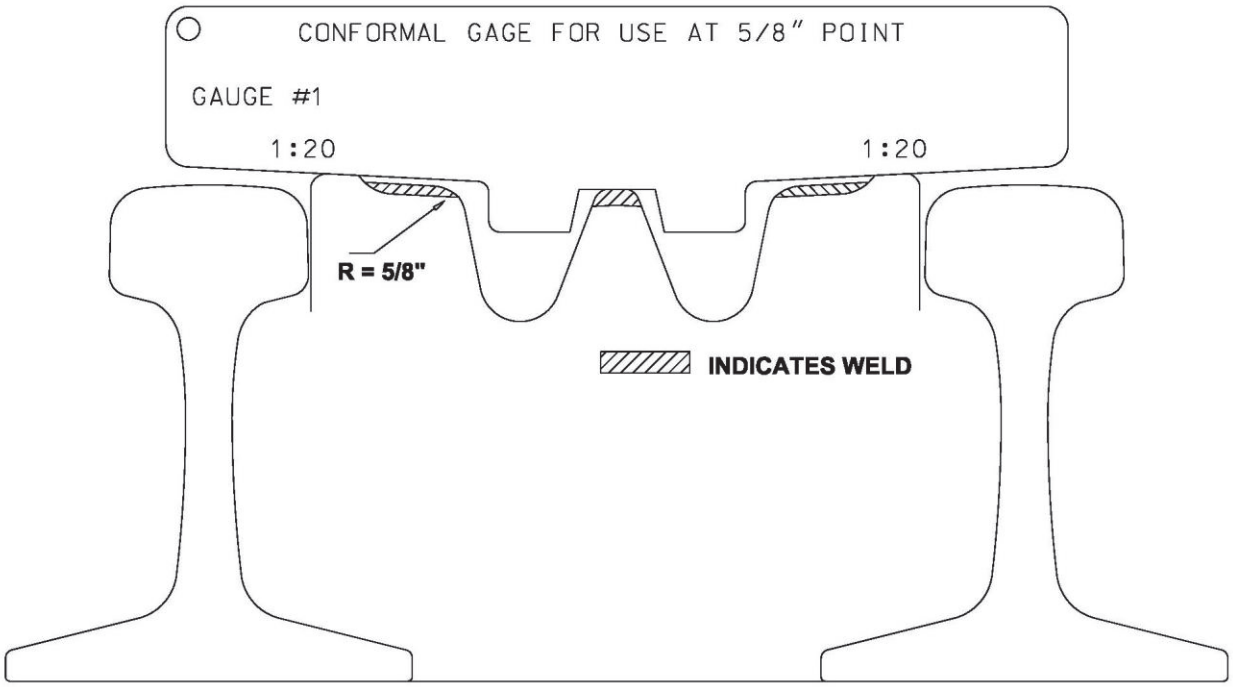
GAUGE TO CHECK 5/8" POINT WEAR ON CONFORMAL FROGS

Sketch G-8

Maintenance grinding of the overflow should be performed when needed.

When repairs are required on the tread area of the point, the area of the point should be brought up to a height that is level with the existing point after finish grinding, with the repaired area being brought up high enough to ensure no welding seams exist after grinding is complete. The repair must be checked using a 36" straight edge (451.0011330.1) or Flip over to flat edge to confirm proper flat repair as in photos G-26 & G-27 below.

New manganese track components must have maintenance grinding performed weekly as needed for a period of one month. Newly repaired manganese components should be maintenance ground at least once per week as needed for a period of three weeks.



CONFORMAL GAUGE FOR WELD REPAIR OF WING AND POINT.

Sketch G-9

Proper grinding for the point repair should be contoured to the 1:20 slope (3 degrees) matching the existing contour left on the point. See Sketch G-9. The existing casting includes the 1:20 slope which may or may not be present. Finish grinding may include the bevel; however, where the weld repair area meets the original casting, the contour should be blended in to allow for a smooth transition from the repair area to the original casting.

Note: The point of a conformal frog DOES NOT have a point slope as a traditional flat top frog design contains a 5/16" point slope. See Photo G-33. A point slope should be made so the point is below the original contour.



Photo G-35 – Flat Top with Point Slope

PROCEDURE FOR REPAIRING FLANGE BEARING FROGS



Photo G-36 – Flange Bearing SMSG

All sharp edges and over flow should be lightly ground (radius). Do not cause bluing. For self-guarded welding, refer to self-guarded frog procedures.



Photo G-37

Flange tread can be lightly ground. Weld only broken or chipped-out areas. Flangeway repair shall be welded to existing wear patterns. When welding, a 36" straight edge is to be used from heel to toe to check the straightness of the flangeway.



Photo G-38

Always check work when complete

PROCEDURE FOR FULL FLANGE BEARING RAILROAD CROSSINGS



Photo G-39

The goal is to “help” the material wear uniformly. Surface irregularities are always going to develop. Like a pot hole, a little dip turns into a big dip pretty quick if it isn’t fixed.

The design starts with a ¼” deep flangeway. As the material wears, the groove gets deeper. Once the groove gets to be 1” deep, new wheel profile can contact the rail head. As the flanges on a wheel can get to be more then 1-1/4” tall, the wear material depth will get deeper and new and shallower flange wheels will make head contact.

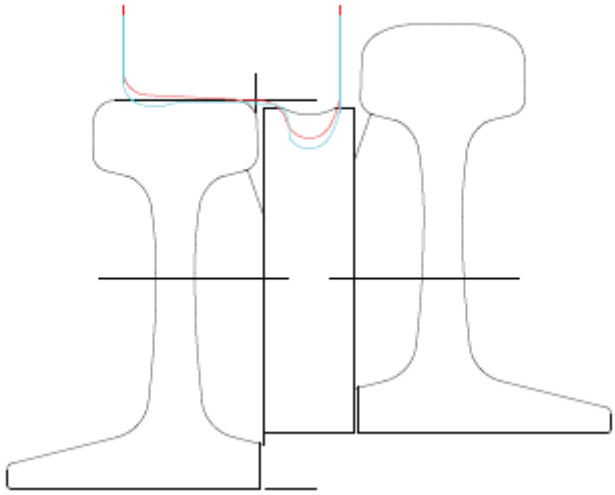


Photo G-40

Dips tend to develop faster where the crossing routes intersect and the filler material joints. These dips can develop impacts the same as a tread bearing crossing.

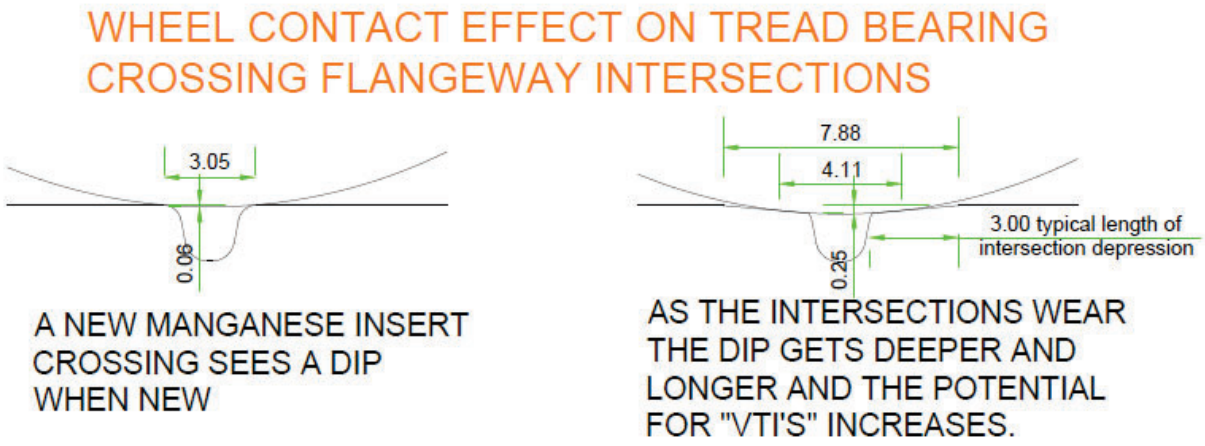


Photo G-41

The impact force is nearly the same as a worn tread bearing crossing and will generate (VTI's) Vehicle Track Interaction.

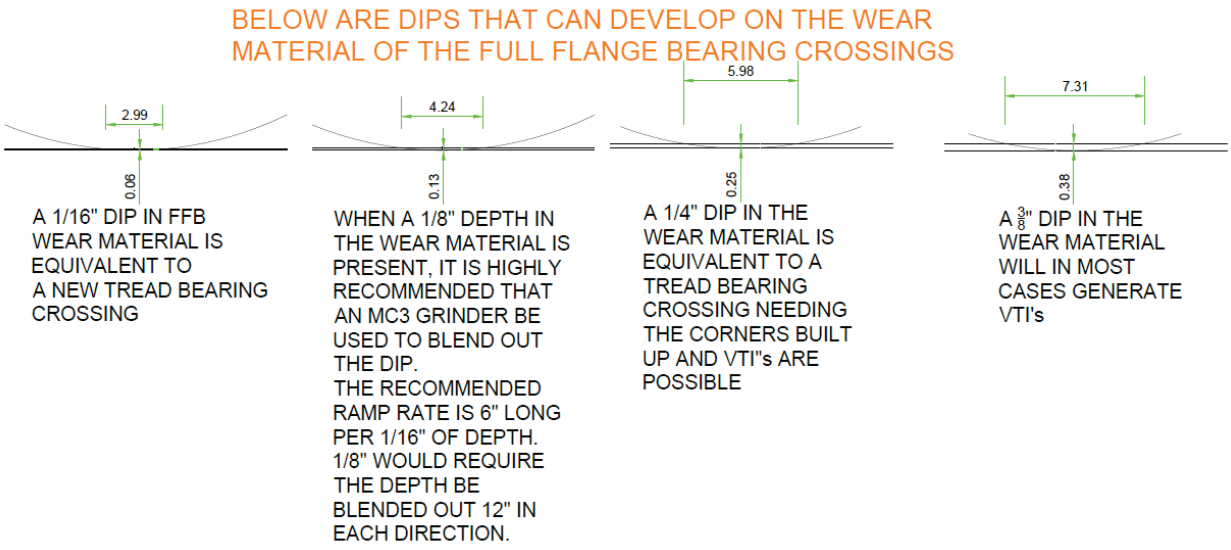


Photo G-42

If the surface isn't maintained the wear life will be cut in half. It is recommended that any dip 1/8" or more be ground immediately. The MC3 grinding of a FFB crossing is the equivalent to the weld repair of a tread bearing crossing.



Photo G-43

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H. CUTTING RAIL

GENERAL



Photo H-1

1. The FRA *Track Safety Standards* have two subparts that specifically address torch cut rails. In general, the FRA states: "**Except as a temporary repair in emergency situations**, no rail having a torch cut end shall be used in Classes 3 through 5 track" and above track. "When a rail end is torch cut, train speed over that rail end shall not exceed the maximum allowable for Class 2." **After trains have run and emergency situation has ended all torch cut rail will be replaced with saw cut rail**.

2. All rail ends must be cut square and straight.

3. If more than one (1) hour has elapsed since the torch cut was made the rail must be replaced.

4. Cutting rail on timber structures or open deck bridges is not permitted without specific approval of the Manager-Bridges or their designated representative. If rail is to be cut on a structure, a fire prevention and response plan must be developed and implemented.

5. **All rail ends that will be used for thermite welding will be saw cut**.

6. To remove torch cut rail ends a minimum of 3/8 inches of rail will be removed by making a saw cut. The thickness of the saw blade may be considered to be part of the 3/8 inch minimum to be removed. Visually inspect the rail end for defects after the cut has been made. This procedure must be performed within (1) hour.

CUTTING RAIL UNDER COMPRESSION

The following steps should be taken to safely, and properly relieve rail that is in compression.

1. Select a location to cut rail with torch in center of crib, not less than 10' from any existing weld in same rail. Select location on both rails with a minimum of a four tie stagger. Both rails will be cut when adjusting tight track.

2. Make a paint mark 2' on field side of rail on each end of location where cut will be made, (overall 4' distance) this will be measured again after rail is adjusted to determine amount of rail removed.

3. Remove ballast out of check where cut will be made to accommodate saw when used to remove torched rail ends.

4. Remove anchors for 10 ties on each side of area to be cut. (This will keep ties from shifting around when rail starts to come in).

5. Use torch to make a straight, complete cut through the rail in the center of the crib. (Use torch cutting guide if available) Start cut from base and cut upward in web area toward ball of rail, switch to opposite side of rail and cut remaining base section, once this is done, cut across the top of ball directly above previous cut to ensure straightness. (Using this process will keep you from having to remove slag from base area to be cut if you were to cut the ball first).

6. Move torch over 1 ½" and start at base of rail and cut within 1" of web area and cut across to previous cut. Move to opposite side of rail and start cut 1 ½" from previous cut and cut within 1" of web and cut across to previous cut through rail. Remove the base cuts with hammer and track punch. (Use of face shield is mandatory)

7. Use torch and start in previous complete cut 2" above base in web of rail and cut across 1 ½" and cut up web area to bottom of ball of rail. Cut ball of rail directly above cut and ensure straightness. Remove ball and web of cut rail with hammer and track punch. (Use of face shield is mandatory)

8. At this time the only area left is the web-base area, now the torch will be used to slowly, safely cut through the center of the remaining rail in the area. Use torch to continue as many passes needed until rail is relieved. If rail runs back tight together follow steps 6 and 7 again, but take caution to only remove in ½" increments at this time.

9. Once rail has quit running, the rail saw should be used to remove a minimum of 3/8” of rail off the torch cut portion of rail, (The saw blade width should be used in the measurement). Both rail ends are to be saw cut with the second rail gap cut a total of 1”. (Use of saw at this point will cut down on amount of heat in rail to be considered after adjustment is made to make the field weld).

10. Remainder of anchors will be removed for 200 ties each side of the cut rail. (Anchor removal will start at the cut and work outward from cut to remove the chance of rail bunching between end of 200 ties and cut).

11. The tie plates should be struck with sledge hammer to allow the rail to move, never strike the rail.

12. As the rail comes together, the rail saw should be used to remove rail, not to exceed a 1” gap at any time due to not knowing how far the rail will run and this will allow for a weld to be made when the rail stops running.

13. Steps 1 through 12 are to be followed for the opposite rail to be adjusted.

14. When rail has stopped running, the anchors are to be replaced starting at the end of the 200 ties and work toward the area of rail that was cut, this will allow for any remaining movement of rail. This will be done on both sides of the cut rail. The same procedure will be followed for the opposite rail.

15. After all anchors are replaced a field weld should be made, if for unknown reason a weld can’t be made, drill rail and apply joint bars.

16. Fill crib areas back in with ballast.

17. Replace any spikes that were removed to make field welds.

18. Re-measure rail reference marks to determine amount of rail removed from each rail.

19. Write weld information in web of rail per CSX Welding Manual.

20. Clean work area.

21. Fill out track disturbance record online.

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I. THERMITE WELDING

GENERAL

1. Only qualified welders will make field welds.

2. **Welds require a high degree of compliance with procedures and attention to detail,** therefore; specific equipment is required. Some required equipment includes a **digital CSX approved stopwatch** (451.0900410.1) and a taper gauge that must be used during the welding process. Stopwatch must not be worn loosely around the neck and is not to hang freely nor catch on any equipment or interfere with the use of a torch.

3. **Torch must be equipped with working in-line pressure gages at torch handle.**



Photo I-1

4. Thermite welding equipment and supplies must be kept dry at all times. The molds, portions, etc. must be kept in the original containers until ready to use. Thermite welding materials must be used within three years from the date of manufacture. Weld kits must be rotated (use up oldest, non-expired stock first) to prevent expiration of the kits. This date is stamped on each box. Store only the supplies needed for one day's work on the truck. If the situation requires large quantities of supplies, they may be stored on the truck after ensuring that the materials can be kept dry and damage free.

USE OF AIR CIRCULATER FAN

DO'S

a. Fan may be used by Thermite (field) Welding Team while make field welds to circulate air for cooling personnel in warm or hot temperatures.

b. Fan should be placed far enough from ongoing work as not to cause a tripping hazard, (suggested 10'), never in the foul of any track and should be placed on a level surface as not to turn over.

c. Fan must be plugged into a GFCI receptacle or a portable GFCI must be used if power source doesn't have one provided (250.0001570.1).

d. Fan should be used in fair weather conditions.

e. When storing fan, it should be covered with a tarp, or some type of covering as to keep dry as much as possible. (Some teams have used grill covers to suffice for this).

f. Fan also may be used to blow smoke fumes away while welding on manganese frogs, or any type of weld repair.

g. Inspect power cord and plug before each use.

DONT'S

a. Fan will not to be used in inclement weather conditions, such as rain, snow, sleet, etc.

b. Fan is not to be placed in a wet location like a puddle, even if the weather conditions are dry, such as a mud location in track. Move to a dry area.

c. Fan will not be used if any portion of the grilling, cord or safety guard area is damaged or missing. Authorized repairs must be made or the fan replaced.

d. If an extension cord is used for powering the fan, it must be rated to match or exceed that of the fan.

e. If the fan is placed in track, the power cord is to either be run under rail in center of check not touching any metal portion of rail, rail anchor or tie plate. If it isn't run under the rail, it must have a rubber pad or some type insulator between power cord and rail. (A round pipe insulator works well for this application).

1. Making thermite welds in rainy weather should be avoided wherever possible. If this is not possible:

   a. All precautions must be taken to ensure that the weld is protected from the rain, including the use of umbrellas. Thermite welds must not be made in blowing rain.

b. All precautions must be taken to ensure that the weld is protected from the large temperature drop that rainfall can cause. The rail must be positively anchored against movement.

2. Unless in an emergency, thermite welds should not be made if the gauge of track is filled with snow. If the weld must be made:

   a. Clear snow around the weld area for a minimum 10' radius. When not practical due to embankment constrains, snow must be cleared to the edge of the ballast section.
   b. Use a metal safety pan as described in item 18 of this section.
   c. A hydraulic puller must be used for all closure welds. The puller must not be released until the weld has cooled below 700ºF.
   d. Just prior to igniting the charge, ensure that everyone is clear of the weld area red zone by at 30' and remain at this distance until the reaction and pour is complete.

3. Thermite welds, especially non-closure welds, can be made successfully at most temperatures provided the proper procedures are followed. The rails must be positively anchored against movement. For closure welds when the rail temperature is less than Desired Rail Neutral Temperature, a rail puller must be used, and a track disturbance record must be made indicating the amount of rail removed during the closure weld.

4. Thermite welds will not be made closer than ten feet (10') from any existing field weld or any closer than three feet (3') from any existing plant weld in the same rail.

   - When installing an Insulated Glued Joint (IJ), thermite welds can not be made closer than 18" from the insulated joint bar.

5. Thermite welds will not be made over a tie. Rail should be cut so that the weld will be made between ties. This will eliminate the need to move cross ties.

6. A waste disposal area must be prepared prior to demolding the weld. This area must be free of any moisture, standing water, snow, ice, and/or frozen ballast. A clear walking path to this area must be maintained. All of the hot demolding debris must be placed in this prepared waste disposal area prior to welders departing the weld area.

7. Ensure that area around where weld is to be made, as well as walking paths for slag basin disposal, are kept clear of obstructions and hazards such as equipment, hydraulic lines, oxygen/propane lines, hand tools, jumper wires, etc. Walking areas should be kept clear at all times during the welding process.

8. When laying rail out of face, thermite welds will be made no closer than the height of the rail from the near edge of a bolt hole. When installing a maintenance plug, the distance from the end of the rail to the near edge of the bolt hole may be less than the height of the rail but it cannot be less than 4".

   Exception for yard tracks: the distance from the end of the rail to the near edge of the bolt hole may not be less than 1 1/2". Any rail cuts, closer than 6" from the edge of a bolt hole,

must be made with a saw to eliminate the heat affected zone that would be caused by a torch cut.

9. Thermite welds will not be made opposite any weld (in same crib) in the other rail. A Thermite weld should be staggered four (4) ties from any weld in the opposite rail, but must not be made any closer than one (1) tie stagger from any weld in the opposite rail (except when designed in special trackwork).

10. When installing a plug rail, the minimum plug length will be twelve (12) feet in tangent track and sixteen (16) feet in curved track. **Exception:** Plant welds made by either the electric flash or the oxy-acetylene method and marked by a rail defect detector car as having a transverse defect may be repaired by cutting out 1" of rail on both sides of the center of the weld (total of 2") and making a thermite weld. These may also be repaired with the Electric Flash Butt Welding process, see section M. This may be done only if the weld is not excessively battered and the proper welding gap is obtained without adversely affecting the adjustment temperature of the rail.

11. All thermite welds must be ground before the heat leaves the weld. Do not re-introduce heat into the sides of the weld where it will be ground.

12. An ultrasonic test device will be used to test thermite welds as shown below:

    a. The Manager–Welding, will randomly test thermite welds on their territory to ensure the weld quality. Additional random tests may be made by individuals from the Rail Testing group.

    b. Thermite Welds made in FRA Class 6 and above tracks – The *FRA Track Safety Standards,* §213.341 (d), identifies the requirement to test these welds. The welds will be tested not more than two (2) days after the weld is made. If the welds are not tested within this time period, a temporary speed restriction of 30 MPH will be placed.
    c. If the thermite weld does not test satisfactorily, it must be removed from the track and replaced by an appropriate length plug or removed with a wide gap weld.
    d. The ultrasonic test device may also be used during the qualification of a Welder.

13. All thermite welds will be identified with the following paint stick markings on the web of the rail:
    a. Specific Mile Post Designation must be on rail.
    b. Date of weld (MM/DD/YY).
    c. Thermite weld batch/serial numbers will be recorded in Division Track Works (DTW).
    d. Team number.
    e. Weld Number, by Team, for the year.
    f. Rail temperature (°F).
    g. Additional information may be required, such as **TC** for torch cut rail, **P** if rail puller is used, and on track class 6 and above the **date the weld is tested** and the **testers initials**.

14. The welder will submit a Welding Report on the Engineering Gateway in DTW at the completion of each work day. A Track Disturbance Report must also be completed for every

thermite weld made in the track structure. Welds made Out Of Track do not require a Track Disturbance Report.

15. Molten steel and slag can explode upon contact with snow, ice, standing water, frozen ballast or soil, and wet ballast or soil. When the ballast or soil under a weld is wet, a metal safety pan containing at least three inches of dry sand should be placed directly under the weld. This will allow any leakage to fall in dry sand. The bridge safety pan will also provide some protection against fire for timber bridge members, and against heat damage to steel beams. The pans may be reviewed in Sketches A-1 and A-2; the pans may be ordered using the following stock control numbers:

Standard Track Safety Pan	280.8033120.1
Bridge Safety Pan	280.8033140.1

16. During the time the weld is reacting or is being ground, personnel and equipment must be located at a safe distance from the weld (minimum 20 feet unless snow on track, then 30 feet). In particular, vehicles shall be located far enough away from the work to ensure that they cannot be showered by the sparks.

17. No thermite welding on timber structures or open deck bridges is permitted without specific approval of the Manager - Bridge or his designated representative. The following minimum safety instructions must have been implemented:
    a. A fire prevention and response plan must be developed and implemented.
    b. An adequate source of pressurized water must be available and accessible.
    c. The entire area, where the weld will be made, will be wetted before commencing work. Any area, which may be showered with sparks, must be kept wet and protected.
    d. A metal safety pan will be used under the weld.
    e. After the weld is completed, the bridge ties will be wetted again. The work area should be inspected again several hours after the work is completed.
    f. Care must be taken to ensure that the rail and weld do not contact water until the weld has cooled.
    g. These are bare minimum requirements. Good judgment must be exercised to ensure that the structure is properly protected.

20. When making a weld in concrete tie track, the tie pads and insulators must be removed for one or more ties on each side of the weld before the weld is made. This will prevent scorching and deformation of these items. They must be replaced before allowing a train to pass after the weld has been made.

21. Heating rail by using rail heaters or cellulose/rope will not be used to make field welds.

22. Maintenance of Way jumper wires may only be used where appropriate. See MWI 1704 and Standard Drawing CSX 2906 for complete details of the use of jumper wires for Maintenance of Way purposes.

23. Temperature and weather must be considered when making a thermite weld. Conditions that increase the cooling rate of the weld must be mitigated so that the weld does not cool too

rapidly. See the chart below: Weld Cooling Cover (Blanket) = 280.2350200.1

Rail Temperature	*Weather Conditions*	
	Clear	*Wind, light rain, or snow*
40°F or greater	• Air Cool • Weld Cooling Cover is not required	• Apply Weld Cooling Cover immediately after shearing. • Leave cover in place until weld is cooled below 900°F (about 35 minutes).
Between 40°F and 0°F	• Prior to installation of molds, preheat railhead and base to 100°F (hand hot) for a distance of 3 feet on both sides of the weld gap. • Complete weld and unmold normally. • Apply Weld Cooling Cover immediately after shearing. • Leave cover in place until weld is cooled below 900°F (about 35 minutes).	
0°F and less	• Welding is not recommended	

24. Check the pressures at the torch by installing test gauges (280.8022250.1) between the torch end check valves and the torch at the beginning of each week, or anytime there is a change in regulators, hoses, flash back arrestors, check valves, or hose reel using the following procedure.

    a. Install the test gauges between the torch end check valves and the torch.
    b. Set the regulators at the tanks to the proper Propane and Oxygen pressure.
    c. Light the torch and adjust the propane valve so that the blue flame tips are of even length and 7/8" long.
    d. Check the oxygen and propane gas pressures at the test gauges at the torch.
    e. Adjust regulators at the tanks, if necessary, to get the proper Propane and Oxygen pressures at the test gauge.
    f. Record the regulator settings for use in preheating the rail ends. The test gauges should be left in-place to ensure that proper delivery point pressures are maintained throughout the entire preheating process. Care must be taken to protect the test gauges from damage.

25. There are two (2) approved thermite weld manufacturers on CSXT. The two (2) approved manufacturers are Orgo-Thermit and Railtech-Boutet. Each manufacturer's process uses different equipment and procedures. A section detailing each of the welding processes follows.

WHEN WELDING ON A BRIDGE USING A HYDRAULIC RAIL PULLER TO MAKE WELDS ON THE OUTSIDE RAIL WHERE NO WALKWAY EXISTS

If the employee is working on the outside of the hydraulic rail puller the bridge must be equipped with a walkway and railings of sufficient height, width, and strength to prevent a fall and no closer than 6' from an opening in the deck or walkway greater than 1' X 1'. **Do not** use the hydraulic rail puller to perform a thermite weld if **no** walkway with railings is installed adjacent

to the rail needing repairs.

WHEN REPAIRING STRIPPED JOINTS WHERE NO WALKWAY EXISTS

When fixing stripped joints, bolts on the gage side can be tightened with a track wrench, then the rail puller removed and the field side bolts can be tightened with an impact wrench following all fall protection guidelines.

ALL CASES

All other FALL PROTECTION guidelines must be adhered to which means the required written Fall Retrieval Rescue Plan must be used. Refer to M 074 for further guidance.

1. Team will have a written Retrieval Plan which includes a list of equipment necessary for the retrieval. See attached CSX Bridge Job Start Up Form and Rescue Plan.

2. Employees will have a coworker that is responsible for knowing their safety partner's location at all times.

3. During the operation of the hydraulic rail puller, each end of the hydraulic rail puller is in the line of movement. This means the hydraulic rail puller can move in either direction along the rail while in operation. Fifteen feet on each end of the rail puller is a red zone

4. In all cases when using a hydraulic rail puller, employees must not stand inside hydraulic rail puller area.

5. When installing the hydraulic rail puller to the rail, ensure the operator controls are within the gage side of the rail.

6. The rail where the jaws of the hydraulic rail puller touch or clamp **must be ground** and all lettering, dirt, or grease removed prior to making a pull with the hydraulic rail puller.

HYDRAULIC RAIL PULLER PROCEDURES FOR GEISMAR MODEL TH-120-STP

Before operating puller, be in compliance with CSX Operating Rules and procedures.



Photo I-2

1. Read and understand operating instructions and maintenance manual supplied with rail puller. If not available, ask welding manager for a copy.

2. Locate joint or defective weld to be removed.

3. **Before starting, surface the joint or defective weld by tamping necessary ties. This should be done if using the puller or not.**

4. Before tear down or saw cuts are made, check for marks on rail if plug was put in during cold weather, and then pull according to winter track buckling procedures. If not, place reference marks each side of joint on rail, six to seven ties away from joint. This should be done on the field side with paint stick to watch and measure movement of rail, just like the winter track buckling procedures. **DO NOT ADD RAIL.**

5. Take off joint bars and or make saw cuts to achieve proper gap for weld. **Check rail laying charts to see how much rail is to be removed to reach the neutral rail temp. Obtain proper gap for weld (1") for regular or (2 ¾") for wide gap weld.**

6. If Rail moves widening the gap, the resulting gap **must not** be used for the weld. One inch (1") or (2 ¾") for wide gap must be cut out of the rail, plus pulling the gap that is needed to reach the proper Neutral Rail Temperature. **DO NOT ADD RAIL**.

7. Remove tie plates at joint and place alignment plates or jacks under rail. Remove anchors where puller is to set on rail and knock down any high spikes. **Alignment plates are mandatory when puller is used during the thermite weld process**. The use of wedges is **not allowed**.

8. Pre align rail to proper crown and gage with alignment plates. To insure puller will set level on rail and not slip, check web of rail for dirt, grease or obstructions. The rail must be ground ensuring all lettering is removed and all rust and grease must be burned off with torch and the

web of the rail ground where puller jaws will make contact. (Roughly 3 feet to the open end and 4 feet to the intensifier end from the rail ends of the joint.)

9. Set puller on rail. Make sure puller is centered to get maximum working area, using centering arrow on beam.

10. Ensure the area to be gripped is clean and dry and any rust or mill scale and raised lettering has been ground flat.

11. Follow operating instructions for clamping and pulling rail. (OPERATING MANUAL)

12. Remove hoisting cable from the lifting beam. **NEVER OPERATE PULLER WITH CABLE ATTACHED.**

13. Connect puller to hydraulic power source set to 5gpm. Turn directional valve to the retract position and draw the jaws up to the web of the rail. Once all four jaws make contact with the rail, return the directional valve to the lock position.

14. Pull the four pins holding the lifting beam to the puller and pick up the lifting beam with the supplied handles and set in the gauge of the track out of the way.

    EVERYONE MUST STAY CLEAR OF THE PULLER RED ZONE DURING PULL AND WHILE UNDER LOAD. THE RED ZONE IS DEFINED AS 15' FROM THE ENDS OF THE TOOL ALONG THE RAIL WHERE IT COULD POSSIBLY SLIP.

15. Begin pull by turning the directional valve to the retract position to get the proper gap (1" or 2¾" for wide gap). **DO NOT ADD RAIL.**

16. If proper gap cannot be achieved when puller is at maximum operating pressure of 120 tons, puller must be unclamped by using instructions in line 20 – 21 and 22 and anchors must be removed.

17. When proper gap is achieved, return directional valve to the center lock position, turn locking valve on control panel clockwise locking pressures in puller to hold in place. Shut the hydraulic power source off, and with the locking valve turned to the closed position, move the directional valve back and forth to relieve pressure at the hose connection. Disconnect hydraulic lines to use grinding tools and shear while the weld is cooling to 700°F.

18. Check rail alignment and adjust if needed.

19. Rail Alignment Plates must be used when using puller.

    IMPORTANT:

    DO NOT STRIKE ANY PART OF PULLER OR TRACK STRUCTURE WHILE PULLER IS UNDER LOAD. DO NOT REMOVE OR APPLY ANY RAIL ANCHORS WHILE THE PULLER IS UNDER LOAD. NO SAW CUTS ALLOWED WHILE

PULLER IS ON RAIL. WHEN USING PULLER AROUND SWITCHES, CAUTION SHOULD BE USED TO KEEP FROM MISSALIGNING. A 200-FOOT DISTANCE OR OUT OF SOLID ANCHORS, IS A GOOD RULE TO FOLLOW.
Note: Puller may be used in a switch area to hold the rail or bring it back to original position (*Do Not Add Rail); however, it is not recommended to remove extra rail around the switch area.

20. Begin making weld by using MWI 801 Thermite welding procedures. (ORG. or BOUTET Wide Gap).

21. **Rail puller cannot be removed until weld has cooled to 700°F or below.** At the end of the finish grinding, a temperature of 700°F is generally reached. Temperature of weld MUST be checked using an infrared temperature gun (023.0062001.1) or a 700F Tempilstik (453.0187689.1) prior to removing puller.

BEFORE REMOVING PULLER

22. Remove rail puller by hooking hydraulic lines to puller. **(DO NOT START UNIT OR PTO).** Open lock valve by turning it counter clockwise. With Locking valve open slowly turn the directional valve to the extend position to release the pressure on the puller.

23. Once the pressure is released off the puller and the gauge reads zero tons, pick up lifting beam with handles and place it back in the cradles and install the four pins.

24. Turn power source on and turn directional valve to the extend position until the jaws on both ends have opened and are clear of the head of the rail.

25. Hydraulics can now be turned off. Do NOT remove hoses yet. **MOVE DIRECTIONAL VALVE BACK AND FORTH TO RELIEVE TRAPPED PRESSURE.** Check pressure gauge to make sure it is on zero and then remove hoses.

26. Hook up lifting cable from crane, lining up cable to get a straight lift. Make sure tagline is connected. Now puller can be lifted off the rail. If more work is to be done, move puller to the clear and put on ground or load in truck.

27. Remove alignment plates, and put tie plates on using proper tool. **Never put fingers under plates.** Spike and apply all anchors and dress work area in compliance with CSX standards.

28. All field welds must be marked with a Paint Marker. If puller was used, web of rail must be marked – PULL WELD or PW.

29. Move to the next weld and follow instructions again.

HYDRAULIC RAIL PULLER PROCEDURES FOR SIMPLEX RP 120



Photo I-3

1. Read and understand operating instructions and maintenance manual supplied with puller. If not available, ask welding supervisor for copy. It is recommended to apply graphite lube (370.0001395.1) on SIMPLEX PULLER only, weekly to all moving parts.

2. Locate joint or defective weld to be removed.

3. **Before starting, surface the joint or defective weld by tamping necessary ties. This should be done if using the puller or not**.

4. Before tear down or saw cuts are made, check for marks on rail if plug was put in during cold weather, and then pull according to winter track buckling procedures. If not, place reference marks each side of joint on rail, two feet each side of joint. This should be done on the field side with paint stick to watch and measure movement of rail, just like the winter track buckling procedures. **DO NOT ADD RAIL.**

5. Take off joint bars and or make saw cuts to achieve proper gap for weld. **Check rail laying chart to see how much rail is to be removed to reach the neutral rail temp. Obtain proper gap for weld (1") for regular or (2 ¾" wide gap weld).**

6. If Rail jumps open, this gap **must not** be used to make the weld. You must still cut (1") or (2¾" for wide gap) out of the rail. Plus pulling the gap that is needed to reach the proper rail temp. **DO NOT ADD RAIL.**

7. Remove tie plates at joint and place alignment plates or jacks under rail. **Alignment plates are mandatory when puller is used during thermite weld process**. Remove anchors where puller is to set on rail and knock down any high spikes. The use of wedges is **not allowed**.

8. Pre align rail to proper crown and gauge with alignment plates. To insure puller will set level on rail and not slip, check web of rail for dirt, grease or obstructions.

9. Set puller on rail. Make sure puller is centered to get maximum working area, using centering arrow on beam. Run pull cylinders ahead 2 inches before clamping to the rail.

10. The rail must be ground ensuring all lettering is removed and all rust and grease must be burnt off with torch and the web of the rail ground where puller jaws will make contact. (Roughly 3 feet to the open end and 4 feet to the intensifier end from the rail end of the joint.)

11. Follow operating instructions for clamping and pulling rail. (OPERATING MANUAL)

12. Remove lifting cable on crane and move it out of work area. **NEVER OPERATE PULLER WITH CABLE ATTACHED**.

13. Connect puller to hydraulic power source, setting to 5gpm. On puller control panel, extend lifting beam to clamp puller to rail. DO NOT STAND OVER BEAM WHEN IT IS BEING MOVED. If beam does not move, the speed control knob must be turned clockwise to send more hydraulic pressure to beam. Now you can remove beam locking pin and retract beam till it is fully contracted. DO NOT STAND OVER BEAM WHEN IT IS BEING MOVED. If beam does not move, the speed control knob must be turned clockwise to send more hydraulic pressure to beam. Lift beam up out of working area and use the lock pin to lock in place (THIS IS THE ONLY TIME THIS PIN IS TO BE REMOVED). This is to provide enough work area to make field welds.

14. Now you can start your pull by using pull lever in the pull mode to get the proper gap (1” or 2 ¾” for wide gap). You can turn speed control knob to speed up (clockwise) or slow down (counter clockwise) the speed of the pull. **DO NOT ADD RAIL.**

15. If proper gap cannot be achieved when puller is at maximum operating pressure 120 tons, puller must be unclamped by using instructions in line 20 – 21 and 22 and anchors must be removed.

16. When proper gap is achieved, turn lock valve on control panel clockwise locking pressures in puller to hold in place and turn speed control knob counter clockwise completely.

17. Disconnect hydraulic lines to use grinding tools and shear while the weld is cooling to 700°F.

18. Check rail alignment and adjust if needed.

19. Rail Alignment Plates **must** be used when using puller. Pandrol and concrete must be pre-aligned with jacks and crowned .020 higher before puller is placed on rail. More clips must be removed.

IMPORTANT: DO NOT STRIKE ANY PART OF PULLER OR TRACK STRUCTURE WHILE PULLER IS UNDER LOAD. DO NOT REMOVE OR APPLY ANY RAIL ANCHORS WHILE THE PULLER IS UNDER LOAD. WHEN USING PULLER AROUND SWITCHES, CAUTION SHOULD BE USED TO KEEP FROM MISSALIGHNING. A 200-FOOT DISTANCE OR OUT OF SOLID ANCHORS, IS A GOOD RULE TO A FOLLOW. NO SAW CUTS ALLOWED WHILE PULLER IS ON RAIL. Note: Puller may be used in a switch area to hold the rail or bring it back to original position (*Do Not Add Rail); however, it is not recommended to remove extra rail around the switch area.

20. Begin making weld by using MWI 801 Thermite welding procedures. (ORGO-THERMIT or BOUTET Wide Gap).

21. **Rail puller cannot be removed until weld has cooled to 700°F or below.** At the end of the finish grinding, a temperature of 700°F is generally reached. Temperature of weld MUST be checked using an infrared temperature gun (023.0062001.1) or a 700F Tempilstik (453.0187689.1) prior to removing puller.

BEFORE REMOVING PULLER

22. Remove rail puller by hooking hydraulic lines to puller. **(DO NOT START UNIT OR PTO).** Open lock valve by turning it counter clockwise. Move both valve handles to left and right to dump pressure in puller back to tank. The gauge should read 0. Start power source for hydraulics.

23. Pull pin and lower lifting beam to rail, making sure guide on bottom of beam is on rail to guide into place. Extend beam slowly until lock pin can be replaced. Replace pin when holes line up. If beam does not move then use speed control knob to help.

24. **REMOVING PULLER After beam lock pin is replaced, retract lifting beam and extend pull cylinders at the same time**, turning speed control knob all the way open, clockwise until puller is completely open. You must visually look to verify puller is open and will clear railhead. Return speed control valve to full counter clockwise position.

25. Hydraulics can now be turned off. **MOVE BOTH BEAM CONTROL HANDLE AND PULL CONTROL HANDLE BACK AND FORTH TO RELEVE ANY TRAPPED PRESURE IN SYSTEM.** Check pressure gauge to make sure it is on zero and then remove hoses.

26. Hook up lifting cable from crane, lining up cable to get a straight lift. Make sure tagline is connected, if it was removed. Now puller can be lifted off the rail. If more work is to be done, move puller to the clear and put on ground or load in truck.

27. Remove alignment plates, and put tie plates on using proper tool. **Never put fingers under plates. Spike and apply all anchors and dress work area in compliance with CSXT and FRA standards.**

28. All field welds must be marked with proper name plate provided, or Paint Marker. If puller was used, web of rail must be marked – PULL WELD or PW.

29. Move to next weld and use instructions again. If using other model numbers or other manufacturers' brand of puller, refer to the manufacturer's written instructions.

THERMITE WELDING PROCEDURES
1" Gap, Orgo-Thermit Weld with Degradable Crucible

1. PREPARATION OF RAIL ENDS AND GAP

a. Prior to removing bars or cutting rail tighten rail anchors at least 40' in either direction of weld location.

b. The rail is to be saw cut. The Welder must have a rail saw in operating condition prior to making a weld.

c. Examine the rail ends to see if they have rail end damage (chips, nicks, and surface deformation) or were previously repaired by welding to remove rail end batter. Do not make a field weld to a rail that has rail end damage or was previously welded unless the rail end is cropped to remove all the damaged area or welded-on material. Also completely remove signal bond wires, if present, by grinding.

d. In an emergency, such as the mechanical failure of the rail saw during the cut, the rail may be torch cut. If a torch is used, **care** must be used to ensure a straight cut. All slag must be removed from the face of a torch cut rail. The weld must be made within one (1) hour of the torch cut. Also, the Welder will mark "TC" on the rail if a torch cut rail is welded into track.

e. Clean the rails for a distance of 4" to 6" from each end with a burner and wire brush until the area is free of grease, rust, mill scale, paint and other foreign matter.

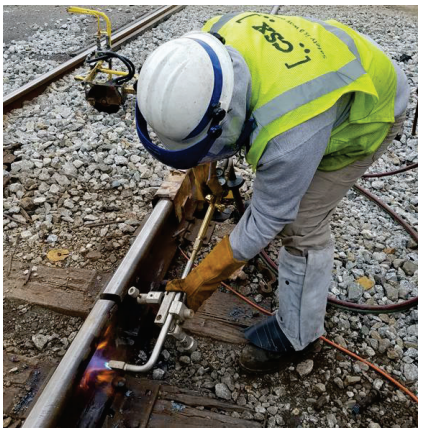


Photo I-4

2. ALIGNMENT OF THE RAILS

a. There are four parameters to be considered in aligning the rails for welding: gap, horizontal alignment, vertical alignment, and twist. The strongest weld is produced when the same section has no mismatch in the elevation of the rail bases, the webs are not twisted in relationship to each other, and any rail head mismatch is removed by grinding after the weld is made.

b. With some worn rails, it may not be possible to have the rail bases at the same elevation without having to perform considerable grinding on the rail heads to obtain a smooth transition between rails. In these instances, a limited amount of rail base mismatch is permitted. As the amount of rail base mismatch increases, it becomes harder to align the webs of rail with a straightedge to eliminate twist. As the rail base mismatch increases, the strength of the weld decreases.

c. Remove or loosen rail fastening from two or three ties (or whatever is necessary) on each side of the weld location.

d. To position rail ends to be welded, use:
   1. alignment plates if available, or
   2. use a mechanical or hydraulic jack under the center of the two rail ends, and lift them slightly. Place the four wedges under each side of the tie plate on both ties to nearly the desired height. Then remove the jack. A few light hits with a dead blow hammer (451.1100250.1) should be all that is required to reach the desired crown and alignment.

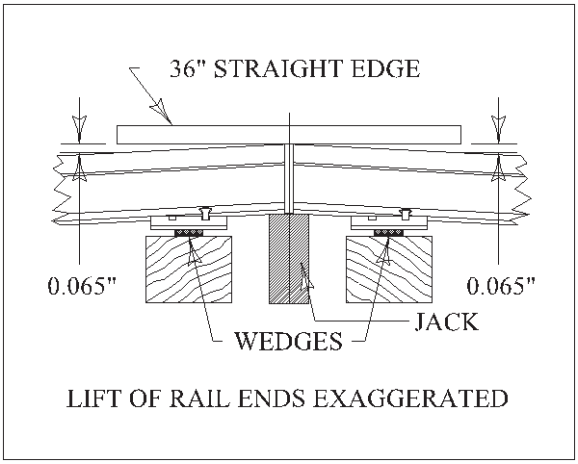
e. **Ensure that the correct gap is obtained**. The correct gap for all rail sections is 1" to 1- 3/16". The gap will be measured on both sides of the head and base (4 measurements) to confirm the proper gap has been established.

f. If the gap between rail ends is too small, the ends may be cut to give the proper gap.

g. All rails should be eye aligned 40' from where the weld is being made.

h. Then use a 36" steel straightedge at the rail ends. The horizontal alignment along the web must be perfect with the straightedge. Check the web from the rail base to the rail head to insure that the two rails are not twisted in relationship to each other.

i. The vertical alignment should have a 1/8" crown at the joint. Using a 36" straightedge, there will be 0.065" between the straightedge and the rail at each end. See Sketch I-1.



Sketch I- 1

j. If necessary, use gage rods,(Ball Ratchet Gage Rod = 015.0003170.1 Base Ratchet Gage Rod = 015.0003175.1)one on each side of the joint, to hold the alignment. Additional gage rods may be required in curved track. Use of a "Canting Tool" (015.0003178.1) is very helpful in removing twist from the rail.

k. When welding top worn rail to new rail, it may be necessary to have the bases of the two rails mismatched. Transition Rails have been developed to address this problem (See MWI 507). If transition rails are not used, it is preferable that the base mismatch does not exceed 1/8" but up to ¼" is permitted. If the rail height difference is greater than ¼", the weld will be made with the running surfaces of the rails mismatched and no more than a ¼" base mismatch. The molds will have to be filed to fit. After the weld is completed, the higher rail will be ground off to match the lower rail.

l. When making compromise welds, the rails will be aligned in a manner similar to that used for worn rail to new rail. Visually check the alignment of the webs to insure that the two rails are not canted in relationship to each other. Railhead mismatch should be corrected by grinding rather than by a major alteration of the molds.

m. If it is necessary to make a compromise weld from rail sections 122# and heavier to rail sections 100# and lighter, a 112# or 115# intermediate rail will be inserted between the heavier and lighter rail sections. Transition rails should be used in main tracks. See MWI 507 for details.

n. When welding in a plug, joint bars should be installed on the end which will be field welded last, in order to hold the plug in true alignment while the first weld is being installed. When placing the plug in track, it should be of proper length to provide 1-inch gaps at each end for welding.

o. Secure the rails. When the desired rail gap has been established, clamp the rails to secure the position so that sudden temperature changes or sudden jolts will not disturb the gap opening. Mark the rails and tie plates on either side of the gap so any longitudinal rail movement can be detected during welding.

3. INSTALLATION OF THE MOLDS

a. Before installation, check the molds for damage. The pouring channels and risers must be clear. Verify that the molds are the correct size for the rails being welded. Some molds may be used for more than one rail section, such as 132 # on 131# rail and 115# on 112# rail. Place each mold in the mold shoe. The sides of the mold shoe must fit the mold tightly. If they do not, adjust the shoes by straightening the angle to 90°.

NOTE: The shoes are designed with structures at the top of the walls, which are used to support and position the single-use crucible above the molds.

b. Apply one mold half on the rail, central to the gap, checking for fit. Match the other mold half to it. If the two halves do not fit tightly together due to a rail mismatch, one or both molds may have to be filed for proper fit. It is preferable that this filing does not exceed 1/8" but up to 1/4" is permitted. File the outer edges only where necessary. Wherever the outer edge is filed, the collar in the same area is also to be filed.

c. Apply one mold half in the mold shoe centrally on the gap and slightly tighten the swivel arm screw of the clamping device while lifting the mold shoe upwards. Match the other mold half to it and slightly tighten the other swivel arm while lifting the mold shoe

upwards. Tap both shoes under the bottom and tighten each swivel arm screw firmly with one hand. Recheck to ensure both molds are flush and fitting tightly together.

d. Cover the mold top with plexiglas or cardboard before starting luting to keep the inside of the mold clean.

e. When welding in curves, the top of the diverting plug is to be filed so that it fits horizontally into the mold. This will achieve a more even flow of the thermite steel into the mold halves.

f. Before luting, pack any gaps between the molds and rails with toilet paper flush with the outside of the mold. Tear a piece of paper to the width of the rail heads, fold into a "Z" shape, and slide along the top of the rail under the mold. A vertical tab will prevent luting sand from falling on the rail head.

g. Ready-to-use luting material is available in 10 pound plastic bags from Orgo-Thermit, Inc. and is shipped with each kit.

h. Fill the luting grooves surrounding the rail and under the rail base with luting sand and pack it firmly into place to prevent leakage of the molten metal when the mold is filled. Take care when luting under the rail base, to make sure the luting sand is placed on the correct side of the luting grove. After luting is completed, check the molds for foreign material, and re-cover.

NOTE: Preheating must begin within ten (10) minutes after molds have been luted. In the event that preheating does not commence within this time, the existing molds may be used, but new luting sand must be applied.

i. Place three-quarter (3/4) inch of dry sand in the slag basin and fit the slag basin to the lugs on the sides of the mold shoes. Place the rail head protecting sheet on the rail heads next to the mold shoes. Carefully place additional luting sand on the rail head between the mold shoes and the rail head protecting sheets.

j. When making welds in turnouts, the Left Handed Hinged Shoe can be used to prevent the slag basin from coming in contact with adjacent rails. This will replace the Turnout Kit was previously used.

4. PREHEATING

a. Ensure that the preheating burner has been tested as detailed in Section I-Thermite Welding, General, paragraph 22.

b. Set the propane and oxygen regulators to deliver the proper pressures to the burner.

c. Place the burner saddle assembly on the universal clamp, turn the saddle adjustment knobs to center the burner head over the rail gap, and remove the burner saddle assembly.

Open the oxygen valve completely and open the propane valve 1/4 turn. Adjust the oxygen and propane regulators to the proper pressures. Light the burner with a flint type lighter. Adjust the torch propane valve so that the blue flame tips are of even length at 7/8" long. Check the burner for clogged holes, and clean if necessary.

d. SKV-Extended (5-minute) data using SKV 5 minute preheating burner. A Digital stopwatch **must** be used to ensure proper preheating times.

Propane:	14 PSI
Oxygen:	65 PSI
Burner Hgt:	1 3/8"

Victor or Harris 6 minute preheat burners are also authorized for preheating the SKV process. Use these pressure settings for Victor or Smith Preheaters:

Propane:	15 PSI
Oxygen:	65 PSI
Burner Hgt:	1 3/8"

e. Pressures are measured at the burner when using 3/8" inside diameter hoses with flash-back arrestors behind the burner bodies. Burner height is measured from the top of the lower rail if the rail ends are mismatched in height.

f. Briefly preheat both slag basins to ensure that they are dry. Position the preheating burner on the universal clamp and adjust the knobs so that the flame is directed down the center of the rail gap. Ensure that the burner saddle is contacting the height adjustment ring. Verify that the burner tip does not touch the sand mold. Tighten the burner saddle clamp.

g. During preheating, ensure that the preheating burner is in the center of the one (1-1/16") gap in the rail. Make certain that it is also aligned in the center across the head.

h. Recheck the gauge pressures, and adjust if necessary. On a windless day the burner flame should rise about 18" from the outside risers. The diverting plug should be dried before placing it in the mold. Wave the diverting plug with the fire tong over the riser flame for approximately 1 to 2 minutes.

CAUTION: Do not hold the diverting plug in the flame until it turns white. The plug will become brittle.

i. At the end of the 6 minute minimum preheating time for rail sections greater than 122#, the rail ends should show good orange/yellow color in the web and the base. Rail sections smaller than 122#, 5 minute minimum preheating time is required. If the rail ends do not show good orange/yellow color, continue to preheat until the color is obtained. When making a compromise weld, the base of the heavier rail section must have an orange/yellow color.

j. It is recommended to use a 450°F temp paint or 450°F temp stick when paint is unavailable to help the welder acknowledge the achievement of 450°F at 2-1/2" from the rail end.

k. Upon completion of preheating, remove the universal clamp and burner saddle assembly and insert the diverting plug into the mold, making sure it seats properly

NOTE: The welding charge must be ignited within fifteen (15) seconds after the preheating burner has been removed.

5. CRUCIBLE PREPARATION AND CHARGING

a. These procedures may be accomplished while the rail ends are being preheated.

b. The crucible is a Degradable Crucible (a beta set process crucible), which is equipped with a self-tapping device. A refractory cap is supplied with each crucible.

c. Remove the lid on the crucible. Gently remove the crucible cap, which is shipped upside-down inside the crucible. Inspect both the cap and crucible for damage.

CAUTION: If there are signs of damage, do not use the crucible.

d. Turn the crucible upside-down and dump out any loose liner material. Inspect the tap hole area to ensure that the refractory discs (white color discs) are in place and nothing is covering them.

e. Place the crucible on a level, clean and dry surface. Place the crucible on cardboard at a dry location near the working area. Pour in the portion, level the surface and install the cap.

CAUTION: Use only the portions designed for the single-use crucible. They are packed in orange bags. Never mix components from different kits.

6. REACTION AND POUR

a. The welder will clear all individuals from the welding area prior to igniting the welding portion. All track equipment working in the area will be stopped if vibrations can be felt in the rail being welded or roadbed until the weld has been poured and solidified.

b. Place the charged crucible on top of the mold shoes. Ensure that it is properly seated.

c. The welder, using a gloved hand, will insert a lit igniter through the top of the crucible cap until it contacts the center of the welding portion. As soon as the igniter is inserted, the Welder will move away from the crucible to a safe position (approximately 20ft, 30ft if snow on track) while the reaction takes place.

d. The tapping time, which is the time from when the portion ignites until the time the portion begins to flow, will be timed for each weld. The normal tapping time is from 23 to 28 seconds. If the tapping time is less than 15 seconds or more than 35 seconds, the weld is to be considered defective and immediately removed from track.

CAUTION: If the crucible's secondary tap does not tap within 1 minute, remain at a safe distance for 20 minutes. The heat from the reaction will slowly transfer through the refractory material. The crucible walls will become red hot.

7. REMOVING THE MOLDS

a. Note that a full face shield, long sleeves and welding gloves are required during the tear down process. This includes shearing of the weld.

b. Stand clear of the assembly for five minutes after the pour.

c. After five minutes have passed, remove the crucible and the slag basins from the mold shoes. Set the crucible aside in a safe location. Carry the slag basins level staying on the level portion of the track. Do not step over the rail while carrying a hot slag basin. Take the slag basin fifteen to twenty feet (eight to ten ties) away from the weld. Place the slag basin on level ballast between the ties. Note that this area must be level and dry. Do not flip over the slag basin at this time; allow time for the slag to cool in the basin.

d. After removing the crucible and slag basins, remove the universal clamp and mold shoes.

e. Score the mold on both sides about 1 ½" above the rail head. Hold a shovel against the score mark on one side of the mold and carefully push the head of the mold from the opposite side until the mold is partially broken. If molten metal leaks out, return the mold to its original position and wait 15 to 30 seconds. Repeat until no leakage occurs; then push the mold head onto the shovel.

f. While the weld is still at red heat, use the power shears to remove the excess metal from the sides and top of the rail head. The power shears must be a type of "Safety Shear", one having a metal shroud completely covering all the hydraulic hoses which will prevent accidental damage to the hydraulic lines from hot material or from being struck by any tool. The safety shear shroud also helps prevent a "flare up" if a hose or fitting should fail during the shearing process. Shears with exposed flexible hydraulic lines will not be used. Operate the shears at a slow and consistent speed. Careful operation of the shears will decrease the likelihood of "hot tears". Leave enough of the weld to permit proper grinding. If power shears are not available, a sledge hammer and hot cut chisel, or a propane torch may be used.

NOTE: When cutting away the excess metal from the top and sides of the ball, the chisel must be turned at an angle to the perpendicular, and not vertical to the ground.

g. Base risers may be bent out slightly to make room for rough grinding. The angle between the riser and the rail head should be approximately 45° degrees. Care must be taken during bending to ensure that a hot tear is not created in the top of the base of the rail.

h. The wedges may be removed after the weld cools to 700°F.

i. After cooling for 20 minutes, the slag basin may be moved to the selected waste area and emptied. The preferred method for handling the debris produced during the welding process is to place it in the used crucible "can" and move it to a normal trash disposal container. If this is not possible, bury the hot debris in a shallow hole. Make sure that the hole is dry. If the ground is wet, let the debris cool before burying. Be careful of underground facilities on the right-of-way, such as signal cables, fiber optic cables, etc.

CAUTION: Do NOT throw debris into water or snow.

j. The site should be left in a neat and orderly condition. All released track materials will be taken to the local material storage site.

THERMITE WELDING PROCEDURES

1" Gap, Pandrol/Railtech Boutet Weld with CJ Crucible (One-Shot):

***Thermite Welding Procedures For the 1" Boutet Weld* ALIGNMENT**

Gap: 1 -1/16" to 1-1/8" +/- 1/16"
Crown: 0.065 - 0.075
Not to exceed 0.005 Vertical Offset

1- PREHEATING
Burner Height: 1-1/2" **TIME**
Oxy: 65 PSI 122# > 6 to 6 1/2 minimum
Propane: 15 PSI 121# < 5 to 5 1/2 minimum.

2-CRUCIBLE REMOVAL
5 Minutes after weld pours. Use crucible fork only for removal.

3-SLAG PAN REMOVAL
5 minutes after weld pours. Do not empty before 20 Minutes.

4-MOLD JACKET REMOVAL
6 minutes after weld pours.

5-MOLD TOP REMOVAL(Demolding)
6 minutes after weld pours

6-SHEAR WELD
6-1/2 to 7-1/2 mins after weld pours. Use slow, constsnt speed, 5GPM. Bend risers to 45° **Hot grinding** can be done at this time leaving .030" (approximately credit card height on the weld.)

7-Wedge & Base Plate Removal
20 minutes after weld pours.

8-RISER REMOVAL
900° or approx 23 to 25 mins. After pour.

9-TRAFFIC
Can be permitted after rough grinding and cooled to 500 degrees.

10-FINISH GRIND
Finish After weld cools below 900°F
Remove puller below 700°F

Photo I-5

1. PREPARATION OF RAIL ENDS

a. The rail is to be saw cut. The Welder must have a rail saw in operating condition prior to making a weld and it must be used.

b. Examine the rail ends to see if they have rail end damage (chips, nicks, bolt hole cracks and surface deformation) or were previously repaired by welding to remove rail end batter. Do not make a field weld to a rail that has rail end damage or was previously welded unless the rail end is cropped to remove all the damaged area or welded-on material. Also completely remove signal bond wires, if present, **by grinding.** To relieve tension on the rail with a torch, refer to Section H (Cutting Rail) on page H-2.

c. Only in an emergency, such as the mechanical failure of the rail saw during the cut, may the rail be torch cut. If a torch is used, care must be used to ensure a straight cut. All slag must be removed from the face of a torch cut rail. The weld must be made within one (1) hour of the torch cut. Also, "TC" will be marked on the rail.

d. Flame clean the rails for a distance of 4" to 6" from each end with the preheater and wire brush until area is free of grease, rust, mill scale, paint and other foreign matter.

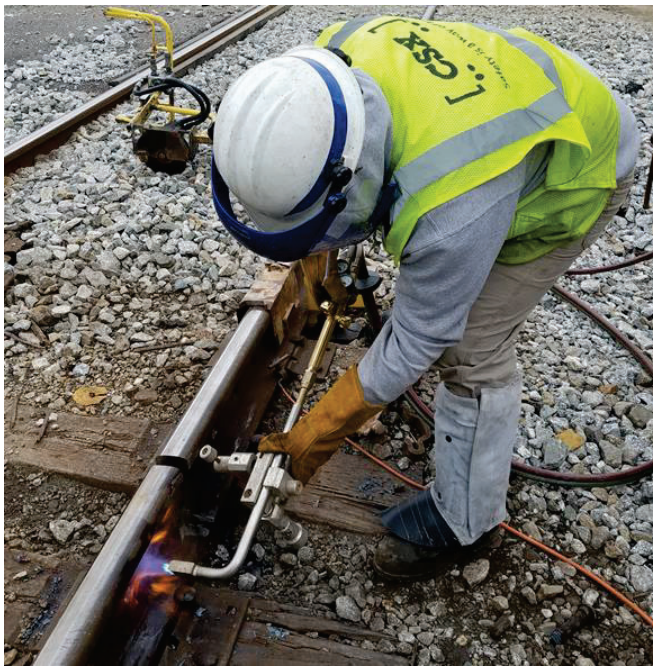


Photo I-6

2. ALIGNMENT OF THE RAILS

a. There are four parameters to be considered in aligning the rails for welding: gap, horizontal alignment, vertical alignment and twist. The strongest weld is produced when the same section has no mismatch in the elevation of the rail bases, the webs are not twisted in relationship to each other, and any rail head mismatch is removed by grinding after the weld is made.



Photo I-7



Photo I-8

b. With some worn rails, it may not be possible to have the rail bases at the same elevation without having to perform considerable grinding on the rail heads to obtain a smooth transition between rails. In these instances, a limited amount of rail base mismatch is permitted. As the amount of rail base mismatch increases, it becomes harder to align the webs of rail with a straightedge to eliminate twist. As the rail base mismatch increases, the strength of the weld decreases.

c. Remove or loosen rail fastening from two or three ties (or whatever is necessary) on each side of the weld location.

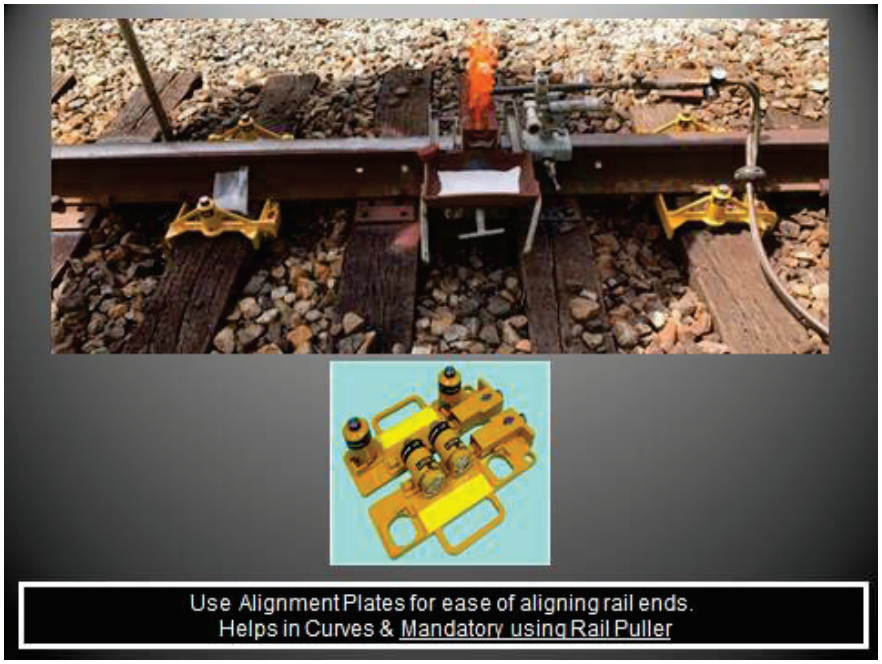


Photo I-9

d. To position rail ends to be welded, use:

1. alignment plates if available, or
2. use a mechanical or hydraulic jack under the center of the two rail ends, and lift them slightly. Place the four wedges under each side of the tie plate on both ties to nearly the desired height. Then remove the jack. A few light hits with a dead blow hammer (451.1100250.1) should be all that is required to reach the desired crown and alignment. Replacement ends for dead blow hammer (451.1200250.1). A dead blow sledgehammer (015.1409374.1) may also be used to achieve desired crown. Replacement ends for dead blow sledgehammer (015.1415309.1).

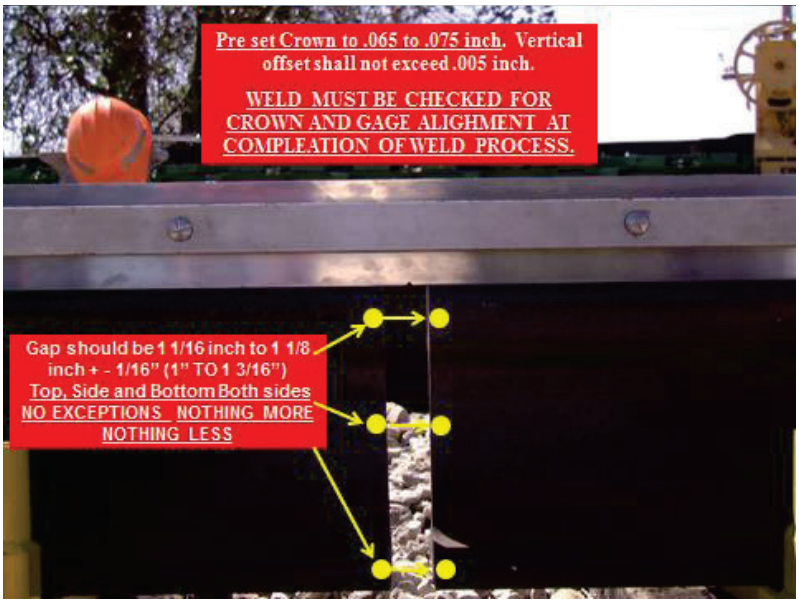


Photo I-10

e. **Ensure that the correct gap is obtained**. The correct gap for all rail sections is 1” to 1-3/16”. The gap will be measured on both sides of the head and base (4 measurements) to confirm the proper gap has been established. Saw must be maintained to specifications to cut within the parameters of accepted tolerances or it MUST be removed from service.

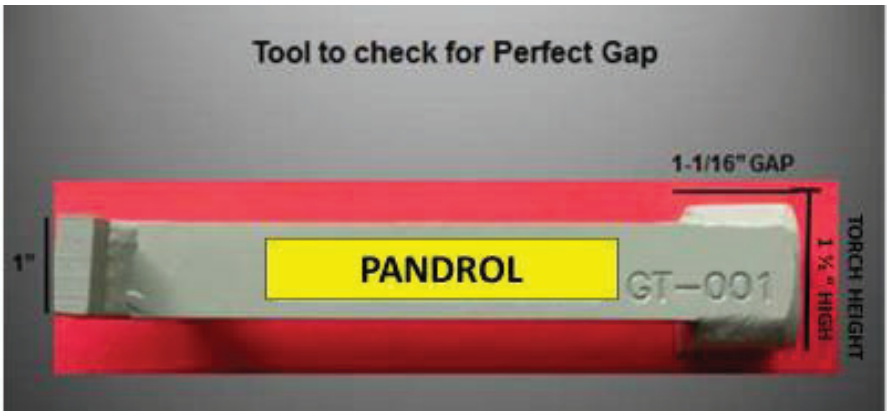


Photo I-11

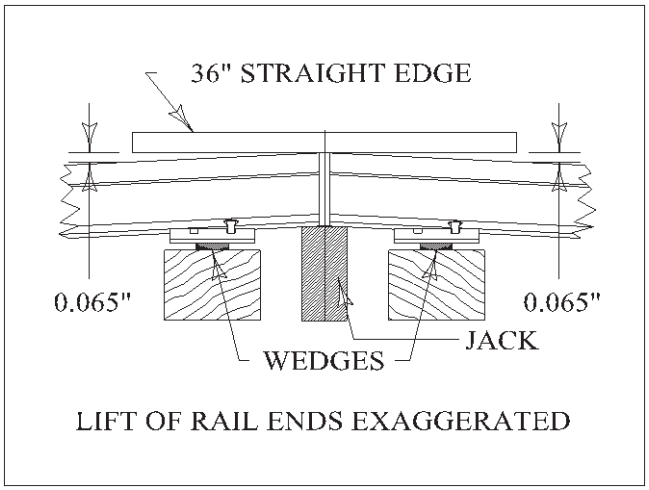
f. If the gap between rail ends is too small, the ends may be cut to give the proper gap.

g. All rails should be eye aligned 40 feet from where the weld is being made.

h. Then use a 36" steel straightedge at the rail ends. The horizontal alignment along the web must be perfect with the straightedge. Check the web from the rail base to the rail head to insure that the two rails are not twisted in relationship to each other.

i. The vertical alignment should have a 1/8" crown at the joint. Using a 36" straightedge, there will be 0.065" between the straightedge and the rail at each end. See Sketch I-2 below.

j. If necessary, use gage rods (Ball Ratchet Gage Rod = 015.0003170.1 Base Ratchet Gage Rod = 015.0003175.1), one on each side of the joint, to hold the alignment. Additional gage rods may be required in curved track. Use of a "Canting Tool" (015.0003178.1) is very helpful in removing twist from the rail.



Sketch I-2

k. When welding top worn rail to new rail, it may be necessary to have the bases of the two rails mismatched. Transition Rails have been developed to address this problem (See MWI 507). If transition rails are not used, it is preferable that the base mismatch does not exceed 1/8" but up to 1/4" is permitted. If the rail height difference is greater than ¼", the weld will be made with the running surfaces of the rails mismatched and no more than a 1/4" base mismatch. The molds will have to be filed to fit. After the weld is completed, the higher rail will be ~~ground~~ blended ~~off~~ to match the lower rail.

l. When making compromise welds, the rails will be aligned in a manner similar to that used for worn rail to new rail. Visually check the alignment of the webs to insure that the

two rails are not twisted or canted in relationship to each other. Rail head mismatch should be corrected by grinding rather than by a major alteration of the molds.

m. If it is necessary to make a compromise weld from rail sections 122# and heavier to rail sections 100# and lighter, a 112# or a 115# intermediate rail will be inserted between the heavier and lighter rail sections. Transition rails should be used in the main track. See MWI 507 for details.

n. When welding in a plug, joint bars should be installed on the end which will be field welded last in order to hold the plug in true alignment while the first weld is being installed. When placing the plug in track it should be of the proper length to provide 1" gaps at each end for welding.

o. Secure the rails. When the desired rail gap has been established, clamp the rails to secure the position so that sudden temperature changes or sudden jolts will not disturb the gap opening. Mark the rails and tie plates on either side of the gap so any longitudinal rail movement can be detected during welding.

p. For the best quality product, no batter on either rail end is preferred. However, if batter is present, only one rail end may contain batter not to exceed 1/8" (approximately 0.125") and grinding must be complete per CSX standards on rail run off. *See Section I Finish Grinding of Thermite Welds, Part 2 Section E.

3. INSTALLATION OF THE MOLDS

a. Before installation, check the molds and base briquette for damage. The pouring channels and risers must be clear. Verify that the molds and base briquette are the correct size for the rails being welded. Place each mold in a mold jacket and the base briquette in the base plate. Plan placement of the mold such that the pour side of the mold is in the gage of the track on tangent track or to the low side of a curve on curved track; this will place the slag basin on the same side as the pour.

b. Test fit the molds to the rail. The molds must be centered over the rail end gap with equal amount of rail exposed in the mold cavity. **Vertical mold mismatch should not exceed 1/8".** Grind off any rail flow that will prevent the molds from fitting tightly against the rail.

c. Test the base briquette fit and alignment on the base of rail before applying the refractory paste. Apply a bead of refractory paste (the diameter of a pencil) in the recess on the base briquette. Do not allow any paste in the middle depression of the base briquette.

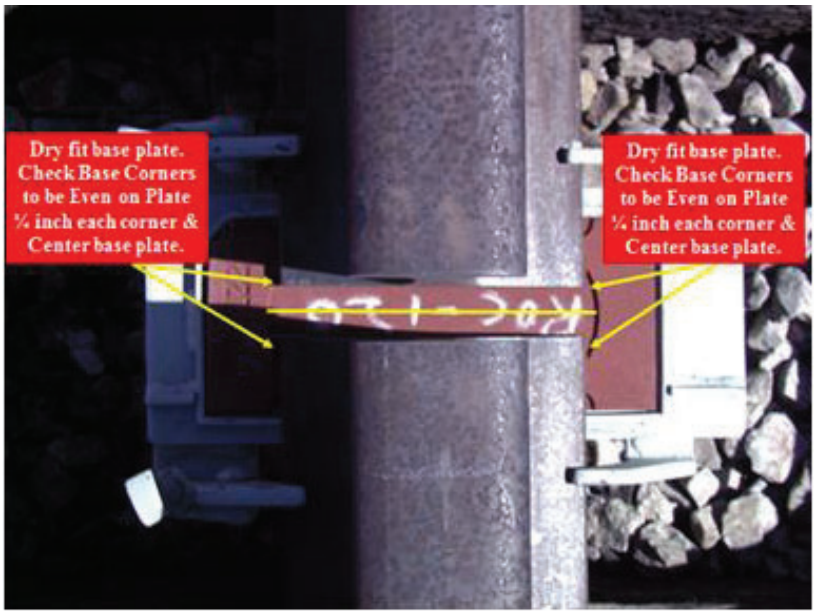


Photo I-12

d. Install the base plate to the base of rail. Make sure that equal amounts of rail are exposed in the depression of the base briquette. Ensure that the thumbscrews are on the field side. Hand tighten the thumbscrews, and then give ¼ turn with a wrench. Recheck the crown after installing the base plate.3



Photo I-13

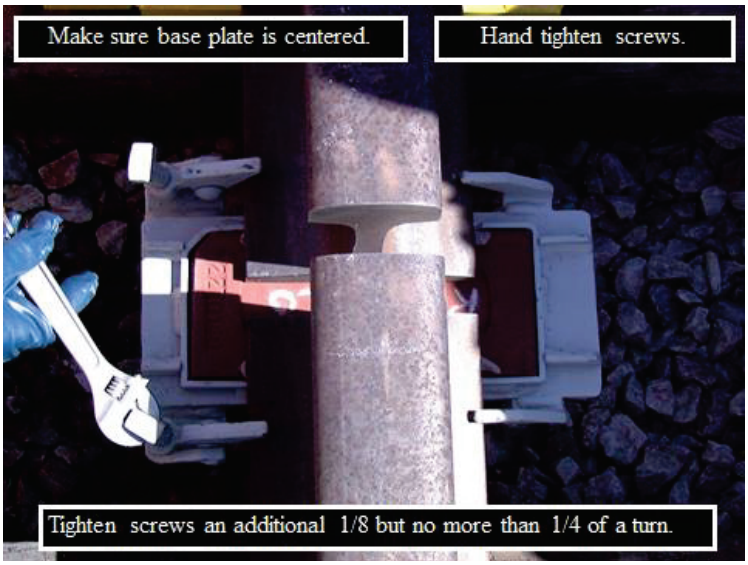


Photo I-14

e. Place one mold half on the rail. Center it in relation to the gap and the base plate. The pouring spout and mold clamp handle should be on the gage side on tangent track or on the low side of curved track. Put the second mold half in place. Center it in relation to the gap and the base plate. Re-adjust the mold halves, if necessary, to achieve a perfect fit.

f. Final adjustment and control is achieved by positioning the mold clamp. Be careful not to break the molds by over-tightening the mold clamp. After clamping cover the mold top with Plexiglas or cardboard before starting luting to keep the inside of the mold clean.

CAUTION: Over-tightening of the base plate or the mold clamp may cause cracking of the molds or base briquette, which could lead to leakage of molten steel and personal injury.

g. The luting process is designed to form a seal between the rail and the molds to prevent leakage of the molten metal when the mold is filled. Poorly aligned rail and/or molds make this process more difficult and increase the chance of leakage.

h. Evenly apply by hand a thin layer of the pre-mixed luting sand to seal the gap between the rail and the mold; follow this thin layer by another to fill completely around the entire profile of the rail, including the bottom of the rail base. After luting the molds, place the slag basin on the mold clamp under the pour spout of the pour mold jacket. Apply a small amount of the luting sand on the lip of the pour spout and place three-quarter (3/4) inch of dry sand in the slag basin. After luting is completed, check the molds for foreign material, and re-cover.

i. Do NOT let completed molds sit idle longer than ten (10) minutes before beginning preheating. In the event that preheating does not commence within this time, the existing molds may be used, but new luting sand must be applied.

CAUTION: If moisture is present under the weld, place a container of dry sand on the ballast under the weld to catch any leakage. Molten steel and slag can cause serious explosions upon coming into contact with snow, ice, standing water and/or frozen ballast/soil.

4. PREHEATING

a. The preheating operation has a major influence on the quality of the finished weld. It must remove the residual moisture from the molds and bring the rail ends to the proper temperature range.

b. Always check the Oxygen and Propane before beginning each preheat. Ensure that there is enough of each to complete the weld procedure and that the pressures are proper.

c. Ensure that the preheating burner has been tested as detailed in Thermite Welding, General, paragraph 22.



Photo I-15

d. Set the propane and oxygen regulators to deliver the proper pressures to the burner.
***Two Stage Regulators are Mandatory for the Thermite preheating process**

e. The proper preheat working pressures are:

Propane:	15 PSI
Oxygen:	65 PSI
Burner Hgt.:	**1 1/2" for 1" Weld**

Pressures are measured at the burner when using Grade T 3/8" inside diameter hoses with reverse flow check valves behind burner body. Burner height is measured from the top of the lower rail if the rail ends are mismatched in height.

f. Position the preheating burner stand on the rail. Attach the unlit burner and align it so that the burner is centered in the gap in the rail. Make certain that it is also aligned in the center across the head and the burner tip is **1 ½**" above the head of the rail. Remove the burner from the stand. Light the burner, replace it on the stand and adjust the flame.



Photo I-16

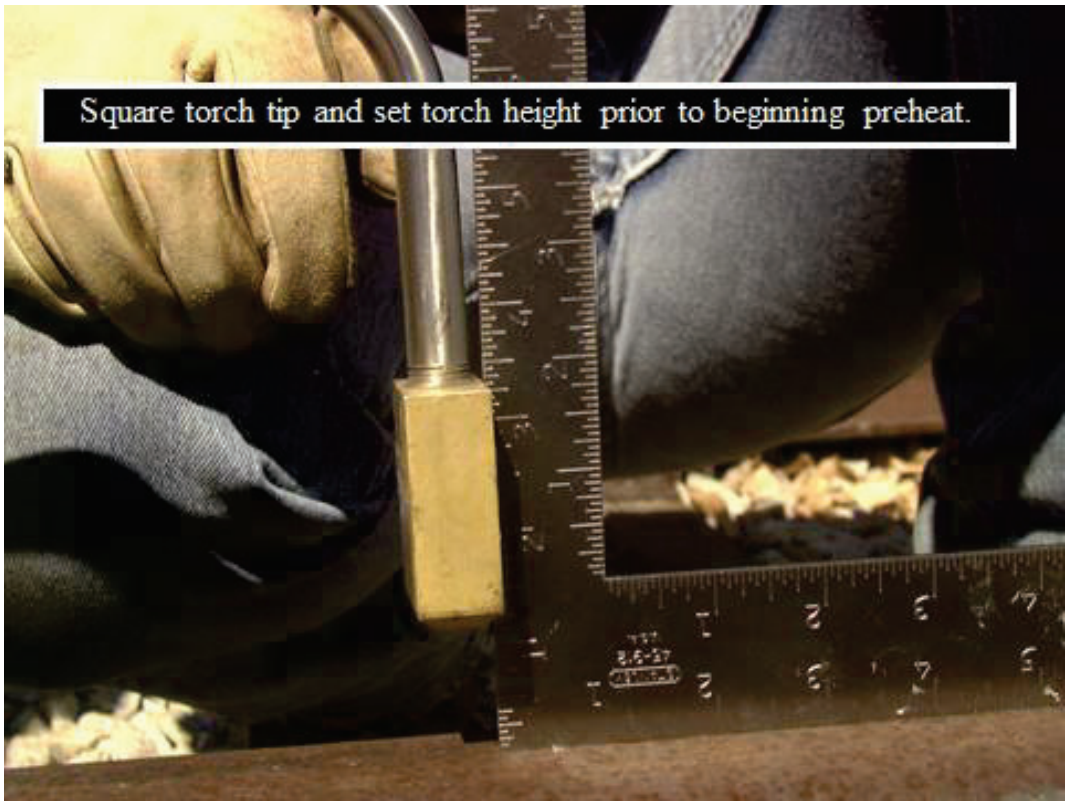


Photo I-17

g. Preheating time starts after the flame has been adjusted and the burner alignment has been "fine-tuned". A digital stopwatch **must** be used to measure the preheat time. The proper preheat times are:

Rail Size	***Duration***
122 # rail and above	6 minutes **minimum**
below 122# rail	5 minutes **minimum**

h. On a windless day the burner flame should rise about 18" from the outside risers. The diverting plug should be dried before placing it in the mold. Place the diverting plug on the edge of the mold next to the riser flame for approximately 1 to 2 minutes. Do not block the flame from the riser hole with the diverter brick.

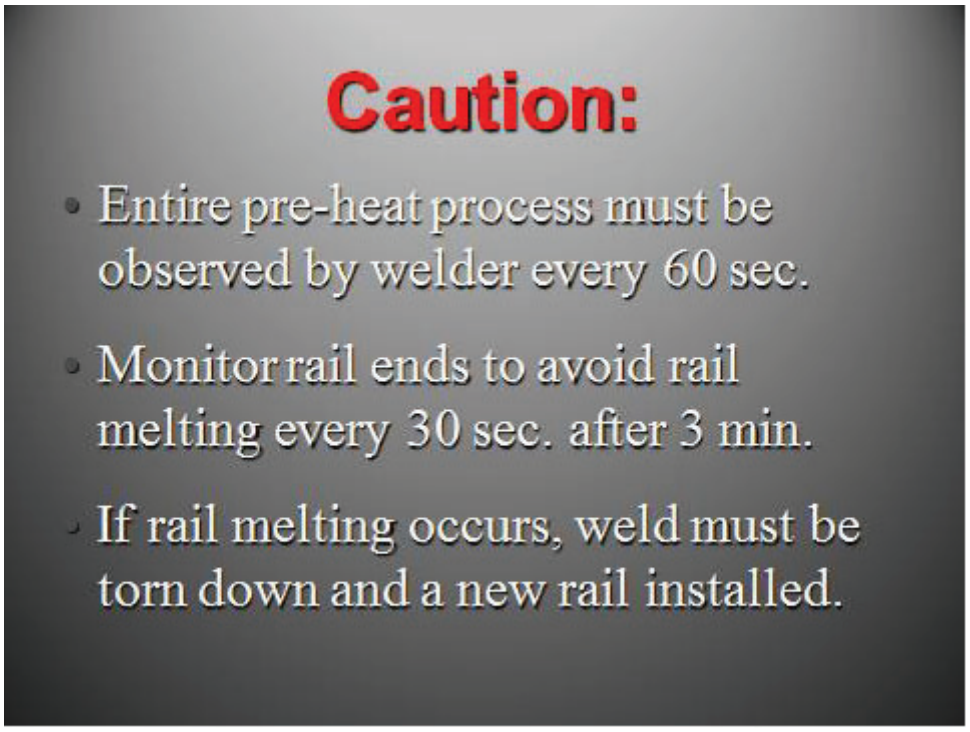


Photo I-18

i. The preheat process must be monitored during the entire preheating duration with the rail ends being visually inspected at a minimum of **once every minute for the first 3 minutes then every thirty (30) seconds for the remainder of preheat**.

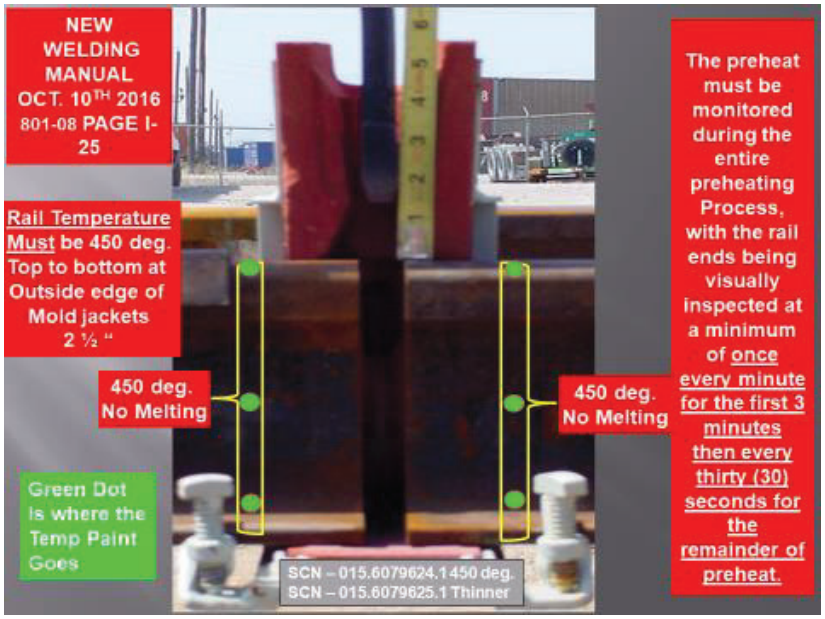


Photo I-19

j. At the end of the preheating time, the rail ends should show good orange/yellow color in the web and the base. If the rail ends do not show good orange/yellow color, continue to

preheat until the color is obtained. When making a compromise weld, the base of the heavier rail section must have an orange/yellow color.

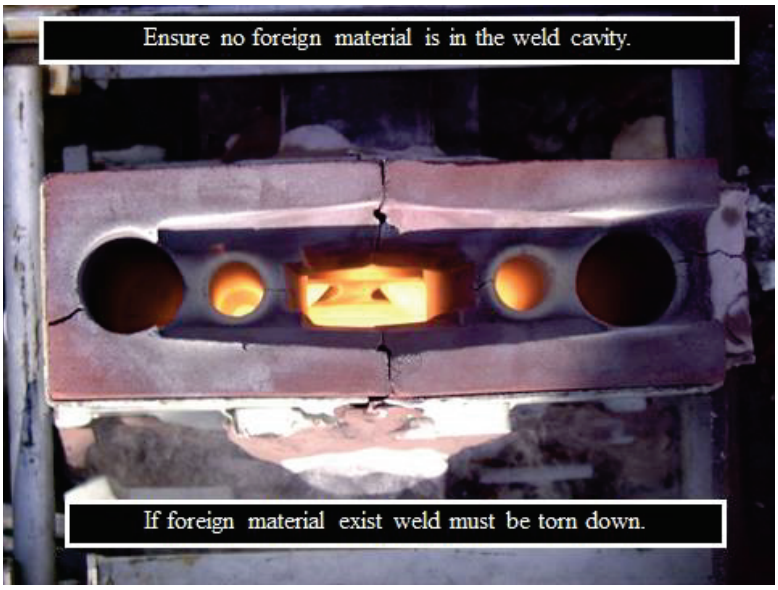


Photo I-20

k. Upon completion of preheating, remove the burner and burner stand. Insert the diverting plug into the mold, making sure it seats properly.

NOTE: The welding charge must be ignited within fifteen (15) seconds after the preheating burner has been removed.

l. If the rail ends melt during the preheating process, the welding process shall cease. If repaired within 1 hour, cut no closer than 3/8" from the damaged (melted) rail ends. If repaired after 1 hour, cut no closer than 6" from the damaged (melted) rail ends to install a plug rail.

5. CJ CRUCIBLE

a. The CJ Crucible (One-shot) is made from a refractory compound combined with a resin. The CJ Welding Charge must be used with the CJ Crucible, ie. only use the welding charge shipped in the field welding kit.

CAUTION: **Never use a welding charge that has lost material or has a hole in the bag. Never mix two welding charges or add anything to the charge.**

b. Preparing the crucible for use may be done before or during the preheat process. Inspect the crucible for cracks or other damage. Clean out any loose sand. Open and pour the welding charge into the crucible. Place the crucible on cardboard at a dry location near the working area. Get an igniter ready. Place the CJ fork near the crucible. Ensure that the slag basins contain 3/4" of dry sand.

6. REACTION AND POUR

a. The welder will clear all individuals from the welding area prior to igniting the welding portion. All track equipment working in the area will be stopped if vibrations can be felt in the rail being welded or roadbed until the weld has been poured and solidified.

b. As soon as the preheating is complete and the diverter plug is in place, place the crucible on top of the molds. Ensure that it is centered by using the two large outside riser holes as a reference.

c. The welder, using a gloved hand, will insert a lit igniter into the center of the welding charge to a depth of ½". Gently place the cover on the crucible, and move to a safe position.

CAUTION: During the reaction and pouring of the weld material, all personnel must move away from the crucible and remain a minimum of 20' (30 feet if snow on track) away while the reaction takes place. Do not return to the weld until you are certain that all molten material is contained.

d. The tapping time, which is the time from when the lit ignitor is placed into the shot portion until the time the portion begins to exit the crucible, will be timed for each weld. The normal tapping time is from 23 to 28 seconds. If the tapping time is less than 15 seconds or more than 35 seconds, the weld is to be considered defective and immediately removed from track. The CJ Crucible is designed with a by-pass feature. In the event that the molten material does not discharge within the normal tapping time, the bypass will pour into the large riser hole at approximately 90 seconds after ignition. If the by-pass tap does not function remain a safe distance away for 20 minutes.

e. When the crucible taps, the molten material will flow into the molds and the excess material and slag will flow into the slag basin. After the flow of molten material has stopped, start the solidification time. Do not place dry sand on top of molds and slag basins until five minutes have passed from the pour.

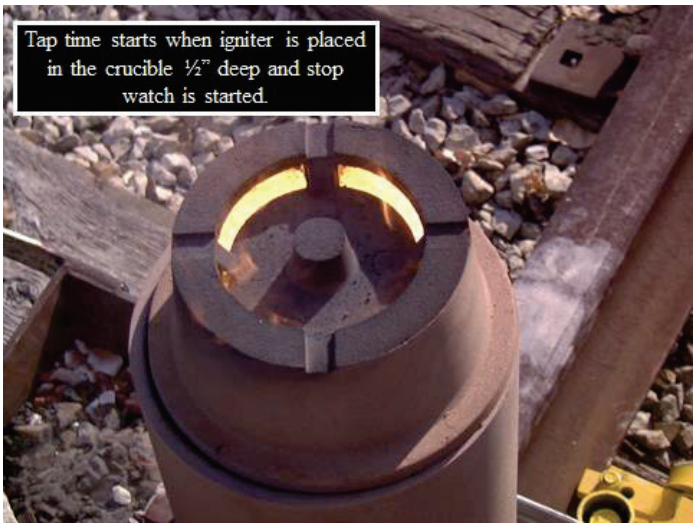


Photo I-21

7. REMOVING THE MOLDS

a. Note that a full face shield, long sleeves and welding gloves are required during the tear down process. This includes shearing of the weld.

b. Following the pour, and after 5 minutes have elapsed, sprinkle dry sand on top of the molds and slag basin and remove the slag basin. Carry the slag basin level staying on the level part of the track. Do not step over a rail while carrying the hot slag basin. Take the slag basin fifteen to twenty feet (eight to ten ties) away from the weld. Place the slag basin on level ballast between the ties. Note that this area must be level and dry. Do not flip over the slag basin at this time; allow time for the slag to cool in the basin.

c. After removing the slag basin, the CJ Crucible may be gently removed from the weld using the CJ Crucible Fork. The crucible will be lifted straight up and leveled. Pause momentarily to ensure that all molten material has drained into the mold. Carry the crucible level and set it down level in the "waste disposal" area.

CAUTION: Hot metal or slag coming in contact with moisture can cause an explosion.

d. Six (6) minutes after the finish of the pour, score the mold on both sides 1 ½" above railhead. Hold a shovel against the score mark on one side of mold and carefully push the head of the mold from the opposite side until mold is partially broken a demolding tool **must** be used if available. If molten metal leaks out, return the mold to its original position and wait 15 to 30 seconds. Repeat until no leakage occurs. Then push the mold head onto the shovel or remove with the demolder over with the handle up and carry the excess weld head to the waste disposal area already predetermined at the welding site.

e. While the weld is still at red heat, use the power shears to remove the excess metal from the sides and top of the railhead. The power shears must be a type of "Safety Shear", one having a metal shroud completely covering all the hydraulic hoses which will prevent accidental damage to the hydraulic lines from hot material or from being struck by any tool. The safety shear shroud also helps prevent a "flare up" if a hose or fitting should fail during the shearing process. Shears with exposed flexible hydraulic lines will not be used. Operate the shears at a slow and consistent speed. Careful operation of the shears will decrease the likelihood of "hot tears". Leave enough of the weld to permit proper grinding. If power shears are not available or in case of a weld shear failure, excess top railhead material may be removed by torch and excess railhead side material may be removed by hot cut chisel.



Photo I-22

NOTE: When cutting away the excess metal from the sides of the railhead, the hot cut chisel must be turned at an angle to the perpendicular, and not vertical to the ground. Refer to page A-13 – Hand Tools.

f. Base risers may be bent out slightly to make room for rough grinding. The angle between the riser and the rail head should not exceed 45°. Care must be taken during bending to ensure that a hot tear is not created in the top of the base of the rail and not to remove the risers.

g. The wedges and weld base plate may be removed after 20 minutes.

h. After cooling for 20 minutes, the slag basin may be moved to the selected waste area and emptied. Bury the hot debris in a shallow hole, making sure there is no water in the hole. If the ground is wet or covered in snow, let the debris cool before burying. Be careful of underground facilities on the right-of-way, such as signal cables, fiber optic cables, etc.

CAUTION: Do NOT throw debris into water or snow.

i. The site should be left in a neat and orderly condition. All released track materials will be taken to the local material storage site.



Photo I-23

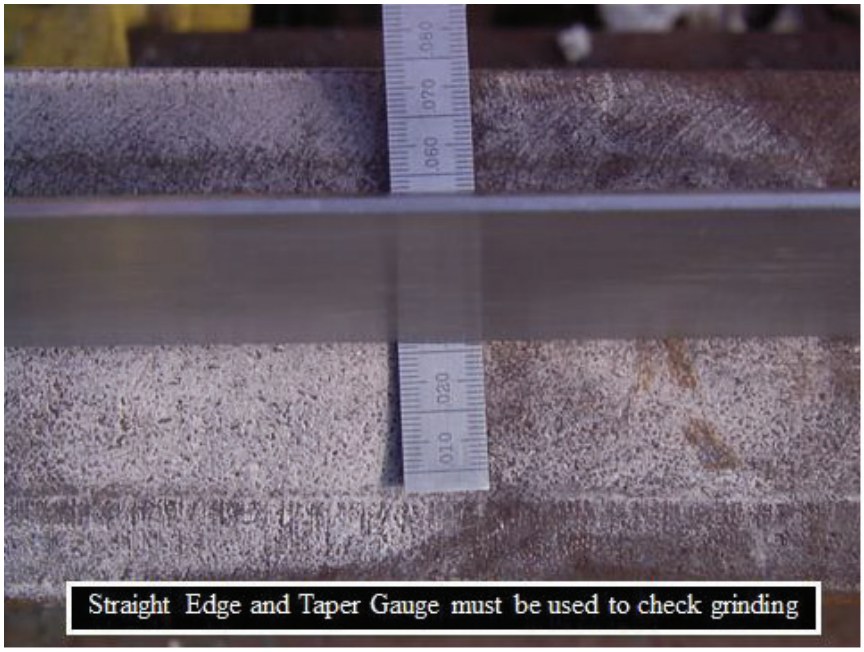


Photo I-24

MWI 801-10
CSX Welding Manual
7/1/20

THERMITE WELDING PROCEDURES
2 3/4" Wide Gap Weld using Boutet CJ Crucible (One-Shot)

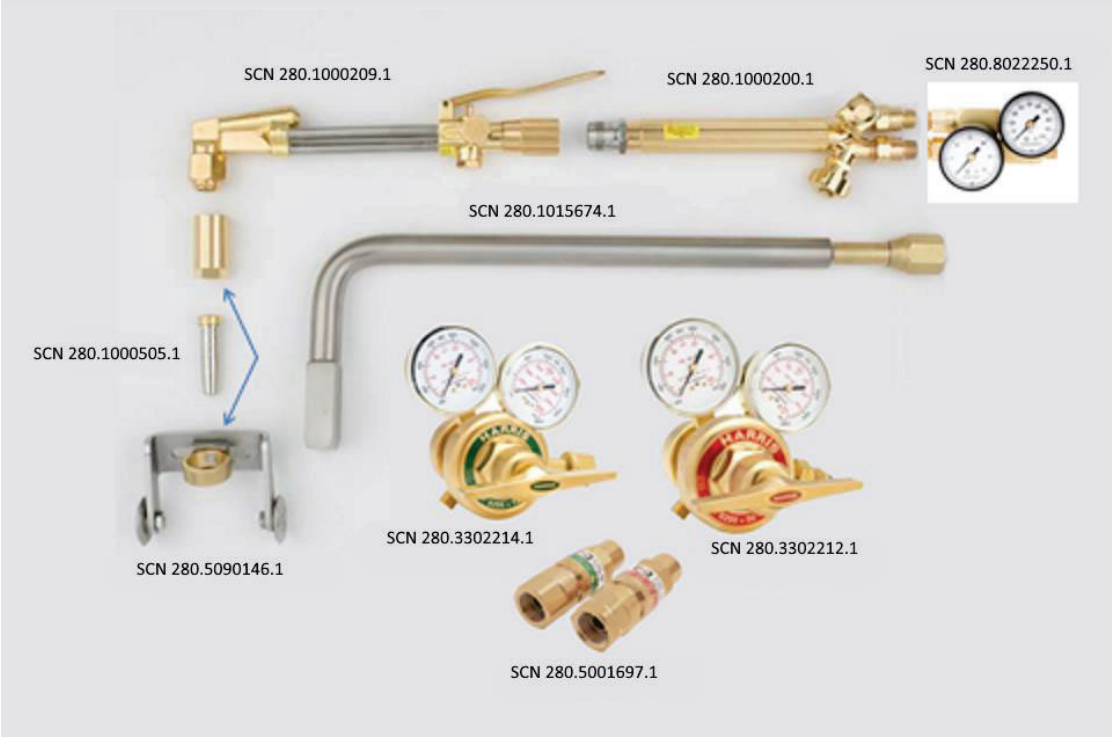


Photo I-25

1. GENERAL

***Thermite Welding Procedures For the 2-3/4" WG Boutet Weld* ALIGNMENT**

Gap: 2 3/4" +/- 1/16"
Crown: 0.085 - 0.095
Not to exceed 0.005 Vertical Offset

1- PREHEATING

Burner Hight 2 3/8 TIME
Oxy: 60 PSI 6-1/2 Minimum
Propane: 15 PSI

2-CRUCIBLE REMOVAL

6 Minutes after weld pours. Use crucible fork only for removal.

3-SLAG PAN REMOVAL

6 minutes after weld pours. Do not empty before 20 minutes.

4-MOLD JACKET REMOVAL
10 minutes after weld pours.

5 - MOLD TOP REMOVAL (Demolding)
10 1/2 minutes after weld pours.

6-SHEAR WELD
11 1/2 minutes after weld pours. Use slow, constant speed, 5 GPM. Bend risers to 45°. Hot grinding can be done at this time leaving .030" (approximately credit card height on the weld.)

7-Wedge & Base Plate Removal
20 minutes after weld pours.

8-RISER REMOVAL

900° or approx. 23 to 25 mins. After pour.

9-TRAFFIC
Can be permitted after rough grinding and cooled to 500 degrees.

10-FINISH GRIND

Finish after weld cools below 900° F Remove puller below 700° F

Photo I-26

Wide Gap Thermite Welds have been approved to be used in the field to replace defective electric flash butt plant welds, oxygen-acetylene plant welds, thermite welds and in-track welder welds. Wide Gap Welds may also be used when changing out a frog that is field welded in track with a frog of the same size, to eliminate installation of additional rails on each leg of the frog.

2. PREPARATION OF RAIL ENDS

a. Locate the defective plant/field weld. The area of the defective weld, that contains the defect, will be indicated by a vertical line on the field side head of the rail. Mark the "cut marks" on the rail head, ensuring that the existing weld and the defect area is completely removed. Also place "reference marks" on the field side of the rail head. The "reference marks" will be 24" apart and centered on the "cut marks".

b. Wide gap welds will not be made on a tie. The weld should be no closer than 4" to the edge of a tie. If tie re-spacing is required, it should be done before the rail is cut.

c. Prior to saw cutting the rail, ensure that all anchors 40' to either side of the cut are installed and tight. The rail is to be saw cut. The Welder must have a rail saw in operating condition prior to making a weld and it must be used.

d. Examine the rail ends to see if they have rail end damage (chips, nicks, and surface deformation) or were previously repaired by welding to remove rail end batter. Do not make a field weld to a rail that has rail end damage or was previously welded unless the rail end is cropped to remove all the damaged area or welded-on material. If signal bond wires are present, remove them by grinding.

e. Flame clean the rails for a distance of 4" to 6" from each end with the preheater and wire brush until area is free of grease, rust, mill scale, paint and other foreign matter.

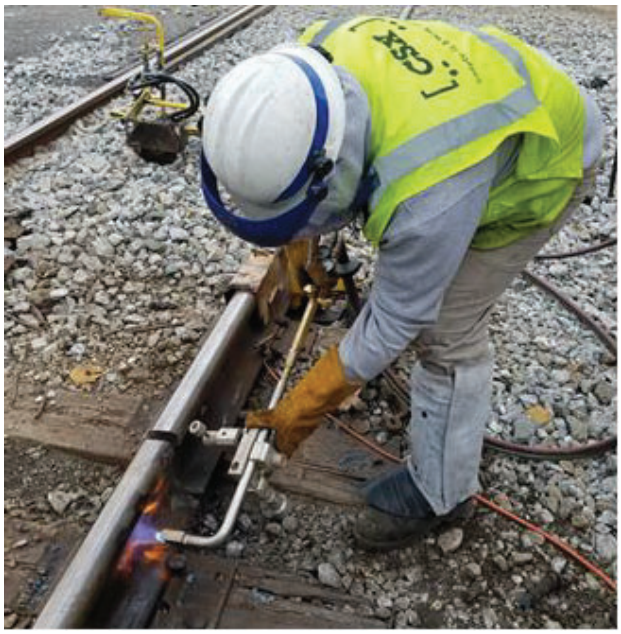


Photo I-27

3. ALIGNMENT OF THE RAILS

a. There are four parameters to be considered in aligning the rails for welding: horizontal alignment, vertical alignment, twist and gap width. The strongest weld is produced when there is no mismatch in the elevation of the rail bases, the webs are not twisted in relationship to each other, and any rail head mismatch is removed by grinding after the weld is made.

b. With some worn rails, it may not be possible to have the rail bases at the same elevation without having to perform considerable grinding on the rail heads to obtain a smooth transition between rails. In these instances, a maximum of 1/8" rail base mismatch is permitted. As the amount of rail base mismatch increases, the strength of the weld decreases.

c. Remove or loosen rail fastening from two or three ties (or whatever is necessary) on each side of the weld location.

d. To position rail ends to be welded, use:
    1. alignment plates if available, or
    2. use a mechanical or hydraulic jack under the center of the two rail ends, and lift them slightly. Place the four wedges under each side of the tie plate on both ties to nearly the desired height. Then remove the jack. A few light hits with a dead blow hammer (451.1100250.1) should be all that is required to reach the desired crown and alignment.

e. **Ensure that the correct gap is obtained**. The correct gap for all rail sections is 2 3/4" with a tolerance of 1/16" (2 ¾" to 2 13/16" permitted). The gap will be measured on both sides of the head and web in the base fillet area to confirm the proper gap has been established. This gap must be maintained throughout the welding process. Use a rail puller when the rail temperature is less than Desired Rail Neutral Temperature.

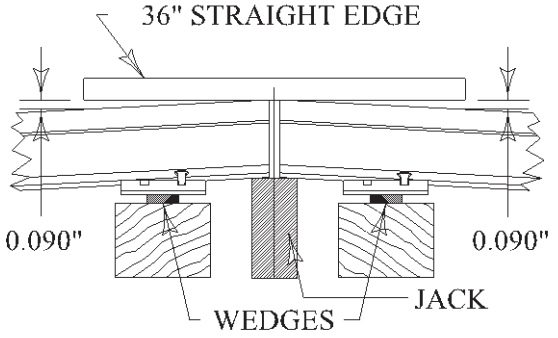
f. If the gap between rail ends is too small, the ends may be trimmed with a saw to give the proper gap.

g. All rails should be eye aligned 40 feet from where the weld is being made.

h. Then use a 36" steel straightedge at the rail ends. The horizontal alignment along the gage side of the web must be perfect with the straightedge. Check the web from the rail base to the rail head to insure that the two rails are not twisted in relationship to each other.

i. The vertical alignment must be crowned at the joint. Determine the crown by placing a 36" straightedge on the rail, so that it is centered on the gap. Then measure between the straightedge and the rail at each end. This measurement will be 0.090 (+/- 0.005). See Sketch I-3 below.

j. When welding top worn rail to new rail, it may be necessary to have the bases of the two rails mismatched. The base mismatch must not exceed 1/8". (If the rail height difference is greater than 1/8", do not use a wide gap weld.) The molds will have to be filed to fit. After the weld is completed, the higher rail will be ground off to match the lower rail. A wide gap weld is not designed to be used in place of a compromise weld. Therefore, use the existing compromise welds where appropriate.



Sketch I-3

k. If necessary, use gage rods (Ball Ratchet Gage Rod = 015.0003170.1 Base Ratchet Gage Rod = 015.0003175.1), one on each side of the joint, to hold the alignment. Additional gage rods may be required in curved track. Use of a "Canting Tool" (015.0003178.1) is very helpful in removing twist from the rail.

l. Secure the rails. When the desired rail gap has been established, tighten or add rail anchors to secure the rail position so that sudden temperature changes or sudden jolts will not disturb the gap opening. The "reference marks" will be checked to ensure that no rail is added to the track. The rails and tie plates on either side of the gap should also be marked so any longitudinal rail movement can be detected during welding. If the temperature is less than Desired Rail Neutral Temperature a hydraulic rail puller must be used to hold the rail from any movement during the solidification of the weld.



Photo I-28



Photo I-29

4. INSTALLATION OF THE MOLDS

a. Before installation, check the molds and base briquette for damage. The pouring channels and risers must be clear. Verify that the molds and base briquette are the correct size for the rails being welded. Place each mold in a mold jacket and the base briquette in the base plate. Plan placement of the mold such that the pour side of the mold is in the gage of the track on tangent track or to the low side of a curve on curved track; this will place the slag basin on the same side as the pour.

b. Test fit the molds to the rail. The molds must be centered over the rail end gap with equal amount of rail exposed in the mold cavity. Vertical mold mismatch should not exceed 1/8". Grind off any rail flow that will prevent the molds from fitting tightly against the rail.

c. Test the base briquette fit and alignment on the base of rail before applying the refractory paste. Apply a bead of refractory paste (the diameter of a pencil) in the recess on the base briquette. Do not allow any paste in the middle depression of the base briquette.
d. Install the base plate to the base of rail. Make sure that equal amounts of rail are exposed in the depression of the base briquette. Ensure that the thumb screws are on the field side. Hand tighten the thumbscrews, and then give ¼ turn with a wrench. Recheck the crown after installing the base plate.

e. Place one mold half on the rail. Center it in relation to the gap and the base plate. The pouring spout and mold clamp handle should be on the gage side on tangent track or on the low side of curved track. Put the second mold half in place. Center it in relation to the gap and the base plate. Re-adjust the mold halves, if necessary, to achieve a perfect fit.

f. Final adjustment and control is achieved by positioning the mold clamp. Be careful not to break the molds by over-tightening the mold clamp. After clamping, cover the mold top with Plexiglas or cardboard before starting luting to keep the inside of the mold clean.

CAUTION: Over-tightening of the base plate or the mold clamp may cause cracking of the base briquette or molds, which could lead to leakage of molten steel and personal injury.

g. The luting process is designed to form a seal between the rail and the molds to prevent leakage of the molten metal when the mold is filled. Poorly aligned rail and/or molds make this process more difficult and increases the chance of leakage. Only luting paste will be applied on the base briquette.

h. Evenly apply by hand the pre-mixed luting sand around the entire profile of the rail, including the bottom of the rail base. After luting the molds, place the slag basin on the mold clamp under the pour spout of the pour mold jacket. Apply a small amount of the luting sand on the lip of the pour spout and place three quarter (3/4) inch of dry sand in the slag basin. After luting is completed, check the molds for foreign material, and re-cover.

i. Do NOT let packed molds sit idle longer than ten (10) minutes before beginning preheating. In the event that preheating does not commence within this time, the existing molds may be used, but new luting sand must be applied.

CAUTION: If moisture is present under the weld, use a safety pan with dry sand between the ties to catch any leakage. Molten steel and slag can cause serious explosions upon coming into contact with snow, ice, standing water and/or frozen ballast/soil.



Photo I-30

5. PREHEATING

a. The preheating operation has a major influence on the quality of the finished weld. It must remove the residual moisture from the molds and bring the rail ends and the molds to the proper temperature range.

b. Always check the Oxygen and Propane before beginning each preheat. Ensure that there is enough of each to complete the weld procedure and that the pressures are proper.

c. Ensure that the preheating burner has been tested as detailed in Thermite Welding, General, paragraph 22.

d. Set the propane and oxygen regulators to deliver the proper pressures to the burner.

e. The proper preheating equipment and working pressures are:

Preheating Equipment		
Torch Body	280.8022200.1	280.1000200.1
Manufacturer	Victor	Harris
Model	HD310C	43-2
Preheating Burner 22 Orifice	280.8021860.1	280.1015674.1
Manufacturer	Victor	Harris
Model	TWN-5	QC2SCT7777

Preheating Operating Pressures at the Torch Handle

Propane: 15 PSI
Oxygen: 60 PSI
Inline pressure gauges (280.8022250.1)

Preheating Time

All rail sections: 6-1/2 minutes A digital stopwatch MUST be used to ensure proper time requirements are followed.

Inline Pressure Gauges (280.8022250.1) **must** be used when making Wide Gap Welds. Pressures are measured at the burner when using 3/8" inside diameter hoses with reverse flow check valves behind burner body. Burner height is measured from the top of the lower rail if the rail ends are mismatched in height.

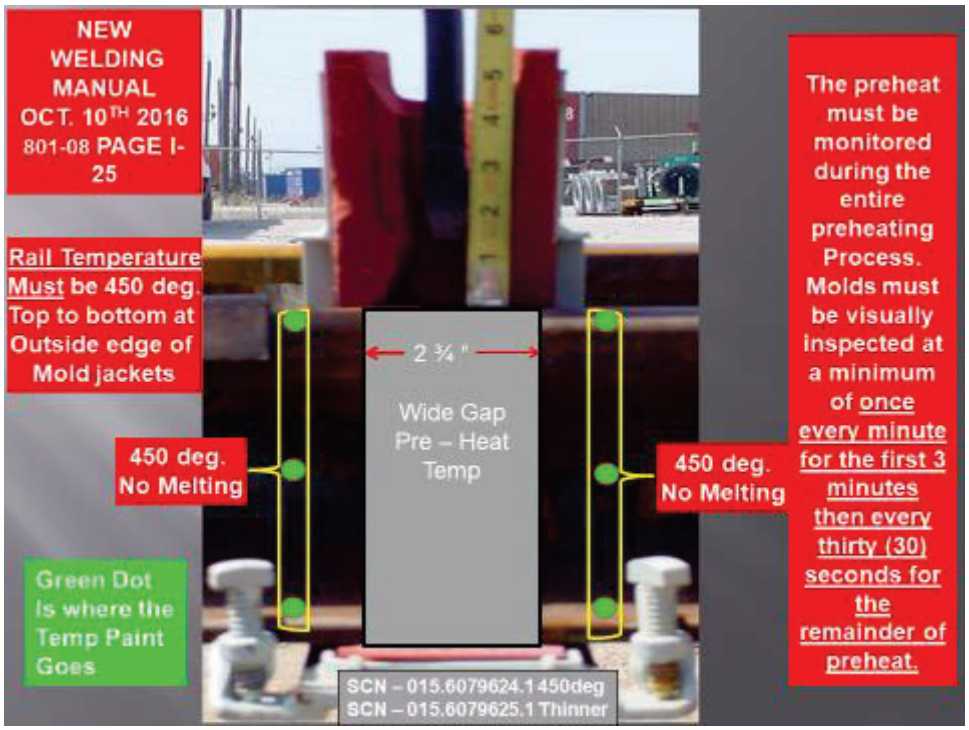


Photo I-31

f. Position the preheating burner stand on the rail. Attach the unlit burner and align it so that the burner is centered in the gap between the rail ends. Make certain that it is also aligned in the center across the head and the burner tip is **2 3/8"** above the head of the rail. Remove the burner from the stand. Light the burner, replace it on the stand and adjust the flame. On a windless day, the burner flame should rise about 12" to 14" from the outside risers.

g. Preheating time starts after the flame has been adjusted to a slight crackle and the burner alignment has been "fine-tuned". A stopwatch is the easiest and most accurate way to measure the preheat time. The proper preheat time is 6 1/2 minutes for all rail sections.

h. The diverting plug must be dried before placing it in the mold. This is accomplished by placing the diverting plug on the end of the mold next to the riser flame for approximately 1 to 2 minutes. Do not block the flame from the riser hole with the diverter plug.

i. At the end of preheating time, remove the burner and burner stand. Insert the diverting plug into the mold, making sure it seats properly.

NOTE: The welding charge must be ignited within fifteen (15) seconds after the preheating burner has been removed.

6. CJ CRUCIBLE

a. The CJ Crucible (One-shot) is made from a refractory compound combined with a resin. The CJ Welding Charge must be used with the CJ Crucible, ie. only use the welding charge shipped in the field welding kit.

CAUTION: **Never use a welding charge that has lost material or has a hole in the bag. Never mix two welding charges or add anything to the charge.**

b. Preparing the crucible for use may be done before or during the preheat process. Inspect the crucible for cracks or other damage. Clean out any loose sand. Open and pour the welding charge into the crucible. Place the crucible on cardboard at a dry location near the working area. Get an igniter ready. Place the CJ fork near the crucible. Ensure that the slag basin contains 1" of dry sand.

7. REACTION AND POUR

a. The welder will clear all individuals from the welding area prior to igniting the welding portion. All track equipment working in the area or vehicular traffic (if adjacent to a road crossing) will be stopped if vibrations can be felt in the rail being welded or roadbed until the weld has been poured and solidified.

b. As soon as the preheating is complete and the diverting plug is in place, place the crucible on top of the molds. Ensure that crucible is perpendicular and flush with side molds as rise holes are not visible as a reference on wide gap welds.

c. The welder, using a gloved hand, will insert a lit igniter into the center of the welding charge to a depth of 1". He will gently place the cover on the crucible, and move to a safe position.

CAUTION: During the reaction and pouring of the weld material, all personnel must move away from the crucible and remain a minimum of 20 feet (30 feet if snow on track) away while the reaction takes place. Do not return to the weld until you are certain that all molten material is contained.

d. The tapping time, which is the time from when the igniter is inserted until the time the portion begins to flow, will be timed for each weld. The normal tapping time is from 23 to 28 seconds. If the tapping time is less than 15 seconds or more than 35 seconds, the weld is to be considered defective and immediately removed from track. The CJ Crucible is designed with a by-pass feature. In the event that the molten material does not discharge within the normal tapping time, the bypass will pour into the large riser

hole at approximately 90 seconds after ignition.

e. When the crucible taps, the molten material will flow into the molds and the excess material and slag will flow into the slag basin. After the flow of molten material has stopped, start the solidification time. Do not place dry sand on top of molds and slag basins until six minutes have passed from the pour.

8. REMOVING THE MOLDS

a. Note that a full face shield, long sleeves and welding gloves are required during the tear down process. This includes shearing of the weld

b. Following the pour and after 6 minutes have passed, sprinkle dry sand on top of molds and slag basin. Now the CJ Crucible may be gently removed from the weld using the CJ Crucible Fork. The crucible will be lifted straight up and leveled. Pause momentarily to ensure that all molten material has drained into the mold. Carry the crucible level and set it down level in the "waste disposal area". Remove the slag basin. Carry the slag basin level staying on the level area of the track. Take the slag basin fifteen to twenty feet (eight to ten ties) away from the weld. Place the slag basin on level ballast between the ties. Note that this area must be level and dry. Do not flip over the slag basin at this time; allow time for the slag to cool in the basin.

CAUTION: The "waste disposal location" should be selected before removing the slag basin. It must be dry, and out of the way. **Hot metal or slag coming in contact with moisture can cause an explosion.**

c. After 10 minutes, remove the mold jackets.

d. After 10-1/2 minutes, remove the mold top using the Boutet de-molding tool.

e. After 11-1/2 minutes, use the power shears and shear the weld through the molds. The power shears must be a type of "Safety Shear", one having a metal shroud completely covering all the hydraulic hoses which will prevent accidental damage to the hydraulic lines from hot material or from being struck by any tool. The safety shear shroud also helps prevent a "flare up" if a hose or fitting should fail during the shearing process. Shears with exposed flexible hydraulic lines will not be used.

f. Operate the shears at a slow and consistent speed. Careful operation of the shears will decrease the likelihood of "hot tears".

g. If the air temperature is below 40° F, or it is windy, raining or snowing, cover the weld with a cooling retarding material immediately after shearing. Remove the cover after the weld cools to 700° F.

h. Base risers may be bent out slightly to make room for rough grinding. The angle between the riser and the rail head should not exceed 45°. Care must be taken during bending to ensure that a hot tear is not created in the top of the base of the rail.

i. The wedges and weld base plate may be removed after 20 minutes in tangent track or 30 minutes in curved track.

j. After cooling for 20 minutes, the slag basin may be moved to the selected waste area and emptied. Bury the hot debris in a shallow hole, making sure there is no water in the hole. If the ground is wet or covered in snow, let the debris cool before burying. Be careful of underground facilities on the right-of-way, such as signal cables, fiber optic cables, pipes, etc.

CAUTION: Do NOT throw debris into water or snow.

9. REPORTING

A welding report on the Engineering Gateway must be submitted at the completion of each work day, as well as a Track Disturbance Record for any Thermite weld made in the track structure. Be sure to use "WG" as the weld type instead of "BU" so that proper credit will be recorded when making Wide Gap Welds. Also record the thermite weld batch/serial numbers, tap times, and crucible type in DTW.

GRINDING OF THERMITE WELDS

1. ROUGH GRINDING THE WELD

a. Rough grinding can be performed immediately after shearing.

b. Prior to rough grinding, the base risers may be bent away from the rail head to provide clearance for the grinder. However, to avoid hot tears in the base, the risers should be bent the minimum distance that is required for clearance but not more than 45° from the vertical. The riser removal tool (015.0003150.1) is available for this task.

c. The rough grinding is finished when the top surface of the railhead is about 0.030" high and the gage side has been ground.

2. FINISH GRINDING THE WELD

a. All thermite welds must be ground before the heat leaves the weld. Do not re-introduce heat into the sides of the weld where it will be ground. **Do not finish grind the rail head freehand.**

b. Finish grinding may be performed while the weld is hot. The weld must be left high to compensate for the reduction in crown that will occur during the cooling to ambient temperature. Leave the weld about 0.030" high if finish grinding is done at 900°F, or about 0.015" high if finish grinding is done at 600°F.

c. If the weld is at ambient temperature, the running surface will be ground within a tolerance of 0.000" low, 0.015" high. Check the final contour of the rail head with the 36" straightedge.

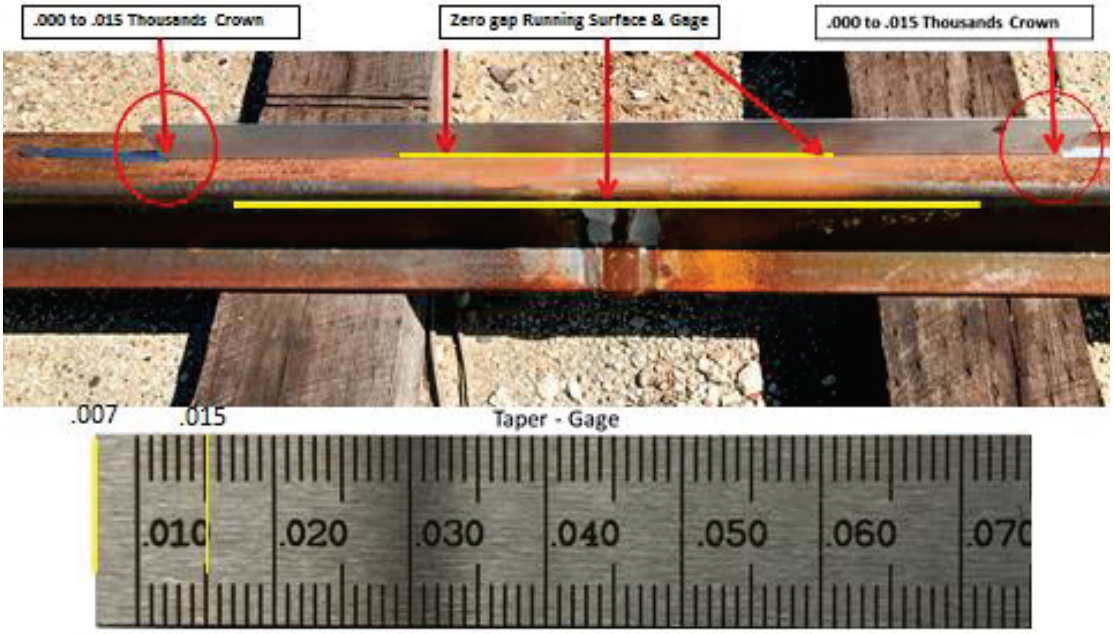
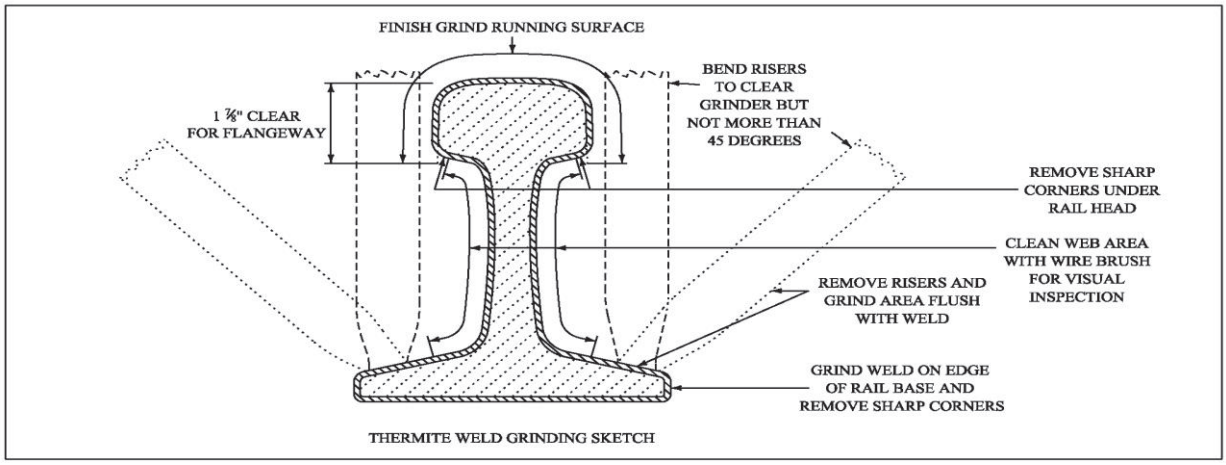


Photo I-32

d. For most welds, finish grinding in the following sequence will require the least handling of the grinding equipment:

1) Sides of the railhead,
2) Edges of the rail base and base riser area,
3) Top of the railhead,
4) Rounding off of sharp corners under the rail head and at the rail base.



Sketch I-4

e. If the weld was made with a rail head mismatch, the higher rail will be runoff at the minimum rate of:
12” for each 1/16” difference in rail height for speeds of 40 MPH and less, and
18” for each 1/16” difference in rail height for speeds greater than 40 MPH.

If the weld was made with a gage face mismatch, the gage face will be ground to provide a gradual change. Check both surfaces with a 36” straightedge for any undesirable alignment.

f. Remove the base risers by bending them back toward the rail. After removing the base risers, grind the riser area flush with the top of the weld metal leaving a smooth surface to avoid any notch effect stresses.

g. The web and base are to be cleaned by hand with a wire brush for inspection.

h. Grinding below the rail head should be done only where necessary to remove sharp edges and to grind the weld on the outside edges of the rail base.

i. After finish grinding, a visual inspection must be made on every weld for hairline cracks and other visible defects. The Welder **must** use a 36” straight edge to verify proper crown.

j. Tamp up the ties on each side of the weld. Re-install any spikes, clips, or anchors removed or missing. On track with concrete ties, replace any clips, tie pads, or insulators.

k. The weld must have been completed for 20 minutes, ties tamped, the surface and gage side grinding completed, and the weld temperature below 500°F (check with a Templestik (360.8770025.1) or a digital thermometer (023.0062001.1)) before allowing a train to pass over.

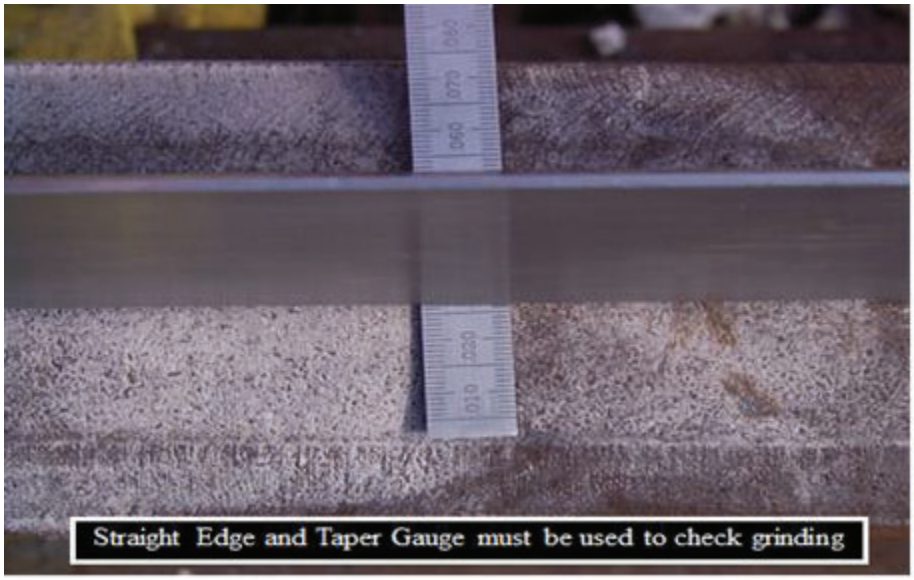


Photo I-33



Photo I-34

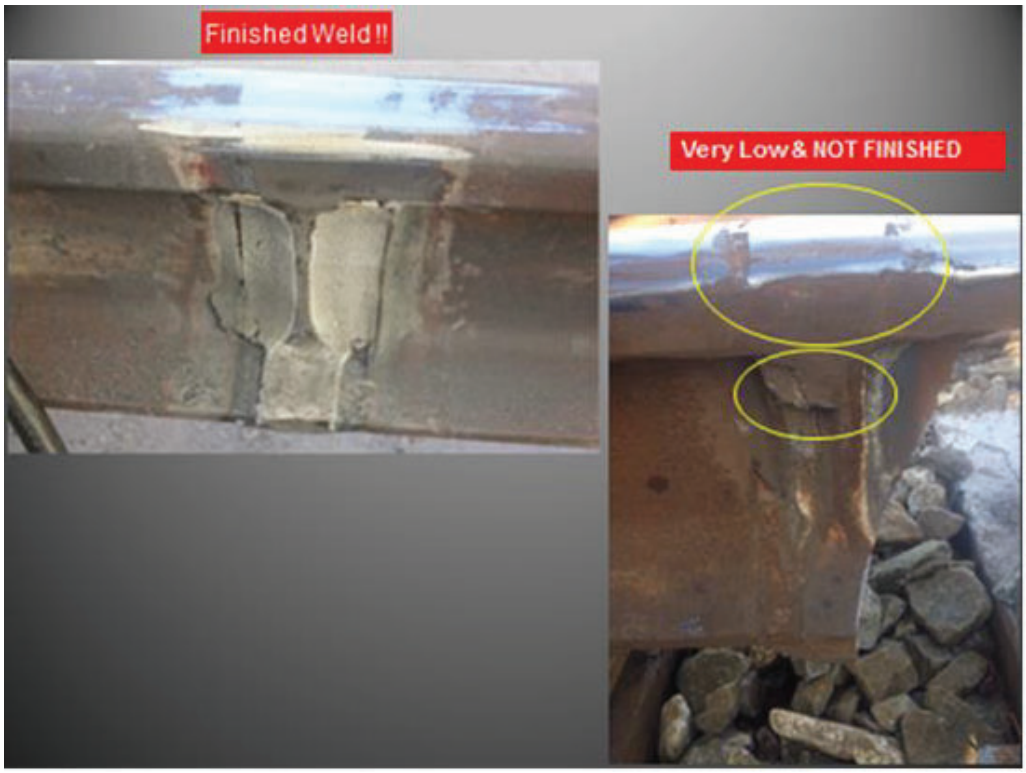


Photo I-35

Welding on out of track Switch Panels
Safety, Procedures, Tools

More Focus must be on walking conditions when working around the out of track panels.
To get safe Quality Welds, panels need to be level as if in the track.

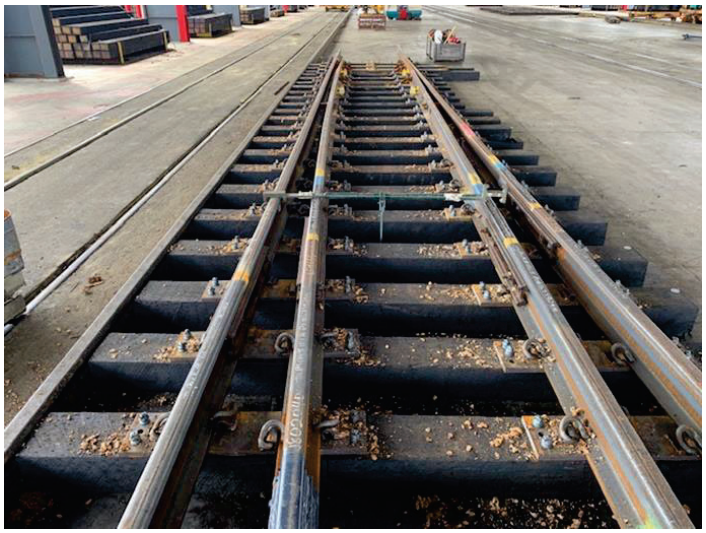


Photo I-36

2 ties are removed at <u>moving panel</u> joints and push joints up tight.
3 ties each way from joint to be un-clipped and de-lagged to free the rail and not fight alignment, counting the ties that were removed.

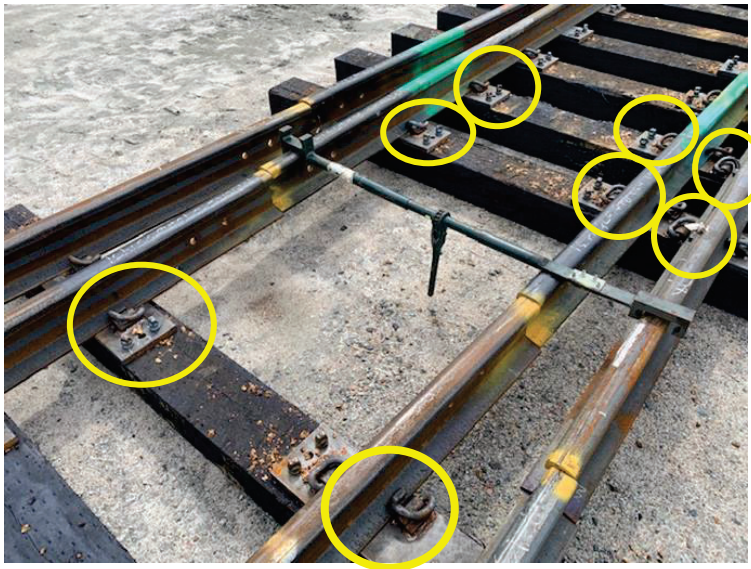


Photo I-37

The 2 Switch-point joints will need moved (with backhoe)
At panel ends, to reduce extra forces to get 3' straight edge alignment before cutting 1 1/16 gap for weld.

Tools

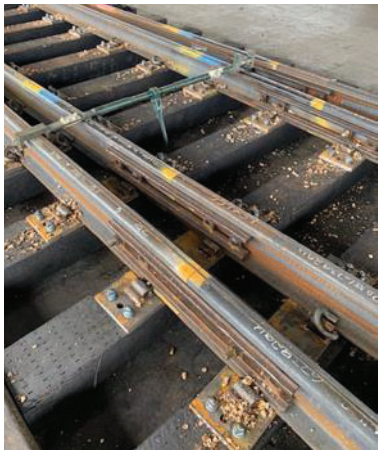


Photo I-38



Photo I-39





Base Ratchet SCN - 015.4364801.1 - LA165 **Rail Head SCN - 015.4364800.1 - LA161**

Photo I-40

Solid Metal Ratchet Gauging bars to be used on out of track panels only.
DO Not Use Non-Insulated Gauging Bars on Main or Signaled Tracks.

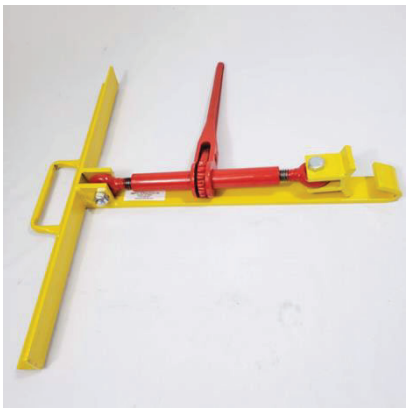




Photo I-41

To remove Rail twist to match web of rail
(SCN - 015.0003178.1)



Photo I-42

2 of each Bottle jacks will be needed when welding panels
(SCN – 450.3621200.1 – 12ton) (SCN – 450.9305000.1 – 5ton)



Photo I-43

SCN – 451.0077030.1 LAG SOCKET

Blocks of wood (2x4 or 1x3) should be used in the **web** of the rail to not cause defect in web or have the jack slip on metal to metal contact.

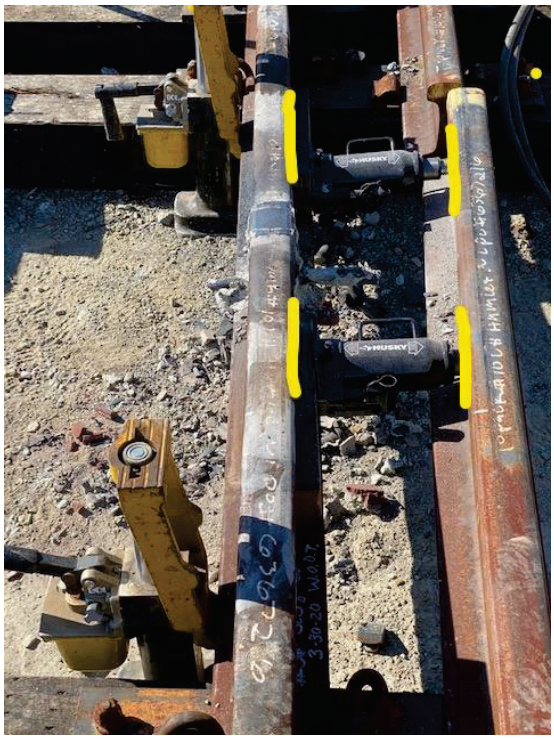


Photo I-44

Wood wedges can also be used to place under ties to raise and lower panels To also adjust for crown.



Photo I-45



Photo I-46



Photo I-47

Loosen 3 ties each direction from the joint to allow for Quality alignment and movement of rail.



Photo I-48

Thermite Welding Hardware

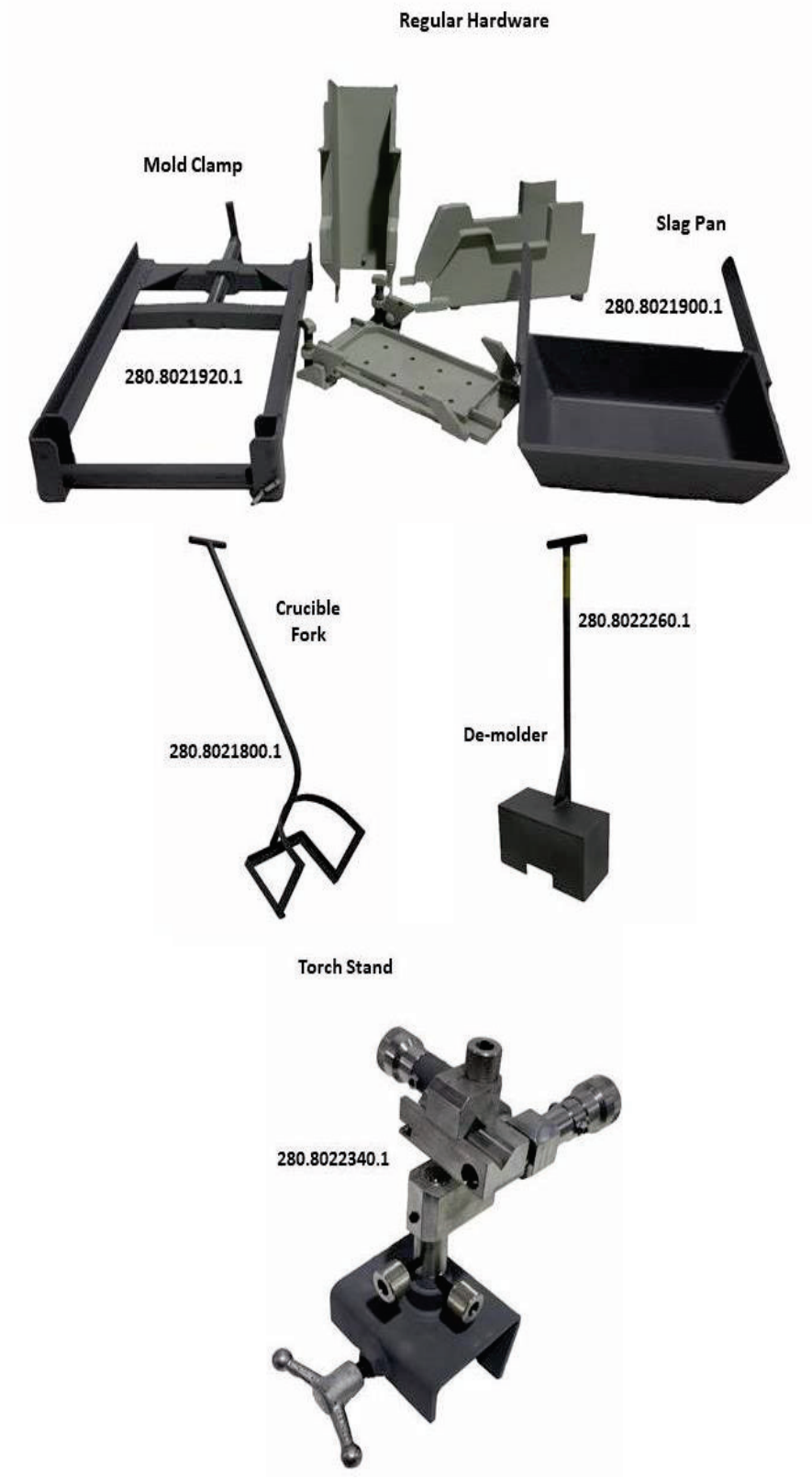


Photo I-49

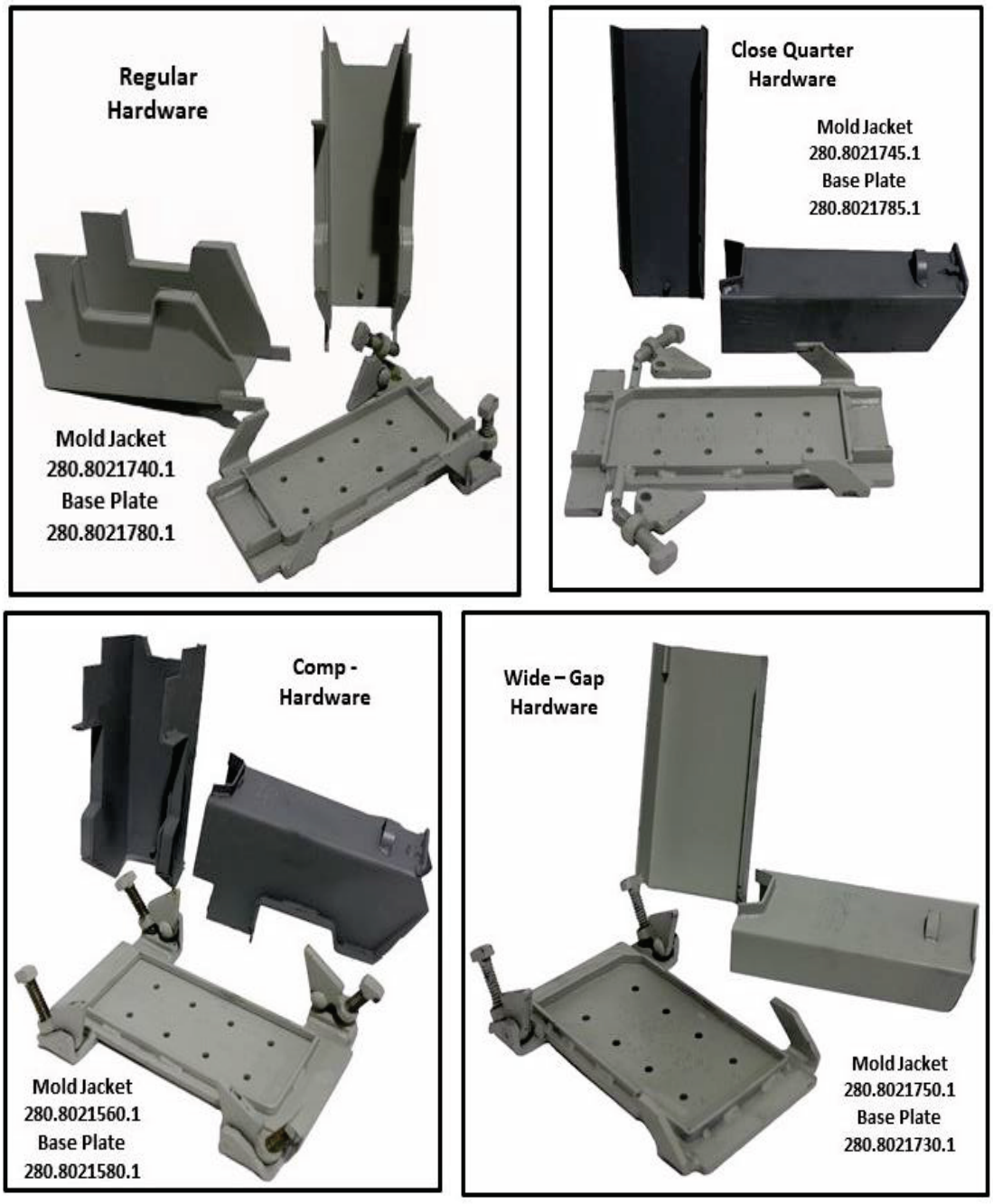
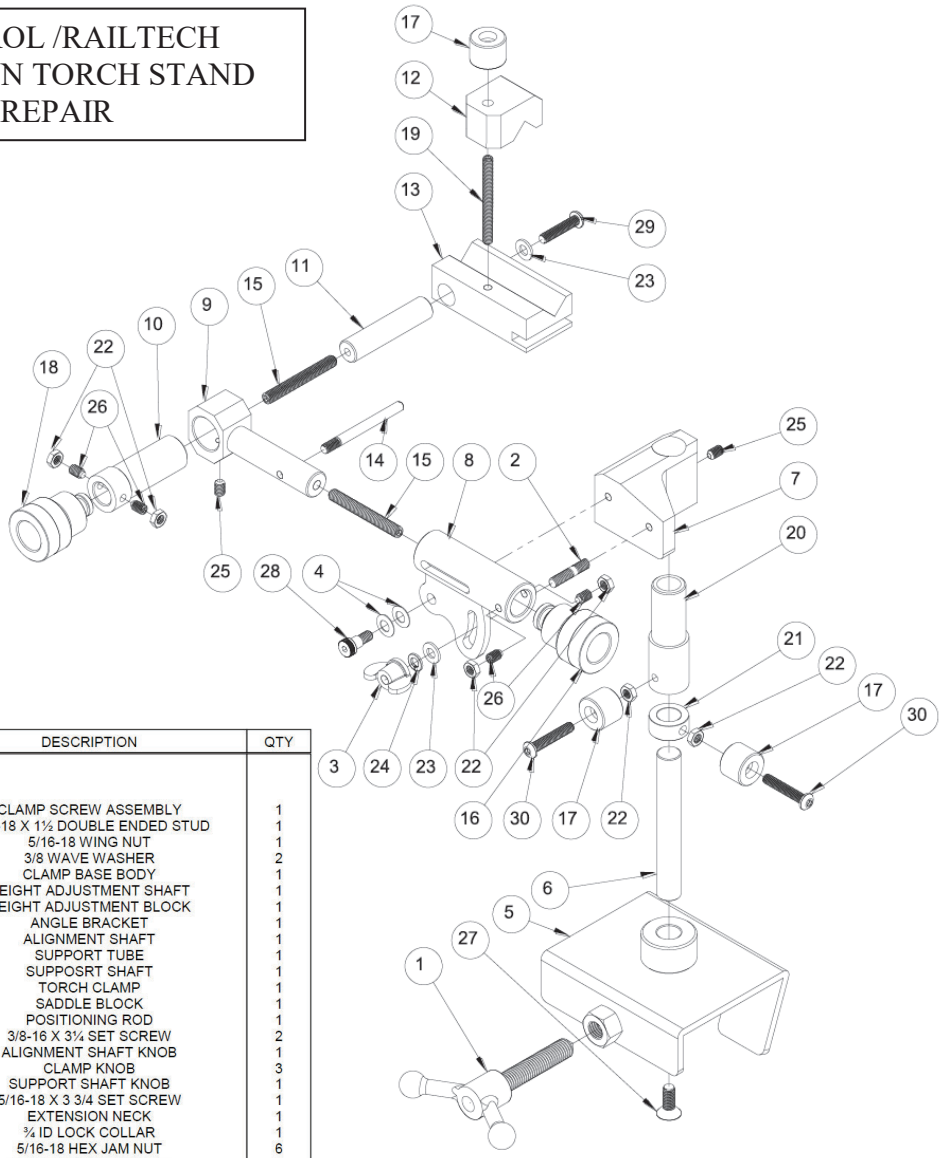

Regular
Hardware
Mold Jacket
280.8021740.1
Base Plate
280.8021780.1
Close Quarter
Hardware
Mold Jacket
280.8021745.1
Base Plate
280.8021785.1
Comp -
Hardware
Mold Jacket
280.8021560.1
Base Plate
280.8021580.1
Wide – Gap
Hardware
Mold Jacket
280.8021750.1
Base Plate
280.8021730.1

Photo I-50

MWI 801-10
CSX Welding Manual
7/1/20

PANDROL /RAILTECH PRECISION TORCH STAND REPAIR



ITEM	PART NUMBER	DESCRIPTION	QTY
1	06814	CLAMP SCREW ASSEMBLY	1
2	06817	5/16-18 X 1½ DOUBLE ENDED STUD	1
3	06818	5/16-18 WING NUT	1
4	06819	3/8 WAVE WASHER	2
5	06820	CLAMP BASE BODY	1
6	06821	HEIGHT ADJUSTMENT SHAFT	1
7	06822	HEIGHT ADJUSTMENT BLOCK	1
8	06823	ANGLE BRACKET	1
9	06824	ALIGNMENT SHAFT	1
10	06825	SUPPORT TUBE	1
11	06826	SUPPOSRT SHAFT	1
12	06827	TORCH CLAMP	1
13	06828	SADDLE BLOCK	1
14	06829	POSITIONING ROD	1
15	06830	3/8-16 X 3¼ SET SCREW	2
16	06831	ALIGNMENT SHAFT KNOB	1
17	06833	CLAMP KNOB	3
18	06835	SUPPORT SHAFT KNOB	1
19	06836	5/16-18 X 3 3/4 SET SCREW	1
20	06837	EXTENSION NECK	1
21	LC-075	¾ ID LOCK COLLAR	1
22	A1452	5/16-18 HEX JAM NUT	6
23	A2191	5/16 SAE FLAT WASHER	2
24	A3810	5/16 LOCK WASHER	1
25	A5620	5/16-18 X ⅛ SET SCREW	2
26	A5630	5/16-18 X ½ DOG POINT SET SCREW	4
27	A6314	3/6 -16 X 1 FLAT HEAD SCREW	1
28	A6925	3/8 X 5/16 SHOULDER BOLT	1
29	A6357	5/16-18 X 1½ BHCS	1
30	A6362	5/16-18 X 1 3/4 BHCS	2

Photo I-63

J. GRINDING EQUIPMENT

GENERAL

1. When operating power grinding machines and abrasive rail saws, the proper hand, leg, and eye protection must be worn. The operator must not place himself or allow others to be in a hazardous position while the machine is in operation.

2. An approved type of metal foot and shin protection or combination welding leggings (360.8312227.1) or metal leggings (360.8312222.1) must be worn when surface grinding, or when doing free hand grinding with plate mounted or cup wheels. Leather leggings must be worn for all other grinding.

3. All grinders and saws must be provided with suitable guards that must be maintained in the correct position for the protection of the operator.

4. When grinding wheels and abrasive blades are stored, they should be left in the original containers until used, and the oldest wheel received will be used first. Containers should be marked with manufacture date in large numbers so proper stock rotation can take place. The manufacturing date is also shown on wheels. **Wheels and blades that are older than 2 years or more specifically 24 months from the date of manufacture must not be used**.

5. For other than temporary storage, straight wheels should be stored on edge and thin wheels should be laid flat to prevent warping. Plate mounted, cylinder, and cup wheels should be stored on their flat sides with cushioning material, such as corrugated paper, between them.

6. Only enough grinding wheels for two or three days use should be kept in welding team trucks or equipment, and a specific place in the truck or equipment shall be provided for storage.

7. Wheels should be tested occasionally during use for balance, and if found out of balance, destroyed.

8. Grinding wheels and abrasive blades absorb moisture. They should not be exposed to rain, dew, or fog, or placed on damp or wet ground. Moisture will throw the wheel out of balance, causing excessive vibration while operating at high speeds, and may result in the breaking of the wheel, which may lead to injury.

9. Extreme care must be used in the mounting of grinding wheels and abrasive blades. Blotters must be used. Wheels must not be forced on the spindles or be too loose. When tightening spindle nuts, care must be taken to tighten them only enough to hold the grinding wheels firmly. Ends of spindles must be so threaded that the nuts on both ends will tend to tighten as the spindles revolve. Ensure that the same size mounting flanges are used on both sides.

10. Grinding wheels and abrasive blades are to be removed from equipment at the end of each days work and stored in original box in a dry location to protect the wheels and blades from moisture.

OPERATING GRINDING WHEELS AND ABRASIVE BLADES

1. Extreme care must be exercised in the use of grinding wheels and abrasive blades.

2. The operator must know that the spindle speed of his grinder or abrasive saw is not greater than the maximum operating speed shown on the grinding wheel or abrasive blade.

3. Grinding wheels and abrasive blades not plainly marked with the maximum operating speed will not be used. The Division Manager–Materials and Roadmaster will promptly be notified of receipt of unmarked wheels and blades.

4. Each wheel must be closely inspected before mounting to make sure it has not been damaged in any way.

5. Grinding wheels and abrasive blades have a date of manufacture on the label. **Wheels and blades that are older than 2 years or more specifically 24 months from the date of manufacture must not be used**. Undated wheels and abrasive blades will not be used.

6. The operator will check and record the speed of their grinder or abrasive saw with a tachometer daily or prior to use if not used daily. Enter speed, on daily RPM Form, and retain for 30 days. If necessary, adjustments will be made in the speed of the wheel spindle prior to use. It is mandatory to use a power blower when grinding manganese. If electricity is available, it is recommended to use a power blower for all grinding operations.

7. Roadway Mechanics are authorized to make adjustments in the speed of the wheel spindle with the Welder present. The Welder's tachometer will be checked at this time by comparing readings with the Mechanic's tachometer, and if found to vary by more than 5%, will be reported to the Roadmaster for adjustment or replacement.

8. Slotting of frogs may be accomplished by use of straight grinders, or electric grinders. Rail end slotting should be accomplished by use of an electric grinder, or slotting attachment.

TACHOMETERS

1. The present standard tachometer for Engineering Department use is a four digit non-contact optical model.

2. The method of operation of an optical tachometer may vary among manufacturers but is typically as follows:

a. The piece of equipment that is to have its rotational speed checked must be stopped and a piece of adhesive backed reflective tape is stuck to the spindle.
b. The equipment is started and brought up to a stable operating speed.
c. The tachometer is aimed at the reflective tape. Some models have aiming bars or other aids for aligning the tachometer with the tape.
d. The power button is pressed and a light parallel to the aiming bars comes from the tachometer as a visual aid in positioning the tachometer on the reflective tape while the reading is taken.
e. The power button is held on until the reading stabilizes. The speed recoding is obtained and recorded. This step is repeated three or four times and compared to the speeds obtained from each reading. This reading must be recorded on CSX form RPM-1 and retained for 30 days. Form RPM-1 is located on the Gateway on the Engineering Standards Document screen under the 800 rules section.
f. The speeds obtained should be the same for each reading if the equipment is running at a constant speed, but a variation of a few RPM between readings is not unusual.
g. The speed obtained must be less than that permitted by CSX rules or the speed shown on the grinding wheel, grinding disk, or abrasive blade, whichever speed is slower.
h. Most optical tachometers can be calibrated by aiming at a single tube florescent light and comparing the reading obtained with the reading given in the operating instructions of the tachometer.

3. Grinding on the flat sides of straight wheels is hazardous, and must be avoided.

4. If a grinding wheel or abrasive blade should break during operation, notify the Roadmaster and Manager–Welding. An inspection must be made to ensure that the hood, flanges, and nuts have not been damaged and that the spindle has not been bent or sprung out of balance. Also, the speed of the machine must be checked. Wheel fragments, mounting plates, and label should be collected in the event the manufacturer desires to perform laboratory tests.

5. Unless grinding equipment is permanently attached to a vehicle, the equipment must be removed from the vehicle before starting to grind.

6. Grinding wheels and abrasive blades must be stopped when a grinding machine is being moved. Care must be taken when moving a grinder so that the wheel does not strike anything that may crack it.

7. Operators must periodically inspect grinding machines and saws that are in use and report to their supervisory officer anything unusual in the operation of the saws or grinders such as peculiar noises, apparent increase in engine or spindle speed, vibration, wheels out of balance or badly worn, etc.

IN-TRACK ELECTRIC FLASH BUTT WELD GRINDING

1. Grinding precautions that are required for thermite welding are also applicable for in-track electric flash butt welding.

2. Due to limited space created by the machinery when rail puller is in place, grinding with a hand held disc grinder to prep the rail is not permitted.

K MISCELLANEOUS WELDING

MANGANESE COMPONENTS

1. Other manganese components, such as, manganese switch point tips and switch point guards, can be repaired in the field only when qualified to do so by a Manager-Welding. Use the electric-arc method and the techniques described in the “Repair of Frogs and Railroad Crossings” section.

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L AIR ARC METAL REMOVAL

GENERAL

1. The exact air quantity and pressure requirements vary with the specific torch used. In general, the compressed air required will vary from 80 to 100 PSI and 26 to 33 CFM for standard torches.



Photo L-1

2. The amperage needed depends upon the electrode diameter. Best results are usually obtained when maximum amperage is used. The recommended current is:

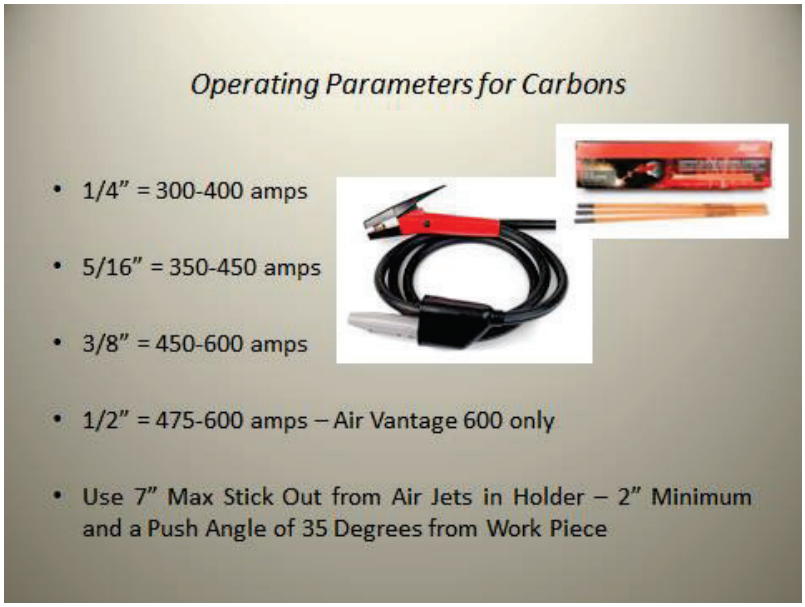


Photo L-2

3. Carbon, stainless, and manganese steels should be cut and gouged with the electrode on DC reverse polarity.

4. The initial rod position should be about 6" out from the holder and the length adjusted as required.

5. The Signal Maintainer will be notified in advance whenever welding is to be performed in track circuit territory.

6. See *Section "A", Safety*, for instructions for electric arc welding in track circuit territory.

PROCEDURE

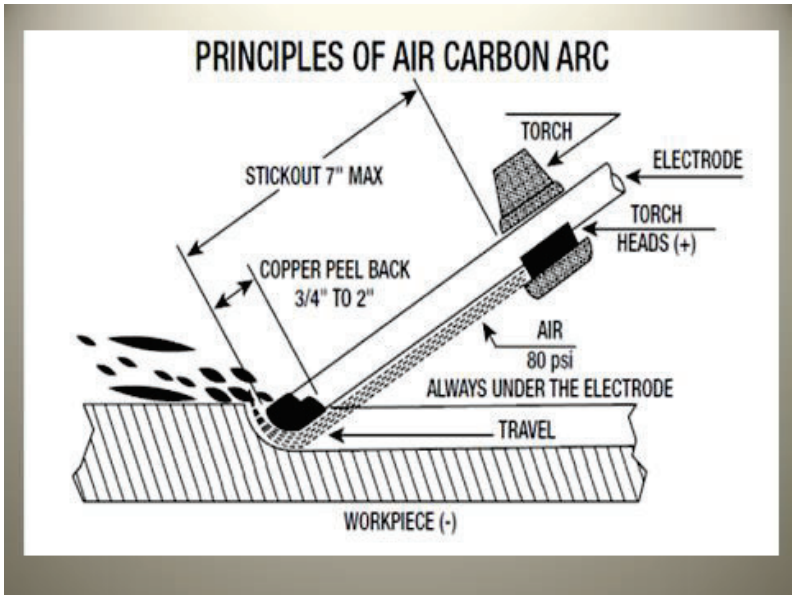
1. The welding machine should be set at the desired amperage.

2. The air should be on before starting to cut or gouge. The air should also be used to cool the cut.

3. The torch should be held so that the electrode slopes back from the direction of travel with the air blast below the electrode.

4. An electrode angle of approximately 45° is recommended.

5. The initial rod position should be about 6" out from the holder and the length adjusted as required by the work.



Sketch L-1

6. If the air blast is above (in front of) the electrode, the metal will not be properly removed and the cut surface will be covered with oxide (dull appearance).

7. Use only a straightforward motion.

8. The depth and contour of the groove is controlled by the electrode angle and travel speed. For a narrow and deep groove, the electrode should be held at a steep angle and used at a slow travel speed. For a shallow groove, the electrode should be held at a flat angle and used at a fast travel speed.

9. The width of the groove is controlled by the size of the electrode. Generally the groove will be approximately 1/8" wider that the electrode diameter.

10. The travel speed should be uniform. The proper speed will produce a good, clean cut without appreciable oxide.

11. During gouging, a short arc must be maintained by progressing in the direction of the cut, fast enough to keep up with the metal removal.

12. Low amperage and/or a bad ground will result in a sputtering arc and intermittent, skimpy cuts.

13. Irregular gouging action is a result of too slow a travel speed.

14. If the electrode is the wrong polarity, it will heat up rapidly and the arc will sputter.

15. If any slag is adhering to the edges of the cut, the air pressure is too low.

16. The cut surface should be ground to remove all traces of oxide, slag, and any other irregularities. The finished cut surface should be clean and smooth.

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M. IN TRACK ELECTRIC FLASH BUTT WELDING

GENERAL

1. Rail Preparation Requirements

   a. All rails used for electric flash butt welds will have the scale removed down to bright metal 27" from each end of the rails where the welding current carrying electrodes contact the rail. Also, any raised mill marking in the web of the rail will be ground smooth.

   b. Rail ends will be clean of all foreign matter.

   c. Rail will be cut by using a rail saw. A weld may also be cut out by using an oxy-propane torch, but only if the new weld is made within 30 minutes of cutting. Torch cut rails, with cuts older than 30 minutes, will have the torch cuts removed by trimming 6 inches from each end with a rail saw before welding.

   d. Electric flash butt welds should not be located on a tie. If the weld location falls on a tie, reposition the tie off the weld.

   e. Electric flash butt welds will be marked on the field side web of the rail near the weld with an identifying marking. This marking will include the following information
      1) The vender or CSXT equipment making the weld.
         a. Holland Co.= HW
         b. Progress Rail = PR
         c. Chemtron = CMW
         d. CSXT Plasser = PW
         e. CSXT Truck = TW
      2) The equipment number of the machine/truck making the weld.
      3) Was this a closure weld?
         a. If it was, insert a "C" before the sequence number.
         b. If not, leave blank.
      4) The weld sequence number.
      5) The date the weld was made.

      A sample marking for a closure weld made by the Holland Co., using their truck #406 follows:

      HW 406 C 1234 1/18/06

2. Parameters For Continuous Welded Rail

   a. Preheating of rail ends for the welding cycle will be done by pulsed flashing.

b. When using a continuous flash welder, no interruption of platen travel or flashing current within 1/2 inch of final flashing is allowed with a minimum of 7/16" (.44") upset required.

c. Low Rail Consumption will be no less then: 3/4 inch

d. Normal Rail Consumption: 1 1/8 inch

e. Upset Current: Must be a minimum of one second in duration.

f. Upset Blow: Upset to refusal within 5/8" is standard. Minimum upset required is 7/16" (.44") low consumption. When using puller, holding pressure until the weld has cooled to 700°F or less (approximately seven (7) minutes after upset) is mandatory for closure welds. No clamp slippage is allowed.

g. Weld Rejection: Welds rejected will be cut down through the middle of the weld with a rail saw or, if torch cut, re-weld within 30 minutes.

3. Welding Machine Setup

The following procedure is to be used in the preparation of the welding machine for welding a specific rail section.

a. Upsetting pressure will be adjusted to the proper setting for the rail section and metallurgy being welded.

b. Flashing time will be lengthened or shortened until the standard 5/8 inch upset is achieved.

4. Upsetting Pressure for any Rail Section

The minimum upset pressure is 40 metric tons or 44.1 US tons.

5. Chart Recorder

A chart recorder approved by CSX is to be used to monitor welding current, platen displacement and hydraulic pressure.

6. Weld Finishing Requirements

a. All notches resulting from offsetting and shearing operations will be eliminated by grinding.

b. A finishing deviation of 0.015" will not be exceeded on the rail running surface.

c. A finishing deviation of 0.010" will not be exceeded on the gage and field sides of the rail head.

d. The web zone (underside of rail head, web, and top of base) will be finished to within 1/8" of parent metal but not deeper than parent section. Care must be exercised to insure that finished grinding on the underside of the rail head and head to web fillets removes all sharp notches and leaves a smooth transition zone.

7. Weld Inspection

a. The electrode contact area will be visually inspected for electrode burns. Electrode burns may appear as small deposits of copper electrode on the rail or there may be evidence of metal flow of the parent rail steel (displacement of metal).

b. After finished grinding, a visual inspection is required.

c. When the external stripper or shear is used for removing the upset, the clamp area in the web will be inspected on every weld for gouges or slippage. Any excessive gouge in the parent metal will be rejected.

d. Any weld not meeting the specified tolerances and tests will be cut out and re-welded.

8. Weld Tolerance Measurement

a. Tools: A 36" straightedge and a taper gauge will be used to take measurements from the finished weld.

b. Procedure: Center the 36" straightedge over the weld against the high side. Gently slip the taper gauge under the extreme end of the straightedge lengthwise, reading the amount of variation from the taper gauge for offset and crown camber measurements.

c. The following tolerances were developed, assuming that like class rail is being welded; i.e. New to New, Class 1 to Class 1, etc.

9. Weld Tolerance Offset Limits for New, Class 1, 2 and 3 Relay Rail.

a. Rail Height Mismatch:
Maximum Height Differential 0.250"

b. Rail Head:

Vertical offset:	0.125"
Gage side horizontal offset:	0.050"
Horizontal kink:	0.025"

c. Rail Base:

Vertical offset:	0.125”
Horizontal offset:	0.100”

10. Surface Misalignment after Grinding:

Combined offset and crown camber:	0.015”
Combined offset and dip camber:	0.000”

11. Gage Misalignment after Grinding:

Combined offset and kink:	0.020”

REPAIR WELDING PROCEDURE

This procedure is designed to produce a quality rail weld and adjust the rail at the same time. It is based on 1 1/8” rail consumption per weld. In this procedure the following terms have been adopted to avoid confusion:

- Defect Plug - The piece of rail to be removed from the track. The normal length of a defect plug is 19’-0”. This length has been selected to balance the physical characteristics of the various In-Track Welding Equipment and track surface and alignment requirements. When using CSX Plasser In-track welder, minimum plug length must be 27 ft.

- Replacement Plug - The piece of rail to be installed into the track. The normal replacement plug length is 19’- 1-1/8” This length is determined by adding 1-1/8” to the length of the defect plug.

- Current Rail Temperature - The rail temperature measured at the work site.

- Adjusted Rail Temperature - The desired rail laying temperature. It is location dependent and is specified in MWI 1125.

- Temperature Measuring Device - The In-Track Welding Team is normally equipped with a CSX infrared approved thermometer. It reads instantly and temperature measurements can be made quickly.

- Reference Marks - Marks precisely measured and placed on web of the existing rail that will remain in track after the defect plug is removed. They are normally 2ft on each side of parent rail joint and are used for quality control purposes in this procedure.

- Plug Weld - The first weld made with the replacement plug, both ends are free.

- Closure Weld - The second weld made with the replacement plug, one end free. This weld restores the track's integrity.

- Closure Weld Release Temperature - The maximum temperature (700° F) at which the puller can be released without damaging a closure weld.

1. Mark the cut marks for the length of the Defect Plug on the top of the existing rail. The marks should be approximately centered in cribs to expedite the welding process. The normal length of a defect plug is 19'-0".

2. Make Reference Marks on the web of the existing rail at least 2ft from cut marks. The Reference marks should be approximately centered around the defect plug cut marks. Enter the measurement on the Track Disturbance form for referencing the information in DTW screen.

3. Measure the Current Rail Temperature with the digital thermometer. Enter the measurement on the Track Disturbance form.

4. Identify the proper Adjusted Rail Temperature from MWI 1125. Enter the temperature on the Track Disturbance form.

5. Determine the RNT for the Adjusted Rail Temperature using the CWR procedures and enter on the Track Disturbance form for the DTW tablet.

6. Remove rail anchors and loosen any tight spikes for the Free Rail Length determined above. Ideally the Defect Plug should be in the center of the freed rail. However when installing plugs near fixed objects, such as bridges, turnouts, road crossings, railroad crossings, etc., the length of freed rail can be moved to location that encompasses the Defect Plug. If possible, there should be at least 230 ft between the fixed object and the beginning of the freed rail.

7. The length of free rail must be examined for anything that would cause the rail to bind or restrict the movement of the rail in the direction of the weld. The weld process can not be initiated until the closest point between the possible obstruction and the adjacent tie/tie plate in the direction of the pull is 2" or greater. Reposition ties as necessary.

8. Polish the webs of the existing rails for electrical contact. Polish both sides of the webs for a distance of 27" from the weld location. Remove any branding in this area.

9. At the completion of the initial saw cut, a gap should open or run in to obtain or calculate the CNRT.

10. The Team Supervisor evaluate the following conditions and determine the proper course of action:
    - Go through the CWR process to obtain the correct NRT

11. Make the second cut to free the Defect Plug.

12. The preparation team removes the defective rail and replaces with plug rail, spikes up moves to next location and the welding team moves into place. The In-Track Welder backs to the free weld of the Plug Rail put in tight, gapped or over lapped to obtain the NRT.

13. Align the rail ends nearest the In-Track Welder and complete the Free Weld. During the upsetting of this weld the rail ends at the Closure Weld location will pass each other (fall in place) or be gapped. (CWR – NRT) Return the existing rail to the tie plate seats.

14. At some locations it might be necessary to saw the rail after free weld is complete, to create a larger gap to properly adjust track to the proper NRT.

15. While the Plug Weld is cooling to the required Closure Weld Release Temperature (700° F), profile grinding the first weld can occur or move across weld and setup Closure Weld to be welded after cooling to 700° F.

16. After the Free Weld has cooled below the 700° F. pre align and pull closed any gap to achieve the NRT after weld is complete. If gap cannot be closed to achieve enough upsetting forces, release the puller and pull the gap again. Read the puller force. It might be necessary to do this multiple times. It may also be necessary to remove more anchors to complete the weld.

17. Check puller force required to close the gap, determine in step #16 above, against the RNT and welder upset needed for the puller you are using to complete the weld. Determine if the puller has adequate capacity to complete the weld.

18. Align the rail ends and complete the Closure Weld. At the completion of the Closure Weld, record the rail measurements for the Track Disturbance in the DTW system.

19. Measure the distance between the Reference Marks. Record the final distance between the Witness Marks on the Track Disturbance form. Determine the amount of rail added/removed during the welding process.

20. While the weld is cooling to the Closure Weld Release Temperature (700° F), re-spike and re-anchor the track. Begin at the Replacement Plug location and work away from it.

21. After the weld has cooled below the Closure Weld Release Temperature (700° F), release the puller, move the In-Track Welder to next location and profile grind the weld.

22. Compare the final and original Reference Mark measurements. The difference should be no less than the 20° F variation to ensure that the Actual Adjusted Rail Neutral Temperature is within 20° F + or - Desired Adjusted Rail Temperature.

23. If plug was already in track and reference marks and rail information for track disturbance is already there, all information and reference marks must be rewritten on the rail in the same location if ground away for electrical contact area for the Electric Flash Welder.

N. APPROVED WELDING ELECTRODES AND WIRES

FOR USE WITH MANGANESE FROGS

Class and Item Number	***Name***	***Size***	***Polarity***	***Description***	***Use***
280.1800217	Lincoln Frogmang ED026101 60 Pounds	3/16" Electrode	*DCEP*	Coated 22% manganese alloy.	Build-up and repair of manganese components in frogs and crossings.
280.2320296	Lincoln Frogmang ED026106 25 Pounds	1/16" Wire	*DCEP*	Flux core, self shielded 25% manganese alloy.	Build-up and repair of manganese components in frogs and crossings.
280.2350278	Lincoln Frogmang ED026105 25 Pounds	5/64" Wire	*DCEP*	Flux core, self shielded 25% manganese alloy.	Build-up and repair of manganese components in frogs and crossings.
280.1033080 280.1033081 280.1033082 280.1805320	Lincoln Excalibur AWS E308L-16 Matweld 900	1/8" 5/32" 3/16" 3/16" Electrode	*DCEP*	Stainless Alloy Electrode	Repairing flangeway cracks and defects in manganese frogs and crossings, and starter pads for manganese build-up. Keep 3/4" below running surface.
280.0000036	Lincoln	5/16"	*DCEP*	Flux core, self shielded	Used for welding pile splices on H-pile, Pipe pile, Sheet pile

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FOR USE WITH RAILS

Class and Item Number	***Name***	***Size***	***Polarity***	***Description***	***Use***
280.0353521	Lincoln Super Rail	3/16” Electrode	*DCEP*	Coated Carbon Steel Alloy. Deposit hardness 208 BHN. Work hardens to 390 BHN.	Build-up and repair of carbon steel components; rail ends, switch points engine burns, and rail, bolted frogs and crossings. Use approximately 190 amps.
280.1435354 280.1434801 280.1435353 280.1434800	Lincoln Super Rail 25 Pounds 25 Pounds 9 Pounds 9Pounds 36 LB Maser Carton	1/16”Wire 5/64” Wire 1/16”Wire 5/64” Wire	DCEP	Coated Carbon Steel Alloy. Deposit hardness 208 BHN. Work hardens to 390 BHN.	Build-up and repair of carbon steel components; rail ends, switch points engine burns, and rail, bolted frogs and crossings. Use approximately 28 Volts
280.1806018 280.1806021 280.1806024	ESAB 6011	3/32” 1/8” 5/32” Rod	DCEP		For repairs on galvanized steel or mild steel with surface contaminants and pipe.

OTHER RODS

Class and Item Number	***Name***	***Size***	***Polarity***	***Description***	***Use***
280.1800021 280.1800022 280.1800025 280.1827660	Arc Air Pack of 50 rods	1/4" x 12" 5/16" x 12" 3/8" x 12" 1/2" X 12" 3/8" x 5/32" x 12"	Round Round Round Round	Copper coated carbon Arc AirVantage 600 Only	For removal of defective material by gouging.
280.1807209 280.1807213 280.1807215 280.1807255 280.1807265	AWS 7018 10 lb packs	1/8" 5/32" 3/16" 3/32" 1/4"x18" Electrode	*DCEP*	Electrode made to AWS E7018E specifications. For Spring Frog Components.	Welding structural steel, repairing roadway machines, frames, etc.
280.1430645 280.1430641	Lincoln Electric Innershield NR-211-MP 25 Pounds	5/64" 1/16" Wire	*DCEN*	RAN 19 to 25 Volts	For welding steel structures on concrete road crossing panels.
280.1805107.1	Lincoln Electric	5/64" Wire	*DCRP*	Innershield NR-305 25 Lb steel spool Lincoln ED034185	For welding frog gauge plates **and Misc. track Components only.**

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O. WELDING SUPPLIES

Item Number	Description
	WELDING BOOKS
480.9000241	Welding Manual.
480.9000285	Welding Machine Inspection Booklet.

Item Number	Description
	ELECTRIC WELDING MATERIALS AND EQUIPMENT
280.0860115	Cable, welding, number 2/0 AWG, 375 amp, 600 volt, neoprene jacket, Mylar separator.
280.0860120	Cable, welding, number 3/0 AWG, 450 amp, 600 volt, neoprene jacket, Mylar separator.
280.5090010	Connector, cable, male. Tweeco 4MPC-1 for 3/0 - 4/0 cable
280.5090012	Connector, cable, female. Tweeco 4MBP-2 for 3/0 - 4/0 cable
280.5101425	Connector, cable, ball point with neoprene cover, TWECO 9405-1100, model 1-MPB.
280.0859925	Clamp, welding, ground, TWECO model TW GC-500.
280.0859924	Ground Clamp - Magnetic - 600 Amp.
280.0860036	Holder, Electrode, 400 Amp, 1/4" capacity, Tweco Model A-14HD.
280.0860030	Holder, Electrode, 500 Amp, 3/8" capacity, Tweco Model A-38HD.
280.1800550	Block, carbon, box of 4. Use in flangeway to repair frog.
360.0000860	Brush, wire, metal cleaning, 1" X 13-3/4" curved hardwood handle.
015.0001750	Gauge, flangeway check, frog and railroad crossing, AREMA Plan 790-55
015.1001731	Gauge - Frog - Use on repair of Conformal Heavy Point Frog. Set of 2 gauges
015.0001713	Stanley Hand Grinder Clockwise
015.0001714	Stanley Hand Grinder Counter-Clockwise
015.0006900	Matweld Multi-Purpose Grinder (Bicycle Grinder) 06950
015.0000700	Matweld Surface Grinder 00700
015.7110000	Matweld 700 Surface Grinder Mod Kit to fit 6”X3”X5/8” stones
015.0004600	Matweld Hand Grinder Clockwise 04600
015.0004700	Matweld Hand Grinder Counter-Clockwise 04700
280.0046011	Matweld Flange, blade flange for changing hand grinder (Slotting) 046011
280.0320171	Matweld Lot Pin Kit
015.0003900	Matweld Reversible Saw 3900A
015.0004090	Modern Track – Gas Saw 400S
451.4089000	Portaco Web Grinder GW-10-89-O
451.1100000	Portaco Web Grinder (Short Frame) GW-110-H
090.0000818	Matweld Saw Arm 03940A
450.9360540	Grinder - W/Guard, 4-1/2" 8500 RPM - 115 V. - 5/8"X11 Spindle. Dewalt
451.1460666	Grinder, Milwaukee 6066 - 9" Grounded – 6000 RPM - 3.5 HP
451.1428499	Grinder, Dewalt D28499X Large Angle Grinder HD 7” & 9”, 5.3 HP, 6000 RPM, w/ Keyless Adjustable Guard HNA #I00213
450.7900130	Needle Scaler Model 182LNA1 - Ingersol Rand - Requires Comp. Air 100 psi.
453.0401653	Needles for Scaler - U/M = Set - 19 needles per set
280.1400420	Wire Brush, 2-3/4" Knot Eagle Cup Wire Brush, .020 wire, 5/8"-11 A.H.

Item Number	Description
360.1330341	Helmet - Welding - Lincoln Electric Viking, Viking Black 3350
250.3330122	Battery for Lincoln Welding Hood
360.1333045	Filter - Auto Darkening - Replacement for Lincoln Electric Viking Helmet
360.1346151	Lens - Cover External - for Lincoln Electric Viking Weld Helmet - Min. Order = 5
360.1346152	Lens - Cover INTERNAL - for Lincoln Electric Viking Weld Helmet - Min. Order = 5
360.1346125	Lens - Magnification X 1.25 - for Lincoln Electric Viking Weld Helmet
360.1346150	Lens - Magnification X 1.50 - for Lincoln Electric Viking Weld Helmet
360.1329291	Liner - Sweatband - for Lincoln Electric Viking Weld Helmet
280.1129371	Helmet - Welding - Jackson Truesight - Digital Auto Darkening
280.1130319	Filter - Auto Darkening - Replacement for Jackson Truesight Helmet.
280.1130320	Lens - Cover External - for Jackson Truesight Weld Helmet - Min. Order = 10
280.1130321	Lens - Cover Internal - for Jackson Truesight Weld Helmet - Min. Order = 10
360.7416800	Speedglas Welding Helmet - complete.
360.7416805	Replacement batteries for Speedglas welding helmet.
360.7416808	Speedglas Kit, inner & outer clear shield and batteries.
360.7416807	Protection plate - inside - clear - for Speedglas Welding Helmet.
360.7416806	Protection plate - outside - clear - for Speedglas Welding Helmet.
280.1809005	Copper Plate - 24"L X 2"W X 1/4"T - For Welding Switch Points.
280.1809000	Copper Plate - 24"L X 2"W X 1/8"T - For Welding Switch Points.
015.0010100	Hammer - Ball Pein - 32 oz. Grade B Steel W/Fiberglas Handle.
451.0020890	Hammer - Slag - Wooden Handle - Vaughn.
450.5600030	Hammer - Chipping - Vaughn
280.5090155	Wire Feeder - Lincoln - LN-25 PRO. - Does NOT include Mig Gun.
280.5090130	Mig Gun - Lincoln - K-126-12 - Fits LN-25 and LN-25 PRO Feeders.
280.5090131	Liner, Replacement - Mig Gun - Lincoln - K-126-12
280.4172117	Lead, Lincoln S17211-7 Ground lead assembly for wire feeder
280.1390662	62° Goose Neck for K126-12
280.1329071	Tip Insulator for K126-12
280.1329081	Tip Holder for K126-12 Magnum T ips
280.2745564	5/64 Magnum Tips for K126-12
015.0000110	Seat - Track Welders W/3 Adj. legs and back support. Eidos Track Master Model 110
015.0000120	Seat - Track Welders W/Three way air splitter - fold down back rest. Model BRET17
280.5090132	Shield - Heat - Fits Lincoln K-126 Mig. Gun.
280.1697116	Drive Roller Kit - Lincoln - 1/16th dia. - Fits LN-25 PRO Feeder.
280.1697332	Drive Roller Kit - Lincoln - 5/64th dia. - Fits LN-25 PRO Feeder.
280.5004320	Wire - Grounding - Lincoln - Connects K-126 Mig Gun to LN-25 Wire Feeder.
453.0443601	Pliers - Mig Welding - Welper 8 in 1 Pliers.
360.8851055	Blower, Utility, Portable 12" Electric - Outdoor Rated 120V. Global Ind. Sourced to IRS. Mandatory use when Welding or Grinding of Manganese.
	WELDING PPE
360.7420015	Glasses - Cutting - Shade 5 (Clear face shield must be worn also)
460.1640015	Gloves, welding, leather with aluminized back.
460.1640043	Gloves, welding, leather. Size Small.
360.1110161	Gloves, welding, leather. Size Medium.
360.1110162	Gloves, welding, leather. Size Large.

Item Number	Description
360.1110163	Gloves, welding, leather. Size X-Large.
360.1110164	Gloves, welding, leather. Size XX-Large.
360.2413455	Jacket, Welding 30" length Small - Flame Retardant - W/Refective Stripes.
360.2413456	Jacket, Welding 30" length Medium - Flame Retardant - W/Reflective Stripes.
360.2413457	Jacket, Welding 30" length Large - Flame Retardant - W/Reflective Stripes.
360.2413458	Jacket, Welding 30" length X- Large - Flame Retardant - W/Reflective Stripes.
360.2413459	Jacket, Welding 30" length 2X- Large - Flame Retardant - W/Reflective Stripes.
360.2413460	Jacket, Welding 30" length 3X- Large - Flame Retardant - W/Reflective Stripes.
360.2413461	Jacket, Welding 30" length 4X- Large - Flame Retardant - W/Reflective Stripes.
360.2413462	Jacket, Welding 30" length 5X- Large - Flame Retardant - W/Reflective Stripes.
360.4588220	Vest, Welding Flame Retardant – Small
360.4588221	Vest, Welder Flame Retardant – Reg.
360.4588222	Vest, Welder Flame Retardant – Jumbo
360.4588223	Vest, Welder Flame Retardant – Super Jumbo
360.1301018	Sleeves, Welding 18”
360.0328172	Welding Leggings
360.8312227	Leggings – Includes longer shoe flap and three spring straps over toe. Geismar PD-101-L
	CUTTING TORCH EQUIPMENT
280.6106201	Torch, Arc-Air Electric - Model H-3 with 7 ft. Swivel Cable. Carbon Arc Gouging.
280.5004420	Torch, Slice - Metal Removal.
451.1301027	Gas Cylinder Cap Wrench
015.1300235	Gas Grab – for lifting oxygen tanks w/ two men
280.5001640	Long Torch, Cutting, 36 inches long - Airco - 822-9555, 75 deg. Head.
280.3302214	Two Stage Harris Regulator – Oxygen 9200-125-540 **Mandatory for Thermite Welding**
280.3302212	Two Stage Harris Regulator – Propane 9200-125-540 **Mandatory for Thermite Welding**
280.3600340	Single Stage Gage-less Harris Regulator – Oxygen **Section Team or Inspector Only**
280.3600320	Single Stage Gage-less Harris Regulator – Propane **Section Team or Inspector Only**
280.3000510	Single Stage w/gage Harris Regulator – Oxygen Cutting Only 25GX-145-540 for **Section Teams Only**
280.3000450	Single Stage w/gage Harris Regulator – Propane Cutting Only 25GX-50-510P for **Section Team Only**
280.0000255	Regulator Mounting kit
280.0000505	OXY Hose Bottle to Reg
280.0505050	Propane Hose Bottle Reg
280.5050505	OXY Hose Reg to Hose Reel
280.0505000	Propane Hose Reg to Hose Reel
280.1000209	Torch, Cutting Attachment, Harris, 90 DEG head #1300440, Model 49-3F
280.1000205	Torch, Cutting Attachment, Harris, 70 DEG head #1300430, Model 49-3AF
280.1000503	Tip, Cutting, Propane, Harris #1501030, Model 6290-2NFF 5/8”-2” Depth of Cut
280.1000504	Tip, Cutting, Propane, Harris #1501040, Model 6290-3NFF 2”–4” Depth of Cut
280.1000505	Tip, Cutting, Propane, Harris #1501050, Model 6290-4NFF (for cutting rail with Harris 49-3F Cutting Attachment) 4”-7” Depth of Cut
280.1501060	Tip, Cutting, Propane, Harris #1501060, Model 6290-5NFF (for cutting rail with Harris

Item Number	Description
	49-3F Cutting Attachment)
280.1501070	Tip, Cutting, Propane, Harris #1501070, Model 6290-6NFF (for cutting rail with Harris 49-3F Cutting Attachment)
280.1501080	Tip, Cutting, Propane, Harris #1501080, Model 6290-7NFF (for cutting rail with Harris 49-3F Cutting Attachment)
280.1000200	Torch Handle, Harris, #1401150, Model 43-2, 9.5 inches long
280.1015674	Preheating Head, Thermite, Harris #1800242, Model QC2SCT7777
280.1003450	One Piece Harris Cutting Torch 18" long 90 degree head
280.1003470	One Piece Harris Cutting Torch 21" long 90 degree head
280.5001640	Long Torch, 36” Harris, #1003400 Model 62-5AFL, 70 deg. head
280.5001476	Long Torch, 48” Harris, #1003481, Model 62-5FL, 90 DEG Head
280.5090146	Torch cutting guide for Harris Torch (guide wheel rollers)
280.5004190	Torch, Cutting Attachment, Victor - CA-2460, 90 deg. Head.
280.5004191	Torch, Cutting Attachment, Victor - CA-2461, 75 deg. Head.
280.5003169	Tip, Cutting, Propane - Size # 3 HPN - Victor # 033-0325.
280.5003170	Tip, Cutting, Propane - Size # 4 HPN - Victor # 033-0326.
280.5003173	Tip, Cutting, Propane - Size # 5 HPN - Victor # 033-0327.
280.8022200	Torch, Handle, Victor - HD 310C Note: Has Rev. Flow Check Valves Built-in. DO NOT ADD.
280.5001696	Check Valves, Torch #4300390 (Oxy-Pro) Harris 88-6CVT
280.8021860	Preheating Head, Victor - Flathead - TWNB-5 (for preheating field welds)
280.0025700	Mount - Oxygen-Propane Gauge Assembly Holder
280.7815127	Regulator, Oxygen, Victor, single stage W/Guards - Smaller Design. For track inspectors only
280.7815136	Regulator, Propane, Victor, single stage W/Guards - Smaller Design. For track inspectors only
280.5001697	Flashback Arrestor, Regulator #4301651 Set (Oxy-Pro) Harris 88-5FBR
280.5001696	Check Valves - Torch, #4300390 set (oxy & pro) Harris 88-6CVT Lincoln Electric
280.8022250	Gauge, Harris #QC2GAU7700, in-line test, 1 Oxygen + 1 propane Set
280.0000005	Plug - Safety - Propane Tank - Brass With Chain & Ring.
280.5201955	Protector, Cylinder Non-Rotating Valve - Oxygen, Wesco Model WES-010
280.5201951	Protector, Cylinder Non-Rotating Valve - Propane, Wesco Model WES-008
280.1250020	Igniter, torch, three flint, Shurelite Model 4501.
280.1250025	Flint, renewal, for Shurlite Model 4501 igniter.
280.5002465	Cleaner, tip, Wypo Number 1 Standard Set.
280.5001120	Wrench, Cylinder, 10 Way combination. Forged steel, not stamped.
470.1663000	Detector, external leak, SNOOP, 8 oz. bottle. Not for use to mounting hoses to fittings.
280.0010020	Hose Reel - 1/4" ID - 100' Twin Hose Capacity.
280.0010030	Hose Reel - 3/8" ID - 75' Capacity.
280.0864146	Hose - welding, Grade T - 100' twin 1/4" dia. W/Fittings. Requires verbal approval of Weld. Manager.
280.0864165	Hose - welding, Grade T - 100' twin 3/8" dia. W/Fittings. Requires verbal approval of Weld. Manager.
280.0864145	Hose, welding, Grade T - 50' twin 1/4" dia. with fittings.
280.0864164	Hose, welding, Grade T - 50' twin 3/8" dia. with fittings.

Item Number	Description
280.0010000	Kit, welding hose repair, with crimper and fittings.
	BOUTET WELD FIELD KITS & ACCESSORIES
280.8020020	Boutet Weld Field Kit 85 lb.
280.8020040	Boutet Weld Field Kit 115 lb.1/4" Worn Both Sides.
280.8020042	Boutet Weld Field Kit 115 lb.New to 1/4" Worn.
280.8020044	Boutet Weld Field Kit 115 lb.3/8" Worn Both Sides.
280.8020046	Boutet Weld Field Kit 115 lb.New to 3/8" Worn.
280.8020048	Boutet Weld Field Kit 132 lb.1/4" Worn Both Sides.
280.8020050	Boutet Weld Field Kit 132 lb.New to 1/4" Worn.
280.8020052	Boutet Weld Field Kit 132 lb.3/8" Worn Both Sides.
280.8020054	Boutet Weld Field Kit 132 lb.New to 3/8" Worn.
280.8020056	Boutet Weld Field Kit 133 lb.3/8" Worn Both Sides.
280.8020058	Boutet Weld Field Kit 133 lb.New to 1/4" Worn.
280.8020060	Boutet Weld Field Kit 136 lb.New to 1/4" Worn.
280.8020062	Boutet Weld Field Kit 136 lb.New to 3/8" Worn.
280.8020064	Boutet Weld Field Kit 136 lb. 1/4" Worn Both Sides.
280.8020066	Boutet Weld Field Kit 136 lb. 3/8" Worn Both Sides.
280.8020070	Boutet Weld Field Kit 100RA / 105 DUDLEY
280.8020080	Boutet Weld Field Kit 100RE
280.8020100	Boutet Weld Field Kit 100RB
280.8020110	Boutet Weld Field Kit 110RE
280.8020120	Boutet Weld Field Kit 115RE
280.8020140	Boutet Weld Field Kit 122CB
280.8020150	Boutet Weld Field Kit 127 DUDLEY
280.8020300	Boutet Weld Field Kit 130 PS
280.8020155	Boutet Weld Field Kit 155#
280.8020160	Boutet Weld Field Kit 132RE
280.8020180	Boutet Weld Field Kit 136RE
280.8020200	Boutet Weld Field Kit 140RE
280.8020210	Boutet Weld Field Kit 141RE
280.8020220	Boutet Weld Comp. Field Weld Kit 100RE/85
280.8020240	Boutet Weld Comp. Field Weld Kit 100RE/90RA
280.8020260	Boutet Weld Comp. Field Weld Kit 100RE/90RB
280.8020280	Boutet Weld Comp. Field Weld Kit 100RE/100RB
280.8020300	Boutet Weld Comp. Field Weld Kit 115RE/90RA Right Hand.
280.8020310	Boutet Weld Comp. Field Weld Kit 115RE/90RA Left Hand.
280.8020315	Boutet Weld Comp. Field Weld Kit 115RE/100RA
280.8020320	Boutet Weld Comp. Field Weld Kit 115RE/100RE
280.8020325	Boutet Weld Comp. Field Weld Kit 115RE/100NW Left Hand.
280.8020330	Boutet Weld Comp. Field Weld Kit 115RE/100NW Right Hand.
280.8020335	Boutet Weld Comp. Field Weld Kit 119/100 Left Hand.
280.8020340	Boutet Weld Comp. Field Weld Kit 119/100 Right Hand.
280.8020345	Boutet Weld Comp. Field Weld Kit 119/115
280.8020350	Boutet Weld Comp. Field Weld Kit 127/115 Left Hand.
280.8020355	Boutet Weld Comp. Field Weld Kit 127/115 Right Hand.

Item Number	Description
280.8020360	Boutet Weld Comp. Field Weld Kit 122CB/100RB
280.8020380	Boutet Weld Comp. Field Weld Kit 122CB/100RE
280.8020400	Boutet Weld Comp. Field Weld Kit 122CB/115RE Right Hand.
280.8020405	Boutet Weld Comp. Field Weld Kit 122CB/115RE Left Hand.
280.8020440	Boutet Weld Comp. Field Weld Kit 132RE/122CB
280.8020445	Boutet Weld Comp. Field Weld Kit 132RE/127
280.8020450	Boutet Weld Comp. Field Weld Kit 132RE/115RE Right Hand.
280.8020455	Boutet Weld Comp. Field Weld Kit 132RE/115RE Left Hand.
280.8020460	Boutet Weld Comp. Field Weld Kit 136RE/115RE Right Hand.
280.8020465	Boutet Weld Comp. Field Weld Kit 133RE/115RE Left Hand.
280.8020467	Boutet Weld Comp. Field Weld Kit 133RE/115RE Right Hand.
280.8020470	Boutet Weld Comp. Field Weld Kit 136RE/115RE Left Hand.
280.8020480	Boutet Weld Comp. Field Weld Kit 136-141RE/122CB
280.8020490	Boutet Weld Comp. Field Weld Kit 136RE/119RE Left Hand.
280.8020495	Boutet Weld Comp. Field Weld Kit 136RE/119RE Right Hand.
280.8020500	Boutet Weld Comp. Field Weld Kit 136-141RE/132RE
280.8020505	Boutet Weld Comp. Field Weld Kit 136RE/133RE
280.8020510	Boutet Weld Comp. Field Weld Kit 140RE/127RE
280.8020515	Boutet Weld Comp. Field Weld Kit 140RE/132RE Left Hand.
280.8020520	Boutet Weld Comp. Field Weld Kit 140RE/132RE Right Hand.
280.8020530	Boutet Wide Gap Weld Kit 115RE.
280.8020535	Boutet Wide Gap Weld Kit 119RE.
280.8020540	Boutet Wide Gap Weld Kit 122CB.
280.8020545	Boutet Wide Gap Weld Kit 132RE.
280.8020550	Boutet Wide Gap Weld Kit 133RE.
280.8020555	Boutet Wide Gap Weld Kit 136RE.
280.8020560	Boutet Wide Gap Weld Kit 141RE.
280.8021820	Boutet Crucible - CJ One Shot - Single Crucible Only.
280.8021960	Boutet Refractory Paste
280.8021850	Boutet Packing Felt
280.8022020	Boutet Packing Sand (MUD) 8 lb. Individual Brick.(5 per case).
280.8030585	Boutet Igniter (Sparkler) U/M = each. Come 20 Igniters per tube.
280.8032810	Dry Sand - 50 lb. Bag
280.8032815	Dry Sand - 1 lb. Bag.
	BOUTET HARDWARE
280.8021740	Boutet Mold Jacket 110-141#
280.8021780	Boutet Base Plate 107-141#
280.8021920	Boutet Mold Clamp
280.8021900	Boutet Slag Pan
280.8021800	Boutet Crucible Fork W/Extension Guard
280.8022340	Railtech Torch Stand - New Style - Fully Adjustable.
280.8021560	Boutet Comp. Mold Jacket
280.8021760	Boutet Base Plate - Small Rail - 85-105#
280.8021720	Boutet Mold Jacket - Small Rail - 85-105#
280.8021730	Boutet Base Plate Wide Gap Weld 110-141#

Item Number	Description
280.8021750	Boutet Mold Jacket - Wide Gap Weld 110-141#
280.8021580	Boutet Base Plate Compromise - 4 Ear Adjustable
280.8022080	Boutet Cooling Retarder Cap
015.0001961	Hydraulic Jack - Stanley
015.0001911	Thermite Welding Alignment Jacks - set of 2
280.8021745	Boutet Close Quarters Mold Jackets
280.8021785	Boutet Close Quarters Base Plate with Detachable Ears.
	BOUTET WELD TOOLS
015.0001678	Stanley Light Weight Weld Shear WS10321A
015.0001742	Modern Track Weld Shear ESN-MTM-AWP
015.1310601	6X3 Stone Removal Wrench
280.8022000	Hot Cut Chisel with 36" Handle
015.1409374	Sledge Hammer, Dead Blow Quick-Change Nupla part # 09374, Requires two replacement tips part # 15309
015.1415309	Tip, Replacement part # 15309 for use with Nupla Quick-Change Dead Blow hammer – Need 2 tips per hammer, for Welders only
451.1100250	Hammer - Dead Blow - Vaughn -W / Replaceable Striking Surfaces.
451.1200250	Replaceable Striking Surfaces for Vaughn Dead Blow Hammer - White Need 2 ea.
280.8031920	6 ¼ Grade B Small Wedges
015.0003185	Wedge - Curved - 12" X 1-1/8" With Strike Protection Installed.
015.0003010	Protector - Chip - Rubber - Large
015.0003005	Protector - Chip - Rubber - X-Large
015.0003165	Alignment Plates - Rail - Thermite Welding - IRS # LMT02R - U/M = Pair.
015.0040775	Plates, Welders Alignment Slip Over Design for all Thermite Welds Including Headwash-Head Repairs
451.3280470	Tool Set For Alignment Plates
015.0003178	Canting Tool - Ratcheting tool to remove rail twist.
280.8022260	Boutet Weld Demolder - Fits Standard and WGW's.
015.0003150	Boutet Riser Removal Tool
090.0000955	Shear Blades - Matweld
090.0000956	Blade Shear Stanley PN 27948 for rail sizes 122LB to 142LB
090.0000958	Weld Shear Stanley hold down kit PN 73394
280.8032080	Firetong - To remove mold jackets from molds
280.1385141	Removal Tool – Base plate and mold jackets
280.0320001	Gap Gauge and Torch height GT-001
280.8021840	Straight Edge - Railtech Magnetic Adjustable
451.0000025	Tool Set - Welders - Includes Tool Box.
015.0001710	Fork - Garden - Narrow - D-Handle 8 Tine
015.0001780	Hammer - Sledge 8 lb. Tampo W/36" Handle
015.0002060	Maul - Spike - 10 lb. Grade B W/36" Handle
015.0002220	Shovel - Size 2 - Square Point W/48" Handle
360.0011605	Shovel Trenching Round Nose
015.0002160	Punch - Track Grade B W/36" Handle
015.0001100	Bar - Claw - per AREMA Drawing 11-97
015.0002050	Mattock Pick W/Handle 6 lb.

Item Number	Description
015.0002030	Lifter - Spike - W/Chip protector
015.0003020	Protector - Spike Lifter Cover Kit.
015.0003170	Ball Ratchet tool insulated
015.0003175	Base Ratchet tool insulated
280.2350200	Blanket, Silica Welding - control heat loss.
014.2500100	Jumper Wire - 50 ft. With Orange Flags - attaches to ball of rail only.
015.0001424	File - 14" Carbide Grit X-Course - No rubber handle - Used for filing Thermite Weld Molds.
015.0015923	File - 14"- Carbide Grit Course -W/Rubber handle - Used for filing Thermite Weld Molds.
015.0001751	Puller - Hyd. Rail - 120 TN. Simplex Model RP-120B (with Ratchet)
015.7510000	Rail Puller (Only) Enerpac (Simplex) (no Ratchet)
015.0055282	Rail Grips - Replacement for Simplex Puller.
015.0001752	Puller - Hyd. Rail - 120 TN. Geismar (Modern Track) Model TH-120
015.0001754	Rail Grips - Replacement for Geismar (Modern Track) Puller.
280.1476653	Height Blocks, Geismar (Modern Track) Rail Puller Model TH-120
280.0228171	Geismar TH-120 Lifting Pins with Safety Chain
015.1201111	Geismar TH-120 Greaser Kit
280.0228172	Geismar TH-120 Pressure Gauge 245-ML-16B
280.0228173	Geismar TH-120 Needle/Locking Valve PT-9575
090.0002350	Hydraulic Hose Reel with Hose
460.2400049	Hydraulic Quick Disconnect Fitting (Female)
460.2400050	Hydraulic Quick Disconnect Fitting (Male)
360.4830251	Cushion, KNEELMATE, 24" X 30" Orange Vinyl.
	MISCELLANEOUS
450.3374000	RET-Tape Measure 40 Foot
450.2500000	Mag Tape Measure Holder
450.8000000	Magnetic Tape Holder with Square Stob
451.1100446	Organizer - Tool - for bucket - 61 compartments - yellow/black - Grainger 4ZB46
360.0950205	Bucket - Plastic 5 gal. - to be used with bucket organizer above.
280.3456789	Umbrella - 9 ft.-3 inches.- Wide coverage - With Stake.
451.0900410	Stopwatch - Digital W/Breakaway Lanyard.
360.3100020	Fire Extinguisher - 2-1/2 Gal.- Stainless Steel - Fill with Water - Pressurize with Air. Comp.
015.3104271	Sprayer - Water Tank - 5 Gal. Indian. IRS
360.3104275	Sprayer - Water Tank - 15 Gal. Plastic tank with 12 Volt pump.
370.0001395	Lube, Graphite, 12 oz. spray cans, 12 per case. Lube Hyd. Rail Puller Swingarms.
451.0027033	Knife - Penguin HD P900C
451.9954847	Knife - Cutter - EasyCut
451.9954956	Replacement Blades for EasyCut Knife.
023.0062001	Thermometer - Infrared - Laser Pointing with Case and batteries. IRS.
015.0002278	Thermometer, Rail - Magnetic - Part # Dwg 34-2.
360.8770020	Tempilstik Marker - 300 Degree F., Box of 12.
360.0086769	Tempilstik Marker - 450 Degree F., Box of 12.
360.8770025	Tempilstik Marker - 500 Degree F., Box of 12.

Item Number	Description
453.0187689	Tempilstik Marker - 700 Degree F., Box of 12.
360.8770030	Tempilstik Marker - 800 Degree F., Box of 12.
015.6079624	Temp Paint 450°
015.6079625	Temp Thinner 450°
360.7449015	Spill Kit
360.0004091	Red Box - Storage for aerosol cans.
470.1510067	Hand cleaner - pop up dispenser
360.9000100	Hand Towels - Blue - Disposable - Roll.
015.7050000	Compact Photo Tachometer and Counter Reed R7050
015.0000010	Reflective Tape for optical tachometer, 5 ft. roll.
100.0001000	Sling, cylinder, nylon, 1000 lb. capacity. Liftex CG10A
360.0011920	Tag Line - 3/8" X 30FT. Snap Lock End - Nylon Rope
360.0011940	Tag Line - 1/2" X 30FT. Snap Lock End - Nylon Rope
471.0610462	Marker - Valve Action - For Marking Rail - White
471.0610447	Marker - Valve Action - For Marking Rail - Yellow
360.0009912	Marker - White - For Marking Rail.- Pump Style
360.0009501	Marker - Green - For Marking Rail.- Pump Style
015.0002547	Box - Saw Blade Storage 14" Dia. Blades
015.0002567	Box - Saw Blade Storage 16" Dia. Blades
451.0512800	Ratchet Strap 2" X18' long 3,330 lb.Load limit, D-ring hooks.To Secure Hyd.Rail Puller
451.0512810	Ratchet Strap 1" X 12'- S-Hooks Load Limit = 1,000 lbs. Secure Welding Cylinders
280.3300003	Shield for Grinding
280.2350205	Spark Shield (Little Sparky) Shield for Grinding
015.0009010	Straight Edge W/ Frog Ruler
451.0011310	Straight Edge, 18" long, Starrett Number 385-18- For Track Inspectors Only
451.0011330	Straight Edge, 36" long, Starrett Number 385-36
451.0014165	Gauge, taper, 6-1/4" long X 0.150" thick, Starrett Number 270.
015.1001700	Gauge, step gauge up to 7/8" H (in 1/8" increments). Use with conformal frog guage.
015.1163091	Kit, straight edge for Track Weld Auditing Complete with carrying case and 8 gauges, IRS P/N XX309
280.9289373	Oil, Welding Machine Compressor Oil for Lincoln Air Vantage Compressors, 4 Liter Container, Lincoln Electric #9SS28937-3
280.0007060	Lube Pads for Wire Cleaning
450.9007642	12 inch proto adjustable wrench
450.9007630	8 inch proto adjustable wrench
451.0310311	3/8 X 72” 300 psi Air Hose with Male Threaded End
280.5107123	Weld Aide LubeMatic Wire Cleaner and Lubricant
014.2500100	Jumper Wire – 50’
451.7901010	20 volt cordless light bare tool tripod (Stanley)
451.7901000	20 volt cordless light kit tripod (Stanley)
250.0001570	Ground Fault Circuit Interrupter, 2' Cord

APPROVED ABRASIVE BLADES AND WHEELS

Item Number	Description
CUTTING RAIL	
015.0002540	14" X 1/8" X 1" Abrasive saw blade, fully reinforced, Norton Maximum 5400 RPM
015.0002565	16” X 1/8” X 1” Abrasive saw blade, Fully Reinforced Premium Geismar GS-MTX-16Z 10 per box, Max 4800 RPM P&M is working sourcing issue
015.0002081	16” X 1/8” X 1” Abrasive saw blade, Norton RX Gen II, double reinforced, Max 4800 RPM
015.0002082	16” X 1/8” X 1” Abrasive saw blade, Norton A48 Railcut, double reinforced, Max 4800 RPM
015.0002560	16" X 1/8" X 1" Abrasive saw blade, Type 1 A36X Rail Cut fully reinforced, Maximum 4800 RPM P&M is working sourcing issue
015.0002580	26" X 7/32" X 1-3/4" Abrasive saw blade, fully reinforced, Maximum 2090 RPM

SLOTTING RAIL	
470.8400940	8” X 1/8” X 5/8” Abrasive slotting wheel, fully reinforced, Maximum 7640 RPM.

GENERAL GRINDING	
451.0045390	4-1/2" X 1/4" X 5/8"-11 Abrasive Grinding - MINI Disk.
015.0002680	8" X 1" X 5/8" Abrasive grinding wheel, fully reinforced, Bluefire Type 1, Maximum 6000 RPM,
015.0002780	9" X 1/4" X 5/8"-11 Abrasive grinding wheel, fully reinforced, Type 27, Maximum 6600 RPM.
015.0002775	9" X 1/8" X 5/8"-11 Abrasive grinding wheel, fully reinforced, Type 27, Maximum 6600 RPM.

SURFACE GRINDING	
451.0042961	6” X 3” X 5/8” - 11 Type 6 grinding wheel, Norton Bluefire, Max 6000 RPM
015.3530844	4” X 3” X 5/8” grinding wheel for Matweld Frog Grinder 09200A
015.0002720	8" X 2" X 2" Plate mounted, 4 bolt grinding wheel, tape wound, Maximum 4500 RPM
015.0002725	6/4-3/4" X 2" X 5/8" -11 Flaring cup abrasive grinding wheel, Maximum 6000 RPM
015.0002730	9" X 1/4" X 7/8" Abrasive grinding wheel, fully reinforced, Maximum 6600 RPM
015.1200001	GS MP-12R – 6X3X5/8
015.1200002	GS MP-12Z – 6X3X5/8

STOCK RAIL & SWITCH POINT GRINDING MACHINE	
015.0002740	10” X 1-1/2” X 1” Recess one side 6” X ½”, abrasive grinding wheel, fully reinforced, Maximum 3630 RPM.

WEB GRINDING	
015.0002800	6" X 2-1/4" X 1" Recess one side 2-3/8" X 1", abrasive grinding wheel, fully reinforced , Maximum 6050 RPM.
015.0002870	8" X 1/2" X 5/8" Wire brush wheel, Maximum 6000 RPM

MWI 1103-04
Surfacing Policy
Issued: 10/18/96 Revised 2/09/07
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PURPOSE: To establish uniform policy and procedures for out-of-face, smoothing and spot surfacing teams.

SAFETY: Observe all applicable Safe Job Procedures and Safety Rules and Regulations.

LOCATION: All CSXT maintained tracks.

ENVIRONMENTAL: Observe all applicable Federal, State and Local environmental regulations.

I. DISCUSSION

A. The goal of this track surfacing policy is to ensure that the work meets or exceeds all CSXT and FRA Standards, as well as Engineering Department goals for safety and quality. Because surfacing work is done in a wide variety of conditions, these instructions will define the process by which agreed upon results can be obtained. The success of this process will require a coordinated effort from a team consisting of Division and System Officers, which includes Transportation, Maintenance of Way, and Communications & Signal.

B. All surfacing operations must be performed in the proper sequence and in a uniform manner. Special attention must be placed on turnout, bridge, tunnel, crossing, and restricted clearance location work. It must be kept as close as possible to the general surfacing.

C. The track being worked will be protected by an appropriate temporary speed restriction during any period that it is not safe for authorized speed. Refer to *MWI 1109*.

D. Current instructions governing jointed and welded rail track maintenance in hot weather will be followed carefully. The Roadmaster will arrange to adjust rail, which requires adjustment by cutting, ahead of surfacing operation.

E. Muddy or fouled ballast locations should be cribbed or undercut in advance of surfacing operations where possible. The forces, as agreed upon in the planning meeting, will do this work. Ballast cleaning, if required, should be done in advance of the surfacing.

F. Switch timber or spot tie installations should be done in advance of the surfacing operation. The forces, as agreed upon in the planning meeting, will do these installations.

G. Road crossings are most efficiently re-worked during the System Production Timbering Program. The surfacing program normally ties into the existing road crossings. Only those crossings, which have drainage or geometry defects, should be re-worked within the surfacing program.

H. System Production Teams will completely surface all ties installed at the end of each workweek.

II. PROCEDURES

A. DISTRIBUTION OF BALLAST

1. When distributing ballast, care must be taken to control the flow of the material. The Roadmaster will ensure that the proper amount of ballast is unloaded, consistent with the required raise and the CSXT Standard Ballast Section (refer to standard drawing 2602).

2. Ballast will not be unloaded on open deck bridges, highway crossings, defect detectors, or other areas where it will damage equipment or interfere with operations. Special care must be taken to ensure that switches can be properly thrown. Sufficient ballast must be provided to do the diverging side of turnouts, ballast decked bridges, and approaches to open decked bridges.

3. When cars are discovered containing excess fines, or other non-standard materials, the employee in charge of unloading will inform the Roadmaster. The Roadmaster is responsible to see that the car number(s) are reported to the Manager Scheduling responsible for ballast cars.

4. Ballast unloading will be kept current with all surfacing operations.

B. SURFACING OPERATING

1. The Surfacing Team Supervisor/Foreman will determine the amount of track raise. The track raise will be based on the available ballast and the following criteria:

   a. The minimum height necessary to maintain proper profile, superelevation, and standard ballast section.

   b. Sufficient space under the tie to allow ballast to be inserted and compacted.

2. When more than one tamping machine is working in tandem, the foremen and operators must have a clear understanding concerning which ties each tamper will tamp.

3. When more than one tamping machine is working in adjacent areas, operators must have a clear understanding concerning the reference rail and runoffs made between tampers.

4. If a tamper malfunctions during surfacing operations in a manner that adversely affects the quality of the raising, aligning or ballast compaction, the following actions are required:

a. A temporary runoff of superelevation or track raise, appropriate to the temporary speed restriction, will be made.

b. The track will be protected by a temporary speed restriction, not exceeding 25 MPH. Use Reason Code 140 - Surfacing Team.

Before this temporary speed restriction is removed, the entire limits of the affected area (including the entire curve) must be checked, and reworked if necessary, with a fully functioning tamper to ensure that the quality of the line and surface is consistent with CSXT Standards.

Some examples of applicable malfunctions are ineffective tamping tools, lifting, lining, or slewing component problems, as well as measurement and data system components problems, etc.

5. The foreman and operators will make inspections, on at least a daily basis or when the rail height changes, to ensure that tamping tools are maintained and adjusted as follows:

   a. All tamping tools must be in place and functional.

   b. Tamping tools should be adjusted so that the top of the tool pad is ½" below the bottom of the crosstie at full insertion.

   c. Tamping tools should be replaced when the tamping tool pad wears to a dimension of less than 1-3/4" high x 4" wide as measured on the smallest side.

   d. When changing tamping tools, the *tamping tool pad must not be struck with a hammer* due to the danger of metal chipping from the hardened surface of the pad. The tamping tool will be removed by the method recommended by the machine manufacturer.

   e. Special attention must be used when tamping concrete ties to ensure correct depth penetration is obtained. Failure to have correct depth penetration will result in damage to the ties if the tamping tool pads press against the side of the ties during the squeeze cycle. Also, care must be used to avoid unintended tie movement and damage to the concrete tie pads.

6. Surfacing operations on or near bridges, at tunnels, at overhead bridges or at other areas of restrictive clearance will conform to the following:

   a. Ballast section at the ends of bridges will be kept clean and well drained with ties fully supported at proper elevation to conform to that of the bridge.

   b. Tracks at ends of the bridges, trestles and through tunnels must be kept in good line and surface at all times.

c. The surface of track shall conform to the existing approach profile of open deck bridges and tunnels.

d. Standard ballast section must be maintained on ballast deck bridges. Therefore, the track shall not exceed an elevation that allows the top of ties to be more than:

1) Four (4) inches above the ballast curb on concrete bridges; or

2) Nine (9) inches above the timber ballast curb on timber bridges.

CAUTION: Ensure that materials do not fall onto roadways or into waterways.

e. There shall be no changes that reduce the clearance of tracks through tunnels without the prior approval of the Chief Engineer-Maintenance of Way.

f. Tracks under overhead structures must not be raised to a height that reduces the minimum route clearance, without the prior approval of the Chief Engineer-Maintenance of Way. In general, the clearance under each structure should be reviewed to ensure that future route clearance improvement projects would not be adversely impacted.

g. Track centers will not be reduced below the minimum route clearance during lining. The Engineer-Track or his designated representative will check restrictive locations in advance of the surfacing team. The track alignment on ballast deck bridges must not be changed without prior approval from the Assistant Chief Engineer-Structures.

7. Ballast will be pulled into shy areas as quickly as possible behind the tamping machine and before the end of the workday. Pulling fouled ballast into the ballast section is not permitted.

8. The foreman will make periodic inspections during ballast regulation operations to ensure that care is being taken:

a. Do not damage adjacent property, especially at highway underpasses.

b. Do not pull fouled ballast or other undesirable material into road crossings. The regulator should work away from the crossings whenever possible.

c. Do not damage rail fastening systems.

9. Special care must be taken to ensure that rail anchors within the work area are properly seated against the ties. In elastic fastener areas, ensure that missing fasteners are replaced. When the entire curve is worked, the completed project will comply with *MWI 1113.*

10. When a track stabilizer is used, a sufficient ballast section must be established before the stabilizer passes.

C. MAINTAINING CURVE GEOMETRY

1. Both vertical and horizontal curve geometry and superelevation will conform to CSXT Standards. Refer to *MWI 1104.*

2. The Engineer-Track will ensure that the Surfacing/Smoothing Team has an accurate copy of the *Master Track Attributes—Curve* from the Engineering Gateway, that conforms to current CSXT Standards, before the work begins. He or a qualified designated employee will determine if advance curve measurement is required for the surfacing/smoothing work and furnish the information to the Surfacing/Smoothing Team.

3. The Foreman/Assistant Foreman, working with the surfacing unit, will mark the control points (TS, SC, CS, and ST) on all curves worked within out-of-face, smoothing, and spot surfacing projects with blue paint.

4. If the surfacing/smoothing work will be done utilizing a tamper equipped with a Computer Aided Geometry System (CAGS) or equal, the tamper can be used to measure the curves. The TS, SC, CS, and ST points will be located while tamping and marked by painting the inside and outside web of the rail blue. All curve data generated by the CAGS must be furnished to the Roadmaster before the surfacing team leaves the Roadmaster's territory.

5. If the surfacing/smoothing work will be done utilizing a tamper that is not equipped with CAGS or capable lining system, the starting and ending points of each curve can be located using a 62-foot chord. Data furnished from a Geometry Vehicle, which has a system that furnishes the information, should be used to determine the accuracy of existing records and if any advance work will be necessary prior to commencing the surfacing and lining operation. The TS, SC, CS, and ST points will be located and marked by painting the inside and outside web of the rail blue.

6. The following procedure will be followed to ensure that track stability is maintained on main and branch lines where:
   - the track is laid with continuous welded rail,
   - on curves one degree (1^{o}) or greater where the maximum authorized speed is 25 miles per hour or greater or on all curves greater than three degrees (3°),
   - and an expected rail temperature of 50° Fahrenheit or below within 24 hours of the work.

   Work during these conditions can create situations that lead to “adding” rail to the track, thereby affecting the track’s neutral temperature. The following procedures will assist in evaluating the track.

a) When the track is to be disturbed, the Roadmaster must ensure references are set at five or more locations before the work is performed. The references will be located at:
   - tangent to spiral (TS)
   - spiral to curve (SC)
   - mid point of the curve
   - within the body of the curve, as necessary,
   - curve to spiral (CS)
   - spiral to tangent (ST)

   The reference may be a fixed object or a 2" x 2" x 12" wood stake. They should be spaced no more than listed below if practicable:
   - 100 feet apart on curves 9^o and above
   - 200 feet apart on 4^o to 9^o curves
   - 400 feet apart on 2^o to 4^o curves
   - 800 feet apart on 1^o to 2^o curves

   and must be clear of maintenance activities. Do not place stakes at the ends of ties or in walking areas.

   Measurements should be taken from the field side head of the near rail to the face of the fixed object or the top near face of the stake. The tape used to make the measurement should not slope more than 1 vertical to 4 horizontal. A record of the reference stake location information will be furnished to the Roadmaster before the Surfacing or Smoothing Team leaves the territory. Use the *Curve Alignment Reference Form* that is included with this MWI to document this information.

b) During the work the rail temperature will be measured three times during the workday. The high and low temperatures will be recorded on the *Track Disturbance Record* and the report will be furnished to the Roadmaster. The measurements will be taken at the beginning, middle, and the end of the workday on the shady side of the rail web with an approved thermometer. The appropriate temperatures will be recorded on the Curve *Alignment Reference Form* and the *Track Disturbance Rail Addition Record* and the reports will be furnished to the Roadmaster. The *Track Disturbance Rail Addition Record* is to be faxed to the number on the form.

c) The Roadmaster or his designated representative will record the amount of movement periodically for up to 15 days after the work has been completed. If the curve moves inward more than an average of 1", a *Track Disturbance Rail Addition* record must be completed. The Roadmaster is responsible for remedial action prior to hot weather. Corrective action will be one or more of the following:
   - Place the curve on its original alignment.
   - Adjust the rail.
   - Place a temporary speed restriction not to exceed 25 MPH until one of the above is accomplished.

   Stakes, that could become a tripping hazard, should be removed as soon as possible.

7. Freshly surfaced track will require a temporary speed restriction. See *MWI 1109* for proper application of the temporary speed restriction.

D. FINISHED TRACK GEOMETRY

1. The minimum quality information shown below applies to out-of-face and smoothing teams. Teams with mechanical equipment must comply with *MWI 1113, Surfacing Section*.

2. The deviation from zero (0) cross level on tangent and designated elevation on curve will not be more than:

Track Class 1	½”
Track Class 2	½”
Track Classes 3 & 4	3/8"
Track Class 5	1/8"
Track Class 6	1/8"

3. The deviation from uniform profile (sags or humps) in 62 feet-will not be more than:

Track Class 1	1"
Track Class 2	¾”
Track Classes 3 & 4	½”
Track Class 5	3/8’
Track Class 6	¼”

4. The deviation from proper alignment on spirals and curves at the midpoint of a 62 foot chord-will not be more than:

Track Classes 1 & 2	1"
Track Classes 3 & 4	3/8"
Track Class 5	1/8"
Track Class 6	1/8"

5. Line swings at the end of spirals will not be permitted. Line swings on tangents which deviate from true line at the rate of more than one inch per hundred feet will not be permitted.

6. Rates of runoffs will be equal to or less than one (1) inch in 100 feet at the end of finished work.

7. Runoffs on the diverging portion of turnouts must be located off the long ties and must comply with paragraphs D 2, 3, and 4 above.

E. FINISHED BALLAST SECTION

1. The cross section of dressed ballast after compaction and expected settlement will have full cribs and shoulders that conform to the Standard Ballast Section. Refer to *CSXT Standard Drawing 2602*.

2. Excess ballast on the shoulder or in the track will not be permitted at highway and railroad crossing approaches, or defect detectors.

3. Excess ballast will be removed from bridge walkways, abutments and curbs, station platforms, and turnouts.

F. OTHER

1. Communication & Signal Equipment - Care must be taken during surfacing operations to avoid damage to wayside Communication & Signal equipment. When surfacing in and near defect detectors, refer to MWI 1121 for detailed procedures.

2. When surfacing switches, use care around snow melters. Do not damage equipment.

3. Road Crossings - Materials unloaded for use in reworking road crossings and materials removed from road crossings should be placed in a vacant quadrant of the crossing, where possible. These materials should be placed in a manner that will not interfere with the clear line of sight for a highway user or rail equipment operator, and will not interfere with the functioning of the road crossing control signal equipment. Care must be taken to maintain visibility, walking conditions and not impede drainage. Disposal of asphalt and other materials removed from the crossing will use a method consistent with CSXT environmental policy. See *MWI 901* for detailed road crossing information.

III. REPORTS

A. The Surfacing/Smoothing Team Supervisor/Foreman will ensure that:

1. Daily Production Reports are completed and submitted at the end of each production day,

2. Track Disturbance Record is completed daily and furnished to the Roadmaster at least weekly,

3. All curve data generated by the CAGS is furnished to the Roadmaster before the surfacing team leaves the Roadmaster's territory, and

4. A record of the reference stake location information will be furnished to the Roadmaster before the Surfacing/Smoothing Team leaves his territory. Use the *Curve Alignment Reference Form* that is included with this MWI to document this information. An Excel version of this form is also available in the Gateway / Engineering Information System.

B. The Engineer-Track will ensure that the *Master Track Attributes—Curve information in the*

Engineering Gateway is updated within 30 days after completion of the work.

Prepared by: J. E. Beyerl
Engineer MOW Standards

Reviewed: _____
Director, Fixed Plant Engineering

Approved: _____
Chief Engineer, Maintenance of Way

Approved: _____
Vice President, Engineering

Office of Vice President - Engineering
Jacksonville, Florida

CURVE ALIGNMENT REFERENCE FORM

Division _____ Subdivision _____ Track _____ Deg Curve _____

Milepost: Prefix _____ Begin _____ End _____
Work Direction: (low to high MP) (high to low MP)
Type of Fasteners: (rail anchors) (Pandrol plates) (other _____)
Team No. _____ Team Type _____

DATE				
RAIL TEMPERATURE				
RECORDER				

NO	DESCRIPTION	MEASUREMENT 1 Before Work	MEASUREMENT 2 After Work	MEASUREMENT 3 Follow Up	MEASUREMENT 4 Follow Up

NOTES:
References should be marked fixed objects or wood stakes if practicable.
Number reference points in sequence in the direction of work.
In "Description", note TS, SC, CS, ST, and identify reference.
Measure from the field side of the near rail to the face of fixed object or stake.
References should be spaced no more than:
- 100 feet on curves 9 degrees and above
- 200 feet on 9 degree to 4 degree curves
- 400 feet on 4 degree to 2 degree curves
- 800 feet on 2 degree to 1 degree curves

Reference stakes must be clear of maintenance activities, walking areas, and tie ends.

MWI 1104-06
Superelevation of Curves
Issued: 3/24/97 Revised 1/10/13
Page 1 of 5

PURPOSE: To establish instructions governing the superelevation of curves.

SAFETY: Observe all applicable Safety Rules and Regulations.

LOCATION: All CSXT tracks.

ENVIRONMENTAL: Observe all applicable Federal, State and Local environmental rules and regulations

I. DISCUSSION

A. Superelevation is the vertical distance that the outer rail is above the inner rail. The inner or low rail is the grade rail and should be maintained in true surface. The outer or high rail must be brought to the proper superelevation. Equilibrium occurs when the overturning forces due to speed are counterbalanced by the amount of superelevation.

B. Due consideration must be given to safety of train operation and the effect on track, when establishing curve characteristics. Speed of trains, the degree of curvature, and the amount of superelevation of the outer rail bear a definite relationship to one another. These factors must be kept in proportion for the curve to ride smoothly. Tracks may be safely superelevated within fairly wide limits as long as the elevation is uniform. Irregularities in superelevation may encourage cars to rock off the track. The Engineer-Track must see that adequate inspections of curves are made and that irregularities are corrected.

C. The Division Engineer will establish the superelevation and speed on curves based on the degree of curvature and these guidelines. The Division Engineer will ensure that all FRA track safety standards pertaining to superelevation requirements are met.

D. Curves, not in compliance with this superelevation policy will be made to conform with this policy the first time the entire length of curve is surfaced.

II. PROCEDURE

A. Superelevation will be established for the curve by taking into account the freight train speed, the degree of curvature, physical constraints, and the latest revision of *CSXT Standard Drawing 2511, Superelevation of Curves*.

B. Using Superelevation Charts

1. Use the superelevation table shown on *CSXT Standard Drawing 2511*. Enter the table with the degree of curvature and the maximum authorized freight train speed for each curve.

2. Select the appropriate superelevation value.

3. If there is NO Passenger/Commuter service over this route, the value identified in step two (2) above will be used.

4. If there IS Passenger/Commuter service over this route, determine if the equipment complies with the requirements in *FRA Track Safety Standards, §213.57.(c).* Passenger/Commuter service operators may operate at either 3-in. Unbalance or 4-in. Unbalance depending on their equipment.

5. If the Passenger/Commuter equipment DOES comply with the requirements in FRA Track Safety Standards, §213.57,(c), check *CSXT Standard Drawing 2510, Sheet 1 of 2, FRA Maximum Allowable Operating Speeds – 4-in. Unbalance*. Enter the table with the degree of curvature and the superelevation value from step two (2). Compare the speed shown in the table against the desired Passenger/Commuter train speed.

   a) If the desired Passenger/Commuter train speed is LESS THAN OR EQUAL TO the speed shown in the table, then the curve is safe for the desired Passenger/Commuter train speed.

   b) If the desired Passenger/Commuter train speed is MORE than the speed shown in the table, than the Passenger/Commuter train speed will be reduced.

6. If the Passenger/Commuter equipment does NOT comply with the requirements in *FRA Track Safety Standards, §213.57,(c)*, *CSXT Standard Drawing 2510, Sheet 2 of 2, FRA Maximum Allowable Operating Speeds – 3-in. Unbalance*. Enter the table with the degree of curvature and the superelevation value from step two (2). Compare the speed shown in the table against the desired passenger/commuter train speed.

   a) If the desired Passenger/Commuter train speed is LESS THAN OR EQUAL TO the speed shown in the table, then the curve is safe for the desired Passenger/Commuter train speed.

   b) If the desired Passenger/Commuter train speed is MORE than the speed shown in the table, than the Passenger/Commuter train speed will be reduced.

C. The Passenger/Commuter train speed determined in paragraph B. above will be rounded down to the nearest 5 mph increment when posting new permanent speed restrictions.

D. The superelevation value, determined by the method shown in paragraph B. above, may be adjusted by the Division Engineer due to site specific train operating conditions, such as speed of loaded trains vs. speed of empty trains, direction of loads vs. direction of empty trains, mix of traffic, etc. The allowable adjustment is plus or minus 1/2". This adjusted superelevation will become the designated superelevation. The designated superelevation will be entered in the *Master Track Attributes—Curve* from the Engineering Gateway. This designated elevation is to be used by all field forces when performing any work on curves.

NOTES:

1. The Division Engineer's allowable adjustment of plus or minus 1/2" will not be used to exceed the superelevation limits show in paragraphs E and F, below.

2. Excessive flattening or flow of the low rail may indicate that there is too much superelevation in the track. Excessive abrasive wear of the high rail may indicate that there is not enough superelevation in the track. If the track is superelevated in accordance with paragraph D, and if excessive rail wear is occurring, furnish the information requested in *MWI 2106, Curve Superelevation Inspection and Change Request Forms* to the Chief Engineer MofW North/South in Jacksonville for review and possible adjustment of the curve elevation. If approved, this revised superelevation will become the designated superelevation and will be input into *Master Track Attributes—Curve* in the Engineering Gateway by the Division Engineer.

E. The maximum allowable superelevation on any curve is five (5”) inches. There are several situations where lesser limits apply. See paragraph F. below.

F. The Chief Engineer – Maintenance of Way must approve the use of more than:

4 1/2" Superelevation on curves greater than 3° - 00' when required to maintain maximum authorized speed.

4" Superelevation on non-signaled branch lines having a maximum authorized speed of 30 miles per hour or less.

4" Superelevation on grades where freight trains regularly operate below 25 miles per hour.

G. Increments of 1/4" will be used in establishing the superelevation to be maintained on a curve.

H. Alignment between tangent and curves, and between different degrees of curves, when actual elevation or difference in elevation exceeds one half (1/2) inch will be adjusted by the use of spiral curves.

I. A spiral is the gradual and uniform introduction of curvature from tangent into full curve or from one degree of curve to another in compound curves.

J. Change in superelevation will follow the alignment spiral where possible.

K. MINIMUM LENGTH OF SPIRAL

Maximum Authorized Speed in MPH	Minimum Spiral Length per 1/2 inch of Superelevation

New construction and existing tracks where practical.

Up to 50	31 feet
55 to 65	39 feet
70 to 80	50 feet
85 and 90	55 feet

Existing tracks

Up to 50	31 feet
55 to 80	39 feet
85 and 90	50 feet

L. In existing track, where there is insufficient distance available to provide a spiral in accordance with these requirements, the outer rail shall have full elevation at the point of full curvature and a portion of the superelevation run off, not exceeding 1", may be made on tangent track. If this is not possible, the curve must be reconfigured.

M. The point of zero superelevation and the point of full superelevation, as well as points of change in superelevation on compound curves, will be marked by blue paint on the web of the rail. See *MWI 2107* for supplemental marking techniques.

N. Spiral design alignment for new construction should be in accordance with current *American Railway Engineering and Maintenance of Way Association, Manual of Railway Engineering Chapter 5 Part 3.*

III. REPORTS

The Division Engineer will ensure that the *Master Track Attributes—Curve* from the Engineering Gateway reflects the designated superelevation and proper spirals.

Checked by: Tom Thoburn
Division Engineer

Mark E. Austin
Engineer Standards II

Reviewed: _____
Director Engineering Standards

Approved by: _____
Assistant Vice President – Engineering

Office of the Vice President, Engineering
Jacksonville, Florida

MWI 1125-03
Installation and Thermal Adjustment of CWR

Issued: 12/01/06 Revised: 8/10/11

PURPOSE: To set instructions governing the installation and thermal adjustment of continuously welded rail (CWR).

SAFETY: Observe all applicable safe job procedures, safety rules, and operating rules.

LOCATION: All CSXT tracks.

ENVIRONMENTAL: Observe all applicable Federal, State and Local environmental rules and regulations.

REFERENCES:
MWI 701 Use of Premium Rail Fasteners with CWR
MWI 703 Rail Anchoring Policy
MWI 901 Road Crossing Installation
CSX 2512, 2513, 2514 Spiking Patterns

I. DISCUSSION

This document concerns the proper procedures for installation and thermally adjusting continuously welded rail installed as part of out of face, curve patch, or new construction projects.

II. PROCEDURE

A. LAYING CONTINUOUS WELDED RAIL

These instructions apply to rail laid out of face, curve patching, repairing of defective rails, or other rail openings in welded rail.

1. For rail replacement projects, ties will be adzed with 0 inch cant (-0” +1/8” to gage) measured at the outside edges of the tie plate during out-of-face and curve patch operations and welded rail laid to 56-1/2 inch gage. Ties on open deck bridges will not be adzed without the approval of the Assistant Chief Engineer - Structures. For new construction projects, ties will not be adzed.

2. All joints should be welded when the rail is laid. Welding will be done as rail is being laid except when weather conditions prevent adjusting of welded rail for

temperature change.

a. If it is not possible to weld a joint, the rail will be drilled with two holes in each rail end to accommodate joint bars with two (2) bolts in the outermost holes. This joint will be welded as soon as practicable but within 60 days one of the following shall occur:
   - Weld joint **or**
   - Install 6 bolts **or**
   - Box anchor joint on every tie for 130 consecutive ties in each direction.

b. For joints being left for later welding, the following information must be marked using permanent paint marker (SCN 471.0610462.1) on the web of rail:
   - Date of installation
   - Team Identification
   - Adjusted rail temperature

c. The Roadmaster must be notified of the location of the joint and the information noted in item b above.

3. Transition or compromise rails are used to eliminate the need for bolted or field welded compromise joints at permanent compromise locations. They are designed to be full rail height on the end that matches the new rail specified for the project; and a varying rail height on the end that ties into the existing rail. When using transition rails:

   a. Determine the rail height at the compromise point for the existing rail.
   b. Identify that same rail height on the transition rail.
   c. Mark and cut the transition rail to match the existing rail height.

   See MWI 507 for additional information on transition and compromise rails.

4. Welded rail will be laid and anchored at a minimum adjusted rail temperature in accordance with the following geographical territories:

   a. A minimum adjusted rail temperature of 95° F will be used for territory north of the States of Tennessee and North Carolina except for the State of Virginia.
   b. A minimum adjusted rail temperature of 100° F will be used in the State of Virginia.
   c. A minimum adjusted rail temperature of 105° F will be used for the States of Tennessee and North Carolina and all territory south thereof.

   The minimum adjusted rail temperature listed above in items a, b, and c will be reduced by 20°F when rail is installed within tunnels 500’ and greater in length. Keep the outside neutral temperature for the first 250’ from both ends of the tunnel. Reduce the neutral temperature on the inside of the tunnel beginning 250 from the

portal.

The proper minimum adjusted rail temperature will be used to calculate the actual rail expansion needed. See paragraph II.B.7 below for specific details.

5. Welded rail that has not been properly adjusted will be protected by a temporary speed restriction when the ambient temperature is expected to exceed 85° F, rail temperature exceeds 110° F, or when the rail temperature is 40° F greater than the rail laying temperature, whichever occurs first. If rail is laid at a temperature more than 40° F. below the designated rail laying temperature, rail must be adjusted or a speed restriction not exceeding 40 mph must be placed prior to rail temperature above designated rail laying temperature. When tight rail conditions exist, be governed by Engineering Field Manual sections 4.5.1 and 7.5.3.

6. The standard rail anchor patterns are detailed in MWI 703, *Rail Anchoring Policy*. Care must be taken to ensure that all welded rail is anchored to standard. At locations where the standard pattern does not restrain rail movement due to tonnage, grade, curvature, or other local conditions, the Division Engineer will provide justification to the Chief Engineer – Maintenance of Way for the application of additional anchors.

7. CWR laid across bridges will be anchored as follows:

   a. Ballast Deck Bridges - CWR will use the standard anchor pattern as described in paragraph MWI 703, *Rail Anchoring Policy*.
   b. Open Deck Bridges with total length 100 ft or less - CWR will be box anchored on every tie that is fastened to the bridge span.
   c. Open Deck Bridges with total length between 100 ft. and 500 ft. with an alignment of 2 degrees or less:

      1) CWR will be box anchored on every tie that is fastened to the bridge span, throughout all spans less than 100 ft.
      2) CWR will be box anchored on every tie that is fastened to the bridge span, for the first 100 ft. from the fixed end of individual spans with length greater than 100 ft.

   d. Rail anchor pattern will be specified by the Assistant Chief Engineer – Structures when any of the following conditions exist:

      1) Open Deck Bridges with a total length greater than 500 feet
      2) Alignment is greater than 2 degrees
      3) Bridges with existing rail expansion joints
      4) Other special situations

8. The Manager - Bridges will submit the details of bridges not meeting the

requirements in paragraph 7 above to the Assistant Chief Engineer – Structures for review. The Assistant Chief Engineer – Structures will provide the anchorage requirements.

9. The standard track spiking patterns are detailed in CSX Standard Drawings 2512, 2513, and 2514. Care must be taken to ensure that all welded rail is spiked to standard. If positive restraint fasteners are present, lock spikes will be replaced with screw spikes and proper tie plates.

B. ADJUSTING CONTINUOUS WELDED RAIL to OBTAIN PROPER ADJUSTED RAIL TEMPERATURE

1. Welded rail being laid with a rail temperature less than stated in Paragraph II.A.4. will be adjusted for length by heating the rail or using a rail expander.

2. The Manager in charge of the rail laying operation is responsible to see that rail is properly adjusted for length and anchored as it is laid. The anchoring operations will be no more than 100 feet behind the rail heater when in use and the anchors must be applied only when the rail had achieved the necessary expansion movement and the rail is at or above the desired temperature.

3. The Manager in charge of the rail laying project is responsible for the quality of welding within the rail laying team.

4. When field welds are installed, caution must be exercised to ensure that rail length is not increased in the joint welding process.

5. The Manager in charge of the rail laying project will ensure a fire prevention plan is in place for heating rail on open deck bridges as developed during planning meetings prior to the rail laying project. Pursuant to MWI 1101, coordination with the Manager - Bridges is required prior to arriving at a bridge where rail will be heated.

6. Tracks in new construction, except when using track laying machine, must be tamped and have a standard ballast section prior to rail adjustment.

7. Adjustment Procedure

   a. Complete the form, *Record of Rail Laying Temperature for Continuous Welded Rail*, as the day progresses. Each string of welded rail is numbered at both ends near the initial and final weld by the welding plant. Enter this number in the second column, "String Number", as each string is laid.

   b. Using a rail thermometer, determine the average cold rail temperature of each rail immediately prior to adjustment by taking three measurements along the

string. Measure temperature on the shady side of the web.

1) System Production Teams and some Division Teams will be equipped with approved digital thermometers. These read instantly and temperature measurements can be made quickly. Ensure that non-contact infrared thermometers are held approximately 18 inches to the rail that is being measured to ensure that only the temperature of the rail is being measured and not the surrounding materials.
2) Division Teams will normally be equipped with the standard dial rail thermometer. To obtain an accurate reading leave the thermometer in place until temperature reading becomes steady, normally about five minutes.

Read the rail temperature and enter the average of the three readings in Column C, "Cold Rail Temperature", of the form.

c. Leave a gap between the string being adjusted and the next string to provide for expansion. The length of the gap should be sufficient to allow for the expansion. The gap is to be protected from opening or closing by applying rail anchors on the string ahead for 50 feet.

d. If rail is installed in a continuous operation not completely in tie plates to produce a gap at the end, ensure that the required expansion is achieved for each quarter portion calculated for that length of rail.

e. Determine the required rail expansion from the *Change in Rail Length due to Change in Temperature* Chart.

1) Measure length of the rail and enter in Column A, "Rail Length in Feet".
2) Select the required adjusted rail temperature from Paragraph II.A.4. and enter in Column B.
3) The average cold rail temperature is shown in Column C.
4) Compute the difference in temperature by subtracting Column C from Column B and enter in Column D. If the cold rail temperature is below the required adjusted rail temperature, see next Paragraph to determine the expansion required. If the cold rail temperature is greater than the required adjusted rail temperature, no adjustment needed.
5) Use chart, *Change in Rail Length due to Change in Temperature*, by locating the row corresponding to rail length and column corresponding to the temperature difference computed in the Paragraph above. Read the expansion length in inches at the intersection of the rail length row and temperature length column. Enter in Column E," Required Expansion".

f. For strings 720’ or longer - reference mark the rail base and the tie plates at the quarter points of the strings. For strings less than 720’ long - reference

mark at the center point of the string. The rail should be measured and reference marked at the same time the cold rail temperature is determined. For example, if you have the following conditions:

1) String length - 1440 feet - Make reference marks on the base of the rail and a secure tie plate at the 360', the 720', and the 1080' quarter points.
2) String length - 500 feet - Make reference marks on the base of the rail and a secure tie plate at the 250' center point.

These reference marks will be used to measure the expansion during adjustment. Adjustment must be as uniform as possible throughout entire string. For example, if you have the following conditions:

1) String length - 1440 ft
2) Cold rail temperature - 75°F^{o}
3) Adjusted rail temperature - 100°F

Using the *Record of Laying Temperature for Continuous Welded Rail* and the *Change in Rail Length due to Change in Temperature* chart, it is determined that the required expansion is 2 3/4". With the rail reference marked at the quarter points, the Supervisor - Production Team would look for one-quarter of the expansion at the first reference mark (11/16"), one-half of the expansion at the second reference mark (1 3/8"), three-quarters of the expansion at the third reference mark (2 1/16") and the full expansion of 2 3/4" at the end of the string.

g. Rail heaters or rail expanders will be used to obtain the required expansion.

h. The Manager in charge of the rail laying project will ensure that the rail heater is operated uniformly and continuously. Vibrate the rail to aid in the rail expansion; do not strike the rail with hammers or other devices.

i. If the required expansion cannot be obtained with rail heaters, do not bump the rail. Use rail expanders or cut the rail into shorter strings.

j. If the complete expansion as determined in Paragraph II.B.5.e. has not been obtained, place a wooden shim in the joint. The length of the wooden shim will be the amount of required expansion less the measured amount that the rail has expanded since laying.

k. The wooden shim will remain in place until the next rail is laid and anchored for 250 feet. At this time the wooden shim is removed, then the first rail is expanded uniformly to fill the gap and the joint is made.

l. Record the amount of expansion in Column F, "Actual Expansion". Then

compute the temperature compensation based on the actual expansion from the chart on page 14, *Change in Rail Length due to Change in Temperature*, and record this temperature in Column G. Add the "Cold Rail" and "Compensated" temperatures, Columns C + G, to determine the adjusted temperature. This must be equal to or greater than the adjusted rail temperature specified in Paragraph II.A.4.

m. The Manager - Production Team will give the completed *Record of Laying Temperature for Continuous Welded Rail* to the Roadmaster after the rail has been laid. The Roadmaster will forward copies to the Division Engineer and Engineer Track.

6. If rail being installed is at or above desired rail laying temperature prior to being installed, mark each quarter point and note no movement in the *Record of Laying Temperature for Continuous Welded Rail*.

7. The Manager - Production Team must ensure that rail is properly adjusted and all documentation completed before the team leaves the rail laying area.

C. CURVE PATCH WELDED RAIL

1. A string of welded rail used for curve patch must be adjusted to the adjusted rail temperature specified in Paragraph II.A.4.

2. The length of rail removed will be measured, the cold rail temperature of the replacement rail measured and the amount of expansion determined in the same manner as for laying rail out of face. See Paragraph II B.7.

3. The rail ends will be miss-matched until proper adjustment is obtained. See Paragraph II B.7. for detailed procedures.

4. Resistance to expansion may be experienced on sharp curves. If this occurs, it is permissible to anchor one rail length in the center of the curve, bypass the rail ends at each end of the string and then expand and vibrate the rail from the center to each end.

D. REPAIR of DEFECTS

1. Before cutting the rail, make reference marks on the web of the rail at least two feet outside the affected area (cut points or joint). Measure the distance between the marks and record it on the web of the rail. Use a permanent paint marker (SCN 471.0610462.1) to mark the rail; do not use chalk, keel, or temporary marks. The

marks should be made on the side of the rail. See figure 1 for detailed information on making reference marks.

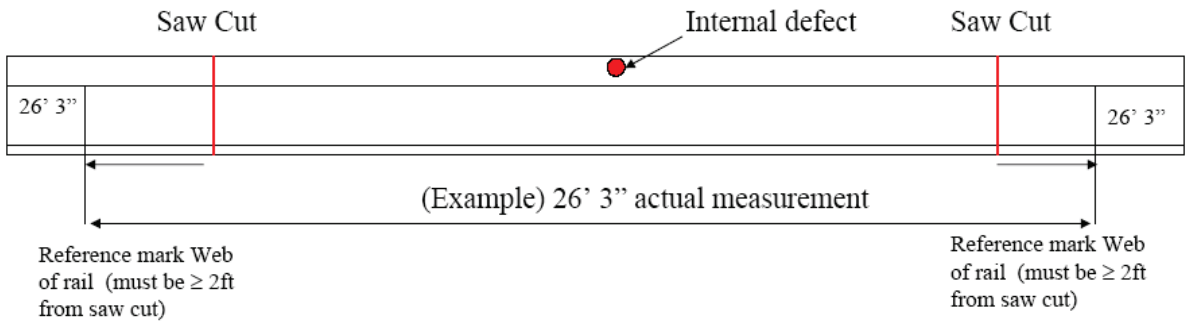


Figure 1. Example of Reference Marks for Rail Plug Change Out

2. Once the rail plug has been replaced, the distance between the reference marks should be the same as the distance recorded on the web of the rail.

3. Record the amount of rail added (if any) on the *Pull Apart and Rail Repair Reporting Form.* A sample of the form is shown in MWI 1109 and it can be down loaded from the Gateway. The *Pull Apart and Rail Repair Reporting Form* shall be completed even if no rail was added. Enter 0 for rail added if the rail was adjusted when installed.

4. This information must be entered into the *Track Disturbance Reporting System* in the Gateway.

5. Rail that has not been properly adjusted will be protected by temporary speed restrictions when the ambient temperature is expected to exceed 85° F, rail temperature exceeds 110° F, or when the rail temperature is 40° F greater than the rail laying temperature. Use the reference marks made in item 1 of this section in determination of whether the track is properly adjusted. Complete a *Track Disturbance Report* once the rail is properly adjusted.

CSX TRANSPORTATION ENGINEERING

RECORD OF RAIL LAYING TEMPERATURES FOR CONTINUOUS WELDED RAIL

YEAR:_____ DIVISION:_____ SUBDIVISION:_____

LAYING DATES:_____ NEAREST STATION:_____

RAIL WEIGHT:_____ TYPE RAIL ANCHORS:_____ TYPE BALLAST:_____

RAIL N S E W	DATE	STRING NUMBER	MILEPOSTS INCLUDING PREFIX		TRACK SG 1 2 YD WYE	RAIL LENGTH IN FEET	RAIL TEMPERATURE			REQUIRED EXPANSION IN INCHES	ACTUAL EXPANSION OBTAINED IN INCHES	LIST CHANGE IN TEMPERATURE FROM CHART IN MWI 1125	ADJUSTED LAYING TEMPERATURE
			FROM	TO			DESIGNATED RAIL LAYING TEMPERATURE 95, 100, OR 105	COLD RAIL TEMPERATURE	DIFFERENCE IN TEMPERATURE				
						A	B	C	D	E	F	G	C + G

C = 12 X 0.0000065LT

C = CHANGE IN LENGTH IN INCHES

L = LENGTH OF RAIL IN FEET

T = CHANGE IN TEMPERATURE IN DEGREES

CHANGE IN RAIL LENGTH DUE TO CHANGE IN TEMPERATURE

LENGTH OF RAIL - FEET	CHANGE IN TEMPERATURE IN DEGREES FAHRENHEIT															
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
100	0	0-1/8	0-1/8	0-1/8	0-1/4	0-1/4	0-1/4	0-3/8	0-3/8	0-3/8	0-3/8	0-1/2	0-1/2	0-1/2	0-5/8	0-5/8
200	0-1/8	0-1/8	0-1/4	0-3/8	0-1/2	0-1/2	0-1/2	0-5/8	0-3/4	0-3/4	0-7/8	0-7/8	1	1-1/8	1-1/8	1-1/4
300	0-1/8	0-1/4	0-3/8	0-1/2	0-5/8	0-3/4	0-7/8	1	1	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	1-7/8
400	0-1/8	0-3/8	0-1/2	0-5/8	0-3/4	1	1-1/8	1-1/4	1-3/8	1-1/2	1-3/4	1-7/8	2	2-1/8	2-3/8	2-1/2
500	0-1/4	0-3/8	0-5/8	0-3/4	1	1-1/8	1-3/8	1-1/2	1-3/4	2	2-1/8	2-3/8	2-1/2	2-3/4	2-7/8	3-1/8
600	0-1/4	0-1/2	0-3/4	0-7/8	1-1/8	1-3/8	1-5/8	1-7/8	2-1/8	2-3/8	2-5/8	2-3/4	3	3-1/4	3-1/2	3-3/4
700	0-1/4	0-1/2	0-7/8	1-1/8	1-3/8	1-5/8	1-7/8	2-1/8	2-1/2	2-3/4	3	3-1/4	3-1/2	3-7/8	4-1/8	4-3/8
800	0-3/8	0-5/8	1	1-1/4	1-1/2	1-7/8	2-1/8	2-1/2	2-3/4	3-1/8	3-3/8	3-3/4	4	4-3/8	4-5/8	5
900	0-3/8	0-3/4	1	1-3/8	1-3/4	2-1/8	2-1/2	2-3/4	3-1/8	3-1/2	3-7/8	4-1/4	4-5/8	4-7/8	5-1/4	5-5/8
1000	0-3/8	0-3/4	1-1/8	1-1/2	2	2-3/8	2-3/4	3-1/8	3-1/2	3-7/8	4-1/4	4-5/8	5-1/8	5-1/2	5-7/8	6-1/4
1100	0-3/8	0-7/8	1-1/4	1-3/4	2-1/8	2-5/8	3	3-3/8	3-7/8	4-1/4	4-3/4	5-1/8	5-5/8	6	6-3/8	6-7/8
1200	0-1/2	0-7/8	1-3/8	1-7/8	2-3/8	2-3/4	3-1/4	3-3/4	4-1/4	4-5/8	5-1/8	5-5/8	6-1/8	6-1/2	7	7-1/2
1300	0-1/2	1	1-1/2	2	2-1/2	3	3-1/2	4	4-5/8	5-1/8	5-5/8	6-1/8	6-5/8	7-1/8	7-5/8	8-1/8
1400	0-1/2	1-1/8	1-5/8	2-1/8	2-3/4	3-1/4	3-7/8	4-3/8	4-7/8	5-1/2	6	6-1/2	7-1/8	7-5/8	8-1/4	8-3/4
1440	0-1/2	1-1/8	1-5/8	2-1/4	2-3/4	3-3/8	3-7/8	4-1/2	5	5-5/8	6-1/8	6-3/4	7-1/4	7-7/8	8-3/8	9
1500	0-5/8	1-1/8	1-3/4	2-3/8	2-7/8	3-1/2	4-1/8	4-5/8	5-1/4	5-7/8	6-3/8	7	7-5/8	8-1/4	8-3/4	9-3/8
1600	0-5/8	1-1/4	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4	6-7/8	7-1/2	8-1/8	8-3/4	9-3/8	10
1700	0-5/8	1-3/8	2	2-5/8	3-3/8	4	4-5/8	5-3/8	6	6-5/8	7-1/4	8	8-5/8	9-1/4	10	10-5/8
1800	0-3/4	1-3/8	2-1/8	2-3/4	3-1/2	4-1/4	4-7/8	5-5/8	6-3/8	7	7-3/4	8-3/8	9-1/8	9-7/8	10-1/2	11-1/4

MINIMUM ADJUSTED RAIL LAYING TEMPERATURES:
95° FOR THE TERRITORY NORTH OF THE STATES OF TENNESSEE AND NORTH CAROLINA EXCEPT VIRGINIA,
100° IN THE STATE OF VIRGINIA,
105° FOR THE STATES OF TENNESSEE, NORTH CAROLINA AND TERRITORY SOUTH THEREOF.

EXAMPLE 1. HOW MANY INCHES MUST A STRING OF WELDED RAIL 1300 FEET LONG LAID AT A RAIL TEMPERATURE OF 50° EXPAND TO BE ADJUSTED FOR 95°.

95° ADJUSTED TEMPERATURE
LESS 50° LAYING TEMPERATURE
45° CHANGE IN TEMPERATURE

GO TO THE TABLE AND READ THE LENGTH GIVEN IN THE COLUMN HEADED BY THE "45" WHERE IT IS CROSSED BY THE ROW LABELED " 1300" IN THE "LENGTH OF RAIL" COLUMN.
AN EXPANSION OF 4-5/8 INCHES IS REQUIRED

EXAMPLE 2. THE ACTUAL RAIL EXPANSION MEASURED WITH THE STRING OF RAIL GIVEN IN EXAMPLE 1 WAS 4 INCHES. TO WHAT TEMPERATURE IS THE RAIL ADJUSTED AND IS IT ADJUSTED WITHIN THE REQUIRED LIMITS.

GO TO THE TABLE AND FIND 4 INCHES ON THE ROW MARKED "1300". RECORD THE CHANGE IN TEMPERATURE AT THE TOP OF THE COLUMN IN WHICH THE 4 INCHES APPEARS. IN THIS EXAMPLE, 40°.

45° LAYING TEMPERATURE
PLUS 40° FIELD TEMPERATURE
85° ACTUAL ADJUSTED TEMPERATURE

THIS IS LESS THAN THE 95°, 100° OR 105° REQUIRED DEPENDING ON LOCATION); THEREFORE, THE RAIL IS NOT ADJUSTED TO THE REQUIRED LIMIT.

NOTE: AT LOCATIONS, SUCH AS EXPANSION JOINTS, WHERE THERE IS A "FREE END" CONDITION, USE ½ THE AMOUNT SHOWN ABOVE.

III. REPORTS

A. The employee-in-charge of the rail laying will complete the records of rail laying on a continuous basis during rail installation. This information will be loaded into the Track Infrastructure Maintenance Reporting System (TIMRS). The Roadmaster and Engineer – Track can download the information as needed.

B. Tracks not properly adjusted using this method must have a track disturbance report completed and provided to the Roadmaster.

Prepared: Mark E. Austin
Engineer Standards II

Reviewed: _____
Director – Engineering Standards

Approved: _____
Assistant Vice President – Engineering

Office of the Vice President Engineering
Jacksonville, Florida

SPIKING REQUIRMENTS													
TRACK ALIGNMENT		MAIN TRACKS AND SIDINGS								OTHER TRACKS			
		MAXIMUM AUTHORIZED FREIGHT SPEED AND TONNAGE								MAXIMUM SPEED & TONNAGE			
		UP TO 45 MPH		>25 MPH & 10 MGT		46 MPH TO 60 MPH		61 MPH AND HIGHER		UP TO 25 MPH		>25 MPH & 10 MGT	
DEGREE FROM	DEGREE TO	SPIKES PER TIE PLATE	SPIKING PATTERN	SPIKES PER TIE PLATE	SPIKING PATTERN	SPIKES PER TIE PLATE	SPIKING PATTERN	SPIKES PER TIE PLATE	SPIKING PATTERN	SPIKES PER TIE PLATE	SPIKING PATTERN	SPIKES PER TIE PLATE	SPIKING PATTERN
TANGENT		2	A	3	B	3	B	4	C	2	A	3	B
0°-01′	1°-59′	3	B	3	B	4	C	4	C	2	A	3	B
2°-00′	3°-59′	4	C	4	C	4	C	4	C	3	B	3	B
4°-00′	5°-59′	4	C	4	C	4	C	4	C	4	C	4	C
6°-00′	11°-59′	5	D	5	D	5	D	5	D	4	C	4	C
12°-00′	12°-59′	5	D	5	D	5	D	5	D	4	C	4	C
13°-00′ AND UP		5	D	5	D	5	D	5	D	5	D	5	D

MAIN TRACK - A TRACK, OTHER THAN AN AUXILIARY TRACK, EXTENDING THROUGH YARDS AND BETWEEN STATIONS, UPON WHICH TRAINS ARE OPERATED IN CONFORMANCE WITH RULES OR SPECIAL INSTRUCTIONS.

SIDING - AN AUXILIARY TRACK DESIGNATED IN SPECIAL INSTRUCTIONS FOR THE MEETING OR PASSING OF TRAINS.

SIDE TRACK - AN AUXILIARY TRACK FOR PURPOSES OTHER THAN MEETING OR PASSING TRAINS.

THE SPIKING PATTERN ON CURVES WILL BEGIN AT THE TANGENT TO SPIRAL MARKER PLATE AND END AT SPIRAL TO TANGENT MARKER PLATE.

THE SPIKING PATTERN ON COMPOUND CURVES WILL BE BASED ON THE HIGHEST DEGREE OF CURVATURE IN THE CURVE AND WILL BE USED FOR THE ENTIRE CURVE.

SIX AXLE LOCOMOTIVES WITH CONVENTIONAL TRUCKS ARE RESTRICTED FROM OPERATING ON CURVES OVER 17°-00′.

SIX AXLE LOCOMOTIVES WITH RADIAL STEERING TRUCKS ARE RESTRICTED FROM OPERATING ON CURVES OVER 23°-00′.

THREE SPIKES PATTERN B AS MINIMUM WILL BE USED ON ALL TRACKS USING DISTRIBUTED OR PUSHER LOCOMOTIVES

IF A TIE PLATE DOES NOT HAVE TWO GAGE SIDE RAIL SPIKES, USE ADDITIONAL SPIKES AS SHOWN IN PATTERN C & D

SPIKING PATTERN "A"



SPIKING PATTERN "C"



SPIKING PATTERN "B"



SPIKING PATTERN "D"



■ - TRACK SPIKE

⊚ - TIE PLATE SCREW

CSX TRANSPORTATION

MAIN TRACK SPIKING PATTERNS
SIDE TRACK SPIKING PATTERNS

POSITIVE RESTRAINT RAIL FASTENERS
ALL TRACK ALIGNMENTS



PANDROL ROLLED PLATE



PANDROL VICTOR PLATE

J. E. BEYERL FOR
APPROVED - DIRECTOR
ENGINEERING STANDARDS

PREPARED BY:
M. E. AUSTIN

APPROVED - VICE PRESIDENT
ENGINEERING

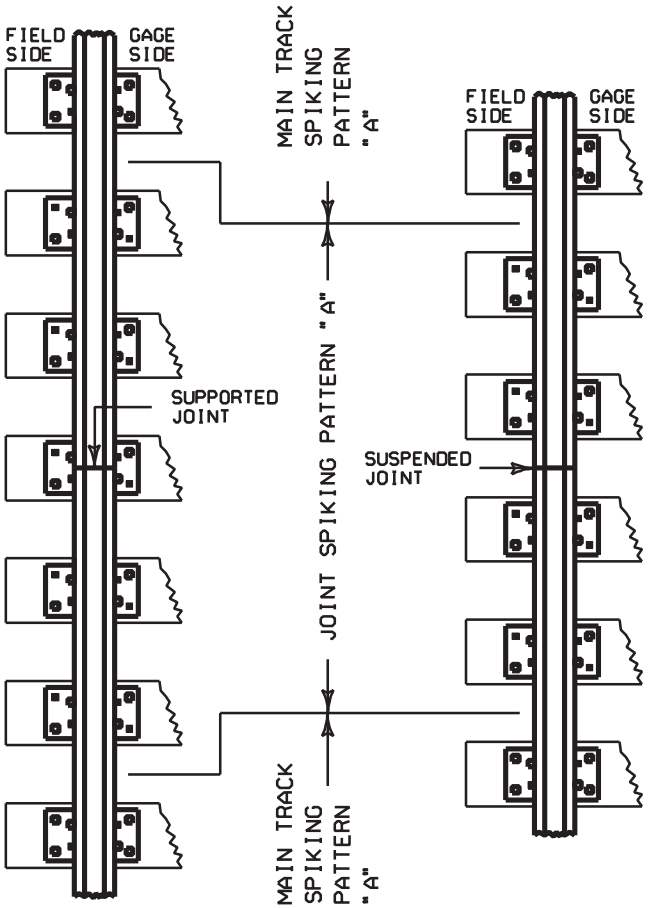
ISSUED: DECEMBER 27, 1996
REVISED: DECEMBER 20, 2010

ADDED NOTE REGARDING TIE PLATES 1/14/11 ADDED VICTOR PLATE DETAIL 4/26/12

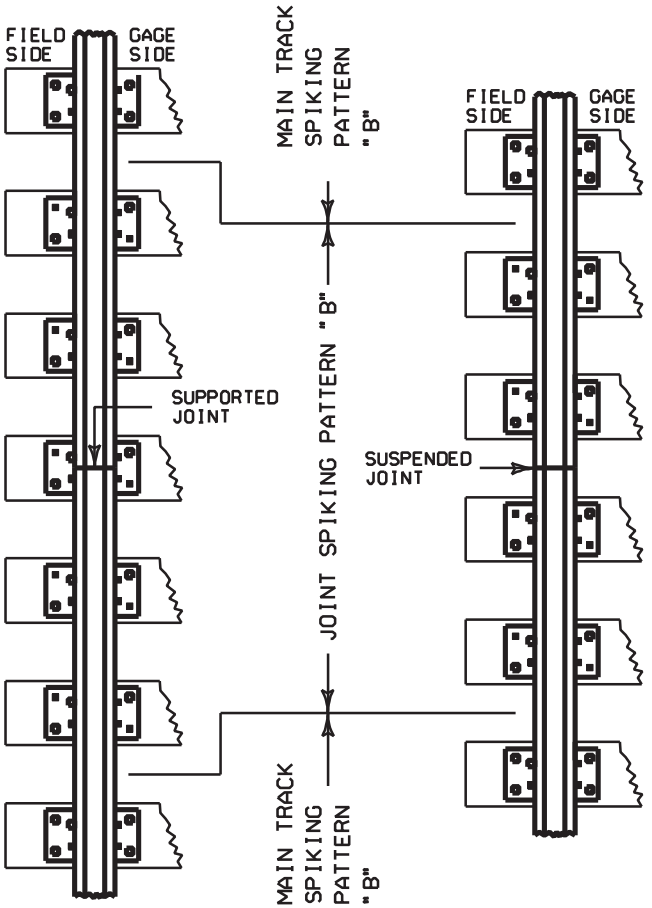
GRAYSON COUNTY
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2514



JOINT SPIKING PATTERN "A"



JOINT SPIKING PATTERN "B"

■ = TRACK SPIKE

JOINT SPIKING PATTERN "A" USED WITH MAIN TRACK SPIKING PATTERN "A".

JOINT SPIKING PATTERN "B" USED WITH MAIN TRACK SPIKING PATTERNS "B", "C" AND "D".

SEE DRAWING 2512 FOR SPIKING PATTERNS WHEN POSITIVE RESTRAINT RAIL FASTENERS ARE USED.

CSX TRANSPORTATION

JOINT AREA SPIKING PATTERNS

SIGNED	SIGNED
REVIEWED · DIRECTOR, STANDARDS AND TESTING	APPROVED · ASSISTANT VICE PRESIDENT, EQUIPMENT AND TRACK SYSTEMS ENGINEERING
ISSUED, DECEMBER 27, 1996	REVISED, INITIAL ISSUE

GRAYSON COUNTY
FD0C043 3153 NEWR1

GENERAL UTILITY NOTES AND INSTRUCTIONS APPLICABLE TO ALL UTILITY WORK MADE A PART OF THE ROAD CONSTRUCTION CONTRACT

The contractor should be aware the following utility notes and KYTC Utility Bid Item Descriptions shall supersede, replace and take precedence over any and all conflicting information that may be contained in utility owner supplied specifications contained in the contract, on plans supplied by the utility owner, or any utility owner specifications or information externally referenced in this contract.

Where information may have been omitted from these notes, bid item descriptions, utility owner supplied specifications or plans; the KYTC Standard Specifications for Road and Bridge Construction shall be referenced.

PROTECTION OF EXISTING UTILITIES

The existing utilities shown on the plans are shown as best known at the time the plans were developed and are to be used as a guide only by the Contractor. The Contractor shall use all means at his disposal to accurately locate all existing utilities, whether shown on the plans or not, prior to excavation. The contractor shall protect these utilities during construction. Any damage to existing utilities during construction that are shown or not shown on the plans shall be repaired at the Contractor's expense.

PREQUALIFIED UTILITY CONTRACTORS

Some utility owners may require contractors that perform relocation work on their respective facilities as a part of the road contract be prequalified or preapproved by the utility owner**. Utility contractors may be added via addendum if KYTC is instructed to do so by the utility owner. Potential contractors must seek prequalification from the utility owner. Any revisions must be sent from the utility owner to KYTC a minimum of one week prior to bid opening.** Those utility owners with a prequalification or preapproval requirement are as follows:

The Following Contractors are approved for providing construction services for the City of Leitchfield Natural Gas System:

1. Cleary Construction, Tompkinsville, KY
2. Martin Contracting, Richmond, KY
3. Miller Pipeline, Louisville, KY

The bidding contractor needs to review the above list and choose from the list of approved subcontractors at the end of these general notes as identified above before bidding. When the list of approved subcontractors is provided, only subcontractors shown on the following list(s) will be allowed to work on that utility as a part of this contract. In such instances, the utility subcontractor is not required to be prequalified with the KYTC Division of Construction Procurement.

IF A UTILITY SUPPLIED CONTRACTOR LIST IS NOT PROVIDED

When the above list of approved subcontractors for the utility work is not provided, the utility work can be completed by the prime contractor, or a prime contractor-chosen subcontractor. In such instances, the subcontractor shall be prequalified with the KYTC Division of Construction Procurement in the work type of "Utilities" (I33). Those who would like to become prequalified may contact the Division of Construction Procurement at (502) 564-3500. Please note: it could take up to 30 calendar days for prequalification to be approved. The prequalification does not have to be approved prior to the bid, but must be approved before the subcontract will be approved by KYTC and the work can be performed.

CONTRACT ADMINISTRATION RELATIVE TO UTILITY WORK

All utility work is being performed as a part of a contract administered by KYTC; there is not a direct contract between the utility contractor and utility owner. The KYTC Section Engineer is ultimately responsible for the administration of the road contract and any utility work included in the contract.

SUBMITTALS AND CORRESPONDENCE

All submittals and correspondence of any kind relative to utility work included in the road contract shall be directed to the KYTC Section Engineer, a copy of which may also be supplied to the utility owner by the contractor to expedite handling of items like material approvals and shop drawings. All approvals and correspondence generated by the utility owner shall be directed to the KYTC Section Engineer. The KYTC Section Engineer will relay any approvals or correspondence to the utility contractor as appropriate. At no time shall any direct communication between the utility owner and utility contractor without the communication flowing through the KYTC Section Engineer be considered official and binding under the contract.

ENGINEER

Where the word "Engineer" appears in any utility owner specifications included in this proposal, utility owner specifications included as a part of this contract by reference or on the utility relocation plans, it shall be understood the "Engineer" is the Kentucky Transportation Cabinet (KYTC) Section Engineer or designated representative and the utility owner engineer or designated representative jointly. Both engineers must mutually agree upon all decisions made with regard to the utility construction. The Transportation Cabinet, Section Engineer shall make all final decisions in all disputes.

INSPECTOR OR RESIDENT PROJECT REPRESENTATIVE

Where the word "Inspector" or "Resident Project Representative" appears in the utility specifications included in this proposal, utility owner specifications included as a part of this contract by reference or on the utility relocation plans, it shall be understood the "Inspector" or "Resident Project Representative" is the utility owner inspector and KYTC inspector jointly. The Transportation Cabinet, Section Engineer shall make all final decisions in all disputes.

NOTICE TO UTILITY OWNERS OF THE START OF WORK

One month before construction is to start on a utility, the utility contractor shall make notice to the KYTC Section Engineer and the utility owner of when work on a utility is anticipated to start. The utility contractor shall again make confirmation notice to the KYTC Section Engineer and the utility owner one week before utility work is to actually start.

UTILITY SHUTDOWNS

The Contractor shall not shut down any active and in-service mains, utility lines or services for any reason unless specifically given permission to do so by the utility owner. The opening and closing of valves and operating of other active utility facilities for main, utility line or utility service shut downs are to be performed by the utility owner unless specific permission is given to the contractor by the owner to make shutdowns . If and when the utility owner gives the contractor permission to shutdown mains, utility lines or utility services, the contractor shall do so following the rules, procedures and regulations of the utility owner. Any permission given by the utility owner to the contractor to shutdown active and in-service mains, utility lines or services shall be communicated to the KYTC Section Engineer by the utility owner that such permission has been given.

Notice to customers of utility shut downs is sometimes required to be performed by the utility contractor. The contractor may be required; but, is not limited to, making notice to utility customers in a certain minimum amount of time in advance of the shut down and by whatever means of communication specified by the utility owner. The means of communication to the customer may be; but is not limited to, a door hanger, notice by newspaper ad, telephone contact, or any combination of communication methods deemed necessary, customary and appropriate by the utility owner. The contractor should refer to the utility owner specifications for requirements on customer notice.

Any procedure the utility owner may require the contractor to perform by specification or plan note and any expense the contractor may incur to comply with the utility owner's shut down procedure and notice to customers shall be considered an incidental expense to the utility construction.

CUSTOMER SERVICE AND LATERAL ABANDONMENTS When temporary or permanent abandonment of customer water, gas, or sewer services or laterals are necessary during relocation of utilities included in the contract, the utility contractor shall perform these abandonments as part of the contract as incidental work. No separate payment will be made for service line and lateral abandonments. The contractor shall provide all labor, equipment and materials to accomplish the temporary or permanent abandonment in accordance with the plans, specifications and/or as directed by the engineer. Abandonment may include, but is not limited to, digging down on a water or gas main at the tap to turn off the tap valve

or corporation stop and/or capping or plugging the tap, digging down on a sewer tap at the main and plugging or capping the tap, digging down on a service line or lateral at a location shown on the plans or agreeable to the engineer and capping or plugging, or performing any other work necessary to abandon the service or lateral to satisfactorily accomplish the final utility relocation.

STATIONS AND DISTANCES

All stations and distances, when indicated for utility placement in utility relocation plans or specifications, are approximate; therefore, some minor adjustment may have to be made during construction to fit actual field conditions. Any changes in excess of 6 inches of plan location shall be reviewed and approved jointly by the KYTC Section Engineer or designated representative and utility owner engineer or designated representative. Changes in location without prior approval shall be remedied by the contractor at his own expense if the unauthorized change creates an unacceptable conflict or condition.

RESTORATION

Temporary and permanent restoration of paved or stone areas due to utility construction shall be considered incidental to the utility work. No separate payment will be made for this work. Temporary restoration shall be as directed by the KYTC Section Engineer. Permanent restoration shall be "in-kind" as existing.

Restoration of seed and sod areas will be measured and paid under the appropriate seeding and sodding bid items established in the contract for roadway work.

BELOW ARE NOTES FOR WHEN "INST" ITEMS ARE IN THE CONTRACT MEANING THE UTILITY COMPANY IS PROVIDING CERTAIN MATERIALS FOR UTILITY RELOCATION

MATERIAL

Contrary to Utility Bid Item Descriptions, those bid items that have the text **"Inst"** at the end of the bid item will have the major components of the bid item provided by the utility owner. No direct payment will be made for the major material component(s) supplied by the utility company. All remaining materials required to construct the bid item as detailed in utility bid item descriptions, in utility specifications and utility plans that are made a part of this contract will be supplied by the contractor. The contractor's bid price should reflect the difference in cost due to the provided materials.

The following utility owners have elected to provide the following materials for work under this contract:

"No materials are being supplied by the utility owner(s). All materials are to be supplied by the contractor per bid item descriptions, utility specifications and utility plans."

SECURITY OF SUPPLIED MATERIALS

If any utility materials are to be supplied by the utility owner, it will be the responsibility of the utility contractor to secure all utility owner supplied materials after delivery to the project site. The utility contractor shall coordinate directly with the utility owner and their suppliers for delivery and security of

the supplied materials. Any materials supplied by the utility owner and delivered to the construction site that are subsequently stolen, damaged or vandalized and deemed unusable shall be replaced with like materials at the contractor's expense.

Standard Gas Bid Item Descriptions

THESE BID ITEM DESCRIPTIONS SHALL SUPERCEDE ANY BID ITEM DESCRIPTIONS CONTAINED IN UTILITY OWNER SUPPLIED SPECIFICATIONS PROVIDED ELSEWHERE IN THIS PROPOSAL.

BOLLARDS This item is for payment for furnishing and installing protective guard posts at above ground utility installations. A bollard may consist of, but not limited to, a steel post set in concrete or any other substantial post material. This item shall include all labor, equipment, and materials needed for complete installation of the bollard, as specified by the utility owner specifications and plans. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Note: A bid code for this item has been established in standard roadway bid items and shall be used for payment of this item. The bid code is 21341ND.

G CAP EXISTING MAIN This item shall include the specified cap, labor, equipment, excavation, backfill, and restoration required to install a steel or polyethylene/plastic cap on an existing main, when the main is to be left in service at the location shown on the plans or as directed, in accordance with the specifications. This item is not to be paid to cap new main installations or mains that are to be abandoned. Caps on new mains are to be considered incidental to the new main, as are other fittings on new mains, and are not to be paid under this item. All caps on existing mains shall be paid under this one bid item included in the contract, regardless of size or material. No separate bid items will be established for size or material variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Plugging of existing abandoned mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

G DIRECTIONAL BORE Payment under this item is made whenever the plans or specifications specifically show directional boring is to be utilized, in order to minimize the impact of open-cut for the installation of gas main under streets, creeks, etc. Payment under this item shall include the specified bore pipe, labor, and equipment. No separate payment shall be made for bore pipe installed in the bore, whether used as a carrier pipe or an encasement of a separate carrier pipe. Carrier pipe and peripherals required to be installed within a bore pipe shall be paid separately under pipe items. Payment under this item shall be for all sizes of bores and not be size specific. No separate bid items will be established for bore size variations. The bore pipe sizes to be included under this item shall be those shown on the plans and/or in the specifications. This bid item shall also include the cost of pre and/or post directional bore video inspection of adjacent sanitary and storm sewer mains, manholes, and laterals, when the utility specifications associated with the contract require such video inspection. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

G ELECTRONIC ID MARKER This bid item is to pay for labor, equipment, computer programing, and installation of an electronic ID marker at the locations shown on the plans, or as directed by the engineer. The marker may be in the form of a ball, disk, cylinder, post, or other shape as required by specification and may be buried, at-grade, or above-grade, as specified. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. Paid EACH (EA) when complete.

NOTE: This bid item is not for payment of standard non-electronic markers or monuments. A separate "Line Marker" bid item is established for this purpose.

G ENCASEMENT STEEL BORED This item shall include the steel encasement pipe size as specified on the plans and in the specifications, excavation, bore pit shoring in compliance with all federal, state, local, and utility owner requirements, casing spacers, end seals, vents, backfill, labor, and equipment to bore and install the encasement complete and ready-for-use in accordance with the plans and specifications. The size shall be the measured internal diameter of the encasement pipe. The sizes of encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

Note: Encasement sizes of 2 inches internal diameter or less shall not be paid separately; but, shall be considered incidental to the carrier pipe.

G ENCASEMENT STEEL OPEN CUT This item shall include the steel encasement pipe size as specified on the plans and in the specifications, excavation, shoring in compliance with all federal, state, local, and utility owner requirements, casing spacers, end seals, vents, backfill, labor, and equipment to open cut and install the encasement complete and ready-for-use in accordance with the plans and specifications. The size shall be the measured internal diameter of the encasement pipe. The size encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

Note: Encasement sizes of 2 inches internal diameter or less shall not be paid separately; but, shall be considered incidental to the carrier pipe.

G FARM TAP AND REGULATOR This item is for the installation of gas service tap and regulator assembly on a gas transmission main. This item shall include excavation, labor, equipment, all tapping, piping, fittings, and regulator materials to install the farm tap and regulator assembly, complete and ready-for-use, in accordance with the plans, specifications, and standard drawings. Only one pay item has been established for Farm Tap and Regulator installations. Payment shall be made under this item regardless of farm tap service and regulator size. No separate pay items will be established for size variation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

G LINE MARKER This item is for payment for furnishing and installing a gas utility line marker as specified by the utility owner specifications and plans. A line marker may consist of a post or monument of whatever materials specified and shall include markings and/or signage on same as specified by plans or specifications. This item shall include all labor, equipment, and materials needed for complete installation of the marker. This item shall be paid EACH (EA) when complete.

NOTE: This bid item is not for payment of "Electronic ID Markers". Electronic ID Markers are paid under a separate bid item.

G MAIN ABANDON This bid item is for payment of abandonment of gas mains that are to be left in place, as shown on plans and only when nitrogen purge is to be employed. If the main is to be left in place without nitrogen purge, no payment shall be made under this item. All work shall be done in accordance with the plans, specifications, and all pipeline safety regulations. This bid item is for all work to abandon and nitrogen purge gas main, regardless of size or length. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LUMP SUM (LS) for the entire project when complete.

Plugging of existing abandoned mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

Any pipe requiring removal that does not require disposal as hazardous waste will be considered incidental to roadway excavation.

G MAIN POINT RELOCATE This item is intended for payment for horizontal and/or vertical relocation of a short length of an existing main at the locations shown on the plans. Payment under this item is to be made only when the pipe must be cut to accomplish the relocation. This bid item is to be used to relocate an existing gas main at point locations, such as to clear a conflict at a proposed drainage structure, pipe, or any other similar short relocation situation. All new materials are to be used. The materials provided shall be of the same type and specifications as those that exist or as specified in plans and specifications. This item includes replacement of tracing wire, pipe, fittings, labor, equipment, excavation, shoring in compliance with all federal, state, local, and utility owner requirements, bedding, backfill, restoration, etc., required to complete the relocation of main at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. For steel pipe, this bid item shall include corrosion coating of the pipe as needed, replacement or relocation of all cathodic protection anodes, lead wire, test boxes or stations, and any accessories. Substitution of alternative materials shall be approved by the engineer in advance on a case-by-case basis. Payment under this item shall be for each location requiring an existing main to be relocated horizontally or vertically, regardless of pipe size or relocation length. No separate pay items will be established for pipe size variations or relocation segment length variations. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. Main Point Relocate shall not be paid on a linear feet basis; but shall be paid EACH (EA) at each location when complete and placed in service.

G MAIN RELOCATE/LOWER IN-PLACE This item is intended for payment for horizontal and/or vertical relocation of an existing steel or polyethylene/plastic main at the locations shown on the plans, where the main has sufficient slack that it can be relocated without cutting the pipe. This bid item is to be used to relocate an existing gas main to clear a conflict at a proposed drainage structure, pipe, road subgrade, or any other similar relocation situation. This item includes replacement of tracing wire, labor, equipment, excavation, shoring in compliance with all federal, state, local, and utility owner requirements, bedding, backfill, restoration, etc., required to complete the relocation of the main at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. For steel pipe, this bid item shall include corrosion recoating of the pipe as needed, replacement or relocation of all cathodic protection anodes, lead wire, test boxes or stations, and any accessories. This bid item shall include material and placement of flowable fill under existing and proposed pavement, and wherever else specified on the plans or in the specifications. Measurement of quantities under this item shall be from end to end of exposed pipe. Payment shall be made under this item regardless of pipe size to be relocated. No separate bid items are provided for varying pipe sizes. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET

(LF) when complete.

G METER AND REGULATOR This bid item description shall be used for all meter and regulator bid items of every size, except those defined as "Special". These pay items are for all labor, equipment, and materials needed for the installation of a service meter and regulator assembly at the locations shown on the plans, or as directed by the engineer in accordance with specifications and standard drawings, complete and ready-for-use. Materials to be provided under this bid item shall include, but are not limited to: meter, regulator, piping, fittings, building anchoring brackets, and hardware needed to create and install the assembly. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

G PIPE This description shall apply to all polyethylene/plastic and steel pipe bid items of every size and type to be used as gas main, except those bid items defined as "Special". This item includes the pipe specified by the plans and specifications, all fittings (including, but not limited to: bends, tees, reducers, plugs, and caps), tracing wire with test boxes (if required by specifications), corrosion protective coatings of steel pipe and fittings, labor, equipment, excavation, shoring in compliance with all federal, state, local, and utility owner requirements, bedding, restoration, pressure testing, backfill, etc., required to install the specified new pipe and new fittings at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. For steel pipe, this bid item shall include all cathodic protection anodes, lead wire, test boxes or stations, and any accessories. No additional payment will be made for rock excavation. This bid item shall include material and placement of flowable fill under existing and proposed pavement, and wherever else specified on the plans or in the specifications. This bid item shall also include the cost of pre and/or post directional bore gas installation video inspection of adjacent sanitary and storm sewer mains, manholes, and laterals, when the utility specifications associated with the contract require such video inspection. Measurement of quantities under this item shall be through valves (including horizontal measurements through above grade valves), fittings, encasements, and directional bores (only when a separate carrier pipe is specified within the directional bore pipe). Measurements shall be further defined to be to the center of tees at branch mains, at tie-ins at the point where new pipe or fittings contacts existing pipe, to the outside face of vault or structure walls, or to the point of main termination at dead ends. No separate payment will be made under pipe items when the directional bore pipe is the carrier pipe. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

G PIPE HAZARDOUS WASTE DISPOSAL This bid item is to be paid only when there is abandoned gas pipe that must be removed and disposed of as hazardous waste due to either internal contamination and/or hazardous external coatings. This item shall include all labor, equipment, excavation, shoring in compliance with all federal, state, local, and utility owner requirements, materials needed for removal and disposal of the pipe, and backfill. All work shall be performed by trained and certified personnel, in accordance with all environmental and pipeline laws and regulations. Any and all pipe removed shall be paid under one bid item included in the contract, regardless of size. No separate bid items will be established for size variations. Method of measurement shall be from end to end of each pipe section removed from the site. Any pipe removed that does not require disposal as hazardous waste shall not be paid under this item but shall be considered incidental to roadway construction. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

G REGULATOR STATION Includes all labor, equipment, materials, and restoration to install a new gas regulator station, as indicated on plans and on standard drawings, complete and ready-for-use. Only one pay item has been established for regulator station installations. Payment shall be made under this item

regardless of regulator station size. No separate pay items will be established for size variation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

NOTE: This item is to be used to pay for regulator stations to reduce the pressure of gas from a higher pressure main to feed a lower pressure main. This item is not to be used to pay for regulators used on individual customer service lines.

G SERVICE LONG SIDE This bid item description shall apply to all service line installations of every size bid, up to and including 2-inch inside diameter, except those service bid items defined as "Special". This item includes the specified piping material, main tap, coupling for connecting the new piping to the surviving existing piping, encasement of 2 inches or less internal diameter (if required by plan or specifications), labor, equipment, excavation, shoring in compliance with all federal, state, local, and utility owner requirements, backfill, testing, and restoration at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for- use. This bid item is to pay for service installations where the ends of the service connection are on opposite sides of the public roadway, and the service line crosses the centerline of the public roadway as shown on the plans. The length of the service line is not to be specified. Payment under this item shall not be restricted by a minimum or maximum length. The contractor shall draw his own conclusions as to the length of piping that may be needed. Payment under this item shall include boring, jacking, or excavating across the public roadway for placement. Placement of a service across a private residential or commercial entrance alone shall not be reason to make payment under this item. Private or commercial entrances shall not be considered a public roadway in defining payment under this item. This pay item does not include installation or relocation of meters. Meters will be paid separately. New service line installations shall be installed to the length required to accommodate the road work; but shall not extend beyond the road right-of-way, temporary roadway easement, or permanent gas easement line, whichever is greatest. Any service replacement found to be needed beyond project limits will need to be accomplished by the utility owner, in consultation with the property owner. Service line replacement beyond project limits is not to be performed as part of road contract work. This bid item shall also include the cost of pre and/or post directional bore gas installation video inspection of adjacent sanitary and storm sewer mains, manholes, and laterals, when the utility specifications associated with the contract require such video inspection. No additional payment will be made for rock excavation or for special bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

G SERVICE SHORT SIDE This bid item description shall apply to all service line installations of every size up to and including 2-inch internal diameter, except those service bid items defined as "Special". This item includes installation of the specified piping material of the size specified on plans, encasement of 2 inches or less internal diameter (if required by plan or specifications), main tap, coupling for connecting the new piping to the surviving existing piping, labor, equipment, excavation, shoring in compliance with all federal, state, local, and utility owner requirements, backfill, testing, and restoration at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready- for-use. This bid item is to pay for service installations where both ends of the service connection are on the same side of the public roadway, or when an existing service crossing a public roadway will remain and is being extended, reconnected, or relocated, with all work on one side of the public roadway centerline, as shown on the plans. The length of the service line is not to be specified and shall not be restricted to any minimum or maximum length. Payment shall be made under this item even if the service crosses a private residential or commercial entrance, but not a public roadway. Private or commercial entrances shall not be considered a public roadway in defining payment under this item. The contractor shall draw his own conclusions as to the length of piping that may be needed. This pay item does not include installation or relocation of meters. Meters will be paid separately. New service line installations shall be installed to the length required to accommodate the road work; but not extend beyond the road right-of-way, temporary roadway easement, or permanent gas easement line, whichever is greatest.

Any service replacement found to be needed beyond project limits will need to be accomplished by the utility owner, in consultation with the property owner. Service line replacement beyond project limits is not to be performed as part of road contract work. This bid item shall also include the cost of pre and/or post directional bore gas installation video inspection of adjacent sanitary and storm sewer mains, manholes, and laterals, when the utility specifications associated with the contract require such video inspection. No additional payment will be made for rock excavation or for bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

G SERVICE RELOCATE This item is for the relocation of an existing gas service line where a meter is not involved, and where an existing service line has sufficient slack, such that it can easily be adjusted by excavating alongside and moving the line horizontally and/or vertically a short distance, without cutting the service line, to avoid conflicts with road construction. This item shall include excavation, shoring in compliance with all federal, state, local, and utility owner requirements, labor, equipment, bedding, and backfill to relocate the line in accordance with the plans and specifications, complete and ready- for-use. Payment under this item shall be for each location requiring relocation. Payment shall be made under this item regardless of service size or relocation length. No separate pay items will be established for size or length variation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

G SERVICE TEST AND RELIGHT This work includes all labor, equipment, and materials for turning off and on a gas service line, testing the service for leaks, relighting pilots on customer appliances. This item also includes separating existing service facilities for testing, air testing, and re-connecting the meter set. All work is to be performed according to utility owner approved specifications and procedures. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

G TIE-IN This bid description shall be used for all polyethylene/plastic or steel gas main tie-in bid items of every size, except those that include a temporary bypass or are defined as "Special". This item includes all labor, equipment, excavation, shoring in compliance with all federal, state, local, and utility owner requirements, fittings, sleeves, reducers, couplings, restoration, testing, and backfill required to make the gas main tie-in as shown on the plans, and in accordance with the specifications, complete and ready-for-use. Pipe for tie-ins shall be paid under separate bid items. No additional payment will be made for rock excavation. This bid item shall also include material and placement of flowable fill backfill under existing and proposed pavement, and wherever else specified on the plans or in the specifications. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

When this bid item is used, no separate payment is to be made under GAS TIE-IN EXCAVATION AND BACKFILL, GAS TIE-IN PIPE PREPARATION, and GAS TIE-IN SHORING bid items since these efforts are incidental to the above G TIE-IN bid description.

G TIE-IN EXCAVATION AND BACKFILL This bid item is for payment for only the excavation and backfill services of utility owner performed tie-ins. This bid item is employed due to utility owner request for excavation, shoring, and backfill assistance. Shoring for tie-in excavation shall be considered incidental to this bid item. Shoring shall be provided to whatever extent required to be in compliance with all federal, state, local, and utility owner requirements to protect all workers including utility owner workers. The shoring shall be left in place until the tie-in is made by the utility owner regardless of how much time that may be. The contractor shall draw his own conclusions on how long the shoring may need to be left in place at each locaiton. No separate payment will be made for rock excavation. The excavation shall be made to the dimensions required by the utility owner regardless of the materials encountered. This bid item shall also include disposal of excavated material deemed to be unsuitable for

backfill, procurement of suitable backfill material as required by specification or on plans, compaction and restoration. Backfill materials to be provided by the contractor may consist of, but is not limited to, sand or flowable fill as may be required. Payment under this item shall be by volume of actual excavation measured in the field. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be measured and paid by CUBIC YARD (CY) when complete.

Payment shall not be made under this item if the entirety of the tie-in is being performed by the contractor and is being paid under a G TIE-IN bid item contained in the contract. Excavation, and backfill for pipe tie-ins being made entirely by the contractor is considered incidental to G TIE-IN bid items contained in the contract.

G TIE-IN PIPE PREPARATION This bid item is for the gas contractor to make ready all polyethylene/plastic and/or steel tie-in fittings and piping short of cutting of the existing main. Separate bid items are provided for polyethylene/plastic mains and steel mains. No separate bid items are provided for size variations or on an individual location basis. Only separate bid items for two material type are provided. Payment is to be made under these items when the gas utility owner is to make the final cut-in of the existing main and tying of the new main to the existing main. One lump sum item is provided for the combined entirety of all polyethylene/plastic tie-in preparations on a project and one lump sum item is provided for the combined entirety of all steel tie-in preparations on a project. This item shall include fusing or welding of all pipe and fittings needed to make the tie-in location ready for completion by the utility owner. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's specifications shall be referenced. This item shall be paid LUMP SUM (LS) for the entirety of the project for each material type when complete.

Payment shall not be made under this item if the entirety of the tie-in is being performed by the contractor and is being paid under a G TIE-IN bid item contained in the contract. Tie-in pipe preparation for tie-ins being made entirely by the contractor is considered incidental to G TIE-IN bid items contained in the contract.

G TIE-IN W/BYPASS This bid description shall be used for all polyethylene/plastic or steel gas main tie-in bid items that include temporary bypass of every size, except those defined as "Special". This item includes all labor, equipment (including tapping, stopple, and/or squeeze equipment), excavation, shoring in compliance with all federal, state, local, and utility owner requirements, permanent and temporary fittings (including, but not limited to: tees, split tees, bends, reducers, plugs, caps, and couplings), temporary bypass piping, restoration, testing, and backfill required to make the gas main tie-in with temporary bypass as shown on the plans, and in accordance with the specifications, complete and ready-for-use. Mainline pipe for tie-ins shall be paid under separate bid items. This bid item shall also include material and placement of flowable fill backfill under existing and proposed pavement, and wherever else specified on the plans or in the specifications. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

The tie-in size reflected in the bid item reflects the nominal internal diameter size of the existing main gas line being tied-in, not the bypass pipe size.

G VALVE This description shall apply to all buried valves of every size and type required in the plans and specifications, except those bid items defined as "Special". Payment under this description is to be for gas valves being installed with new main. This item includes: the valve as specified in the plans and specifications, protective coating and corrosion protection, labor, equipment, excavation, valve box and valve stem extensions, backfill, restoration, testing, etc., required to install the specified valve at the location shown on the plans, in accordance with the specifications and standard drawings, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

G VALVE ABOVE GRADE This description shall apply to all above grade valve assemblies of every size and type required in the plans and specifications, except those bid items defined as "Special". Payment under this description is to be for above grade gas valves being installed with new main. This item includes the above grade valve, pipe, and fittings as specified in the plans, specifications, and standard drawings. This bid items shall also include protective coating and corrosion protection, labor, equipment, excavation, backfill, restoration, testing, etc., required to install the specified above grade valve at the location shown on the plans, in accordance with the specifications and standard drawings, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

G VALVE BOX ADJUST This item includes all labor, equipment, valve box and valve stem extensions (if required), excavation, backfill, concrete pad around valve box (when specified in specifications or plans), restoration, etc. to adjust the top of the box to finished grade, complete and ready-for- use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

G VALVE BOX REMOVE This item includes all labor, equipment, restoration materials, disposal and any other effort for removal of a valve box, leaving the valve in place. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

G VALVE REMOVE This item includes all labor, equipment, and restoration materials for cutting of existing pipe and any other effort necessary for total removal of an existing valve and valve box. This bid item shall include disposal of the valve and box, unless plans or specifications state the valve and box are to be salvaged and delivered to the utility owner for reuse. No separate pay items are to be established for size variations. All valve removals, regardless of size, shall be paid under this one pay item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

If plugging of existing abandoned mains is needed after valve removal, the work shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

G WELD X-RAY INSPECTION This description shall apply to all radiographic x-ray inspections of steel pipe joints of every size, within the pipe size ranges given in the bid item text. This bid includes all labor, equipment, and materials to assess the acceptability of the weld in order to comply with specifications, industry and regulatory standards. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) for each pipe joint inspected.

Standard Water Bid Item Descriptions

THESE BID ITEM DESCRIPTIONS SHALL SUPERCEDE ANY BID ITEM DESCRIPTIONS CONTAINED IN UTILITY OWNER SUPPLIED SPECIFICATIONS PROVIDED ELSEWHERE IN THIS PROPOSAL.

W AIR RELEASE VALVE This bid item description shall apply to all air release valve installations of every size except those defined as "Special". This item shall include the air release valve, main to valve connecting line or piping, manhole, vault, structure, access casting or doors, tapping the main, labor, equipment, excavation, proper backfill, and restoration required to install the air release valve at the location shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

BOLLARDS This item is for payment for furnishing and installing protective guard posts at above-ground utility installations. A bollard may consist of, but is not limited to, a steel post set in concrete or any other substantial post material. This item shall include all labor, equipment, and materials needed for complete installation of the bollard, as specified by the utility owner specifications and plans. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

NOTE: A bid code for this item has been established in standard roadway bid items and shall be used for payment of this item. The bid code is 21341ND.

W CAP EXISTING MAIN This item shall include the specified cap, concrete blocking and/or mechanical anchoring, labor, equipment, excavation, backfill, and restoration required to install the cap on an existing main to be left in service at the location shown on the plans or as directed, in accordance with the specifications. This item is not to be paid to cap new main installations or mains that are to be abandoned. This pay item is only to be paid to cap existing mains to be left in service. Caps on new mains are to be considered incidental to the new main, as are other fittings, and are not to be paid under this item. All caps on existing mains shall be paid under this one bid item included in the contract, regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Plugging of existing abandoned mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

W CATHODIC PROTECTION This item is for providing and installing all cathodic protection materials to iron pipe and fittings, as specified in plans and specifications, complete and ready-for-use. Materials to be supplied and installed by the contractor shall include, but are not limited to, anodes, wire, fusion kits, test stations, and/or marker posts. All cathodic protection required for the entire project shall be paid under this one item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LUMP SUM (LS) when complete.

W DIRECTIONAL BORE Payment under this item is made whenever the plans or specifications specifically show directional boring is to be utilized to minimize the impact of open-cut for the installation of water main under streets, creeks, etc. Payment under this item shall include the specified bore pipe, labor, and equipment. No separate payment shall be made for bore pipe installed in the bore, whether used as a carrier pipe or an encasement of a separate carrier pipe. This item shall also include pipe anchors at

each end of the bore, when specified, to prevent the creep or contraction of the bore pipe. Carrier pipe installed within a bore pipe shall be paid separately under pipe items. Payment under this item shall not be size specific and no separate bid items will be established for size variations. The bore pipe sizes to be included under this item shall be as shown on the plans and/or in the specifications. Any and all directional bores in each contract shall be paid under one directional bore bid item included in the contract, regardless of size. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT CONCRETE This item shall include all labor, equipment, excavation, concrete, reinforcing steel, backfill, restoration, etc., to construct the concrete encasement of the water main as shown on the plans, and in accordance with the specifications and standard drawings. Payment under this item shall be in addition to the carrier pipe, as paid under separate bid items. Carrier pipe is not included in this bid item. Any and all concrete encasements shall be paid under one bid item included in the contract, regardless of the size of the carrier pipe or the volume of concrete or steel reinforcement, as specified in the plans and specifications. No separate bid items will be established for size variations. Measurement of pay quantity shall be from end of concrete to end of concrete. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT STEEL BORED This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to bore and install the encasement in accordance with the plans and specifications, complete and ready-for-use. The size shall be the measured internal diameter of the encasement pipe. The sizes of encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately but shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT STEEL OPEN CUT This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to open-cut and install the encasement in accordance with the plans and specifications, complete and ready-for-use. The size shall be the measured internal diameter of the encasement pipe. The size encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately but shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W FIRE HYDRANT ADJUST This item includes all labor, equipment, excavation, materials, and backfill to adjust the existing fire hydrant using the fire hydrant manufacturer's extension kit for adjustments of 18" or less. Adjustments greater than 18" require anchoring couplings and vertical bends to adjust to grade. The Contractor will supply and install all anchor couplings, bends, fire hydrant extension, concrete blocking, restoration, granular drainage material, etc., needed to adjust the fire hydrant, complete and ready-for-use as shown on the plans, and in accordance with the specifications and standard drawings. This also includes allowing for the utility owner inspector to inspect the existing fire hydrant prior to adjusting, contractor returning unusable fire hydrants to the utility owner warehouse and picking up a replacement hydrant. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete and ready for use.

W FIRE HYDRANT ASSEMBLY This item includes all labor, equipment, new fire hydrant, isolating valve and valve box, concrete pad around valve box (when specified in specifications or plans), piping, anchoring tee, anchoring couplings, fire hydrant extension, excavation, concrete blocking, granular drainage material, backfill, and restoration, to install a new fire hydrant assembly as indicated on plans and standard drawings, compete and ready-for-use. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FIRE HYDRANT RELOCATE This item includes all labor and equipment to remove the existing fire hydrant from its existing location and to reinstall at a new location. This item shall include a new isolating valve and valve box, concrete pad around valve box (when required in specifications or plans), new piping, new anchoring tee, anchoring couplings, fire hydrant extensions, concrete blocking, restoration, granular drainage material, excavation, and backfill as indicated on plans, specifications, and standard drawings, compete and ready-for-use. This item shall also include allowing for utility owner inspector to inspect the existing fire hydrant prior to reuse, contractor returning unusable fire hydrants to the utility owner warehouse and picking up a replacement hydrant for use if the existing fire hydrant is determined unfit for reuse. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FIRE HYDRANT REMOVE This item includes removal of an abandoned fire hydrant, isolating valve, and valve box, to the satisfaction of the engineer. The removed fire hydrant, isolating valve, and valve box shall become the property of the contractor for his disposal as salvage or scrap. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FLUSH HYDRANT ASSEMBLY This item shall include the flushing hydrant assembly, service line, tapping the main, labor, equipment, excavation, backfill, and restoration required to install the flush hydrant at the location shown on the plans and in accordance with the specifications and standard drawings, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FLUSHING ASSEMBLY This item shall include the flushing device assembly, service line, meter box and lid, tapping the main, labor, equipment, excavation, backfill, and restoration required to install the flushing device at the location shown on the plans and in accordance with the specifications and standard drawings, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W LEAK DETECTION METER This item is for payment for installation of a water meter at main valve locations, as shown on the plans, for detection of water main leaks. The meter shall be of the size and type specified in the plans or specifications. This item shall include all labor, equipment, meter, meter box or vault, connecting pipes between main and meter, main taps, tapping saddles, casting, yoke, and any other associated material needed for installation of a functioning water meter in accordance with the plans and specifications, complete and ready-for-use. No separate payment will be made under any other contract item for connecting pipe or main taps. All leak detection meters shall be paid under one bid item included in the contract, regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete and ready for use.

W LINE MARKER This item is for payment for furnishing and installing a water utility line marker as specified by the utility owner specifications and plans. A line marker may consist of a post or monument of whatever materials specified and shall include markings and/or signage on same as specified by plans or specifications. This item shall include all labor, equipment, and materials needed for complete installation of the marker. This item shall be paid EACH (EA) when complete.

W LINE STOP SIZE 1 OR 2 This item shall include the line stop saddle/sleeve, valve, completion plug and any other material, labor, and equipment necessary to complete the line stop as indicated in the plans and/or specifications. This installation shall allow the waterline system to operate as usual without any interruption of service. The size shall be the measured internal diameter of the live pipe to be tapped. The line stop size to be paid under sizes 1 or 2 shall be as follows:
Size 1 = All live tapped main sizes up to and including 8 inches
Size 2 = All live tapped main sizes greater than 8 inches
Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W MAIN POINT RELOCATE This item is intended for payment for horizontal and/or vertical relocation of a short length of an existing main at the location shown on the plans. This bid item is to be used to relocate an existing water main at point locations, such as to clear a conflict at a proposed drainage structure, pipe, or any other similar short relocation situation, and where the existing pipe material is to be reused. The contractor shall provide any additional pipe or fitting material needed to complete the work, as shown on the plans and specifications. The materials provided shall be of the same type and specifications as those that exist. Substitution of alternative materials shall be approved by the engineer in advance on a case-by-case basis. New polyethylene wrap is to be provided (if wrap exists or is specified in the specifications to be used). If it is necessary that the pipe be disassembled for relay, payment under this item shall also include replacement of joint gaskets as needed. Bedding and backfill shall be provided and performed the same as with any other pipe installation as detailed in the plans and specifications. Payment under this item shall be for each location requiring an existing main to be relocated horizontally or vertically, regardless of pipe size or relocation length. No separate pay items will be established for pipe size variations or relocation segment length variations. Water Main Relocate shall not be paid on a linear feet basis but shall be paid EACH (EA) at each location when complete and placed in service. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced.

W METER This item is for payment for installation of all standard water meters of all sizes 2 inches in diameter or less as specified on the plans. This item shall include all labor, equipment, meter, meter box, casting, yoke, and any other associated materials needed for installation of a functioning water meter, in accordance with the plans and specifications, complete and ready-for-use. This item shall include connections to the new or existing water service line. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER ADJUST This item includes all labor, equipment, excavation, materials, backfill, restoration, etc., to adjust the meter casting to finished grade (whatever size exists) at the location shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER RELOCATE This item includes all labor, equipment, excavation, additional fittings, disinfection, testing, restoration, etc., to relocate the existing water meter (whatever size exists), meter yoke, meter box, casting, etc., from its old location to the location shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. The new service pipe (if required) will be paid under the short side or long side service bid item. Any and all meter relocations of 2 inches or less shall be paid under one bid item included in the contract, regardless of size. Each individual relocation shall be paid individually under this item; however, no separate bid items will be established for meter size variations of 2 inches in diameter or less. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER VAULT SIZE RANGE 1 OR 2 This item is for payment for installation of an underground structure for housing of a large water meter, fittings, and valves as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or access doors, the specified meter(s) valve(s), all piping, and fitting materials associated with installing a functioning meter and vault in accordance with the plans, standard drawings, and specifications, complete and ready-for-use. The size shall be the measured internal diameter of the meter and piping to be installed. The size meter vault to be paid under size 1 or 2 shall be as follows:

Size Range 1 = All meter and piping sizes greater than 2 inches up to and including 6 inches
Size Range 2 = All meter and piping sizes greater than 6 inches

This item shall be paid EACH (EA) when complete. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced.

W METER/FIRE SERVICE COMBO VAULT This item is for payment for installation of an underground structure for housing of a water meter and fire service piping, fittings, and valves as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or access doors, the specified meter(s), valve(s), all piping, and fitting materials associated with installing a functioning meter and fire service vault, in accordance with the plans and specifications, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER WITH PRESSURE REDUCING VALVE (PRV) This item is for payment for installation of all standard water meters with pressure reducing valves (PRV) of all sizes 2 inches in diameter or less,

as specified on the plans. This item shall include all labor, equipment, meter, PRV, meter box, casting, yoke, and any other associated materials needed for installation of a functioning water meter with PRV, in accordance with the plans and specifications, complete and ready-for-use. This item shall include connections to the new or existing water service line. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W PIPE This item shall apply to all pipe of every size and type material to be used as water main, except those bid items defined as "Special". This item includes the pipe specified by the plans and specifications, all fittings (including, but not limited to, bends, tees, reducers, plugs, and caps), tracing wire with test boxes (if required by specifications), polyethylene wrap (when specified), labor, equipment, excavation, bedding, backfill, restoration, testing, sanitizing, etc., required to install the specified new pipe and new fittings at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. No additional payment will be made for rock excavation. This bid item includes material and placement of flowable fill under existing and proposed pavement, and wherever else specified on the plans or in the specifications. This item shall include all temporary and permanent materials, as well as equipment required to pressure test and sanitize mains including, but not limited to, pressurization pumps, hoses, tubing, gauges, main taps, saddles, temporary main end caps or plugs and blocking, main end taps for flushing, chlorine liquids or tablets for sanitizing, water for testing/sanitizing and flushing (when not supplied by the utility), chlorine neutralization equipment and materials, and any other items needed to accomplish pressure testing and sanitizing the main installation. This item shall also include pipe anchors at each end of polyethylene pipe runs, when specified to prevent the creep or contraction of the pipe. When owner specifications require, this bid item shall include contractor preparation of as-built drawings to be provided to the engineer and/or utility owner at the end of construction. Measurement of quantities under this item shall be through fittings, encasements, and directional bores (only when a separate carrier pipe is specified within the directional bore pipe). Measurements shall be further defined to be to the center of tie-in where new pipe contacts existing pipe at the center of connecting fittings, to the outside face of vault or structure walls, or to the point of main termination at dead ends. No separate payment will be made under pipe items when the directional bore pipe is the carrier pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W PLUG EXISTING MAIN This item shall include the specified plug, concrete blocking and/or mechanical anchoring, labor, equipment, excavation, backfill, and restoration required to install the plug on an existing main to be left in service at the location shown on the plans or as directed, in accordance with the specifications. This item is not to be paid to plug new main installations or mains that are to be abandoned. This pay item is only to be paid to plug existing mains that are to be left in service. Plugs on new mains are to be considered incidental to the new main, as are other fittings, and are not to be paid under this item. All plugs on existing mains left in service shall be paid under this one bid item included in the contract, regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Plugging of existing abandoned mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

W PRESSURE REDUCING VALVE This item shall apply to all pressure reducing valves (PRV) of every size required in the plans and specifications, except those bid items defined as "Special". Payment under this description is to be for PRVs being installed with new main. This item includes the PRV as specified in the plans and specifications, polyethylene wrap (if required by specification), labor, equipment, excavation, anchoring (if any), pit or vault, backfill, restoration, testing, disinfection, etc., required to install the specified PRV at the location shown on the plans, in accordance with the specifications and standard

drawings, complete and ready-for-use. If required on the plans and/or proposed adjoining DIP is restrained, PRVs shall be restrained. PRV restraint shall be considered incidental to the PRV and adjoining pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W PUMP STATION This item is for payment for installation of pumps and an above or below ground structure for housing of the pumps. This item shall include all pumps, piping, fittings, valves, electrical components, building materials, concrete, any other appurtenances, labor, equipment, excavation, and backfill, to complete the pump station installation as required by the plans, standard drawings, and specifications, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LUMP SUM (LS) when complete.

W REMOVE TRANSITE (AC) PIPE This item shall include all labor, equipment, and materials needed for removal and disposal of the pipe as hazardous material. All work shall be performed by trained and certified personnel, in accordance with all environmental laws and regulations.
Any and all transite AC pipe removed shall be paid under one bid item included in the contract, regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W SERVICE LONG SIDE This item shall apply to all service line installations of every size bid up to and including 2-inch inside diameter, except those service bid items defined as "Special". This item includes the specified piping material, main tap, tapping saddle (if required), corporation stop materials, coupling for connecting the new piping to the surviving existing piping, encasement of 2 inches or less internal diameter (if required by plans or specifications), labor, equipment, excavation, backfill, testing, disinfection, and restoration, at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. This bid item is to pay for service installations where the ends of the service connection are on opposite sides of the public roadway and the service line crosses the centerline of the public roadway, as shown on the plans. The length of the service line is not to be specified. Payment under this item shall not be restricted by a minimum or maximum length. The contractor shall draw his own conclusions as to the length of piping that may be needed. Payment under this item shall include boring, jacking, or excavating across the public roadway for placement. Placement of a service across a private residential or commercial entrance alone shall not be reason to make payment under this item. Private or commercial entrances shall not be considered a public roadway in defining payment under this item. This pay item does not include installation or relocation of meters. Meters will be paid separately. No additional payment will be made for rock excavation or for special bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W SERVICE SHORT SIDE This item shall apply to all service line installations of every size up to and including 2-inch internal diameter, except those service bid items defined as "Special". This item includes installation of the specified piping material of the size specified on plans, encasement of 2 inches or less internal diameter (if required by plans or specifications), main tap, tapping saddle (if required), corporation stop, coupling for connecting the new piping to the surviving existing piping, labor, equipment, excavation, backfill, testing, disinfection, and restoration at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. This bid item is to pay for service installations where both ends of the service connection are on the same side of the public roadway, or when an existing service crossing a public roadway will remain and is being extended, reconnected, or relocated, with all work on one side of the public roadway centerline as shown on the plans. The length of

the service line is not to be specified and shall not be restricted to any minimum or maximum length. Placement of a service lateral across a private residential or commercial entrance alone shall not be reason to make payment under this item. Private or commercial entrances shall not be considered a public roadway in defining payment under this item. The contractor shall draw his own conclusions as to the length of piping that may be needed. This pay item does not include installation or relocation of meters. Meters will be paid separately. No additional payment will be made for rock excavation or for bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W SERVICE RELOCATE This item is for the relocation of an existing water service line where a meter is not involved, and where an existing service line can easily be adjusted by excavating alongside and moving the line horizontally and/or vertically a short distance without cutting the service line to avoid conflicts with road construction. This item shall include excavation, labor, equipment, bedding, and backfill to relocate the line, in accordance with the plans and specifications, complete and ready-for-use. Payment under this item shall be for each location requiring relocation. Payment shall be made under this item regardless of service size or relocation length. No separate pay items will be established for size or length variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W STRUCTURE ABANDONMENT This item is to be used to pay for abandonment of larger above or below ground water structures such as meter vaults, fire pits, pump stations, tanks, etc. Payment under this item shall not be limited to size or scope; however, structures with connecting pipes of 2 inches or less shall not be paid under this item but shall be considered incidental to water construction (i.e., abandonment of standard water meters up to and including 2 inches would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted fill or flowable fill for abandonment of the structure in-place and complete restoration. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W STRUCTURE REMOVAL This item is to be used to pay for removal of larger above or below ground water structures such as meter vaults, fire pits, pump stations, tanks, etc. Payment under this item shall not be limited to size or scope; however, structures with connecting pipes of 2 inches or less shall not be paid under this item but shall be considered incidental to water construction (i.e., removal of standard water meters up to and including 2 inches would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted backfill for removal of the structure and complete restoration. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W TAPPING SLEVE AND VALVE SIZE 1 OR 2 This item shall include the specified tapping sleeve, valve, valve box, concrete pad around valve box (when required in specifications or plans), labor, and equipment to install the specified tapping sleeve and valve, complete and ready-for-use, in accordance with the plans and specifications. The size shall be the measured internal diameter of the live pipe to be tapped. The size tapping sleeve and valve to be paid under sizes 1 or 2 shall be as follows:

Size 1 = All live tapped main sizes up to and including 8 inches
Size 2 = All live tapped main sizes greater than 8 inches

Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W TIE-IN This item shall be used for all main tie-in bid items of every size, except those defined as "Special". This item includes all labor, equipment, excavation, fittings, sleeves, reducers, couplings, blocking, anchoring, restoration, disinfection, testing, and backfill required to make the water main tie-in as shown on the plans and in accordance with the specifications, complete and ready-for-use. Pipe for tie-ins shall be paid under separate bid items. This item shall be paid EACH (EA) when complete.

Plugging of existing abandoned mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

W VALVE This item shall apply to all valves of every size required in the plans and specifications, except those bid items defined as "Special". Payment under this description is to be for gate or butterfly valves being installed with new main. This item includes the valve as specified in the plans and specifications, polyethylene wrap (if required by specifications), labor, equipment, excavation, anchoring (if any), valve box and valve stem extensions, backfill, concrete pad around valve box (if required by specifications), restoration, testing, disinfection, etc., required to install the specified valve at the location shown on the plans, in accordance with the specifications and standard drawings, complete and ready-for-use. If required on plans and/or proposed adjoining DIP is restrained, valves shall be restrained. Valve restraint shall be considered incidental to the valve and adjoining pipe. This description does not apply to cut-in valves. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE ANCHOR EXISTING This item is intended to pay for installation of restraint hardware on an existing valve where no restraint exists, to hold the valve in place to facilitate tie-ins and other procedures where restraint is prudent. This work shall be performed in accordance with water specifications and plans. This bid item shall include all labor, equipment, excavation, materials, and backfill to complete restraint of the designated valve, regardless of size, at the location shown on the plans, complete and ready-for-use. Materials to be provided may include, but are not limited to, retainer glands, lugs, threaded rod, concrete, reinforcing steel, or any other material needed to complete the restraint. Should the associated valve box require removal to complete the restraint, the contractor shall reinstall the existing valve box, the cost of which shall be considered incidental to this bid item. No separate bid items are being provided for size variations. All sizes shall be paid under one bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE BOX ADJUST This item include all labor, equipment, valve box and valve stem extensions (if required), excavation, backfill, concrete pad around valve box (when specified in specifications or plans), restoration, etc., to adjust the top of the box to finished grade, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE BOX REMOVE This item is in payment for all labor, equipment, restoration materials, disposal, and any other effort for removal of a valve box, leaving the valve in place. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE CUT-IN This item is for new cut-in valve installations of all sizes, where installation is accomplished by cutting out a section of existing main. This item shall include cutting the existing pipe, supplying the specified valve, couplings or sleeves, valve box, concrete pad around valve box (when required in specifications or plans), labor, equipment, and materials to install the valve at the locations

shown on the plans, or as directed by the engineer, complete and ready-for-use. Any pipe required for installation shall be cut from that pipe removed or supplied new by the contractor. No separate payment will be made for pipe required for cut-in valve installation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE REMOVE This item is in payment for all labor, equipment, and restoration materials for cutting of existing pipe and any other effort necessary for total removal of an existing valve and valve box. This bid item shall include disposal of the valve and box, unless plans or specifications state the valve and box are to be salvaged and delivered to the utility owner for reuse. No separate pay items are to be established for size variations. All valve removals, regardless of size, shall be paid under this one pay item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.
If plugging of existing abandoned mains is needed after valve removal, the work shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

W VALVE VAULT This item is for payment for installation of an underground structure for housing of specific valve(s), as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or doors, the specified valve(s), all piping, and fitting materials associated with installing a functioning valve vault, in accordance with the plans, standard drawings, and specifications, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Standard Sanitary Sewer Bid Item Descriptions

THESE BID ITEM DESCRIPTIONS SHALL SUPERCEDE ANY BID ITEM DESCRIPTIONS CONTAINED IN UTILITY OWNER SUPPLIED SPECIFICATIONS PROVIDED ELSEWHERE IN THIS PROPOSAL.

S BYPASS PUMPING This item shall include all labor, equipment, and materials needed to complete a bypass pumping and/or hauling operation for diversion of sewage during sanitary sewer construction. Examples of such operations when bypass pumping and/or hauling may be necessary during force main tie-ins, manhole invert reconstruction, insertion of new manholes into existing mains, or other similar construction. There may be more than one bypass pumping/hauling operation on a project. This item shall be paid for each separate bypass pumping/hauling operation occurrence as called out on the plans or directed by the engineer and actually performed. There will be no separate bid items defined for length, duration, or volume of sewage pumped or hauled in each occurrence. If a bypass pumping/hauling operation is called out on the plans, but conditions are such that the bypass pumping/hauling operation is not needed or utilized, no payment will be made under this item. The contractor shall draw his own conclusions as to what labor, equipment, and materials may be needed for each bypass pumping/hauling occurrence. The contractor should be prepared to handle the maximum volume of the sewer being bypassed, even during a storm event. This item shall not be paid separately, but shall be considered incidental, when bypass pumping and/or hauling is needed during cast-in-place-pipe (CIPP) and/or point repair operations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA).

S CIPP LATERAL SERVICE INVESTIGATION This item shall include all equipment, materials, labor, and incidentals necessary to enter the sewer, in compliance with all safety/confided space requirements to perform the identification, assessment, and pre-measurement of all existing and abandoned laterals for the placement of Cured-In-Place-Pipe lining. This item shall be payment for all lateral service investigation for all sewer segments to be lined as a part of this contract. This bid item shall include bypass pumping when required. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. Payment for this item shall be LUMP SUM (LS).

S CIPP LATERAL REINSTATEMENT This item is to pay for installing a Cured-In-Place-Pipe liner in service laterals and service/mainline connections to stabilize structural defects and construction inadequacies. This bid item shall include all labor, equipment, materials and incidentals necessary to perform the service lateral reinstatement, in accordance with the plans and specifications. Work under this item shall include bypass pumping, sewer flow control, pre-installation cleaning, sealing connections to existing sewer main, pre- and post- construction CCTV inspection, and final testing of the CIPP system. This item shall also include the "top hat" required by the specifications. All CIPP lateral reinstatements shall be paid under this item, regardless of the size or length of reinstatement. No separate bid items of varying sizes or length of CIPP lateral reinstatement will be provided in the contract. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. Payment for this item shall be EACH (EA) for each CIPP lateral reinstatement, complete and ready-for-use.

S CIPP LINER This item is to pay for rehabilitation of existing sanitary sewers using the Cured-In-Place-Pipe method. This bid item description applies to all CIPP sizes included in the contract. All CIPP Liner items, of all varying sizes, shall include all labor, materials, customer notification, testing, necessary permits,

ingress and egress procedures, bypass pumping, pre-construction video, sediment and root removal, dewatering, traffic control, erosion and sediment control, excavation pits, removal and replacement of manhole frames and covers as necessary to facilitate the lining work, sealing at manholes and service connections, clearing and grubbing, pipeline cleaning, re-cleaning, video inspection as many times as necessary, debris collection and disposal, root removal, pre- and post-construction video inspection, all digital inspection footage, final report preparation and approval, the cost of potable water from the Owner, required compliance tests, site restoration, site cleanup, sealing of liner at manholes, acceptance testing, and all other rehabilitation work and incidentals not included under other pay items, necessary to complete the rehabilitation per the plans and specifications. There will be no separate payment for acceptance testing of the lined pipe but shall be considered incidental to this item. Pay under this item shall be by each size bid in the contract. Pay measurement shall be from center of manhole to center of manhole. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S CIPP PROTRUDING LATERAL REMOVAL This item includes all equipment, materials, labor, and incidentals necessary to enter the sewer in compliance with all safety/confined space requirements, remove a sufficient amount of the protruding tap to insure a proper and safe Cured-In-Place-Pipe lining insertion, and perform pre-installation CCTV. This bid item shall include bypass pumping when required. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. Payment for this item shall be EACH (EA) for each protruding lateral removed.

S CONCRETE PIPE ANCHOR This item shall be constructed on the sewer pipe at the locations shown on the plans, in accordance with sanitary sewer specifications and standard drawings. Payment for concrete anchors will be made at the contract unit price each, in place, complete and ready-for-use. Each concrete anchor of sewer pipe or force main shall be paid under one bid item per contract regardless of the sizes of carrier pipe being anchored in the contract. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S DIRECTIONAL BORE Payment under this item is made whenever the plans or specifications specifically show directional boring is to be utilized in order to minimize the impact of open-cut for the installation of force main or gravity sewer under streets, creeks, and etc. Payment under this item shall include the specified bore pipe, labor, and equipment. No separate payment shall be made for bore pipe installed in the bore, whether used as a carrier pipe or an encasement of a separate carrier pipe. This item shall also include pipe anchors at each end of the bore, when specified, to prevent the creep or contraction of the bore pipe. Carrier pipe installed within a bore pipe shall be paid separately under pipe items. Payment under this item shall not be size specific and no separate bid items will be established for size variations. The bore pipe sizes to be included under this item shall be as shown on the plans and/or in the specifications. Any and all directional bores in each contract shall be paid under one directional bore bid item included in the contract, regardless of size. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S ENCASEMENT CONCRETE This item includes all labor, equipment, excavation, concrete, reinforcing steel, backfill, restoration, etc. to construct the concrete encasement of the sewer or force main, as shown on the plans and in accordance with the specifications and standard drawings. Payment under this item shall be in addition to the carrier pipe, as paid under separate bid items. Carrier pipe is not included in this bid item. Any and all concrete encasements shall be paid under one bid item, included in the contract, regardless of the size of the carrier pipe or the volume of concrete or steel reinforcement as specified in the plans and specifications. No separate bid items will be established for size variations. Measurement of

pay quantity shall be from end of concrete to end of concrete. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

S ENCASEMENT STEEL BORED This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to bore and install the encasement, in accordance with the plans and specifications, complete and ready-for-use. The size shall be the measured internal diameter of the encasement pipe. The sizes of encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately, but shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S ENCASEMENT STEEL OPEN CUT This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to open-cut install the encasement, in accordance with the plans and specifications, complete and ready-for-use. The size shall be the measured internal diameter of the encasement pipe. The size encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately, but shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S FORCE MAIN This item description shall apply to all PVC, ductile iron, and polyethylene/plastic pipe bid items of every size and type, except those bid items defined as "Special". This item includes the pipe specified by the plans and specifications, all fittings (including, but not limited to, bends, tees, reducers, plugs, and caps), tracing wire with test stations (if required by specifications), polyethylene wrap (when specified), labor, equipment, excavation, bedding, restoration, testing, backfill, etc., required to install the specified new pipe and new fittings at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. No additional payment will be made for rock excavation. This bid item includes material and placement of flowable fill under existing and

proposed pavement, and wherever else specified on the plans or in the specifications. This item shall also include pipe anchors on polyethylene pipe runs, as shown on the plans or required by the specifications, to prevent the creep or contraction of the pipe. Measurement of quantities under this item shall be through fittings, encasements, and directional bores (only when a separate carrier pipe is specified within the directional bore pipe). No separate payment will be made under pipe items when the directional bore pipe is the carrier pipe. Measurements shall be further defined to be to the center of tie-in where new pipe contacts existing pipe at the center of connecting fittings, to the outside face of vault or structure walls, or to the point of main termination at dead ends. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S FORCE MAIN AIR RLS/VAC VLV This item description shall apply to all force main air release/vacuum valve installations of every size, except those defined as "Special".
This item shall include the air release/vacuum valve, main to valve connecting line or piping, manhole/vault/structure, access casting or doors, tapping the main, labor, equipment, excavation, proper backfill, and restoration required to install the air release/vacuum valve at the location shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. All air release/vacuum valves on a project shall be paid under one bid item, regardless of size. No separate pay items will be established for size variations. Only in the case of the uniqueness of a particular air release/vacuum valve would a separate bid item be established. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S FORCE MAIN DIRECTIONAL BORE Payment under this item is made whenever the plans or specifications specifically show directional boring is to be utilized in order to minimize the impact of open-cut for the installation of sewer or force main under streets, buildings, creeks, etc. Payment under this item shall include the specified bore pipe, labor, and equipment. No separate payment shall be made for bore pipe installed in the bore, whether used as a carrier pipe or an encasement of a separate carrier pipe. This item shall also include pipe anchors at each end of the bore, when specified, to prevent the creep or contraction of the bore pipe. Carrier pipe installed within a bore pipe shall be paid separately under pipe items. Payment under this item shall not be size specific and no separate bid items will be established for size variations. The bore pipe sizes to be included under this item shall be as shown on the plans and/or in the specifications. Any and all directional bores in each contract shall be paid under one directional bore bid item included in the contract, regardless of size. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S FORCE MAIN POINT RELOCATE This item is intended for payment for horizontal and/or vertical relocation of a short length of an existing main at the location shown on the plans. This bid item is to be used when the existing pipe material is to be reused when relocating an existing force main at point locations, such as to clear a conflict at a proposed drainage structure, pipe, or any other similar short relocation situation. The contractor shall provide any additional pipe or fitting material needed to complete the work as shown on the plans and specifications. The materials provided shall be of the same type and specifications as those that exist. Substitution of alternative materials shall be approved by the engineer in advance on a case-by-case basis. New polyethylene wrap is to be provided (if wrap exists or is specified in the specifications to be used). If it is necessary that the pipe be disassembled for relay, payment under this item shall also include replacement of joint gaskets as needed. Bedding and backfill shall be provided and performed the same as with any other pipe installation, as detailed in the plans and specifications. Payment under this item shall be for each location requiring an existing main to be relocated horizontally or vertically, regardless of pipe size or relocation length. No separate pay items will be established for pipe size variations or relocation segment length variations. Force Main Relocate shall not be paid on a linear feet

basis, but shall be paid EACH (EA) at each location when complete and placed in service. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced.

S FORCE MAIN TAP SLEVE/VALVE RANGE 1 OR 2 This item shall include the specified tapping sleeve, valve, valve box, concrete pad around valve box (when required in specifications or plans), labor, and equipment to install the specified tapping sleeve and valve, complete and ready-for-use, in accordance with the plans and specifications. The size shall be the measured internal diameter of the live pipe to be tapped. The size tapping sleeve and valve to be paid under sizes 1 or 2 shall be as follows:

Range 1 = All live tapped main sizes up to and including 8 inches
Range 2 = All live tapped main sizes greater than 8 inches

Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S FORCE MAIN TIE-IN This item description shall be used for all force main tie-in bid items of every size, except those defined as "Special". This item includes all labor, equipment, excavation, fittings, sleeves, reducers, couplings, blocking, anchoring, restoration, testing, and backfill required to make the force main tie-in as shown on the plans and in accordance with the specifications, complete and ready-for-use. This bid item shall include purge and sanitary disposal of any sewage from any abandoned segments of force main. Pipe for tie-ins shall be paid under separate bid items. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Plugging of existing abandoned mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

S FORCE MAIN VALVE This item description shall apply to all force main valves of every size required in the plans and specifications, except those bid items defined as "Special". Payment under this description is to be for gate or butterfly force main valves being installed with new force main. This item includes the valve as specified in the plans and specifications, polyethylene wrap (if required by specification), labor, equipment, excavation, anchoring (if any), valve box and valve stem extensions, backfill, concrete pad around valve box (if required by specification), restoration, testing, etc., required to install the specified valve at the location shown on the plans, in accordance with the specifications and standard drawings, complete and ready-for-use. If required on plans and/or proposed adjoining DIP is restrained, force main valves shall be restrained. Force main valve restraint shall be considered incidental to the force main valve and adjoining pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S FORCE MAIN VALVE BOX ADJUST This item includes all labor, equipment, valve box and valve stem extensions (if required), excavation, backfill, concrete pad around valve box (when specified in specifications or plans), restoration, etc., to adjust the top of the force main valve box to finished grade, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S LAMPHOLE Payment under this item is for the installation of a lamphole along or at the end of a gravity sewer pipe for inspection and cleaning of a sewer pipe. Lampholes shall include, but are not limited

to bends, tees, vertical pipe, casting, any other materials specified, excavation, backfilling, air testing, restoration, and cleanup in accordance with the plans, specifications, and standard drawings, complete and ready-for-use. Payment shall be made under this bid item regardless of lamphole size. No separate pay items will be established for size variations. All materials shall be new and unused. No additional compensation will be paid for lamphole height variations. All vertical pipe required to construct the lamphole, regardless of height, shall be considered incidental to this item. No additional payment will be made for rock excavation. Cleanouts on pipes 6 inches or less are not considered lampholes and are not to be paid under this item. Only lampholes on pipes 8 inches or larger are to be paid under this item. Cleanouts on pipes 6 inches or less are to be paid under pay item S LATERAL CLEANOUT. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S LATERAL CLEANOUT This item shall be for payment for installation of a cleanout in a service lateral line. This item shall include furnishing and installation of a tee, vertical pipe of whatever length required, and threaded cap. The cleanout shall extend from the lateral to final grade elevation. The size of the cleanout shall be equivalent to the size of the lateral. The cleanout materials shall meet the same specification as those for the lateral. The cleanout shall be installed at the locations shown on the plans or as directed by the engineer. Only one pay item shall be established for cleanout installation. No separate pay items shall be established for size or height variations. Payment under this item is for cleanouts on pipe of 6 inches or less. Cleanouts on pipes of 8 inches or greater are considered lampholes and shall be paid under the S LAMPHOLE bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S LATERAL LOCATE This item description is to pay for all labor, equipment, and materials needed in locating an existing sanitary sewer service lateral for tie-in of the lateral to new mainline sewers and/or for the relocation of a lateral. This bid item shall be inclusive of all methods and efforts required to locate the lateral for tie-in or relocation of the lateral. Locating methods to be included under this item shall include, but are not limited to those efforts employing the use of video cameras from within an existing sanitary sewer main or lateral, electronic locating beacons and/or tracers inserted into the sanitary sewer main or lateral, careful excavation as a separate operation from mainline sewer or lateral excavation, the use of dyes to trace the flow of a lateral, or any combination of methods required to accurately locate the lateral. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA).

S LATERAL LONG SIDE This item description shall apply to all service lateral installations of every size up to and including 6-inch internal diameter, except those lateral bid items defined as "Special". This item includes the specified piping material, main tap, bends, clean outs, labor, equipment, excavation, backfill, testing, and restoration, at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for- use. This bid item is to pay for service lateral installations where the ends of the lateral connection are on opposite sides of the public roadway. The new lateral must cross the centerline of the public roadway to qualify for payment as a long side lateral. The length of the service lateral is not to be specified. Payment under this item shall not be restricted by a minimum or maximum length. The contractor shall draw his own conclusions as to the length of piping that may be needed. Payment under this item shall include boring, jacking, or excavating across the public roadway for placement. Placement of a service lateral across a private residential or commercial entrance alone shall not be reason to make payment under this item. Private or commercial entrances shall not be considered a public roadway in defining payment under this item. No additional payment will be made for rock excavation or for bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S LATERAL SHORT SIDE This item description shall apply to all service lateral installations of every size up to and including 6-inch internal diameter, except those lateral bid items defined as "Special". This item includes the specified piping material, main tap tee, bends, clean outs, labor, equipment, excavation, backfill, testing, and restoration, at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready- for-use. This bid item is to pay for lateral installations where both ends of the lateral connection are on the same side of the public roadway, or when an existing lateral crossing a public roadway will remain and is being extended, reconnected, or relocated, with all work on one side of the public roadway centerline as shown on the plans. The length of the service lateral is not to be specified and shall not be restricted to any minimum or maximum length. Placement of a service lateral across a private residential or commercial entrance along shall not be reason to make payment under this item Private or commercial entrances shall not be considered a public roadway in defining payment under this item. The contractor shall draw his own conclusions as to the length of piping that may be needed. No additional payment will be made for rock excavation or for bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S LINE MARKER This item is for payment for furnishing and installing a sewer utility line marker as specified by the utility owner specifications and plans. A line marker may consist of a post or monument of whatever materials specified and shall include markings and/or signage on same as specified by plans or specifications. This item shall include all labor, equipment, and materials needed for complete installation of the marker. This item shall be paid EACH (EA) when complete.

S MANHOLE Payment under this item is for the installation of new 4-foot interior diameter sanitary sewer manhole. Payment for manholes will be at the contract unit price, in-place, complete and ready-for-use at the locations shown on plans, in accordance with specifications and standard drawings. Manholes shall include concrete base, barrel sections, cone section or slab top, steps, excavation, backfilling, air testing, restoration, and cleanup, in accordance with the specifications and standard drawings. Payment shall be made under this item regardless of whether the base is to be precast or cast-in-place (doghouse). All materials, except casting, shall be new and unused. An existing casting from an existing abandoned or removed manhole is to be reused when available and shall be considered incidental to this item. When an existing casting is unavailable or a new casting is specified on plans or elsewhere in the contract, a new casting shall be paid as a separate bid item. Anchoring of a casting, new or used, shall be considered incidental to this bid item. No additional compensation will be paid for manhole height variations. No additional payment will be made for rock excavation. In cases where a manhole is to be located within a grade-sensitive area such as roadway pavement, sidewalks, shared-use-paths, etc., the final casting grade given on plans shall be considered approximate. Any readjustment of a manhole casting to meet field conditions shall be incidental to this item. No additional payment shall be made for casting adjustments on new manholes. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE ABANDON/REMOVE Payment under this item is for the full or partial removal, disposal, and/or filling of any sanitary sewer manhole, regardless of size or depth, that no longer serves any purpose. All manholes partially removed shall be removed to a point at least 12 inches below final grade, 12 inches below roadway subgrade, or 12 inches clear of any other underground infrastructure, whichever is lowest. If partial removal of an abandoned manhole is elected, the remaining manhole structure shall be filled with flowable fill. Flowable fill shall be considered incidental to this bid item. Plugging of pipes entering and exiting within an abandoned manhole that is left in place partially or in whole shall be considered incidental to this item. All sanitary sewer castings shall be salvaged and securely stockpiled for reuse on new sanitary sewer manholes. Salvage of manhole castings for reuse on the project shall be considered incidental to this

bid item. Any casting that is not needed for reuse, is not reusable, or is directed by the engineer not to be reused shall be disposed of by the contractor. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Plugging or safeloading of pipes required at locations outside of manholes when manholes are removed in total shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

S MANHOLE ADJUST TO GRADE Payment under this item is for the adjustment of sanitary sewer casting elevation on all sizes of existing sanitary manholes. This work shall be performed in accordance with the sanitary sewer specifications. Payment shall be made under this bid item regardless of the amount of adjustment necessary to a sanitary sewer manhole casting or diameter of the manhole. Work under this pay item may be as simple as placing a bed of mortar under a casting, but shall also be inclusive of installation of adjusting rings, and /or addition, removal, or replacement of barrel sections. The existing casting is to be reused unless a new casting is specified on the plans. New casting, when specified, shall be paid as a separate bid item. Anchoring of the casting shall be incidental to this item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE CASTING STANDARD Payment under this item is for the furnishing of a new, standard, traffic-bearing casting for sanitary manholes that meets the requirements of the sanitary sewer specifications and standard drawings. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when installed.

S MANHOLE CASTING WATERTIGHT Payment under this item is for the furnishing of a new, watertight, traffic-bearing casting for sanitary manholes that meets the requirements of the sanitary sewer specifications and standard drawings. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when installed.

S MANHOLE OVERSIZED Payment under this item is for the installation of a new manhole greater than the standard 4-foot interior diameter. Payment for oversized manholes will be made at the contract unit price in-place, complete and ready-for-use at the locations shown on plans, in accordance with specifications and standard drawings. Manholes shall include concrete base, barrel sections, cone section or slab top, steps, excavation, backfilling, air testing, restoration, and cleanup, in accordance with the specifications and standard drawings. Payment shall be made under this item regardless of whether the base is to be precast or cast-in-place (doghouse). All materials, except casting, shall be new and unused. An existing casting from an existing abandoned or removed manhole is to be reused when available and shall be considered incidental to this item. When an existing casting is unavailable or a new casting is specified on plans or elsewhere in the contract, a new casting shall be paid as a separate bid item. Anchoring of casting, new or used, shall be considered incidental to this bid item. No additional compensation will be paid for manhole height variations. No additional payment will be made for rock excavation. In cases where a manhole is to be located within a grade-sensitive area such as roadway pavement, sidewalks, shared-use-paths, etc., the final casting grade given on plans shall be considered approximate. Any readjustment of a manhole casting to meet field conditions shall be incidental to this item. No additional payment shall be made for casting adjustments on new manholes. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE RECONSTRUCT INVERT This item is to pay for all labor, equipment, and material for

the rework of an existing manhole bench to redirect or eliminate flow, such as when the flow of a pipe or pipes are being removed or redirected. This work will be as specified in the plans, specifications, or directed by the engineer. This work may consist of, but is not limited to, removal of concrete and/or placement of concrete in elimination or redirect of flow. This item shall also include providing and placement of a rubber seal or boot, as required by utility specifications, standard drawings, or plans. The contractor shall draw his own conclusions as to the effort and scope of work needed to comply with the specifications, standard drawings, and plans. No payment shall be made under this bid when MANHOLE TAP EXISTING or MANHOLE TAP EXISTING ADD DROP are being paid at the same location, as this type of work is included in those items. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE TAP EXISTING This item is to pay for all labor, equipment, and material for coring one opening in an existing manhole base, addition of a rubber seal as specified, and rework of the manhole bench to direct the additional pipe flow. The bid item shall be paid for each core opening added to a single manhole. This bid item shall also include any rework of the existing manhole bench due to the elimination of other existing pipes and flow. This work will be as specified in the plans, specifications, or directed by the engineer. This work may consist of, but is not limited to, removal of concrete and/or placement of concrete in the addition, elimination, or redirect of flow. The contractor shall draw his own conclusions as to the effort and scope of work needed to comply with the specifications, standard drawings, and plans. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE TAP EXISTING ADD DROP This item is to pay for all labor, equipment, and material for coring one opening in an existing manhole base and one opening in a manhole wall for cleanout, addition of rubber seals as specified, addition of a vertical drop pipe to the outside of the manhole, placement of reinforcing steel and concrete to encase vertical pipe, and rework of the manhole bench to direct the additional pipe flow. This bid item shall be paid for each drop added to a single manhole. This bid item shall also include any rework of the existing manhole bench due to the elimination of other existing pipes and flow. This work will be as specified in the plans, standard drawings, specifications, or directed by the engineer. This work may consist of, but is not limited to, removal of concrete and/or placement of concrete in the addition, elimination, or redirect of flow. The contractor shall draw his own conclusions as to the effort and scope of work needed to comply with the specifications, standard drawings, and plans. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE WITH DROP Payment under this item is for the installation of new 4-foot interior diameter sanitary sewer manhole with drop. Payment for drop manholes will be made at the contract unit price, in-place, complete and ready-for-use at the locations shown on plans, in accordance with specifications, and standard drawings. Drop manholes shall include concrete base, barrel sections, drop materials, cone section or slab top, steps, excavation, backfilling, air testing, restoration, and cleanup. Payment shall be made under this item regardless of whether the base is to be precast or cast-in-place (doghouse). All materials, except casting, shall be new and unused. An existing casting salvaged from an existing abandoned or removed manhole is to be reused and shall be considered incidental to this item. When a new casting is specified, or an existing casting is unavailable, it shall be paid as a separate bid item. Anchoring of casting, new or used, shall be considered incidental to this bid item. No additional compensation will be paid for manhole height variations. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE WITH LINING Payment under this item is for the installation of a new 4-foot interior

diameter sanitary sewer manhole with corrosion-resistant lining. Payment for manholes with lining will be made at the contract unit price, in-place, complete and ready-for-use at the locations shown on plans, in accordance with specifications, and standard drawings. Manholes shall include concrete base, barrel sections, cone section or slab top, steps, lining, excavation, backfilling, air testing, restoration, and cleanup. Payment shall be made under this item regardless of whether the base is to be precast or cast-in-place (doghouse). All materials, except casting, shall be new and unused. An existing casting from an existing abandoned or removed manhole is to be reused and shall be considered incidental to this item. When a new casting is specified, or an existing casting is unavailable, it shall be paid as a separate bid item. Anchoring of casting, new or used, shall be considered incidental to this bid item. No additional compensation will be paid for manhole height variations. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE WITH TRAP Payment under this item is for the installation of a new manhole with trap. Payment for trap manholes will be made at the contract unit price each, in-place, complete and ready-for-use at the locations shown on plans, in accordance with specifications, and standard drawings. Trap manholes shall include concrete base, manhole structure and trap materials, cone section or slab top, steps, excavation, backfilling, air testing, restoration, and cleanup. All materials, except casting, shall be new and unused. Payment shall be made under this item regardless of whether the base is to be precast or cast-in-place (doghouse). An existing casting from an existing abandoned or removed manhole is to be reused and shall be considered incidental to this item. When a new casting is specified, or an existing casting is unavailable, it shall be paid as a separate bid item. Anchoring of casting, new or used, shall be considered incidental to this bid item. No additional compensation will be made for manhole height variations. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S PIPE This item description shall apply to all gravity and force-main sewer pipe bid items, of every size and type of material 8 inches internal diameter and larger, except those bid items defined as "Special". This item includes the pipe specified by the plans and specifications, all fittings (including, but not limited to, tap tees and couplings for joining to existing similar or dissimilar pipes), polyethylene wrap (if required by specification), labor, equipment, excavation, bedding, backfill, restoration, pressure or vacuum testing, temporary testing materials, video inspection, etc., required to install the specified new pipe and new fittings at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. This bid item shall include material and placement of flowable fill under existing and proposed pavement, and wherever specified on the plans or in the specifications. No additional payment will be made for rock excavation. Measurement of quantities under this item shall be through fittings and encasements to a point at the outside face of manhole barrels, or to the point of main termination at dead ends or lampholes. Carrier pipe placed within an encasement shall be paid under this item and shall include casing spacers and end seals. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S PIPE POINT REPAIR This item is to be used to pay for repair of short lengths of existing sanitary sewer pipe that, through prior video inspection or other means, are known to have pre-existing failure. Pipe Point Repair may be needed in preparation for installation of cured-in-place-pipe (CIPP) lining, or other instances where failure is known and repair is prudent. The size of pipe shall not be defined in separate bid items. All diameter sizes of point repair shall be paid under this one item. The materials to be used to make the repair shall be as defined on the plans or in the specifications. This bid item shall include all excavation, pipe materials, joining materials to connect old and new pipe, bedding, and backfill to complete the repair at the locations shown on the plans or as directed by the engineer, complete and ready-for-use.

This bid item shall include bypass pumping when required. Measurement shall be from contact point to contact point of old and new pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S PUMP STATION This item is for payment for installation of sanitary pump stations, including above or below ground structures for housing of the pumps. This item shall include all pumps, piping, fittings, valves, electrical components, building materials, concrete, any other appurtenances, labor, equipment, excavation, and backfill, to complete the pump station installation as required by the plans, standard drawings, and specifications, complete and ready- for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LUMP SUM (LS) for each when complete.

S STRUCTURE ABANDON This item is to be used to pay for abandonment of larger above or below ground sewer structures such as air release/vacuum valve vaults, pump stations, tanks, etc. Payment under this item shall not be limited to size or scope; however, structures with connecting pipes of 2 inches or less shall not be paid under this item but shall be considered incidental to sewer construction (i.e., abandonment of standard air release/vacuum valves, up to and including 2 inches, would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted fill or flowable fill for abandonment of the structure in place and complete restoration. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Manhole abandonment shall not be paid under this item but shall be paid under the bid item S MANHOLE ABANDON/REMOVE.

S STRUCTURE REMOVAL This item is to be used to pay for removal of larger above or below ground sewer structures, such as air release/vacuum valve vaults, pump stations, tanks, etc. Payment under this item shall not be limited to size or scope; however, structures with connecting pipes of 2 inches or less shall not be paid under this item but shall be considered incidental to sewer construction (i.e., removal of standard air release/vacuum valves and their structures, up to and including 2 inches, would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted backfill for removal of the structure and complete restoration. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Manhole removal shall not be paid under this item but shall be paid under the bid item S MANHOLE ABANDON/REMOVE.

KENVIRONS

TECHNICAL SPECIFICATIONS

FOR THE

LEITCHFIELD BYPASS
KYTC ITEM NO. 04-8954.00

CITY OF LEITCHFIELD UTILITY COMMISSION
LEITCHFIELD, KENTUCKY

Prepared By:

Kenvirons, LLC.
770 WILKINSON BOULEVARD
FRANKFORT, KENTUCKY 40601

PROJECT NO. 2021119

DECEMBER 2024

Kenvirons

Civil & Environmental Engineering and Laboratory Services

SECTION 00000
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SECTION 01015

SPECIAL CONDITIONS

1. PURPOSE OF SPECIFICATIONS

The specifications and plans provided herein shall govern and control the materials and installation of utilities for the City of Leitchfield, Kentucky potable water, sanitary sewer, and natural gas system. All existing and proposed facilities shall be designed, constructed, and tested in compliance with the applicable regulations of the US Department of Transportation, Kentucky Transportation Cabinet, and the Kentucky Public Service Commission.

2. CONTRACTOR QUALIFICATIONS

Contractor shall have a minimum of 10 years experience with the installation and testing of the aforementioned utilities, including medium pressure natural gas systems. The Contractor shall have an Occupational Safety and Health Administration (OSHA) competent superintendent on the project site at all times during construction activity. Equipment and tools shall be of adequate size and in proper condition to perform the work. The Owner/Engineer reserves the right to request and review a list of current equipment and tools to verify the contractors capabilities.

The Contractor shall provide a list of similar projects, with references, to demonstrate their qualifications and experience. The Owner reserves the right to reject any proposed Contractor.

For all work pertaining to the installation Natural Gas Piping, the Contractor shall submit for review and approval the following material, including data as required by the Pipeline Safety Act:

A) Contractor’s current Operator Qualification Plan. This plan shall include all qualified employees for performing each task pertaining to the particular project.

B) Contractor’s current Drug Prevention Program which shall include procedures for random drug testing.

C) Contractor’s current Safety and Operations Plan.

D) Fusion/Welding certificate for each employee joining pipe via welding or fusion and accessories.

The Following Contractors are approved for providing construction services for the City of Leitchfield Natural Gas System:

1. Cleary Construction, Tompkinsville, KY
2. Martin Contracting, Richmond, KY
3. Miller Pipeline, Louisville, KY

3. INSTALLATION CRITERIA

All natural gas facilities shall be installed to conform to Title 49 of the Code of Federal Regulations, Parts 191 and 192, Transportation of Natural and Other Gas by Pipeline, as promulgated by the United States Department of Transportation and regulated by the Kentucky Public Service Commission.

All materials used for the construction of utility facilities shall be new.

A. Medium Pressure Gas Mains and Appurtenances

(1) All pipelines and service lines to be operated at less than 60 psi may be polyethylene.

(2) Minimum depth of bury for gas mains shall be 30 inches, except it shall be 60 inches deep when located on KYTC right-of-way.

(3) Minimum depth of bury for potable water and sanitary sewer lines shall be 30 inches, except it shall be 42 inches deep when located on KYTC right-of-way.

4. INSPECTION AND TESTING OF MATERIALS

Attention is called to the portions of the specifications requiring various testing of materials.

5. SECOND HAND AND SALVAGED MATERIALS

The use of second-hand and/or salvaged materials will not be permitted.

6. WARRANTY PERIOD

The CONTRACTOR shall return to the site of the work at any time within a period of one year from the date of final acceptance of the work, and shall repair any defect due to faulty workmanship or materials which may occur within this period. This guarantee shall include, but not be limited to, damage done by settlement of backfills, such damage and sinking of fills being considered as defective workmanship.

7. SHOP DRAWINGS

The CONTRACTOR shall submit shop drawings for all materials proposed for integration into the project. Shop drawings shall be submitted in digital, PDF, format. Reviewed shop drawings shall be returned to the Contractor in digital format. The Contractor shall maintain a printed copy of all shop drawings at the project site. The OWNER will not be responsible for any materials or equipment ordered prior to approval of shop drawings.

8. PROTECTION OF PUBLIC, WORKMEN, WORK AND PROPERTY

The CONTRACTOR shall continuously maintain adequate protection of all his work from damage and shall protect the OWNER'S property from injury or loss arising in connection with this work. He shall make good any such damage, injury, or loss. CONTRACTOR shall adequately protect adjacent property as provided by law.

The CONTRACTOR shall take all necessary precautions for the safety of the public, employees and others engaged on the work and shall comply with all applicable provisions of federal, state, and local laws, regulations and building codes, to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed. He shall erect and properly maintain all necessary safeguards for the protection of workmen and the public, and shall post danger signs at proper places warning against the hazards created by the CONTRACTOR. Barricades and signs shall be kept clearly painted with applicable designations. All barricades, holes and obstructions shall be illuminated from sunset to sunrise.

9. INSPECTION OF WORK

The OWNER and ENGINEER shall, at all times, have access to the work and the CONTRACTOR shall provide proper facilities for such access and for inspection. If any work shall be covered up without approval or consent of the OWNER, it must, if required by the OWNER, be uncovered for examination at the CONTRACTOR'S expense. The OWNER will furnish a resident construction inspector for the project.

10. CORRECTION OF WORK AFTER FINAL ACCEPTANCE

The final acceptance shall not relieve the CONTRACTOR of responsibility for faulty materials or workmanship and, unless otherwise specified, he shall remedy any defect due thereto and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of final acceptance of the work by the OWNER. The OWNER shall give notice of observed defects with reasonable promptness. If replacements are not made within 10 days after notice is given of such defects in workmanship, or 30 days in case of materials, then the OWNER shall have the right to make replacements and charge cost of same to the CONTRACTOR or his bondsman.

11. LIENS

Before the work is finally accepted by the OWNER, the CONTRACTOR shall deliver to the OWNER a complete release of all liens arising out of this project, or receipts in full in lieu thereof and, if required in either case, an affidavit that so far as he has knowledge or information, the releases and receipts include all the labor and material for which a lien could be filed; but the CONTRACTOR may, if any Subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the OWNER, to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, the CONTRACTOR shall refund to the OWNER all moneys that the latter may be compelled to pay in discharging such a lien, including all costs and a reasonable attorney's fee.

12. SUBCONTRACTORS

The CONTRACTOR agrees that he is as fully responsible to the OWNER for the acts and omissions of his Subcontractors and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him. Nothing contained in the specifications shall create any contractual relation between any Subcontractor and the OWNER.

The name of each Subcontractor proposed for work shall be submitted to the OWNER for approval prior to starting the work, together with such information as may be required to prove his ability to complete the work involved.

13. ENGINEER'S STATUS

In rendering general engineering service and resident construction observation, the ENGINEER and the OWNER shall not be in charge of or be responsible for the methods of construction, construction forces and equipment, their safety procedures, or knowledge of status of CONTRACTOR'S payment of his bills for labor and materials on the project.

14. FINAL INSPECTION

Prior to acceptance by the OWNER, an inspection shall be made of all facilities included in the construction. All noted defective items shall be corrected before final acceptance.

15. "AS BUILT" DRAWINGS AND RECORDS

The CONTRACTOR shall deliver a set of record drawings to the ENGINEER sufficient to locate all main utility pipelines, all service lines, all valves, any and all fittings and subgrade appurtenances constructed as part of the Project.

16. PERFORMANCE AND PAYMENT BOND

The CONTRACTOR will be required to furnish a Performance and Payment Bond, acceptable to the OWNER, to run for a period of one year after date of acceptance of the work, in an amount equal to 100 percent of the value of the work.

END OF SECTION

SECTION 02072

HORIZONTAL DIRECTIONAL DRILLING

1.0 GENERAL

1.1 WORK INCLUDED

The work specified in this section consists of furnishing and installing underground utilities using the directional boring (horizontal directional drilling, HDD) method of installation, also commonly referred to as guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

1.2 QUALITY ASSURANCE

The requirements set forth in this document specify a wide range of procedural precautions necessary to insure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification. Adherence to the specifications contained herein, or the Engineer's approval of any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

1.3 SUBMITTALS

A. WORK PLAN: Prior to beginning work, the Contractor must submit to the Engineer a general work plan outlining the procedure and schedule to be used to execute the project. Plan should document the thoughtful planning required to successfully complete the project. At a minimum, the Plan shall cover general construction activities, job safety, emergency response, and scheduling.

B. EQUIPMENT: Contractor will submit specifications on directional boring equipment to be used to ensure that the equipment will be adequate to complete the project. Spares inventory shall be included.

C. MATERIAL: Specifications on material to be used shall be submitted to Engineer. Material shall include the pipe, fittings and any other item which is to be an installed component of the project.

D. PERSONNEL: Documentation of training and relevant experience of personnel shall be submitted.

2.0 EQUIPMENT REQUIREMENTS

2.1 GENERAL

The directional boring equipment shall consist of a directional boring rig of sufficient capacity to perform the bore and pullback the pipe, a boring fluid mixing and delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

2.2 BORING SYSTEM

A. BORING RIG: The directional boring machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system shall be self-contained with sufficient pressure and volume to power boring operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during boring and pull-back operations. Sufficient spares shall be kept on hand for any break-downs which can be reasonably anticipated.

B. BORE HEAD: The bore head shall be steerable by changing it’s rotation and shall provide the necessary cutting surfaces and boring fluid jets.

C. MUD MOTORS (if required): Mud motors shall be of adequate power to turn the required boring tools.

D. DRILL PIPE: Shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

2.3 GUIDANCE SYSTEM

The Guidance System shall be of a proven type and shall be setup and operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

2.4 BORING FLUID (MUD) SYSTEM

A. MIXING SYSTEM: A self-contained, closed, boring fluid mixing system shall be of sufficient size to mix and deliver boring fluid composed of bentonite clay, water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. Mixing system shall continually agitate the boring fluid during boring operations.

B. Boring FLUIDS: Drilling fluid shall be composed of clean water and an appropriate additive. Water shall be from a clean source with a pH of 8.5 - 10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No hazardous additives may be used. Boring fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall.

C. DELIVERY SYSTEM: The mud pumping system shall have an adequate flow and pressure for the directional bore. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used boring fluid and boring fluid spilled during boring operations shall be contained and properly disposed of. A berm, minimum of 12” high, shall be maintained around boring equipment, boring fluid mixing system, entry and exit pits and boring fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps of sufficient size shall be in place to convey excess boring fluid from containment areas to storage facilities.

2.5 OTHER EQUIPMENT

A. PIPE ROLLERS: Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe while being tested and during pull-back operations. Sufficient number of rollers shall used to prevent excess sagging of pipe.

B. PIPE RAMMERS/PULLERS: Hydraulic or pneumatic pipe rammers or pullers may only be used if necessary and with the authorization of Engineer.

3.0 OPERATIONS

3.1 GENERAL

The Engineer shall be notified 7 days in advance of starting work. The Directional Bore shall not begin until the Engineer is present at the job site and agrees that proper preparations for the operation have been made. The Engineer approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the

Contract. It shall be the responsibility of Engineer to provide inspection personnel at such times as appropriate without causing undue hardship by reason of delay to the Contractor.

3.2 PERSONNEL REQUIREMENTS

All personnel shall be fully trained in their respective duties as part of the directional boring crew and in safety. Training shall be provided specific to the project if any potential hazards may be encountered which has not already been included in personnel's training.

3.3 BORING PROCEDURE

A. SITE PREPARATION: Prior to any alterations to work-site, Contractor shall photograph or video tape entire work area, including entry and exit points. One copy of which shall be given to the Engineer and one copy to remain with Contractor for a period of one year following the completion of the project. Work site, as indicated on drawings and within right-of-way, shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.

B. BORE PATH SURVEY: Entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If Contractor is using a magnetic guidance system, drill path will be surveyed for any surface geo-magnetic variations or anomalies.

C. ENVIRONMENTAL PROTECTION: Contractor shall place silt fence between all boring operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or boring fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations. Fuel or oil may not be stored in bulk containers within 200' of any water-body or wetland.

D. UTILITY LOCATES: Contactor shall notify all companies with underground utilities in the work area via the state or local "one-call" (BUD) to obtain utility locates. Once the utilities have been located Contractor shall physically identify the exact location of the utilities by vacuum or hand excavation, when possible, in order to determine the actual location and path of any underground utilities which might be within 20 feet of the bore path. Contractor shall not commence boring operations until the location of all underground utilities within the work area have been verified.

E. SAFETY: Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner. Safety meetings shall be conducted at least weekly with a written record of attendance and topic submitted to Engineer. The Contractor shall implement the safety guidelines and practices established by:

1. Occupational Safety and Health Act (OSHA).
   (a) In particular, Subpart P, Excavations of 29 CFR 1926.650, .651, 652, and OSHA Publication 2226, “Excavation, Trenching & Shoring”

2. American Gas Association, Directional Drilling Damage Prevention Guidelines for the Natural Gas Industry

F. BORE PIT: The boring pit shall be solid sheeted, braced, and shored as necessary to provide a safe work environment. The Contractor shall take all precautions, and comply with all requirements as may be necessary to protect employees, and private and public property. As required by federal and/or state regulations, bore pit excavation and shoring shall be designed by a professional engineer registered in Kentucky. Tabulated data, calculations, and/or drawings shall be signed and sealed by the bore pit design professional engineer and submitted for review.

G. PIPE: Pipe shall be connected together in one length prior to pull-back operations, if space permits. Steel pipe welds will be X-rayed prior to being placed in bore hole. Pipe will be placed on pipe rollers before pulling into bore hole with rollers spaced close enough to prevent excessive sagging of pipe.

H. PILOT HOLE: Pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100’. In the event that pilot does deviate from bore path more than 5% of depth in 100’, Contractor will notify Engineer and Engineer may require Contractor to pull-back and re-drill from the location along bore path before the deviation.

In the event that a boring fluid fracture, inadvertent returns or returns loss occurs during pilot hole boring operations, Contractor shall cease boring, wait at least 30 minutes, inject a quantity of boring fluid with a viscosity exceeding 120 seconds as measured by a March funnel and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor will cease operations and notify Engineer. Engineer and Contractor will discuss additional options and work will then proceed accordingly.

I. REAMING: Upon successful completion of pilot hole, Contractor will ream bore hole to a minimum of 25% greater than outside diameter of pipe using the appropriate tools. Contractor will not attempt to ream at one time more than the boring equipment and mud system are designed to safely handle.

J. PULL-BACK: After successfully reaming bore hole to the required diameter, Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull pressure at any time.

In the event that pipe becomes stuck, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify Engineer. Engineer and Contractor will discuss options and then work will proceed accordingly.

3.4 PIPE TESTING

Following successful pull-back of pipe, Contractor will pressure test pipe using nitrogen gas for a period of 24 hours at the pressure rating of the pipe. A calibrated pressure recorder will be used to record the pressure during the test period. This record will be presented to Engineer. After successful completion of the pressure test, the pipe will be pigged dry.

3.5 SITE RESTORATION

Following boring operations, Contractor will de-mobilize equipment and restore the work-site to original condition. All excavations will be backfilled and compacted to 95% of original density. Landscaping will be restored to original.

3.6 RECORD KEEPING, AS-BUILTS

Contractor shall maintain a daily project log of boring operations and a guidance system log with a copy given to Engineer at completion of project. As-built drawings shall be certified as to accuracy by the Contractor. Third-party verification of as-built drawings may be done at Owner’s expense.

END OF SECTION

SECTION 02326

NATURAL GAS STEEL CASING PIPE

1.0 GENERAL

1.1 SCOPE OF WORK

A. Steel cover (casing) pipe shall be furnished and installed as shown on the Drawings and specified herein.

1.2 RELATED WORK

A. Natural Gas Pressure pipe is specified in Section 02610.

2.0 PRODUCTS

2.1 STEEL COVER PIPE

A. Steel cover or jack pipe shall be plain end steel pipe with minimum yield strength of 35,000 psi and tensile strength of 60,000 psi per API-5L Grade B material. The steel pipe supplied shall be manufactured by the seamless, electric-weld, submerged-arc weld or gas metal-arc weld process as specified in API-5L. Certification of 35,000 psi minimum yield strength shall be furnished by the supplier through the Contractor to the Owner in sufficient copies before pipe is shipped to job to permit the Owner to retain three copies.

B. Supplier shall furnish through the Contractor to the Owner 3 copies of certification of test results of strength tests conducted on the pipe prior to shipment to job site. Used pipe with excessive corrosion and pitting present shall not be supplied.

C. The inside diameter of steel cover pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe, joints or couplings, except for carrier pipe 6 inches or greater in diameter the difference shall be 4 inches instead of 2 inches.

D. Cover pipe shall have a **minimum** wall thickness of 0.188 Inches.

3.0 EXECUTION

3.1 TUNNELING, BORING OR JACKING

A. Boring or jacking as specified herein will be allowed at locations other than those noted on the Drawings, where advantageous to lay pipe under streets, driveways, and sidewalks, without their monolithic structure being destroyed.

B. Tunneling under paving, railroads, buildings and underground structures is included as an alternate to boring or repaving required by open cut trenching. Bore and cover pipe is also included as an alternate to tunneling. Backfilling of tunnels shall be mechanically tamped in not more than 3 inch layers and with materials rendered suitable for tamping before being placed in tunnel unless otherwise shown on the Drawings.

C. In tunneling under buildings, the Contractor will be held responsible for all damage by his operations and methods of excavation and backfilling.

D. Boring or jacking under highways, railroads, sidewalks, pipelines, etc., shall be done at the locations shown on the Drawings. It shall be performed by mechanical means and accurate vertical and horizontal alignment must be maintained. When shown on the Drawings, cover pipe shall be used and shall be installed inside bored holes concurrently with boring, or jacking.

3.2 STEEL COVER PIPE INSTALLATION

A. Steel cover pipe shall be of the size and wall thickness as shown on the Drawings.

B. When cover pipe is jacked, concurrent with boring, all joints shall be solidly welded. The weld shall be such that the joint shall be of such strength to withstand the forces exerted from the boring and jacking operation as well as the vertical loading imposed on the pipe after installation. The weld shall also be such that it provides a smooth, non-obstructing joint in the interior of the pipe which will allow easy installation of the carrier pipe without hanging or abrasion to the carrier pipe upon installation.

C. When cover pipe is installed in open trench or permanent tunnel, it shall be bedded and backfilled per Specifications applying to gas line pipe in such locations. When cover pipe is installed in temporary tunnel, it shall be laid accurately to alignment of proposed gas line and at an elevation below gas line necessary to support it at the planned elevation. Bedding and backfill for cover pipe in temporary tunnel shall be per Specifications for gas line in temporary tunnel.

D. Cover pipe in open trench, permanent tunnel and temporary tunnel shall be joined in such manner that they will not be moved out of alignment or grade and that will prevent backfill material from entering joint. Where cover pipes are shown on the Drawings to be equipped with vent pipes, vents shall be installed as shown on the Drawings.

3.3 CARRIER PIPE IN COVER PIPE INSTALLATION

A. Pipeline Spacers

1. High density polyethylene (HDPE) casing spacer shall be non-metallic and molded in segments for easy field assembly with a supplied ball tip Allen wrench. Individual segments shall have a solid core with runners extending to within 1.5" from the casing pipe. The runners shall essentially center the carrier pipe within the casing. Plastic casing spacers shall be located within two feet of both ends of the casing. Casing Spacers shall be installed along the carrier pipe length at the spacing indicated in the table below. All casing spacers shall be supplied with a molded TPR (Thermo Plastic Rubber) non-slip button comprised of pliable material having a high coefficient of friction that is designed to grip all types of pipe materials. All mounting hardware shall be constructed from 304 or 316 stainless steel. The casing spacers shall be Cascade Phoenix Gold Series, as manufactured by Cascade Waterworks Mfg. Co., Yorkville, Illinois, or approved equal.

2. Spacers shall be of such dimensions to provide 1) full supportive load capacity of the pipe and contents; 2) of such thickness to allow installation and/or removal of the pipe; and 3) to allow no greater than 1/2 inch movement of the carrier pipe within the cover pipe after the carrier pipe is installed.

3. Spacers shall be located immediately behind each weld and at a maximum spacing distance as shown below unless a lesser maximum spacing distance is recommended by the pipe manufacturer:

Diameter (inches)	Max. Spacing (feet)
2 – 2 – ½	4
3 – 8	7
10 – 26	10
28	9
30	8
32	7
34	6

The materials and spacing to be used shall be accepted by the Engineer prior to installation. The pipeline spacers shall be manufactured by Cascade Waterworks Manufacturing Co., of Yorkville, Illinois, Allied Corrosion Industries, of Marietta, Georgia, or approved equal. Installation shall be in accordance with the manufacturer's recommendations.

B. Cover Pipe End Seals

1. Upon completion of installation of the carrier pipe, the annular space at the ends of the cover pipe shall be sealed to prevent the entrance of groundwater, silt, etc., into the cover pipe. The seal shall be a manufactured product specially made for this purpose. The seal shall be Model ESC - Seamless as manufactured by CCI Pipeline Systems, Breaux Bridge, Louisiana, or approved equal.

C. Cover Pipe Vents

1. Vent pipes shall be installed on the ends of cover pipes in the following numbers and at the following locations:

   a. Interstate Routes, U.S. Routes, KY Routes, Railroad Crossings, Creek Crossings — each end of cover pipe.

   b. County, City, local routes and other major streets — one end of cover pipe.

   c. For other areas, provide vents at locations as directed by the Owner.

2. Vent pipes shall be installed at a distance from the end of the cover pipe sufficient not to interfere with the installation or removal of the cover pipe end seals. Vent pipes shall be extended to the street, road, highway, or railroad right-of-way line(s) or as directed by the Owner.

3. Vent pipes shall be constructed of 2-inch coated steel pipe, same as for main line steel pipe, with return bend and bug screen. Vent pipes return bend to be 6 feet above ground elevation or as directed by the Owner.

4. Steel coating of vent pipe shall extend 6 inches above ground surface with the remaining above ground portion to be painted with 2 coats of white.

END OF SECTION

SECTION 02327

NATURAL GAS PRESSURE PIPE

1.0 GENERAL

1.1 SUMMARY

A. For Cover Pipe and Boring and/or Jacking see Section 02326.

1.2 SUBMITTALS

A. Prior to the shipment of any pressure pipe to the project site, the Contractor shall submit to the Owner a bill of materials and shop drawings for all, in the number of copies listed in Special Conditions.

B. Supplemental Submittal Requirements

1. Shop drawings are required for metering and regulating facilities only.

2. All testing and certification requirements and descriptive literature remain as described.

1.3 SAFETY

A. Natural gas pressure pipe shall be installed and inspected in compliance with the requirements of the Pipeline Safety Regulations, 49 CFR, Part 192, Minimum Federal Safety Standards.

2.0 PRODUCTS

2.1 MATERIALS - GAS PIPE

A. Polyethylene Pipe for Gas Service

1. Pipe

a. General

(1) All polyethylene pipe and tubing furnished under this Specification shall meet or exceed all applicable requirements of ASTM D 2513-81, "Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings." In addition to complying with the above standard, the pipe, tubing and fittings shall

meet, be equivalent to or exceed the additional requirements herein specified.

b. Material Qualification

(1) The polyethylene plastic compound to be extruded shall conform to the requirements as listed in ASTM D 1248-81a for Grade P23 (Type II, Grade 3), Class C, material, and ASTM D 3350-81a as listed for cell classification of 234433. The plastic compound shall be of virgin quality and have been listed by the Plastic Pipe Institute as a PE 2306 designated compound.

c. Pipe Size, Dimensions and Tolerances

(1) The polyethylene pipe 3 inches in diameter and higher shall meet all applicable dimensional requirements of ASTM D 2513-81 for SDR 11.5 rated pipe. Polyethylene service tubing 2 inches in diameter and less shall be rated as SDR 11.0.

d. Marking

(1) Marking of the tubing shall conform to the requirements listed in ASTM D 2513-81.

e. Packaging

(1) Tubing shall be delivered in cardboard disposable reels or coils standard to the supplier.

(2) Reels to be sequentially marked numerically as extruded with reference to quality control.

2. Fittings

a. Fittings furnished under this Specification shall meet all applicable requirements of ASTM D 2683-80 "Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe" for use with SDR 11 polyethylene pipe.

b. Fittings furnished for this project shall be manufactured by the same manufacturer as the pipe.

2.2 SOURCE QUALITY CONTROL

A. Polyethylene Pipe for Gas Service

1. General

a. A nominal physical properties list for the base compound shall be submitted and accepted as part of this Specification. Manufacturer shall certify that production materials used are in conformance with the published properties.

2. Quality Tests

a. The P.E. tubing shall be subjected to the applicable quality control tests outlined in Appendix X4, ASTM D 2513-81, "Recommended In-plant Quality Control Program for Plastic Pipe and Fittings Intended for Use in Natural Gas Distribution Systems."

b. The polyethylene pipe and fittings shall also be tested for "Time-to-Failure of Plastic Pipe Under Constant Internal Pressure," ASTM D 98-81, "Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings," ASTM D 1599-81 and the long-term pressure test as noted in Appendix X2.2 of ASTM D 2513-81 using test method per ASTM D 2837-76 (1981).

3. Inspection

a. The Owner reserves the right to inspect the product at the place of manufacture, or at the point of delivery and to reject any shipment which does not conform to these Specifications. Defective tubing shall be replaced by the Contractor, at no cost to the Owner. Upon request, the manufacturer shall allow access to the OWNER during the extrusion of the specific lot purchased.

4. Qualification of Manufacturer

a. The manufacturer shall have adequate equipment and quality control facilities to continually produce finished tubing that will have the properties indicated herein.

3.0 EXECUTION

3.1 TRENCH EXCAVATION – NATURAL GAS PRESSURE PIPE

A. General

1. Trenching shall include all clearing and grubbing, including all weeds, briars, trees and stumps encountered in the trenching, regardless of size. The Contractor shall dispose of any such material by burning, burial or hauling away or as noted on the Drawings.

2. Trenching also includes such items as railroad, street, road, sidewalk, pipe and small creek crossings; cutting, moving or repairing damage to fences, poles or gates and other surface structures, regardless of whether shown on the Drawings. The Contractor shall protect existing facilities against danger or damage while pipeline is being constructed and backfilled or from damage due to settlement of the backfill.

3. All excavation shall be open trenches, except where the Drawings call for tunneling, boring or jacking under structures, railroads, sidewalks, roads or highways. No extra payment for rock excavating or bedding.

B. Trees and Shrubs

1. Where pipelines run through wooded terrain, cutting of trees within limits of maximum permissible trench widths, as set forth in this article, will be permitted. However, cutting of additional trees on sides of trench to accommodate operating of trenching machine will not be permitted.

C. Highways, Streets and Railroads

1. Construction equipment injurious to paving encountered shall not be used. Curbs, sidewalks, and other structures shall be protected by the Contractor from damage by his construction equipment.

2. Where trenching is cut through paving which does not crumble on edges, trench edge shall be cut to at least 2 inches deep to straight and neat edges, before excavation is started, and care taken to preserve the edge to facilitate neat repaving.

3. The Contractor shall so coordinate his work as to produce a minimum of interference with normal traffic on highways and

streets. He may, with the approval of the governing agency, close a street to traffic for such length of time considered necessary, provided persons occupying property abutting the street have an alternate route of access to the property which is suitable for their needs during the time of closure. It shall be the responsibility of the Contractor to give 24 hours advance notice to fire and police departments and to occupants of a street which will be closed, in a manner approved by the governing body.

4. The Contractor shall maintain road crossings in a passable condition for traffic until the final acceptance of the work.

5. Railroad and Highway Department requirements in regard to trenching, tunneling, boring and jacking shall take precedence over the foregoing general specifications and the following tunneling and boring or jacking specifications, where they are involved.

6. Uneven surfaces or humps in the ground encountered and high driveways and road crossings shall be dug through to such depth that pipe may be laid to a reasonably even grade and have minimum cover at the low places.

D. Existing Utilities

1. The Contractor shall determine, as far as possible in advance, the location of all existing sewer, culvert, drain, water, electric, telephone conduits, and gas pipes, and other subsurface structures and avoid disturbing same in opening his trenches. In case of sewer, water and gas services and other facilities easily damaged by machine trenching, same shall be uncovered without damage ahead of trenching machine and left intact or removed without permanent damage ahead of trenching and restored immediately after trenching machine has passed. The Contractor shall protect such existing facilities, including power and telephone poles and guy wires, against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of his backfill. It shall be the responsibility of the Contractor to inform the customers of utilities of disruption of any utility service as soon as it is known that it has been or will be cut off.

E. Pipelines in Same Trench

1. Pipelines, force mains, and sewers laid in same trench shall, in all cases, be bedded on original earth, or other specified bedding materials, regardless of divergence in their elevations, unless

otherwise specified. They shall never be laid in unsupporting backfill or one above the other.

F. Location of Proposed Pipelines

1. The location of pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. Also, development of property traversed may require location changes. In such cases, the Owner reserves the right to make reasonable changes in line and structure locations. The Owner is under no obligation to locate pipelines so that they may be excavated by machine.

G. Trench Requirements

1. All trenches must be dug neatly to lines and grades.

2. The opening of more than 500 feet of trench ahead of pipe laying and more than 500 feet of open ditch left behind pipe laying, before backfilling, will not be permitted, except upon written consent of the Owner. No trench shall be left open or work stopped on same for a considerable length of time. In case of objectionable delay trench shall be refilled according to backfill specifications.

3. Where subgrade of trench has insufficient stability to support the pipeline and hold it to its original grade, the Owner may order stabilization by various means. Exclusive of dewatering normally required for construction and instability caused by neglect of the Contractor, such items as extra excavation, crushed rock for pipe bedding, concrete cradle or piling may be required.

4. Excavation for pipe laying must be made of sufficient width to allow for proper jointing and alignment of the pipe, but not greater than the maximums permitted in the following table:

MAXIMUM TRENCH WIDTH

Pipe Size (inches)	Trench Width (inches)	Pipe Size (inches)	Trench Width (inches)
4	28	18	42
6	30	20	44
8	32	24	48
10	34	30	54
12	36	36	60
14	38	42	66
16	40	48	72

5. Trenches in earth or rock shall be dug as shown on the Drawings and be sufficiently deep to insure a 30 inch minimum cover over gas lines, or as noted on the Drawings. Depths of trenching shall also be adequate for at least 1 foot minimum cover over valve nuts. In order to insure an earth cushion under the pipe for uniform bearing, trench depth shall be the cover requirement plus outside diameter of barrel of pipe plus the required bedding cushion. The cushion construction requirement shall also apply to tunnels.

6. Trench line stations and locations of accessories will be set ahead of the trenching. These will be set at least each 100 feet of pipeline. Trenches must be dug true to alignment of stakes. Alignment of trenches or pipes in trench must not be changed to pass around obstacles such as poles, fences and other evident obstructions without the permission of the Owner. Lines will be laid out to avoid obstacles as far as possible, contingent with maintenance of alignment necessary to finding pipeline in the future and avoiding obstruction to future utilities.

H. Damage to Existing Structures

1. Hand trenching is required, at no extra payment, where undue damage would be caused to existing structures and facilities by machine trenching.

2. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good condition and serve its purpose as completely as before. Where there is the possibility of damage to existing utility lines by trenching machine, the Contractor shall make hand search excavation ahead of machine trenching to uncover same.

I. Dewatering of Trenches

1. Dewatering of trenches shall be considered a part of trenching. Dewatering of trenches shall include groundwater and storm or sanitary sewage. Suitable pumping and other dewatering equipment is to be provided by the Contractor, to insure the installation of the pipeline structure in a dewatered trench and under the proper conditions. Dewatering shall include all practical means available for prevention of surface runoff into trenches and scouring against newly laid pipe.

2. Piles of excavated materials shall be trenched or temporarily piped to prevent, as far as practical, blockage of drainage ditches and gutters, and water carriage of excavated materials over street and highway surfaces.

3.2 LAYING NATURAL GAS PRESSURE PIPE

A. General

1. Inspection of Materials

a. All pipe, fittings and accessories shall be subject to an inspection by the Owner at the job site. Any damaged materials shall be repaired or replaced to the satisfaction of the Owner. Should repairs to the piping materials be necessary, then same shall be made in the presence of the Owner using proven methods prescribed by the pipe manufacturer.

b. The Owner's inspection of materials shall in no way relieve the Contractor of his responsibility.

2. Laying Requirements

a. Pressure pipe shall be laid to lines, cover or grades shown on the Drawings.

b. Pipes must be swabbed out before lowering into trench. In the case of pipelines 4 inch through 20 inch, a swab must also be dragged through the pipe after it is in place. Larger size pipe shall be visually inspected for cleanliness and proper jointing.

c. The points insisted upon in the laying of pipe will be: Proper alignment, evenness of width and depth of joints, perfection in jointing, and care of the pipe in handling. For gas lines, proper coating and wrapping, electrical inspection and blow-down (purging of air in case of gas lines) of pipes are also essential and will be required.

d. Precautions must be taken to prevent flotation of the pipe should water enter the trench prior to putting the pipeline into operation.

e. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or alignment,

or where the backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective.

f. Whenever pipe laying is stopped, the end of the pipe shall be securely plugged with the manufacturer's standard expandable pipe plug, or similar conical plug, held in place by proper bracing or backing is required.

g. No pipe shall be laid resting on solid rock, blocking or other unyielding objects. Jointing before placing in the trench and subsequent lowering of more than one section jointed together may be allowed, subject to the Owner’s permission.

3. Installing Gas Pipe in Cover Pipe

a. Installation of gas pipe in cover pipe is covered in Section 02326 of these specifications.

B. Laying Plastic Pipe

1. Installing Polyethylene Pipe for Gas Service

a. The pipe shall be bedded in 4 inches minimum of Class I sand with the haunching and initial backfill lightly consolidated to a depth of 12 inches above the top of the pipe with Class I sand. The machined placed backfill may contain rock no larger than 12 inches in any dimension and to an extent no greater than 2 the volume of backfill materials used. The top 12 inches of backfill shall contain no rocks over 1-1/2 inches in diameter nor pockets of crushed rock.

b. Polyethylene pipe shall be joined by the heat fusion welding process. Welding equipment may be either electric or electrofusion as the Contractor may select. The welding equipment must be capable of attaining the temperature recommended by the manufacturer for the particular polyethylene extrusion used on the project. Pouring of water on completed joints to speed cooling will not be allowed.

c. Care shall be taken in lowering the pipe onto the earth bedding. The pipe shall be snaked into the trench, employing the natural snaking tendency of the pipe. Sharper bends shall be made with fittings rather than bending the pipe

alone. The pipe will be rejected if it contains kinks and gouges.

d. After the pipe is placed in the trench on the required bedding, Class I sand shall be placed to a minimum depth of 12 inches over the pipe. The remainder of the trench may then be machine backfilled with material excavated from the trench, except in no case shall rock spalls over 8 inches be permitted.

e. All polyethylene pipe installed shall have installed in the trench with the pipe #10 solid copper tracing wire. The wire shall be buried directly over the pipe in the 12 inch covering of earth.

f. At each 500 feet of new pipeline installed, or at locations as directed by the Owner, cathodic test boxes as specified under steel pipe installation shall be installed. These boxes will be installed with the pipe locater wire attached to the poles in the box and used for pipe location only.

g. Where tie-in to existing steel main is made, the connection shall be made with special factory molded transition fittings. The polyethylene end of the polyethylene to steel transition shall be of the same material as that of the polyethylene pipe supplied. Compression type transition fittings for polyethylene gas mains will be allowed only for unusual conditions encountered during construction.

h. Compression type fittings will be allowed for use on polyethylene service lines at locations such as curb valves and meter risers. It is the intent of this requirement that all other joining of polyethylene service line be accomplished by heat fusion.

C. Supplemental Backfilling Information

1. General

a. Excavated materials from trenches and tunnels, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. It shall be the responsibility of the Contractor to obtain location or permits for its disposal.

b. Where sod is destroyed in areas maintained equivalent to residence yards, it shall be replaced on slightly ridged

backfill on trench, and where destroyed in areas adjacent to the trench, it shall be replaced by the Contractor with fresh sod. The timing of resodding shall be controlled by the Owner. Ground shall be prepared and fertilized as herewith specified for seeded areas. In small patches, supplying of 3 inches of topsoil and raking may be substituted for disking.

c. Where pastures, thin grass or cover crops are destroyed by trenching, laying, backfilling, or tunneling operations, surface shall be prepared by disking, fertilizing, and seeding, as specified in Section 02920. The timing of this operation shall be controlled by the Owner. Requirements of the Department of Highways for reseeding shall take precedence over these Specifications.

d. Before completion of the Contract, all backfills shall be reshaped, holes filled, and surplus materials hauled away and all permanent walks, street, driveways, and highway paving and sod replacement and reseeding performed.

e. Backfill material must be uniformly ridged over trench, and excess hauled away. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth, and its height shall not be in excess of needs for replacement of settlement of backfill.

f. All rock, including crushed rock or gravel from construction, must be removed from yards and fields. Streets and walks shall be broomed to remove all earth and loose rock immediately following backfilling.

2. Special Requirements

a. In case of street, highway, railroad, sidewalk and driveway crossings or within any roadway paving, or about manholes, valve and meter boxes located in such paving, the following backfill material and procedure is required.

b. The pipe shall be bedded in 4 inches minimum depth (for pipe sizes through 16 inches) of crushed rock meeting the requirements of the Kentucky Department of Highways standard size No. 8.

c. Similar material shall be used for haunching up to the spring line of the pipe, and it shall be worked under the haunch of the pipe to provide adequate side support. The crushed rock

shall then be hand placed to a point 12 inches above the top of the pipe.

d. After the above bedding and selected backfill have been placed, fill trench to within 6 inches of the surface with Kentucky Department of Highways No. 57 crushed stone, uniformly distributed, or other gradation acceptable to the Owner. In order to accommodate compacted temporary surfacing it may be necessary to bulkhead or otherwise confine the stone fill at the open end of the trench.

e. Temporary surfacing of street, highway, railroad, sidewalk and driveway crossings, or within any roadway paving, or about manholes, valve and meter boxes located in such paving, shall consist of 6 inches compacted depth of crushed stone as specified under Section 02235 for temporary walkway or road surfacing, placed and compacted in the trench. Compaction shall be accomplished by methods which shall be sufficient to confine stone to the trench under normal traffic. Backfills shall be maintained easily passable to traffic at original paving level until acceptance of project or replacement of paving or sidewalks.

f. Railroad Company and Department of Highways requirements in regard to backfilling will take precedence over the above general specifications where they are involved.

D. Cut-Ins, Tie-Ins, and Cutting and Plugging

1. The Owner shall not be responsible for extra costs of cut-ins, tie-ins, cutting and plugging, due to flow not being entirely cut off by the existing main valves.

2. A cut-in is defined as the removal of one section of existing pipeline (2 cuts of pipe) and insertion of one or more new pipeline connections therein.

3. A tie-in is defined as the removal of an existing plug or cap and the connecting of the new pipeline into the existing pipeline or fitting or valve at the joint opened by such removal.

4. A cutting and plugging is defined as the cutting and installation of a plug in an existing line.

3.3 FIELD QUALITY CONTROL

A. Testing Polyethylene Gas Pipe

1. Prior to the beginning of construction, the Owner may require a sample join to be performed by each jointer the Contractor plans to use on the project. The Owner may require a “bend” test on each joint performed or a visual inspection by sampling a portion of the completed joint, or both.

2. Upon completion of each line installed, an air test shall be applied. The test pressure shall be 150 percent of the maximum allowable operating pressure (MAOP) or 90 psi, whichever is greater. The test pressure shall be maintained for a period of 24 hours, with pressure recording chart, without loss of air or appreciable drop in pressure. Should a line pressure drop occur, it shall be the responsibility of the Contractor to locate and repair the leaks and retest the line. The Contractor shall provide the compressor with valves and pressure gauges for the tests as well as all operational personnel to perform the tests.

3. Only lines which have been tested as outlined above in the presence of the Owner or his authorized representative, will be approved for incorporation into the Gas system.

3.4 PURGING OF GAS LINES

A. Scope

1. These procedures cover the purging of air or natural gas from distribution facilities. They describe the manner in which the facilities are to be purged, how to determine when the purge is complete, and items to be considered prior to and during purging.

2. Purging procedures and examples are included.

B. General

1. Purging is required when:

a. New or existing facilities are temporarily taken out of service and the removal of natural gas is necessary.

b. Existing facilities are temporarily taken out of service and the removal of natural gas is necessary.

c. Lines are abandoned.

d. Service restoration due to emergency depressurization for any cause.

2. Except for simple line piping systems, a written plan for purging should be prepared prior to the work and reviewed with owner personnel involved. The following items should be discussed:

a. The extent of the facility to be purged and points of isolation.
b. The purging medium to be used.
c. The sequence of operation and assignment of personnel.
d. Safe working practices (especially around plastic pipe).
e. Means of communication during purging.
f. Means of determining end of purge at vent points.
g. Procedure for handling emergencies, such as gas ignition.
h. Notification for governmental authorities (police, fire, medical).
I. Back-up provisions, in case of unanticipated occurrences (i.e. compressor failure, purging medium, etc.).

3. When purging, the air or gas to be removed must be removed from all sections of the piping system. Branches and services must be individually purged. The straight through section should be purged first, then each lateral.

4. Injection Rate

a. Injection of purging medium into a medium or pipeline should be done at high enough velocity to create a minimum lineal flow of 100 feet per minute. This flow rate will maintain a turbulent interface, thereby minimizing mixing of gases and the possibility of the gases stratifying.

b. When purging air from pipelines, the minimum inlet control pressure specified in Table 1 should be maintained whenever possible. This pressure will create a flow velocity which greatly exceeds the 100 feet per minute requirement, maximizes turbulence and shortens purge duration.

c. For purging air in other than low pressure systems, a cracked main line valve will create a minimum lineal velocity of 100 feet per minute within the pipeline.

5. It is essential that vented natural gas and air/gas mixtures be diffused into the air without hazard to Owner personnel, the general public, or property. Valved vertical vent stacks should be used to keep the natural gas out of the work area and to blow it in a safe direction. Buildings, overhead lines and other obstructions or sources of ignition should be considered when determining the location for venting the gas.

6. Considerations must be given to public relations with regard to noise and odor as well as to any applicable state and local noise and air pollution regulation. Such considerations may include the notification of residents in close proximity to the blow down operation, reduction of line pressure, reduced rate of venting, etc.

7. Purging once started, must be continued until complete.

C. Purging Air from Facilities to Be Placed in Service

1. Purging Services

a. Service installations may be purged by opening the riser valve after the service tee has been tapped. Care must be given to blow gas away from structures by connecting a meter bend or street ell to the riser valve and pointing the stream of gas in a safe direction. The valve should be opened slowly to the full open position; no person or object should be in the exhaust stream area. The operator shall hold the wrench and keep it in contact with the valve at all times. Care must also be taken that no source of ignition is present in the area. A sufficient amount of gas should be blown to atmosphere to insure that all air is removed from the line. Service lines should be purged immediately after the service tee has been tapped and gas is in the service line.

2. Purging of Pipelines

a. Small diameter mains should be purged of air by injecting gas at high enough velocities to create a minimum lineal flow of 100 feet per minute within the pipeline. If this velocity cannot be met, a slug of nitrogen between the air and gas is required (see Procedure 4).

3. The following methods can be used to determine the absence of air:

a. A portable combustible gas indicator set on percent gas scale. The reading must indicate 100 percent gas.

D. Purging Natural Gas from Existing Facilities

1. When natural gas is purged by injecting air into lines less than 10 inches in diameter, it is not necessary to separate the air and natural gas with a nitrogen slug.

2. The disposal of large volumes of natural gas into the atmosphere should be minimized as far as practical by transferring as much as possible to adjacent systems.

3. Determine the absence of natural gas with a combustible gas indicator set on 100 percent gas.

4. Working on Existing Pipelines Which Have Been Purged

a. When it is necessary to perform work on an existing pipeline which has been purged, precautions shall be taken to verify that a combustible mixture has not developed inside the pipeline due to leakage from a segment of pipeline remaining in service, or from the release of gas from residual liquids in the pipeline. Special care must be taken when performing cutting or welding operations on such a line. The degree of isolation should be determined by observing any pressure increases within the purged space with all vents closed and by monitoring for the presence of natural gas using the method of Section C.3.

E. Purging Procedures

1. Purging Air with Natural Gas in Newly Installed Piping

a. Close off lines at C and D, isolating by pinching, fitting, valve or other means.
b. Open vent at 1.
c. Open valve A. Leave valve B closed.
d. Close vent at 1 when 100 percent natural gas is detected.
e. Open vent at 2. Close when 100 percent natural gas is detected.
f. Open vent at 3. Close when 100 percent natural gas is detected.
g. Open vent at 4. Close when 100 percent natural gas is detected.

h. Open vent at 5. Close when 100 percent natural gas is detected.
I. Open isolation point C and D.
j. Open valve B.
k. Purge all service lines installed. Stub services do not have to be purged.

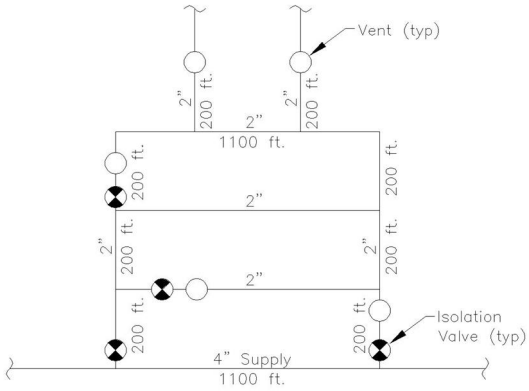


FIGURE 1

2. Purging Air from Pipelines Using Natural Gas Without a Nitrogen Slug

a. Determine blow-off size from table 1, using pipeline size and length of section to be purged (2-inch blow-off, 6-inch pipeline, 6000-foot section).

a. Determine minimum inlet control pressure from Table 1 (22.4 psig). Verify that upstream pressure is equal to or greater than the inlet control pressure. If it is not, determine if adequate pressure exists to ensure a flow of 100 feet per minute. If this velocity cannot be met, a slug of nitrogen is required between the air and gas.

b. Install on the section to be purged and near the upstream mainline valve, a pressure gauge which is accurate and readable within 1 psi, so that the inlet pressure can be observed. (The gauge should be connected through several feet of flexible tubing to eliminate excessive vibration.)

c. Open the blow off valve at the downstream end of the section to be purged. Downstream blow off valves should always be in the fully open position.

d. Begin purging by cracking upstream mainline valve to quickly bring the inlet pressure to the minimum inlet control pressure (12 psig) or greater. When minimum inlet control pressure cannot be obtained, purge at the highest feasible inlet pressure.

e. Monitor blow off gas until combustible gas indicator reads essentially 100 percent natural gas. Close mainline valve to stop injection. The use of a combustible gas indicator provides a means of analyzing the gas/air mixture throughout the purging operation. If the pressure at the gauge is maintained at the minimum inlet control pressure, the time it takes for natural gas to reach the blow off location should be approximately 2 minutes for every mile of pipeline being purged.

f. Close blow off valve and return pipe to service.

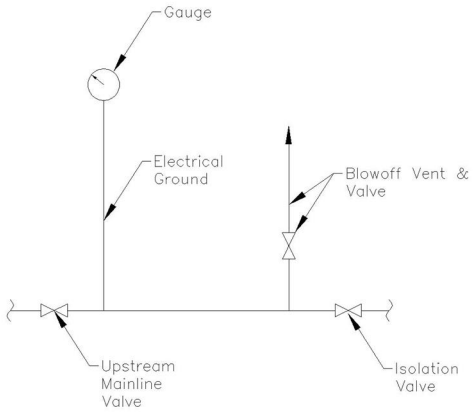


FIGURE 2

3. Purging of Natural Gas from Pipelines Using Air Without a Nitrogen Slug

a. Determine blowdown valve size and vent pipe diameter from Table 1.

b. Determine injection rate required for a minimum slug velocity of 100 feet per minute for a 6 inch pipe. Table 2 shows an injection rate of 20 cfm is required.

c. Determine air injection pressure. Table 3 shows that air injection pressure of 20 cfm through a ¾ inch I.D. hose 50 feet long is 3 psig.

d. Install connection to inject air.

e. Open blow off valve near downstream mainline valve.

f. Blow down line to atmospheric pressure and leave vent open.

g. Inject air; maintain at least 3 psig on the gauge at the inlet to the air hose.

h. Stop injection of air when no natural gas can be detected. Refer to Section C.3 for method to determine presence of natural gas.

i. Positive steps should be taken before working on a section of pipeline which has been purged to isolate the purge section from any source of leakage. Isolation of the section may be accomplished by insertion of blanks, approved stoppers or actual detachment. Actual detachment is preferred.

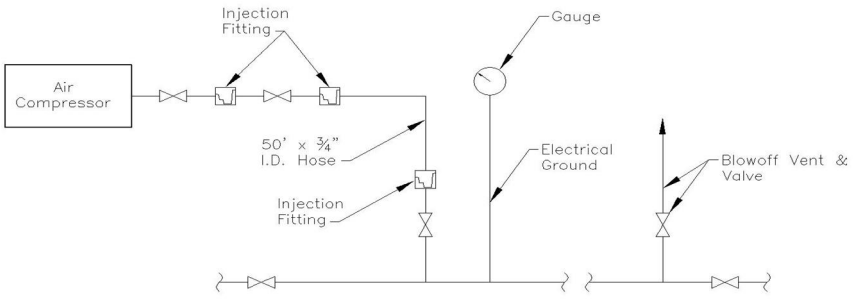


FIGURE 3

TABLE 1 - MINIMUM INLET CONTROL PRESSURE (psig)

BlowOff Valve (in.)	Line Size (in.)	Length of Pipeline (miles)													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
2	4	14	20	25	29	33	37	40	43	46	49	52	55	57	60
	6	22	25	28	30	32	35	37	39	41	43	44	46	48	50
4	6	8	12	16	19	22	24	27	29	32	34	36	38	40	41
	8	8	11	13	16	18	20	22	24	26	28	29	31	32	34

Information from Table 8-1 “Purging Principles and Practices,” AGA #XK0775

TABLE 2 - NITROGEN PURGING DATA FOR 4’’ TO 8’’

Volume of nitrogen required for inert slug and injection rates								
Pipe Size	Pipe Connect Cu. Ft./Ft.	Slug Veloc	Inject Rate Cu. Ft./Min.	Cu. Ft. Nitrogen per length				
				500’	1000’	2000’	5000’	10000’
4’’	.09	100	10	10	10	20	20	20
6’’	.22	100	20	30	30	30	40	50
8’’	.37	100	40	70	70	80	90	120

TABLE 3 - MEASURING INJECTION PRESS. THRU HOSES AND ORIFICES

Determination of pressure required to inject flow rates of nitrogen or air through various size hoses and orifices				
Desired Inject Rate CFM	Minimum required pressure upstream of hose or orifice, psi			
	Each ¾’’ I.D. 50’ Hose	Each 1 – ¼’’ 50’	Each 2’’ I.D. 50’ Hose	Orifices
				3/8’’ ½’’ 5/8’’
10	3			
20	5			
40	11			
60	18			25

SECTION 02510

WATER LINES

1.0 GENERAL

The Contractor shall furnish all labor, materials, and equipment to install the water lines as shown on the plans and as specified herein.

The water lines may be either pressure-rated plastic pipe (PVC) using the ASTM or AWWA C-900 standard, or ductile iron (DI), all as specified hereinafter and as noted on the plans. The bid documents shall show the amounts of each type and class of pipe to be provided by the Contractor.

The Owner will obtain all rights-of-way for operations through private property. It will also secure building permits and the permits for all pipe laid in highway rights-of-way. Any charges for inspections or other fees required will be the responsibility of the Contractor since the amounts of these are dependent upon the operation of the Contractor.

1.1 KENTUCKY TRASPORATION CABINET BONDING

The Kentucky Transportation Cabinet will require that the Owner post a bond for all work accomplished on their right-of-way. Each contract on which work is to be performed will be a separate application and will require a separate bond. Each permit will have conditions attached and these conditions will vary depending on the area where work is to be performed. In areas where traffic control may pose a problem, working hours may be limited. A copy of the encroachment permit will be provided to the Contractor. The Contractor will be responsible for knowledge of the permit's content and conditions in order that the construction may be accomplished in accordance with the specified requirements.

Should any additional bonds or requirements be imposed by the Kentucky Transportation Cabinet, the Owner shall also be responsible for the bonding of the additional requirements.

1.2 MULTIPLE CONSTRUCTION CREWS

The Contractor may utilize multiple construction crews to complete the project within the specified time. The crews shall be located within close proximity of each other. The contractor shall limit the separation of crews to no more than 5 miles unless further distances are approved by the Engineer.

2.0 MATERIALS

2.1 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

This specification covers rigid, pressure-rated, polyvinyl chloride pipe and fittings, hereinafter called PVC pipe and PVC fittings, for sizes 1/2 inch through 16-inch. Pipe shall be as manufactured by JM Eagle, North American, or approved equal.

2.1.1 General.

2.1.1.1 Pipe Markings. Depending on the type of PVC pipe being used, the following shall be marked along the length of each joint of pipe: manufacturer's name, nominal pipe size and size base, material code (PVC 1120), dimension ratio or standard dimension ratio, pressure class or rating, production record code, certification seal (NSF logo), and specification designation (i.e., AWWA C-900).

2.1.1.2 Underground Marking for PVC Pipe. Underground marking for pipe shall use both tracing wire and marking tape.

2.1.1.2.1 *Underground Tracer Wire.* A detectable underground tracer wire shall be placed in the trench directly on top of the pipe. Wire shall be taped to the top of the pipe. The wire used shall be 12 AWG solid HDPE 30 MIL copper conductor with a 30 mil thick, high-density, high molecular weight polyethylene (HDPE) insulation and rated for 30 volts. Extreme care shall be exercised in splicing wire ends to assure continuity. Wire nuts designed specifically for buried service shall be used at all splices. At each valve box the wire shall be looped to the surface extending 12 inches above the concrete valve box pad (see Std. Dwg. for valve). When the entire project or pipeline segment is complete, including meter installation and leak repairs, the locating wire system shall be checked for continuity. Tracer wire to be provided by Pro-Line Safety Products, or approved equal. Wire insulation color shall be blue.

2.1.1.2.2 *Underground Marking Tape.* A detectable underground marking tape shall be placed in the trench approximately 12 inches below the finished grade. The tape used shall be laminated aluminum foil with the printing "CAUTION - Buried Water Line Below". Printing shall be readable through the clear poly lamination and surface printing is not acceptable. Tape size shall be 2 inch width as provided by Presco Products, or approved equal. Color of the tape shall be blue.

2.1.2 Polyvinyl Chloride (PVC) Pipe—ASTM Standard.

2.1.2.1 PVC Pipe. PVC pipe shall be extruded from Type 1, Grade 1, polyvinyl chloride material with a hydrostatic design stress of 2,000 psi for water at 73.4°F, designated as PVC 1120, meeting ASTM Specifications D-1784 for material and D-2241 for pipe, latest revisions. Pipe shall also meet all applicable provisions of the Product Standards and shall bear the National Sanitation Foundation (NSF) seal of approval in compliance with NSF Standard No. 14. PVC pipe having a maximum

hydrostatic working pressure of 160 psi (SDR-26), 200 psi (SDR-21), 250 psi (SDR-17), or 315 psi (SDR-13.5) shall be used as shown in the Bid Documents and Plans.

Samples of pipe and physical and chemical data sheets shall be submitted to the ENGINEER for review and determination of compliance with these specifications before pipe is delivered to job. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects.

The workmanship, pipe dimensions and tolerances, outside diameters, wall thickness, eccentricity, sustained pressures (ASTM D-1598), burst pressures (ASTM D-1599), flattening, extrusion quality (ASTM D-2152), marking and all other requirements of the Product Standard PS 22-70 shall be conformed with in all respects. No pipe, 2 inches in diameter or larger, with a wall thickness less than 0.090 inches may be used.

Pipe shall be furnished in 20 feet lengths. The pipe may be double plain end or with bell on one end. Male ends of pipe must be beveled on the outside. Pipe shall have a ring painted around the male end or ends in such a manner as to allow field checking of setting depth of pipe in the socket. This requirement is made to assist construction superintendents and inspectors in visual inspection of pipe installation.

Pipe must be delivered to job site by means which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe must not be exposed to the direct rays of the sun for an extended period of time. If pipe is not to be installed shortly after delivery to the job site, it must be stored in a shaded location and strung as needed.

2.1.2.2 PVC Pipe Jointing. Pipe shall be joined with slip-type joints with rubber gaskets. Pipes with bells shall have all parts of the bell, including the gasket groove, made from the same extruded piece, integral with the pipe, and shall be thickened to meet standard dimension ratios of wall thickness to outside diameter. This manufacturing procedure shall be the normal practice of the pipe manufacturer and proven by past performance of pipe in service. The gasket groove shall be constructed such that gasket rollout will not occur. Rubber gasketing shall conform to ASTM D-3139.

Joint lubricant shall be of a type recommended by the manufacturer for their pipe subject to the Engineer approval. Lubricant shall be water soluble, non-toxic and have no objectionable properties.

Due to special requirements for special gaskets for use within 200 feet of underground fuel tanks, gas lines, and/or oil transport lines, PVC pipe shall not be used under these circumstances.

2.1.2.3 PVC Couplings. Where PVC couplings are used, they shall be of the same material as the pipe and may be of the molded, or extruded type. PVC couplings shall have a minimum pressure rating equal to the pipe in which it is being used, but no less than 200 psi for continuous operation at 73.4 °F.

2.1.2.4 Fittings Restrained ductile iron mechanical joint fittings shall be used with PVC pipe. All such fittings shall be approved by the pipe manufacturer, and complete data sent to the ENGINEER, including the manufacturer's approval, for review. Fittings shall comply with AWWA C-110 or C-153 and shall be manufactured for the size and pressure class of the line on which they are used. Coatings and lining shall be in accordance with section 2.2.8 of the Specifications.

2.1.2.5 Service Connections. All service connections on PVC lines shall be made by means of a bronze service clamp, manufactured specifically for use with PVC pipe and appropriate corporation stop.

2.1.3 Polyvinyl Chloride (PVC) Pipe—AWWA C-900 Standard.

This specification covers the requirements for AWWA approved Polyvinyl Chloride Pressure Pipe for water supply and distribution systems.

2.1.3.1 PVC Pipe—AWWA C-900 Standard. PVC pipe shall meet the requirements of AWWA C-900, latest revision and shall be furnished in cast-iron pipe equivalent outside diameters with rubber gasketed joints.

C-900 PVC pipe shall be made from Class 12454-A or Class 12454-B virgin compounds as defined in ASTM D-1784. The standard code designation shall be PVC 1120. The PVC compounds shall be tested and certified as suitable for potable water products by the NSF Testing Laboratory and shall carry the NSF approval marking.

Solvent-cement couplings or joints shall not be used. PVC joints using elastomeric gaskets shall be tested as assembled joints and shall meet the laboratory performance requirements specified in ASTM D-3139.

Pipe shall be DR (Dimension Ratio) 18, or as shown on the plans or in the bid form.

Pipe and couplings shall meet or exceed the following test requirements:

Hydrostatic Integrity - Each standard and random length of pipe shall be proof-tested at four times its rated class pressure for a minimum of 5 seconds. Bells or couplings shall be tested with pipe. The pipe and couplings shall further meet or exceed the pressure test requirements of ASTM D-1598 and D-1599.

Flattening - The pipe shall not split, crack, or break when tested by the parallel-plate method as specified by ASTM D- 2241.

Extrusion quality - The pipe shall not flake or disintegrate when tested by the acetone-immersion method as specified in ASTM D-2241.

Standard length - Pipe shall be furnished in standard laying lengths of 20 ft. ± 1 in. A maximum of 15 percent of each pipe size may be furnished in random lengths of not less than 10 ft. each.

2.1.3.2 C-900 PVC Pipe Jointing. Pipe shall be joined with slip-type joints with rubber gaskets. Manufacturing and installation procedures shall be as recommended by the manufacturer and as described for PVC pipe in section 2.1.2 of this specification.

2.1.3.3 Fittings. Fittings for municipal PVC shall be ductile iron only. Fittings shall be restrained mechanical joint. Fittings shall be manufactured for the size and pressure class of the line on which they are used and shall comply with AWWA C-110 or C-153. Coatings and lining shall be in accordance with section 2.2.7 of the Specifications.

2.1.3.4 Service Connections. Service connections shall be made by means of a bronze service clamp, manufactured specifically for use with C-905 PVC pipe and appropriate corporation stops.

2.2 DUCTILE IRON PIPE

These specifications cover ductile iron pipe (3-inch diameter and greater) to be used in water transmission systems with mechanical joints, rubber ring slip type joints or flanged joints.

2.2.1 General. Ductile iron pipe shall be designed in accordance with AWWA and for pressures and conditions as stated in these specifications or called for on the plans. Ductile iron pipe shall conform to AWWA C-151.

2.2.2 Minimum Nominal Thickness. The specified thickness will be determined for the given internal and external loading requirements in accordance with AWWA C-150. The class of pipe, wall thickness, and coatings required will be shown on the plans or the bid form and/or as specified herein for all ductile iron pipe installation.

2.2.3 River Crossing Pipe. River crossing pipe shall be ductile iron, Flex-Lok as manufactured by the American Cast Iron Pipe company or equal conforming to the appropriate requirements of AWWA C150/ANSI A21.50 and AWWA C151/ANSI A21.5 with a minimum thickness class of 54.

2.2.4 Lengths. Pipe may be furnished in 12, 16, 16 1/2, 18 or 20 feet nominal laying lengths.

2.2.5 Marking. The net weight, class or nominal thickness and sampling period shall be marked on each pipe.

2.2.6 Underground Marking for DI Pipe. Underground marking for pipe shall be both tracing wire and marking tape.

2.2.6.1 *Underground Tracer Wire.* A detectable underground tracer wire shall be placed in the trench directly on top of the pipe. Wire shall be taped to the top of the pipe. The wire used shall be 12 AWG solid HDPE 30 MIL copper conductor with a 30 mil thick, high-density, high molecular weight polyethylene (HDPE) insulation and rated for 30 volts. Extreme care shall be exercised in splicing wire ends to assure continuity. Wire nuts designed specifically for buried service shall be used at all splices. At each valve box the wire shall be looped to the surface extending 12 inches above the concrete valve box pad (see Std. Dwg. for valve). When the entire project or pipeline segment is complete, including meter installation and leak repairs, the locating wire system shall be checked for continuity. Tracer wire to be provided by Pro-Line Safety Products, or approved equal. Wire insulation color shall be blue.

2.2.6.2 *Underground Marking Tape.* A detectable underground marking tape shall be placed in the trench approximately twelve inches below the finished grade. The tape used shall be Mylar encased aluminum foil with the printing “CAUTION - Buried Water Line Below”. Printing shall be readable through the clear Mylar and surface printing is not acceptable. Tape size shall be 2 inch width as provided by Lifeguard, Inc. or approved equal. Color of the tape shall be blue.

2.2.7 Pipe Joints for Ductile Iron Pipe. Joints for buried pipe shall be either mechanical joint or push-on joint conforming to the requirements of AWWA C-111. Mechanical joint bolts and nuts shall be the low-alloy steel type conforming to AWWA C-111.

Interior piping of vaults, plants, etc. shall be supplied with flanged joints meeting the requirements of AWWA C-115. Special joints, such as the “locked” or “restrained” type, shall be as shown on the plans and/or called for in the bid schedule.

Gaskets resistant to hydrocarbon penetration shall be used within 200 feet of underground fuel tanks, gas lines, and/or oil transport lines. The gaskets shall be approved by the Engineer.

2.2.8 Coatings and Lining. All buried ductile iron pipe shall have manufacturers outside coal tar or asphaltic base coating and a cement lining and bituminous seal coat on the inside. Cement mortar lining and a bituminous seal coat inside shall conform to AWWA C-104 latest revision.

Where specifically called for on the plans, pipe and fittings housed and in vaults shall be lined and coated on the inside as specified herein for buried ductile iron pipe and fittings, but the exterior shall be proved with a red primer coat. Pipe penetrating from the interior of vaults to the exterior shall be coated with coal tar epoxy.

2.2.9 Fittings for Ductile Iron Pipe. Ductile iron mechanical, push-on and flanged joints shall conform to AWWA C-110 or C-153 for centrifugally cast iron water pipe.

Mechanical joints shall also conform in all respects to AWWA C-111. All fittings shall be manufactured for the size and pressure class of the pipeline in which they are to be used. All fittings shall be furnished complete with all joint accessories. All ductile iron pipe fittings for water, sewer, air, gas and force main service shall be coated outside and lined on the inside the same as the line on which they are installed.

2.2.10 Locking Gaskets/ Restrained Joint. Restrained joint ductile iron pipe shall utilize push on gaskets such as Fast Grip, Field Lok, Sure Stop, or approved equal. Alternative restraint methods for ductile iron pipe may utilize standard gaskets with locking hubs, such as TR-Flex, or approved equal. Pipe shall be provided as noted on plans or as detailed in the Bid Schedule.

3.0 EXECUTION

3.1 HAULING AND STORAGE

The Contractor shall notify the Engineer when pipe will be received on the job so that proper arrangements may be made for inspecting the unloading and stringing, as well as inspecting and examining the pipe materials.

All pipe shall be covered with tarpaulin during hauling from the manufacturer to the job site. It is acceptable for the front end only to be covered. The intent is to prevent diesel exhaust residue from coating the pipe and/or contaminating the gaskets.

Care must be exercised in the handling of all materials and equipment. The Contractor will be held responsible for all breakage or damage to items caused by his workmen, agents, or appliances for handling or moving. Pipes and other castings shall in no case be thrown or dropped from cars, trucks, or wagons to the ground, but shall be lowered gently and not allowed to roll against or strike other castings and unyielding objects violently.

Valves, castings, fabricated metal, reinforcing steel, etc. shall be yarded or housed in some convenient location by the Contractor and delivered at the construction site as required. All equipment and materials subject to damage from the weather, dampness, changes in temperature, or exposure shall be protected by a dry, weatherproof enclosure until ready for installation or use. The cost of all hauling, handling, and storage shall be included in the prices bid for equipment and materials in place. The Owner takes no risk or responsibility for fire, flood, theft, or damage until after the final acceptance of the work.

3.2 LINES AND GRADES

The Contractor will be required to accomplish any detailed layout, including that required for establishing the grade of the pipe line.

3.3 TRENCH EXCAVATION

3.3.1 General. This section describes the acceptable methods of trenching for the installation of pressure pipe and casing pipe in an open trench.
Trenching may be accomplished by excavator, backhoe, trenching machine or by hand depending on the construction area.

At the Contractor's option, trenching, by a trenching machine, excavator, or by backhoe is acceptable except as noted below:

Where the pipe line is being constructed close to other utilities, structures, building, or large trees, and it is reasonable to anticipate possible damage from the use of powered excavation equipment, then trenching shall be made by hand methods.

The Contractor shall include in his unit price bid, all trenching necessary for installation of all pipelines as planned and specified. Trenching shall include all clearing and grubbing, including all weeds, briars, trees, stumps, etc. encountered in the trenching. The Contractor shall dispose of any such material by burning, burial, or hauling away (or as noted on the drawings), at no extra cost to the Owner. It shall be the Contractor's responsibility to notify the appropriate State and local Air Pollution Control agencies when he conducts open burning of refuse. Ornamental shrubs shall be removed, protected, and replanted. Trenching also includes such items as minor street, road, sidewalk, pipe and small creek crossings, and cutting, moving or repairing damage to fences, poles, gates and/or other surface structures regardless of whether shown on the plans.

The Contractor shall protect existing facilities against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of this backfill. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structures will be in as good condition and serve its purpose as completely as before and such restoration and repair shall be done without extra cost to the Owner. The use of trench-digging machinery will be permitted except where its operations will cause damage to trees, buildings or existing structures above or below the ground. At such locations hand methods shall be employed to avoid such damage. All excavated material shall be piled in a manner that will not endanger the work and will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions made for street drainage.

All excavation shall be open trenches, except where the drawings call for tunneling, boring, or jacking under structures, railroads, sidewalks and roads. The construction procedure for these types of excavation is described elsewhere in these specifications.

All trench excavation shall be termed unclassified and costs shall be included in the unit price bid for the pipe.

3.3.2 Clearing. The Contractor shall accomplish all clearing and/or grubbing as required for the construction under this contract. Clearing and grubbing shall include the cutting and removal of trees, stumps, brush, roots, logs, fences and other loose or projecting material and natural obstructions which, in the opinion of the Engineer, must be removed to properly construct and operate the facilities. Ornamental shrubs, plantings, fences, walls, etc. shall be removed and replanted or replaced or protected from the construction activity. Clearing and/or grubbing shall be incidental to the various bid items and no additional compensation will be paid for these activities.

3.3.3 Trench Depth. Trenches shall be excavated to the line and grade required for the installation of pipe at the elevations indicated on the plans. The minimum depth of cover shall be 30 inches above the top of the pipe, unless shown otherwise on the plans or on the Standard Details. When the pipe is laying in or on solid rock, the minimum depth of cover shall also be 30 inches above the top of the pipe. No additional compensation will be made for extra depth where required by the plans or due to Contractor error. Excavation, except as required for exploration, shall not begin until the proposed work has been staked out. Materials which are not required for backfill and site grading shall be removed and disposed of as directed by the Engineer. Hauling, bedding, and backfilling shall be considered incidental to the various bid items and will not be paid for directly. Excavation shall be of sufficient depth to allow the piping to be laid on the standard pipe bedding in accordance with Section 3.4. The trenches shall be excavated to a minimum of six inches below the bottom of the pipe barrel in rock. In all cases where lines are under traffic, a minimum cover of forty-two inches (42") shall be provided. Should it be necessary to avoid existing utilities, culverts, outlets, or other structures, the water line shall be carried deeper at no additional expense to the Owner.

Where the plans call for extra trench depth, this extra depth shall be provided at no extra cost.

3.3.4 Trench Width. Trench widths shall meet or exceed the minimum width that will provide free working space on each side of the pipe and to permit proper backfilling around the pipe as shown in the accompanying table and unless specifically authorized by the Engineer, shall not be excavated to wider than two feet (2') plus the nominal diameter of the pipe at the top of the trench. Before laying the pipe, the trench shall be opened far enough ahead to reveal any obstruction that may necessitate changing the line and grade of the pipe. Should the Contractor fail to accomplish this, and changes are required, they shall be at his sole expense. In rock, all ledge rocks, boulders and large stones shall be removed to provide eight inches (8") of clearance on each side and below all pipe and fittings.

Minimum Trench Width

Size	Width
Up to 4"	1'-6"
6" Pipe	2'-0"
8" Pipe	2'-0"

Size	Width
15" Pipe	2'-8"
16" Pipe	2'-8"
18" Pipe	3'-0"

10" Pipe	2'-4"
12" Pipe	2'-6"
14" Pipe	2'-6"

20" Pipe	3'-2"
21" Pipe	3'-4"
24" Pipe	3'-8"

3.3.5 Shoring, Sheeting, and Bracing of Excavation. Where unstable material is encountered, or where the depth of the excavation in earth exceeds five feet (5'), the sides of the trench or excavation shall be supported by substantial sheeting, bracing, or shoring. The design and installation of all sheeting, sheet piling, bracing or shoring shall be based on computations of pressure exerted by the materials to be retained under retaining conditions. Adequate and proper shoring of all excavations will be the entire responsibility of the Contractor. The Standards of the Federal Occupational Safety and Health Act and the Kentucky Department of Labor shall be followed.

The Engineer will not be responsible for determining requirements for bracing or sheeting.

3.3.6 Removal of Water. The Contractor shall provide for adequate removal of all water and the prevention of surface water from entering the excavation. The Contractor shall maintain dry conditions within the excavations until the backfill is placed. No additional compensation will be paid for replacement and/or stabilization of prepared excavations due to flooding and/or deterioration from extended exposure. All water pumped or drained from the excavation shall be disposed of in a suitable manner without damage to adjacent property or to other work under construction.

3.3.7 Pavement Removal. Pavement removal shall be as indicated on the plans or directed by the Engineer. When so required, or when directed by the Engineer, only one-half (1/2) of the street crossings or road crossings shall be excavated before placing temporary bridges over the side excavated, for the convenience of the traveling public. All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property Owners abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged at the direction of the Engineer. Pavement replacement shall be in accordance with Section 02539 of these specifications. Excavated materials shall be disposed of so as to cause the least interference and in every case the disposition of excavated materials shall be satisfactory to the Engineer.

3.3.8 Traffic Maintenance. The Contractor shall be held responsible for any damage that may occur to persons or property by reason of the failure of the Contractor to properly guard and flag all open trenches or obstructions along the routes of the water lines. The Contractor, at his own expense, shall maintain warning signs, barricades and watchmen or flag men to control traffic at such times as his work would interfere with the flow of traffic. No excavation shall begin that may present a safety hazard unless the signs, barricades, lights, etc. are available to protect the open excavation at the conclusion of the day. The Contractor shall comply with all Federal and State Occupational Safety and Health requirements for this type of construction. The

Contractor shall also comply with all local and Kentucky Department of Highways requirements for signing and traffic control.

3.3.9 Line Location. The location of pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. In such cases, the Owner reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by extra units of materials and construction actually involved. The Owner is under no obligation to locate pipelines so they can be excavated by machine.

3.4 BEDDING OF PIPELINE

In all cases the foundation for pipe shall be prepared so that the entire load of the back-fill on top of the pipe will be carried uniformly on the barrel of the pipe. The bells of the pipe shall not carry any of the load of the backfill. The Contractor should refer to the Standard Details for pipe bedding shown in the plans. The bedding specifications shall govern the backfill from the bottom of the trench up to the centerline or spring line of the pipe.

3.4.1 Stable Earth Foundation. On all PVC pipelines, the trench bottoms shall be smooth and free of frozen material, clodded dirt and stones over 1/2" diameter. Bottom dirt left by trenching equipment will usually provide adequate material to level the trench bottom and provide bedding support for the pipe barrel. If the trench bottom is free of dirt, soft material may be shoveled off the side walls or shoveled under the pipe to insure proper pipe barrel bedding. In areas where the trench bottom is hard, a layer of soft backfill must be provided to insure the pipe barrel is properly cushioned. See the plans for proper bedding material depth.

If the foundation is good firm earth the pipe may be laid directly on the undisturbed earth provided the pipe barrel is supported for its full length.

Bedding of No. 9 stone, fine gravel, sand or compacted finely graded select earth shall be used to correct irregularities in the subgrade.

As an alternative to the above method, excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe on a bed of granular material or finely graded select earth to provide continuous support for the pipe barrel. Bedding depth shall be as shown on the plans.

The bedding is not a separate pay item and shall be included as incidental expense in the unit price for the pipe bid per foot of pipe.

3.4.2 Trenches in Rock. All installation in rock will utilize the undercutting method. Bedding will be with 6 inches crushed stone or suitable earth material. Bedding will be

provided at no additional cost. Costs for the bedding shall be included in the unit price for the pipe.

3.5 PIPE LAYING

3.5.1 General. Proper instruments, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. Each pipe manufacturer shall have an experienced representative on the job for at least one day at the commencement of jointing and laying operations.

Before any length of pipe is placed in the trench, a careful inspection shall be made of the interior of the pipe to see that no foreign material is in the pipe. In order to properly remove any foreign materials, a swab of necessary length is to be available at all times.

All pipe shall be lowered carefully into the trench, properly aligned and properly jointed by use of suitable tools and equipment, in such a manner as to prevent damage to pipe materials and protective coatings and linings. Excessive scratching of the exterior surface of the pipe will be cause for rejection of the pipe.

Under no circumstances shall pipeline materials be dropped or dumped into the trench. The pipe and fittings shall also be inspected for the purpose of determining if they are sound and free from cracks. Laying of pipe shall be commenced immediately after excavation is started. Pipe shall be laid with bell ends facing in the direction of laying.

When pipe laying is not in progress, the open ends of pipe shall be closed by approved means to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. Any pipe which has floated shall be removed from the trench and re-laid as directed by the Engineer. No pipe shall be laid in water or on frozen trench bottom, or whenever the trench conditions or the weather are unsuitable for such work.

If any defective pipe and fittings shall be discovered after the pipeline is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge to the Owner. Open ends of unfinished pipe lines shall be securely plugged or closed at the end of each day's work or when the line is left temporarily at any other time.

3.5.2 Laying Ductile Iron Pipe. Ductile iron pipe shall first be thoroughly cleaned at joints, then joined according to instructions and with tools recommended by the manufacturer. Three (3) copies of instructions shall be furnished to the Engineer and one (1) copy shall be available at all times at the site of the work. The lining inside ductile iron pipe must not be damaged by handling.

All pipes must be forced and held together, or "homed" at the joints, before sealing or bolting. Pipe must be aligned as each joint is placed, so as to present as nearly true, straight lines and grades as is practical, and all curves and changes in grades must be

laid in such a manner that the manufacturer's recommended maximum deflection is not exceeded at any joint.

Cutting of pipe may be done by wheeled pipe cutters or saws as the Contractor may elect, but the Contractor will be held responsible for breakage or damage caused by careless cutting or handling.

All ductile iron pipe shall be installed per AWWA C150 Laying Condition Type 3 unless otherwise noted, six inches (6”) crushed stone bedding or suitable earth shall be used in rock. No pipe shall be laid resting on rock, blocking, or other unyielding objects. Jointing before placing in trench, and subsequent lowering of more than one section jointed together may be allowed, subject to the Engineer approval and direction.

When using pipe with push-on joints care must be exercised to make certain that the correct gasket is being used for the type of joint installed and that the gasket faces the proper direction. Before inserting the gasket, the groove and bell socket should be carefully cleaned of all dirt. If sand or dirt is permitted to remain in the groove, leaks may occur. Lubricant must be applied to bell socket, gasket and plain-end of pipe as required by manufacturer. Plain-end must be beveled before joint is made. Deflection required at the joint shall be obtained after the joint is made.

3.5.3 Laying Plastic Pipe. The trench bottom must be smooth and uniform and the alignment must conform to the plans. Bedding and cover as specified herein and shown in the Standard Details is required.

To make a clean and unobstructed joint, it is necessary to wipe the ring, groove and pipe spigot free from all foreign materials at the time of assembly. The ring must be positioned properly in the fitting to receive the pipe by a worker who is not in contact with the lubricant. In general, the lubricant is applied to the spigot (not the ring or groove). However, the manufacturer's instructions are to be followed in all cases. Only an approved lubricant may be used in accordance with the manufacturer's recommendations. All plastic pipe shall be joined by hand.

Where good bedding conditions are obtained PVC pipe smaller than 4 inches may be assembled outside the trench in longer sections (as conditions allow) and then lowered into the trench. At any time when improper bedding is discovered or the pipe is severely deflected the pipe will be removed from the trench and the condition corrected. Pipe in sizes 4 inch and above may be assembled outside the trench but must be lowered into the trench as each joint is assembled. Regardless of installation methods all joints must be inspected after laying in trench for proper insertion and alignment. Field cuts and bevels will be allowed in accordance with the manufacturer's recommendations for these operations. A new reference mark shall be installed before joining any field cut pipe. The same requirements for clearance from rock or other objects, thrust blocking and deflections shall apply to PVC pipe as for other pipe materials.

C-900 PVC pipe of all sizes must be assembled in the trench in strict accordance with the manufacturer's requirements.

3.5.4 Installation of River Crossing Pipe. The ball joint pipe shall be assembled and installed in accordance with manufacturer's recommendations. Installation shall be made at time of low flow, using cofferdams as necessary to divert stream flow. The ball joint pipe shall be laid and allowed to settle before joining to the pipe on each side of the stream. The ball and joint pipes shall be tested separately once in place to detect any leaks or bad joints. After connecting to the land pipe, it shall be tested the same as specified for the other water mains. See the DRAWINGS for additional installation requirements.

3.6 BACKFILLING

Backfilling must be started as soon as practicable after pipe has been laid. The Engineer shall be given a minimum of 8 hours for inspection before backfilling. The backfill shall be crushed rock, sand, or finely divided earth free from debris, organic material and stones, places simultaneously on both sides of pipe to the same level by hand.

In backfilling of the lower part of the trench beginning at the top of the bedding, the backfill material shall be carefully selected and walked-in around the pipe in 6” layers to a point 8 inches higher than the top of the pipe. The filling of the trench and the tamping of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipe line will not be disturbed and injurious side pressures do not occur.

After the above specified backfill is hand placed, rock may be used in the backfill in pieces no larger than 18 inches in any dimension and to an extent not greater than one-half (1/2) the backfill materials used. If additional earth is required, it must be obtained and placed by the Contractor. Filling with rock and earth shall proceed simultaneously, in order that all voids between rocks may be filled with earth. Above the hand placed backfill, machine backfilling may be employed without tamping, (if not contrary to specified conditions for the location) provided caution is used in quantity per dump and uniformity of level of backfilling. Backfill material must be uniformly ridged over trench and excess hauled away, with no excavated rock over 1-1/2 inches in diameter or pockets of crushed rock or gravel in top 6 inches of backfill. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth and its height shall not be in excess of needs for replacement of settlement of backfill. All rock, including crushed rock or gravel from construction, must be removed from yards and fields. Streets, roadways and walks shall be swept to remove all earth and loose rock immediately following backfilling.

In the case of street, highway, railroad, sidewalk and driveway crossings or within any roadway paving or about manholes, valve and meter boxes, the backfill must be machine tamped in not over 4-inch layers, measured loose in accordance with the

standard details. Where backfill is under paved driveways, streets, highways, railroads, sidewalks, paved parking areas and other areas where settlement is not allowed, crushed stone or coarse sand backfill only shall be used up to the paving surface. Crushed stone shall be Kentucky Department of Highways Standard Specification No. 57. Coarse sand backfill shall be spread in layers not over 4 inches thick and thoroughly compacted. Sand may be moistened to aide compaction. Tunnels shall be backfilled in not over 3-inch layers, measured loose, with selected material suitable for mechanically tamping. If material suitable for tamping cannot be obtained, sand, gravel or crushed rock shall be blown, packed or sluiced to completely fill all void spaces.

Where local conditions permit, pavement shall not be placed until 30 days have passed since placing backfill. Crushed stone is specified for roads and parking areas and sidewalks or their bases, shall be placed and compacted to the top of trench. Backfills shall be maintained easily passable to traffic at original ground level, until acceptance of project or replacement of paving or sidewalks.

Where the final surfacing is to be crushed stone, compacted earth backfill may be used in the trench to within 6 inches of the top as shown in the Standard Details.

The Kentucky Transportation Cabinet requires that water and sewer lines—when placed within the limits of the roadway embankment and/or beneath the roadway itself—be backfilled with sand, limestone sand (11's or smaller), or "flowable fill" as defined by Section 601.03.03.B(5) of their "Standard Specifications for Road and Bridge Construction". The Cabinet typically requires that sand, limestone sand, or flowable fill be used to backfill the trench and/or bore pit up to the subgrade elevation and extending to the outside edge of the shoulder.

Railroad Company and Highway Department requirements in regard to backfilling will take precedence over the above general specification where they are involved.

The Contractor shall protect all sewer, gas, electric, telephone, water and drain pipes or conduits, power and telephone poles and guy wires from danger of damage while pipelines are being constructed and backfilled, or from danger due to settlement of his backfill.

In case of damage to any such existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good condition and serve its purpose as completely as before uncovering and such restoration and repair shall be done without extra charge.

No extra charge shall be made for backfilling of any kind, except as provided in the Bid. Backfilling shall be included as a part of the unit price bid for which it is subsidiary. No extra charge shall be made for supplying outside materials for backfill.

Before completion of contract, all backfills shall be reshaped, holes filled and surplus material hauled away, and all permanent walks, street, driveway and highway paving, and sod, replaced and reseeding performed.

The line Contractor shall be responsible for clean-up, grading, seeding, sodding or otherwise restoring all areas that he disturbs.

Any deficiency in the quantity of material for backfilling the trenches or for filling depressions caused by settlement, shall be supplied by the Contractor.

3.7 TIE-INS TO EXISTING PIPELINES

This work shall consist of connecting new water pipes to the existing system where shown on the plans and shall include the necessary fittings, tapping sleeves, valves and necessary equipment and material required to complete the connection.

Knowledge of pipe sizes in the existing system may not be accurate, therefore, it is recommended that the Contractor check outside diameters of existing pipe and types of pipe prior to ordering the required accessories. No additional payment will be allowed for matching pipe and/or accessories when the proper size is not ordered.

Neither the Owner nor the Engineer can guarantee the location of the existing lines. The Contractor shall verify the location of all existing water mains and valves pertaining to the proposed improvements before excavation is started.

The necessary regulation or operation of the valves on existing mains, to allow for the connections being made, shall be supervised by the Engineer or Engineers' Representative. Before shutting down an existing water main or branch main for a proposed connection, prior approval for a specific time and time interval shall be obtained from a representative of the Owner. At no time shall an existing main be shut down without the Owner's knowledge and permission.

Excavation to existing water mains shall be carefully made, with care being exercised not to damage the pipe. The excavation shall not be of excessive size or depth beneath the pipe. The sides of the excavation shall be as nearly vertical as possible.

The Contractor shall be responsible for any damage to the existing system and any such damage shall be repaired to the satisfaction of the Engineer at the Contractor's expense.

The Contractor shall verify, by field inspection, the necessary sizes, lengths and the types of fittings needed for each inter-connection. Typical connections are shown on the plans and any modifications or changes shall be subject to the approval of the Engineer. The exact length of the proposed water main needed for this work shall also be determined by field measurement as required.

The probing required to locate existing mains is not a separate pay item.

3.8 PIPE ENTERING STRUCTURES

Ductile iron, steel or PVC pressure pipe, 4-inch diameter or larger, entering a structure below original earth level, unsupported by original earth for a distance of more than six feet (6'), shall be supported by #57 crushed stone. Costs for the support shall be included in the unit price for the pipe.

3.9 OWNERSHIP OF OLD MATERIALS

All fittings, valves, hydrants and other appurtenances that are removed as a result of new construction shall be removed by the Contractor but shall become the property of the Owner. All such items shall be delivered to a point by the Contractor. Said point shall be on the Owner's property and shall be designated by the Owner or Engineer.

3.10 THRUST BLOCKS AND ANCHORAGE

Thrust blocks shall be installed whenever the pipe line changes direction, as at tees, bends, crosses, stops, as at a dead end; or at valves. The locations of thrust blocks depend on the direction of thrust and type of fitting. Their size and type depends on pressure, pipe size, kind of soil, and the type of fitting. Where thrusts act upward (as at vertical curves) the weight of the pipe, the water in the pipe and the weight of the soil over the pipe should be determined to make certain that the total weight is sufficient to resist upward movement. If there is not enough soil or if it will not compact over the pipe or it is too soft to resist movement, then ballast or concrete may be placed around the pipe in sufficient weight and volume to counteract the thrust. Where a fitting is used to make a vertical bend, the fitting may be anchored to a concrete thrust block designed to key in to undisturbed soil and to have enough weight to resist upward and outward thrust, since the newly placed backfill may not have sufficient holding power.

Thrust blocks shall be constructed of not less than 3,000 psi concrete conforming to KTC Specification 601 and placed between the fitting and the trench wall. It is important to place the concrete so it extends to undisturbed (freshly cut) trench wall.

3.11 MAINTENANCE OF FLOW OF DRAINS AND SEWERS

Adequate provision shall be made for the flow of sewers, drains and water courses encountered during construction. Any structures which are disturbed shall be satisfactorily restored by the Contractor.

3.12 INTERRUPTION OF UTILITY SERVICES

No valve, switch or other control on any existing utility system shall be operated for any purpose by the Contractor without approval of the Engineer and the Utility. All

consumers affected by such operations shall be notified by the Contractor as directed by the Engineer and utility before the operation and advised of the probable time when service will be restored.

3.13 FENCING

Where water supply line is being constructed in fields where stock is being grazed, Contractor shall provide temporary fence as approved by the Engineer around open trenches to prevent stock from falling in trenches. Where trenching operations should isolate grazing stock from their source of water, Contractor will either provide temporary bridging over trench or else provide water for such stock.

Where trench crosses near sound existing corner posts and existing fence is in good condition, fence may be taken loose, rolled back and stored until pipe line is completed at this point, then replaced. Additional posts will be provided and additional new fence shall be provided when it is necessary to place the fence crossed by the water line in a condition equal to existing fence before water line was constructed.

Where it is necessary to cut existing fence, new end posts shall be installed on each side of the water line and the old fence thoroughly fastened to these new posts before cutting. After pipe line is completed at this point, a new fence of galvanized wire (No. 9 gauge with No. 11 filler wires) shall be stretched between these new end posts and thoroughly fastened to existing posts and any new intermediate posts necessary to provide a good fence. Replacement of all fences shall be on a replacement in-kind basis, and shall be considered incidental to laying of the lines and any additional cost shall be included in the unit price bid per lineal foot of pipe.

3.14 PROTECTION OF ADJACENT LANDSCAPE

Reasonable care shall be taken during construction of the water lines to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

In the course of construction, the Contractor may deflect horizontal alignment of the water line to avoid trees and to keep from damaging their roots. The Contractor shall be fully responsible for settling all claims by private property owners concerning damage to trees and shrubs.

3.15 COORDINATION WITH UTILITIES

Prior to construction, the Contractor shall arrange to meet with representatives of all utilities, and provide them with his anticipated work schedule. The Contractor shall have the utilities make their best determination of utility locations in the areas in which

he is working. Throughout the progress of the work, such field markings of utilities shall be kept current.

Repairs to any utilities damaged by the Contractor shall normally be performed by the utility at the Contractor's expense, unless the Contractor and the utility negotiate other understandings and/or procedures.

3.16 BLASTING AND ROCK EXCAVATION

The Contractor shall make his own investigation as he deems necessary to ascertain the sub-surface conditions to be encountered in the work.

All blasting operations shall be conducted in accordance with municipal ordinances, state and federal laws and Section 9, Explosives, of the "Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, Inc. Soil particle velocity shall not exceed limit set by Kentucky law. All explosives shall be stored in conformity with said ordinances, laws and safety regulations. No blasting shall be done within five feet of any water mains, sewer lines, natural or manufactured gas lines, liquid petroleum product lines or other utilities. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by him.

The Contractor shall use delay caps or other approved methods to reduce earth vibrations and noise. Mud capping, as defined in the above manual, will not be permitted as a method of breaking boulders. No blasting shall be permitted on Sundays or after dark.

Prior to commencing with the work, the Contractor shall, during a preconstruction conference with the Owner and the Engineer, state clearly his approach to performing the excavations on the project. He shall be familiar with the laws and ordinances covering blasting and shall also give consideration to the use of hydraulically operated rock breaking devices in lieu of blasting where considered necessary. If blasting is not handled in an expert manner at all times, the Engineer reserves the right to suspend blasting and require the work to proceed without it.

Prior to blasting, the Contractor shall make his own detailed preblast survey of adjacent walks, curbs, retaining walls, house foundations, etc. to determine conditions prior to the work. Such a file of information, including photographs, may be certified in such a manner as the Contractor believes necessary since this information that may stand in his defense.

4.0 PAYMENT

Payment for supplying, transporting and storing pipe, trenching, standard bedding, pipe installation, fittings, thrust-blocking, pipe locating wire and tape, testing, backfilling (including flowable fill, if required), disinfection, seeding, crop damage, regular stream

crossings, clean-up, tie-ins to other structures and other incidental items in this section shall be made on the basis of the unit price per linear foot for the type and size of pipe installed. Payment will include all those items not specifically covered by another proposal. Pipe will be measured along the centerline of the pipe as installed with no deduction for valves and fittings.

END OF SECTION

SECTION 02511

WATERLINE ACCESSORIES

1.0 GENERAL

The Contractor is to supply and install all valves, hydrants, blowoffs and other equipment at the locations shown on the plans in complete accordance with these specifications.

2.0 GATE VALVES

All gate valves shall be the resilient seat-type, iron body, non-rising stem, fully bronze mounted, and suitable for working water pressures of not less than 200 psi for installations on PVC pipe and not less than 250 psi for installations on DI pipe. Valves shall be of standard manufacture and of the highest quality both of materials and workmanship and shall conform to the latest revision of AWWA C-509 Standard. Valves shall be furnished with flanged connections for exposed piping and push-on or mechanical joint connections for buried service. Gate valves shall have a clear water way equal to the nominal diameter and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow cast in the middle, indicating the direction of opening. Each valve shall have the maker's initials, pressure rating and the year in which it was manufactured, cast on the body. Prior to shipment from the factory each valve shall be tested with hydraulic pressure of at least 300 pounds per square inch.

Underground valves shall be nut operated, unless otherwise shown on the plans. All underground valves which have nuts deeper than thirty inches (30'') below the top of valve box shall have extended stems with nuts located within two feet (2') of valve box cap. Buried service valves shall have either epoxy-coated or tar-coated exteriors.

The valve maker is to supply the Engineer, through the bidder, within one week after the award is made, complete catalogs or other material giving complete details and dimensions of valves and accessories.

Gate valves installed in underground piping systems may be installed in the vertical position for sizes up to 12-inch. Gate valves 14-inch and larger shall be installed in the horizontal position with bevel gear operators unless otherwise noted on the drawings. Gear operators shall be the totally enclosed type, oil filled and designed for buried and submerged service. Gear housing shall be ductile iron. Gears shall be steel. Pinion shafts shall be stainless steel. Shaft bearings shall be Teflon with "O"-Ring bearings. Gate Valves shall be Kennedy Brand or approved equal.

3.0 FIRE HYDRANTS

3.1 WORK INCLUDED

Under this Item, the Contractor shall provide all labor, tools, equipment, and materials to furnish and install hydrants with gate valves as shown on the drawing and as directed by the Engineer.

3.2 MATERIALS

All fire hydrants shall have a six-inch bell connection, shall have two hose outlets and one pumper connection, shall be designed for 250 pounds working pressure or 300 pounds hydrostatic pressure and shall conform to the latest specifications of the AWWA C502. All working parts shall be bronze. Both hose outlets shall be 2-1/2 inch with NST threads and the pumper outlet shall be 4-1/2 inch with NST thread. Hydrants shall be designed so that no water will be lost when they are broken off and so they can be repaired with a repair kit. Design, materials, and workmanship shall be similar and equal to the latest stock pattern ordinarily produced by the manufacturer. Length of barrel shall be such to provide a 42 inch bury depth. Working drawings and full description of hydrants shall be submitted to the Engineer before ordering. All hydrants shall have a 5-1/4 inch valve opening against pressure. The hydrants shall be Kennedy brand or approved equal. All hydrant extensions will be the responsibility of the Contractor.

3.3 PAINT

Hydrants shall be painted one coat of red paint and two finish coats of approved paint of color directed by the Engineer. All hydrants are to receive the final coat of paint after field installation.

3.4 INSTALLATION

Hydrants shall be set at such elevations that the connecting pipe will have the same depth of cover as the distribution main. The back of the hydrant opposite the pipe connection shall be firmly wedged against one and one-half square feet or enough of the vertical face of the trench with concrete to prevent the hydrants from blowing off the line. In addition, all fittings, valves and hydrants shall be joined by the use of all-thread rods, nuts and "DUC-LUG" offsets as shown on the attached drawing to prevent movement of the hydrant. If the character of the soil is such, in the opinion of the Engineer, that the hydrant cannot be securely wedged, bridle rod collars shall be used which shall be not less than three-fourths inch stock and shall be protected by a coat of acid resistant paint.

Not less than seven cubic feet of No. 9 stone shall be placed around the base of the hydrant to insure drainage. Before the No. 9 stone is placed and before it is backfilled the drain hole shall be inspected and thoroughly cleaned if necessary. The backfill

around the hydrant shall be thoroughly compacted to the grade line in a manner satisfactory to the Engineer. Hydrants shall have the interior cleaned of all foreign matter before installation. All hydrants will be installed with the pumper connection facing the main access road or as directed by the Engineer. Stuffing boxes shall be tightened and the hydrants shall be inspected in open and closed position to see that all parts are in working condition.

4.0 AIR VALVES

4.1 AIR RELEASE VALVES

A valve designed to allow exhaust of small pockets of air from the water main while in use shall be installed where shown on the plans or where directed by the Engineer. The air release valve shall have a 3/4” iron pipe thread inlet, cast iron body construction, bronze trim, with all internal parts of stainless steel. The valve shall have a minimum orifice size of 3/32”. Valves shall be suitable for a working water pressure of 150 PSIG. The air release valve shall be mounted on 3/4” bronze riser pipe. The riser pipe shall be connected to the water main by use of a service clamp and a corporation stop. The riser shall also have a 3/4" lead free bronze ball valve with stainless steel handle and be suitable for a 150 PSIG working water pressure. Air release valves shall be as manufactured by DeZURIK/APCO Model 50, or approved equal.

Air release valves shall be installed in the same type of box used for residential water meter installation. The box must allow for adequate cover over the pipe at the installation.

In locations where the air release valve can not be placed directly above the water main, such as roadway drainage ditches, then a section of piping shall be used to locate the valve as directed by the Engineer. The piping shall be installed with a continuous upward slope to eliminate air pockets. Additional payment for the piping shall be made based on the linear foot bid for service tubing. Piping shall also be rodded through the box to support the valve. No additional payment will be made for these supports.

5.0 VALVE BOXES

All valves (gate, air release, check, etc.) installed underground shall be installed in an approved valve box. Each gate valve shall be installed in a vertical position with a valve box. Valve boxes shall be of cast iron, slip-type consisting of a base, a center section and a top section with a cover marked "water". Where valve box is constructed in a paved area the box shall be a screw type box. The entire assembly shall be adjustable for elevation and shall be set vertically and be properly adjusted so that the cover will be in the same plane as the finished street surface (no more than 1/2" above ground in yards or pastures or 2" in unsodden areas). The assembly must provide for the required cover over the pipe at the installation site and shall rest on concrete pads as shown in the Standard Details.

6.0 BLOW-OFF VALVES

Blow-off valves shall be installed in accordance with the standard details and the specifications at locations shown on the plans and in other locations as directed by the Engineer. The Contractor should refer to the Standard Details for blow-off installation.

The blowoff pipe from the main to the flush valve shall be connected to the main by means of a tee. Do not use a corporation stop for this connection. The gate valve included in the blow-off connection shall be a resilient seat gate valve in conformance with AWWA C509 and with Section 2.0 of this specification.

7.0 TAPPING SLEEVE AND VALVE

Tapping sleeves shall be as manufactured by Romac, Ford, or approved equal, and shall be rated for a minimum working water pressure of 150 psi. Contractor shall ascertain the type and size of pipe to which the connection is to be made prior to selection. The valve shall be as specified under section 2.0 of this specification.

8.0 TIE-IN CONNECTIONS

All tie-in connections shall include labor, equipment, excavation, and any fittings necessary to make the required connection as shown on the plans. The fittings shall be mechanical joint, ductile iron type as specified in other sections, or as specified on the plans. Pipe for tie-ins shall be paid under separate bid items.

9.0 STUB-OUT

A stub-out shall consist of a gate valve restrained with all-thread to the main line. The valve shall be the same size as the main line and be as close to the main line as practical. The valve shall be as specified under section 2.0 of this specification. A minimum of one joint of pipe shall be laid past the valve with the bell end away from the valve. A cap matching the material and size of the pipe shall be placed at the end of the line. A wooden stake marked “WATER”, and flagged with blue paint and marking tape shall be placed at the end of the cap and shall extend above finished grade level thirty six inches (36”) to indicate position of stub-out.

10.0 MEASUREMENT AND PAYMENT

Payment for gate valves, check valves and other special valves installed underground shall include all work necessary for a complete installation and shall include all valve stem boxes or other valve boxes and box covers. Payment will be made at the unit price bid for the type and size of valve installation. The unit price bid for blow-off assemblies shall constitute full compensation for the furnishing and installation of the complete blow-off assembly. Tapping sleeve and valve tie-in connections shall be paid as indicated in the bid schedule. Stub-outs shall be paid as indicated in the bid schedule.

END OF SECTION

SECTION 02514

PRESSURE TESTING AND STERILIZATION

1.0 TESTING

1.1 After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure test of at least 1.5 times the working pressure at the point of testing, but in no case less than that required by other sections herein. In addition, a leakage test shall be conducted concurrently with the pressure test.

1.2 PRESSURE TEST

1.2.1 Test pressure shall:

1.2.1.1 Not be less than 1.25 times the working pressure at the highest point along the test section.

1.2.1.2 Not exceed pipe or thrust restraint design pressures at the lowest point along the test section.

1.2.1.3 Be of at least six (6) hour duration unless otherwise stipulated by owner.

1.2.1.4 Not vary by more than plus or minus 5 psi.

1.2.1.5 Not exceed twice the rated pressure of the valves or hydrants when the pressure of the test section includes closed gate valves or hydrants.

1.2.1.6 Not exceed the rated pressure of resilient seat butterfly valves when used.

1.2.2 Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer.

1.2.3 Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged, or left in place at the discretion of the Engineer.

1.2.4 All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves or hydrants that are

discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Engineer.

1.3 LEAKAGE TESTING

1.3.1 Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

1.3.2 No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND\sqrt{P}}{133{,}200}$$

in which L is the allowable leakage, in gallons per hour; N is the length of pipeline tested in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

1.3.2.1 Allowable leakage at various pressures is shown in TABLE K-1.

1.3.2.2 When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in of nominal valve size shall be allowed.

1.3.2.3 When hydrants are in the test section, the test shall be made against the closed hydrant.

1.3.3 Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than that specified in Section 1.3.2 the contractor shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.

1.3.3.1 All visible leaks are to be repaired regardless of the amount of leakage.

Table K-1
Allowable Leakage per 1,000 Ft. Of Pipeline (GPH)

Avg. Test Pressure (psi)	Nominal Pipe Diameter (Inches)								
	2	3	4	6	8	10	12	14	16
450	0.32	0.48	0.64	0.95	1.27	1.59	1.91	2.23	2.55
400	0.30	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40
350	0.28	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25
300	0.26	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08
275	0.25	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99
250	0.24	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90
225	0.23	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80
200	0.21	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70
175	0.20	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59
150	0.19	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47
125	0.17	0.25	0.34	0.50	0.67	0.84	0.01	1.18	1.34
100	0.15	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20

Avg. Test Pressure (psi)	Nominal Pipe Diameter (Inches)							
	18	20	24	30	36	42	48	54
450	2.87	3.18	3.82	4.78	5.73	6.69	7.65	8.60
400	2.70	3.00	3.60	4.50	5.41	6.31	7.21	8.11
350	2.53	2.81	3.37	4.21	5.06	5.90	6.74	7.58
300	2.34	2.60	3.12	3.90	4.68	5.46	6.24	7.02
275	2.24	2.49	2.99	3.73	4.48	5.23	5.98	6.72
250	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41
225	2.03	2.35	2.70	3.38	4.05	4.73	5.41	6.03
200	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73
175	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36
150	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97
125	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53
100	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05

2.0 STERILIZATION (NOT REQUIRED ON RAW WATER LINES)

2.1 GENERAL

It is the intent of this section to present essential procedures for disinfecting new and repaired water mains. Sterilization is only required on potable water lines. The section is patterned after AWWA C651. The basic procedure comprises:

2.1.1 Preventing contaminating materials from entering the water mains during construction or repair and removing by flushing materials that may have entered the water main.

2.1.2 Disinfecting any residual contamination that may remain.

2.1.3 Determining the bacteriologic quality by laboratory test after disinfection.

2.2 PREVENTIVE MEASURES DURING CONSTRUCTION

2.2.1 Precautions shall be taken to protect pipe interiors, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize entrance of foreign material. When pipe laying is not in progress, as, for example, at the close of the day's work, all openings in the pipeline shall be closed by water tight plugs. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

If dirt, that, in the opinion of the Engineer, will not be removed by the flushing operation (section 2.3) enters the pipe, the interior of the pipe shall be cleaned and swabbed as necessary, with a five (5%) percent hypochlorite disinfecting solution.

2.3 PRELIMINARY FLUSHING

The main shall be flushed prior to disinfection unless disinfected by the method in section 2.4.2.1. It is recommended that the flushing velocity be not less than 2.5 ft/sec. The rate of flow required to produce this velocity in various diameters is shown in Table K-2. No site for flushing should be chosen unless it has been determined that drainage is adequate at the site.

Table K-2
Required Openings to Flush Pipelines
(40-PSI Residual Pressure)

Pipe Size (in)	Flow Required to Produce 2.5 fps Velocity (gpm)	Orifice Size (in)	Hydrants Required	
			Number of Hydrants	Nozzle Size (In)
4	100	15/16	1	2 1/2
6	220	1 3/8	1	2 1/2
8	390	1 7/8	1	2 1/2
10	610	2 5/16	1	2 1/2
12	880	2 13/16	1	2 1/2
14	1,200	3 1/4	2	2 1/2
16	1,565	3 5/8	2	2 1/2
18	1,980	4 3/16	2	2 1/2

2.4 FORM OF CHLORINE FOR DISINFECTION

The most common forms of chlorine used in the disinfecting solutions are liquid chlorine (gas at atmospheric pressure), calcium hypochlorite granules, and sodium hypochlorite solutions.

2.4.1 Liquid Chlorine

2.4.1.1 *Use*: Liquid chlorine shall be used only when suitable equipment is available and only under the direct supervision of a person familiar with the physiological, chemical, and physical properties of this element and who is properly trained and equipped to handle any emergency that may arise. Introduction of chlorine-gas directly from the supply cylinder is unsafe and shall not be permitted.

NOTE: The preferred equipment consists of a solution fed chlorinator in combination with a booster pump for injecting the chlorine-gas water mixture into the main to be disinfected. Direct feed chlorinators are not recommended because their use is limited to situations where the water pressure is lower than the chlorine cylinder pressure.

2.4.2 Hypochlorites

2.4.2.1 *Calcium Hypochlorite*: Calcium hypochlorite contains seventy (70%) percent available chlorine by weight. It is either granular or tabular in form. The tablets, 6-8 to the ounce, are designed to dissolve slowly in water. Calcium hypochlorite is packaged

in containers of various types and sizes ranging from small plastic bottles to one hundred (100) pound drums.

A chlorine-water solution is prepared by dissolving the granules in water in the proportion requisite for the desired concentration.

2.4.2.2 Sodium Hypochlorite: Sodium hypochlorite is supplied in strengths from five and one-quarter (5.25%) to sixteen (16%) percent available chlorine. It is packaged in liquid form in glass, rubber, or plastic containers ranging in size from one (1) quart bottles to five (5) gallon carboys. It may also be purchased in bulk for delivery by tank truck.

The chlorine-water solution is prepared by adding hypochlorite to water. Product deterioration must be reckoned with in computing the quantity of sodium hypochlorite required for the desired concentration.

2.4.2.3 *Application*: The hypochlorite solutions shall be applied to the water main with a gasoline or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solutions may be fed with a hand pump, for example, a hydraulic test pump. Feed lines shall be of such material and strength as to withstand safely the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the hypochlorite solution is applied to the main.

2.5 METHODS OF CHLORINE APPLICATION

2.5.1 Continuous Feed Method: This method is suitable for general application.

2.5.1.1 Water from the existing distribution system or other approved sources of supply shall be made to flow at a constant, measured rate into the newly laid pipeline. The water shall receive a dose of chlorine, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration in the water in the pipe is maintained at a minimum of 50 mg/L of available chlorine. To assure that this concentration is maintained, the chlorine residual should be measured at regular intervals in accordance with the procedures described in the current edition of Standard Methods and AWWA M12—Simplified Procedures for Water Examination.

NOTE: In the absence of a meter, the rate may be determined either by placing a pitot gauge at the discharge or by measuring the time to fill a container of known volume.

TABLE K-3 gives the amount of chlorine residual required for each one hundred (100) feet of pipe of various diameters. Solutions of one (1%) percent chlorine may be prepared with sodium hypochlorite or calcium hypochlorite. The latter solution requires approximately one pound (1 lb.) of calcium hypochlorite in eight and five tenths (8.5) gallons of water.

Table K-3
Chlorine Required To Produce 50 mg/L Concentration
In 100 Ft. Of Pipe (By Diameter)

Pipe Size (in)	100 Percent Chlorine (lb)	1 Percent Chlorine Solutions (gal)
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88

2.5.1.2 During the application of the chlorine, valves shall be manipulated to prevent the treatment dosage from flowing back into the line supplying the water. Chlorine application shall not cease until the entire main is filled with the chlorine solution. The chlorinated water shall be retained in the main for at least twenty-four (24) hours during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this twenty-four (24) hour period, the treated water shall contain no less than 25 mg/L chlorine throughout the length of the main.

2.5.2 Slug Method: This method is suitable for use with mains of large diameter for which, because of the volumes of water involved, the continuous feed method is not practical.

2.5.2.1 Water from the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate (see section 2.5.1.1) into the newly laid pipeline. The water shall receive a dose of chlorine also fed at a constant, measured rate. The two rates shall be proportionate so that the concentration in the water entering the pipeline is maintained at no less than 300 mg/L. The chlorine shall be applied continuously and for a sufficient period to develop a solid column or "slug" of chlorinated water that will, as it passes along the line, expose all interior surfaces to a concentration of at least 300 mg/L for at least three (3) hours. The application shall be checked at a tap near the upstream end of the line by chlorine residual measurements.

2.5.2.2 As the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated as to disinfect appurtenances.

2.6 FINAL FLUSHING

After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/L. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipeline.

Disposing of Heavily Chlorinated Water: The environment into which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to be discharged to thoroughly neutralize the chlorine residual remaining in the water. See Table K-4 below for neutralizing chemicals. Federal, state, and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

Table K-4
Amount of Chemicals Required to Neutralize Various Residual Chlorine Concentrations in 100,000 Gallons of Water

Residual Chlorine Concentration	Sulfur Dioxide	Sodium Bisulfate	Sodium Sulfite	Sodium Thiosulfate
mg/L	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

2.7 BACTERIOLOGIC TESTS

2.7.1 After final flushing, and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriologic quality and shall show the absence of coliform organisms. If the number and frequency of samples is not prescribed by the public health authority having jurisdiction, at least one sample shall be collected from chlorinated supplies where a chlorine residual is maintained throughout the new main. From un-chlorinated supplies at least two samples shall be collected at least twenty-four (24) hours apart.

2.7.2 Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulphate. No hose or fire hydrant shall be used in the collection of samples. A suggested sampling tap consists of a standard corporation cock installed in the main with a copper tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed, and retained for future use.

2.8 REPETITION OF PROCEDURE

If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. The tablet method cannot be

used in these subsequent disinfections. When the sample tests indicate that disinfection has been effective, the main may be placed in service.

2.9 PROCEDURE AFTER CUTTING INTO OR REPAIRING EXISTING MAINS

The procedures outlined in this Section apply primarily when mains are wholly or partially dewatered. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under pressure present little danger of contamination and require no disinfection.

2.9.1 Trench "Treatment": When an old line is opened, either by accident or by design, the excavation will likely be wet and may be badly contaminated from nearby sewers. Liberal quantities of hypochlorite applied to open trench areas will lessen the danger from such pollution. Tablets have the advantage in such a situation because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.

2.9.2 Main Disinfection: The following procedure is considered as a minimum that may be used.

2.9.2.1 *Swabbing with Hypochlorite Solution*: The interior of all pipe and fittings used in making the repair (particularly couplings and tapping sleeves) shall be swabbed with a five (5%) percent hypochlorite solution before they are installed.

2.9.2.2 *Flushing*: Thorough flushing is the most practical means of removing contamination introduced during repairs. If valving and hydrant locations permit, flushing from both directions is recommended. Flushing shall be started as soon as the repairs are completed and continued until discolored water is eliminated.

2.9.2.3 *Slug Method*: Where practicable, in addition to the procedures of section 2.9.2.1, a section of main in which the break is located shall be isolated, all service connections shut off, and the section flushed and chlorinated as described in section 2.5.2, except that the dose may be increased to as much as 500 mg/L, and the contact time reduced to as little as one-half (1/2) hour. After chlorination, flushing shall be resumed and continued until discolored water is eliminated.

2.9.3 Sampling: Bacteriologic samples shall be taken after repairs to provide a record by which the effectiveness of the procedures used can be determined. If the direction of flow is unknown, samples shall be taken on each side of the main break.

3.0 PAYMENT

No separate payment shall be made for testing and sterilization of water lines. Items described in this section shall be incidental to the cost of installing the water line.

END OF SECTION

SECTION 02534

SEWER FORCE MAINS

1.0 GENERAL

The CONTRACTOR shall furnish all labor and equipment to install the sewer lines as shown on the plans and as specified herein.

The sewer force mains are to be DIP, PVC or HDPE plastic pipe, as specified hereinafter, and as shown on the project drawings. The bid documents shall show the locations and amounts of each type and class of pipe to be installed by the CONTRACTOR.

Note that this project includes connecting new force mains to existing force mains as indicated on the project drawings.

The OWNER will obtain all rights-of-way for operations through private property. It will also secure building permits and the permits for all work to be done in highway rights-of-way. Any charges for inspections or other fees required will be the responsibility of the CONTRACTOR since the amounts of these are dependent upon the operation of the CONTRACTOR.

2.0 MATERIALS

2.1 POLYVINYL CHLORIDE (PVC) PIPE

PVC pipe shall comply with ASTM D-1784 for material and shall be Class 200 (SDR-21), as shown on the PLANS or indicated in the proposal form. (SDR PR, Type 1, Grade 1). All PVC pipe shall conform to the latest revisions of the following specifications:

ASTM D2241 (PVC Plastic Pipe SDR-PR and Class T)

The name of the manufacturer of the plastic pipe to be used must be found on the current listing of Plastic Materials for Potable Water Application, published by the NSF (National Sanitation Foundation), Ann Arbor, Michigan, and must meet the requirements of the Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, D1784, 12454-B (PVC 1120) published by ASTM. Rubber gaskets shall conform to ASTM D3139.

Wall thickness shall be in accordance with ASTM D-2241. Pipe ends shall be beveled to accept the gasketed coupling. The bell section shall be designed to be at least as strong as the pipe wall.

Samples of pipe, physical and chemical data sheets shall be submitted to the ENGINEER for approval and his approval shall be obtained before pipe is purchased.

The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions, or other defects. The pipe shall be as uniform as commercially practical in color. The pipe for all sewer lines shall be green in color. Pipe shall have a ring painted around spigot ends in such a manner as to allow field checking of setting depth of pipe in the socket. Pipe must be delivered to the job site by means that will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical.

Pipe markings shall include the following, marked continuously down the length:

Manufacturer's Name
Nominal Size
PVC 1120
Class Pressure Rating
Identification Code

Lubricant shall be water soluble, non-toxic, non-objectionable in taste and odor imparted to the fluid, non-supporting of bacteria growth, and have no deterioration effect on the PVC or rubber gaskets.

2.2 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

The polyethylene base resin shall meet all requirements of ASTM D-1248 for Type III Grade P34, Category 5 and has a PPI rating of PE 3408 by the plastic pipe institute.

The pipe and fittings produced from this resin shall have a cell classification of PE 345434C under ASTM D-3350 and meet or exceed all the requirements.

All pipe shall meet AWWA C906 standards and shall be clearly marked on each joint of pipe. All PE pipe used for sewer lines shall be marked with a green stripe.

High density polyethylene pipe shall be joined by means of a butt fusion as per manufacturer’s recommendations.

2.3 DUCTILE IRON PIPE

Standard ductile Iron pipe provided shall be thickness Class 51 / Class 350 with push-on joints, restrained type where shown and/or specified and furnished in full compliance with AWWA Standards.

A. Heavier wall pipe shall be provided where shown and/or specified in the Contract Documents.

B. All pipe and fittings shall be cement lined and bituminous coated on the inside and coal tar enamel coated on the outside, unless otherwise shown and/or specified in the Contract Documents.

C. Interior and exterior epoxy coating shall be provided where shown and/or specified in the Contract Documents.

2.3 FITTINGS

Ductile iron mechanical joint fittings with appropriate adaptors shall be used with all plastic pipe. All such fittings shall be approved by the pipe manufacturer, and complete data sent to the ENGINEER, including the manufacturer's approval, for review. Fittings shall comply with AWWA C110 or C115 and shall be manufactured for the size and pressure class of the line on which they are used. All mechanical joints shall be restrained using the appropriate EBAA Iron Megalugs, Romac Grip-Rings, or approved equal.

2.4 UNDERGROUND MARKING TAPE

At all locations where plastic pipe is utilized, a detectable underground marking tape shall be placed in the trench approximately six inches below the finished grade. The tape used shall be mylar encased aluminum foil with the printing "CAUTION - Buried Sewer Line Below". Printing shall be readable through the clear mylar and surface printing is not acceptable. The tape size shall be 2-inch width as provided by Lifeguard, Inc. or approved equal. Color of the tape shall be green for the force mains and pressure mains.

2.5 UNDERGROUND TRACER WIRE

At all locations where indicated on the plans where plastic pipe is utilized, a #12 solid strand wire shall be placed along all pipe. At locations approximately every 700 feet, the wire shall be brought up to three feet (3’) above the ground surface and terminated in an appropriate line marker with terminals. All wire shall maintain continuity along all pipe in the sewer system. Connecting the wires will require wire nuts with tape.

3.0 EXECUTION

3.1 RESPONSIBILITY OF CONTRACTOR

When material deliveries are made, a representative of the CONTRACTOR and OWNER shall be present to inspect the material and the handling and storage activities. The materials to be installed by the CONTRACTOR will be delivered to the site(s)

established by the CONTRACTOR. Security of the materials storage shall be the responsibility of the CONTRACTOR. The cost of any lost or stolen materials shall be borne by the CONTRACTOR. The representatives of both the CONTRACTOR and OWNER shall sign the delivery invoices. The CONTRACTOR shall be responsible for the materials purchased by the OWNER and delivered to the site as if the materials were furnished by the CONTRACTOR.

3.2 HANDLING AND STORAGE OF MATERIALS

The CONTRACTOR will be required to deliver all equipment and other materials and place same where required for installation. Care must be exercised in the handling of all materials and equipment and the CONTRACTOR will be held responsible for all breakage or damage to same caused by his workmen, agents, or appliances for handling or moving. Pipes and other castings shall in no case be thrown or dropped from cars, trucks, or wagons to the ground, but same shall be lowered gently and not allowed to roll against or strike other unyielding objects violently. Pipe may be distributed at places that will not interfere with other construction operations and unloaded, or yarded and distributed as required, as the Contractor may elect.

Valves, castings, fabricated metal, casing, and appurtenances shall be yarded or housed in a convenient location by the CONTRACTOR and delivered to the active work areas as required. All equipment and materials subject to damage from the weather, dampness, changes in temperature, or UV exposure shall be protected by a dry, weatherproof enclosure until ready for installation or use. The cost of all hauling, handling, and storage shall be included in the prices bid installation in place. The OWNER takes no risk or responsibility for fire, flood, theft, or damage until after the final acceptance of work.

3.3 HAULING AND STORAGE

The CONTRACTOR shall notify the ENGINEER when pipe will be received on the job so that proper arrangements may be made for inspecting the unloading and stringing, as well as inspecting and examining the pipe materials.

All pipe shall be covered with tarpaulins or similar protection during hauling from the manufacturer to the job site. It is acceptable for the front end only to be covered. The intent is to prevent diesel exhaust residue from coating the pipe and/or contaminating the gaskets.

Care must be exercised in the handling of all materials and equipment. The CONTRACTOR will be held responsible for all breakage or damage to items caused by his workmen, agents, or appliances for handling or moving. Pipes shall in no case be thrown or dropped from cars, trucks, or wagons to the ground, but shall be lowered gently and not allowed to roll against or strike other unyielding objects violently.

Valves, castings, fabricated metal, reinforcing steel, etc. shall be yarded or housed in some convenient location by the CONTRACTOR and delivered at the construction site as required. All equipment and materials subject to damage from the weather, dampness, changes in temperature, or exposure shall be protected by a dry, weatherproof enclosure until ready for installation or use. The cost of all hauling, handling, and storage shall be included in the prices bid for equipment and materials in place. The OWNER takes no risk or responsibility for fire, flood, theft, or damage until after the final acceptance of the work.

3.4 LINES AND GRADES

The CONTRACTOR will be required to accomplish any detailed layout, including that required for establishing the grade and alignment of the pipe lines in accordance with the plans.

3.5 TRENCH EXCAVATION

3.5.1 General. This section describes the acceptable methods of trenching for the installation of pressure pipe and casing pipe in an open trench.

Trenching may be accomplished by means of a backhoe, approved trenching machine, or by hand depending on the construction area. No unapproved trenching machines shall be used.

At the CONTRACTOR'S option, trenching by backhoe is acceptable except as noted below:

> Where the pipeline is being constructed close to other utilities, structures, building, or large trees, and it is reasonable to anticipate possible damage from the use of a backhoe, then trenching shall be made by hand methods.

The CONTRACTOR shall include in his unit price bid, all trenching necessary for installation of all pipelines as planned and specified. Trenching shall include all clearing and grubbing, including all weeds, briars, trees, stumps, etc. encountered in the trenching. The CONTRACTOR shall lawfully dispose of any such material by burning, burial, or hauling away (or as noted on the drawings), at no extra cost to the OWNER. It shall be the CONTRACTOR'S responsibility to notify the appropriate State and local Air Pollution Control agencies when he conducts open burning of refuse. Ornamental shrubs shall be removed, protected, and replanted. Trenching also includes such items as minor street, road, sidewalk, pipe and small creek crossings, and cutting, moving or repairing damage to fences, poles, gates and/or other surface structures regardless of whether shown on the plans.

The CONTRACTOR shall protect existing facilities against danger or damage while pipelines are being constructed and backfilled, or from damage due to settlement of this backfill. In case of damage to any existing structures, repair and restoration shall be

made at once and backfill shall not be replaced until this repair and restoration is completed to the satisfaction of the ENGINEER and the OWNER. In all cases, restoration and repair shall be such that the damaged structures will be in as good condition and serve its purpose as completely as before and such restoration and repair shall be done without extra cost to the OWNER. The use of trench digging machinery will be permitted except where its operations will cause damage to trees, buildings or existing structures above or below the ground. At such locations hand methods shall be employed to avoid such damage. All excavated material shall be piled in a manner that will not endanger the work and will avoid obstructing sidewalks and driveways. Street and roadway gutters shall be kept clear, or other satisfactory provisions made for street drainage.

All excavation shall be open trenches, except where the drawings call for tunneling, boring, or jacking under structures, railroads, sidewalks, roads, creeks or streams/rivers. The construction procedure for these types of excavation is described elsewhere in these specifications.

All trench excavation shall be considered unclassified, and costs shall be included in the unit price bid for the pipe.

3.5.2 Clearing. The CONTRACTOR shall accomplish all clearing and/or grubbing as required for the construction under this contract. Clearing and grubbing shall include the cutting and removal of trees, stumps, brush, roots, logs, fences and other loose or projecting material and natural obstructions which, in the opinion of the ENGINEER, must be removed to properly construct and operate the facilities. Ornamental shrubs, plantings, fences, walls, etc. shall be removed and replanted or replaced or protected from the construction activity. Clearing and/or grubbing shall be incidental to the various bid items and no additional compensation will be paid for same.

3.5.3 Trench Depth. Trenches shall be excavated to the line and grade required for the installation of pipe at the elevations indicated on the plans. The minimum depth of cover shall be 36 inches above the crown (top) of the pipe, unless shown otherwise on the plans or on the Standard Details. When the pipe is laying in or on solid rock, the minimum depth of cover shall also be a minimum of 36 inches above the top of the pipe. No additional compensation will be made for extra depth where required by the plans, or due to CONTRACTOR error. Excavation, except as required for exploration, shall not begin until the proposed work has been staked out by the CONTRACTOR from control points provided by the ENGINEER and included on the plans. Materials which are not required for backfill and site grading shall be removed and disposed of as directed by the ENGINEER. Hauling, bedding, and backfilling shall be considered incidental to the various bid items and will not be paid for directly. Excavation shall be of sufficient depth to allow the piping to be laid on the standard pipe bedding in accordance with the section 3.6. The trenches shall be excavated to a minimum of six inches below the bottom of the pipe barrel in rock. In all cases where lines are under traffic a minimum cover of forty-two inches (42") shall be provided. Should it be necessary to avoid

existing utilities, culverts, outlets, or other structures, the sewer pressure and force main lines shall be carried deeper at no additional expense to the OWNER.

Where the plans call for extra trench depth, this extra depth shall be provided at no extra cost beyond the unit price bid for the force mains and pressure mains.

3.5.4 Trench Width. Trench widths shall not exceed the minimum width that will provide free working space on each side of the pipe, and to permit proper backfilling around the pipe as shown in the accompanying table, and unless specifically authorized by the ENGINEER, shall not be excavated to wider than two feet (2') plus the nominal diameter of the pipe at the top of the trench. Before laying the pipe, the trench shall be opened far enough ahead to reveal any obstruction that may necessitate changing the line and/or grade of the pipe. Should the CONTRACTOR fail to accomplish this, and changes are required, they shall be at his sole expense. In rock, all ledge rocks, boulders and large stones shall be removed to provide six inches (6") of clearance on each side and below all pipe and fittings.

Minimum Trench Width

Size	Width	Size	Width
Up to 4" Pipe	1'-6"	15" Pipe	2'-8"
6" Pipe	2'-0"	16" Pipe	2'-8"
8" Pipe	2'-0"	18" Pipe	3'-0"
10" Pipe	2'-4"	20" Pipe	3'-2"
12" Pipe	2'-6"	21" Pipe	3'-4"
14" Pipe	2'-6"	24" Pipe	3'-8"

3.5.5 Shoring, Sheeting, and Bracing of Excavation. Where unstable material is encountered, or where the depth of the excavation in earth exceeds five feet (5'), the sides of the trench or excavation shall be supported by substantial sheeting, bracing, or shoring. The design and installation of all sheeting, sheet piling, bracing or shoring shall be based on computations of pressure exerted by the materials to be retained under retaining conditions. Adequate and proper shoring of all excavations will be the entire responsibility of the CONTRACTOR. The Standards of the Federal Occupational Safety and Health Act and the Kentucky Department of Labor shall be followed.

The ENGINEER will not be responsible for determining requirements for bracing or sheeting.

3.5.6 Removal of Water. The CONTRACTOR shall provide for adequate removal of all water and the prevention of surface water from entering the excavation. The CONTRACTOR shall maintain dry conditions within the excavations until the backfill is placed. No additional compensation will be paid for replacement and/or stabilization of prepared excavations due to flooding and/or deterioration from extended exposure. All water pumped or drained from the excavation shall be disposed of in a suitable manner without damage to adjacent property or to other work under construction.

3.5.7 Pavement Removal. Pavement removal shall be as indicated on the plans or directed by the ENGINEER. When so required, or when directed by the ENGINEER, only one-half (1/2) of the street crossings or road crossings shall be excavated before placing temporary bridges over the side excavated, for the convenience of the traveling public. All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property owners abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged at the direction of the ENGINEER. Pavement replacement shall be in accordance with Section 02539 of these specifications. Excavated materials shall be disposed of so as to cause the least interference and in every case the disposition of excavated materials shall be satisfactory to the ENGINEER.

3.5.8 Traffic Maintenance. The CONTRACTOR shall be held responsible for any damage that may occur to persons or property by reason of the failure of the CONTRACTOR to properly guard and flag all open trenches or obstructions along the routes of the sewer lines. The CONTRACTOR at his own expense shall maintain warning signs, barricades and watchmen or flag men to control traffic at such times as his work would interfere with the flow of traffic. No excavation shall begin that may present a safety hazard unless the signs, barricades, lights, etc. are available to protect the open excavation at the conclusion of the day. The CONTRACTOR will comply with all Federal and State Occupational Safety and Health requirements for this type of construction. The CONTRACTOR shall also comply with all local and Kentucky Department of Highways requirements for signing and traffic control. Additionally, the CONTRACTOR shall ensure that at least a single lane for traffic is maintained such that emergency vehicles have access and can transit the work areas at all times during project construction.

3.5.9 Line Location. The location of pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. In such cases, the OWNER reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by extra units of materials and construction actually involved. The OWNER is under no obligation to locate pipelines so they can be excavated by machine.

3.6 BEDDING OF PIPELINE

In all cases the foundation for pipe shall be prepared so that the entire load of the back-fill on top of the pipe will be carried uniformly on the barrel of the pipe. The bells (if applicable) of the pipe shall not carry any of the load of the backfill. The CONTRACTOR should refer to the Standard Details for pipe bedding shown in the plans. The bedding specifications shall govern the backfill from the bottom of the trench up to the centerline or spring line of the pipe.

3.6.1 Stable Earth Foundation. On all plastic pipelines, the trench bottoms shall be smooth and free of frozen material, dirt clods, and stones over 1/2" dimension in any direction. Bottom dirt left by trenching equipment will usually provide adequate material to level the trench bottom and provide bedding support for the pipe barrel. If the trench bottom is free of dirt, soft material may be shoveled off the side walls or shoveled under the pipe to insure proper pipe barrel bedding. In areas where the trench bottom is hard, a layer of soft backfill or crushed stone must be provided to ensure the pipe barrel is properly cushioned. See the plans for proper bedding material depth.

If the foundation is good firm earth the pipe may be laid directly on the undisturbed earth provided the pipe barrel is supported for its full length.

Bedding of No. 9 stone, fine gravel, sand or compacted finely graded select earth shall be used to correct irregularities in the subgrade.

As an alternative to the above method, excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe on a bed of granular material or finely graded select earth to provide continuous support for the pipe barrel. Bedding depth shall be as shown on the plans.

The bedding is not a separate pay item and shall be included as incidental expense in the unit price for the pipe bid per foot of pipe.

3.6.2 Trenches In Rock. All installation in rock will utilize the undercutting method. Bedding will be with a minimum of 6 inches of crushed stone, or suitable earth material approved by the ENGINEER and OWNER.

3.7 PIPE LAYING

3.7.1 General. Proper instruments, equipment, tools, and facilities satisfactory to the ENGINEER shall be provided and used by the CONTRACTOR for the safe and convenient prosecution of the work. Each pipe manufacturer shall have an experienced representative on the job for at least one day at the commencement of jointing and laying operations.

Note that this project includes dual force mains laid in a common trench.

Pipe is to be laid in a trench that is no less than 36” deep to the top of the pipe.

Before any length of pipe is placed in the trench, a careful inspection shall be made of the interior of the pipe to see that no foreign material is in the pipe. In order to properly remove any foreign materials, a swab of necessary length is to be available at all times.

All pipe shall be lowered carefully into the trench, properly aligned and properly jointed or fused by use of suitable tools and equipment, in such a manner as to prevent

damage to water line materials and protective coatings and linings. Excessive scratching of the exterior surface of the pipe will be cause for rejection of the pipe.

Under no circumstances shall pipeline materials be dropped or dumped into the trench. The pipe and fittings shall also be inspected for the purpose of determining if they are sound and free from cracks. Laying of pipe shall be commenced immediately after excavation is started.

When pipe laying is not in progress, the open ends of pipe shall be closed by approved means to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. Any pipe which has floated shall be removed from the trench and re-laid as directed by the ENGINEER. No pipe shall be laid in water or on frozen trench bottom, or whenever the trench conditions or the weather are unsuitable for such work.

If any defective pipe and fittings shall be discovered after the pipeline is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge to the OWNER. Open ends of unfinished pipe lines shall be securely plugged or closed at the end of each day's work or when the line is left temporarily at any other time.

3.7.2 Laying Ductile Iron Pipe (not applicable to this project). Ductile iron pipe shall first be thoroughly cleaned at joints, then joined according to instructions and with tools recommended by the manufacturer. Three (3) copies of instructions shall be furnished to the ENGINEER and one (1) copy shall be available at all times at the site of the work. The lining inside ductile iron pipe must not be damaged by handling.

All pipes must be forced and held together, or "homed" at the joints, before sealing or bolting. Pipe must be aligned as each joint is placed, so as to present as nearly true, straight lines and grades as is practical, and all curves and changes in grades must be laid in such a manner that the manufacturer's recommended maximum deflection is not exceeded at any joint.

Cutting of pipe may be done by wheeled pipe cutters or saws as the CONTRACTOR may elect, but the CONTRACTOR will be held responsible for breakage or damage caused by careless cutting or handling.

All ductile iron pipe shall be installed per AWWA C150 Laying Condition Type 3 unless otherwise noted, six inches (6”) crushed stone bedding or suitable earth shall be used in rock. No pipe shall be laid resting on rock, blocking, or other unyielding objects. Jointing before placing in trench, and subsequent lowering of more than one section jointed together may be allowed, subject to the ENGINEER’S approval and direction.

When using pipe with push-on joints care must be exercised to make certain that the correct gasket is being used for the type of joint installed and that the gasket faces the proper direction. Before inserting the gasket, the groove and bell socket should be carefully cleaned of all dirt. If sand or dirt is permitted to remain in the groove, leaks

may occur. Lubricant must be applied to bell socket, gasket and plain-end of pipe as required by manufacturer. Plain-end must be beveled before joint is made. Deflection required at the joint shall be obtained after the joint is made.

3.7.3 Laying Plastic Pipe. The trench bottom must be smooth and uniform and the alignment must conform to the plans. Bedding and cover as specified herein and shown in the Standard Details is required.

HDPE pipe shall be butt fused in accordance with the manufacturer's recommendations, by a certified fusing technician using equipment meeting the manufacturer's requirements. The fusing technician shall have a minimum of 50,000 LF of prior experience fusing HDPE pipe.

Where good bedding conditions are obtained HDPE pipe smaller than four (4'') inches may be assembled outside the trench in longer sections (as conditions allow) and then lowered into the trench. At any time when improper bedding is discovered or the pipe is severely deflected the pipe will be removed from the trench and the condition corrected. Pipe in sizes four inch (4'') and above may be assembled outside the trench but must be lowered into the trench as each joint/section is assembled. Regardless of installation methods all joints must be inspected after laying in trench for proper insertion and alignment. Field cuts and bevels will be allowed in accordance with the manufacturer's recommendations for these operations. A new reference mark shall be installed before joining any field cut pipe. The same requirements for clearance from rock or other objects, thrust blocking and deflections shall apply to HDPE pipe as for other pipe materials.

3.7.4 Installation of River Crossing Pipe (if applicable). The pipe shall be assembled and installed in accordance with manufacturer's recommendations. Installation shall be made at time of low flow, using cofferdams as necessary to divert stream flow. The pipe shall be laid and allowed to settle before joining to the pipe on each side of the stream. The pipes shall be tested separately once in place to detect any leaks or bad joints. After connecting to the land pipe, it shall be tested the same as specified for the other sewer mains. See the Drawings for additional installation requirements.

3.8 BACKFILLING

Backfilling must be started as soon as practicable after pipe has been laid. The Engineer/Inspector shall be given a minimum of eight hours (8) for inspection before backfilling. The backfill shall be crushed rock, sand, or finely divided earth free from debris, organic material and stones, placed simultaneously on both sides of pipe to the same level by hand. In backfilling of the lower part of the trench beginning at the top of the bedding, the backfill material shall be carefully selected and walked-in around the pipe in 6" layers to a point eight inches (8'') higher than the top of the pipe. The filling of the trench and the tamping of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipe line will not be disturbed, and injurious side pressures do not occur.

After the above specified backfill is placed, rock may be used in the backfill in pieces no larger than 3 inches (3”) in any dimension, to an extent not greater than one-half (1/2) the backfill materials used, and no closer than within 8” of the pipe. If additional earth is required, it must be obtained and placed by the CONTRACTOR. Filling with rock and earth shall proceed simultaneously, in order that all voids between rocks may be filled with earth. Above the hand placed backfill, machine backfilling may be employed without tamping, (if not contrary to specified conditions for the location) provided caution is used in quantity per dump and uniformity of level of backfilling. Backfill material must be uniformly ridged over trench and excess hauled away, with no excavated rock over 1-1/2 inch in diameter or pockets of crushed rock or gravel in the upper six inches (6’’) of backfill. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth and its height shall not be in excess of needs for replacement or settlement of backfill. All rock, including crushed rock or gravel from construction, must be removed from yards and fields. Streets, roadways and walks shall be swept to remove all earth and loose rock immediately following backfilling.

In the case of street, highway, railroad, sidewalk and driveway crossings or within any roadway paving or adjacent to manholes, and valve and meter boxes, the crushed stone backfill must be machine tamped in not over four-inch (4’’) layers, measured loose in accordance with the standard details. Where backfill is under paved driveways, streets, highways, railroads, sidewalks, paved parking areas and other areas where settlement is not allowed, crushed stone or coarse sand backfill only shall be used up to the paving surface. Crushed stone shall be Kentucky Department of Highways Standard Specification No. 9 or No. 57. Coarse sand backfill shall be spread in layers not over four inches (4’’) thick and thoroughly compacted. Sand may be moistened to aide compaction. Tunnels shall be backfilled in not over 3-inch layers, measured loose, with selected material suitable for mechanically tamping. If material suitable for tamping cannot be obtained, sand, gravel or crushed rock shall be blown, packed or sluiced to complete fill all void spaces.

Where local conditions permit, pavement shall not be placed until thirty days (30) have passed since placing backfill. Crushed stone backfill is specified for roads, parking areas, and sidewalks, or their bases, and shall be placed and compacted to the top of trench. Backfills shall be maintained easily passable to traffic at original ground level, and until acceptance of project or replacement of paving or sidewalks.

Where the final surfacing is to be crushed stone, compacted earth backfill may be used in the trench to within six inches (6’’) of the finished surface elevation as shown in the Standard Details.

The Kentucky Transportation Cabinet requires that open cut water and sewer lines—when placed within the limits of the roadway embankment and/or beneath the roadway itself—be backfilled with sand, limestone sand (11’s or smaller), or “flowable fill” as defined by Section 601.03.03.B(5) of their “Standard Specifications for Road and Bridge Construction”. The Cabinet typically requires that sand, limestone sand, or flowable fill

be used to backfill the trench and/or bore pit up to the subgrade elevation and extending to the outside edge of the shoulder.

Railroad Company and Highway Department requirements in regard to backfilling will take precedence over the above general specification where applicable.

The CONTRACTOR shall protect all sewer, gas, electric, telephone, water and drain pipes or conduits, power and telephone poles and guy wires from danger of damage while pipelines are being constructed and backfilled, or from danger due to settlement of his backfill.

In case of damage to any such existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good condition and serve its purpose as completely as before uncovering and such restoration and repair shall be done to the satisfaction of the affected utility without extra charge to the OWNER.

No extra charge shall be made for backfilling of any kind, except as provided in the Bid as a bid item. Backfilling shall be included as a part of the unit price bid for which it is subsidiary. No extra charge shall be made for supplying outside materials for backfill if such materials are necessary.

Before completion of the contract, all backfills shall be reshaped, holes filled and surplus material hauled away, and all permanent walks, street, driveway and highway paving, and sod, replaced and reseeding performed.

The line Contractor shall be responsible for clean-up, grading, seeding, sodding or otherwise restoring all areas that he disturbs.

Any deficiency in the quantity of material for backfilling the trenches or for filling depressions caused by settlement, shall be supplied by the CONTRACTOR.

3.9 TIE-INS TO EXISTING PIPELINES

This work shall consist of connecting new sewer lines to the existing system where shown on the plans and shall include the necessary fittings, couplings, adapters, tapping sleeves, valves and necessary equipment and material required to complete the connection.

Knowledge of pipe sizes in the existing system may not be accurate, therefore, it is strongly recommended that the CONTRACTOR check outside diameters of existing pipe and types of pipe prior to ordering the required accessories. No additional payment will be allowed for matching pipe and/or accessories when the proper size is not ordered.

Neither the OWNER nor the ENGINEER can guarantee the location of the existing lines. The CONTRACTOR shall verify the location of all existing sewer lines pertaining to the proposed improvements before excavation is started.

The necessary regulation or operation of the valves on existing mains, to allow for the connections being made, shall be supervised by the ENGINEER / INSPECTOR. Before shutting down an existing sewer line or branch line for a proposed connection, prior approval for a specific time and time interval shall be obtained from an authorized representative of the OWNER. At no time shall an existing sewer line or force main be shut down without the OWNEW'S full knowledge and permission.

Excavation to existing sewer lines shall be carefully made, care being exercised not to damage the pipe. The excavation shall not be of excessive size or depth beneath the pipe. The sides of the excavation shall be as nearly vertical as possible.

The CONTRACTOR shall be responsible for any damage to the existing system and any such damage shall be repaired to the satisfaction of the ENGINEER and OWNER at the CONTRACTOR's expense.

The CONTRACTOR shall verify, by field inspection, the necessary sizes, lengths and the types of fittings needed for each inter-connection. Typical connections are shown on the plans, and any modifications or changes shall be subject to the approval of the ENGINEER. The exact length of the proposed sewer lines needed for this work shall also be determined by field measurement as required.

The probing and exploration required to locate existing mains is not a separate pay item, and is to be included in the bid price for the item(s) to which it is subsidiary.

3.10 PIPE ENTERING STRUCTURES

Ductile iron, steel, PVC, or HDPE pressure pipe, four-inch (4'') diameter or larger, entering structure below original earth level, unsupported by original earth for a distance of more than six feet (6'), shall be supported by compacted #57 crushed stone. Costs for the support shall be included in the unit price for the pipe.

3.11 OWNERSHIP OF EXISTING MATERIALS

All fittings, valves, and other appurtenances that are removed as a result of new construction shall be removed by the CONTRACTOR but shall become the property of the OWNER. All such items shall be delivered to a designated location by the CONTRACTOR. Said location shall be on the OWNER's property and shall be designated by the ENGINEER and OWNER.

3.12 THRUST BLOCKS AND ANCHORAGE

Thrust blocks shall be installed whenever the pressure sewer lines / force mains change direction, as at tees, bends, crosses, stops, as at a dead end; or at valves. The locations of thrust blocks depend on the direction of thrust and type of fitting. Their size and type depends on pressure, pipe size, kind of soil, and the type of fitting. Where thrusts act upward (as at vertical curves) the weight of the pipe, the water in the pipe and the weight of the soil over the pipe should be determined to make certain that the total weight is sufficient to resist upward movement. If there is not enough soil or if it will not compact over the pipe or it is too soft to resist movement, then ballast or concrete may be placed around the pipe in sufficient weight and volume to counteract the thrust. Where a fitting is used to make a vertical bend, the fitting may be anchored to a concrete thrust block designed to key in to undisturbed soil and to have enough weight to resist upward and outward thrust, since the newly placed backfill may not have sufficient holding power.

Thrust blocks shall be constructed of not less than Class B concrete conforming to KTC Specification 601 and placed between the fitting and the trench wall. It is important to place the concrete so it extends to undisturbed (freshly cut) trench wall.

3.13 MAINTENANCE OF FLOW OF STORM DRAINS AND SEWERS

Adequate provision shall be made for the flow of gravity sewers, drains and water courses encountered during construction. Any structures which are disturbed shall be satisfactorily restored by the CONTRACTOR to the satisfaction of the ENGINEER and the OWNER.

3.14 INTERRUPTION OF UTILITY SERVICES

No valve, switch or other control on any existing utility system shall be operated for any purpose by the CONTRACTOR without approval of the ENGINEER and the OWNER. All consumers affected by such operations shall be notified by the CONTRACTOR as directed by the ENGINEER and OWNER before the operation and advised of the probable time when service will be restored.

3.15 FENCING

Where force or pressure mains are being constructed in fields where stock is being grazed, CONTRACTOR shall provide temporary fence as approved by the ENGINEER around open trenches to prevent stock from falling in trenches. Where trenching operations should isolate grazing stock from their source of water, CONTRACTOR will either provide temporary bridging over trench or else provide water for such stock.

Where trench crosses near sound existing corner posts and existing fence is in good condition, fence may be taken loose, rolled back and stored until pipe line is completed at this point, then replaced by stretching tightly and thoroughly stapling. Additional

posts will be provided and additional new fence shall be provided when it is necessary to place the fence crossed by the water line in a condition equal to existing fence before water line was constructed.

Where it is necessary to cut existing fence, new end posts shall be installed on each side of the sewer line and the old fence thoroughly stapled to these new posts before cutting. After pipe line is completed at this point, a new fence of galvanized wire (No. 9 gauge with No. 11 filler wires) shall be stretched between these new end posts and thoroughly stapled to existing posts and any new intermediate posts necessary to provide a good fence. Replacement of fences shall be on a replacement in-kind basis, and shall be considered incidental to laying of the lines and any additional cost shall be included in the unit price bid per lineal foot of pipe.

3.16 PROTECTION OF ADJACENT LANDSCAPE

Reasonable care shall be taken during construction of the sewer lines to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

In the course of construction, the CONTRACTOR may deflect horizontal alignment of the sewer line to avoid trees and to keep from damaging their roots. The CONTRACTOR shall be fully responsible for settling all claims by private property owners concerning damage to trees and shrubs.

3.17 COORDINATION WITH UTILITIES

Prior to construction, the CONTACTOR shall arrange to meet with representatives of all utilities, and provide them with his anticipated work schedule. The CONTRACTOR shall have the utilities make their best determination of utility locations in the areas in which he is working. Throughout the progress of the work, such field markings of utilities shall be kept current.

Repairs to any utilities damaged by the CONTRACTOR shall normally be performed by the affected utility at the CONTRACTOR'S expense, unless the CONTRACTOR and the utility negotiate other understandings and/or procedures.

3.18 BLASTING AND ROCK EXCAVATION

The CONTRACTOR shall make his own investigation as he deems necessary to ascertain the sub-surface conditions to be encountered in the work.

All blasting operations shall be conducted in accordance with municipal ordinances, state and federal laws and Section 9, Explosives, of the "Manual of Accident Prevention

in Construction", published by the Associated General Contractors of America, Inc. Soil particle velocity shall not exceed limit set by Kentucky law. All explosives shall be stored in conformity with said ordinances, laws and safety regulations. No blasting shall be done within five feet of any water mains, sewer lines, natural or manufactured gas lines, liquid petroleum product lines or other utilities. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by him.

The CONTRACTOR shall use delay caps or other approved methods to reduce earth vibrations and noise. Mud capping, as defined in the above manual, will not be permitted as a method of breaking boulders. No blasting shall be permitted on Sundays or after dark.

Prior to commencing with the work, the CONTRACTOR shall, during a preconstruction conference with the OWNER and the ENGINEER, state clearly his approach to performing the excavations on the project. He shall be familiar with the laws and ordinances covering blasting and shall also give consideration to the use of hydraulically operated rock breaking devices in lieu of blasting where considered necessary. If blasting is not handled in an expert manner at all times, the ENGNEER reserves the right to suspend blasting and require the work to proceed without it.

Prior to blasting, the CONTRACTOR shall make his own detailed preblast survey of adjacent walks, curbs, retaining walls, house foundations, etc. to determine conditions prior to the work. Such a file of information, including photographs, may be certified in such a manner as the Contractor believes necessary since this information that may stand in his defense.

3.19 TESTING AND CLEANING

As sections of the new sewer lines are completed the pipe shall be thoroughly cleaned by forcing a “Pig” type cleaner through the pipe a sufficient number of times to remove all debris and deleterious matter inside the pipe that has accumulated during construction. A minimum of two “Pig” runs will be required.

The force mains, pressure mains, and appurtenances, as soon as practical as valves are installed, shall be tested to the pressure rating of the pipe, or as directed by the ENGINEER, at point of maximum pressure. Defective joints of pipe shall be cut out and replaced as directed by the ENGINEER. Cracked or defective pipe fittings, valves, or appurtenances revealed by the pressure test shall be replaced by the CONTRACTOR with sound material, and the test shall be repeated until the test results are satisfactory to the ENGINEER and OWNER.

The test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section and the hydrostatic test shall be of at least a two (2) hour duration. The test pressure shall not vary by more than +/- 5 psi for the duration of the test.

3.19.1 Pressurization. After the pipe has been laid, all newly laid pipe, or any valved section thereof, shall be subjected to a hydrostatic pressure of at least 1.25 times the working pressure of that section of pipe, and shall be slowly filled with water, and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the ENGINEER and OWNER. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.

3.19.2 Air Removal. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the CONTRACTOR shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the OWNER.

3.19.3 Leakage Defined. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled.

Leakage shall not be measured by a drop in pressure in a test section over a period of time.

3.19.4 Allowable Leakage. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\,(SQ.\ ROOT\ (P))}{133{,}200}$$

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pound per square inch (gauge)

This formula is based on an allowable leakage of 11.65 gpd/mi/in. of nominal diameter at a pressure of 150 psi.

All leaks shall be repaired whenever or wherever there is evidence of a leak. Water used by the CONTRACTOR shall be paid for by the CONTRACTOR at the rate charged by the local water company.

3.20 WARRANTY

The normal one year warranty shall be provided by the CONTRCTOR as stipulated in the General Conditions. In the event a problem involves defective materials, the OWNER will enjoin the CONTRACTOR in the resolution of the problem.

3.21 SETTLEMENT OF QUANTITIES

When the project is complete, a settlement of quantities will be accomplished. All left-over material quantities will be the property of the OWNER. Pipe quantities will be considered only in full pipe lengths. The difference in the inventory of remaining pipe and installed quantities shall be considered waste incidental to the installation. The CONTRACTOR shall compensate the OWNER for the cost of this wasted quantity based on the delivered invoice prices.

4.0 PAYMENT

The unit prices bid for force mains and pressure mains shall constitute full payment for furnishing and installing such lines, including all work as specified hereinabove. The distance shall be precisely measured as work progresses.

In making monthly payment estimates, failure of the contractor to provide continuous and orderly clean-up, periodic testing and orderly "as-built" records shall reduce "work-in-place" computations by ten percent (10%).

END OF SECTION

SECTION 02535

GRAVITY SEWER

1.0 GENERAL

This work shall consist of the furnishing, bedding, laying, jointing, backfilling, compaction and testing of all sanitary sewers, force main or drainage pipe shown on the Plans or otherwise required by the Contract. The Contractor shall limit active pipe installation to assure clean up following such work, in accordance with Section 3.1. of this Specification.

2.0 PRODUCTS

2.1 GENERAL

Sanitary sewer pipe may be any of the following types, unless shown otherwise in the Contract. Pipe strength classes listed are the minimum acceptable classes for each type of pipe. Conditions of the construction may warrant a stronger pipe than listed herein, and the pipe supplied shall be as required by the Plans. If the Contractor requests a method other than that of the Plans and Specifications, and the method requires a stronger pipe or alternate, the Contractor will incur the additional cost of the stronger pipe needed. Should the Engineer or the Owner request a stronger or alternate pipe other than specified on the Plans and Specifications, the Owner will reimburse the contractor for the stronger pipe. Any pipe found defective, or otherwise not meeting the Specifications shall be rejected and replaced by pipe meeting these Specifications at no additional cost to the Owner. The Owner reserves the right to randomly test up to 3 sections of pipe for each size furnished, in accordance with ASTM standards. Upon passing the tests, the Owner shall reimburse the Contractor for the cost of the testing. The Contractor shall pay for any failed tests.

The Contractor shall furnish three copies of the supplier's certification stating that pipe materials were manufactured, sampled, tested and inspected in accordance with the standards listed in this Section and have been found to meet those requirements.

2.2 SANITARY SEWERS

2.2.1 Concrete Pipe. Reinforced concrete pipe shall meet the requirements of ASTM C 76, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
Unless shown otherwise on the Plans or required by the Contract, Class III, Wall B or thicker pipe shall be used. For circular pipe sizes 12-inch through 24-inch diameter, nonreinforced concrete pipe meeting ASTM C14, Class 3 can be used where reinforced concrete pipe Class III is allowed.

Cement used in the manufacture of reinforced concrete pipe shall meet the requirements of ASTM C 150, Standard Specification for Portland Cement, for Type II cement. All reinforcing cages shall be circular; elliptical reinforcement shall not be permitted unless shown on the Plans or allowed by the Engineer. Joints shall be sealed with Type A - rubber compression or confined O-ring or other Engineer approved gaskets. Joints shall meet the requirements of ASTM C 443-05A, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

Unless otherwise directed by the Engineer, T-branch and Y-branch fittings shall be manufactured at the pre-cast plant and supplied to the Project site as single units. When field-fabricated branches are permitted, the openings in the pipe shall be properly cast at the time of manufacture.

2.2.2 Ductile Iron Pipe and Fittings. Ductile iron pipe shall meet the requirements of ANSI/AWWA C151/A21.51, Ductile Iron Pipe, and Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids. Unless shown otherwise on the Plans or in the Contract, the thickness class shall be determined based on a working pressure of 150 psi, in accordance with ANSI/ AWWA C150/A21.50, Thickness Design for Ductile Iron Pipe.

Flanged joint ductile iron fittings shall meet the requirements of ANSI/AWWA C110/A21.10, Ductile Iron and Gray Iron Fittings, 3 inch through 48 inch for Water and Other Liquids. Unless shown otherwise on the Plans or in the Contracts, Class 250 fittings with class 53 wall thickness shall be used.

Mechanical, push on and other such joints shall meet the requirements for ductile iron fittings, 3 in. through 16 in., ANSI/AWWA C153/A21.53. Where these short bodied compact fittings are to be fitted to aged existing cast iron pipe of larger diameter than specified in A21 standards, mechanical joint sleeves or bell-and-spigot sleeves shall provide transition.

All pipe and fittings shall be cement-lined in accordance with ANSI/AWWA C104/A21.4, Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, or polyurethane lined over concrete or ductile iron or gray iron pipe and fittings. The polyurethane lining shall be an ASTM Type V, chemical cure, 100% solids, elastomeric and aromatic with no sand fillers or extenders added. It shall be capable of being spray applied to 50 mils nominal thickness in a single application. Minimum lining thickness shall be 40 mils. The polyurethane lining shall be a seamless flexible membrane that is corrosion, abrasion, and impact resistant; with a Shore ”D” hardness of 60 to 65 at 78ºF (25.5ºC); a tensile strength of 2,878 psi and elongation of 52% per ASTM D-412; shall be resistant to abrasion as measured by a weight loss of no more than 42 mgs. per ASTM D-1044; and shall have a water vapor transmission rate (WVTR) of no more than 0.016 grams per 100 square inches (254 cm^2) per 24 hours (75 mils DFT @ 73ºF (22.7ºC), 100% RH, per ASTM F-1249-90).

Unless otherwise noted on the Plans or in the Special Provisions, all pipes shall be cement lined. Lining thickness per ANSI/AWWA C-104/A21.4 shall be 1/16 in. (min.) for 3 through 12 in. pipe, 3/32 in. for 14 in. through 24 in. pipe, and 1/8 in. for 30 through 54 in. pipe.
Joints shall be push-on rubber gasket types which meet the requirements of ANSI/AWWA C111/A21.11, Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.

When flanged joints are required, they shall meet the requirements of ANSI/AWWA C115/A21.15, Flanged Ductile Iron and Gray Iron Pipe with Threaded Flanges. Mechanical flanged restrained joints may be used when approved by the Engineer.

All flanged and mechanical joints for ductile iron pipe and fittings shall be made with stainless steel nuts, bolts, etc.

2.2.3 Polyvinyl Chloride (PVC) Pipe and Fittings. Unless shown otherwise on the Plans, in the Contract, or stipulated by the Engineer, the Contractor may, at his option, use any of the following types of PVC pipe:

(A) PVC pipe meeting the requirements of ASTM D 3034, Standard Specification for Type PSM Poly (Vinyl Chloride)(PVC) Sewer Pipe and Fittings. Unless shown otherwise on the Plans or in the Contract, SDR 26 pipe shall be required.

(B) PVC pipe meeting the requirements of ASTM F 679, Standard Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings. Unless shown otherwise on the Plans or in the Contract, SDR 26 (approximate) shall be required.

(C) PVC pipe meeting the requirements of ASTM F 789, Standard Specification for Type PS46 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings.

(D) PVC pipe meeting the requirements of ASTM D 1785, Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120. Unless shown otherwise on the Plans or in the Contract, Schedule 40 pipe shall be required. Fittings shall meet the requirements of ASTM D 2466, Standard 4 Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings.

(E) PVC open or closed profile pipe meeting the requirements of ASTM F 794, Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

(F) Corrugated PVC pipe meeting the requirements of ASTM F 949, Latest Revision, "Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings".

Polyvinyl Chloride Pipe shall be installed in accordance with these Specifications and ASTM Standards for "Underground Installation of Flexible Thermoplastic Sewer Pipe", D2321 requiring a minimum trench width of not less than the greater of either the pipe outside diameter plus 16 inches or the pipe outside diameter times 1.25 plus 12 inches. Joints for PVC pipe meeting the requirements of ASTM D 3034, ASTM F 679, ASTM F 789, ASTM F949, and ASTM F 794 shall be gasket, bell and spigot, push-on types which meet the requirements of ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe. For 4 inch diameter pipe meeting the ASTM F 949 requirements, double gaskets shall be used at the Tee/ Wye.

2.2.4 Polyethylene Pipe and Fittings. Polyethylene pipe shall meet the requirements of ASTM F 894, Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe. The pipe shall be manufactured from material which meets the requirements of ASTM D 1248, Standard Specification for Polyethylene Plastics Molding and Extrusion Materials for Type III, Class C, Category 5, Grade P34 High Density Polyethylene. The pipe class shall be as shown on the Plans or in the Contract. Polyethylene pipe shall not be delivered to the site until the Engineer has provided approval for the pipe class to be used.

Polyethylene pipe shall be installed in accordance with these Specifications and ASTM Standards for "Underground Installation of Flexible Thermoplastic Sewer Pipe", D2321.

Joints shall be gasket, bell and spigot, push-on types which meet the requirements of ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

2.2.5 Adapters and Couplings. Connections of sanitary sewer pipes of dissimilar materials or different sizes shall be made with connectors or adapters of the compression or mechanical seal types, and which have been approved by the Engineer. Bitumastic, butyl resin and mastic types of connections will not be acceptable.

2.3 CRADLES AND ENCASEMENT

2.3.1 Crushed Stone. Crushed stone for cradles and encasements shall be as set forth in Subsection 3.2.1. of this Specification.

2.3.2 Concrete. Concrete for cradles, encasements or caps shall be Class B concrete as set forth in Section 03001 of these Specifications.

2.4 UNDERGROUND PIPE MARKING

2.4.1 Underground Marking Tape. A detectable underground marking tape shall be placed in the trench approximately 12 inches below the finished grade. The tape used

shall be 5 mil thick laminated aluminum foil with the printing “CAUTION - Buried Sewer Line Below”. Printing shall be readable through the clear poly lamination and surface printing is not acceptable. Tape size shall be 2 inch width as provided by Presco Products, or approved equal. Color of the tape shall be green.

3.0 EXECUTION

3.1 GENERAL

Prior to beginning pipe laying operations, the trench shall have been excavated to the subgrade level and unsuitable foundation conditions, when encountered, shall be corrected as described in this Section of these Specifications. The pipe within the right-of-way shall be supported on a crushed stone cradle or a concrete cradle as shown on the plans, specified herein, or directed by the Engineer. For concrete pipe installed outside the right-of-way, see Section 3.11.2 of these Specifications.

Crushed stone or concrete shall be used to encase the pipe as specified herein or directed by the Engineer.

3.2 EXCAVATION

3.2.1 Classification. Without regard to the materials encountered, all excavation shall be unclassified. It shall be distinctly understood that reference to rock, earth, or any other material on the Plans or in the Contract, whether in numbers, words, letters, or lines, is solely for the Owner's information and is not to be taken as an indication of classified excavation or the quantity of either rock, earth, or any other material involved.

The Contractor must draw his own conclusions as to the conditions to be encountered. Neither the Owner nor the Engineer give any guarantee as to the accuracy of the data and no claim will be considered for additional compensation when the materials encountered are not in accord with the classification shown. In the event contaminated materials are encountered, the Contractor shall cease Work and immediately contact the appropriate agencies, including the Owner, in accordance with Section 3.3.3.2.

Blasting and rock removal shall be performed at a safe distance ahead of the installation of the pipes and structures to prevent damage as the shots are fired. Blasting of rock for property service connections, branches, and stubs shall be performed concurrent with the trench blasting. The rock at the ends of all pipes, branches, stubs and property service connections, shall be shattered by continuing the blasting operations approximately 6 feet beyond the end of the pipe.

For property service connections, consent and release must be obtained by the Owner and include approximately one full joint of pipe beyond the manhole or the end of the main line sewer. Sufficient explosive shall be used to shatter the rock to allow for future excavation. To prevent damage to installed sewers or structures, concrete for walls,

footings, or encasements shall not be poured in direct contact with bedrock unless otherwise shown on the Plans or directed by the Engineer.

The blasting of rock under existing pavement, prior to uncovering the rock, may be permitted provided the Contractor assumes full responsibility for all damage to the existing pavement. The Owner and Engineer reserve the right to require the uncovering of rock prior to blasting if blasting without uncovering proves unsatisfactory.

If the Contractor chooses to shoot rock under pavement without uncovering the rock, the Contractor shall immediately repair humps in the paving which create a traffic hazard. All distortions outside the limits of the trench caused by the blasting shall later be removed and replaced as part of the pavement restoration at no additional cost to the Owner.

After the blast is fired, the Contractor shall thoroughly scale the excavation. All loose, shattered rock or other loose material which may be dangerous to the workmen, pipe, or structure shall be removed and the excavation made safe before proceeding with the work.

The fact that the removal of loose, shattered rock or other loose material may enlarge the excavation beyond the required width will not relieve the Contractor from making such removal and filling the extra space. If rock is excavated beyond the trench width indicated on the Standard Drawings, such unauthorized excavation, or overbreakage, shall be refilled with crushed stone in the pipe zone and the remaining backfill will be per section 3.4 or Class B concrete in ditches and streams, at no additional cost to the Owner. Remove all blasting debris to ensure public and Contractor’s safety.

3.2.2 Stockpiling Excavated Materials. The Contractor shall be responsible for determining the limits of stockpiles in relation to excavations and maintaining such limits to prevent excessive loads on the sides of excavations or sheeting and bracing systems.

Excavated material shall not obstruct crosswalks, sidewalks, street intersections, nor interfere unreasonably with travel on streets by occupants of adjoining property. Gutters or other surface drainage facilities shall not be obstructed. When clear access to fire hydrants, mail boxes, sewer or conduit manholes, and similar utilities or municipal service facilities is required, the Contractor must provide such access. All work shall conform to the Kentucky Occupational Safety and Health Program and Section 29 CFR 1926, Subpart P, "Trenching and Shoring."

3.2.3 Wasting Excavated Materials. All materials excavated by the Contractor not used for backfilling trenches, channels, or structure excavations or not used in restoration of the ground surface, shall be removed from the site and disposed of by the Contractor at a preapproved site, unless otherwise specified in the Contract. The Owner reserves the right to retain excess excavated materials and direct the Contractor to deliver it to a site specified by the Contract at the Contractor's expense. When the Contractor proposes to

waste unsuitable or excess excavated material upon any privately-owned property, written consent from the property owner must be secured in advance and a copy provided to the Owner prior to scheduling the work. All filling operations must be approved by the Owner prior to placement of said material. No surplus or unsuitable materials shall be deposited in any stream channel nor in any place where pre-construction surface drainage would be changed without written permission from the Owner and the Engineer.

3.2.4 Sheeting and Bracing and Trench Boxes. The Contractor shall furnish, place and maintain adequate sheeting and bracing or trench boxes as may be required to support the sides of the excavation and prevent any movements of earth which could, in any way, diminish the width of the excavation to less than that necessary for proper construction, cause damage to the sewer or structure being constructed or to adjacent structures, utilities, pavements or walks, or cause injury to workmen or others through movement of the adjacent earth banks, or to otherwise damage or delay the work. All work shall conform to the Kentucky Occupational Safety & Health Program and Section 29 CFR 1926, Subpart P, "Trenching and Shoring."

Sheeting and bracing or trench boxes shall be of wood or steel and shall be of adequate strength for excavation. Wherever possible, the sheeting and bracing shall be driven ahead of the excavation to avoid loss of material from behind the sheeting. If it is necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along which the sheeting will be driven. Care shall be taken to prevent voids outside the sheeting, but if voids develop, they shall be immediately filled with sand backfill and densified by flushing and jetting with water. Where drop inlets, stacks or other appurtenances are constructed, the trench excavation shall be offset, as required, without additional compensation.

Sheeting left in place shall be cut off at least 18 inches below the ground surface and the cutoff material shall be removed from the excavation. All voids created by cutting off the sheeting shall be immediately filled with sand backfill and densified by flushing and jetting with water. Sheeting and bracing specified to be left in place as shown on the Plans shall be incidental to the project. Sheeting and bracing left in place at the Contractor's option, shall be at his expense.

All sheeting, bracing, and shoring which is not left in place under the foregoing provisions shall be removed in a manner which will not endanger the completed work or other structures, utilities, sewers, or property whether, public or private. The Contractor shall exercise care to prevent the opening of voids during the extraction process. Any voids created while pulling sheeting and bracing shall be immediately filled with sand backfill and densified by flushing and jetting with water.

3.2.5 Trench Dimensions. No more than 300 feet of trench in unpaved areas and 100 feet of trench in paved areas shall be opened at any time in advance of the pipe, nor shall more than 100 feet be left unfilled except by written permission from the Owner. In special cases, the Owner may limit the distance to which the trench may be open by

notifying the Contractor in writing. Excavations for pipe in both earth and rock trenches shall display a width between the minimum and maximum allowable width, below a level 1 foot above the outside top of the pipe, as shown on the Standard Drawings. If the maximum allowable trench width is exceeded, a higher strength classification of pipe may be required, at no additional cost to the Owner.

Trench excavations for cast-in-place concrete sewers and structures shall have the minimum width necessary, as determined by the Contractor, for proper and safe construction. Trenches shall be excavated to a subgrade depth of six inches below the outside of the pipe, unless unsuitable foundation materials are encountered at the subgrade level.

3.2.6 Unsuitable Foundation. Unsuitable foundation materials shall consist of soft, spongy earth, mud, unconsolidated fill, organic matter, or any other materials which will not, in the opinion of the Engineer, provide suitable support. The Engineer may order extra work performed when the bottom of the excavation is unsuitable. It shall be undercut below the subgrade level, to a depth approved by the Engineer, and backfilled with crushed stone or other approved backfill material. Class B concrete shall be used to backfill the undercut zones in ditches and streams.

If the unsuitable material is mud or muck caused by the activity of the Contractor or by his failure to provide adequate drainage for the excavation, no payment shall be made for the removal or replacement of such material.

3.2.7 Drainage of Excavations. The Contractor shall maintain all excavations free of water. He shall provide all dams, flumes, channels, sumps, or other works necessary to keep the excavation entirely clear of water and shall provide and operate pumps or other suitable equipment of adequate capacity for dewatering the excavations. He shall avoid producing mud in the trench or channel bottom by his operations. If necessary or so directed by the Engineer, the Contractor shall place crushed stone at his own expense to maintain a firm, dry excavation bottom and base. Pipe bedding, laying, jointing, and the placing of concrete shall be done in a water-free trench or excavation. The water shall be disposed of at the Contractor's expense.

Where the excavation extends below the water table, and lowering of the water table is necessary to prevent excessive inflows and maintain stability within the excavation, dewatering shall be performed. The Contractor shall use well points, sump pumps, or any other method of dewatering as required to lower the water table below the bottom of the excavations in a manner that will prevent saturated soil from flowing into open trenches, shafts, structures and tunnels, and render such excavations firm until the structures to be built therein are completed. The Contractor shall obtain the Engineer's approval prior to the use of pecial dewatering equipment other than well points or sump pumps. Dewatering operations are considered incidental to the work and no additional compensation shall be made to the Contractor. The groundwater shall not be allowed to rise until the backfilling operations are complete. The Contractor shall be responsible for preventing pipe flotation. Prior to beginning the work, the Contractor shall obtain, at his

expense, a water withdrawal permit from the Commonwealth of Kentucky, Department of Natural Resources and Environmental Protection Cabinet (KNREPC) in accordance with the following criteria:

(A) Where the average withdrawal rate is more than ten thousand gallons per day (10,000 gal/day), a permit shall be required, except as exempted by KRS 151.140.

(B) Where the withdrawal of water is made at a relatively constant rate each day and the average withdrawal rate is ten thousand gallons per day (10,000 gal/day), or less, no permit will be required.

(C) Where withdrawals are made on an irregular basis at an irregular rate, permits may be required where the Division of Water determines that the water withdrawn represents a significant portion of the available water supply or that collection of withdrawal data is necessary for water resource planning purposes.

The Contractor shall assume all responsibility for claims resulting from damage to any land, wells, structures or improvements due to his dewatering operations.

Prior to any point discharge into a blueline stream or intermittent blueline stream, the Contractor shall obtain necessary permits from the Kentucky Division of Water and provide a copy to the Owner. Point discharge operations are considered incidental to the work and no additional compensation shall be made to the Contractor.

3.2.8 Blasting and Hoe-Ramming. When blasting is required to excavate rock, the Contractor shall comply fully with the provisions of the Laws and Regulations Governing Explosives and Blasting, as issued by the Kentucky Department of Mines and Minerals, and the Kentucky Occupational Safety and Health Standards for the Construction Industry, Subpart U, Blasting, as issued by the Kentucky Labor Cabinet.

Prior to any blasting or hoe-ramming operations, a pre-blast survey of potentially affected homeowners and properties shall be conducted by the Contractor or his agent. The Contractor shall provide the Owner with the name of the agency and person(s) who will be performing the survey. All appointments for surveys shall be made in advance by the Contractor or his agent. The Owner will provide the person(s) performing the pre-blast survey an original letter of introduction to identify them to the residents. No copies of the letter shall be permitted.

The property owner(s) will be notified of the above procedure for the pre-blast survey by the Contractor or his agent. The affected property owners will be instructed by the Contractor to only accept an original letter of introduction on the Owner's letterhead. The Contractor shall furnish, upon request, all photographs taken and reports made during the pre-blast and postblast surveys, without any additional cost to the Owner.

No blasting or hoe-ramming shall be done unless proper insurance has been secured and is in force. Except with written permission by the Owner, no blasting of rock, or hoeramming, will be permitted at nights or on Sundays.

During blasting operations, every precaution shall be used for the protection of persons and private and public property. Each blast shall be well covered with mats and other suitable means to confine the rock fragments. Only the minimum amounts of explosives shall be used to shatter the rock. The Contractor shall monitor the blasts to ensure that excessive charges are not being used. The debris from the blasting operations shall be disposed of properly, in accordance with Department of Mines and Minerals Standards.

3.3 EMBANKMENT

Non trench-type embankment shall conform to section 206 of the KYTC Standard Specifications

3.4 EXCAVATION AND BORROW MATERIALS

3.4.1 Selected Excavated Material. This material shall consist of earth removed from excavations and used for backfill. It shall be free from rubbish, organic matter, frozen soil, muck, and other perishable, compressible debris which prevent compaction of the material to a dense, uniform state. Rock and other hard, durable fragments shall be limited to the particle sizes described in Section 3.4., with adequate fines to fill all voids, and shall be uniformly distributed throughout the material.

3.4.2 Unsuitable Contaminated Materials. The property owner-shall be responsible for any asbestos, PCB's, petroleum, hazardous waste or radioactive material uncovered or revealed at the site, which was not shown or indicated in the Project Plans or identified in the Contract to be within the scope of the work and which may represent a substantial danger to persons or property exposed thereto in connection with the Work site. Once a problem is identified, work shall stop until the course of action can be determined by the Owner. It shall then be up to the property owner to participate in paying additional costs for hauling and disposal at a landfill or appropriate facility or the cost of testing as delineated further within these specifications.

The Owner shall NOT be responsible for any such materials brought to the site by the Contractor sub-Contractor, suppliers, or anyone else for whom the Contractor is responsible.

If unsuitable contaminated materials are encountered, the Contractor shall take the following action:

(A) The Contractor shall immediately stop all work in connection with such hazardous condition and notify the Owner (and thereafter confirm in writing such notice to the Owner).

(B) The Contractor shall then be responsible for making notification to "911" (Emergency Response) in the event of discovery of a release of contaminated material.

(C) The Contractor is responsible for making notification to the Kentucky Department for Environmental Protection at (502) 564-2380 or 1-800-928-2380.

(D) The Contractor is responsible for securing the work site to prevent access by unauthorized personnel.
NOTE: The above notices should include the precise location, the suspected material type, and the approximate quantity and concentration if known.
IF MATERIALS ARE HAULED WITHOUT NOTICE TO THE OWNER, IT SHALL BE THE PROPERTY OF THE CONTRACTOR. THE OWNER WILL NOT PAY FOR DISPOSAL OR ASSOCIATED ADDITIONAL COSTS.

The Contractor shall not be required to resume work in connection with such condition until the Owner and/or the owner of the property has obtained any required permits for disposal of the unsuitable materials. The Owner's Engineer shall promptly determine the means and methods to evaluate such condition or take corrective action on a case-by-case basis. This action could involve realignment or other design changes. The Owner will provide the Contractor special written notice specifying that the condition is rendered safe for the resumption of work, or specifying any special conditions under which the work may be resumed. The cost of sampling and lab testing will be the responsibility of the property owner. The property owner will also be responsible for substantiated additional costs for disposal such as receiving fees at the local landfill or additional hauling fees.

The Contractor shall resume such work based on special conditions or the Owner may order such portion of the work that is in connection with hazardous condition to be deleted from the work according to the unit price of the Contract. The Owner may choose to perform the deleted portion of the work with its own forces or make such provisions as necessary to complete that portion of the Project.

3.4.3 Borrow Material. Borrow material used as backfill or embankment shall be approved for such use by the Engineer. The Contractor shall not use borrow material from the permanent or temporary construction easement without the written consent of the Owner. Prior to its use, the Contractor shall identify the source and provide samples for soil classifications and moisture-density tests. Borrow material shall meet the following requirements:

(A) Unless otherwise permitted by the Owner, borrow material shall not be comprised of soils represented by the following classifications, as determined in accordance with ASTM D 2487: MH, CH, OL, OH, or Pt.

(B) The borrow material shall be free from rubbish, organic matter, frozen soil, muck or other perishable, compressible debris, which prevent compaction to a dense, uniform state. Rock and other hard, durable fragments shall be limited to particles displaying a

maximum dimension of 4 inches, shall not exceed 10 percent of the total volume, and shall be uniformly distributed throughout the material.

(C) The maximum dry density of the borrow material shall meet or exceed 98 pounds per cubic foot in accordance with ASTM D 698, Standard Specification for Test Methods for Moisture-Density Relations for Soils and Soil-Aggregate Mixtures, Using a 5.5-lb. Rammer and a 12-in. Drop.

3.5 BACKFILL OF TRENCH EXCAVATIONS

3.5.1 General. Backfilling of trenches, and tunnel shaft excavations shall be accomplished as soon as possible after the pipe is placed or the tunnel is completed. The Contractor shall have the option of using flushed and jetted or compacted backfill materials. The Contractor shall notify the Owner at least forty-eight (48) hours in advance of all flushing and jetting and/or mechanical compaction operations.

3.5.1.1 Compaction. Compaction around structures will be performed by a mechanical compactor when flushing and jetting of sand and earth material is not possible or practical, or when required by the Plans.

3.5.2 Within Limits of Existing or Proposed Paved Surfaces. At the Contractor's option, with prior approval by the Engineer, backfill within the limits of existing or proposed paved surfaces shall consist of: Type I-A Backfill - sand, flushed and jetted, Type I-B Backfill - sand, combination flushed and jetted and mechanically compacted, or Type III Backfill - selected excavated material and/or approved borrow material - mechanically compacted. In special cases and with the approval of the Engineer, the Contractor may utilize Type I-A sand backfill - flushed and jetted in the lower portion of the excavation and Type III backfill selected excavated materials - mechanically compacted in the upper portion of the excavation.

(A) Sand - Flushed and Jetted (Type I-A). After the trench has been completely backfilled with sand, the backfill shall be densified by thoroughly flushing and jetting with water, beginning at the downstream end of the trench and proceeding upstream.

Water to be used for flushing and jetting shall be supplied through hoses and pipes having a minimum diameter of 2 inches. The jet pipe shall have a minimum diameter of 1-1/2 inches. Jet pipes used to penetrate the backfill material shall be equipped with a shut-off valve and be of sufficient length to completely penetrate the sand backfill. The jet pipe shall be inserted into the sand backfill at a maximum spacing along the trench of 6 feet and the spacing shall be staggered along the trench area.

The jet pipe shall penetrate the sand backfill to within 12 inches of the crushed stone encasement. Care shall be exercised to prevent the jet pipe from penetrating the crushed stone encasement. When the depth of the trench exceeds the length of the jet pipe the flushing and jetting shall be completed in lifts. The pipe shall remain in place until water is observed rising above the backfill throughout the full width of the trench

and over a length of the trench equal to one-half the distance between adjacent jet installations. If this condition is not observed within a reasonable period, the Contractor shall increase the water flow or provide additional jet pipes. If the Contractor fails to flush and jet the sand backfill in accordance with the Specifications, the sand backfill shall be excavated and replaced with properly flushed and jetted sand backfill or material compacted in accordance with Section 3.4.2.C., at no additional cost to the Owner.

The Contractor shall provide all piping, fittings, etc., necessary to deliver the water along the site of the work and shall arrange with the water utility for making the necessary taps and metering. All expenses incurred for installing the pipe and hose, together with the cost of the water, shall be borne by the Contractor. Following flushing and jetting and prior to pavement construction, the surface of the sand subgrade shall be thoroughly compacted following the procedures described in Section 3.4.2(B).

(B) Sand, Combination Flushed and Jetted, and Mechanically Compacted (Type I-B).

The trench shall be completely backfilled with sand, and the backfill shall be densified by thoroughly flushing and jetting with water. Flushing and jetting procedures shall be in accordance with Section 3.4.2.(A) above. Next, the sand backfill shall be removed to a depth of 3 feet below the pavement surface and stockpiled for later mechanical compaction. The exposed surface shall then be thoroughly compacted. The remainder of the trench shall be backfilled in two lifts of sand (approximately 12-inches thick) up to the pavement subgrade level with each lift being thoroughly compacted. For compaction, the Contractor shall supply a vibratory plate compactor or smooth drum vibratory roller capable of compacting sands to a minimum effective depth of 16-inches. The Contractor shall submit the manufacturer’s equipment specifications for proof of this required effective compaction depth. The required number of passes of the roller or plate shall be established at the beginning of compaction operations for the Project by taking nuclear density tests to monitor the density increase with increased passes of the roller or plate. The required number of passes shall be set when no further increase in sand backfill density is measured.

(C) Earth Materials - Compacted (Type III-A). Selected excavated materials or approved borrow materials containing no rock fragments with a maximum dimension larger than 4 inches shall be carefully deposited in uniform, horizontal layers, not exceeding 6 inches in compacted depth, in a zone located from the top of the cradle or encasement up to a horizontal plane located 2 feet above the exterior top of the pipe. Prior to compaction, each layer shall be level and evenly distributed on both sides of the pipe so as to not disturb, displace or damage the pipe. Each layer shall be thoroughly compacted to a minimum of 95 percent of the standard Proctor density, at moisture content between plus 2 percent and minus 4 percent of the optimum moisture content, as determined by ASTM D 698, utilizing mechanical compaction. Each layer shall be properly compacted before the next succeeding layer is placed. Any lift of fill which pumps under the weight of the compaction equipment shall be rejected, regardless of the field density test results.

The remainder of the trench from the horizontal plane located 2 feet above the pipe up to the ground surface or top of the existing subgrade shall be backfilled with selected excavated materials containing no rock fragments with a maximum dimension larger than 4 inches, or approved borrow materials. The backfill shall be placed in uniform horizontal layers not exceeding 12 inches in compacted depth.

Each layer shall be thoroughly compacted to a minimum of 95 percent of the standard Proctor density and a moisture content between plus 2 percent and minus 4 percent of the optimum moisture content, as determined by ASTM D 698, utilizing mechanical compaction methods. Each layer shall be properly compacted before the next succeeding layer is placed. Any lift of fill which pumps under the weight of the compaction equipment shall be rejected, regardless of the field density test results. Follow guidelines set forth in the Specifications Section 3.9.3. at no additional cost to the Owner.

(D) Combination Sand (Type I-A) and Earth Backfill (Type III-A) - In trench situations where the lower trench dimensions limit the use of mechanical compaction equipment, the existing site conditions limit the effectiveness of the mechanical compaction methods, or where additional backfill material is required to replace unsuitable excavated materials, the Contractor may utilize flushed and jetted sand backfill in the lower portion of the trench and mechanically compacted earth material in the upper portion of the trench with prior approval of the Engineer. The sand backfill operations shall extend from the top of the cradle or encasement up to a point where mechanical compaction can be properly accomplished in accordance with Section 3.4.2.C. The mechanical compaction operations shall extend from the top of the sand backfill up to the ground surface or top of the existing subgrade. Follow guidelines set forth in the Specifications Section 3.9.3.

(E) No. 57 Crushed Stone - Compacted. With prior approval from the Engineer, No. 57 crushed stone may be used as trench backfill within paved areas. The stone shall be carefully deposited in uniform, horizontal layers not exceeding 12 to 24 inches in compacted depth, depending on the type and size of compaction equipment used. The initial lift(s) of stone immediately above the pipe shall be level and evenly distributed on both sides of the pipe. Each layer shall be thoroughly compacted by making a minimum of two passes using a vibratory plate compactor or smooth drum vibratory roller capable of compacting clean stone to a minimum effective depth of the lift thickness selected. The Contractor shall submit the manufacturer’s equipment specifications for proof of this required effective compaction depth.

3.5.3 Outside Limits of Existing or Proposed Paved Surfaces. At the Contractor's option, except as otherwise specified in Section 3.4.4., trench backfill outside the limits of existing or proposed paved surfaces shall consist of earth materials (selected excavated or approved borrow materials) which are flushed and jetted or compacted. The upper one foot of the earth backfill shall be essentially free from rock, gravel or other hard, durable fragments.

(A) Earth Materials - Flushed and Jetted (Type II Backfill). The lower portion of the trench backfill extending from the top of the cradle or encasement to a horizontal plane located 2 feet above the exterior top of the pipe shall contain no rock or rock fragments with a maximum dimension larger than 1 inch. The remainder of the trench shall be backfilled with selected excavated materials or approved borrow materials containing no rock fragments larger than 1 cubic foot. After the trench has been completely backfilled with selected excavated material or approved borrow material, the backfill shall be densified by thoroughly flushing and jetting with water, beginning at the downstream end of the trench and proceeding upstream. The backfill shall be thoroughly and uniformly sluiced and flooded by introducing water at the top of the trench and by inserting the jet pipe into the backfill at intervals as specified in Section 3.4.2.(A) along the trench. This process shall be continued until the backfill is completely saturated and no further settlement is observed. Hoses, jet pipes and the maximum depth of insertion shall be as specified in Section 3.3.4.2.A. After the backfill in the trench has substantially dried and completed any additional settlement, any settlement below the finish grade shall be refilled with additional earth, and compacted in accordance with (B), below.

(B) Mechanical Compaction of Earth Materials (Type III-B) - Selected excavated materials or approved borrow materials, containing no rock or rock fragments with a maximum dimension larger than 3 inches, shall be carefully deposited in uniform, horizontal layers, not exceeding 6 inches in compacted depth, in a zone located from the top of the cradle or encasement up to a horizontal plane located 2 feet above the exterior top of the pipe. Prior to compaction, each layer shall be leveled and evenly distributed on both sides of the pipe so as not to disturb, displace or damage the pipe. Each layer shall be thoroughly compacted to a minimum of 85 percent of the Standard Proctor density before the next succeeding layer is placed. Any lift of fill which pumps under the weight of the compaction equipment shall be rejected, regardless of the field density test results. Follow guidelines set forth in the Specifications Section 3.9.3. The remainder of the trench from the horizontal plane located 2 feet above the top of the pipe up to the ground surface shall be backfilled with selected excavated materials or approved borrow material containing no rock fragments larger than 1 cubic foot. The material shall be placed in uniform horizontal layers not exceeding 12 inches in compacted depth. Each layer shall be compacted with a dozer or other heavy, earth-moving equipment traveling back and forth over the material until no further settlement is observed.

3.5.4 Between Pipe and Drainage Swale or Ditch. The Contractor shall use Type III - A backfill in pipe trenches where a surface ditch or swale is to be constructed above the pipe.

This includes all ditches and swales - paved, sodded, rip-rapped or seeded.

3.6 DEPOSITING BACKFILL MATERIAL

All backfilling shall be done in a manner to avoid displacing or damaging the pipe or structure. Any pipe or structure damaged or displaced shall be excavated and repaired or replaced at the Contractor's expense.

3.7 BACKFILL AGAINST STRUCTURES

3.7.1 Backfill Against Retaining Walls and Box Culverts. Unless shown otherwise on the Plans, backfill shall be selected excavated materials or approved borrow materials. The placement of any backfill shall be delayed until representative test samples of the concrete have attained a compressive strength of 3,500 pounds per square inch and the concrete has been in place at least seven days.

When the back slopes bounding the excavation lie within the slope limits of 6:1 to 1/4:1, the planes of the slopes shall be destroyed by stepping or serrating to prevent wedging action during compaction. Backfill material shall be placed and compacted in uniform horizontal layers not exceeding 6 inches in thickness, loose measurement. Each layer shall be compacted by means of approved manually-directed mechanical tampers or rollers. Successive blows of the tamper shall overlap no less than one-fourth of the width of the tamper head.

Successive passes of the roller shall overlap no less than one-fourth the width of the roller. Each layer shall be dampened when necessary to ensure the maximum density obtainable, as directed. The Contractor shall not permit heavy rolling compaction equipment to operate closer to the back of the culvert or retaining walls than a distance equal to the unbalanced height of the fill at any time. Backfill that will be beneath or within a proposed embankment or pavement area shall be thoroughly compacted to a minimum of 95 percent of the standard Proctor density, as determined by ASTM D 698.

Each layer shall be properly compacted before the next succeeding layer is placed. Backfill shall be brought up equally on both sides of the walls to the elevation shown on the drawings to prevent unequal loading.

3.7.2 Backfill Against Wet Wells and Deep Structures. Unless otherwise shown on the Plans, backfill shall be selected excavated materials, approved borrow materials, sand, or crushed stone. The backfill shall be brought up evenly on all sides to reduce any unbalanced lateral loading that could cause tilting, or opening of joints between riser sections.

For earth materials, backfill shall be flushed and jetted, or mechanically compacted as set forth in the Specifications Section 3.4.3. Section (B) and Section 3.9.3. when directed by the Engineer or as required by the Plans.

3.8 EMBANKMENTS

Embankments placed in areas over which sanitary or storm drainage facilities will be constructed, pavements will be constructed, which will be subjected to erosive action of water flowing through adjacent channels or streams, or for the purpose of storm water detention basins, shall be constructed of selected excavated materials or approved borrow materials. Embankment material shall be placed and compacted in uniform horizontal layers not exceeding 12 inches in thickness, loose measurement. Each layer shall be thoroughly compacted to a minimum of 95 percent of standard Proctor density at a moisture content between plus 2 percent and minus 4 percent, as determined by ASTM D 698. Each layer shall be properly compacted before the next succeeding layer is placed. Any lift of fill which deflects under the weight of compaction equipment shall be rejected, regardless of field density test results.

3.9 FINAL GRADING

Final grading around and above sanitary sewer or storm drainage improvements shall be shaped to the slope of adjacent undisturbed ground. Sufficient grading operations shall be performed to prevent ponding and to provide natural surface drainage from adjacent areas into storm water inlets, ditches or swales.

3.10 INSPECTION AND TESTING

3.10.1 Inspection Personnel. All flushing and jetting operations shall be performed in the presence of the Inspector assigned to the Project. All backfill operations which involve mechanical compaction and which are required to meet a specified degree of compaction, shall be performed in the presence of an Engineer approved inspector or an experienced earthwork inspector who represents an Agency designated or approved by the Owner to provide earthwork inspection and testing on Projects involving the Owner's facilities.

3.10.2 Laboratory Tests. Selected excavated materials or approved borrow materials shall be sampled and tested for standard Proctor density, optimum moisture content and classification by the Agency approved by the Owner. These tests will be required whenever such materials are proposed for use in compacted backfill or embankment and a specified degree of compaction is required. A minimum of one week should be allowed for the Agency to obtain samples and complete the tests.

3.10.3 Field Density Tests. Field density tests shall be performed on compacted backfill or embankment materials. The Owner must be notified 24 hours in advance. Scheduling of field density tests with an approved Agency shall be performed 24 hours in advance of the backfill operations. Acceptable methods of performing field density tests include the following:

(A) Nuclear Density Test - ASTM D 2922, Standard Specification for Test Methods for Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).

(B) Sand Cone Test - ASTM D 1556, Standard Specification for Test Method for Density of Soil In-Place by the Sand Cone Method.

(C) Rubber Balloon Test - ASTM D 2167, Standard Specification for Test Method for Density and Unit Weight of Soil In-Place by the Rubber Balloon Method.

(D) Drive-Cylinder Method - ASTM D 2937, Standard Specification for Test Method for Density of Soil In-Place by the Universal Cylinder Method.

The frequency that field density tests shall be performed will be in accordance to the following minimum schedule. Additional testing shall be performed when directed by the Inspector or by the Owner.

(A) A minimum of 1 test per 100 cubic yards of material placed and compacted in trenches or 500 cubic yards of material in embankments.

(B) A minimum of 1 test per lift per 200 feet of material placed and compacted in trenches.

(C) A minimum of 1 test per lift of material placed and compacted in embankments.

(D) A minimum of 1 test per shift (day) of compaction operations.

(E) A minimum of 1 test whenever there is a suspicion of a change in material, moisture content, or degree of compaction control.

When instructed by the Owner, the Contractor shall excavate previously untested backfill or embankment material to a particular grade for testing. Backfilled areas which do not pass this test shall be excavated and recompacted until they meet the compaction specifications. Areas excavated for testing shall be recompacted in accordance with the Project Specifications. The cost of this Work shall be at the Contractor's expense.

3.10.4 Payment for Inspection and Testing. When the Contract requires mechanical compaction on Projects, earthwork inspection and testing shall be performed as specified at the Owner's expense. When the Contractor has the option of backfilling by flushing and jetting or by mechanical compaction, and he selects to backfill using mechanical compaction, earthwork inspection and testing shall be performed as specified at the Contractor's expense for any Project. The mechanical compaction option shall be approved by the Owner prior to placement of backfill and the Testing Agent must be designated in writing.

3.11 CRADLE AND ENCASEMENT

Cradle and encasement shall be of crushed stone or concrete and shall be installed as specified and within the limits shown on the Plans or directed by the Engineer.

3.11.1 Crushed Stone Cradle. Crushed stone cradle shall mean the placement of crushed stone from the subgrade level (6 inches below the outside of the pipe) up to the springline of the pipe. The crushed stone shall be deposited in the trench to grade, allowing for the thickness of the pipe wall. Bell holes shall be dug to relieve the bells of all concentrated loads and to provide uniform support throughout the pipe section. For larger pipes, the crushed stone shall be shoveled and shovel-sliced beneath the haunches of the pipe to assure uniform support. Unless shown otherwise on the Plans or directed by the Engineer, the following types of pipes shall be supported on a crushed stone cradle.

A. Concrete Pipe
B. Ductile Iron Pipe

3.11.2 Soil Bedding/Cradle. For concrete pipe installed outside the roadway right-of-way with 9 feet of cover or less, the crushed stone cradle can be eliminated and replaced with job excavated native soil material. The earth trench bottom foundation should be scarified for the middle third of the pipe O.D. or at the Contractors option a minimum thickness of granular bedding can be provided. For rock foundations provide a standard 6-inch thick granular bedding.

3.11.3 Crushed Stone Encasement. Crushed stone encasement shall mean the placement of additional crushed stone above the crushed stone cradle to a level at least 6 inches above the outside top of the pipe and leveled off between the trench walls. The additional stone shall be placed in such manner to prevent damage to the pipe. Unless shown otherwise on the Plans or directed by the Engineer, the following types of pipe shall be encased in crushed stone.

A. Polyvinyl Chloride Pipe
B. Polyethylene Pipe
C. Corrugated Polyethylene Pipe
D. Corrugated Steel Pipe
E. Corrugated Polyvinyl Chloride Pipe

3.11.4 Concrete Cradle. Where a concrete cradle is required as additional support for a sanitary sewer pipe, or if a sanitary sewer pipe will have less than 2 feet of vertical clearance above an existing or proposed storm drain or utility conduit, a concrete cradle shall be installed. The length of the concrete cradle shall be as shown on the Plans or 2 feet beyond the outside edge of the underlying storm drain or utility conduit. The pipe shall be laid to line and grade, and shall be supported on concrete blocks, bricks or saddles set to prevent both vertical and lateral movement of the pipe. The use of wooden blocks will not be permitted. Concrete shall be placed around the pipe up to the springline of the pipe. Proper bracing shall be provided to prevent displacement or flotation of the sewer pipe during placing of concrete.

3.11.5 Concrete Cap. The length of the concrete cap shall either be as shown on the plans; or 2 feet beyond the outside edge of the storm drain or utility conduit; or 2 feet

beyond the point where the sewer pipe attains 30 inches of cover in an easement; or 4 feet of cover in a right-of way or surfaces subject to vehicular traffic, or as directed by the Engineer. The sewer pipe shall be laid and supported on a crushed stone cradle, and concrete shall be placed around the pipe and at least 6 inches above the top of the pipe for the full trench width, as shown on the Standard Drawings. Proper bracing shall be provided to prevent displacement or flotation of the sewer pipe during placing of the concrete.

3.11.6 Concrete Encasement. Where shown on the Plans or where conditions exist requiring additional pipe protection (stream crossings, ditch crossings, shallow trench or poor soil conditions), pipes shall be encased in concrete, as determined by the Engineer. The length of the concrete encasement shall be at least 2 feet beyond the point where additional pipe protection is required, as shown on the Plans, or as directed by the Engineer. The sanitary sewer pipe shall be laid and supported as required for a concrete cradle, and concrete shall be placed around the pipe 6 inches either side of it and up to at least 6 inches over the top of the pipe. Proper bracing of the pipe shall be provided to prevent movement or flotation of the sewer pipe during placing of concrete. In rock-bottom streams, the encasement shall extend from 6 inches below the pipe up to the original rock level. Encasement shall be required when crossing a blue line stream and shall extend to 5 feet beyond the top of bank on each side of said stream. Concrete encasement is required for plastic pipe with less than 4 feet of cover in easements and less than 5 feet of cover in street rights-of-way. Unless otherwise directed by the Engineer, a 4-inch PVC drain pipe shall be placed in the trench next to the carrier pipe and shall extend through the concrete encasement and 5 feet into the crushed stone encasement on both sides. The drain pipe shall be open on both ends. This will allow unimpeded flow of any groundwater in the sewer trench.

3.11.7 Safeloading. Safeloading shall consist of completely filling the designated areas with grout in such a manner to make them safe from collapse or at the Contractor's option, safeloading may be done by filling the designated area with free-flowing grout of sand or other approved free flowing material. Appreciable deposits of debris shall be removed from other structures prior to safeloading. The ends of existing culverts shall be plugged by use of bulkheads containing small openings at the tops through which the grout may be pumped at a minimum pressure of 15 pounds per square inch.

3.11.8 Thrust Block. Concrete Thrust Blocks, or reaction backing, shall be placed at all fittings used for changes of horizontal and vertical direction, at reducers, and at each valve, unless otherwise directed by the Engineer. Thrust blocks shall be installed in accordance with the details illustrated on the plans.

Thrust blocks shall be placed between solid ground and the fitting to be anchored. The backing shall, unless otherwise shown or directed, be placed such that the pipe and fitting joints will be accessible for repair. Do not encase bolts or nuts.

Class B Concrete shall be used to fabricate Thrust Blocks, in accordance with Section 03001 of the Specifications, and have a minimum 28-day compressive strength of 2,500 psi.

3.12 PIPE INSTALLATION

3.12.1 Inspection and Handling. All pipes shall be inspected on delivery and such pipe sections that do not conform to these Specifications and which are not suitable for use shall be rejected and immediately removed from the Work site. Equipment used to handle, lay, and joint pipe shall be so used to prevent damage to the pipe and its jointing materials. All pipe and fittings shall be carefully handled and lowered into the trench. Damaged pipe or jointing material shall not be installed.

3.12.2 Pipe Laying and Jointing. The laying of pipe shall begin at the lowest point and proceed upstream with the bell pointing upstream unless conditions dictate otherwise, in which case Engineer approval must be obtained. Prior to making pipe joints, all joint surfaces shall be clean and dry and free from gravel or other extraneous materials. All necessary lubricants or adhesives shall be used as recommended by the pipe manufacturer. Suitable means shall be used to force the spigot or tongue end of the pipe the proper distance into the bell or groove end without damage to the pipe and its jointing materials and without disturbing previously laid pipe sections. Special care shall be taken to ensure that the pipe is solidly and uniformly cradled or encased in accordance with these Specifications. No section of pipe shall be brought into position for jointing until the preceding section has been bedded and secured in place.

3.12.3 Line and Grade. Each section of pipe shall be checked for vertical and horizontal alignment immediately after being laid. A calibrated survey transit shall be on site and in use at all times during pipe laying operations. All adjustments to line and grade must be made by scraping away or filling in under the barrel of the pipe and not by wedging or blocking up any portion of the pipe or striking the pipe in an effort to drive it down. Curved alignments may be allowed on a case-by-case basis, as approved by the Engineer, except on gravity sanitary sewers smaller than 48 inches in diameter.

3.12.4 Protection of Installed Pipe. As the Work progresses, the interior of the pipe shall be protected from and cleaned of all dirt, cement, extruded joint materials, debris, and other extraneous materials. Whenever pipe laying is stopped for any significant length of time, such as at the end of a workday, the unfinished end shall be protected from displacement, floatation, cave-in, and in-wash of soil or debris. A suitable temporary tight-fitting plug, stopper or bulkhead shall be placed in the exposed end of the pipe.

Water shall not be allowed to rise in the excavation until the joint materials and/or concrete cradle or encasement has hardened and cannot be damaged by the water. Particular care shall be used to prevent disturbance or damage to the pipe and the joints during backfilling or at any other time. Walking or working over the pipe, except as necessary for placing and compacting backfill, or operating compaction equipment

directly over the pipe shall be allowed until a minimum of 24 inches of cover over the outside top of the pipe has been placed. Mechanical compaction in this zone shall be with manual pneumatic tampers or other hand-operated methods which will not damage the pipe.

3.12.5 Property Service Connections. Property service connections shall be installed at the locations and with the pipe sizes shown on the Plans. Manufactured wye and tee fittings and reducers shall be used for new sewer line installations, unless noted otherwise in the Contract. The property service connection pipe shall be laid on a uniform grade from the sanitary sewer to the property or easement line. Where a stack is required, the pipe shall be laid on a uniform grade from the top of the stack to the property or easement line. The pipe depth at the property or easement line shall be at least 30 inches in easements, and shall be 4 feet below the final street grade, unless shown otherwise on the Plans or directed by the Engineer. Where no final street grade has been established, the depth of the connection shall be as directed by the Engineer. For existing sewer lines, property service connections shall be made with Owner approved wye, tee saddles or insert-a-tees only.

In sewer easement or right-of-way, two-way (or double wye) polyethylene cleanout fittings shall be installed at each property service connection unless otherwise directed by the Owner.

At the upstream end of each property service connection, the Contractor shall install a watertight stopper or cap. For any thermoplastic pipe other than SDR-35, a Schedule 40 adapter shall be installed at the end of each property service connection in the event that the cleanout is not installed. The Contractor shall mark the end of each property service connection with a 2x4 board which extends from the pipe to approximately 3 feet above the ground surface and marked with green paint (Catalog No. 4634 Sewer Green Fluorescent by Rainbow Manufacturing, or approved equal).

3.12.6 Stacks. Stacks shall be constructed at the locations and to the height shown on the Plans or directed by the Engineer. Stacks shall be constructed in accordance with the Standard Drawings.

3.12.7 Stoppers and Bulkheads. When the open ends of pipes or fittings smaller than 18 inches in diameter are to be sealed, the openings shall be sealed with stoppers, cemented into place using a rubber gasket between the stopper and bell or socket. Openings 18 inches in diameter or larger shall be sealed with concrete brick masonry or concrete bulkheads at least 4 inches thick, verified or redesigned by a professional engineer to meet pressure requirements.

All openings into pipes shall be protected from the entrance of earth, water or other extraneous materials. If a temporary bulkhead is constructed to prevent sewage from backing into the excavation or to prevent extraneous material from entering the sewer, the Contractor shall be responsible for reconstructing, repairing or replacing those portions of the existing sewer removed or damaged by this operation.

When an existing bulkhead is to be removed, its removal shall be coordinated with the Owner.

During construction, use a mechanical plug, properly braced and tied off, when tying into an existing sewer. The plug shall remain until the sewer lines are accepted by the Owner. It is the Contractor's responsibility to remove the plug prior to approval of flow being allowed into the system. The Contractor shall assume full responsibility for any damage or claims due to the installation and removal of the plug.

3.12.8 Underground Marking for Sewer Main and Property Service Connections. Underground marking for pipe shall utilize a detectable marking tape and shall be as specified in Section 2.4.1 of these specifications.

3.13 LEAKAGE TESTING FOR SANITARY SEWERS

3.13.1 General. Testing shall not be scheduled until at least 48 hours after verbal contact is made with the project inspector. The Contractor shall perform leakage tests on sanitary sewer pipes and force mains to ensure that installed pipes are not subject to excessive infiltration or exfiltration. Sanitary sewer pipes installed in areas where other underground facilities will be constructed subsequent to the sanitary sewer shall be tested twice; at the completion of the sanitary sewer installation, and following the installation of the other underground facilities. All leakage testing must be performed in the presence of a representative of the Engineer. No leakage testing shall be performed prior to jetting.

When conducting any leakage test, the Contractor shall provide all meters, weirs, gages, water, equipment and personnel necessary to perform the test as specified. The Owner and/or Engineer shall provide the inspection personnel, stopwatch, recording forms and calculations to demonstrate if the test passed or failed.

If a pipe installation fails to pass the requirements as specified herein, the Contractor shall repair or replace all defective materials or Workmanship, and conduct additional leakage tests necessary to demonstrate that the repaired section meets the leakage requirements, at no additional cost to the Owner. If requested by the Owner, the Contractor shall submit in writing a method of repair, and must be approved by the Engineer before repair can begin.

3.13.2 Low-Pressure Air Tests. When conducting a low-pressure air test, the Contractor shall securely install and brace all plugs prior to pressurizing the pipe. Personnel shall not be allowed to enter manholes when the sewer pipe is pressurized. Low-pressure air tests shall be conducted in accordance with the following:
(A) Reinforced Concrete Pipe - ASTM C 924, Recommended Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Test Method.
(B) Polyvinyl Chloride Pipe (PVC), Corrugated PVC Pipe, Polyethylene Pipe, Corrugated Polyethylene Pipe - UNI-B-6 Recommended Practice for Low-Pressure Air

Testing of Installed Sewer Pipe. The "half-time" testing method will be accepted for these pipes only if the section of pipe being tested has a zero drop in pressure for half the test time specified for the pipe's length to diameter ratio.

3.13.3 Infiltration/Exfiltration Tests for Concrete Pipe. Reinforced concrete pipe may be tested for direct infiltration or exfiltration in lieu of performing low-pressure air tests. Tests shall be performed in accordance with ASTM C 969, Standard Practice for Infiltration and Exfiltration

Acceptance Testing of Installed Precast Concrete Pipe Lines, except that the allowable rate of infiltration or exfiltration shall be 150 gallons per 24 hours per inch diameter per mile of pipe. Regardless of the leakage test results, any spurting or gushing streams of water entering the sewer or manhole shall be sealed at no additional cost to the Owner.

3.14 DEFLECTION TESTS FOR SANITARY SEWERS

The Contractor shall test all thermoplastic main line pipe by use of a calibrated mandrel, or other device approved by the Engineer, to ensure that no pipe deflection has occurred greater than 5 percent of the inside diameter of the pipe. Pipe shall be fully backfilled and compacted at least 15 days prior to testing. The Contractor shall test the entire length of the sewer installed. Any pipe section exhibiting greater than 5 percent deflection shall be replaced and retested, at no additional cost to the Owner. Should this time frame for testing be waived, and the Owner requires a second deflection test after 30 days, it will be at the Contractor’s expense.

Deflection testing shall be performed at the time of the first or final air test. If conditions warrant, the Engineer’s inspector may request additional tests to be performed after final restoration.

NOTE: When failure of the second air test requires repair of the main line sewer, an additional deflection test shall be required.

4.0 PAYMENT

The unit prices bid for sewer lines of various diameters shall constitute full payment for furnishing and installing sewers, including all work as specified herein above such as gravel backfill in traveled areas, testing, and video recording. The sewer line shall be paid on a per foot basis as it is installed.

In making monthly payment estimates, failure of the Contractor to provide continuous and orderly clean-up, periodic testing and orderly "as-built" records shall reduce "work-in-place" computations by ten percent (10%).

Other items described in this section shall be incidental to gravity sewer installation unless called out on the bid schedule.

END OF SECTION

SECTION 02536

MANHOLES

1.0 GENERAL

This Work shall consist of the construction of manholes of the kind and dimensions shown on the Plans. The construction shall be accomplished in accordance with these Specifications and in conformity with the lines, grades, cross-sections, and details shown on the Plans or established by the Engineer. The Work shall include such labor, material, equipment, removal and abandonment of structures, brick masonry, cast-in-place concrete construction, precast concrete construction, rims and covers, frames and grates, miscellaneous iron castings, and all other items as may be necessary to complete the structures as shown on the Plans.

2.0 PRODUCTS

2.1 CONCRETE

Concrete for all cast-in-place sanitary sewer and storm drainage structures shall be Class A concrete.

2.2 STEEL REINFORCEMENT

Deformed steel reinforcing bars shall be Grade 60 bars of the sizes, dimensions, spacings and locations shown on the Plans.

2.3 GROUT

Grout shall consist of a mixture of water and cement or cement with fly ash, or water and one part cement or cement with fly ash to two parts mortar sand as defined in Section 804.05 of the KYTC Standard Specifications (current edition), by volume. The water may be adjusted to produce a mixture of a consistency suitable for job conditions; however, not over 5 1/2 gallons of water shall be used per sack of cement.

2.4 NON-SHRINK GROUT

Non-shrink grout shall be an approved non-shrink, non-staining grout consisting of either a mixture of hydraulic cement, water, fine aggregate, and an approved nonferrous expansive admixture, or a packaged commercial product and shall meet the requirements of Section 601.03.03B3 of the KTC Standard Specifications.

2.5 PRECAST STRUCTURES

Any use of precast structures must be so noted on the Plans, including a typical detail for each type of structure for the Project. Round structures shall conform to ASTM C 478 and square and rectangular structures shall meet the requirements of ASTM C 913.

Structures which require specially designed footings, cut-off walls, etc. will not be allowed as precast.

Openings in precast structures for pipes shall be the outside diameter of the pipe plus a maximum of 6 inches. In order to use non-shrink grout, the opening shall be the outside diameter of pipe plus 3 inches. (Outside diameter of pipe plus 4 1/2 inches is permissible when tapered hole forms are utilized).

For precast structures (other than those with knockout panels) the opening around the pipe shall either be filled with non-shrink grout for the wall thickness of the structure or the pipe shall be encased with minimum 6 inch collar of concrete from the inside face of the wall to 1'-0" outside the outer face of the wall. The pipe shall be adequately supported to prevent settling while the grout or the concrete encasement is setting up. The inside faces of the structure walls shall be finished with a trowel and wet brush finish.

For circular structures and rectangular structures (other than those with knockout panels) the minimum vertical distance from the holes for the pipes to the top of the structure wall shall be 4 inches. If this vertical distance is less than 12 inches, then additional reinforcing steel shall be furnished for this section. The top slab must be designed for AASHTO HS-20 loading.

For precast structures with knockout panels, holes for the pipes shall not be cut into the structural members (i.e., top beams and corner columns) and non-shrink grout shall not be allowed to be placed around the pipes. The pipes shall be encased with concrete a minimum 6 inch collar around the outside of pipe or a minimum of 3 inches beyond the hole knocked in the wall, whichever is greater. Also, the concrete encasement shall extend from the inside face of the wall to 1'- 0" outside the outer face of the wall.

Precast structures with knockout panels shall not be used with more than 2 feet of earth cover, as measured from the top of the structure, unless load calculations are supplied.

For rectangular structures where pipe will be installed in adjacent walls (other than those with knockout panels), at least 6 inches of wall (measured from the interior corner) is required on each side of the pipe beyond the precast opening for the pipe. This rule is not applicable for structures which have pipe installed in opposite walls or where one outlet reinforced concrete pipe is utilized.

A wash is required in the bottom of catch basins to provide positive drainage (sloped toward outlet).

Precast structures in roadways other than installed sanitary manholes and wet wells shall have a minimum of two 4” weep holes. There will be a 2 cubic foot burlap or plastic sack filled with No. 57 stone over the weep holes.

2.5.1 Precast Manhole Sections. All precast concrete manhole risers, cones, grade rings, flat slab tops, and bases shall conform to the requirements of ASTM C 478, Standard Specification for Precast Reinforced Concrete Manhole Sections, and the Standard Drawings. All cone and transition sections shall be eccentric in shape. Base and riser sections shall be custom-made with openings to meet indicated pipe alignment conditions. The following applies as to the maximum inside diameter (or horizontal dimension) of pipe to be used with a given size of manhole.

Diameter of Structure	Maximum Size Pipe*
4'-0"	24 inches
5'-0"	36 inches
6'-0"	48 inches

*Outside diameter may be considered on a case-by-case basis for other pipe materials.

The minimum distance allowed between precast holes for the pipes shall be 12 inches, or one-half the outside diameter, whichever is larger.

2.6 WATERTIGHT SEWER PIPE CONNECTIONS

Watertight sewer pipe connections shall be elastomeric gaskets or couplings manufactured in accordance with ASTM C 923, Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes, and shall be on the Owner's list of approved materials.

2.7 JOINT SEALANTS

Type A - Is a compression rubber gasket in conformance with ASTM C443-05a Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets. Note – in applications where a Type A joint is specified, the receiving structure joint will need to be manufactured such to accept the particular gasket type selected (Example O-Ring, Press-Seal, Forsheda, etc)

Type B - Is a preformed flexible butyl rubber sealant in conformance with ASTM C990-06 - Joints for Concrete Pipe Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealant.

Reference is made to 3.3 for applications.

Neither bituminous mastic joint sealing material (brush on type) nor (oil-based) bitumastic asphaltic butyl shall be allowed in the construction of structure joints.

2.8 EXTERIOR JOINT WRAP

A six-inch wide strip of polyolefin covered with butyl mastic joint sealant, or a hydrophilic sealant having a 50% expansion factor and being capable of withstanding 25 PSI of pressure shall be placed over all exterior manhole joints, including grade rings. The product will be in accordance with ASTM C877-08. Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.

2.9 WATERSTOPS

Waterstops shall be extruded from an elastomeric plastic compound, the basic resin of which shall be polyvinylchloride. The compound shall contain any additional resins, plasticizers, stabilizers, or other materials needed to ensure that when the material is compounded it will meet the physical property requirements shown below:

Physical Property	Required Value	Test Method
Tensile Strength (Die "C")		
Sheet Material	2,000 psi	ASTM D 412
Finished Waterstop	1,700 psi	ASTM D 412
Ultimate Elongation (Die "C")		
Sheet Material	350% Min.	ASTM D 412
Finished Waterstop	300% Min.	ASTM D 412
Stiffness in Flexure	750 psi Min.	ASTM D 747
Accelerated Extraction		CRD C 572
Tensile Strength (Die "C")	1,750 psi	ASTM D 412
Elongation (Die "C")	300%	ASTM D 412
Effect of Alkali (After 7 Days)		
Change in Weight	-0.1 to 0.25%	
Change in Hardness, shore Durometer	+ or - 5%	
Low Temperature Brittleness	-35°	ASTM D 746
Specific Gravity	1.3	ASTM D 792

When required, the Contractor shall submit a manufacturer's certificate stating that all of the physical property requirements specified above for the sheet material have been satisfied. Field splices for waterstops shall be performed by heat-sealing the adjacent surfaces in accordance with the manufacturer's recommendations. Waterstops shall be manufactured with an integral cross-section which shall be uniform within plus or minus 1/8 inch in width, and the web thickness or bulb diameter within plus 1/16 inch and minus 1/32 inch.

2.10 MANHOLE STEPS

Manhole steps shall be polypropylene plastic-coated steel bar with treads having anti-skid properties for hand and foot grips. Manhole steps shall be cast, epoxy grouted, or attached by mechanical means into the walls of the manholes in such manner as to

conform with ASTM C 478. Steps shall be spaced not more than 12 inches vertically on centers and shall be so arranged that the lowest rung is no more than 12 inches above the bench, and the top rung is 18 inches below the bottom of the casting. The steps shall be arranged out of alignment of the flow channel, and shall be centered on the grate or lid opening.

2.11 CASTINGS

Castings shall be of uniform good quality, free from scale, lumps, blowholes, shrinkage, distortions or other defects. They shall be smooth and thoroughly cleaned by shotblasting. Castings shall meet the requirements of ASTM A 48, Standard Specification for Gray Iron Castings, for Class No. 35-B, Gray Iron. Manhole rims and covers and inlet frames and grates shall be machined or ground at touching surfaces so as to seat firmly and prevent rocking. Any set not matching perfectly shall be removed and replaced at no additional cost to the Owner.

2.12 MANHOLE INVERTS

Manhole Inverts on 8” and larger size lines shall have a minimum 0.10 foot drop through the structure unless one of the lines exceeds a 10% grade. All grades exceeding 10% on 8” lines and all other pipe sizes shall continue to have their grade ending at the manhole P.I.

2.13 CHIMNEY SEALS

The manhole chimney section shall be sealed and made watertight using either a mechanically locking internal butyl rubber chimney seal or a chemically bonding chimney seal as identified on the plans. Installation of the chimney seals shall be performed by manufacturer certified personnel. The actual product used shall be identified on the shop drawing submittal.

3.0 EXECUTION

3.1 MODIFICATION TO EXISTING AND PROPOSED STRUCTURES

3.1.1 Removal. Existing structures to be removed shall be indicated on the Plans or as directed by the Engineer. The Owner reserves the right to retain or reject salvage of any materials encountered. Unless otherwise directed by the Owner, all castings and mechanically locking internal chimney seals shall be retained by the Owner. All salvage materials retained by the Owner shall be delivered to the appropriate storage yard as directed by the Owner. All remaining materials shall become the property of the Contractor who will be responsible for disposing of same. The excavation shall be backfilled in accordance with Section 3 of these Specifications.

3.1.2 Abandonment. Existing structures to be abandoned in place shall be as shown on the Plans or as identified by the Owner. After removing structure frames, covers,

grates, mechanically locking internal chimney seals and similar items, all pipes shall be bulkheaded. The walls shall be lowered to 2 feet below final grade if in earth or to 12 inches below subgrade if in pavement. The remaining structures shall be filled with crushed stone or sand. In paved areas or where directed by the Engineer, a 12 inch thick plain concrete slab shall be installed over the manhole or structure top such that it extends 12 inches beyond the outside face of the manhole or structure. The Owner reserves the right to retain or reject salvage of any materials encountered. All remaining materials shall become the property of the Contractor who will be responsible for disposing of same.

3.2 CONNECTIONS

The Contractor shall verify the exact locations and elevations of existing structures or sewers prior to construction and any differences between actual and plan locations and elevations shall be brought to the attention of the Engineer before proceeding with the Work. If a bulkhead opening of adequate size, or a stub of proper size, elevation, location and direction exists, the connection shall be made as required for normal pipe laying.

For all sanitary sewer pipes an opening shall be core drilled in the structure to permit inserting the pipe at the required elevation, direction, and slope. The circumference of the opening shall allow approximately two inches of space between the inserted pipe and the structure. Care shall be used to avoid unnecessary damage to existing concrete or brick masonry. All loose material shall be removed from the cut surfaces and the cut surfaces shall be completely coated with non-shrink grout. Before setting the pipe, a sufficient thickness of grout shall be placed at the bottom and sides of the opening for proper bedding of the pipe. After setting the pipe, all spaces around the pipe shall be solidly packed and filled with nonshrink grout which shall be neatly pointed up on the inside to present a smooth joint, flush with the inner wall. When making connections to existing stubs, approved pipe adapters shall be used.

For all drainage pipe, an opening may be saw cut and provided with approved connectors. Modifications to the existing invert shall be made as needed to provide a smooth plastered channel to accommodate the flow from the new pipe.

When reconstruction of a manhole is required, entry into the manhole shall be at the elevation indicated on the Plans or at the invert of the manhole. Entries shall not be allowed on top of the wash unless otherwise directed.

3.3 MANHOLES AND WET WELLS

3.3.1 General. Manholes shall be neatly and accurately built in accordance with the Plans and the Standard Drawings. Precast manhole and wet well bases, when used for sanitary sewer manholes and wet wells, shall be supplied with watertight sewer pipe connections. When the manhole base slab will consist of cast-in-place concrete for existing sewer lines, the sewer pipe and the lower precast barrel section shall be in

place and supported by concrete blocks prior to placing concrete for the slab. All rough openings between pipes and precast sections shall be thoroughly and completely filled with non-shrink grout, applied so that there will be no leakage around pipes. The grout shall be finished smooth and flush with the interior and exterior manhole or wet well wall surfaces. When the manhole base slab will consist of cast-in-place concrete for new construction, pipe to manhole connections in the precast barrel section shall be done at the manufacturing plant. Field modifications will be allowed to precast structures if approved by the Engineer. When core drilling is not possible, saw cutting shall be performed when modifying an existing structure.

Manhole inverts shall consist of Class A concrete, placed to conform to the shapes indicated on the Standard Drawings. Inverts shall include both channel and wash sections with channels so constructed as to create the least resistance to flow. A smooth, uniform dense finish shall be required. Inverts may be either precast or cast-in-place.

3.3.2 Joints. Joint sealant materials shall be of the sizes recommended by the manufacturer to provide watertight seals between precast manhole sections. When requested, the Contractor shall furnish information showing that the sizes of the joint ealants being supplied meet the manufacturer's recommendations.

Joints between precast sections shall be sealed in a two-way fashion consisting of a Type B sealant, described in 2.7, and an exterior joint wrap described in 2.8. Reference is made to the Manhole standard drawings for additional reference. For wet well joints, the same two-way sealing system described for sanitary manholes shall be used. For non-circular valve vaults and wet wells, the sealing system shall consist of a double strip of butyl rubber mastic sealant conforming to ASTM C990, and a 6-inch wide strip of polyolefin covered with butyl mastic exterior wrap joint sealant. The butyl rubber mastic sealant shall be placed approximately 1 to 2 inches apart, centered on the structure shoulder.

3.3.3 Future Connections and Drop Inlets. When indicated on the Plans, provisions for future sewers shall be provided at manholes by providing 12 inch long stubs of the sizes, lines and grades shown. The upstream ends shall consist of the bell or spigot ends, and they shall be sealed with removable stoppers or bulkheads. If the specified length of any stub is exceeded, it shall be at no additional cost to the Owner, unless the extra length is ordered by the Owner and/or Engineer. Drop inlets shall be constructed at manholes where indicated on the Plans as per the standard drawings. Inside drops are not allowed on new facilities and must have prior Engineer approval on existing structures. Manhole barrel sections shall be supplied with openings for upper and lower inlet pipes. The annular spaces between the inlet pipes and the manhole walls shall be filled with non-shrink grout. Grout shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces. Encasement of the outside drop pipe shall be with Class B concrete. In case of precast, concrete encasement shall be doweled with reinforcing steel and shall extend a minimum of 2 L.F., or to the undisturbed soil.

For the purposes of property service connection reference and manhole identification, each manhole shall be sequentially numbered with a number provided by the Owner. The Contractor shall stamp the numbers into the north edge of the rim of each manhole as shown on the approved Plans. Numbers shall be 3/8 inch high block numerals clearly visible without removing the manhole lid.

3.3.4 Frames and Chimney Seals. Manhole frames shall be placed in the positions shown on the Standard Drawings and shall be set to the correct elevations or adjusted to match final grade. Manhole adjusting rings shall only be used to make final elevation corrections and are not required otherwise. Use the least number of standard size rings as required for proper grade. If the concrete adjusting ring height will equal or exceed 12 inches, use 1-ft. barrel sections. Frames shall be set concentrically with the precast concrete collars and sealed between the two with a strip of butyl resin (Type B). The remaining annular space shall be filled with grout so that the spaces between the collars and the bottom flanges of the frames shall be completely filled and made watertight. A frame shall not be disturbed until the grout has hardened to adequate strength.

Chimney Seals shall be installed in accordance with the Manufacturer's Specification for installation. The Installer shall be certified by the product manufacturer and proof of such certification shall be provided to the Engineer prior to installation of chimney seals. In addition, the installer shall carry a copy of his/her certification at all times during installation. Chimney Seals shall be installed after the binder course is placed when the manholes are constructed in roadways and after rough grading in all other areas.

The Engineer reserves the right to visually inspection and/or water test all chimney seal installations to ensure that the seal has not been damaged or compromised during final site restoration and/or paving. The contractor at no additional cost to the Owner shall correct any defects identified by these inspections and tests.

The water test method shall be either a Static Head Test or Gravity Test as defined below. The test method shall be selected by the Inspector and may vary from manhole to manhole.

Static Head Test - A 1-foot tall section of PVC pipe with external diameter matching the internal diameter of the manhole frame shall be temporarily sealed to the frame. Sandbags or an approved alternative shall be used to form a 6 inch tall ring around the PVC pipe allowing a 6 inch annular space between the PVC pipe and the outer ring. The annular space shall then be filled with water to a height of 6 inch and the water level maintained for 10 minutes. The inspector shall observe the sealed area during the test for leakage. The installation shall be deemed unacceptable if any visible, continuous stream of water leaking from the sealed area is observed.

Gravity Test – The gravity test may be used as an alternative to the static head test on mechanically locking seals. The test shall be performed by introducing approximately 1 gallon of water directly behind the seal and extension, if used. The installation shall be

deemed unacceptable if the Owner, the Engineer or its representative observes any visible, continuous stream of water leaking from the sealed area.

The following restrictions apply to the use of Chemical Chimney Seals:
(A) Shall not be used when wet weather is expected before the product is sufficiently cured to withstand water contact per the manufacturer's recommendations.

(B) Shall not be used to bridge gaps greater than ½-inch.

(C) Shall not be used with HDPE grade adjustment rings.

(D) Shall not be used on concrete or grout that has not cured for at least 30 days.

3.3.5 Testing. All manholes installed for a project shall be subject to vacuum testing in accordance with ASTM C1244. Vacuum testing shall be conducted in the presence of the inspector after Chimney Seal installation. Chemical Chimney Seals shall not be subject to vacuum testing until the product has sufficiently cured to withstand vacuum pressures. Manholes shall be capable of holding a vacuum of 5 psi (10-inches of Mercury) without dropping more than 0.5 psi (1 inch of Mercury) for the times stated below:

	Depth (ft)											
Diameter (in)*	8	10	12	14	16	18	20	22	24	26	28	30
	Times (s)											
48	20	25	30	35	40	45	50	55	59	64	69	74
60	26	33	39	46	52	59	65	72	78	85	91	98
72	33	41	49	57	67	73	81	89	97	105	113	121

*Refer to ASTM C1244 for required test times on manholes with other diameters

Minimum test times for typical manhole diameters (ASTM C1244)

Vacuum testing of manholes exceeding 15 feet in depth shall take groundwater into consideration and the vacuum pressure for testing shall be reduced by 0.5 psi (1 inch of Mercury) for every five feet of groundwater depth above the outgoing pipe. The Contractor shall determine the groundwater elevation immediately prior to vacuum testing. Manholes that do not pass the initial vacuum test shall be repaired and retested at no cost to the Owner. A 100% pass rate shall be achieved.

Exfiltration tests will not be allowed for manhole acceptance testing unless directed otherwise by the Engineer or its representative. When required, exfiltration tests shall be performed in accordance with ASTM C 969, Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines. The maximum allowable exfiltration rate shall be 0.1 gallons per foot diameter, per foot of head, per hour. If the exfiltration rate exceeds this value, the Contractor shall make repairs as required including re-testing, at no additional cost to the Owner.

3.4 ADJUSTING MANHOLES AND CATCH BASINS

All frame height and alignment adjustments shall be subject to field inspection by the Engineer and be subject to correction as directed by the Engineer.

Concrete brick (conforming to ASTM C-55 for Type II Grade 5) may be used when adjusting the casting no more than 4 inches.

Precast concrete riser rings may be used when the casting is raised more than 4 inches or when total combined height of existing and proposed exceeds 4 inches. If the concrete riser ring height will exceed 12 inches, use 1-ft. barrel sections. Use the least number of standard size rings as required for proper grade.

No wood shims, wood blocks or shot rock shall be used to adjust or reset the frame height.

In asphalt pavement, the excavated area around the manhole or catch basin that is raised shall be backfilled with a minimum of 8 inches Class "A" concrete to a level 2 inches below the new top of grate or lid elevation. The remaining 2 inches shall be paved with bituminous surface.

Prior to raising manhole or catch basin frames, the Contractor, Design Engineer, and Owner’s representative shall inspect for damaged frames and grates or lids. Damaged frames, grates or lids shall be replaced by the Contractor at no expense to the Owner unless item was damaged prior to start of construction.

4.0 PAYMENT

The unit price bid for 4'-0" diameter standard manholes and drop manholes along with the indicated depth shall be full compensation for furnishing and installing manholes. Extra depth shall not apply to this contract. The depth of manholes shall be measured as the distance from the downstream invert to the top of the manhole cover. This distance shall be field determined by the Engineer or his designated representative and shall be placed on the As-Built drawings.

END OF SECTION

SECTION 02538

SEWER TIE-INS

1.0 GENERAL

The Contractor shall provide all labor, materials, tools and equipment to tie-in the new sewer lines to manholes, pump stations, force mains, etc.

2.0 PRODUCTS

Not applicable.

3.0 EXECUTION

3.1 TIE-IN TO MANHOLE

The Contractor shall connect, as indicated on the plans, a pipe to a manhole. The pipe shall allow sewage to enter or leave the manhole as appropriate. The connection of the pipe to the manhole shall be done in a way to prevent sewage from escaping from the sewer system. Any abandoned sewer lines connected to the manhole shall be cut and capped as described in Section 3.4. The bottom of the manhole shall be reshaped in accordance to the pipes entering and exiting the manhole.

3.2 TIE-IN TO FORCE MAIN

The Contractor shall connect new force mains, as indicated on the plans, to the existing force main. The connection shall be done with appropriate fittings. The Contractor shall seal the end of the abandoned force main as part of the tie-in.

3.3 TIE-IN TO PUMP STATION

The Contractor shall connect any gravity sewer or force main, as indicated on the plans, to a pump station. The Contractor shall meet the specifications in Section 3.1 for gravity sewers entering a pump station and/or Section 3.2 for force mains entering or existing a pump station. No sewage shall be allowed to escape from the sewer system

3.4 CUT AND CAP

The Contractor shall cut all abandoned lines from existing manholes as indicated on the plans. The cut and cap shall be installed in a way to prevent sewage from escaping from the sewer system

4.0 PAYMENT

Payment for sewer line tie-ins shall not apply unless indicated on the plans and in the bid schedule. Payment for sewer line tie-ins shall only occur when a new sewer line connects to an existing sewer line, manhole, or wet well.

The Contractor shall be paid the unit bid price for supplying all labor, materials, and equipment to connect a new line to an existing sewer line.

END OF SECTION

SECTION 02539

SPECIAL ITEMS OF CONSTRUCTION

1.0 GENERAL

These specifications govern special crossings, installations and construction procedures required to deal with unusual construction items or special requirements of governing agencies.

2.0 PRODUCTS

2.1 CASING PIPE

In general, the diameter, thickness, style, joints and materials selected for casing pipe shall be as shown on the plans or as specified herein and shall be considered as "minimum" requirements, all subject to prior approval of the Engineer. In all cases, the approval for construction by agreement with the private company and/or construction permit issued by the State, County, or Municipal agency will be required before construction starts.

Steel casing pipe for road and railroad crossings using the boring and jacking method shall be steel, plain end, uncoated and unwrapped, and shall be furnished in at least 18-foot lengths. Steel pipe shall meet the requirements of ASTM Specification A-120 and AWWA C200. Pipes up to and including 4 inches in diameter shall be Schedule 40. Pipe larger than 4 inches and less than 18 inches shall have a wall thickness equal to or greater than 0.312 inches under railroads and 0.250 for all other uses. Pipe larger than 18 inches under roads shall have a wall thickness as indicated in the table below.

Minimum Thickness (Inches)	Nominal Diameter (Inches)
Use Schedule 40	Less than 4
0.250	4 – 18
0.281	20
0.312	22
0.344	24
0.375	26
0.406	28 – 30
0.438	32
0.469	34 – 36
0.500	38 – 42

The inside diameter of all casing pipes shall be a minimum of four inches (4") greater than the largest outside diameter of the carrier pipe, joint or coupling.

The pipe shall be steel, new material, with a minimum yield of 35,000 psi. The steel casing pipe shall be bored and/or jacked in place at the locations as shown on the plans or as directed by the Engineer. All joints between lengths shall be solidly welded with a smooth non-obstructing joint inside. Any field welding shall be performed by a certified welder and shall be in accordance with AWWA C206. The casing pipe may be extended beyond the boring limits by open trenching as shown in the Standard Details. This would apply when the casing is required from right-of-way to right-of-way or ditch line to ditch line. Open trenching at jacked or bored locations will be allowed no closer than 3 feet from the edge of pavement or toe of the slope embankment.

Positioning guides (insulators) shall be utilized on all carrier pipe which is within the casing pipe. Positioning shall be accomplished by the use of prebuilt spacers such as those manufactured by BWM Company, Advance Products & Systems, LLC. (APS), or an approved equal. The Contractor shall submit the type of position guide proposed for use for the approval of the Engineer. Spacing of the positioning guides shall be in accordance with the Standard Drawings. The carrier pipe shall not be permitted to rest on bells or couplings. The spacers shall be sized to fit the carrier pipe and the walls of the encasement pipe.

The ends of the casing pipe shall be plugged and made watertight in a manner acceptable to the Engineer prior to backfilling. Casing seals as manufactured by BWM Company, APS, or equal shall be used.

Where road crossings are made using plastic pipe, the location of joints under the roadway should be avoided by using lengths of adequate dimension for the crossing. This principle also applies to other types of pipe where sufficiently long lengths are available.

2.2 PAVEMENTS

2.2.1 Concrete Pavement Replacement. This pavement replacement shall be Portland cement concrete construction in accordance with the requirements shown in the Standard Details. It shall include all pavement replacement on concrete surfaced roads, concrete driveways, concrete sidewalks and concrete parking areas, both public and private.

2.2.2 Heavy-Duty Bituminous Pavement Replacement. This type of asphalt pavement replacement shall be bituminous concrete surface over concrete base in accordance with the details. This type of pavement replacement shall be used on all heavily trafficked roads having an existing pavement greater than 2", whether public or private, or in other locations as directed by the Engineer.

2.2.3 Light-Duty Bituminous Pavement Replacement. This type of pavement replacement shall be bituminous concrete constructed in accordance with the details. This item shall include all light-duty bituminous concrete roadways, bituminous driveways and bituminous parking lots, both public and private.

2.2.4 Crushed Stone Surface Replacement. This type of surface replacement shall include all graveled roadways, driveways, parking areas, or other gravel surfaced areas, both private and public.

2.3 CRUSHED STONE

The crushed stone backfill as noted on the drawings shall be dense #57 aggregate per Kentucky Department of Highways Specifications. The Contractor shall continuously be responsible for the maintenance of the aggregate and the surface of the trenches until the pavement replacement is completed.

2.4 PORTLAND CEMENT CONCRETE

Portland cement concrete for pavement replacement shall contain a minimum of 6 sacks of cement per cubic yard, the maximum free water content shall be 6 gallons per sack of cement, the slump shall be between 2 and 4 inches, and the concrete shall have minimum 28-day compression strength of at least 3,500 PSI. Cement, aggregate and water shall be described in these specifications for Class "A" concrete. A set of cylinders shall be made and tested for each 25 cubic yards of concrete placed, or fraction thereof, to supply representative sampling and testing of the concrete, upon the direction of the Engineer. The Contractor shall produce a broomed, or burlaped uniformly smooth and nonskid surface, consistent with the existing pavement.

Bituminous materials and mixes shall be consistent with the recommended practice of the asphalt institute and it shall conform to the requirements of the Kentucky Department of Highways for prime coat and Class 1 bituminous concrete. The bituminous concrete shall consist of a binder or base course and a surface course.

3.0 EXECUTION

3.1 ROAD CROSSINGS

In all cases, these crossings will be made in compliance with the requirements of the State Highway Department or the appropriate county or city office. State requirements will normally be described by the appropriate District Highway Office. In general, unless otherwise shown on the plans or directed otherwise by the Engineer, the crossing of all State Highways shall be accomplished by boring under the roadway. In addition, the crossing of service lines 1-1/2 inches and greater under rigid and flexible surfaced paved roads shall be accomplished by boring and jacking a casing pipe under said roadway. In certain cases, as shown on the plans, service lines of all sizes will require casing pipe installed with the crossing.

Under state roads, requirements of the Kentucky Transportation Cabinet shall apply. Unless stated otherwise by the Engineer, all pipe crossing a state road shall be cased with casing pipe bored under the road. Pipe crossing under county roads or city streets shall be cased with casing pipe, and crossed in the manner as directed on the plans.

3.1.1 OPEN TRENCH CROSSINGS

The trench shall be excavated to a minimum width that will allow the pipe installation. The trench walls shall be kept as nearly vertical as possible. The minimum specified cover above the pipe shall be maintained. The Standard Details section shows the requirements for open trench crossings.

The backfill in the trench under any roads, driveways, or parking areas where the open trench method is used shall be of the type shown in the Standard Details and shall be deposited and compacted in uniform layers not to exceed the depth shown in the Standard Details.

The surface of the road, driveway, or parking area shall be replaced with the same type of material as specified under pavement replacement.

3.1.2 BORING AND JACKING

The work is herein defined as the operations in which both the boring by auger and the jacking of the casing pipe are done mechanically and in which the diameter of the casing pipe is too small to permit hand working at the heading of the casing pipe. Two basic methods are: (1) pushing the casing pipe into the fill or earth simultaneously as the boring auger drills out the ground and (2) drilling the hole through the fill or earth and pushing the casing or carrying pipe into the hole after the drill auger has completed the bore.

A suitable approach trench shall be opened adjacent to the slope of the embankment, or adjacent to point of bored and jacked section as shown on the plans. The approach trench shall be long enough to accommodate the selected working room. Guide timbers or rails for keeping the casing pipe on line and grade shall be accurately set and maintained in the bottom of the approach trench and with heavy timber back-stop supports installed at the rear of the approach trench to adequately take thrust of the jacks without any movement or distortion. It is paramount to the securing of acceptable tolerance limits of workmanship in the boring and jacking operation that extreme care be taken in the setting of all guides, rails and jacks to the end that the casing pipe in final position be within the limits of acceptability for the placing and laying of the carrier pipe. The minimum cover of forty-two inches (42”) under the roadway must be maintained. Additional depth may be required as shown on the plans.

3.2 RAILROAD CROSSINGS

At all railroad crossings, cover pipe (casing) for water lines (carrier pipe) shall be jacked or pushed beneath tracks and the carrier pipe jointed and pushed through the cover pipe. Detailed drawings of railroad crossings including the length of casing and depth below track are shown in the plans. Contractor shall obtain and pay for services of a representative of the railroad to direct the Contractor's operations while on the railroad property when required by the railroad.

3.3 FREE BORE

At locations indicated in the plans, the Contractor shall provide a jacking pit and bore through the earth at the proper line and grade. The augured hole shall be as small as practical to allow the carrier pipe to pass through.

This bid item does not apply to service tubing.

3.4 CREEK CROSSINGS

3.4.1 Special Creek Crossing. Where required on the plans or instructed by the Engineer, the Contractor shall construct a special creek crossing as shown in the Standard Details. Crossings shall be scheduled for construction in times of low flow, if practicable, otherwise cofferdams of sand bags or clay shall be used to divert the stream flow while crossing is made. Concrete shall not be placed under water and Contractor shall provide suitable pumps to keep water out of trench excavation during stream crossing construction.

3.4.2 Normal Earthen Creek Crossing. Where the stream crossing is made in earth or other beds which are stable (no casing or anchorage required), then the pipe will be laid in a narrow trench at the depth specified in the Standard Details to maintain the required cover between pipe and stream bed. Initial backfill will be mechanically compacted. Trench backfill in any stream crossing area from one foot (1') above the top of the pipe shall consist of trench excavated rock, if available. No extra payment will be made above normal construction for this type of creek crossing.

3.4.3 Bypass Test Meter. At locations as indicated on the plans, where a new creek crossing is installed, a bypass test meter shall be installed. The meter shall be installed as a normal water meter with taps on each side of a valve, as shown on the Standard Drawing.

3.5 RIVER OR LAKE CROSSINGS

Crossings in rivers or lakes where the pipe cannot be laid in a trench shall normally be made with ductile iron pipe having ball and socket joints or polyethylene pipe as indicated on the Drawings. Details for any required installations of this type including

pipe required, anchors (number, size and location), and installation technique are shown in the plans.

3.6 BRIDGE CROSSINGS

Wherever possible bridges will not be utilized for stream crossings. However, where it is necessary for the water line to be attached to bridges, the pipe shall be securely fastened to bridge stringers or beams using supports as dimensioned and located in the plans. The carrier pipe shall be insulated with Vermiculite or other approved material to prevent freezing. Expansion joints to allow for movement of the bridge will be required as shown on the plans.

3.7 WATER LINES AND SEWER LINES SEPARATION

3.7.1 General. Wherever sewer lines cross, or are adjacent to, each other, special precautions shall be taken.

3.7.2 Parallel Water and Sewer Lines. Water lines must, if possible, be located a minimum lateral distance of 10 feet from any existing or future sewer lines measured from outside diameters. Where water lines and sewer lines must be placed in the same trench, the water line must be located on a shelf, two feet (2') above and two feet (2') to the side of the sewer line. Whenever this condition cannot be met, and upon direction from the Engineer, the water line shall be uncovered and encased with concrete per the standard encasement detail.

3.7.3 Crossing Water and Sewer Lines. Wherever sewer lines and water lines cross, it is desirable, if practical, that the sewer line be at least twenty-four inches (24") below the water line.

Where it is not practical to provide such a separation, care shall be taken to ascertain that the existing water line or existing sewer line is in good sound condition and that no evidence of joint leakage is known in that vicinity. If any such evidence does exist, the existing line shall be exposed by the Contractor at least ten feet (10') each side of the new pipe crossing, carefully examined and any defects positively corrected. The Owner will arrange for examining and correcting any defects in the existing lines, but the Contractor shall cooperate in every way possible.

When the water line must be below or less than two feet (2') above the sewer line, the Contractor shall encase the water line five feet (5') in each direction from the crossing as directed by the Engineer. This encasement should only be accomplished when directed by the Engineer and shall be accomplished in accordance with the details shown on the drawings. The encasement is a separate pay item.

3.8 SEEDING AND SODDING

Upon completion of the installation of the work, the Contractor shall remove all debris and surplus construction materials resulting from the work. The Contractor shall fine grade all the disturbed surfaces around the area of the work in a uniform and neat manner leaving the construction area in a condition as near as possible to the original ground line or to the lines as directed by the Engineer.

All graded areas shall be left smooth and thickly sown with a mixture of grasses. The mixture of grasses shall consist of one-third (1/3) Rye grass, one-third (1/3) Kentucky Fescue and one-third (1/3) Kentucky Bluegrass by weight, and shall be applied to the graded areas at a rate of not less than 1 pound of seed per one thousand square feet of area. When the final grading has been completed, the entire graded area to be seeded shall be fertilized with 12-12-12 fertilizer, applied at the rate of 6 pounds per one thousand square feet of area. After the seed and fertilizer have both been applied, the Contractor shall then lightly cover the seed by use of a drag or other approved device. The seeded area shall then be covered with straw to a depth of approximately one inch (1”).

Where existing lawns have been disturbed, the existing sod will be removed and stored and replaced to its original position once the work is in place. If the Contractor damages or destroys the original sod, it shall be replaced with a sod having at least 60% good quality Kentucky Bluegrass, strongly rooted and free of pernicious weeds and shall be so laid that no voids occur between strips. When placing sod, it shall be tamped or rolled immediately after it is laid and the finished surface shall be true to grade, even and equally firm at all points. Well screened top soil shall be lightly sprinkled over the sodded areas and shall be raked to insure sealing the sod joints. The sodded areas shall be thoroughly watered. Sod damaged by the Contractor shall be replaced with new sod by the Contractor at no cost to the Owner.

The fine grading, seeding, sodding and clean-up shall be considered as incidental expense and shall not be separate pay items.

Meadows and hay fields will require replacement in kind unless the Contractor secures a release from the property Owner agreeing to no replacement or alternate replacement.

3.9 PAVEMENT AND OTHER STRUCTURE REPLACEMENT

The Contractor shall replace all pavement cut or disturbed, with pavement similar in all respects to existing pavement in accordance with the Standard Details and at those locations approved by the Engineer. Every effort shall be made to avoid cutting the pavement. In restoring pavement, new pavement is required, except that granite paving blocks, sound brick or sound asphalt paving blocks may be reused. No permanent paving shall be placed within thirty (30) days after the backfilling has been completed. All concrete and asphalt paving materials shall be in conformance with the Standard

Details shown in the plans. The pipeline trench through all paved areas (parking lots, driveways, roads, etc.) shall be fully backfilled with crushed stone.

3.9.1 Installation of Pavement Replacement. The Contractor shall cut back the surfacing adjacent to the trench for twelve inches (12”) on both sides of the trench and shall cut down the dense graded aggregate he has placed to a depth required for either type of pavement replacement. The resulting surface shall be rolled to yield a smooth, dense surface and a uniform depth.

The concrete shall be placed in accordance with standard practice, with the welded wire mesh if required in proper position and thoroughly vibrated into place. The Contractor shall produce a surface consistent with the existing pavement. The Contractor shall apply a liquid curing component, sprayed on the surface of the concrete, and shall provide adequate protection to the pavement until it has set.

For bituminous concrete, the Contractor shall clean and broom the prepared surface, then apply the prime coat at the rate of 0.20 to 0.25 gallons per square yard, with a pressure distributor or approved pressure spray method. When the prime coat has become tacky but not dry and hard, the bituminous binder course, or base course, whichever applies, shall be placed and compacted. The Contractor shall then apply the surface course. It is recommended, but not required, that the base course remain in place for approximately one week before placing the surface course. The finished course shall be compacted and the completed surface shall match the grades and slopes of the adjacent existing surfacing and be free of offsets, depressions, raised places and all other irregular surfaces.

3.9.2 Seasonal and Weather Limitations for Pavement Replacement. In the event the progress and scheduling of the work is such that the bituminous pavement replacement would occur in the winter months, during adverse cold weather and/or during such times the asphalt plants are not in operation, then the final pavement replacement shall be postponed until favorable weather occurs in the spring and the asphalt plants resume normal operations. No bituminous concrete shall be laid when the temperature is below 40°F except by written permission of the Engineer.

Concrete pavement shall not be placed when the temperature is such that the pavement placed will freeze before it has had adequate time to set and shall be placed in conformance with the temperature conditions specified in this section of these specifications.

The Contractor shall be responsible for replacement of pavement which he has placed which has been damaged by cold weather or freezing without additional compensation.

In the meantime, the Contractor will be required to maintain the temporary surfacing until the permanent pavement is placed. Such labor, materials and equipment as is required for temporary maintenance of the streets, roadways and driveways shall be provided at the Contractor’s expense and is not a pay item. The Contractor will be

required to use a cold mix asphaltic concrete as a temporary surface for trenches under heavy traffic use.

3.9.3 Guarantee. The one year guarantee as specified in the contract documents is also applicable to trench settlement and pavement replacement.

3.10 SIDEWALK AND DRIVEWAY REPLACEMENT

Sidewalks and driveways will be replaced if damaged by the Contractor in any way. Payment will be made for those pavements necessarily damaged by the line installation in accordance with the Standard Details. No pavements are to be replaced over a backfilled trench for at least thirty (30) days after filling. Pavements damaged otherwise are to be replaced immediately at the Contractor's expense.
Materials and dimensions are to be at least equal to existing pavement and are to conform to the Standard Details.

3.11 PAYMENT FOR WATER

All water used from the Utility shall be metered with meters supplied by the Contractor. The Contractor shall pay for such water monthly at the rates published by the Utility. Unmetered water lost through water line breakage shall also be paid at the rates published by the Utility. The quantity lost shall be computed on the basis of a discharge velocity of 7 feet/second, the diameter of the line, and the estimate duration of free uncontrolled discharge.

3.12 FINAL CLEAN-UP

The Contractor shall provide effective cleanup of the work as it progresses. Procrastination of cleanup will not be tolerated. At the time of final inspection, no trenches shall show any undue evidence of the previous construction. All areas shall be left free of ruts due to construction equipment and shall have a clean and neat appearance without rubble or debris. The areas shall not be mounded up and shall be completely restored, and all yards and fields shall be reseeded so land may be cultivated, mowed, etc. Straw and fertilizing shall accompany the seeding in accordance with Section 3.8—Seeding and Sodding of this section. If necessary to hasten proper restoration of terraces, principally along ditch lines, the Contractor shall sod such areas at the Engineer's direction. For all line segments, final cleanup shall be performed within 30 days from day of installation.

3.13 PROTECTION OF ADJACENT LANDSCAPE

Reasonable care shall be taken during construction of the water lines to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

In the course of construction, the Contractor may deflect horizontal alignment of the water line to avoid trees and to keep from damaging their roots. The Contractor shall be fully responsible for settling all claims by private property owners concerning damage to trees and shrubs.

4.0 PAYMENT

Casing pipe will be paid according to the unit bid price for boring or open cutting, as appropriate. The price shall include, as necessary, the cost of the casing pipe, the cost of boring or cutting, and the cost of special requirements for the road or railroad crossing. Carrier pipe will be paid according to Section 15100.

The unit price bid per linear foot for free boring, as measured from edge of pavement to edge of pavement, regardless of size of bore, shall constitute full compensation for the work specified.

Payment for special creek crossings will be at the unit price bid per linear foot for that item and shall include encasement pipe, crushed stone, concrete, solid rock excavation and all other work necessary for a satisfactory installation. The carrier pipe installed in the casing shall be paid separately under the unit price bid for pipe installed.

Payment for Bypass Test Meter or Leak Detection Test Meter shall include a meter setting (5/8'' x 3/4'') and taps on both sides of a gate valve. The gate valve, sized for the line, is a separate pay item, covered in Section 15110.

Additional costs for normal earth creek crossings shall be included in the unit price bid for pipe installation and no special payment will be made for these crossings.

Payment for asphalt and concrete pavement replacement will not be based on the quantities purchased by the Contractor. Payment for surfacing will be paid on the basis of linear feet installed in accordance with the Standard Drawings with a maximum width of pipe diameter plus twenty-four inches (24”). Crushed stone sub-grade under paving shall be included in paving price and not paid for separately. Any additional cost estimated by the Contractor must be included in the cost of pipe in place.

Sidewalk /driveway crossings when included as a bid item shall include the extra cost of free-boring or the removal and disposal of existing pavement and replacement with new construction. Payment for pavement replacement will be on the basis of linear feet installed. Width for payment for a standard trench crossing is shown in the Standard Details. When sidewalk/driveway crossings or replacement are not included as a bid item, their costs shall be considered subsidiary to the bid for pipe installation.

Where required by the Special Provisions or the Bid Proposal, the cost of pavement replacement, boring, crossings of all types and other incidental construction shall be included in the unit price bid for pipe line installation and shall comprise total compensation for all such work.

All clean-up associated with installing water lines is incidental to the cost of installing the water lines. There is no separate pay item for clean-up.

END OF SECTION

SECTION 02960

TEMPORARY BYPASS PUMPING SYSTEMS

1.0 GENERAL

1.1 DESCRIPTION

Section includes requirements for implementing a temporary pumping system for the purpose of diverting existing sewage flow around work area for duration of the project.

1.2 QUALITY ASSURANCE

1. Follow national standards and as specified herein.

2. Perform leakage and pressure tests on discharge piping using clean water, before operation. Contractor shall notify Owner & Engineer 24 hours prior to testing.

3. Maintain and inspect temporary pumping system every two hours. Contractor shall maintain an experienced and responsible operator on-site when bypass pump system is operating.

4. Keep and maintain spare parts for pumps and piping on site, as required.

5. Maintain adequate hoisting equipment, backup power supply, suction and discharge piping and appropriate accessories on-site for each pump within bypass pumping system.

1.3 SUBMITTALS

1. Contractor shall submit a detailed plan and description of proposed pumping system. Indicate number, size, material, location, and method of installation of suction and discharge piping, size of pipeline or conveyance system to be bypassed, staging area for pumps, site access point, and flow capacity of system.
   a. Size and location of manhole or access points for suction and discharge hose or piping.
   b. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill, if buried.
   c. Temporary pipe supports and anchoring, if required.
   d. Thrust and restraint block sizes and locations, if necessary.
   e. Sewer plugging method and type of plugs.
   f. Bypass pump sizes, capacity, number of each size to be on site and power requirements.
   g. Backup pump, power and piping equipment that will be kept on-site.
   h. Calculations of static lift, friction losses, and flow velocity. Pump curves showing pump operating range.

i. Design plans and access to bypass pumping locations are indicated on drawings.
j. Calculations for selection of bypass pumping pipe size.
k. Method of noise control for each pump and/or generator.
l. Method of protecting discharge manholes or structures from erosion and damage.
m. Schedule for installation and maintenance of bypass pumping lines.
n. Procedures to monitor upstream mains for backup impacts.
o. Procedures for setup and breakdown of pumping operations.
p. Emergency plan detailing procedures to be followed in event of pump failures, sewer overflows, service backups, and sewage spillage. Contractor shall maintain a copy of their emergency plan on site for duration of project. All personnel assigned to monitor and operate the bypass pumping system shall have a thorough understand the emergency plan.

1.4 CONTRACTORS RESPONSIBILITY FOR OVERFLOWS AND SPILLS

The contractor shall schedule and perform work in a manner that does not cause or contribute to incidence of overflows, releases, or spills of sewage from sanitary sewer system or bypass operation. Contractor will be responsible for reporting any overflows or spills to the proper permitting office. Any overflows or spills caused by any action of the contractor will be the responsibility of the contractor, including any fines levied for uncontrolled discharge.

1.5 DELIVERY AND STORAGE

1. Contractor shall transport, deliver, handle, and store pipe, fittings, pumps, ancillary equipment, and all materials necessary to prevent damage to any of the products within the bypass pumping system and shall follow all manufacturer's recommendations.

2. Inspect all material and equipment for proper operation before initiating work. Any material found to be defective or damaged due to manufacturer or shipment of products shall be reported to the Owner & Engineer. If Owner or Engineer deems any product is not repairable or in conformance with these specifications, the contractor shall replace as directed before initiating work.

3. Repair or replacement of defective or damaged material and equipment shall be at no cost to utility or engineer.

2.0 PRODUCTS

2.1 MATERIALS

1. Discharge and Suction Pipes: Shall be approved by Engineer.
   a. Discharge piping: Determined according to flow calculations and system

operating calculations.

b. Suction piping: Determined according to pump size, flow calculations, and manhole depth following manufacturer's specifications and recommendations.

2. Polyethylene Plastic Pipe.
   a. High density solid wall and following ASTM F714 Polyethylene (PE) Plastic Pipe (SDR-DR) based on Outside Diameter, ASTM D1248 and ASTM D3550
   b. Homogenous throughout, free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, blisters, or other deleterious faults.

3. High-Density Polyethylene (HDPE).
   a. Homogenous throughout, free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, blisters, or other deleterious faults.
      1. Defective areas of pipe: Cut out and joint fused as stated herein.
   b. Assembled and joined at site using couplings, flanges, or butt-fusion method to provide leak proof joint. Follow manufacturer's instructions and ASTM D 2657.
      2. Threaded or solvent joints and connections are not permitted.
   c. Fusing: By personnel certified as fusion technicians by manufacturer of HDPE pipe and/or fusing equipment.
   d. Butt-fused joint: True alignment and uniform roll-back beads resulting from use of proper temperature and pressure.
1. Allow adequate cooling time before removal of pressure.
2. Watertight and have tensile strength equal to that of pipe
3. Acceptance by Engineer before insertion
   e. Use in streams, storm water culverts and environmentally sensitive areas.

4. Flexible Hoses and Associated Couplings and Connectors.
   a. Abrasion resistant.
   b. Suitable for intended service.
   c. Rated for external and internal loads anticipated, including test pressure.
      1. External loading design: Incorporate anticipated traffic loadings, including traffic impact loading.
   d. When subject to traffic loading, compose system, such as traffic ramps or covers.
      1. Install system and maintain H-20 loading requirements while in use or as directed by the Engineer.

5. Valves and Fittings: Determined according to flow calculations, pump sizes previously determined, and system operating pressures.

6. Plugs: Selected and installed according to size of line to be plugged, pipe and manhole configurations, and based on specific site.
   a. Additional plugs shall be available in the event a plug fails. Plugs will be inspected by owner and engineer or engineers representative before use for defects which may lead to failure.

7. Aluminum “irrigation type” piping or glued PVC piping will not be permitted.

8. Discharge hose will only be allowed in short sections when approved by Engineer.

2.2 EQUIPMENT

1. Pumps.
   a. Fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in priming system.
   b. Electric or diesel powered.
   c. Constructed to allow dry running for long periods of time to accommodate cyclical nature of effluent flows.

2. Provide.
   a. Necessary stop/start controls for each pump.
   b. One standby pump of each size maintained on site.
      1. On-line, isolated from primary system by a valve.
   c. Quiet flow pumps at request of Owner or Engineer.

2.3 DESIGN REQUIREMENTS

1. Bypass pumping systems:
   a. Sufficient capacity to pump peak flow of **500 GPM.**

2. Engineer will provide flow data for bypass system.
   a. Contractor shall have in place staff for manual operation or automatic pump controls to maintain operation of bypass pumping. Pumps to be operated as needed, with the capacity to operate 24 hours per day, if necessary.

3. Provide pipeline plugs and pumps of adequate size to handle peak flow, and temporary discharge piping to ensure total flow of main can be safely diverted around section to be repaired/replaced/constructed.

3.0 EXECUTION

3.1 PREPARATION

1. Determining location of bypass pipelines.
   a. Minimal disturbance to existing utilities.
      1. Field locate existing utilities in proposed bypass area.
   b. Obtain approvals for placement within public or private property.
   c. Obtain Owner and Engineer’s approval of location.
   d. Costs associated with relocation of utilities and obtaining approvals will be at no cost to the utility or engineer.

3.2 INSTALLATION AND REMOVAL

1. Provisions and requirements must be reviewed by Engineer before starting construction.

2. Remove manhole sections or make connections to existing sewer and construct temporary bypass pumping structures at location(s) indicated on Drawings and as required to provide adequate suction conduit.

3. Plugging or blocking of sewage flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance of work, remove in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.

4. When working inside manhole or force main, exercise caution. Contractor shall closely follow all OSHA, Local, State and Federal requirements as applicable. Take required measures to protect workforce against sewer gases and/or combustible or oxygen-deficient atmosphere. Contractor is solely responsible for jobsite safety.

5. Installation of Bypass Pipelines:
   a. Pipeline may be placed along shoulder of roads.
      1. Do not place in streets or sidewalks.
   b. When bypass pipeline crosses local streets and private driveways, place in roadway ramps, or as directed by Engineer.
      1. When roadway ramps cannot be used, place bypass in trenches and cover with temporary pavement or road plates as approved by Engineer.

6. During bypass pumping operation, protect pumps and sewer lines from damage that may be inflicted by equipment or vandalism. Contractor shall erect berms, barricades, or temporary fencing as necessary to protect bypass pumping system and discourage or prevent entry by unauthorized personnel. Contractor is solely responsible for jobsite security and controlled access.

7. Upon completion of bypass pumping operations, and after the receipt of written permission from Engineer, remove piping, restore property to pre-construction condition and restore pavement.

END OF SECTION

SECTION 15100

NATURAL GAS VALVES AND GAS MAIN ACCESSORIES

1.0 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install complete and ready for operation all natural gas valves, gas main accessories and all related appurtenances as shown on the Drawings and as specified herein.

B. The equipment shall include, but not be limited to, the following:

1. Ball Valves
2. Polyethylene Gas Valves
3. Radial Flow Valves
4. Needle Valves
5. Relief Valves
6. Filters
7. Tapping Tees and Transition Fittings
8. Line Stoppers
9. Pressure Gauges
10. Field Regulators

1.2 RELATED WORK

A. Excavation, backfill and grading is included in Division 2.

B. Natural Gas Piping as included in Division 2.

1.3 DESCRIPTIONS OF SYSTEMS

A. All of the equipment and material specified herein is intended to be standard for use in natural gas systems.

B. See the Drawings for equipment sizes, quantities, connections, type, location, etc.

1.4 QUALIFICATIONS

A. All of the types of equipment and appurtenances shall be products of well established firms that are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

B. Acceptable Manufacturers

1. Ball Valves - Rockwell, Kerotest, Balon, Camron or KF Valves
2. Radial Flow Valves - American Meter
3. Polyethylene Gas Valves - Flowserve
4. Needle Valves - American Meter
5. Relief Valves - Fisher
6. Filters - American Meter (KleanLine)
7. Tapping Tees and Transition Fittings - Mueller
8. Line Stoppers - Mueller
9. Pressure Gauges - Wika
10. Field Regulators - Fisher

1.3 SUBMITTALS

A. Complete shop drawing of all equipment and appurtenances shall be submitted to the Owner for review.

B. The Owner shall be furnished 2 certified copies of reports covering proof-of-design tests on the valves.

2.0 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. General

1. All equipment and appurtenances shall be of the size and type shown on the Drawings.

2. All equipment and appurtenances shall have the name of the maker, flow-directional arrows, and the working pressure for which they are designed cast in raised letter on some appropriate part of the body.

3. All buried valves shall open left (counter clockwise). Insofar as possible, all valves shall open counter clockwise.

4. All valves and equipment shall be provided with suitable operating devices and adapted for the operation in the position in which they are shown on the Drawings.

5. Bolts and Studs

a. All bolts and studs shall be in accordance with ASTM A-307 Grade B and nuts shall be in accordance with ASTM A-563. bolts, studs and nuts shall be electrogalvanized according to ASTM B-633.

b. All bolts, studs and nuts in contact with water, in any moist atmosphere or damp area such as occurs above water, or exposed to weather shall be stainless steel.

c. All bolts delivered to the job shall be free of rust and dirt and shall be stored in a manner to protect them from rust and dirt. All bolts shall be tightened to the proper torque. They shall be of the size recommended for the pipe and fittings they are to be used on and shall be in the recommended quantity. Tightening of bolts shall be alternated, so as to not produce undue stress on the valves and fittings.

2.2 BALL VALVES

A. Welded Body Ball Valves

1. Valves shall be ANSI CLASS 300 flange for above ground and welded below ground, 720 psi, standard seat and shall be of the size shown on the Drawings.

2. Valves shall be manufactured from forged carbon steel.

3. Vales shall have the operator type as shown on the Drawings.

4. Trim material for standard valves shall be as follows:

a. Temperature Range: -20°F to +250°F (-29EC to +121EC)
b. Body: ASTM A350 Gr. LF-2(M)
c. End Connection: ASTM A350 Gr. LF-2(M)
d. Ball: ASTM A694 Gr. F50(M) Cr. Pl.
e. Seat Ring: AISI 1040
f. Seat Load Spring: AISI 1040
g. Stem Seals: PTFE
h. Lip Seals: PTFE
I. Seat Ring Insert: Nylon

B. Polyethylene Gas Valves

1. Valve body shall be high density polyethylene with BUNA N capable of withstanding 100 psi service pressures butt or socket fused.

2. Valve shall be of the size shown on the drawings or the size of the adjacent pipe.

3. Valve shall be Poly-Gas as manufactured by Flow Serve.

2.3 RADIAL FLOW VALVES

A. Series 300 Radial Flow Valves

1. General

a. Radial flow valves shall be a pilot unloading type of valve. Under gas flow conditions the pilot opens, exhausting pressure from the control chamber above the diaphragm and causing the diaphragm to lift. When the gas demand decreases or stops completely, outlet pressure builds slightly closing the pilot and increasing the control pressure.

2. Materials of Construction

a.	Top	Cast Steel
b.	Cage	Cast 17-4 PH Stainless Steel
c.	Body	Cast Steel
d.	O-Rings	Buna
e.	Spring	Stainless Steel
f.	Manifold Block	Cadmium Plated Steel

3. General Design

a. Restrictor Manifold Block B The valve shall be provided with an adjustable restrictor in the control block to limit the flow of gas to the control chamber and to the pilot.

b. Valve shall be provided with a manifold filter.

c. Valve shall be provided with a pilot for pressure reduction.

d. Two valves shall be utilized to provide pilot controlled passive upstream monitoring.

e. Valve setup to be coordinated with the Owner.

4. Manufacturer and Model Number

a. Valve shall be Series 300 Radial Flow Valve with Diaphragm H-5 as manufactured by American Meter Company.

2.4 NEEDLE VALVES

A. Stainless Steel Needle Valve

1. Features

a. Metal-to-metal hard seat design for a bubble-tight seal.

b. 10,000 psi pressure rating (@200°F maximum).

c. Blowout-proof stem that provides a secondary stem seal in the full-open position.

d. Stem packing below the threads to prevent thread galling and corrosion.

e. Viton O-Ring and Teflon back-up ring stem seals.

f. 316 stainless steel stems.

g. Stem and bonnet thread shall be rolled for greater strength and smoother operation.

h. Stem and bonnet sealing surfaces shall be burnished to a 16 RMS mirror finish.

I. Angled stem for precise flow metering.

j. One-piece bonnet with a metal-to-metal seal to the valve body below the bonnet threads.

k. Bonnet lock pin to prevent accidental loosening.

l. Vinyl bonnet and stem dust cap.

m. Electro-polish finish on stainless-steel valves.

B. Materials of Construction

1. Valve Body 316SS

2. Bonnet 316SS
3. Valve Stem 316SS
4. Handle 316SS
5. Handel Setscrew 18-8SS
6. Bonnet Lock 18-8SS
7. Stem Seals Viton O-Ring and Teflon Back-Up Ring

2.5 RELIEF VALVES

A. General

1. Relief valve shall be a pilot-operated throttling pressure control device that opens to ensure the upstream pressure does not rise above a predetermined pressure. The valve shall be of the size shown on the Drawings for relief pressure maximum operating inlet pressure of 500 psig and ANSI Class 300 flanged inlet and outlet connections. A stainless steel inlet strainer shall be provided.

B. Materials of Construction

1. Vales shall be constructed from 312SS.

C. Manufacturer and Model

1. Relief Valves shall be Model 289-H Series Relief Valve as manufactured by Fisher.

2.6 FILTERS

A. General

1. Filters shall be all steel construction and capable of removing particles to 10 microns in size. Filters shall be of the size shown on the drawings with a maximum working pressure of 720 psi and a 300# ANSI flange. Filter shall be KLEANLINE Model KL-2 as manufactured by American Meter Company.

2.7 TAPPING TEES

A. Curb Valve Tee and Transition Fittings

1. General

a. Unless otherwise shown on the drawings, Curb Valve Tees shall be used to make main to service connections and shall be provided with a means to shut off the service line at the main.

2. Materials of Construction

a. Curb Valve Tees shall have machined forged steel bodies (ASTM A105) and completion caps (AISI 12L14), One piece stainless steel stem and bushing (314), ductile iron operating nut, and o-ring sealed stem and completion cap.

3. General Design and Manufacturer

a. Curb Valve Tees shall have a maximum working pressure of 1440 psig and have weld x weld connections. Curb Valve Tees shall be Mueller Model H-17800.

b. Transition fittings shall be Mueller H-13143 or H-13138 as applicable.

B. AUTOPERF Tee

1. General

a. AUTOPERF Tees shall be provided where shown on the drawings or where a drilling machine cannot be utilized and shall be provided with a separate control valve and all required tool kits and/or accessories.

2. Materials of Construction

a. AUTOPERF Tees shall have machined forged steel bodies (ASTM A105) and completion caps (AISI 12L14), steel perforator (specially heat treated) and o-ring sealed completion cap.

3. General Design and Manufacturer

a. AUTOPERF Tees shall have a maximum working pressure of 1200 psig and have weld x weld connections. AUTOPERF Tees shall be Mueller Model H-18101.

2.8 LINE STOPPERS

A. Weld Type Line Stopper for Steel Pipe

1. General

a. Unless otherwise shown on the Drawings, Weld Type Line Stoppers for Steel Pipe shall be used to stop off gas mains as indicated shall be provided with a valve box, steel ball valve and all required tool kits/accessories.

2. Materials of Construction

a. Line Stopper shall have machined forged steel flanges, fitting top and bottom halves (ASTM A105) and completion caps (ASTM A126 CLB), o-ring sealed cast iron (ASTM A105) completion plug with equalizing valve and class 150 lb flanges.

3. General Design and Manufacturer

a. Line Stopper shall have a maximum working pressure of 275 psig and have welded connections. Line Stoppers shall be Mueller Model H-17255 for 4-inches and smaller and H17275 for 6 and 8 inches.

2.9 PRESSURE GAUGES

A. General

1. Pressure gauges shall be WIKA 213.53, 2.5-inch dial with a ¼" NPT male lower brass connection, glycerine filled with a range as required (submit quantity and associated ranges for review).

2. Pressure gauges shall be provided with a needle valve for isolation.

2.10 FIELD REGULATORS

A. General

1. Field regulators shall be self-operated pressure reducing regulator with an internal relief valve and open throat. End connection shall be NPT screwed or Class 300 raised face flange with a maximum inlet pressure rating of 2000 psig for screwed steel and 1480 for RF flanged steel.

B. Materials of Construction

1. Body:	Steel
2. Spring Case and Diaphragm Case:	Steel
3. Seat Ring:	Stainless Steel
4. Disk Holder with Valve Disk:	Stainless Steel with Nylon
5. O-Rings and Diaphragm:	Nitrile or Fluoroelastomer

C. Manufacturer and Model Number

1. Field regulators shall be Model 627R as manufactured by Fisher Controls.

3.0 EXECUTION

3.1 GENERAL

A. All flanged valves shall be bolted to the adjacent pipe with 304 stainless steel bolts and nuts.

B. Buried valves shall be installed with operating stem vertical. Tips of operating nuts shall be not more than 30 inches below ground surface. Where valve operating nuts are more than 30 inches below tops of valve boxes, stem shall be provided to bring the operating nut to within 12 inches of box tops.

C. Valve boxes shall be accurately centered over valve operating nuts and the backfill shall be mechanically tamped about them, to prevent subsequent movement. Tops of boxes shall be flush with the surface, paving, walk, or road surface and shall have the appropriate grade cover to withstand loading.

D. All equipment and appurtenances shall be installed in strict accordance with the manufacturer's recommendations/instructions. All necessary material, parts, operator and gaskets shall be provided.

3.2 TOOLS AND SPARE PARTS

A. All special tools required for normal operation and maintenance shall be furnished by the valve manufacturer.

3.3 SHOP COATING

A. The exterior surface of various parts of the equipment shall be thoroughly cleaned of all scale, dirt, grease, or other foreign matter and thereafter shop coated with an approved rust-inhibitive primer of the manufacturers= recommendations and compatible with the final field coating specified in Section 02610.

3.4 FIELD COATING

A. All buried equipment shall be field coated with the same material used to field coat the adjacent piping as specified in Section 02610.

B. All exposed equipment shall be field coated with the same material used to field coat the adjacent piping as specified on the Drawings.

C. The Contractor and the equipment manufacturer shall coordinate shop and field coating to assure compatibility as specified in Section 02610.

3.5 INSPECTION AND TESTING

A. The various pipelines in which the equipment and appurtenances are to be installed are specified to be field tested. During these tests and defective equipment or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the Engineer.

B. Various regulating valves, strainers, or other appurtenances shall be tested to demonstrate their conformance with the specified operation capabilities any deficiencies shall be corrected or the devise replaced or otherwise made acceptable to the Engineer.

END OF SECTION

2021 Nationwide Permit Summary

US Army Corps of Engineers
Louisville District ®

Issued: **March 15, 2021**
Expires: **March 14, 2026**

No. 58. Utility Line Activities for Water and Other Substances

(NWP Final Rule, 86 FR 2744)

Activities required for the construction, maintenance, repair, and removal of utility lines for water and other substances, excluding oil, natural gas, products derived from oil or natural gas, and electricity. Oil or natural gas pipeline activities or electric utility line and telecommunications activities may be authorized by NWPs 12 or 57, respectively. This NWP also authorizes associated utility line facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project.

Utility lines: This NWP authorizes discharges of dredged or fill material into waters of the United States and structures or work in navigable waters for crossings of those waters associated with the construction, maintenance, or repair of utility lines for water and other substances, including outfall and intake structures. There must be no change in pre-construction contours of waters of the United States. A "utility line" is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose that is not oil, natural gas, or petrochemicals. Examples of activities authorized by this NWP include utility lines that convey water, sewage, stormwater, wastewater, brine, irrigation water, and industrial products that are not petrochemicals. The term "utility line" does not include activities that drain a water of the United States, such as drainage tile or french drains, but it does apply to pipes conveying drainage from another area.

Material resulting from trench excavation may be temporarily sidecast into waters of the United States for no more than three months, provided the material is not placed in such a manner that it is dispersed by currents or other forces. The district engineer may extend the period of temporary side casting for no more than a total of 180 days, where appropriate. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. The trench cannot be constructed or backfilled in such a manner as to drain waters of the United States (e.g., backfilling with extensive gravel layers, creating a french drain effect). Any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line crossing of each waterbody.

Utility line substations: This NWP authorizes the construction, maintenance, or expansion of substation facilities associated with a utility line in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not result in the loss of greater than 1/2-acre of waters of the United States. This NWP does not authorize discharges of dredged or fill material into non-tidal wetlands adjacent to tidal waters of the United States to construct, maintain, or expand substation facilities.

Foundations for above-ground utility lines: This NWP authorizes the construction or maintenance of foundations for above-ground utility lines in all waters of the United States, provided the foundations are the minimum size necessary.

Access roads: This NWP authorizes the construction of access roads for the construction and maintenance of utility lines, including utility line substations, in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not cause the loss of greater than 1/2-acre of non-tidal waters of the United States. This NWP does not authorize discharges of dredged or fill material into non-tidal wetlands adjacent to tidal waters for access roads. Access roads must be the minimum width necessary (see Note 2, below). Access roads must be constructed so that the length of the road minimizes any adverse effects on waters of the United States and must be as near as possible to pre-construction contours and elevations (e.g., at grade corduroy roads or geotextile/gravel roads). Access roads constructed above pre-construction contours and elevations in waters of the United States must be properly bridged or culverted to maintain surface flows.

This NWP may authorize utility lines in or affecting navigable waters of the United States even if there is no associated discharge of dredged or fill material (see 33 CFR part 322). Overhead utility lines constructed over section 10 waters and utility lines that are routed in or under section 10 waters without a discharge of dredged or fill material require a section 10 permit.

This NWP authorizes, to the extent that Department of the Army authorization is required, temporary structures, fills, and work necessary for the remediation of inadvertent returns of drilling fluids to waters of the United States through sub-soil fissures or fractures that might occur during horizontal directional drilling activities conducted for the purpose of installing or replacing utility lines. These remediation activities must be done as soon as practicable, to restore the affected waterbody. District engineers may add special conditions to this NWP to require a remediation plan for addressing inadvertent returns of drilling fluids to waters of the United States during horizontal directional drilling activities conducted for the purpose of installing or replacing utility lines.

This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the utility line activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges of dredged or fill material, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After construction, temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) a section 10 permit is required; or (2) the discharge will result in the loss of greater than 1/10-acre of waters of the United States. (See general condition 32.) (Authorities: Sections 10 and 404)

Note 1: Where the utility line is constructed, installed, or maintained in navigable waters of the United States (i.e., section 10 waters) within the coastal United States, the Great Lakes, and United States territories, a copy of the NWP verification will be sent by the Corps to the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), for charting the utility line to protect navigation.

Note 2: For utility line activities crossing a single waterbody more than one time at separate and distant locations, or multiple waterbodies at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. Utility line activities must comply with 33 CFR 330.6(d).

Note 3: Access roads used for both construction and maintenance may be authorized, provided they meet the terms and conditions of this NWP. Access roads used solely for construction of the utility line must be removed upon completion of the work, in accordance with the requirements for temporary fills.

Note 4: Pipes or pipelines used to transport gaseous, liquid, liquescent, or slurry substances over navigable waters of the United States are considered to be bridges, not utility lines, and may require a permit from the U.S. Coast Guard pursuant to the General Bridge Act of 1946. However, any discharges of dredged or fill material into waters of the United States associated with such pipelines will require a section 404 permit (see NWP 15).

Note 5: This NWP authorizes utility line maintenance and repair activities that do not qualify for the Clean Water Act section 404(f) exemption for maintenance of currently serviceable fills or fill structures.

Note 6: For activities that require pre-construction notification, the PCN must include any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings that require Department of the Army authorization but do not require pre-construction notification (see paragraph (b)(4) of general condition 32). The district engineer will evaluate the PCN in accordance with Section D, "District Engineer's Decision." The district engineer may require mitigation to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see general condition 23).

Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. Navigation. (a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his or her authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. Aquatic Life Movements. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed

and constructed to minimize adverse effects to aquatic life movements.

3. Spawning Areas. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. Migratory Bird Breeding Areas. Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. Shellfish Beds. No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. Suitable Material. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

7. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. Adverse Effects From Impoundments. If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. Management of Water Flows. To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. Fills Within 100-Year Floodplains. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. Equipment. Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. Removal of Temporary Structures and Fills. Temporary structures must be removed, to the maximum extent practicable, after their use has been discontinued. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. Single and Complete Project. The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. Wild and Scenic Rivers. (a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

(b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. Permittees shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.

(c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

17. Tribal Rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

18. Endangered Species. (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed

for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify designated critical habitat or critical habitat proposed for such designation. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the consequences of the proposed activity on listed species or critical habitat has been completed. See 50 CFR 402.02 for the definition of "effects of the action" for the purposes of ESA section 7 consultation, as well as 50 CFR 402.17, which provides further explanation under ESA section 7 regarding "activities that are reasonably certain to occur" and "consequences caused by the proposed action."

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA (see 33 CFR 330.4(f)(1)). If pre-construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat or critical habitat proposed for such designation, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation), the pre-construction notification must include the name(s) of the endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or that utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. For activities where the non-Federal applicant has identified listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have "no effect" on listed species (or species proposed for listing or designated critical habitat (or critical habitat proposed for such designation), or until ESA section 7 consultation or conference has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation or conference with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWPs.

(e) Authorization of an activity by an NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.

(g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://www.nmfs.noaa.gov/pr/species/esa/ respectively.

19. Migratory Birds and Bald and Golden Eagles. The permittee is responsible for ensuring that an action authorized by an NWP complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting the appropriate local office of the U.S. Fish and Wildlife Service to determine what measures, if any, are

necessary or appropriate to reduce adverse effects to migratory birds or eagles, including whether "incidental take" permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

20. Historic Properties. (a) No activity is authorized under any NWP which may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)(1)). If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts commensurate with potential impacts, which may include background research, consultation, oral history interviews, sample field investigation, and/or field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: no historic properties affected, no adverse effect, or adverse effect.

(d) Where the non-Federal applicant has identified historic properties on which the proposed NWP activity might have the potential to cause effects and has so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed. For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. Discovery of Previously Unknown Remains and Artifacts. Permittees that discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by an NWP, they must immediately notify the district engineer of what they have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. Designated Critical Resource Waters. Critical resource waters include, NOAA-managed marine sanctuaries and marine

monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, 52, 57 and 58 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed by permittees in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after she or he determines that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation. The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

(d) Compensatory mitigation at a minimum one-for-one ratio will be required for all losses of stream bed that exceed 3/100-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. This compensatory mitigation requirement may be satisfied through the restoration or enhancement of riparian areas next to streams in accordance with paragraph (e) of this general condition. For losses of stream bed of 3/100-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult-to-replace resources (see 33 CFR 332.3(e)(3)).

(e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. If restoring riparian areas involves planting vegetation, only native species should be planted. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation.

(2) The amount of compensatory mitigation required by the district engineer must be

sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f).)

(3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation.

(4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). If permittee-responsible mitigation is the proposed option, and the proposed compensatory mitigation site is located on land in which another federal agency holds an easement, the district engineer will coordinate with that federal agency to determine if proposed compensatory mitigation project is compatible with the terms of the easement.

(5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan needs to address only the baseline conditions at the impact site and the number of credits to be provided (see 33 CFR 332.4(c)(1)(ii)).

(6) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).

(g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs.

(h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

24. Safety of Impoundment Structures. To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state or federal, dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. Water Quality. (a) Where the certifying authority (state, authorized tribe, or EPA, as appropriate) has not previously certified compliance of an NWP with CWA section 401, a CWA section 401 water quality certification for the proposed discharge must be obtained or waived (see 33 CFR 330.4(c)). If the permittee cannot comply with all of the conditions of a water quality certification previously issued by certifying authority for the issuance of the NWP, then the permittee must obtain a water quality certification or waiver for the proposed discharge in order for the activity to be authorized by an NWP.

(b) If the NWP activity requires pre-construction notification and the certifying authority has not previously certified compliance of an NWP with CWA section 401, the proposed discharge is not authorized by an NWP until water quality certification is obtained or waived. If the certifying authority issues a water quality certification for the proposed discharge, the permittee must submit a copy of the certification to the district engineer. The discharge is not authorized by an NWP until the district engineer has notified the permittee that the water quality certification requirement has been satisfied by the issuance of a water quality certification or a waiver.

(c) The district engineer or certifying authority may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. Coastal Zone Management. In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). If the permittee cannot comply with all of the conditions of

a coastal zone management consistency concurrence previously issued by the state, then the permittee must obtain an individual coastal zone management consistency concurrence or presumption of concurrence in order for the activity to be authorized by an NWP. The district engineer or a state may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its CWA section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. Use of Multiple Nationwide Permits. The use of more than one NWP for a single and complete project is authorized, subject to the following restrictions:

(a) If only one of the NWPs used to authorize the single and complete project has a specified acreage limit, the acreage loss of waters of the United States cannot exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

(b) If one or more of the NWPs used to authorize the single and complete project has specified acreage limits, the acreage loss of waters of the United States authorized by those NWPs cannot exceed their respective specified acreage limits. For example, if a commercial development is constructed under NWP 39, and the single and complete project includes the filling of an upland ditch authorized by NWP 46, the maximum acreage loss of waters of the United States for the commercial development under NWP 39 cannot exceed 1/2-acre, and the total acreage loss of waters of United States due to the NWP 39 and 46 activities cannot exceed 1 acre.

29. Transfer of Nationwide Permit Verifications. If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

"When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

_____
(Transferee)

_____
(Date)

30. Compliance Certification. Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

(a) A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

(c) The signature of the permittee certifying the completion of the activity and mitigation.

The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

31. Activities Affecting Structures or Works Built by the United States. If an NWP activity also requires review by, or permission from, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a "USACE project"), the prospective permittee must submit a pre-construction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission and/or review is not authorized by an NWP until the appropriate Corps office issues the section 408 permission or completes its review to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

32. Pre-Construction Notification. (a) *Timing*. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the

information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) *Contents of Pre-Construction Notification*: The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed activity;

(3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;

(4) (i) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures.

(ii) For linear projects where one or more single and complete crossings require pre-construction notification, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters (including those single and complete crossings authorized by an NWP but do not require PCNs). This information will be used by the district engineer to evaluate the cumulative adverse environmental effects of the proposed linear project, and does not change those non-PCN NWP activities into NWP PCNs.

(iii) Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial and intermittent streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45-day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(7) For non-federal permittees, if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat (or critical habitat proposed for such designation), the PCN must include the name(s) of those endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or utilize

the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act;

(8) For non-federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act;

(9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the "study river" (see general condition 16); and

(10) For an NWP activity that requires permission from, or review by, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from, or review by, the Corps office having jurisdiction over that USACE project.

(c) *Form of Pre-Construction Notification*: The nationwide permit pre-construction notification form (Form ENG 6082) should be used for NWP PCNs. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals.

(d) *Agency Coordination*: (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity's adverse environmental effects so that they are no more than minimal.

(2) Agency coordination is required for: (i) all NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iii) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes.

(3) When agency coordination is required, the district engineer will immediately provide (e.g., via e-mail, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or e-mail that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure that the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of pre-construction notifications to expedite agency coordination.

2021 District Engineer's Decision

1. In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If a project proponent requests authorization by a specific NWP, the district engineer should issue the NWP verification for that activity if it meets the terms and conditions of that NWP, unless he or she determines, after considering mitigation, that the proposed activity will result in more than minimal individual and cumulative adverse effects on the aquatic environment and other aspects of the public interest and exercises discretionary authority to require an individual permit for the proposed activity. For a linear project, this determination will include an evaluation of the single and complete crossings of waters of the United States that require PCNs to determine whether they

individually satisfy the terms and conditions of the NWP(s), as well as the cumulative effects caused by all of the crossings of waters of the United States authorized by an NWP. If an applicant requests a waiver of an applicable limit, as provided for in NWPs 13, 36, or 54, the district engineer will only grant the waiver upon a written determination that the NWP activity will result in only minimal individual and cumulative adverse environmental effects.

2. When making minimal adverse environmental effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. He or she will also consider the cumulative adverse environmental effects caused by activities authorized by an NWP and whether those cumulative adverse environmental effects are no more than minimal. The district engineer will also consider site specific factors, such as the environmental setting in the vicinity of the NWP activity, the type of resource that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. If an appropriate functional or condition assessment method is available and practicable to use, that assessment method may be used by the district engineer to assist in the minimal adverse environmental effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site-specific environmental concerns.

3. If the proposed activity requires a PCN and will result in a loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for NWP activities with smaller impacts, or for impacts to other types of waters. The district engineer will consider any proposed compensatory mitigation or other mitigation measures the applicant has included in the proposal in determining whether the net adverse environmental effects of the proposed activity are no more than minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse environmental effects are no more than minimal, after considering mitigation, the district engineer will notify the permittee and include any activity-specific conditions in the NWP verification the district engineer deems necessary. Conditions for compensatory mitigation requirements must comply with the appropriate provisions at 33 CFR 332.3(k). The district engineer must approve the final mitigation plan before the permittee commences work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the proposed compensatory mitigation plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure that the NWP activity results in no more than minimal adverse environmental effects. If the net adverse environmental effects of the NWP activity (after consideration of the mitigation proposal) are determined by the district engineer to be no more than minimal, the district engineer will provide a timely written response to the applicant. The response will state that the NWP activity can proceed under the terms and conditions of the NWP, including any activity-specific conditions added to the NWP authorization by the district engineer.

4. If the district engineer determines that the adverse environmental effects of the proposed activity are more than minimal, then the district engineer will notify the applicant either: (a) that the activity does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (b) that the activity is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal; or (c) that the activity is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse environmental effects, the activity will be authorized within the 45-day PCN period (unless additional time is required to comply with general conditions 18, 20, and/or 31), with activity-specific conditions that state the mitigation requirements. The authorization will include the necessary conceptual or detailed mitigation plan or a requirement that the applicant submit a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal. When compensatory mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan or has determined that prior approval of a final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation.

2021 Further Information

1. District engineers have authority to determine if an activity complies with the terms and conditions of an NWP.

2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.

3. NWPs do not grant any property rights or exclusive privileges.

4. NWPs do not authorize any injury to the property or rights of others.

5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).

2021 Nationwide Permit Definitions

Best management practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural.

Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Direct effects: Effects that are caused by the activity and occur at the same time and place.

Discharge: The term "discharge" means any discharge of dredged or fill material into waters of the United States.

Ecological reference: A model used to plan and design an aquatic habitat and riparian area restoration, enhancement, or establishment activity under NWP 27. An ecological reference may be based on the structure, functions, and dynamics of an aquatic habitat type or a riparian area type that currently exists in the region where the proposed NWP 27 activity is located. Alternatively, an ecological reference may be based on a conceptual model for the aquatic habitat type or riparian area type to be restored, enhanced, or established as a result of the proposed NWP 27 activity. An ecological reference takes into account the range of variation of the aquatic habitat type or riparian area type in the region.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

High Tide Line: The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete non-linear project in the Corps Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Indirect effects: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. The loss of stream bed includes the acres of stream bed that are permanently adversely affected by filling or excavation because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters or wetlands for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the United States.

Navigable waters: Waters subject to section 10 of the Rivers and Harbors Act of 1899. These waters are defined at 33 CFR part 329.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Non-tidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of flowing or standing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of "open waters" include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: The term ordinary high water mark means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

Perennial stream: A perennial stream has surface water flowing continuously year-round during a typical year.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands next to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects riverine, lacustrine, estuarine, and marine waters with their adjacent wetlands, non-wetland waters, or uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 23.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term "single and complete project" is defined as that portion of the total linear project proposed or accomplished by one owner/developer or partnership or other association of owners/developers that includes all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete non-linear project must have independent utility (see definition of "independent utility"). Single and complete non-linear projects may not be "piecemealed" to avoid the limits in an NWP authorization.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the

purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized jurisdictional stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a jurisdictional wetland that is inundated by tidal waters. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line.

Tribal lands: Any lands title to which is either: 1) held in trust by the United States for the benefit of any Indian tribe or individual; or 2) held by any Indian tribe or individual subject to restrictions by the United States against alienation.

Tribal rights: Those rights legally accruing to a tribe or tribes by virtue of inherent sovereign authority, unextinguished aboriginal title, treaty, statute, judicial decisions, executive order or agreement, and that give rise to legally enforceable remedies.

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: For purposes of the NWPs, a waterbody is a "water of the United States." If a wetland is adjacent to a waterbody determined to be a water of the United States, that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)).

TECHNICAL SPECIFICATIONS

KY 3155 Leitchfield By-Pass WATER MAIN RELOCATION

GRAYSON COUNTY WATER DISTRICT

Leitchfield, Grayson County, Kentucky

Kentucky Engineering Group, PLLC

P.O. Box 1034

Versailles, Kentucky 40383

December, 2023

KEG Project No. 20019

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, equipment, service, other necessary supplies and perform all work, including all excavation, backfilling, & cleanup (without additional compensation, except where specifically set out in these specifications) at the unit or lump sum prices for the following items.

1.02 PROGRESS AND PAYMENTS SCHEDULES

A. Within ten (10) days after the date of formal execution of the AGREEMENT, the Contractor shall prepare and submit to the Engineer, for approval, a construction schedule which depicts the Contractor's plan for completing the contract requirements and show work placement in dollars versus contract time. The Contractor's construction schedule must be approved by the Engineer before any payments will be made on this contract.

B. Within ten (10) days after the date of formal execution of the CONTRACT AGREEMENT, the Contractor shall prepare and submit to the Engineer, for approval, a periodic estimate which depicts the Contractor's cost for completing the contract requirements and show by major unit of the project work, the Contractor's dollar value for the material and the labor (two separate amounts) to be used as a basis for the periodic payments. The Contractor's periodic estimate must be approved by the Engineer before any payments will be made on this contract.

C. The Engineer's decision as to sufficiency and completeness of the Contractor's construction schedule and periodic estimate will be final.

D. The Contractor must make current, to the satisfaction of the Engineer, the construction schedule and periodic estimate each time he requests a payment on this contract.

E. The Contractor's construction schedule and periodic estimate must be maintained at the construction site available for inspection and shall be revised to incorporate approved change orders as they occur.

F. When the Contractor requests a payment on this contract, it must be on the approved periodic estimate and be current. Further, the current periodic estimate and construction schedule (both updated and revised) shall be submitted for review and approval by the Engineer before monthly payments will be made by the Owner. The Contractor shall submit six (6) current copies of each (periodic estimate and construction schedule) when requesting payment.

1.03 CONDITIONS FOR PAYMENT

A. The Owner will make payments for acceptable work in place and materials properly stored on-site. The value of payment shall be as established on the approved construction schedule and periodic estimate, EXCEPT the Owner will retain five percent (5%) of the work in place and a percentage as hereinafter listed for items properly stored or untested.

B. No payment will be made for stored materials unless a proper invoice form the supplier is attached to the pay request. Items submitted for payment shall be limited to pipe, valves, meter setters, meter boxes, meters, hydrants, vaults, and pump stations.

C. Payment for stored materials that are submitted with each monthly pay request will require documentation from the material supplier indicating that those items have been paid. Proof of payment for stored materials shall be in the form of "paid invoice" receipts or cancelled checks. Failure to provide adequate documentation will result in delays in processing subsequent pay requests.

D. Payment for pipeline items may be limited to eighty percent (80%) of the bid price until the pipeline items have been tested and clean up has been completed and accepted by the Engineer.

E. Payment for equipment items shall be limited to eighty-five percent (85%) of their scheduled value (materials portion only) until they are set in place. Eighty-five percent (85%) for stored materials and equipment shall be contingent on proper on-site storage as recommended by the manufacturer or required by the Engineer.

F. Payment for equipment items set in place shall be limited to ninety percent (90%) of their scheduled value until they are ready for operation and have been certified by the manufacturer. Ninety percent (90%) payment for installed equipment shall be contingent on proper routine maintenance of the equipment in accordance with the manufacturer's recommendations.

G. Payment for equipment items set in place and ready for operation shall be limited to ninety-five percent (95%) of their scheduled value until all acceptance tests have been completed and the required manufacturer's pre-startup operator's training has been completed.

H. Payment for the labor portion of equipment items will be subject only to the degree of completeness and the appropriate retainage.

I. The retainage shall be an amount equal to 5% of said estimate. The retainage on the equipment items shall be 5% as defined hereinbefore.

J. If at any time thereafter when the progress of the WORK is not satisfactory or determine that the Contractor is not making satisfactory progress, additional amounts may be retained.

1.04 DETERMINATION OF THE VALUE OF EXTRA (ADDITIONAL) OR OMITTED WORK

A. The value of extra (additional) or omitted work shall be determined in one or more of the following ways:

1. On the basis of the actual cost of all the items of labor (including on-the-job supervision), materials and use of equipment, plus a maximum 20% for added work or a minimum 20% for deleted work which shall cover the Contractor's general supervision, overhead and profit. In case of subcontracts, the sum of total overhead amounts of the subcontractors and Contractor, plus total profit amounts for the subcontracts and Contractor shall not exceed 25% of the cost. Subcontractors shall be limited to 15% and Contractors shall be limited to 10% for combined overhead and profit. The cost of labor shall include required insurance, taxes and fringe benefits. Contractor to provide detailed breakdown of all cost as justification of change in work. Equipment costs shall be based on current rental rates in the areas where the work is being performed, but in no case shall such costs be greater than the current rates published by the Associated Equipment Distributors, Chicago, Illinois.

2. By estimate and acceptance in a lump sum.

3. By unit prices named in the Contract or subsequently agreed upon.

B. Provided, however, that the cost or estimated cost of all extra (additional) work shall be determined in advance of authorization by the Engineer and approved by the Owner.

C. All extra (additional) work shall be executed under the conditions of the original Contract. Any claim for extension of time shall be adjusted according to the proportionate increase or decrease in the final total cost of the work unless negotiated on another basis.

D. Except for over-runs in contract unit price items, no extra (additional) work shall be done except upon a written change Order from the Engineer, and no claim on the part of the Contractor for pay for extra (additional) work shall be recognized unless so ordered in writing by the Engineer.

E. Change Orders to the construction contract must comply with DOW Procurement Guidance for Construction and Equipment Contracts. Contract requires cost, pricing, and certification for change orders exceeding $25,000 as required by DOW Procurement Guidance for Construction and Equipment Contracts.

PART 2 - PRODUCTS

2.01 WATER MAIN

A. Payment for installing the water main will be made at the contract unit price per linear foot, complete in place, which shall include compensation for furnishing pipe, trenching (including rock excavation), earth or Class I material bedding, thrustblocking, earth backfill, fittings, valve markers, tracer wire, marking tape, (crushed stone, bituminous (HMA), and/or concrete pavement replacement, unless specified on plan sheets), boring without casing under bituminous and concrete drives, sidewalk repair or replacement, laying in/with/parallel a crushed stone, bituminous, or concrete roadway with appropriate backfill, laying between guardrail and road, reconnection of existing hydrant assemblies, loading existing casing with water main including spacers and end seals, nitrile gaskets when within 200 LF of a fuel tank/container, disinfecting, clean up and restoration of all disturbed areas, including seeding and mulching as required, testing and all appurtenances required. The quantity of water mains to be paid for shall be the length of the completed line as measured along its centerline without any deduction for lengths of fittings, valves or other appurtenances.

B. Payment of the capping and thrustblocking of the existing water main as shown on the drawings and as may be necessary in order to abandon the existing water mains shall be considered incidental to this bid item and is not a separate pay item.

2.02 GATE VALVES AND BOXES

Payment for furnishing and installing gate valves, valve boxes with lids, and valve markers in water mains will be made at the contract unit price each, complete in place, which shall include compensation for furnishing, hauling, trenching (including rock excavation), bedding, laying, jointing, backfilling, concrete supports and concrete valve box protector ring with copper locate pen.

2.03 BORED HIGHWAY CROSSING W/STEEL CASING

Payment for water mains crossing the railroad, highway, roadway, driveway or other areas shown on the plans shall include the respective encasement pipe bored under roadways and will be paid for at the contract unit price per linear foot of steel encasement pipe for the various sizes and types. This work shall include the encasement pipe, complete in place with fittings, spacers, end seals, skids, blocking, line markers on each side of crossed roadway, and all items necessary for its construction and installation. Carrier pipe is paid separately under item 2.01. The casing pipe shall be as noted in section 02302-2.

2.04 GAS MAIN CROSSING

Payment for PVC Encasement shall be made at the contract unit price per linear foot of encasement pipe for the various pipe sizes and types. This work shall include the encasement pipe, fittings, blocking, end seals, spacers, and all items necessary for its complete installation. Carrier pipe is paid separately under item 2.01.

2.05 CREEK CROSSING

Payment for water mains crossing major creeks or streams shall include excavation, concrete, rip-rap, crushed stone backfill , anchors, PVC/Steel casing pipe which ever is called for on the contract drawings, and field lock gaskets when called for on the contract drawings, will be paid for at the contract unit price per linear foot of creek crossing. This work shall include the excavation, concrete, gravel backfill material and anchors complete in place with fittings, blocking, and all items necessary for its construction. The length of the creek crossing to be paid for shall be measured from end to end of the encasement pipe. Carrier pipe is paid separately.

2.06 WET TAP CONNECTION - CONNECTION TO EXISTING WATER MAIN

A. Payment for connecting to an existing water main at the location listed shall include all materials and labor necessary for making a connection to the existing water main as shown on the plans. Payment will be made per connection and will include but not limited to, mechanical joint fittings, tapping valve, tapping sleeve, and box.

B. Connections at dry tie-ins or without use of wet tap method will be paid per connection to the existing water main and will include but not limited to, mechanical joint fittings, valve, box, and a maximum of 20 LF of pipe. Size of the valves and piping will be paid as one price and will not be differentiated.

C. Connections to existing water mains shall include but not limited to, reconnecting existing flushing or blowoff hydrants with a new gate valve and box, fittings, stainless steel all thread rods and nuts, and a maximum of 20 LF of pipe when specified on plans.

2.07 OPEN CUT ROADWAY CROSSING

A. Payment for water mains crossing the highway, roadway or other areas shown on the plans shall be paid for at the contract unit price per linear foot of pipe for the various sizes and types. This work shall include the fittings, PVC casing pipe, blocking, backfill, and all items necessary for its construction and installation. Carrier pipe is paid separately under item 2.01.

B. Payment for final backfill shall be included in this pay item including Class II material (DGA) and bituminous binder material required in restoration of paved areas as defined in Section 02310. Class II material and bituminous binder shall be included in this pay item and is considered incidental to the installation of the water main.

C. PVC casing pipe is required for all open cuts.

2.08 BLOW-OFF/FLUSHING/HYDRANT ASSEMBLY

Payment for blow-off/flushing assemblies will be made at the unit price, complete in place, which shall include all hydrants, piping, fittings, gate valve and valve box and cover, 6 feet of connecting pipe, concrete blocking and supporting pad, drainage bed, anchor tee, anchor couplings, wrenches, and all other materials and labor necessary to complete the installation.

2.09 AIR RELEASE ASSEMBLY

Payment for an air release valve will be made at the contract unit price each, complete in place, including all excavation, material, valve box and lid, saddles, fittings, ball valve, backfilling, and labor necessary to complete to complete the installation.

2.10 NEW CUSTOMER SERVICES

Payment will be made per complete installation to include saddle, corporation stop, copper service tubing (appropriate size), tandemsetter, ¾'' pressure reducing valve, meter box and lid, excavation, valve, casing pipe (if applicable) and all items necessary for a complete installation. Services to be placed five (5) feet inside the customer's property line including a two (2) foot stub out with female adapter on customer side of meter box. Same side services shall include a maximum of fifty (50) feet of service line. Opposite side services shall also include a maximum of one hundred fifty (150) feet of service line and all costs of boring or pushing the service line.

2.11 ADDITIONAL SERVICE TUBING

Payment for additional copper service pipe and fittings installed in open trench and backfilled will be made per linear foot in place. Payment for concrete, crushed stone, bituminous and concrete drives; sidewalk repair or replacement is included in the contract unit price for "service tubing." Excavation is unclassified and included in this item.

2.12 HIGHWAY/DRIVEWAY BORE W/HDPE

Payment for water mains and services crossing the highway, railroad, roadway, driveway or other areas shown on the plans shall include the respective encasement pipe bored under roadways and will be paid for at the contract unit price per linear foot of encasement pipe for the various sizes and types. This work shall include the encasement pipe, complete in place with fittings, spacers, skids, end seals, blocking, and all items necessary for its construction and installation. Carrier pipe is paid separately.

PART 3 - EXECUTION

3.01 PAY ITEMS

A. The pay items listed herein before refer to the items listed in the Bid Schedule and cover all of the pay items under the base bid for this contract.

B. Any and all other items of work listed in the specifications or shown on the Contract Drawings for this contract shall be considered incidental to and included in those pay items.

3.02 QUANTITIES OF ESTIMATE

A. Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the documents, including the Bid Proposal, they are given for use in comparing bids and the right is especially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this

Contract, and such increase or diminution shall not give cause for claims or liability for damages. The Engineer will not be financially responsible for any omissions from the Contract Documents and therefore not included by the Contractor in his proposal.

B. Aerial photographs utilized for plan sheets in the Contract Documents are indicated at an approximate scale and shall not be scaled for quantity take-offs. The pipeline quantities listed in the Bid Schedule are given for use in comparing bids and may not be the actual quantities to be installed. It is the Contractor's responsibility to field verify the length and quantities of pipeline to be installed prior to the ordering of materials. Payment on unit price contracts are based on actual quantities installed. The Owner or Engineer will not be financially responsible for any shortage of pipe or overrun of pipe ordered for the pipeline quantities.

C. The actual quantities of all materials to be used for this project shall be field verified prior to the Contractor ordering the necessary materials. The quantity listed in the bid schedule is given for use in comparing bids and may increase or diminish as may be deemed necessary or as directed by the Owner. Any such increase or diminution shall not give cause for claims or liability for damages. The Engineer or Owner will not be financially responsible for any charges incurred for restocking of materials ordered.

- END OF SECTION -

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 COMPLIANCE WITH SAFETY REGULATIONS

The equipment items furnished shall comply with all governing Federal and State laws regarding safety, including all requirements of the Occupational Safety and Health Act of 1970 (OSHA).

PART 2 - PRODUCTS

2.01 REFERENCES

A. General Provisions: Section 10 Correction and Guarantee of Work, Section 13 Materials and Equipment.

B. Section 02600 – Pipe, Fittings, and Installation

C. Section 02640 - Valves.

D. All material shall meet applicable American Water Works Association (AWWA), American Standard Testing Methods (ASTM), Underwriters Laboratories (UL), Factory Mutual (FM), National Sanitation Foundation (NSF) standards.

2.02 AMERICAN IRON AND STEEL

Under the requirements of Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A-Agriculture, Rural Development, Food and Drug Administration, and Related Agencies, Appropriations Act, 2017) and subsequent statutes mandating domestic preference applies to American Iron and Steel requirement to this project. All listed iron and steel products used in this project must be produced in the United States.

GRAYSON COUNTY WATER DISTRICT

The following is a list of approved manufacturers for the materials to be provided on the project. All material shall meet applicable AWWA, ASTM, Underwriters Laboratories, and Factory Mutual standards. The Owner approves this list and the Owner and Engineer shall approve any deviation.

MATERIAL/ITEM	APPROVED MANUFACTURER
Air Release Valve	APCO #50 Series or approved equal
All Brass Fittings (AWWA brass)	Mueller or approved equal
Aluminum Hatch	Haliday S1R or approved equal
Flushing Hydrant Assembly	Mueller A423 5-1/4 3 Way or approved equal
Flanged Coupling Adapter	FORD Style FFCA
Brass Nipples and Pipe	BMI
Brass Service Saddles	Mueller S-13000 Series or approved equal
Butterfly Valves (Class 150)	Mueller LINESEAL III (CLASS150B) or approved equal

MATERIAL/ITEM	APPROVED MANUFACTURER
Butterfly Valves (Class 250)	Mueller LINESEAL XPII (CLASS250B) or approved equal
Casing Spacers	CCI CSP Poly/End Seal Mod Esc or approved equal
End seals	FERNCO adapter two- part doughnut and ring, style 1056
Control Valve	CLA-VAL or approved equal
Gate Valves	Mueller A-2361 or approved equal
Valve Boxes	Mueller, Clow, M&H or approved equal
Restraint Joint MJ Packs	ROMAC Grip Ring or approved equal
MJ Fittings Compact/Full Body MJ Packs	Mueller, Clow, or approved equal
Blow-off & Air Release Boxes	ETI Ultra Rib or approved equal
Copper Tracing Wire	#12 Solid Copper
Mainline Pressure Reducing Valve	CLA-VAL or approved equal
Customer Individual Pressure Reducing Valve	Watts 3/4 LF 25AUB M3-Z6
Mainline Master Meter	Badger E-Series® Ultrasonic or approved equal
Customer Meter	Badger M 25 W/HRE-LCD With ITRON 100W+ endpoint ERS-1300-403 with CFG 1300004 mounting kit
Customer Meter Box	18x24 PVC
Customer Meter Box Cover	FORD A32-T-LB or approved equal
Customer Meter Setter	Mueller B2404R-2-24 N (REGULATED SET) B 2404-R2---N (NON-REGULATED) ¾" x 6" Brass Nipple
Service Tubing – Polyethylene Tubing (CTS Service Tubing)	CTS #200 SDR-9 ENDOPURE POLY
Steel Tapping Valves and Sleeves (Check Working Pressure)	Tapping sleeves for D.I. shall be MuellerH615 or equal and for PVC shall be Mueller H612
Service Saddles	Mueller S-13000
DI Pipe Class 350	Clow or approved equal
Full Circle Repair Clamps	Ford FS1 ss/JCM Model 131
Above Ground Valve Marker	Rhino SD-5401R-K 66" or approved equal
Precast Concrete Manholes	Old Castle Pre-Cast or approved equal (Round)
PVC Couplings	Harco or approved equal
PVC Pipe Class 200, 250, or C900	Vulcan or approved equal

SECTION 02070

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 BLASTING

All blasting shall conform to the requirements of the General Conditions. The Contractor shall also comply with the following additional requirements for blasting:

A. Blasting operations shall be covered by public liability insurance or if said public liability insurance does not cover blasting, then the contractor shall have separate public liability insurance to cover his blasting operations.

B. All blasting shall be supervised and performed by qualified and experienced personnel.

C. No explosives shall be used within 20 feet of:

1. Buildings and/or structures constructed or under construction.

2. Underground and/or overhead utilities whether existing or partially constructed.

D. Permission for any deviation from the restrictions set forth above shall be secured from the Engineer, in writing; however, permission for any such deviations shall not relieve the Contractor from any responsibility in the event of damage to buildings, structures or utilities.

E. All explosives shall be stored, handled, and employed in accordance with State, City and local laws and ordinances, and, in any event, in accordance with the "Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc.

F. The Contractor shall be solely responsible for his blasting operations. The Contractor shall not hold the Owner and/or the Engineer liable for any damages resulting from his blasting operations on this project.

1.02 HAUL

No payment will be made separately or directly for haul on any part of the work. All haul will be considered a necessary and incidental part of the Work, and the cost thereof shall be considered by the Contractor in the contract unit price for the pay items of work involved.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

- END OF SECTION -

SECTION 02200

SITE CLEARING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Clear site within construction limits of plant life and grass.

B. Remove root system of trees and shrubs.

C. Remove surface debris

1.02 REGULATORY REQUIREMENTS

Conform to applicable local codes and ordinances for disposal of debris.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 EXISTING TREES AND OTHER VEGETATION

A. The Contractor shall not cut or injure any trees or other vegetation outside right-of-way or easement lines and outside areas to be cleared, as indicated on the Drawings, without written permission from the Engineer. The Contractor shall be responsible for all damage done outside these lines.

B. The Engineer shall designate which trees are to be removed within permanent and temporary easement lines or right-of-way lines.

3.02 CLEARING

A. From areas to be cleared, the Contractor shall cut or otherwise remove all trees, brush, and other vegetable matter such as snags, bark and refuse. The ground shall be cleared to the width of the permanent easement or right-of-way unless otherwise directed by the Engineer.

B. Except where clearing is done by uprooting with machinery, trees, stumps, and stubs to be cleared shall be cut as close to the ground surface as practicable, but no more than 6" above the ground surface for small trees and 12" for larger trees.

C. Elm bark shall be either buried at least 1 foot deep or burned in suitable incinerators off site with satisfactory antipollution controls and fire prevention controls, to prevent the spread of Dutch Elm disease and as required by applicable laws.

3.03 GRUBBING

From areas to be grubbed, the Contractor shall remove completely all stumps, remove to a depth of 12" all roots larger than 3" in diameter, and remove to a depth of 6" all roots larger than 1/2" in diameter. Such depths shall be measured form the existing ground surface or the proposed finished grade, whichever is lower.

3.04 STRIPPING OF TOPSOIL

Prior to starting general excavation, strip topsoil to a depth of 6" or to depths required by the Engineer. Do not strip topsoil in a muddy condition and avoid admixture of subsoil. Stockpile the stripped topsoil within easement or right-of-way lines for use in finish grading and site restoration. Topsoil stockpiled, shall be free from trash, brush, stones over 2" in diameter and other extraneous material.

3.05 PROTECTION

A. Protect plant growth and features remaining as final landscaping.

B. Protect bench marks and existing work from damage or displacement.

C. Maintain designated site access for vehicle and pedestrian traffic.

D. Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

3.06 REMOVAL

A. All material resulting from clearing and grubbing and not scheduled for reuse shall become the property of the Contractor and shall be suitable disposed of off-site, unless otherwise directed by the Engineer, in accordance with all applicable laws, ordinances, rules and regulations.

B. Such disposal shall be performed as soon as possible after removal of material and shall not be left until the final period of cleaning up.

- END OF SECTION -

SECTION 02202

ROCK REMOVAL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Removal of discovered rock during excavation.

B. Rock removal is part of and incidental to unclassified excavation. No separate payment shall be made for rock removal.

1.02 RELATED WORK

A. Section 01450 - Quality Control

B. Section 02070 - Selective Demolition

C. Section 02220 - Excavation

1.03 REFERENCES

A. NFPA 495 - Code for Manufacture, Transportation, Storage and Use of Explosive Materials.

B. Commonwealth of Kentucky Department of Mines and Minerals, Laws and Regulations Governing Explosives and Blasting.

1.04 QUALITY ASSURANCE

A. Seismic Survey Firm: Company specializing in seismic surveys with five years documented experience.

B. Explosives Firm: Company specializing in explosives for disintegration of subsurface rock with five years documented experience.

1.05 REGULATORY REQUIREMENTS

A. All blasting work done shall conform to Kentucky Department of Mines and Minerals code for explosive disintegration of rock.

B. The Contractor shall obtain permits from local authorities having jurisdiction before explosives are brought to site or drilling is started.

C. The Contractor shall conform to all State, Federal, and City laws, ordinances and regulations in regard to transportation, use and handling of explosives.

1.06 SHOP DRAWINGS

A. Submit shop drawings under provisions of Section 01300.

B. Indicate proposed method of blasting, delay pattern, explosive types, type of blasting mat or cover, and intended rock recovery method.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Rock Definition: Solid mineral material that cannot be removed with a power shovel.

B. Explosives: Type recommended by explosives firm and required by authorities having jurisdiction.

C. Delay Devices: Type recommended by explosives firm and conforming to State regulations.

D. Blasting Mat Materials: Type recommended by explosives firm and conforming to State regulations.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify site conditions and note irregularities affecting work of this Section.

B. Beginning work of this Section means acceptance of existing condition.

C. All excavation is Bid Unclassified - No additional payment will be made for rock excavation.

3.02 ROCK REMOVAL

A. Excavate for and remove rock by a mechanical method.

B. Cut away rock at excavation bottom to form even surface.

C. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

D. Rock shall be disposed of in an approved manner acceptable to the Engineer. No payment will be made for hauling of rock.

E. Correct unauthorized rock removal in accordance with backfilling and compaction requirements of Section 02610, Article 3.07.

3.03 ROCK REMOVAL - EXPLOSIVES METHODS

A. If rock is uncovered requiring the explosives method for rock disintegration, notify the Engineer.

B. Advise owners of adjacent buildings or structures in writing prior to setting up seismographs. Describe blasting and seismic operations.

C. Peak particle velocity will be limited to 4.0 in/sec.

D. Provide seismographic monitoring during progress of all blasting operations, or as required by State regulations.

E. Disintegrate rock and remove from excavation in accordance with Article 3.02.

F. The Contractor shall be solely responsible for his blasting operations.

3.04 FIELD QUALITY CONTROL

Engineer or his representative shall approve the depth of final rock.

3.05 HAUL

No payment will be made separately or directly for haul on any part of the work for removed rock. All haul will be considered a necessary and incidental part of the work and the cost thereof shall be considered by the Contractor in the contract unit price for the pay items of work involved.

- END OF SECTION -

SECTION 02220

EXCAVATION

PART 1 - GENERAL

1.01 WORK INCLUDED

All excavation for the project is unclassified excavation. No separate payment shall be made for rock excavation.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 EXCAVATION FOR TRENCHES

A. If the foundation is good firm earth and the machine excavation has been accomplished, the remainder of the material shall be excavated by hand and the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot pipe are involved, bell holes shall be excavated during this latter operation to prevent the bells from being supported on undistributed earth. If for any reason the machine excavation in earth is carried below an elevation that will permit the type of bedding in undistributed earth, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in the granular fill as described in Section 02610, Part 3.

B. If the foundation is rock and the excavation has been undercut as set out hereinbefore, a bed of No. 9 crushed stone aggregate shall be placed to provide continuous support for the lower quadrant of the pipe.

C. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2'-6" plus the nominal diameters of the pipe at the level of or below the top of pipe. Trenches cut in roads and streets shall not exceed a maximum width of 3'-6" plus the nominal diameters of the pipe at the level of the road or street surface.

D. All excavated materials shall be placed a minimum of 2 feet back from the edge of the trench.

E. Unless specifically directed otherwise by the Engineer, not more than 500 feet of trench shall be opened ahead of the pipe laying work of any one crew, and not more than 500 feet of open ditch shall be left behind the pipe laying work of any one crew. Watchmen or barricades, lanterns and other such signs and signals as may be necessary to warn the public of the dangers in connection with open trenches, excavations and other obstructions, shall be provided by and at the expense of the Contractor.

F. When so required, or when directed by the Engineer, only one-half of street crossings and road crossings shall be excavated before placing temporary bridges over the side excavated, for the convenience of the traveling public. All backfilled ditches shall be maintained in such manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property owners abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled at the direction of the Engineer.

G. Where existing drainage ditches coincide with the proposed water main alignment, the

Contractor shall re-establish the drainage ditch after the water main has been laid and properly backfilled. The drainage ditch shall be of equal size as the previously existing one and free of any restrictions which might impede flow.

3.02 SHORING, SHEETING, AND BRACING OF EXCAVATION

A. Where unstable material is encountered or where the depth of excavation in earth exceeds five (5) feet, the sides of the trench or excavation shall be supported by substantial sheeting, bracing, and shoring, or the sides sloped to the angle of repose. Sloping the sides of the ditch to the angle will not be permitted in streets, roads, narrow rights-of-way or other constricted areas unless otherwise specified. The design and installation of all sheeting, sheet piling, bracing and shoring shall be based on computations of pressure exerted by the materials to be retained under obtaining conditions. Adequate and proper shoring of all excavations shall be the entire responsibility of the Contractor; however, the Engineer may require the submission of shoring plans (accompanied by supporting computations) for approval prior to the Contractor undertaking any portion of the work. The standards of the Federal Occupational Safety and Health Act and the Kentucky Labor Cabinet shall be followed.

B. Foundations, adjacent to where the excavation is to be made below the depth of the existing foundation, shall be supported by shoring, bracing or underpinning as long as the excavation shall remain open, or thereafter if required to insure the stability of the structure supported by the foundation, and the Contractor shall be held strictly responsible for any damage to said foundations.

C. Solid sheeting will be required for wet or unstable material. It shall consist of continuous vertical sheet piling of timber or steel with suitable wales and braces.

D. Care shall be taken to avoid excessive backfill loads on the completed pipelines and the trench width requirements at the level of the crown of the pipe and at the level of a road or street be strictly observed.

E. Trench sheeting shall not be removed until sufficient backfill has been placed to protect the pipe.

F. All sheeting, planking, timbering, bracing and bridging shall be placed, renewed and maintained as long as is necessary.

3.03 REMOVAL OF WATER

A. The Contractor, at his own expense, shall provide adequate facilities for promptly and continuously removing water from all excavation.

B. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to remove promptly and dispose properly of all water entering trenches and other excavations. Such excavation shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.

C. All water pumped or drained from the work shall be disposed of in s suitable manner without undue interference with other work, damage to pavements, other surfaces, or property. Suitable temporary pipes, flumes, or channels shall be provided for water that may flow along or across the site of the work.

D. If necessary, the Contractor shall dewater the excavations by means of an efficient drainage wellpoint system which will drain the soil and prevent saturated soil from flowing into the excavation. The wellpoints shall be designed especially for this type of service. The pumping unit shall be designed for use with the wellpoints, and shall be capable of maintaining a high vacuum and of handling large volumes of air and water at the same time.

E. The installation of the wellpoints and pump shall be done under the supervision of a competent representative of the manufacturer. The Contractor shall do all special work such as surrounding the wellpoints with sand or gravel or other work which is necessary for the wellpoint system to operate for the successful dewatering of the excavation.

F. The Contractor shall at all times during construction provide and maintain means and devices with which to promptly dispose of all water entering the excavations or other parts of the work and shall keep said excavations dry until the structures to be built therein are complete. No concrete shall be placed in water nor shall water be allowed to rise over structures if there is danger of floatation or of setting up unequal pressures in the concrete, until the concrete has set at least twenty four (24) hours and any danger of floatation has been removed.

G. The Contractor shall dispose of water from the work in a suitable manner without damage to adjacent property or sewers. No water shall be drained into work built or under construction. No sanitary sewer shall be used for the disposal of trench water.

3.04 DISPOSITION OF EXCAVATED MATERIAL

Material excavated for pipe lines and structures not suitable or needed for backfilling purposes, shall be disposed of by the Contractor at his own expense in a manner satisfactory to the Engineer.

3.05 UNAUTHORIZED EXCAVATION

Whenever the excavation is carried beyond or below the required lines and grades, the Contractor, at his own expense, shall refill said excavated space with suitable material in a manner approved by the Engineer.

3.06 EXISTING UTILITIES AND OTHER OBSTRUCTIONS

Prior to the commencement of construction on the project, the Contractor shall contact the utility companies whose lines, above and below ground, may be affected during construction and verify the locations of the utilities as shown on the Contract Drawings. The Contractor shall ascertain from said companies if he will be allowed to displace or alter, by necessity, those lines encountered or replace those lines disturbed by accident during construction, or if the companies themselves are only permitted by policy to perform such work. If the Contractor is permitted to perform such work, he shall leave the lines in as good condition as were originally encountered and complete the work as quickly as possible. All such lines or underground structures damaged or molested in the construction shall be replaced at the Contractor's expense, unless, in the opinion of the Engineer, such damage was caused through no fault of the Contractor.

3.07 FINAL CLEANUP AND RESTORATION

Unless specifically approved by the Owner and Engineer, **cleanup of disturbed areas shall be kept current with construction** and restoration efforts by the contractor initiated **immediately** and areas not remain **unprotected** for more than **seven 7days.** Any large rocks, stones or debris shall be removed from the site, and shall not be a burden to the property owner(s) and/or adjacent properties. The contractor may windrow or track-in the excavated material over the trench prior to final cleanup to allow for and to assist in the initial settlement of the trench. All disturbed areas must be seeded at least with a temporary seed mix if for some reason the area cannot be permanently seeded within two (2) weeks.

- END OF SECTION -

SECTION 02230

TRENCH BEDDING AND BACKFILLING

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish, place and compact all bedding and backfill materials specified herein or denoted on the Drawings. The materials, equipment, labor, etc. required herein are to be considered as part of the requirements and costs for installing the various pipes, structures and other items they are incidental to.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Crushed stone material shall conform with the requirements of applicable sections of the Kentucky Bureau of Highways Standard Specifications and shall consist of clean, hard, and durable particles or fragments, free from dirt, vegetation or objectional materials.

B. Two classes of crushed stone material are used in this Section for pipe bedding and backfill. The type of material in each class is as follows:

1. Class I - No. 9 Aggregate.

2. Class II - Dense Graded Aggregate (DGA).

C. Subbase material for structures shall be naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed stone.

D. Backfill materials at structures shall be satisfactory soil materials free of debris, waste, frozen materials, vegetable, and other deleterious matter.

PART 3 - EXECUTION

3.01 PIPE BEDDING

A. Piping for gravity sewers and force mains shall be supported as follows:

1. All gravity sewer piping shall be laid on a bed of granular material except when a concrete encasement situation occurs. All pipe bedding material shall be Class I (No. 9 crushed stone aggregate) and shall be placed to a depth of 4" in an earth trench and 6" in a rock trench. Aggregate bedding shall be graded to provide for a uniform and continuous support beneath the pipe at all points.

2. The trench bottom for force main piping shall be stable, continuous, relatively smooth and free of frozen material, clodded dirt, foreign material larger than 1/2-inch in diameter. The foundation for force main piping shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. Any uneven areas in the trench bottom shall be shaved off or filled in with Class I granular bedding. When the trench is made through rock, the bottom shall be lowered

to provide 6 inches of clearance around the pipe. Class I granular bedding shall be used to bring the trench bottom to grade.

B. After each pipe has been brought to grade, aligned, and placed in final position, Class I material for gravity sewer piping and earth material for force main piping shall be deposited and densified under the pipe haunches and on each side of the pipe up to the spring line of the pipe to prevent lateral displacement and hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations.

C. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or line, or where backfill materials are of such a fluid nature that such movements of pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective.

D. Where an unstable (i.e., water, mud, etc.) trench bottom is encountered, stabilization of the trench bottom is required. This is to be accomplished by undercutting the trench depth and replacing to grade with a foundation of crushed stone aggregate.

E. The depth of the foundation is dependent upon the severity of the trench bottom. The size of stone aggregate used in the foundation will be determined by the condition of the unstable material. Once the trench bottom has been stabilized, the required Class I bedding material can be placed.

F. It should be noted that no pipe shall be laid on solid or blasted rock.

G. Pipe bedding as required in Paragraphs A, B and D of this article is <u>not</u> considered a separate pay item.

3.02 BACKFILL FOR PIPING

A. Initial Backfill

1. This backfill is defined as that material which is placed over the pipe from the spring line to a point 6 inches above the top of the pipe. For gravity sewer piping the material shall be Class I (No. 9 crushed stone aggregate) and may be machine placed without compaction. Uneven places in the backfill shall be leveled by hand. For force main piping, initial backfill material shall be earth material free of rocks, acceptable to the Engineer or with Class I material when a condition exists mentioned in Paragraph A, 3. below.

2. Material used, whether earth or Class I, in the initial backfilling is <u>NOT</u> a separate pay item. Payment for the material is included in the unit price per linear foot of gravity sewer or force main.

3. In areas where large quantities of rock are excavated and the available excavated earth in the immediate vicinity is insufficient for placing the required amount of backfill over the top of the pipe as set forth in Paragraph A.1., the Contractor shall either haul in earth or order Class I material for backfilling over the pipe. Neither the hauling and placement of earth nor the ordering and placement of Class I material to fulfill the backfill requirements set forth herein is considered a separate pay item.

B. Final Backfill

1. There are two cases where the method of final backfilling varies. The various cases and their trench situations are as follows:

a. Case I - Areas not subject to vehicular traffic.

b. Case II - Paved areas including streets, drives and walks.

2. In all cases, walking or working on the completed pipelines, except as may be necessary in backfilling, will not be permitted until the trench has been backfilled to a point six (6) inches above the top of the pipe. The method of final backfilling for each of the above cases is as follows:

a. Case I - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 8 inches below the surface of the ground with earth material free from large rock (over one-half cubic foot in volume), acceptable to the Engineer. The remainder of the trench shall be backfilled with earth material free of any rocks.

b. Case II - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 12 inches below the existing pavement surface with Class I (No. 9 crushed stone aggregate) material. The backfill shall be mechanically tamped in approximately 6-inch layers to obtain the maximum possible compaction. The remaining backfill shall be Class II (dense graded aggregate) material mechanically tamped to maximum possible compaction. The trench may be left with a slight mound if permitted by the Engineer.

3. Earth and Class I material used in final backfill is not a separate pay item. Payment shall be included in the unit price per linear foot of gravity sewer and force main.

4. Class II material used in final backfill shall be included in the unit price per linear foot of bituminous pavement replacement.

C. A sufficient amount of Class II material shall be stockpiled to insure immediate replacement by the Contractor of any settled areas. No extra payment will be made for the filling in of settled or washed areas by the Contractor.

D. Excavated materials from trenches, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. It shall be the responsibility of the Contractor to obtain location or permits for its disposal, unless specific waste areas have been designated on the Drawings or noted in these specifications. Unit prices for the various pipe sizes shall include the cost of disposal of excess excavated materials, as set forth herein, not additional compensation being allowed for hauling or overhaul.

3.03 BACKFILL AND FILL AT STRUCTURES

A. Place No. 57 stone fill material in maximum 6" lifts (loose thickness to required subgrade elevations).

B. With the exception of the organic debris, existing fill material, and topsoil, the on-site soil removed from the excavations could be used as fill or backfill material provided the moisture content of the soil is adjusted.

C. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

D. All materials used for backfill around structures shall be of a quality acceptable to the Engineer and shall be free from large or frozen lumps, wood and other extraneous material. All spaces excavated and not occupied by footings, foundations, walls or other permanent work shall be refilled with earth up to the surface of

the surrounding ground, unless otherwise specified, with sufficient allowance for settlement. In making the fills and terraces around the structures, the fill shall be placed in layers not exceeding 12 inches in depth and shall be kept smooth as the work progresses. Each layer of the fill shall be rolled with an approved type roller and/or be compacted. When it is not practicable to compact sections of the fill immediately adjacent to the buildings or structures by rolling,then such sections shall be thoroughly compacted by means of mechanical tamping or hand tamping as may be required by the conditions encountered. All fills shall be placed so as to load symmetrically.

E. Grade areas adjacent to building lines to drain away from structures to prevent ponding.

F. Control soil compaction during construction providing minimum compaction to 95% of Standard Proctor density at a moisture content of $\pm$ 2% of optimum.

G. All excess excavated material shall become the property of the Contractor and shall be disposed of by him outside the project limits. It is the Contractor's responsibility to locate a suitable waste area off-site, obtain necessary permits for use of the waste area and be in compliance with applicable laws and regulations. The Contractor shall place and compact all excess excavated material at the waste area, with the cost of hauling, placing, compacting, and grading included in the Contractor's bid. Acceptable excavated material includes suitable demolition materials.

3.03 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.04 MEASURMENT

A. All trench excavation, backfill and compaction are not considered pay items. Payment for these items shall be included in the unit price laid for each size of pipe at their respective depths. This unit price shall be full remuneration for performing the trench and backfill complete including grading, bell holes, sheeting, dewatering, and tamping; and including the furnishing of sewer pipe, all equipment, labor, materials, power, tools, and transportation necessary or incidental thereto.

- END OF SECTION -

SECTION 02270

EROSION CONTROL, SEDIMENTATION AND CONTAINMENT OF CONSTRUCTION MATERIALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall do all work and take all measures necessary to control soil erosion resulting from construction operations, shall prevent the flow of sediment from the construction site, and shall contain construction materials (including excavation and backfill) within his protected working area so as to prevent damage to the adjacent wetlands.

B. The Contractor shall not employ any construction method that violates a rule, regulation, guideline or procedure established by Federal, State or local agencies having jurisdiction over the environmental effects of construction.

C. Pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste shall not be discharged into or alongside of any body of water or into natural or man-made channels leading thereto.

D. Permits:

1. The Contractor shall apply for a permit (if applicable) for stormwater runoff from the construction site for the project. It shall be the Contractor's responsibility to determine if the proposed construction activities will require a permit from the federal, state and local regulatory agencies.

2. For this project, the stormwater permitting process falls under the Kentucky Pollutant Discharge Elimination System (KPDES) permit program administered by the Kentucky Division of Water, Frankfort, Kentucky.

E. No wastewater bypassing will occur during construction unless a schedule has been approved by the State and/or by EPA/NEPA permit if required.

PART 2 - PRODUCTS

2.01 MATERIALS

Bales may be hay or straw, and shall be reasonably clean and free of noxious weeds and deleterious materials. Filter fabric for sediment traps shall be of suitable materials acceptable to the Engineer.

PART 3 - EXECUTION

3.01 METHODS OF CONSTRUCTION

A. The Contractor shall use any of the acceptable methods necessary to control soil erosion and prevent the flow of sediment to the maximum extend possible. These methods shall include, but not be limited to, the use of water diversion structures, diversion ditches and settling basins.

B. Construction operations shall be restricted to the areas of work indicated on the Drawings and to the area which must be entered for the construction of temporary or permanent facilities. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of the wetlands and adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

C. Excavated soil material shall not be placed adjacent to the wetlands or watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by means acceptable to the Engineer. If for any reason construction materials are washed away during the course of construction, the Contractor shall remove those materials from the fouled areas as directed by the Engineer.

D. For work within easements, all materials used in construction such as excavation, backfill, roadway, and pipe bedding and equipment shall be kept within the limits of the easements.

E. The Contractor shall not pump silt-laden water from trenches or other excavations into the wetlands, or adjacent watercourses. Instead, silt-laden water from his excavations shall be discharged within areas surrounded by baled hay or into sediment traps to ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.

F. Prohibited construction procedures include, but are not limited to, the following:

1. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.

2. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters.

3. Pumping of silt-laden water from trenches or excavations into surface waters, or wetlands.

4. Damaging vegetation adjacent to or outside of the construction area limits.

5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.

6. Permanent or unauthorized alteration of the flow line of any stream.

7. Open burning of debris from the construction work.

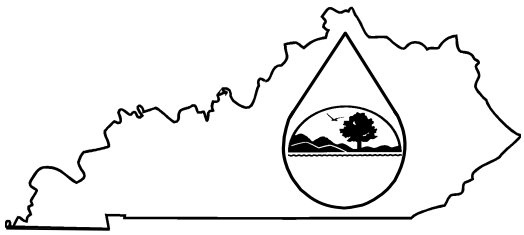
G. Any temporary working roadways required shall be clean fill approved by the Engineer. In the event fill is used, the Contractor shall take every precaution to prevent the fill from mixing with native materials of the site. All such foreign fill materials shall be removed from the site following construction.

3.02 EROSION CHECKS

The Contractor shall furnish and install baled hay or straw erosion checks in all locations indicated on the Drawings, surrounding the base of all deposits of stored excavated material outside of the disturbed area, and where indicated by the Engineer. Checks, where indicated on the Drawings, shall be installed immediately after the site is cleared and before trench excavation is begun at the location indicated. Checks located surrounding stored material shall be located approximately 6 ft. from that material. Bales shall be held in place with two 2 in. by 2 in. by 3 ft. wooden stakes. Each bale shall be butted tightly against the adjoining bale to preclude shortcircuiting of the erosion check.

- END OF SECTION -

KPDES FORM NOI-SW



Kentucky Pollutant Discharge Elimination System (KPDES)

Notice of Intent (NOI)
for Storm Water Discharges
Associated with Industrial Activity Under the KPDES General Permit

Submission of this Notice of Intent constitutes notice that the party identified in Section I of this form intends to be authorized by a KPDES permit issued for storm water discharges associated with industrial activity. Becoming a permittee obligates such discharger to comply with the terms and conditions of the permit.

ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM (See Instructions on back)

I. Facility Operator Information

Name:		**Phone:**	
Address:		**Status of Owner/Operator:**	
City, State, Zip Code:			

II. Facility/Site Location Information

Name:			
Address:			
City, State, Zip Code:			
County:			
Site Latitude: (degrees/minutes/seconds)		**Site Longitude: (degrees/minutes/seconds)**	

III. Site Activity Information

MS4 Operator Name:							
Receiving Water Body:							
Are there existing quantitative data?	**Yes** ☐ **If Yes, submit with this form.** **No** ☐						
SIC or Designated Activity Code Primary		**2nd**		**3rd**		**4th**	
If this facility is a member of a Group Application, enter Group Application Number:							
If you have other existing KPDES Permits, enter Permit Numbers:							

IV. Additional Information Required FOR CONSTRUCTION ACTIVITIES ONLY

Project Start Date:		**Completion Date:**	
Estimated Area to be disturbed (in acres):			
Is the Storm Water Pollution Prevention Plan in Compliance with State and/or Local Sediment and Erosion Plans?		**Yes** ☐ **No** ☐	

V. Certification: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed or Typed Name:			
Signature:		**Date:**	

Kentucky Pollutant Discharge Elimination System (KPDES)
Instructions
Notice of Intent (NOI) for Storm Water Discharges Associated with Industrial Activity
To Be Covered Under The KPDES General Permit

WHO MUST FILE A NOTICE OF INTENT (NOI) FORM

Federal law at 40 CFR Part 122 prohibits point source discharges of stormwater associated with industrial activity to a water body of the Commonwealth of Kentucky without a Kentucky Pollutant Discharge Elimination System (KPDES) permit. The operator of an industrial activity that has such a storm water discharge must submit a NOI to obtain coverage under the KPDES Storm Water General Permit. If you have questions about whether you need a permit under the KPDES Storm Water program, or if you need information as to whether a particular program is administered by the state agency, call the **Storm Water Contact, Industrial Section, Kentucky Division of Water at (502) 564-3410.**

WHERE TO FILE NOI FORM

NOIs must be sent to the following address:

Section Supervisor
Inventory & Data Management Section
KPDES Branch, Division of Water
Frankfort Office Park
14 Reilly Road
Frankfort, KY 40601

COMPLETING THE FORM

Type or print legibly in the appropriate areas only. If you have any questions regarding the completion of this form call the **Storm Water Contact, Industrial Section, at (502) 564-3410.**

SECTION I - FACILITY OPERATOR INFORMATION

Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same as the name of the facility. The responsible party is the legal entity that controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Enter the appropriate letter to indicate the legal status of the operator of the facility.

F = Federal M = Public (other than federal or state)
S = State P = Private

SECTION II - FACILITY/SITE LOCATION INFORMATION

Enter the facility's or site's official or legal name and complete street address, including city, state, and ZIP code.

SECTION III - SITE ACTIVITY INFORMATION

If the storm water discharges to a municipal separate storm sewer system (MS4), enter the name of the operator of the MS4 (e.g., municipality name, county name) and the receiving water of the discharge from the MS4. (A MS4 is defined as a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that is owned or operated by a state, city, town, borough, county, parish, district, association, or other public body which is designed or used for collecting or conveying storm water.)

If the facility discharges storm water directly to receiving water(s), enter the name of the receiving water.

Indicate whether or not the owner or operator of the facility has existing quantitative data that represent the characteristics and concentration of pollutants in storm water discharges. If data is available submit with this form.

List, in descending order of significance, up to four 4-digit standard industrial classification (SIC) codes that best describe the principal products or services provided at the facility or site identified in Section II of this application.

If the facility listed in Section II has participated in Part 1 of an approved storm water group application and a group number has been assigned, enter the group application number in the space provided.

If there are other KPDES permits presently issued for the facility or site listed in Section II, list the permit numbers.

SECTION IV - ADDITIONAL INFORMATION REQUIRED FOR CONSTRUCTION ACTIVITIES ONLY

Construction activities must complete Section IV in addition of Sections I through III. Only construction activities need to complete Section IV.

Enter the project start date and the estimated completion date for the entire development plan.

Provide an estimate of the total number of acres of the site on which soil will be disturbed (round to the nearest acre).

Indicate whether the storm water pollution prevention plan for the site is in compliance with approved state and/or local sediment and erosion plans, permits, or storm water management plans.

SECTION V - CERTIFICATION

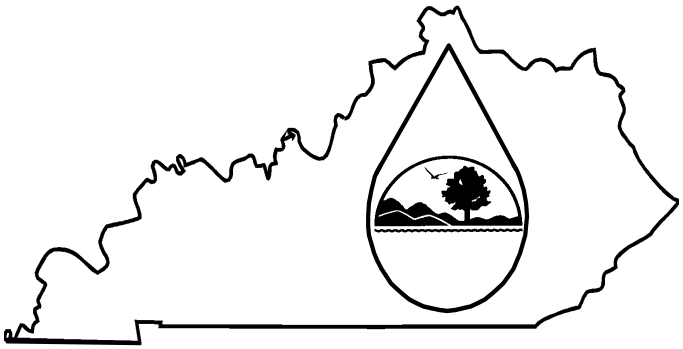
Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer,which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authroity to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, state, Federal, or other public facility: by either a principal executive officer or ranking elected official.

KPDES FORM NOT-SW



Kentucky Pollutant Discharge Elimination System (KPDES)

NOTICE OF TERMINATION (NOT)
of Coverage Under the KPDES General Permit for Storm Water Discharges Associated with Industrial Activity

Submission of this Notice of Termination constitutes notice that the party identified in Section II of this form is no longer authorized to discharge storm water associated with industrial activity under the KPDES program.

ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM.
(Please see instructions on back before completing this form.)

I. PERMIT INFORMATION
KPDES Storm Water General Permit Number:
Check here if you are no longer the Operator of the Facility: ☐
Check here if the Storm Water Discharge is Being Terminated: ☐
II. FACILITY OPERATOR INFORMATION
Name:
Address:
City/State/Zip Code:
Telephone Number:
III. FACILITY/SITE LOCATION INFORMATION
Name:
Address:
City/State/Zip Code:

Certification: I certify under penalty of law that all storm water discharges associated with industrial activity from the identified facility that are authorized by a KPDES general permit have been eliminated or that I am no longer the operator of the facility or construction site. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with industrial activity under this general permit, and that discharging pollutants in storm water associated with industrial activity of waters of the Commonwealth is unlawful under the Clean Water Act and Kentucky Regulations where the discharge is not authorized by a KPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Kentucky Revised Statutes.

NAME (Print or Type)	TITLE
SIGNATURE	DATE

INSTRUCTIONS
NOTICE OF TERMINATION (NOT) OF COVERAGE UNDER THE KPDES GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY

Who May File a Notice of Termination (NOT) Form
Permittees who are presently covered under the Kentucky Pollutant Discharge Elimination System (KPDES) General Permit for Storm Water Discharges Associated with Industrial Activity may submit a Notice of Termination (NOT) form when their facilities no longer have any storm water discharges associated with industrial activity as defined in the storm water regulations at 40 CFR 122.26 (b)(14), or when they are no longer the operator of the facilities.

For construction activities, elimination of all storm water discharges associated with industrial activity occurs when disturbed soils at the construction site have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time, or that all storm water discharges associated with industrial activity from the construction site that are authorized by a KPDES general permit have otherwise been eliminated. Final stabilization means that all soil-disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles have been employed.

Where to File NOT Form
Send this form to the following address:

Section Supervisor
Inventory & Data Management Section
KPDES Branch, Division of Water
14 Reilly Road, Frankfort Office Park
Frankfort, KY 40601

Completing the Form
Type or print legibly in the appropriate areas and according to the instructions given for each section. If you have questions about this form, call the Storm Water Contact, Industrial Section, at (502) 564-3410.

Section I - Permit Information
Enter the existing KPDES Storm Water General Permit number assigned to the facility or site identified in Section III. If you do not know the permit number, **call the Storm Water Contact, Industrial Section at (502) 564-3410.**

Indicate your reason for submitting this Notice of Termination by checking the appropriate box:

If there has been a change of operator and you are no longer the operator of the facility or site identified in Section III, check the corresponding box.

If all storm water discharges at the facility or site identified in Section III have been terminated, check the corresponding box.

Section II - Facility Operator Information
Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same name as the facility. The operator of the facility is the legal entity which controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Section III - Facility/Site Location Information
Enter the facility's or site's official or legal name and complete address, including city, state and ZIP code. If the facility lacks a street address, indicate the state, the latitude and longitude of the facility to the nearest 15 seconds, or the quater, section, township, and range (to the nearest quarter section) of the approximate center of the site.

Section IV - Certification
Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, State, Federal, or other public facility: by either a principal executive

SECTION 02302

RAILROAD OR HIGHWAY CROSSINGS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes railroad or highway crossings including casing pipes for pipelines installed by (jacking), (tunneling) or (boring) method, and installation of the carrier pipe within the casing in the location(s) and to the limits as shown on the Contract Drawings. The engineer has filed for the permits, but it is the responsibility of the contractor to put up the bond for the State Highway crossings.

B. All work shall be performed in accordance with the applicable rules and regulations of the State and Federal Codes and with the terms and conditions of the permit issued by the railroad or highway having jurisdiction.

1.02 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:

1. Method of Installation

   a. Following the award of the Contract, the Contractor shall submit a description of the method and equipment which is proposed to be employed in installing the casing.

   b. A Professional Engineer licensed in the State of Kentucky shall design all sheeting and bracing at the Contractor's expense. The seal of the Professional Engineer shall appear on all drawings and design sheets submitted for review.

2. Materials

   a. Drawings and manufacturer's data of the casing materials showing compliance with this specification.

3. Contractor's Data

   a. The Contractor shall submit such data as may be required as conditions of the Railroad or Highway Permit.

1.03 QUALITY ASSURANCE

A. Contractor's Qualifications

1. The casing shall be installed by a contractor who has experience in this field of construction and can furnish a record of satisfactory performance on at least three projects for work of comparable type.

PART 2 PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

A. Casings

1. The casing shall be of the size and type as shown on the Contract Drawings.

a. Steel pipe of the thickness specified shall have a minimum yield strength of 35,000 psi and a minimum ultimate strength of 60,000 psi. Steel casing pipe shall be uncoated .

b. Liner plate of the gauge specified shall be pressed steel, galvanized and bituminous coated.

c. Concrete pipe shall be designed for the purpose of jacking and shall be tongue and grooved.

d. All joints in the encasement pipe shall be of continuous solid weld.

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE

Minimum Thickness Inches	Normal Diameter Inches
0.250	4 thru 12
0.312	14 thru 18
0.375	20 thru 24
0.500	26 thru 42

B. The steel casing pipe for all highway crossings shall be as follows:

Carrier Pipe Size	Casing Pipe Size
2"	6"
3"	8"
4"	12"
6"	14"
8"	16"
10"	18"
12"	20
14"	24"
16"	26"
20"	30"
24"	34"
30"	40"

B. Carrier Pipes

1. The carrier pipe shall be as specified on the Contract Drawings and in accordance with the Section for the type of pipe.

C. Signs

1. Signs shall be weatherproof.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Unless otherwise shown or specified, the Contractor may employ any one of jacking, tunneling or boring methods within the limits shown for the installation of the casing.

    a. The remaining portion of the casing may be constructed by open cut method in a sheeted trench.

2. Installation of the casing pipe shall be carried out without disturbance of the embankment, pavement, tracks or other railroad or highway facilities and without obstructing the passage of traffic at any time.

3. Once the jacking, tunneling or boring operation is started, it shall proceed on a 24-hour basis without interruption until completed.

4. The casing pipe shall be maintained accurately to line and grade during the installation operation.

5. The casing shall be advanced from the lower end.

6. The use of water or other liquid, except bentonite slurry with prior approval of the Engineer, to facilitate casing placement or spoil removal is prohibited.

7. Dewatering shall be in accordance with the Section entitled "Earthwork".

B. Jacking

1. The jacking force shall be properly distributed through the jacking frame to the casing and parallel with the axis.

2. The soil shall be trimmed with care and shall not precede the jacking operation, to insure a minimum disturbance to the natural soils adjacent to the casing.

    a. No augering will be allowed.

C. Tunneling

1. Excavation shall be in such a manner that voids behind the liner plates shall be held to a minimum.

2. Poling plates shall be used as necessary to prevent caving of material above the tunnel prior to liner plate installation.

    a. Poling plates shall not be driven into the unexcavated material.

3. Liner plates shall be installed as soon as excavation proceeds the necessary distance for the next set of plates.

4. Grout plugs shall be placed on approximately 4-foot centers, at the top, bottom and on the spring line.

   a. Grout holes shall be not less than 1-inch diameter.

   b. Voids between the liner plates and the excavation shall be filled with a 1:6 cement grout placed under pressure.

   c. Not more than 6 lineal feet of tunnel shall progress beyond the grouting.

5. Tunneled casings shall have a foundation of Class "C" concrete placed for the entire length of the interior of the casing.

   a. The leveling course shall be at such an elevation that the carrier pipe, when installed, shall be at the grade specified.

D. Boring

1. Boring shall consist of pushing the casing with an augur rotating within to remove the spoil.

2. The auger or cutting head shall not lead the casing and shall be removable from within the casing.

3. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor materials.

E. Pressure Carrier Pipe

1. No contact shall be permitted between the casing and the carrier pipe.

   a. Casing spacers shall be used between the casing pipe and carrier pipe. Spacers shall be manufactured by Pipeline Seal & Insulator, Inc. (PSI) of Houston Texas, or equal and be of the type to separate dissimilar metals and keep the carrier pipe centered within the casing. The spacers shall be installed within the casing in the quantity and at the locations recommended by the manufacturer.

   b. Both ends of the casing pipe shall be sealed with rubber boot “End Seals” by PSI or equal, held in place by stainless steel bands/clamps.

F. Non-Pressure Carrier Pipe

1. No contact shall be permitted between the casing and the carrier pipe.

   a. Casing spacers shall be used between the casing pipe and carrier pipe. Spacers shall be manufactured by Pipeline Seal & Insulator, Inc. (PSI) of Houston Texas, or equal and be of the type to separate dissimilar metals and keep the carrier pipe centered within the casing. The spacers shall be installed within the casing in the quantity and at the locations recommended by the manufacturer.

   e. Both ends of the casing pipe shall be sealed with rubber boot “End Seals” by PSI or equal, held in place by stainless steel bands/clamps.

-END OF SECTION-

SECTION 02340

ENCASEMENT PIPE

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor, materials, tools and equipment necessary to complete the borings as shown on the Contract Drawings and as herein specified.

PART 2 - PRODUCTS

2.01 MATERIAL

A. The pipe shall be steel, new material, with a minimum yield of 35,000 psi and a wall thickness as shown below. All joints in the encasement pipe shall be welded.

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE

MINIMUM THICKNESS INCHES	NOMINAL DIAMETER INCHES
0.250	4 thru 14
0.250	14 and 16
0.250	18
0.281	20
0.312	22
0.344	24
0.375	26
0.406	28 and 30
0.438	32
0.469	34 and 36
0.500	38, 40 and 42

B. The steel casing pipe for all highway crossings shall be as follows:

CARRIER PIPE SIZE	CASING PIPE SIZE
4"	10"
6"	14"
8"	16"
10"	18"
12"	20"
15"	24"

C. Weldings of the steel casing pipe shall be solidly butt-welded with a smooth non-obstructing joint inside and conform to all specifications as required by American Welding Society (AWS). The casing pipe shall be installed without bends. All welders and welding operators shall be qualified as prescribed by AWS requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Where shown on the Drawings, the Contractor shall install encasement pipe by two methods the open cut method or the boring method. The open-cut method shall consist of placing the encasement pipe in the trench first then the carrier pipe is placed inside of the encasement pipe. All backfilling shall be in accordance with Section 2700, Article 3.05. Two methods of boring will be permitted. In the first, the encasement pipe is pushed or jacked into the hole as the auger cuts out the material. The second method consists of drilling the hole completely through the fill and pushing or jacking the encasement pipe into the hole after the auger has completed the bore. The pipe shall be installed in a manner that will not disrupt traffic.

B. The carrier pipe will not be permitted to rest on bells or couplings. Polyethlene pipe spacers, equally spaced and extending the full length of the pipe contained within the encasement pipe, shall be securely fastened to the carrier pipe. The spacers shall be manufactured by Advanced Products and Systems, Inc. Lafayette, Louisiana or approved equal.

C. When more than one carrier pipe is installed within the encasement pipe, each carrier pipe shall be individually secured to the four pressure treated wood members in the manner described in this article to facilitate removal of any one of the pipes when repair is necessary.

3.02 SEALING

After installation of the carrier pipe within the encasement pipe, the ends of the casing shall be sealed in the following manner. The space between the casing and the carrier pipe shall be filled with concrete or a waterproofing bitumastic compound until a tight seal is obtained. An Ethylene Propylene Diene Monomer (EPDM) elastomeric membrane shall be wrapped around the end of the encasement pipe in three layers and securely bound to the casing and the carrier pipe barrel with stainless steel bands. The EPDM membrane shall be 0.045" thick and have a tear resistance of 125 lbs/in. The membrane shall be manufactured by Carlisle Tire & Rubber Co., Firestone Industrial Products Co., or approved equal.

3.03 DAMAGE

The cost of repairing damage which is caused by the boring operation to the highway above the bore shall be borne by the Contractor.

- END OF SECTION -

SECTION 02500

BITUMINOUS PAVEMENT

PART 1 - GENERAL

1.01 DESCRIPTION OF THE WORK

Extent of bituminous pavement paving is shown on the Drawings, including roads, driveways and parking areas.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Unless noted, all specification designations refer to the Kentucky Department of Highways Standard Specifications, (KDOHSS) Latest Edition. Appropriate portions of the referenced sections of the Specifications shall apply, but all work shall be included in bid items described herein unless otherwise specified or shown on the Drawings.

B. Preparation of subbase is specified in this Division, Section 02200.

C. Crushed stone and dense graded aggregate are specified in this Division, Section 02255.

1.03 QUALITY ASSURANCE

A. Performance: Bituminous seal coat that fails as the result of not meeting the requirements of these Specification shall be corrected at the Contractor's expense.

B. The design plant mix shall be submitted to the Engineer for review and acceptance. The submittal shall include the last date the mixture was approved by the Kentucky Department of Highways for use on a state road project; and the location where the mixture was recently used, and the name and address of the paving contractor.

PART 2 - PRODUCTS

2.01 BITUMINOUS CONCRETE SURFACE MATERIAL

A. Aggregates shall meet the applicable requirements of the KDOHSS.

B. Bituminous materials shall meet the applicable requirements of the KDOHSS.

C. Bituminous materials for tack coat shall be one of the following: SS-1, SS-1h, CSS-1, CSS-1h, AE-60, RS-1, CRS-1, RC-70 or RC-250.

D. Steel, wood or other suitable material shall be of size and strength necessary to resist movement during bituminous placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

2.02 BITUMINOUS SEAL COAT MATERIAL

A. Coarse aggregate shall be Kentucky Department of Highways Standard Size No. 8, meeting applicable requirements of Section 805 of KDOHSS.

B. Bituminous materials shall meet applicable requirements of Section 806 of KDOHSS.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

The road shall be swept with an approved mechanical sweeper and with wire hand brooms, when necessary. Special care shall be taken to clean the edges of the surface so that full width of the roadway to be treated shall be uniformly clean. Where any mud or earth exists, it shall be removed sufficiently in advance of application of bituminous material to allow the surface to become thoroughly dry.

3.02 BITUMINOUS CONCRETE PAVING

A. Composition of Mixtures: Surface pavement mixture, meeting requirements of the KDOHSS shall be used as determined by local plant mix availability. The mixture shall have been approved recently by the Kentucky Department of Highways, used recently on a state project, and conform to the requirements below when tested in accordance with ASTM D 1559-76:

Stability, minimum pounds	1200
Flow, 0.01 inch	Min. 6, Max. 16
Percent air voids	Min. 4, Max. 8
Minimum voids in mineral aggregate,	
percent: 3/4 inch	14
1 inch	13

B. Construction Methods: Construction requirements shall conform to applicable requirements of the KDOHSS.

C. A tack coat shall be required to bond new paving to the surface of concrete or brick pavements and bases or existing bituminous surfaces. It shall be applied in accordance with Section 407 of KDOHSS.

D. Where bituminous paving is placed against vertical surfaces such as curbs, gutters, manhole frames, valve boxes, etc., the vertical face shall be tack coated to seal the surface. Where these surfaces are inaccessible to pressure distributor, the tack coat may be brushed or broomed into place. The tack coat shall not be allowed to spill over onto any horizontal surface outside the area to be paved.

E. Unless otherwise indicated on the Drawings or in these Specifications, the compacted thickness of the bituminous concrete paving shall be a minimum of 2 inches and the minimum ambient temperature for placing shall be 40 deg F. Mixing and laying temperatures shall be as follows:

Aggregates	Min. 240 deg F Max. 325 deg F
Asphalt Cement	Min. 225 deg F Max. 325 deg F
Mixture at Plant (measured in truck)	Min. 240 deg F Max. 325 deg F
Mixture when Placed (measured in truck when discharging)	275 deg $\pm$ 20 deg F**

**The 275 deg F + 20 deg F mixture placing temperature is based on 275 deg F being about the ideal temperature for obtaining optimum compaction under average conditions. However, when the distance

between asphalt plant and the job is such that specified placing temperatures cannot be maintained even though maximum mixing temperatures are covered, insulated hauling equipment as described below are used, the minimum placing temperature shall be 225 deg F.

F. Trucks for hauling bituminous mixtures shall have tight, clean and smooth metal beds that have been sprayed with a minimum amount of soap emulsion, paraffin oil, or other approved material that is not detrimental to the mixture to prevent the mixture from adhering to the beds. All trucks shall be equipped with covers of sufficient size to completely cover the located material and all covers shall be securely fastened in place before the truck leaves the plant. Truck beds shall be insulated, when necessary, to maintain the specified temperature to the point of delivery. Any truck causing excessive segregation of material by its spring suspension or other contributing factors shall be discharged from the work until such conditions are corrected.

G. The Contractor shall have an accurate thermometer on the job at all times for verifying all temperature requirements and for taking temperature measurements whenever requested by the Engineer or Owner. The Contractor shall closely control temperature and compaction requirements to achieve quality bituminous paving and related work.

H. Bituminous paving that fails as the result of not meeting the requirements of these Specifications shall be removed and replaced at the Contractor's expense.

- END OF SECTION -

SECTION 02510

WALK, ROAD AND PARKING PAVING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Crushed stone paving course, compacted.

B. Asphaltic concrete paving. (Replacement of asphaltic pavement disturbed during construction only)

1.02 REFERENCES

A. ASTM C33 - Aggregate for Concrete.

B. State of Kentucky Highway Standard Specifications for Road and Bridge Construction (latest revision).

1.03 TESTS

Gradation of stone materials will be performed in accordance with ASTM C33.

1.04 RELATED WORK

Section 01450 - Quality Control: Compaction requirements of backfill.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials used shall meet the appropriate physical test requirements of the latest edition and/or revision of State of Kentucky Highway Department Standard Specifications for Road and Bridge Construction.

B. Replacement of Bituminous Surface on City Streets and Secondary State Highways: Bituminous surfacing materials for replacement of City Streets and Secondary State Highways of bituminous construction shall be hot mixed bituminous concrete, as specified in the State of Kentucky Highway Department Standard Specifications for Road and Bridge Construction, Section 401 (latest revision).

C. Bituminous Seal Coat Treatment: Bituminous seal coat treatment shall conform to the requirements as set forth in the State of Kentucky Highway Department Standard Specifications for Road and Bridge Construction Section 406 (latest revision).

D. Tack Coat: Bituminous material for tack coat shall be as specified in State of Kentucky Highway Department Standard Specifications for Road and Bridge Construction, Section 407 (latest revision).

E. Dense Graded Aggregate: Crushed rock for temporary or permanent traffic bound surfacing shall be No. 610 as specified in Section 303 (State of Kentucky Highway Department Standard Specifications for Road and Bridge Construction). The crushed stone shall be crushed limestone meeting the requirement of Section 805 of the Kentucky Highway Department Standard Specification for Road and Bridge Construction.

F. Crushed stone shall conform to ASTM C33.

G. The sidewalks and curbs shall consist of 4" of 3000 PSI concrete reinforced with wire mesh placed over the previously prepared stone base. The shapes and sizes of the sidewalks shall be as indicated on the Drawings. The materials and methods of construction shall conform in all respects to the applicable sections under Section 712 of the State of Kentucky Highway Department Standard Specifications for Road and Bridge Construction.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify compacted subgrade.

B. Verify compacted granular base is dry and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

D. Verify surface of existing paved area is clean and prepared for application of tack coat and paving. conditio

E. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Concrete and Bituminous Paving Repair, Replacement or Resurfacing: In case of replacement of state highway paving, depth, other details and method of applying, including base, shall be as specified herein and as required by the Kentucky Highway Department. Pavement for state highway, county road, or city street paving replacement shall be as described in the following Specifications.

B. Trench Surface Repaving on City and County Streets and Roads:

1. Bituminous Paving Replacement: The cut edges of the existing paving surface shall be trimmed a depth of at least 2" to straight lines for uniform appearance and clean surface at joints. The area between the cut edges of the paving shall be removed to a depth of 1" (minimum) below the bottom of the existing paving. All unstable material in the trench shall be removed and replaced with compacted dense graded aggregate added as needed to bring the base surface to 1" below bottom of existing paving. Dense graded aggregate required for stabilizing the subgrade will be paid for as an extra with the width and weight limitations as specified. No extra payment will be allowed for removal of unstable backfill.

2. The paving subgrade shall be compacted under the wheel of a loaded dual wheel vehicle until there is no observed settlement of the subgrade.

3. Prior to placing the paving material, the bottom and sides of surface to be paved shall be covered with a prime coat to insure adhesion.

4. Next, the bituminous paving shall be hot applied and rolled in accordance with the provisions of Section 401, KHDSSRBC. Surface shall then be graded to one-quarter inch above existing paving surface at edges and crowned to one-half inch above such surface at the center.

3.03 PLACING STONE PAVING AND STONE BASE

A. Spread stone material over prepared base to a total compacted thickness of 12 inches.

B. Place stone in 6 inch layers and compact.

C. Level surfaces to elevations and gradients indicated.

D. Add small quantities of sand to stone mix as appropriate to assist compaction.

E. Adequately compact placed stone materials.

F. Add water to assist compaction. With an excess water condition, rework topping and aerate to reduce moisture content.

3.04 SUBSOIL PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches and stones in excess of one inch in size.

3.05 PLACING ASPHALT PAVEMENT

A. The preparation of the base shall include cleaning of original surface to be resurfaced, the removal of unstable material from the trench, removal of crushed rock from the trench to bottom of the existing bituminous pavement, and the addition of crushed rock to the trench where needed. No cutting of edges of existing paving will be required.

B. If temporary pavement has been placed, it shall be removed and the stone base course restored as hereinafter specified. All catchbasin and manhole frames and covers, water and gas gates, and other structures in the roadway to receive the surface course shall be adjusted to the elevation required for the finished pavement to conform to the proper grade.

C. Prior to placing pavement, all backfill shall have been properly compacted as required under BACKFILLING AND EMBANKMENT to eliminate settling of backfill. No pavement shall be placed over poorly compacted backfill. Backfill and stone base course shall be compacted, brought to the proper elevation, and dressed so that new pavement construction shall be at the required grade. The Contractor shall maintain the surfaces of all excavated and disturbed areas until the pavement is placed. If there is a time lapse of more than 24 hours between completion of preparation of subgrade or placing of stone base course and placing of paving, or if subgrade or stone base course has been eroded or disturbed by traffic, the subgrade or stone base course shall be restored before placing paving.

D. After the stone base course has been rolled to the required grade, the edges of existing pavement shall be cut back 12" or more, as required, from the trench excavation wall or damaged area to sound undamaged material, straightened, cleaned, and painted with an approved cut back asphalt to insure a satisfactory bond between it and the newly placed permanent paving.

3.06 TEMPORARY PAVEMENT

A. The Contractor upon completing the backfilling of the trenches and the placing of the gravel base, may be required to construct a temporary pavement.

B. The temporary pavement shall be placed in one course and shall consist of 2" compacted thickness of bituminous concrete as directed by the Engineer. The pavement shall be maintained in good repair, flush with the existing pavement at all times, at the Contractor's expense.

C. The materials and methods of construction for temporary bituminous-concrete pavement shall conform in all respects to the applicable
subsections under Section 401, of the Kentucky Highway Department Standard Specifications for Road and Bridge Construction.

3.07 TOLERANCES

A. Flatness: Maximum variation of 1/2" measured with 10 feet straight edge.

B. Compacted Scheduled Thickness: Within 1/4".

C. Variation from True Elevation: Within 1/2".

D. Top of Sidewalk and Curbs: Plus or minus 1 inch.

3.08 PROTECTION

Immediately after placement, protect pavement from damage until surface is sufficiently hardened for traffic.

3.09 SURFACE MAINTENANCE

Until the expiration of the guarantee period, the Contractor shall maintain surfacing placed under this contract and shall promptly correct all defects such as cracks, depressions, and holes that occur. At all times, the surfacing shall be kept in a safe and satisfactory condition for traffic. If defects occur in surfacing constructed by the Contractor, the Contractor shall remove all bituminous concrete and base course as is necessary to properly correct the defect. The Contractor shall replace the base course and bituminous concrete in accordance with the requirements of these Specifications.

- END OF SECTION -

SECTION 02600

PIPE, FITTINGS AND INSTALLATION

PART 1 - GENERAL

1.01 SCOPE

A. Furnish all labor, materials, equipment and incidentals necessary to install and test pipe and fittings as shown on the Drawings and required by the Specifications.

B. Piping shall be located substantially as shown. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference between pipes or for other reasons.

C. Wherever the word pipe or piping is used it shall mean pipe and fittings unless otherwise noted. All ductile iron pipe (D.I.P.), fittings, glands and accessories shall be of the same manufacturer unless approved otherwise.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE (D.I.P.) AND FITTINGS

A. Ductile iron pipe (D.I.P.) shall conform to ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51 Standard. The pipe shall conform to thickness class 350 unless noted otherwise. All pipe, fittings and joints should be capable of accommodating pressure up to 350 psi. Joint restraints required. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURE.

B. Ductile iron mechanical joint fittings shall have a body thickness and radii of curvature conforming to ANSI A21.10 and have joints in accordance with ANSI/AWWA C111.A21.11. Fittings and joints shall be supplied with all accessories.

C. All pipe and fittings shall be tar coated outside and shall receive a standard cement lining with bituminous seal coat on the inside in accordance with ASA Specification A21.40 (AWWA-C104).

D. Cement mortar lining and seal coating for pipe and fittings, where applicable, shall be in accordance with ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.

E. All ductile fittings shall be rated at 350 psi water working pressure plus water hammer. Ductile iron fittings shall be ductile cast-iron grade 80-60-03 per ASTM Specification A339-55.

F. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of the fittings and installation in the unit price for pipe.

G. Push-on type joints shall be single rubber gasket, with cast gasket socket and recessed bell with a tapered annular opening and flared socket and shall conform to ANSI/AWWA C111/A21.11. Plain spigot ends shall be suitably beveled to permit easy entry into the bell, centering and compressing the gasket.

H. Ductile iron flanged joint pipe shall conform to ANSI/AWWA C115/A 21.15 Standard and have a Class of 350. The pipe shall have a rated working pressure of 350 psi with Class 125 flanges. Gaskets shall be ring gaskets with a thickness of 1/8-inch. Flange bolts shall conform to ANSI B16.1.

I. Flanged fittings shall meet all requirements of ANSI/AWWA C110/A21.10 and have Class 125 flanges. Fittings shall accommodate a working pressure up to 350 psi and be supplied with all accessories.

J. River crossing pipe shall be ductile iron with ball and socket type joint. The joint shall be boltless with restraint provided by a bayonet-type locking of the retainer over the bell. All pipe components shall be rugged, high strength ductile iron. The barrel is cast of 60-42-10 ductile iron in accordance with American National Standard A21.51. The bell, ball, and retainer are cast of 70-50-05 ductile iron in accordance with the applicable requirements of American National Standard A21.10. The gasket will be of high quality rubber and symmetrical in shape. The first and last section of river crossing pipe shall be furnished with mechanical joint ends suitable for connection to the remaining system piping.

K. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of the fittings and installation in the unit price for pipe.

L. Restraint glands or fittings shall be either "Meg-a-Lug" or "Series 100" or "Series 1200" as manufactured by EBBA Iron Sales, Inc., Eastland, Texas.

M. Restrained Joint Pipe:

1. Restrained joints for 4" through 16" push-on joint pipe installation is required and indicated in the project plans or specifications, restrained push-on joint pipe and fittings utilizing ductile iron components shall be provided.

2. Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11. Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50, and shall be based on laying conditions and internal pressures as stated in the project plans and specifications. Pipe shall be U.S. Pipe TR FLEX pipe or equal.

3. Restrained joint fittings shall be ductile iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 with the exception of the manufacturer's proprietary design dimensions. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11. Fittings shall be U.S. Pipe TR FLEX fittings or equal.

4. Cement mortar lining and seal coating for pipe and fittings, where applicable, shall be in accordance with ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.

5. Restrained push-on joints for pipe and fittings shall be designed for a water working pressure of 350 psi in sizes 4" through 24" and 250 psi for sizes 30" through 54".

6. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.

2.02 POLYVINYL CHLORIDE (PVC) PIPE (SDR 21 AND SDR 17)

A. Polyvinyl chloride (PVC) pipe for water mains shall be Class 200 (SDR 21) or Class 250 (SDR 17) PVC pressure rated pipe as shown on the Drawings or indicated in the proposal form with either twin gasket joints or integral bell joints with rubber O-ring seals.

B. All PVC pipe shall conform to the latest revisions of ASTM D-1784 (PVC Compounds), ASTM D-2241 (PVC Plastic Pipe, SDR) and ASTM D-2672 (Bell-End PVC Pipe). Rubber gasketed joints shall conform to ASTM D-3139. The gaskets for the PVC pipe joint shall conform to ASTM F-477 and D-1869.

C. Couplings shall be furnished by the pipe manufacturer and shall accommodate the pipe for which they are used. Rubber gasket joints shall provide adequate expansion to allow for a 50 degree change in temperature on one length of pipe. Lubrication for rubber connected couplings shall be water soluble, non-toxic, be non-objectionable in taste and odor and have no deteriorating affect on the PVC or rubber gaskets and shall be as supplied by the pipe manufacturer. Couplings shall conform to ASTM D-3139; SDR-21, 200 psi.

D. All pipe and couplings shall bear identification markings that will remain legible during normal handling, storage and installation, which have been applied in a manner that will not reduce the strength of the pipe or coupling or otherwise damage them. Pipe and coupling markings shall include the normal size and OD base, material code designation, dimension ratio number, ASTM Pressure Class, ASTM designation number for this standard, manufacturer's name or trademark, seal (mark) of the testing agency that verified the suitability of the pipe material for potable-water service. Each marking shall be applied at intervals of not more than 5 feet for the pipe and shall be marked on each coupling.

2.03 POLYVINYL CHLORINE (PVC) PIPE - C.I. PIPE SIZE DR14 AND DR 18

A. Pipe shall meet the requirements of AWWA C-900 Polyvinyl Chlorine (PVC) Pressure Pipe. All Class 200 pipe shall meet the requirements of DR 14 and all Class 150 pipe shall meet the requirements of DR 18. Joints shall be integral bell or twin gasket joints with rubber O-ring seals.

B. All pipe shall be suitable for use as a pressure conduit. Provisions must be made for expansion and contractions at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring which meets the requirements of ASTM D-1869 and F-477. The bell section shall be designed to be at least as strong as the pipe wall. Sizes and dimensions shall be as shown in this specification.

C. Gaskets and lubricants intended for use with PVC pipe and couplings shall be made from materials that are compatible with the plastic material and with each other when used together, will not support the growth of bacteria, and will not adversely affect the potable qualities of the water that is to be transported. Gaskets and lubricants shall be supplied by the pipe manufacturer.

D. Physical Requirements:

1. Standard Laying Lengths - Standard laying lengths shall be 20 ft. (plus or minus 1") for all sizes. The total footage of pipe of any class and size shall be furnished in standard lengths. Each length of pipe shall be tested to four times the class pressure of the pipe for minimum of 5 second. The integral bell shall be tested with the pipe.

2. Pipe Stiffness - The pipe stiffness using F/y for PVC class water pipe shall be as follows:

Class	DR	F/y
200	14	815
150	18	364

3. Quick Burst Test - Randomly selected tested in accordance with ASTM D-1599 shall withstand without failure pressures listed below when applied in 60 - 70 seconds. Class 150 shall have a minimum burst pressure of 755 psi and Class 200 shall have a minimum burst pressure of 986 psi at 73 degrees F. for all sizes.

4. Drop Impact Test - Pipe shall withstand without failure at 73 degrees F. an impact of 120 ft/lbs created by a falling 12 lb missile with a 2" radius nose without visible evidence of shattering or splitting.

E. All pipe and couplings shall bear identification markings that will remain legible during normal handling, storage and installation, which have been applied in a manner that will not reduce the strength of the pipe or coupling or otherwise damage them. Pipe and coupling markings shall include the nominal size and OD base, material code designation, dimension ratio number, AWWA Pressure Class, AWWA designation number for this standard, manufacturer's name or trademark, seal (mark) of the testing agency that verified the suitability of the pipe material for potable-water service. Each marking shall be applied at intervals of not more than 5 feet for the pipe and shall be marked on each coupling.

2.04 DUCTILE IRON MECHANICAL JOINT FITTINGS FOR PVC PIPE

A. General: Cast-iron mechanical joints shall conform to the latest revision of ANSI A21.11 for centrifugally cast-iron water pipe.

1. 3" to 12". All Working Pressures: Fittings shall conform to ASA Specification A21.10 for 250 psi water working pressure plus water hammer.

2. Fittings 12" and Over, for 150 psi and Less WWP: Fittings for use on 150 psi WWP pipe shall be AWWA Class D Pattern.

3. Fittings 12" and Larger, for 200 psi and Above WWP: Fittings shall be ductile iron or gray iron rated at 250 psi water working pressure plus water hammer. Ductile iron fittings only will be used with ductile iron pipe.

B. All ductile iron fittings shall be rated at 250 psi water working pressure plus water hammer. Ductile iron fittings shall be ductile cast-iron grad 80-60-03 per ASTM Specification A33955. All fittings for connection to PVC pipe-all classes, shall be ductile iron.

C. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of the fittings and installation in the unit price for pipe.

D. Lining and Coating: All mechanical joint fittings shall be cement lined and bituminous seal coated per Federal Specification WW-P-42lb and ASA Specification A421.40 (AWWA C104). Bituminous outside coating shall be in accordance with ANSI/AWWA C110/A21.10.

2.05 HIGH-DENSITY POLYETHYLENE - AWWA APPROVED POTABLE WATER PIPE

A. General: This section is for High-density Polyethylene AWWA C906 and NSF 14 Approved Pipe for Potable Water Service in Sizes 4" to 24" DIPS (Ductile Iron Pipe Size) and defines the characteristics and properties of high-density polyethylene pipe. This specification governs the material, pipe, fittings, butt fusion, and general construction practice for HDPE piping systems.

Pipe shall have a hydrostatic design stress rating of 800 psi based on a material with a 1,600 psi at 23^{o} hydrostatic design basis as determined in accordance with ASTM D-2837.

Fittings shall be molded or fabricated from material meeting the same standards as the pipe.

Joints shall be made by the thermal butt fusion system. All joints shall be completely watertight, airtight and as strong as or stronger than the pipe wall, in strict accordance with the manufacturer's recommendations.

Sections of polyethylene pipe shall be joined into continuous lengths on the job site above ground. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400^{o}F, alignment, and 150 psi interfacial fusion pressure.

Heat fusion joining shall be 100% efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used.

B. References: Where all or part of a Federal, ASTM, ANSI, AWWA, etc., standard specification is incorporated by reference in these Specifications, the reference standard shall be the latest edition and revision and considered a part of these specifications.

C. Material: Materials used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high density PE 3408 polyethylene resin. The material shall be listed by PPI (Plastics Pipe Institute, a division of the Society of the Plastics Industry) in PPI TR-4 with a 73°F hydrostatic design basis of 1,600 psi and a 140°F hydrostatic design basis of 800 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D 2837 testing.

D. Pipe and Fittings: Qualification of Manufacturers. The Manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Owner or his Authorized Representative.

1. Pipe: Pipe supplied under this specification shall have a nominal DIPS (Ductile Iron Pipe Size) OD unless otherwise specified. The DR (Dimension Ratio) and the pressure rating of the pipe supplied shall be as shown on the drawings. The pipe shall be produced from approved HDPE pipe grade resin with the nominal physical properties as specified in the appropriate ASTM specifications for the sizes indicated. Pipe having a diameter 3” and larger will be made to the dimensions and tolerances specified in ASTM F 714.

   The pipe shall contain no recycled compound except that generated in the manufacturer’s own plant. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

2. Pipe Performance: The pipe will be extruded from resin meeting the specifications of ASTM D 3350 with a minimum cell classification of 345464C.

3. Fittings: HDPE fittings shall be in accordance with ASTM D 3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe conforming to this specification. The fittings shall be fully pressure rated and provide a working pressure equal to that of the pipe with an included 2:1 safety factor. The fittings shall be manufactured from the same base resin type and cell classification as the pipe itself. The fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects.

4. Molded Fittings. Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.

5. X-Ray Inspection. The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection.

6. Fabricated Fittings. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe. Fabricated fittings shall be tested in accordance with AWWA C906.

7. Polyethylene Flange Adapters. Flange adapters shall be made with sufficient throughbore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations) to promote gasketless sealing, or restrain the gasket against blowout.

E. Joining - Butt Fusion: Sections of polyethylene pipe shall be joined by the butt fusion process into continuous lengths at the job site. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer. Properly executed electrofusion fittings may be used. Extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications or fabrications where shear or structural strength is important. Mechanical joint adapters, flanges, unions, grooved-couplers, transition fittings, and some mechanical couplings may be used to mechanically connect HDPE pipe. Refer to the manufacturer's recommendations.

F. Joining - Other Means: Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and back-up rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, (c) MJ Adapters or (d) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.

ID Stiffener and Restraint. A stiffener shall be installed in the bore of the polyethylene pipe when an OD compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. External clamp and tie rod restraint shall be installed where PE pipe is connected to the socket of a mechanical joint pipe, fitting or appurtenance except where an MJ Adapter is used.

G. Quality and Workmanship: The pipe and/or fitting manufacturer's production facilities shall be open for inspection by the owner or his designated agents with a reasonable advanced notice. During inspection, the manufacturer shall demonstrate that it has facilities capable of manufacturing and testing the pipe and/or fittings to standards required by this specification. Pipe which has been tested by the manufacturer and falls outside of the appropriate limits set forth in this specification will be cause for rejection.

H. QA Records: QA/QC records shall be maintained intact for a minimum of one year from the date of production.

I. Pipe Marking: During extrusion production, the HDPE pipe shall be continuously marked with durable printing including the following in formation:

Nominal Size
Dimension Ratio
Pressure Class, psi
Manufacturer's Name and Product Series
Cell Class
ASTM Basis
"NSF-PW"
Pipe Test Category
Plant Code & Extruder
Production Date
Operator Number (Shift Letter optional)
Resin Supplier Code

J. Pipe Packaging, Handling, & Storage: The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage. The transportation carrier shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method. Fused segments of pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.

K. Testing:

- Fusion Quality. The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

- Hydro-Test: Pipelines shall be tested to the requirements and specifications of the engineer of record. HDPE pressure pipe shall be tested in accordance with the specifications and requirements of the engineer of record and/or with the manufacturer's recommendations. The pressure rating of the pipe is a function of temperature at the time of hydro-test. Refer to the manufacturer's temperature related pressure ratings. At a minimum and if not specified elsewhere, hydro-test the piping system at 1.5 times the pressure rating of the pipe for 2 to 3 hours per Driscopipe Technical Note #35. If a system component such as a fabricated or mechanical fitting has a pressure rating less than that of the pipe, the piping system should be pressure tested to manufacturer's guidelines on that component.

PART 3 - EXECUTION

3.01 LAYING DEPTHS FOR WATER MAINS

In general, water mains shall be laid with a minimum cover of 36" above the top of the main, unless otherwise noted on the Drawings , i.e. for minimum separation between water main and other utilities, connections to existing mains, valve locations, or when required by Kentucky Department of Highways, i.e. ditch lines and borings shall be 42" minimum cover.

3.02 PIPE BEDDING

A. The foundation for pipes laid in trenches shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. Pipe bells shall not carry any of the load of the backfill.

B. The Contractor shall use the "Undercutting Method" of pipe bedding.

C. When the "Undercutting Method" is used in rock bottom trenches, Class I granular bedding (No.9 crushed stone aggregate) or earth shall be of such depth that the bottom of the barrel of the pipe will be at least 6" above the bottom of the trench as excavated. Pipe bedding required in this paragraph is NOT considered a separate pay item.

D. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, the pipe must be weighted or secured permanently in place by such means as will prove effective. In areas where a high water table exists, the Contractor is cautioned to exercise extreme care in the placement of the backfill material to prevent flotation of the pipe at any time.

E. Where an unstable (i.e., water, mud, etc.) trench bottom is encountered, stabilization of the trench bottom is required. This is to be accomplished by undercutting the trench depth and replacing to grade with a foundation of crushed stone aggregate. The depth of the foundations dependent upon the severity of the trench bottom. The size of stone aggregate used in the foundation will be determined by the condition of the unstable material. Once the trench bottom has been stabilized, the required Class I bedding can be placed. The amount of crushed stone aggregate required to bring the top of the foundation to the trench bottom prior to the removal of the unstable material will be considered a separate pay item following negotiation between the Contractor and Owner and constitute a change order item. No compensation will be made if the instability of the trench bottom is caused by the Contractor's neglect.

F. The Contractor shall use compacted earth material or Class I granular bedding (No.9 crushed stone aggregate) when the pipe is to be placed in the rock bottom trenches or in trenches with excavated rock present. This type of bedding material shall be placed 12" above and 6" below the pipe as shown on the Contract Drawings as "Class C Bedding Detail".

G. It should be noted that no pipe shall be laid on solid or blasted rock. No rock shall be allowed to rest against the pipe once it is placed in the trench.

H. Pipe bedding as required in Paragraphs C and D of this Article is NOT considered a separate pay item.

3.03 PIPE LAYING

A. All pipe shall be laid with ends abutting and true to the lines and grades indicated on the Plans. Pipe shall be fitted and matched so that when laid in the work, it will provide a smooth and uniform invert. Supporting of pipe shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipe on blocks be permitted.

B. Fittings and specials for the water main shall be provided and laid as and where directed by the Engineer or as shown on the Plans.

C. Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to insure its being clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles tot he longitudinal axis of the pipe.

D. The interior of the pipe, as the work progresses, shall be cleaned of dirt, jointing materials, and superfluous materials of every description. When laying of pipe is topped for any reason, the exposed end of such pipe shall be closed with a plywood plug fitted into the pipe bell so as to exclude earth or other material and precautions shall be taken to prevent flotation of pipe by runoff into trench.

E. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade in the section laid, but such inspection shall not relieve the Contractor of further liability in case of defective joints, misalignment caused by backfilling and other such deficiencies that are noted later.

F. Anchorage of Bends, Tees, Plugs and Valves:

1. At all tees, plugs, caps and bends of 11-1/4 degrees and over, and at reducers or in fittings where changes in pipe diameter occur, movement shall be prevented by using suitable harness, thrust blocks or ballast. Valves shall be provided with similar protection. Thrust blocks and supports shall be as shown in the typical details, with sufficient volumes of concrete being provided; however, care shall be taken to leave weep holes unobstructed and allow for future tightening of all nearby joints. Unless otherwise directed by the Engineer, thrust blocks shall be placed so that the pipe and fitting joints will be accessible for repair. Thrust blocks shall bear on undisturbed earth or rock.

2. Bridles, harness or pipe ballasting shall meet with the approval of the Engineer. Steel rods and clamps shall be galvanized.

3. No extra pay shall be allowed for work on proper anchorage of pipe, fittings or other appurtenances; such items shall be included in the unit price bid for the supported item.

3.04 HORIZONTAL DIRECTIONAL DRILLING (HDPE)

Horizontal directional drilling technique shall be used for installing pipes and utility lines below ground using a surface-mounted drill rig that launches and places a drill string at a shallow angle to the surface and has tracking and steering capabilities. The drill shall be advanced underground, creating a borehole along its path. As the destination is reached, the drill string is angled upwards to penetrate the surface. After the borehole has been opened, a backreamer shall be attached to the head of the drill string and the HDPE pipe shall be attached to the backreamer. The drill string shall then be retracted. During retraction, the borehole will be expanded by the backreamer and the HDPE pipe drawn into the borehole. To protect HDPE pipe against excessive pulling load, a weak-link or breakaway device shall always be used at the head of the HDPE pipe. the allowable tensile load for setting weak-link devices shall be determined using ASTM F 1804 Standard Practice for Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe During Pull-In Installation. Horizontal Directional Drilling (HDD) applications shall be installed in accordance with ASTM F1962 Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacle, Including river Crossings, Plastic Pipe Institute (PPI) Polyethylene Pipe for Horizontal Directional Drilling, and the Mini Horizontal Directional Drilling Manual published by the North American Society of Trenchless Technology (NASTT). Additional information is available in Plexco® Literature Trenchless Technology Bulletin No. 1 - Horizontal Directional Drilling Note.

3.05 WATER MAINS PUSHED UNDER DRIVEWAYS

The Contractor may be required to tunnel or bore under a bituminous or concrete surface driveway instead of open trenching as requested by the property owner. The opening under the driveway shall be of the smallest diameter possible to accommodate the water main to minimize settlement of the driveway. Should settlement occur, the Contractor shall repair the driveway at his own expense in a manner satisfactory to the Engineer and the property owner.

3.06 JOINTING

Jointing shall be accomplished in accordance with the manufacturer's recommendation.

3.07 TYPES OF CRUSHED STONE MATERIAL

Two classes of crushed stone material are mentioned in the Detailed Specifications. The Type of material used in each class is as follows:

Class I No. 9 Aggregate

Class II Dense Graded Aggregate

3.08 BACKFILLING

A. Initial Backfill:

1. This backfill is defined as that material which is placed over the water main from the spring line in an earth trench to a point 6" above the top of the pipe or from the trench bottom in a rock trench to a point 12" above the top of the pipe. The initial backfill for Case I situations shall be earth material free of rocks, acceptable to the Engineer or Class I material (No. 9 crushed stone aggregate). The initial backfill for Case II, Case III and Case IV situations shall be compacted earth material or be Class I material (No.9 crushed stone aggregate).

2. In areas where large quantities of rock are excavated, and the excavated earth is insufficient, then the Contractor must either haul in earth or order crushed stone aggregate for backfilling over the top of the pipe. Neither earth nor the crushed stone aggregate used to fulfill the backfill requirements is considered a pay item.

B. Final Backfill: There are four cases where the method final backfilling varies. The various cases and their trench situations are as follows:

1. Case I: Areas not subject to vehicular traffic.

2. Case II: Gravel areas subject to light vehicular traffic such as residential driveways; church and commercial parking lots and entrances; and farm drives.

3. Case III: City and County gravel roads; gravel and bituminous road shoulders; all bituminous surface areas such as City and County streets, residential driveways, church and commercial parking lots, and entrances; City and County road shoulders.

4. Case IV: State maintained streets and roads; road shoulders for State roads and streets.

C. In all cases, walking or working on the completed pipelines, except as may be necessary in backfilling, will not be permitted until the trench has been backfilled to a point twelve (12) inches above the top of the pipe. The method of final backfilling for each of the above cases is as follows:

1. Case I - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of the pipe to a point 8" below the surface of the ground with earth material free from large rock (over one-half cubic foot in volume), acceptable to the Engineer. The remainder of the trench to existing grade shall be backfilled with earth material reasonably free of any rocks.

   Earth backfill used in this Case is not a separate pay item but will be paid under the pay item "Water Main".

2. Case II - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of the pipe to a point 12" below the surface of the ground with Class I (No. 9 crushed stone aggregate) material. The trench shall be tamped to assure maximum possible compaction (approximately 80 to 85 percent of Standard Proctor density). Extreme care shall be exercised to prevent damage to the pipe during tamping operation. The remainder of the trench to existing grade shall be backfilled with Class II (dense graded aggregate) material with the material being mounded over the trench.

The trench shall be tamped again to assure additional compaction. The trench may be left with a slight mound if permitted by the Engineer.

Class I material used and method of backfilling used in this case is not a separate pay item and is considered incidental to the work and will be paid for under the item "Water Main".

Class II material used in this method of backfill is not a separate pay item and will be included in the unit price per linear foot under the item "Water Main".

Sufficient stockpiles of Class II material shall be placed throughout the project area to insure immediate replacement by the Contractor of any settled areas. No extra payment will be made for the filling of settled areas by the Contractor.

3. Case III - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of pipe to the height indicated in the "City and County Maintained Streets, Roads and Driveway Pavement Replacement" detail with Class I (No. 9 crushed stone aggregate) material. Said material shall be tamped as described for Case II. A 12-inch layer of Class II (dense graded aggregate) material shall be placed over the compacted backfill before bituminous or concrete surface is placed as shown in the previously mentioned details. The 12-inch layer of Class II material is NOT a separate pay item but such expense will be borne by the Contractor and is considered incidental to the bid items "Bituminous Surface Replacement" and "Concrete Surface Replacement". Also considered incidental is all temporary stone required for a temporary surface between backfilling and pavement replacement.

   Sufficient stockpiles of Class II material shall be placed throughout the project area to insure immediate replacement by the Contractor of any settled areas. No extra payment will be made for the filling in of settled areas by the Contractor. Class II material used in this method of backfill is paid for as a support item under item "Bituminous Surface Replacement" or "Concrete Surface Replacement" as its unit price per linear foot.

   Class I material used for backfilling is not a separate pay item and is considered incidental to the bid item "Water Main".

4. Case IV - The trench shall be backfilled from the spring line to a point one 12-inches above the top of the pipe with earth material free from rock and acceptable to the Engineer, it shall be carefully and solidly tamped by approved mechanical methods. The remainder of the trench shall be backfilled to the height indicated in the "State Maintained Streets and Roads Pavement Replacement Detail" in the Contract Drawings, with material free from rock and acceptable tot he Engineer; said material shall be mechanically tamped in approximately six-inch layers to obtain the maximum possible compaction. The backfilling method is NOT a separate pay item. A 12-inch layer of dense graded aggregate shall be placed over the compacted earth backfill when a bituminous or concrete surface street or road has been trenched. The 12-inch layer of stone is not a separate pay item but such expense will be borne by the Contractor.

D. Excavated materials from trenches and tunnels, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. The Contractor may contact the Owner regarding the location of a suitable disposal site; however, if the Owner cannot recommend a site, it shall be the responsibility of the Contractor to obtain locations or permits for the disposal of the waste material. Unit prices for the various pipe sizes shall include the cost of disposing of excess excavated materials, as set forth herein, no additional compensation being allowed for hauling or overhaul.

3.09 CRUSHED STONE BACKFILL

A. The Class I granular material used in Case II and Case III backfill situations shall be No. 9 Crushed Stone aggregate (No.9 Stone). Granular material will not be paid for as a separate bid item.

B. The twelve inches 12-inch of crushed stone backfill that is required in "City and County Maintained Streets, Roads and Driveway Pavement Replacement" or "State Maintained Streets and Roads Pavement Replacement" will not be paid for under the provisions of this article.

3.10 BITUMINOUS PAVEMENT REPLACEMENT

A. Sections of pavement shall be replaced as required to install the pipelines under the work of this Section. Disturbed pavement shall be reconstructed to original lines and grades with bituminous binder as detailed on the Drawings and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to these operations.

B. Prior to trenching, the pavement shall be scored or cut to straight edges along each side of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be recut and trimmed as necessary to square, straight edges after the pipe has been installed and prior to placement of the binder course.

C. Backfilling of trenches shall be in accordance with the applicable portions of this section.

D. Bituminous concrete binder shall be one course construction in accordance with applicable provisions of the Kentucky Department of Highways Standard Specifications, Section 402. Placement and compaction of binder course shall be in accordance with Section 402 of the Kentucky Department of Highways Standard Specifications. Minimum thickness after compaction shall be as shown on the Drawings.

3.11 CRUSHED STONE SURFACE REPLACEMENT

The Class II granular material used in Case II backfill situations shall be dense graded aggregate (D.G.A.). Granular material will be included in the unit price per linear foot for "Water Mains".

3.12 CONCRETE SEPARATOR FOR UTILITY CROSSING OR CASING PIPE WATER/SAN. SEWER CROSSING

A. At locations shown on the Contract Drawings, or as required by the Specifications and Contract Drawings, concrete separator shall be used when the clearance between the proposed water main and any existing non-contaminating utility pipe is one (1) foot or less. Utility pipe includes underground gas, telephone and electrical conduit, storm sewers, or any other underground utility pipe.

B. There are two cases of non-contaminating utility crossing encasement. Case I is applicable when the proposed water main is <u>below</u> the existing utility line. Case II is applicable when the proposed water main is laid <u>above</u> the utility line. In either case, the concrete shall extend to at least the spring line of each pipe involved.

C. When a water main crosses an existing sanitary sewer line, either above or below and less than two feet vertical or ten feet horizontal separation, the water main shall be encased as shown on the Standard Details, or as required by the Specifications and Contract Documents.

D. Concrete shall be Class B (2500 psi) and shall be mixed sufficiently wet to permit it to flow between the pipes to form a continuous bridge. In tamping the concrete, care shall be taken not to disturb the grade of line of either pipe or damage the joints.

3.13 CONCRETE FOR CREEK CROSSING (Type B and C Creek Crossing)

A. At locations shown on the Contract Drawings, or as required by the Specifications and Contract Drawings, concrete encasement shall be used when the water main crosses a stream or creek which is in rock or as directed by the Engineer.

B. All creek crossings (Types B and C) shall be constructed as per the detail shown on the Contract Drawings.

C. Concrete shall be Class B (3000 psi) and shall be mixed sufficiently wet to permit flow around the pipe and to form a continuous bed. In tamping the concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete shall be protected from excess water.

D. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment. Concrete will be paid under the pay items "Crossing Type B and Creek Crossing Type C.

3.14 TESTING OF WATER MAINS

The completed work shall comply with the provisions listed below, or similar requirements which will insure equal or better results:

A. Before any allowable leakage calculation are preformed the pipeline being tested must pass the hydrostatically test.

B. The pipe shall be hydrostatically tested at 1.5 times the design pressure at the point of testing. The duration of the test(s) shall be at least 2 hours during which time the pressure shall not fall more than 4 psi. The pipe shall be tested for allowable leakage according to AWWA C-600 (latest revision) concurrently with the pressure test.

C. Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 3000 feet. Testing shall proceed from the source of water toward the termination of the line. The line shall be tested upon the completion of the first 3000 feet. After the completion of two consecutive tests without failure, the Contractor, at his option and with the Engineer's approval, may discontinue testing until the system is complete.

D. Duration of test shall be not less than 2 hours.

E. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.

F. All pipe, fittings and other materials found to be defective under test shall be removed and replaced at the Contractor's expense.

G. Test pressures shall not be less than 1.5 times the working pressure at the highest point along the test section, not exceed pipe or thrust restraint design pressure, not vary more than $\pm$ 4 psi and not exceed twice the rated pressure of the valves when the pressure boundary of the test sections include closed gate valves.

H. Before applying the specified test pressure, air shall be expelled completely from the pipes and valves. If permanent air vents are not located at high points within the test section, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water.

3.15 LEAKAGE TEST

A. The leakage shall be defined as the quantity of water that must be supplied to the tested section to maintain pressure within 4 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

B. The allowable leakage shall not be greater than that determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{133{,}200}$$

Where L is the allowable leakage in gallons per hour; S is the length of the pipeline tested; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gage.

C. All visible leaks are to be repaired regardless of the amount of leakage.

3.16 DISINFECTION OF WATER LINES

A. New potable water lines shall not be placed into service, either temporarily or permanently, until they have been thoroughly disinfected in accordance with the following requirements and to the satisfaction of the OWNER.

B. New or relocated water lines shall be thoroughly disinfected in accordance with AWWA C651, latest version, upon completion of construction and before being placed into service. After pressure testing, a solution of chlorine or chlorine compounds in such amounts shall be introduced into the section of the line being disinfected sufficient to insure a chlorine dosage of at least 50 parts per million (PPM) in the water main. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall remain in the pipe for 24 hours. Disinfection shall be repeated until a minimum chlorine residual of 25 PPM is measured after 24 hours. Once a chlorine residual of 25 PPM is obtained after 24 hours, the water main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 PPM.

C. Following disinfection of the line, bacteriological samples shall be collected and analyzed in accordance with the requirements of Kentucky Department of Natural Resources and Environmental Protection, 401 KAR 8:150. When the samples have been tested and reported safe from contamination, the water line may be connected to the system. The Contractor shall provide to OWNER written documentation that the water sample passed the bacteriological test and is safe.

D. Bacteriological samples shall be taken in the following manner. A sample shall be taken in the newly-constructed line at each of the following points:

1) Within 1,200 feet downstream of each connection point between the existing and new lines;
2) One (1) mile intervals; and
3) Each dead end, without omitting any branch.

E. All sampling shall be taken in the presence of the Engineer or his representative.. All bacteriological sampling and testing shall be paid for by the Contractor and included in the unit price for the bid item "water main".

3.17 DECHLORINATING OF HEAVILY CHLORINATED WATER

A. Dechlorination of heavily chlorinated water shall be in accordance with AWWA C651 and shall be accomplished using sodium bisulfite, sodium thiosulfate, sodium sulfite, or calcium thiosulfate solution of a concentration sufficient to remove all chlorine to a level not to exceed 0.019 mg/l. The solution shall be applied by a metering pump directly into the chlorinated water flow stream by injection into a discharge line or into the free discharge from a hydrant. The treated water may then be conveyed to the nearest sanitary sewer, storm sewer, or local stream.

B. The feed rate (gpm) of solution shall be governed by the chlorine (ppm) concentration of the water to be dechlorinated and the rate (gpm) at which it can be discharged. Constant monitoring of the chlorine residual concentration shall be made using the colorimetric method to ensure the optimum solution feed rate.

a. Feed System

C. The dechlorinating agent shall be fed from prepared carboys utilizing a metering pump equipped with a suitable meter and valve to adjust/monitor the feed rate.

3.18 PLACEMENT OF TRACING WIRE

Detectable underground copper tracing wire shall be installed with all utility lines. Insulated copper trace wire shall be attached to the top of the pipe with adhesive tape or other suitable devices. At each hydrant, valve, and end of new pipe installation, the trace wire shall be daylighted and the ends connected together with split bolt connectors covered with waterproof tape or wrap. For long runs of pipe, the maximum unbroken length of the trace wire shall be 2500 feet. Underground splicing shall be made using brass split bolt electrical connectors. The trace wire shall be #12 AWG THWN copper.

3.19 PLACEMENT OF IDENTIFICATION TAPE

A. The placement of detectable underground marking tape shall be installed over all utility lines. Care shall be taken to insure that the buried marking tape is not broken when installed. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURE.

B. The identification tape shall bear the printed identification of the utility line below it, such as "CAUTION - BURIED WATER LINE BELOW". Tape shall be reverse printed, surface printing will not be acceptable. The tape shall be visible in all types and colors of soil and provide maximum color contrast to the soil. The tape shall meet the APWA color code, and shall be two (2) inches in width. Colors are: yellow - gas, green - sewer, red - electric, blue - water, orange - telephone, brown - force main.

C. The tape shall be the last equipment installed in the ditch so as to be first out. The tape shall be buried 4 - 6 inches below top of grade. After trench backfilling, the tape shall be placed in the backfill and allowed to settle into place with the backfill. The tape may be plowed in after final settlement, installed with a tool during the trench backfilling process, unrolled before final restoration or installed in any other way acceptable to the Owner or his agent or Engineer.

3.20 CLEAN-UP

Upon completion of the installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

3.21 CONNECTING TO THE WATER SYSTEM

Unless otherwise directed by the OWNER, the CONTRACTOR shall connect the new water main to the existing water system. The CONTRACTOR shall notify the OWNER when the connection is to be made so that representatives of the OWNER may operate existing valves and witness the connection. A minimum notice of at least 24 hours in advance of the connection shall be given to the UTILITY. The Contractor shall coordinate all connections and other work which require disruption of water service so as to minimize the amount of time the affected water lines are out of service.

- END OF SECTION -

SECTION 02601

**HORIZONTAL DIRECTIONAL DRILLING (HDD)
INSTALLATION OF DUCTILE IRON PIPE**

PART 1 - GENERAL

1.01 SCOPE

A. This section is applicable to the installation of Flex-Ring® or approved equal, flexible restrained joint ductile iron pipe, in sizes 4-in. through 48-in. manufactured per ANSI/AWWA C151/A21.51, using horizontal directional drilling (HDD). It includes minimum requirements for design, materials, and equipment used for the horizontal directional drilling installation of ductile iron pipes and joints for the substantially trenchless construction of pipelines or portions of pipelines.

B. This section also include materials, dimensions, and other pertinent properties of pipes and required accessories. They provide several minimum performance requirements for various components including joints.

3.2 REFERENCE

A. The following standards contain provisions that, through reference in this section, constitute provisions of these specifications. All standards are subject to revision and the most recent editions of the standards indicated below shall apply.

3.2 ANSI/AWWA C150/A21.50 -- American National Standard for the Thickness Design of Ductile-Iron Pipe
3.3 ANSI/AWWA C151/A21.51 -- American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water
3.4 ANSI/AWWA C111/A21.11 -- American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
3.5 ANSI/AWWA C104/A21.4 -- American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
3.6 ASTM A746 - Ductile Iron Gravity Sewer Pipe
3.7 ASTM A716 – Standard Specification for Ductile Iron Culvert Pipe
3.8 ANSI/AWWA C105/A21.5 -- American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
3.9 ANSI/AWWA C110/A21.10 -- American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
3.10 ANSI/AWWA C153/A21.53 -- American National Standard for Ductile-Iron Compact Fittings 3-inch through 24-inch and 54-inch through 64-inch, for Water Service
3.11 ANSI/AWWA C600 -- AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances

PART 2 - PRODUCTS

3.2 SUBMITTALS

The Contractor or sub-contractor must submit the following information as described in the sections below for review by the Engineer 30 days prior to mobilizing to the project site for the work involving the

installation of the ductile iron pipe by the horizontal directional drilling method.

A. General: Prior to the start of drilling, reaming, and pipe placement operations, the Contractor shall properly locate and identify all existing utilities in proximity to the pipeline alignment. The Contractor shall confirm the alignment of all critical utilities, by pot-holing/day-lighting using vacuum excavation or other suitable excavation method, for further detailed confirmations as necessary.

B. Equipment: Provide the description of the using horizontal directional drilling (HDD) equipment proposed for use on the project including the thrust and torque capacities.

C. Operator Experience: Provide project references for the operator and project manager or supervisor that they were directly involved in completing. This reference list shall include the projects description, location, owner and contact information, quantity, size and type of pipe installed by using horizontal directional drilling.

D. Drilling Plan: The drilling plan shall provide a detail of the planned drilled borepath and the method for monitoring and controlling the speed, line, grade, and rate of fluids delivery. It shall include the sequence, size and description of each reamer and the capabilities of each through various geologic formations. The Contractor or HDD sub-contractor must maintain the alignment and minimum radii as detailed on the plan sheets. Any drill plan should include a final swabbing of the borepath prior to pipe pullback. Unless approved by the Engineer prior to the start of drilling operations, pipe pullback of the new Flex-Ring® joint pipe without prior swabbing of the borepath to the finished borepath inside diameter will not be permitted.

E. Estimated Pullback Thrust: The Contractor shall submit to the Engineer an estimate of the anticipated pullback thrust that will be required to install the new Flex-Ring® pipe. This estimate shall include the calculated buoyant force or buoyant weight of the new pipe and any proposed method for counter-weighting the pipe during pullback.

F. Drilling Fluids Management: A fluids management plan shall be submitted to the Engineer for review. This plan shall include the proposed mix design for each specific geological strata or formation anticipated during drilling of the borepath, an estimate of quantities, delivery volume and pressure for each and the proposed method for monitoring. This plan shall also include details of the drilling fluid / soil slurry solids separation, recycling or disposal plan that will describe the equipment and capacities for separation and recirculation. If direct vacuum excavation of the slurry is selected the disposal site shall be identified and copies of all required permits shall be presented to the Engineer for approval. The Contractor shall submit a written plan that details the estimated quantity of slurry to be vacuum excavated and provide substantiation that there is sufficient equipment to adequately pump or shuttle the slurry to and from the disposal site(s) as required to maintain a near continuous drilling and pipe pull-back.

G. Inadvertent surface discharge of drilling fluid (Frac-out): The CONTRACTOR shall submit to the Engineer a plan for a quick response team to address inadvertent fluid discharges to the surface (frac-outs).

H. Equipment and Expertise: The Contractor shall have equipment and expertise, appropriate for horizontal directional drilling installations of the size and scope of the project covered by this specification. This includes the preparation and maintenance of the borepath using drilling fluids appropriate for the geology of the soils. The Contractor shall also have experience in safely and dependably installing, in similar geology, similar size and length of piping involved.

I. Safety Plan: The Contractor shall be responsible for securing a safe worksite that meets all Federal, State, and Local government codes.

3.3 DUCTILE IRON PIPE FOR HDD

A. General: Ductile iron pipe used for directional drilling shall meet all requirements of ANSI/AWWA C151/ A21.51. Unless otherwise specified pipe shall be lined with cement mortar per ANSI/AWWA C104/ A21.4, with all operations completed in a single facility by a one manufacturer. Pipe shall be AMERICAN Flex-Ring® or approved equal.

B. Pipe Joints: Joints used for directional drilling shall be boltless, flexible restrained, with smooth contoured bells and shall have the minimum properties as shown in Table 1. Joints with bulky glands or flanges that may prevent the smooth flow of the drilling fluid/soil slurry over the joint are not acceptable. Pipe shall be AMERICAN Flex-Ring® or approved equal.

C. Pressure and Thrust (Pulling): Joint seals and Flex-Ring® joint pipe used for HDD, when properly assembled and installed, shall be capable of dependably handling the specified internal pressure and pulling loads, in straight alignment or at maximum rated joint deflection. Maximum internal pressure and allowable pulling loads for all sizes are provided in Table 02601-1.

D. Proof-of-Design Tests: The manufacturer shall make available to the Engineer representative proof-of-design tests for each size and type of flexible restrained joint pipe used. These tests shall establish the basis for the maximum allowable pulling loads shown in Table 02601-1. Proof-of-design tests for the pulling heads shall also be made available to the Engineer.

F. External Loads and Buckling: In cases where the borepath alignment is at an extreme depth or if the Contractor anticipates high pumping pressures particularly for larger sizes of pipes, the Contractor shall consult the pipe Manufacturer to assure that the buckling strength of the pipe has been properly evaluated.

G. Lining and Coating: Ductile iron pipe for water service shall be lined with cement mortar per ANSI/AWWA C104/A21.4. Ductile iron pipe for wastewater service and for application as culvert pipes shall be lined with cement mortar per ANSI/AWWA C104/A21.4 unless otherwise specified. The exterior of all ductile iron pipe and fittings shall be coated with an asphalt-based coating as required by ANSI/AWWA C151/A21.51.

H. Special Linings (For wastewater applications): The interior of the ductile iron pipe shall be coated with 40 mils of Protecto 401® as manufactured by Induron Coatings. The applicator shall apply the coating to the interior of the pipe in strict accordance with the procedure approved by the coating manufacturer.

I. Pipe Weight – Net Unit Buoyancy: Pipe buoyant force or buoyant weight required in section 2.01, E shall be calculated based on the density of drilling fluid(s) to be used. Any counter-weight placed inside the pipe shall be free from any dirt, grease, oil, or other contaminants that may prevent proper disinfection for waterlines.

J. Entry and Exit Angles: The entry angle of the drill string shall range from 8 degrees to 20 degrees. Exit angles for the drill string shall take into consideration the allowable deflection (reference Table 02601-1) and the method of installation proposed for the new Flex-Ring®, flexible restrained joint ductile iron pipe. The Contractor shall submit a detailed plan showing the connection between the HDD installed piping and the next section of pipeline

K. Minimum Radius of Curvature: The Contractor shall maintain the borepath alignment and radii that are indicated on the project drawings. Any alternate designs must be submitted to the Engineer for approval prior to commencement of drilling operations, and shall be based on a range from 50-feet to 100-feet per inch of nominal diameter, using 20-foot joint lengths.

L. Borepath Inside Diameter: The finished inside diameter of the borepath shall be nominally 1.5 times the outside diameter of the Flex-Ring bell (see Table 02601-1) for pipe sizes 4-inch through 24-inch. The inside diameter of the borepath for pipe sizes 30-inch through 48-inch shall be equal to the outside diameter of the Flex-Ring bell (see Table 02601-1) plus 12-inches. To assure proper borepath size and integrity, the borepath shall be swabbed prior to final pipe pullback.

Table 02601-1
Flex-Ring Dimensions and Other Parameters

Nominal Pipe Size (in.)	Maximum Working Pressure (psi) (1)	Pipe Barrel O.D. (in.)	Pipe Bell Outside Diameter (in.)	Unit Weight Lined CL 350 DIP (lb/ft)	Bulk Density of Empty Pipe (lb/ft3)	Net Unit Buoyancy, Empty Pipe in Water (lb/ft)	Allowable Pulling Loads (lbs)	Allowable Deflection (Deg.)
4	350	4.80	7.06	13	100	Minus 5	10,000	5
6	350	6.90	9.19	18	69	Minus 2	20,000	5
8	350	9.05	11.33	25	55	3	30,000	5
10	350	11.10	13.56	31	46	11	45,000	5
12	350	13.20	15.74	40	42	19	60,000	5
14	350	15.30	19.31	53	41	27	75,000	4
16	350	17.40	21.43	65	40	38	95,000	3.75
18	350	19.50	23.70	78	37	52	120,000	3.75
20	350	21.60	25.82	90	35	69	150,000	3.5
24	350	25.80	29.88	122	34	104	210,000	3
30	250	32.00	36.34	173	31	175	220,000	2.5
36	250	38.30	42.86	233	29	266	310,000	2
42	250	44.50	49.92	315	29	359	390,000	2
48	250	50.80	56.36	395	28	484	500,000	2

(1) Working pressure is the maximum pressure rating of the joint and is based on its capability to resist thrust due to internal pressure. If higher working pressure is required, check AMERICAN. Pressure rating of the joint is limited by the pressure rating of the parent pipe.

(2) Based on weight of empty (full of air) Pressure Class 350 Flex-Ring pipe with standard cement lining immersed in water. Positive numbers indicate such pipe will float.

M. External Protection (If required or as indicated on the drawings) - Polyethylene Encasement: Polyethylene (PE) encasement shall be applied by the Contractor according to the following procedure. Using only tube-type polyethylene sleeves, the polyethylene tube shall be centered onto the barrel of the pipe and firmly secured as per the requirements of AWWA C105, Method A and other requirements as described herein. The contractor shall insure that all excess material along the barrel of the pipe is creased and the excess folded over itself longitudinally so that the polyethylene wrap is tight up against the pipe barrel. The Contractor shall then secure the wrap tightly to the pipe by applying circumferential wraps of tape applied over the folded polyethylene encasement, and applied at intervals of approximately 2-ft to within 18 to 24-inches of either end of the pipe. Applying tape in a helical pattern should only be used as a supplementary wrap

The excess PE encasement shall be pulled back over itself to expose approximately 18” to 24” of both end of the pipe. The Contractor must first overlap the PE encasement so that this first layer can be securely

anchored to the pipe barrel, without interference from the PE encasement on that pipe section, using tape. The excess material should be trimmed, or the length and/or positioning of the PE tube may need adjustment to accomplish this.

After engaging the spigot into the bell and verifying engagement of the restraining flex-ring or flex-ring segments, the following sequence is recommended for securing and completing the PE encasement at the pipe joints. This sequence should be followed so that the final overlap is made opposite to the direction of the pull, preventing any catching of the edge and minimizing any collection of drilling fluids etc. inside the wrap. For each layer of PE encasement the Contractor shall always complete the joint by first overlapping the end of the tube from the spigot end over the bell and secure the end of the tube onto the pipe barrel with several contiguous circumferential wraps of tape. It is important to assure that the PE encasement is secured to the pipe barrel with sufficient number of circumferential wraps to anchor the PE encasement so that any possibility of slippage is reduced. The PE encasement from the pipe closest to the HDD drilling machine (bell end of pipe) shall then be overlapped over its' bell and secured to the barrel on the spigot end of the pipe being installed with circumferential wraps of tape. When double PE encasement is specified the same procedure is repeated, with the final overlap being secured to the barrel on the spigot end of the pipe with circumferential wraps of tape.

In the case of double polyethylene wrapping, each layer shall be applied in the same manner with the exception that the excess PE encasement should be folded over itself in such a way as to avoid the excess in the first layer. Also, all bell over-laps (and fastening to the pipe barrel etc.) should be accomplished one layer at a time.

The Contractor should apply one final, tight circumferential wrap a few inches from the bell face on the last polyethylene wrap overlap over the most recently assembled spigot end. This final wrap should consist of strong strapping tape or other firm fastening means (that will not damage the wrap and) that will further minimize any slippage or bunching of the wrap in installation. The Contractor must have any other proposed methods of installing and fastening PE encasement approved by the Engineer.

N. Joint Bonding (If required or as indicated on the drawings): The Contractor shall provide electrical continuity for each joint using the number and size insulated AWG copper wire bonding cable given in Table 02601-2. Each wire bonding cable shall have approximately 1.5 to 2-inches of the insulation removed from one end with the opposite end prepared with a crimped-on electrical terminal suitable for connection to a tapped pipe with a ¼-inch bolt. In all cases the Contractor shall apply the bonding cables in the field prior to the pipe pull back using the following procedure and as modified by the Corrosion Engineer.

Table No. 02601-2
Joint Bonding

Pipe Size (Inches)	AWG Wire Gauge	No. Bonding Cables
4 through 14	8	2
16 through 36	4	2
42 through 48	2	2

1. Spigot End - at the "Field-Top" position and at a distance not to exceed 4-inches from the assembly stripe painted on the spigot end of the pipe, the bare end of the copper wire shall be CAD-welded to the pipe barrel. The CAD welds and any exposed wire shall be coated using an aerosol primer and then covered with mastic filled Handi-Cap as manufactured by Royston or

approved equal.

2. Bell End – at the "Field-Top" position the vertical face of the bell shall be drilled and tapped, to a depth of 5/8-inch, to accept a ¼-inch NC-Thread x 0.5-inch NC-Thread bolt for the number of copper wire bonding cables shown in Table 2.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Cartridge Assembly (Option 1): Cartridge assembly option shall be defined by the assembling of individual sections of Flex-Ring®, flexible restrained joint ductile iron pipe in a secured entry and assembly pit. The pipe sections are assembled individually and then progressively pulled into the borepath a distance equivalent to a single pipe section. This assembly-pull process is repeated for each pipe length until the entire line is pulled through the borepath to the exit point. At all times prior to the pipe entering the bore path the Contractor shall monitor the pipe to assure that the allowable joint deflection, as shown in Table 02601-1, is not exceeded. When polyethylene encasement is required the Contractor shall repair any damage to the wrap prior to the pipe section entering the borepath.

B. Assembled-Line (Option 2): Assembled-line option shall be defined by the pre-assembly of multiple pieces of Flex-Ring®, flexible restrained joint ductile iron pipe, with subsequent pulling installation into the borepath as one continuous pipe string. With this option the Contractor shall provide an entry ramp to the entrance of the borepath. The ramp should be of sufficient length and grade such that no pipe joint exceeds the allowable joint deflection as shown in Table 02601-1, at any point prior to the pipe string entering the properly designed and prepared borepath. The Contractor shall be responsible for providing the necessary equipment or ground surface preparation to allow the pipe to be pulled back along the surface prior to the entry ramp and borepath. If polyethylene encasement is required, the contractor shall provide a sufficient number of pipe rollers such that the pipe is supported every 20-feet for the entire length of the assembled pipe length. At all times prior to the pipe entering the bore path the Contractor shall monitor the pipe to assure that the allowable joint deflection, as shown in Table 02601-1, is not exceeded. When polyethylene encasement is required the Contractor shall repair any damage to the wrap prior to the pipe section entering the borepath.

3.2 BASIC ASSEMBLY/PULLING METHODS

Pulling Head Assemblies: Pulling head assembly for ductile iron pipe shall be designed and furnished by American Ductile Iron Pipe. The pulling bell shall be a boltless, glandless, flexible restrained joint that will allow for the smooth flow of the drilling fluid/soil slurry over the joint and must also have the same performance characteristics as the pipe to which it is connecting. They shall also be fabricated with filling/testing ports, of appropriate size, for testing of the pipe after it is pulled through the borepath. For pipe that is installed using the Assembled Line method the pulling bell may also be used to test the pipe prior to pull back.

3.3 JOINT ASSEMBLY

Joint Assembly: The Contractor shall be responsible for the proper assembly of all pipe and appurtenances in accordance with the Manufacturers written procedure and as supplemented by these guidelines. Prior to joint assembly all joints and joint components shall be thoroughly cleaned and examined to assure proper assembly and performance. In the event that the Contractor is not experienced with the

assembly of the type of flexible restrained joint being used, it shall be the responsibility of the Contractor to contact a factory-trained representative for recommendations on the proper and efficient installation of the joint.

3.4 TESTING

Testing: The contractor shall be responsible for hydrostatically testing the installed pipeline per the requirements of Section 02600, 3.13 - TESTING OF WATER MAINS and 3.14 - LEAKAGE TEST. An air test is not a substitute for, nor is it intended to replace a properly specified and accomplished hydrostatic test after complete installation.

- END OF SECTION -

SECTION 02626

CUSTOMER METER SERVICE AND SERVICE TUBING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes service pipelines constructed of seamless copper tube as shown on the Contract Drawings, complete with fittings and accessories.

B. Certain features of copper tubing shall be as scheduled.

C. The Contractor shall furnish all labor, tools, equipment, and materials necessary to complete the meter service connections as shown on the Contract Drawings and herein specified.

1.02 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)
2. American Water Works Association (AWWA)

1.03 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:

1. Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the referenced standards and this specification.

2. Layout drawings showing the location of copper tube including details of the support system, sleeves, unions and appurtenances.

PART 2 PRODUCTS

2.01 SERVICE CLAMPS

All service connections of all sizes shall be made through the use of service clamps or saddles. Service saddles shall have ductile iron body, double strapped with O-ring resilient gasket, suitable for use on ductile iron pipe or PVC pipe, and tapped with same threads as the corporation stops. Saddles for all mains shall be double strap type saddles and have a maximum working pressure of 350 psi *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURE.

2.02 CORPORATION STOPS

Corporation stops for use in service clamps shall be equal for 3/4", 1" and 2" service tubing and have a maximum working pressure of 300 psi. Corporation stops shall have iron pipe threads with compression coupling connection for copper tubing outlets. A rigid stainless steel insert stiffener shall be used inside the PE tubing, when encountered. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURE.

2.03 SERVICE TUBING 3/4", 1" AND 2" POLYETHYLENE TUBING (CTS SERVICE TUBING)

A. Pipe shall be made from virgin, ultra-high molecular weight polyethylene resin meeting the requirements of Type III, Class C, Category P34 polyethylene as defined by ASTM D-1248, latest revision, "Polyethylene Plastics Molding and Extrusion Materials".

B. Dimensions and tolerances shall meet the values as listed in AWWA C-901, latest revision, "Polyethylene (PE) Pressure Pipe Tubing and Fittings". Standard dimension ratio shall be DR-7.3 (OD base), Pressure Class 200 psi.

C. Pipe shall be rated for use with water at 73.4 degrees F. at a hydrostatic design stress of 630 psi and a maximum working pressure of 200 psi. The pipe shall sustain a water pressure as defined in ASTM D 1598 for 1000 hours with water at 73.4 degrees F.

D. Surface shall be homogeneous inside and out and completely free of irregularity. Random testing shall be performed at intervals during all production runs to assure uniformity in all respects. The tubing shall carry the National Sanitation Foundation seal of approval for drinking water.

E. Pipe shall be marked in lettering at intervals of not more than five (5) feet and such marking shall include nominal size; manufacturer's name or trademark; pressure rating for water at 73.4 degrees F., 200 psi; applicable ASTM specification,; ASTM material specification, PE 3406; standard dimension ratio, DR-7.3; the National Sanitation Foundation Seal of Approval (NSF mark) and production code.

F. Pipe shall be guaranteed in writing against rot, corrosion and defects for 50 years from date of installation, with pipe replacement and labor cost warranted in writing for 25 years from date of installation.

2.04 COPPER SERVICE TUBING

A. Buried, Exterior - Copper Pipe: Type K hard drawn copper per ASTM B-88. Fittings: Wrought copper or cast brass. Joints: Lead free, tin-silver solder.

B. Buried, Below Slab: Copper Pipe, 2" and Smaller: Type K soft drawn copper per ASTM B-88. Fittings and joints shall not be permitted below slab.

C. Buried: Copper Pipe, 2" and Smaller: Type K soft drawn copper per ASTM B-88. Fittings and joints shall not be permitted in the service tubing.

D. All solder joints shall be soldered with an approved, lead free tin-silver solder. Acid core solder shall not be used.

E. Copper tube shall be as specified herein unless otherwise shown on the Contract Drawings or in the pipe schedule.

F. Copper tube shall conform to the following standards:

ASTM

Seamless Copper Water Tube	B88
Copper Drainage Tube (DWV)	B306
Seamless Copper Tube, Bright Annealed	B68

1. Seamless copper water tube shall be used for hot and cold water and compressed air.

   a. Type K where installed in concrete, underground or when immersed in liquids.

   b. Type L where exposed and in concealed locations inside structures.

   c. Soft temper when installed in concrete or underground.

   d. Hard temper when installed in exposed and concealed locations.

2. Copper drainage tube will be permitted only for sanitary waste, drain and vent piping above ground and inside structures.

3. Bright annealed seamless copper tube shall be used for liquid fuel and refrigerant and all small (3/8 inch and smaller) tubing unless otherwise specified.

G. Wall thickness shall be at least equal to Type K seamless copper water tube unless heavier walls are specified.

2.05 METER SETTING EQUIPMENT

A. Meters shall be placed inside meter boxes using coppersetters with 3/4" or 1" saddle nut connection for the meter. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURE. All coppersetters shall have a ball angle meter valve (lockable) stop at the meter inlet and dual check valve on the outlet. Coppersetters shall be 12 inches in height with connections for the appropriate service tubing and have a maximum working pressure of 300 psi.

B. For larger meters (1-1/2" and 2") the meters shall be installed with ball meter valves on inlet side and the meter outlet side. Meters shall be placed on concrete block or equivalent support inside the meter box.

C. For individual meter with pressure reducing valves or more than one meter the coppersetters shall be the Tandem type coppersetters as manufactured by Ford, Mueller or Engineer approved equal and 12 inches in height and placed in meter boxes with 18" I.D.

D. A rigid stainless steel insert stiffener shall be used inside the PE tubing at all connections to the coppersetters.

2.06 SERVICE METERS

The service meter main body shall be of high grade bronze, with hinges, single lid cover and raised characters cast on the body indicating the direction of flow. Meter shall have a working pressure rating of 150 psi. The register shall be straight reading gallon type. The register unit shall be hermetically sealed, and driven by permanent magnets. The register shall have a center sweep hand and a test circle shall be divided into 100 equal parts and include a flow finder. The register shall carry a minimum 10-year warranty.

The meters shall be “BADGER ORION” radio read equipment with data profiling feature. Model 25 for 3/4-inch services, Model 70 for 1-inch services and Model 170 for 2" services. Meter shall include Data

Profiling Feature. The entire unit is to be pre-assembled in a workmanlike manner with all components fitted snugly into the box and fastened to prevent movement. All joints shall be sealed with Teflon tape. The inlet and outlet is to be equipped with compression couplings.

2.07 METER BOXES

Meter boxes shall be plastic or "Ultra-Rib" circular with dimension as shown on the Drawings. The meter box cover where installation is to be in roadways or sidewalks and shall have heavy duty lid for light vehicular traffic. The meter box where installation is to be roadways or sidewalks shall be of concrete construction for vehicular traffic. The meter box, cover and meter setting shall be constructed as shown on the drawings or as directed by the Owner or Engineer. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURE.

2.08 ACCESSORIES

A. Fittings and Couplings

1. Fittings for copper tube shall be wrought copper or cast bronze for soldered joints and brass for flared joints.

2. Flexible couplings as shown or required for copper tube shall be flexible metal hose couplings.

B. Joints

1. Joints for seamless copper water tube to be installed in concrete and underground shall be flared type and shall have threads in accordance with AWWA C 800.

2. Joints for seamless copper water tube and copper drainage tube installed exposed and inside structures shall be soldered.

a. Solder and flux used in joints of water lines, shall contain no more than 0.2% lead.

b. Solder shall be Tin-Silver or approved equal.

c. Solder flux shall be as recommended by the solder manufacturer.

3. Joints for bright annealed seamless copper tube used in liquid fuel lines shall have flared joints, approved by Underwriter's Laboratories.

4. Joints for small tubing (3/8 inch and smaller) shall be of the locking type compression fittings or soldered as shown in the piping schedule and as directed.

PART 3 - EXECUTION

3.01 INSTALLATION OF METER SERVICES

All customer meter services shall be installed as shown on the Contract Drawings and shall be set near the property owner's property line and outside of the highway right-of-way. The Owner reserves the right to change the location of the meter services prior to installation for ease of daily operation of the system and reading the individual meters. Existing customer services must be connected on customer side of meter.

3.02 INSTALLATION OF SERVICE TUBING

A. All service tubing installed beneath bituminous or concrete roads shall be jacked under the roads. When State maintained roads are being jacked and rock is encountered, permission to open cut the road shall be obtained by the Contractor from the Department of Transportation's District Permit Engineer. If permission is refused, the Contractor shall attempt to jack at another location and shall continue to do so until a successful crossing is obtained.

B. Minimum cover for all service lines shall be 36 inches (at all locations) when within the proposed and existing highway right-of-way and construction easements. Additional cover may be required at proposed drainage ditch, storm sewer, or other noted locations.

3.03 BACKFILLING SERVICE TUBING

When service tubing is laid in an open cut across a road of any type surface (crushed stone, bituminous or concrete), the backfill shall consist of Class II granular material (dense graded aggregate) and shall be placed full depth. Payment for Class II material used will not be paid as a separate pay item, but will be included in the price for installing the service tubing.

3.04 INSTALLATION OF COPPER TUBING

A. Install copper tubing, fittings, specials, and accessories in accordance with the applicable configuration shown on the Contract Drawings and the provisions of the Sections entitled "Trenching, Backfilling and Compacting" and "Pipeline Installation".

B. Exposed copper tube shall be carefully erected and neatly arranged.

1. Copper tube shall be run parallel with walls inside structures and shall be pitched to drain.

2. Drain valves shall be installed at the low points of liquid filled systems.

3. Valved fill connections shall be provided for closed systems.

C. Copper tube installed for a compressed air or gas system shall be pitched in the direction of flow.

1. Connections shall be at the top of the main.

2. Low points of the system shall have drip pipes not less than 12 inches long and drain pet-cocks unless automatic moisture traps are shown.

D. Unions shall be provided on copper tube systems with soldered joints.

1. Unions shall be located at control valves, solenoid valves, moisture and steam traps, other items of connected equipment and as shown on Contract Drawings.

2. Unions shall be of cast bronze or brass construction.

3. Dielectric unions shall be used when connecting copper tube to ferrous metals.

E. Copper tubing shall be supported and anchored in place by the use of copper or brass units spaced not greater than 10 feet on center and each side of each change of direction.

3.05 FIELD TESTING AND CHLORINATION

A. Perform hydrostatic and leakage tests in accordance with the applicable provisions of the Section entitled "Leakage Tests", at the test pressure specified or scheduled.

B. Disinfect piping and appurtenances in accordance with the Section entitled "Chlorination", where specified or scheduled.

-END OF SECTION-

SECTION 02630

TAPPED CONNECTIONS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes tapping and installing of corporation stops and valves on existing or newly installed pipes without interruption of service, as shown on the Contract Drawings, complete with connections and accessories.

B. Installing of curb stops and boxes where specified or directed.

1.02 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American Water Works Association (AWWA)

1.03 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:

1. Detail drawings for each size corporation stop, curb stop, tapping sleeve and valve, and service box.

PART 2 PRODUCTS

2.01 CORPORATION STOPS

A. Corporation stops shall be threaded to conform to AWWA C800 with standard corporation stop thread at the inlet. The outlet shall be fitted with coupling nut for flared tube service unless otherwise specified.

SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.

2.02 CURB STOPS

A. Curb stops shall be threaded to conform to AWWA C 800 with coupling nuts for flared tube service.

1. ¾-inch shall be of the inverted new type.

2. 1-inch to 2-inch shall be of the plug-type with "O" ring seals to withstand a minimum working pressure of 175 psi.

3. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURE.

2.03 SERVICE CLAMPS

A. Service clamps shall be designed for use on the type of pipe to which the connection is being made.

1. Ductile iron and asbestos-cement service clamps shall be the double strap type with neoprene gaskets.

2. Polyvinyl chloride pipe service clamps shall be of a full circle design with a minimum width of 2 inches.

3. Prestressed concrete pipe service clamps shall be made by or approved for use by the pipe manufacturer.

4. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURE.

2.04 SERVICE BOXES

A. Service boxes shall be constructed of cast iron and sized for the curb stop upon which it is being installed.

1. Stationary shut-off rod shall be provided unless otherwise specified.

2. Boxes shall be telescopic with a minimum of 1-foot adjustment.

3. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURE.

2.05 TAPPING SLEEVES AND VALVES

A. Tapping sleeves and valves shall be used for connections larger than 2 inches.

1. Tapping sleeves shall be designed and sized in accordance with the recommendations of the manufacturer.

2. Working pressure shall be 200 psi unless higher pressures are scheduled.

3. The seal of the tapping sleeve shall be mechanical joint or low lead 2.5% or less. Low lead as conforming to current regulations.

4. Valves for tapping sleeves shall be designed for the intended service and shall conform to the requirements of the Section entitled "Valves".

5. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURE.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install connections and accessories under the direction of personnel who have performed at least ten similar connections in accordance with the configuration shown on the Contract Drawings and the applicable provisions of the referenced Standards.

1. Threaded taps shall be made using a machine designed for cutting, threading and inserting the corporation without interruption of service.

a. Teflon tape may be used on corporation threads.

2. Tapping sleeve connections shall be made using a machine to cut and remove the segment through the valve without interruption of service.

B. Service boxes shall be set plumb and shall be independently supported on two bricks so no weight will be transmitted to the curb stop or carrier pipe.

C. Service clamps and tapping sleeves installed on prestressed concrete pipe shall be encased in a minimum of 2 inches of concrete mortar after installation.

-END OF SECTION-

SECTION 02640

VALVES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install valves and miscellaneous piping appurtenances, as indicated on the Drawings and as herein specified.

B. The Drawings and Specifications direct attention to certain features of the equipment, but do not purport to cover all the details of their design. The equipment furnished shall be designed and constructed equal to the high quality equipment manufactured by such firms as are mentioned hereinafter, or as permitted by the Engineer. The Contractor shall furnish and install the equipment complete in all details and ready for operation.

C. Electrical work and equipment specified herein shall conform to the requirements of the applicable electrical sections.

D. Enclosures shall be of a suitable type for the atmospheres in which they are installed.

E. Sizes and capacities not specified herein are indicated on the Drawings.

F. Valves required within pre-engineered pump stations are not covered by this specification section.

PART 2 – PRODUCTS

2.01 BUTTERFLY VALVES

A. Butterfly valves and operators shall conform to the AWWA Standard Specifications for rubber seated butterfly valves, Designation C504, Class 150, except as hereinafter specified. Valves shall have a minimum 150 psi pressure rating.

B. All butterfly valves shall be of cast iron body per ASTM A-126, Class B. Valve discs shall be of ductile iron per ASTM A-536 and provide uninterrupted 360 degree seating edge. Permanently self-lubricating body bushings shall be provided and shall be sized to withstand bearing loads. Valve shafts shall be Type 304 stainless steel with V-type packing. O-ring seals are not acceptable.

C. Valve seats shall be full resilient seats of Buna - N or Hycar and retained in the body or on the disc edge. If the resilient seat is in the body, the disc shall conform to ASTM A-436 Type 1 (Ni-Resist) or gray/ductile iron with corrosion resistant seating surface. If the resilient seat is mounted on the disc edge, it shall be securely attached with Type 304 stainless steel retaining ring or pins. The disc seating edge shall be Type 316 stainless steel.

D. Valve operators shall be electric actuators as specified elsewhere in the specifications. The valve shaft and actuators shall be designed for both torsional and shearing stresses when the valve is operated under its greatest torque.

E. All valves shall conform with the latest revision of AWWA Standard for Butterfly Valves for Ordinary Water Service, AWWA C504. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

2.02 GATE VALVES AND BOXES

A. All gate valves shall be of the resilient seat wedge, iron body, non-rising stem, fully bronze mounted with O-ring seals. Valves shall be of standard manufacture and of the highest quality both as to materials and workmanship and shall conform to the latest revisions of AWWA Specification C-500. Valves shall have a rated working pressure of 250 psi.

B. Gate valves for buried service shall be furnished with mechanical joint end connections, unless otherwise shown on the plans or specified herein. The end connections shall be suitable to receive ductile iron or PVC pipe.

C. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working pressure cast on the body of the valve.

D. Buried service gate valves shall be provided with a 2" square operating nut and shall be opened by turning to the left (counterclockwise).

E. Buried service gate valves shall be installed in a vertical position with valve box as detailed on the plans. They shall be set vertically and properly adjusted so that the cover will be in the same plane as the finished surface of the ground or street. All underground gate valves which have nuts deeper than 36 inches below the valve box top shall have extended stems with nuts located within one foot of the valve box cap.

F. Valve boxes shall be cast iron, two-piece, screw type (as shown on the drawings) with drop-cover marked "Water". They shall be set vertically and properly adjusted so that the cover will be in the same plane as the finished surface of the ground or street. A concrete pad shall be placed around the valve box cover as shown on the drawings.

G. The Contractor shall furnish two (2) T-operating wrenches in the lengths necessary to operate the buried gate valves for an operator of average height in a normal working position.

H. Gate valves for installation in building, drywells, pits or vaults shall be flanged ANSI B16.1, Class 125 with handwheel operator, non-rising stem or OS&Y as indicated on the drawings.

I. Gate valves installed with tapping sleeves shall have a mechanical joint outlet and a flanged joint connection to the sleeves.

J. All valves shall conform with the latest revision of AWWA Standard for Gate Valves for Ordinary Water Works Service, AWWA C500. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

K. All 24” or larger gate valves shall be supplied with spur gearing and grease case.

L. All gate valves shall receive at two part thermosetting epoxy protective coating both inside and outside of the valve and shall be listed for use as with potable water by the Federal EPA. The epoxy coating shall meet or exceed ANSI/AWWA C550 Standard and ASTM D1763 Standard.

2.03 CONTROL VALVE

A. The control valve shall be a hydraulically operated, single diaphragm-actuated, solenoid controlled, globe pattern design. A 3-way solenoid pilot valve either applies upstream pressure to the upper control chamber to close the main valve or vents the upper control chamber to atmosphere allowing the main valve to open. The solenoid and a limit switch assembly on the main valve are electrically synchronized with the telemetry controls to allow the valve to open or close to fill the tank.

B. In the event of a power failure the valve will open immediately, regardless of the operational mode of the valve at the time of the power failure.

C. The main valve shall be a center guided diaphragm actuated globe valve design. The body and cover shall be ductile iron, ASTM A536, with stainless steel disc guide, seat and cover bearing. The internal and external surfaces of the valve body shall be fusion bonded coated. End connections shall meet the ANSI, or other internationally recognized standard required. The body shall have a replaceable non-threaded seat ring that is held in place by set screws which tighten into a body groove. This seat should be accessible and serviceable without removing the valve from the pipeline. The seat area shall have a flow opening with no stem guides, bearings or supporting ribs.

D. The electric solenoid valve shall be a 3-way solenoid with a manual override system to allow the valve to be operated manually should electrical power be unavailable. The solenoid and limit switch shall be properly rated for the intended service. Liquid to the pilot must be filtered and a cock valve must be provided to isolate the control loop.

F. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

2.04 DUAL DISK VALVE

A. Dual Disc Check Valves shall be suitable for pressures up to 250 psig water service. The check valve shall be of the dual disc, wafer style with torsion spring induced closure. The valves shall be provided for installation between ANSI B16.1 Class 125 iron flanges.

B. The body shall be of one piece construction incorporating a vulcanized synthetic seal. Seal design must allow for positive seating at both high and low pressures. This shall be achieved by a minimal seal contact at low pressure with progressively increased contact at higher pressures. The disc shall fully overlap the synthetic seal, preventing pressure indentations. Opening and closing of the valve must utilize a lift and

pivot action to prevent seal wear and ensure long seal life. The stop and pivot pins shall be stabilized by the use of synthetic spheres to prevent wear due to vibration during operating conditions.

C. The valve body shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. The disc shall be constructed of ASTM B584, Alloy C83600 (2"-12") cast bronze or ASTM B148, Alloy C95200 (14" and larger) cast aluminum bronze. The disc pins and stop pins shall be Type 316 stainless steel. The torsion spring shall be ASTM A313 Type 316 stainless steel up to 16 in. sizes and ASTM A313 Type 17- 7 PH on 18 in. and larger sizes. The seal shall be Buna - N per ASTM D2000-BG or Viton per D2000-CA.

D. End connections shall be full diameter threaded flanges.

E. The valves shall be hydrostatically tested at 1.5 times their rated cold working pressure. A seat closure test at the valve rating shall be conducted to demonstrate zero leakage. The manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.

F. The exterior of the valve shall be coated with a universal alkyd primer.

G. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

2.05 CHECK VALVES

A. The check valves shall be a swing check valve with flanged ends; outside lever and weight and function to prevent reverse flow. The valve shall be tight seating when closed and full ported when open. The hinged shaft shall be completely out of the water way employing a disc with a convex shape facing the normal flow. The valve shall be manufactured where the closing of the valve will not cause water hammer and minimize disc slam. The valve shall be capable of a tight seal at pressures above 5 psi.

B. The valve body shall be cast iron with a bronze seat ring. The valve disc shall be cast iron and suspended from a non-corrosive shaft. Valves shall be rated at a minimum working pressure of 175 psi.

C. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

2.06 TAPPING VALVES AND SLEEVES

A. Tapping valves and sleeves shall be installed in the locations shown the Contract Drawings. The valves shall be a resilient seat wedge, iron body, non-rising stem, gate valve with a mechanical joint outlet and a flanged joint connection to the sleeves. They shall be provided with a valve box, counterclockwise opening and installed as described in detail on the plans.

B. Tapping Sleeves: Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable-iron, split-sleeve type with flanged outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 200 psi. Bolts shall have hexagonal heads and nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 50 foot-pound.

C. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

D. Tapping valves shall be suitable for a maximum working pressure of 200 psi with 125 lb. flanges

2.07 CUSTOMER SERVICE PRESSURE REDUCING VALVE

A. The individual customer service pressure reducing valve shall be hydraulically operated, spring loaded, diaphragm type control regulator. The valve shall be held open by the force of the compression spring above the diaphragm and shall maintain a constant delivery pressure downstream without shock or water hammer. Adjustments shall be made by an adjusting screw on top of the valve. Setting shall be as shown on the plans. The valve shall have a cast brass or bronze body and cover per ASTM B-62, stainless steel seat (Stainless Steel 303) and adjustment ranges of 40 to 300 psi.

B. The individual pressure reducing valve shall be equipped with a built-in by-pass to prevent a closed system on the customer's side of the meter service.

C. All valves shall be preceded by a strainer provided by the valve manufacturer and have a maximum working pressure the same as the pressure reducing valve.

D. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

2.08 MAIN LINE PRESSURE REDUCING VALVE

A. The pressure reducing valve shall maintain a constant downstream pressure regardless of varying inlet pressure. This valve shall be a hydraulically operated, diaphragm actuated, globe pattern valve. It shall contain a resilient, synthetic rubber disc, having a rectangular cross section, contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. The diaphragm assembly containing a valve stem shall be fully guided at both ends by a bearing in the valve cover and integral bearing in the valve seat. This diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the vale, separating operating pressure from line pressure. The diaphragm shall consist of nylon fabric bonded with synthetic rubber and shall not be used as a seating surface. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the valve or pilot controls. All necessary repairs shall be possible without removing valve from the line.

B. The main valve body and cover shall be Cast Iron per ASTM A48, and the main valve trim shall be 303 stainless steel. The valve shall come equipped with a valve position indicator. The valve shall be equipped with a flow clean strainer, closing speed control, opening speed control and flow stabilizer. The valve shall be equipped with a V-port diaphragm plug for low flow conditions or approved equal by the Engineer.

C. The pilot control shall be a direct acting, adjustable, spring loaded, normally open, diaphragm valve, designed to permit flow when controlled pressure is less than the spring setting. The control system shall include a fixed orifice. The pilot control valve trim shall be 303 stainless steel.

D. The valve shall have a maximum working pressure rating as stated on the Drawings.

E. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

2.09 AIR RELEASE VALVE

A. The valve shall have a 1" screwed inlet diameter with a 1" corporation stop and a minimum of 3/32" size orifice. The body and cover shall be constructed of cast iron while the float shall be stainless steel. All internal parts, such as lever pins, retaining rings, screws, etc. shall be of stainless steel or bronze construction. Valves shall be suitable for use in lines with an operating pressure up to 175 psi. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

B. A service clamp shall be used to connect the air release valve to the water main. Service clamps and corporation stops shall be those as previously specified in Section 02650, except the corporation stops shall have a female IP thread outlet.

C. The air release valve box shall be a standard meter box with dimensions of 18" I.D. and a height of 36". The valve box cover shall be a standard water meter box cover.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Valves shall be installed as nearly as possible in the positions indicated on the Drawings consistent with conveniences of operating the handwheel or wrench. All valves shall be carefully erected and supported in their respective positions free from all distortion and strain on appurtenances during handling and installation.

B. All material shall be carefully inspected for defects in workmanship and material, all debris and foreign material cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness.

C. Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense.

D. Valves shall be set plumb and supported adequately in conformance with the instructions of the manufacturer. Valves mounted on the face of concrete shall be shimmed vertically and grouted in place. Valves in the control piping shall be installed so as to be easily accessible.

E. All buried valves require a concrete collar for stability. Collar shall be no less than 4'' thick and poured to flow water away from the valve. The concrete valve box protector ring is top be with copper locate pen.

3.02 INTERIOR PIPING INSTALLATION

A. It shall be the Contractor's responsibility to furnish a complete system of pipe supports, to provide expansion joints and to anchor all piping. The pipe support system shall be installed complete with all necessary inserts, bolts, nuts, rods, washers, miscellaneous steel, and other accessories.

B. In some instances, expansion joints have been shown on the drawings, but no attempt has been made to indicate every expansion joint for piping included under this portion of the specifications. Portions of the piping are shown on the detail drawings. Some of the piping, however, is shown only on the schematics.

C. Reaction Anchorage and Blocking: All piping exposed in interior locations and subject to internal pressure in which flexible connectors are used shall be blocked, anchored, or harnessed, as shown on the drawings, or as directed by the Engineer to preclude separation of joints.

3.03 PAINTING

Field painting is specified in elsewhere in these specifications.

- END OF SECTION -

SECTION 02645

HYDRANT ASSEMBLY

PART 1 - GENERAL

1.01 SCOPE

The Contractor shall furnish and install, where shown on the plans and additional locations as directed by the Owner, hydrant assemblies and blow-hydrants manufactured and equipped as described below.

PART 2 - PRODUCTS

2.01 FLUSHING HYDRANT ASSEMBLY

A. Hydrants shall conform in all respects to the requirements of AWWA C502. All hydrants shall have 6-inch mechanical joint shoe connection, two (2) 2-1/2" hose outlets, one (1) 4-1/2" pumper nozzle with caps. Connection threads and operation nuts shall conform to National Standard Specifications as adopted by National Board of Fire Underwriters. The hydrant shall be equipped with safety flanges designed to prevent barrel breakage when struck by a vehicle and an auxiliary gate valve.

B. Each hydrant shall be fully bronze mounted with the main valve having a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust or corrosion.

C. Operating stems shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stops shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.

D. Hydrants shall be designed for 250 psi working pressure and shop tested to 1250 psi pressure with main valve both opened and closed. Under test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet. Hydrants shall have a UL/FM approved rating.

E. Each hydrant shall be installed with an auxiliary shut-off valve and valve box; valve box cover shall be marked "WATER" as required. Hydrants shall be secured to the shut-off valve by AWWA approved restraint joints, rodding with four (4) equally spaced all thread rods and "Duc-Lugs", or other equally approved method.

F. Inlet cover depth shall be 36" and the minimum dimension from ground to centerline of lowest opening shall be 18". Hydrants shall be supported on a poured-in-place concrete thrust block and provided with a drainage pit as indicated on Standard Detail Sheet.

G. All hydrants shall receive two (2) field coats of Koppers Company, Inc. Glamortex enamel (red). The Owner shall be furnished with two (2) hydrant barrel wrenches, four (4) spanner wrenches and two (2) operating nut wrenches.

H. Below ground hydrants shall be flush type with the upper barrel and nozzles contained in a cast iron box with a non locking lid.

I. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

J. Hydrant assemblies shall include the isolation valve and both valve and hydrant shall have a UL/FM approved rating.

2.02 UNDERGROUND BLOW-OFF ASSEMBLY

A. Blow-off hydrants shall be of non-freezing, self-draining type, with an overall length of 30". Set underground in a 30" meter box, these hydrants will be furnished with a 2⅛ " Main Valve Opening inlet, a non-turning operating rod, 7/16 inch square operating nut, and shall open to the left. All of the working parts shall be of bronze-to-bronze design, and be serviceable from above grade with no digging. The outlet shall also be bronze and be 2-1/2" NST. Hydrants shall be lockable to prevent unauthorized use. **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

B. The Contractor shall furnish two (2) T-operating wrenches in the lengths necessary to operate the blow-off hydrants for an operator of average height in a normal working position.

2.02 BLOWOFF HYDRANT ASSEMBLY

A. 3-inch Hydrants shall be self-draining, non-freezing, compression type with 2⅛" main valve opening. Inlet connection shall be MJ. Outlet shall be 2" IP. Hydrants shall be post type **SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.**

B. Hydrants shall have a ductile iron pipe riser with a cast iron stock top, and non-turning operating rod. Principal interior operating parts shall be brass and removable from the hydrant for servicing without excavating the hydrant.

C. Flushing assembly installation shall also include all excavation, backfill, thrust blocking, and #9 crushed stone.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Hydrants shall be located as shown on the drawings unless otherwise specified by the Owner. Each hydrant shall be connected to the main with a 6-inch branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with pumper nozzle facing the roadway and the cast-iron valve box set flush with the finished surrounding grade. Except where approved otherwise, the backfill around hydrants shall be thoroughly compacted to the finished gradeline immediately after installation to obtain beneficial use of the hydrant as soon as practicable. All hydrants shall be provided with a shut-off valve in the hydrant lateral as shown. All hydrants shall be installed in accordance with the manufacturer's directions and as detailed on the Contract Drawings.

B. Blow-off hydrants shall be located as shown on the drawings unless otherwise specified by the Utility. Each blow-off hydrant shall be connected to the main with at least as much cover as the distribution main. Blow-off hydrants shall be set plumb with nozzle facing the roadway and with the box cover set flush with the finished surrounding grade. The backfill around each hydrant shall be thoroughly compacted to the finished gradeline immediately after installation to obtain beneficial use of the hydrant as soon as practicable. All blow-off hydrants shall be provided with a shut-off valve in the lateral as shown.

- END OF SECTION -

SECTION 02700

SITE RESTORATION

PART 1 - GENERAL

1.01 CLEAN-UP

Upon completion of the installation of the sewer main and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from his work. The Contractor shall grade the ground along each side of the pipe trench and/or structure in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

PART 2 - PRODUCTS

2.01 SEEDING

A. All graded areas shall be seeded at the rate of six (6) pounds of seed per 1,000 square feet. The mixture shall consist of:

Kentucky 31 Fescue	60%
Creeping Red Fescue	20%
Annual Rye Grass	20%

B. After seed has been distributed, the Contractor shall cover areas with straw to a depth of 1-1/2". Any necessary re-seeding or repairing shall be accomplished by the Contractor before final acceptance. Seeding is not a pay item.

PART 3 - EXECUTION

3.01 SITE RESTORATION

A. After installation of water lines, the construction site will be restored to its original condition or better. All paved streets, roads, sidewalks, curbs, etc. removed or disturbed during construction shall be replaced, and all materials and workmanship shall conform to standard practices and specifications of the Owner, and/or to the Kentucky Department of Highways requirements, and specifications, whichever applies. Gravel, cinder or dirt streets, drives and shoulders shall be replaced and sufficiently compacted to provide a surface suitable for carrying the type of traffic normally imposed at the location.

B. All seeded areas shall be watered daily during the germination period, unless rain supplies the required moisture. The Contractor shall replace, at his own expense, trees, shrubs, etc. disturbed during construction.

C. The Contractor shall remove from the site all equipment, unused materials and other items at his expense. The construction site shall be left in a neat, orderly condition, clear of all unsightly items, before the Work is finally accepted.

- END OF SECTION -

SECTION 02936

SEEDING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Preparation of subgrade to receive topsoil.

B. Spreading topsoil.

C. Seeding and fertilizing.

D. Seed protection on slopes.

E. Hydroseeding.

F. Maintaining seeded areas until acceptance.

1.02 RELATED WORK

Section 01450 - Quality Control.

1.03 QUALITY ASSURANCE

Test top soil under provisions of Section 01450.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, new weight, date of packaging and location of packaging. Damaged packages are not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.05 EXISTING CONDITIONS

Beginning work of this Section means acceptance of existing conditions.

PART 2 - PRODUCTS

2.01 GROWING MEDIA

A. Existing Topsoil: Natural, fertile agricultural soil capable of sustaining vigorous plant growth, not in frozen or muddy condition, containing not less than 6 percent organic matter, and corrected to pH value of 5.9 to 7.0. Free from subsoil, slag, clay, stones, lumps, live plants, roots, sticks, crabgrass, couchgrass, noxious weeds, and foreign matter.

B. Fertilizer: 10-10-10 commercial type with 50 percent of the elements derived from organic sources.

2.02 SEED

Seed shall be proportioned by weight as follows: Kentucky 31 Fescue, 60%; Creeping Red Fescue, 20%, Annual Rye Grass, 20%.

2.03 ACCESSORIES

A. Mulching Material: Straw from oat, wheat, rye or barley, reasonably free from seeds, foreign matter detrimental to plant life, and in dry condition.

B. Mulching Material: Wood or wood cellulose fiber free of growth or germination inhibiting ingredients.

C. Establishment Blanket: Uniform, open weave jute matting.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect existing underground improvements from damage.

B. Remove foreign materials, plants, roots, stones, and debris, from site. Do not bury foreign material.

C. Remove contaminated subsoil.

D. Cultivate to depth of 3 inches, area to receive topsoil. Repeat cultivation areas where equipment has compacted subgrade.

3.02 SPREADING TOPSOIL

A. Spread topsoil to depth of 6 inches over area to be seeded. Place during dry weather, and on dry unfrozen subgrade.

B. Cultivate topsoil to depth of 6 inches with mechanical tiller. Cultivate inaccessible areas by hand. Rake until surface is smooth.

C. Remove from site, foreign materials collected during cultivation.

D. Grade to eliminate rough spots and low areas where ponding may occur. Maintain smooth, uniform grade.

E. Assure positive drainage away from buildings.

F. Finish ground level firm and sufficient to prevent sinkage pockets when irrigation is applied.

3.03 FERTILIZING

A. Apply fertilizer, at a rate of 15 lbs. per 1,000 sq. ft.

B. Do not apply grass seed and fertilizer at same time in same machine.

C. Lightly water to aid breakdown of fertilizer and to provide moist soil for seed.

3.04 SEED

A. Apply seed at a rate of 6 lbs. per 1,000 sq. ft. evenly in two intersecting directions. Rake in lightly.

B. Do not sow immediately following rain, when ground is too dry, or during windy periods.

C. Roll seeded area with roller not exceeding 112 lbs.

D. Apply water with fine spray immediately after each area has been sown.

E. Seed shall be sown from March 15 to April 15 or from August 25 to September 25.

3.05 HYDROSEEDING

A. Apply slurry at rate of 6 lbs., per 1,000 sq. ft. evenly in two intersecting direction and with hydraulic seeder.

B. Immediately following hydroseeding, mulch areas by means of mulch blower at rate of 1,200 pounds per acre on level grades, 2,000 lbs. on slopes.

C. Do not seed area in excess of that which can be mulched on the same day.

3.06 SEED PROTECTION ON SLOPES

A. Cover seeded slopes where grade is 3:1 or greater with jute matting. Roll matting down over slopes without stretching or pulling.

B. Lay matting smoothly on soil surface, boring top end of each section in narrow 6-inch trench. Leave 12-inch overlap from top roll over bottom roll. Leave 4-inch overlap over adjacent section.

C. Staple outside edges and overlaps at 36-inch intervals.

D. Lightly dress slopes with topsoil to ensure close contact between matting and soil.

E. In ditches, unroll matting in direction of flow. Overlap ends of strips 6 inches with upstream section on top.

3.07 MAINTENANCE PERIOD

Maintenance Period: Until final acceptance.

3.09 RESTORATION

Restore grassed areas damaged during execution of work of this Section.

3.10 ACCEPTANCE

Seeded areas will be accepted at end of maintenance period when seeded areas are properly established and otherwise acceptable.

- END OF SECTION -

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED

The work in this section shall include all formwork, shoring, bracing, anchorage, concrete reinforcement and accessories for cast-in-place concrete.

1.02 GENERAL REQUIREMENT

All concrete construction shall conform to all applicable requirements of ACI 301-84 Specifications for Structural Concrete for Buildings, except as modified by the supplemental requirements specified herein.

1.03 RELATED WORK

Section 05500 - Miscellaneous Metals.

1.04 REFERENCES

A. The Contractor shall obtain and have available in the field office at all times, the following references:

1. Specifications for Structural Concrete for Buildings ACI 301-84 (latest revision).
2. Field Reference Manual SP-15 (81).
3. Manual of Standard Practice - CRSI (latest revision).
4. Placing Reinforcing Bars - CRSI (latest revision).
5. Building Code Requirements for Reinforced Concrete ACI 318 (latest revision).

B. The following standard shall also apply to this work:

1. ASTM C-143
2. ASTM C-150
3. ASTM C-33
4. ASTM C-260
5. ASTM C-494
6. ASTM A-615
7. ASTM D-638
8. ASTM D-695
9. ASTM D-570
10. ASTM D-1252
11. ANSI A-116.1
12. ASTM A-120
13. ASTM C-94
14. ASTM D-2146
15. Federal Specifications FF-S~325

1.05 SUBMITTALS

A. The Contractor shall submit the following data to the Engineer for review:

1. Concrete mix designs, test results and curves plotted to establish water-cement ratio if Method 1 of ACI 301 is used.

2. Proposed mix designs and all necessary substantiating data used to establish proposed mix designs if Method 2 of ACI 301 is used.

3. Mix designs for all mixes proposed or required to be used, including all mixes containing admixtures.

4. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in Paragraph 3.8.2.3 of ACI 301.

B. Certification attesting that admixtures equal or exceeds the physical requirements of ASTM C-494 for Type A admixture and, when required, for Type D admixture.

C. Drawings showing locations of all proposed construction joints.

D. Shop drawing for reinforcing steel showing bar schedules, location, and splices.

PART 2 - PRODUCTS

2.01 CLASSES OF CONCRETE AND USAGE

A. Structural concrete of the various classes required shall be proportioned by either Method 1 or 2 of ACI 301 to produce the following 28-day compressive strengths:

1. Selection of Proportions for Class A Concrete:

a. 4,000 psi compressive for strength at 28 days.

b. Type I cement plus dispersing agent and air.

c. Maximum (water)/(cement and dispersing agent) ratio 0.50.

d. Minimum cement content = 564 lbs. (6.0 bags)/cu. yd. concrete.

e. Nominal maximum size coarse aggregate = No. 67 (3/411 maximum) or No. 57 (111 maximum). Walls with architectural treatment shall use No. 67 (3/411 maximum).

f. Air content = 5% plus or minus 1% by volume.

g. Slump = 211-311 in accordance with ASTM C-143.

2. Selection of Proportions for Class B Concrete:

a. 3,000 psi compressive strength at 28 days.

b. Type I cement plus dispersing agent and air.

c. Maximum (water)/(cement and dispersing agent) ratio 0.56.

d. Minimum cement content = 470 lbs. (5.0 bags)/cu. yd. concrete.

e. Nominal maximum size coarse aggregate = No. 67 (3/4" maximum) or No. 57 (111 maximum).

f. Air content = 6% plus or minus 1% by volume.

g. Slump - 311-411 in accordance with ASTM C-143.

B. Concrete shall be used as follows:

1. Class A concrete for all concrete work except as noted below.

2. Class B concrete for fill concrete and thrust blocks, and where indicated on the Drawings.

C. All testing shall be or have been performed by a recognized independent testing laboratory.

D. Cement for exposed concrete shall have a uniform color classification.

E. Coarse aggregate shall conform to all requirements of ASTM C-33.

F. Manufactured sand shall not be used as fine aggregate in concrete.

2.02 ADMIXTURES

A. An air entraining admixture shall be used on all concrete and shall be the neutralized vinsol resin type such as Master Builders MB-VR, or Euclid Chemical Co. AIR-MIX or equal. The admixture shall meet the requirements of ASTM C-260. Certification attesting to the percent of effective solids and compliance of the material with ASTM C-260 shall be furnished, if requested.

B. A water-reducing, set controlling admixture (non-lignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions, specified early strength development, finishing characteristics required, and surface texture, as determined by the Engineer.

C. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C-494, Type A, water-reducing and normal setting admixture, and when required, for ASTM C-494, Type D, water-reducing and retarding admixture when used with local materials with which the subject concrete is composed.

D. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He shall also be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.

E. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met:

The admixture shall conform to ASTM C-494 except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum of 90 percent of control and length change shall not be greater than control, as defined in ASTM C-494.

F. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the Engineer may at his discretion require the use of a set retardant admixture for mass concrete 2.5 feet or more thick and for all concrete whenever the temperature at the time concrete is cast exceeds 80-F. The admixture shall be selected by the Contractor subject to the review of the Engineer. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.

G. Admixtures shall be used in concrete design mixes in the same manner and proportions as in the field so that the effects of the admixtures are included in preliminary tests submitted to the Engineer for review prior to the start of construction.

H. When more than one admixture is used, all admixtures shall be compatible. They should preferably be by the same manufacturer.

I. Calcium chloride will not be permitted as an admixture in any concrete.

2.03 REINFORCEMENT

A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A-615. All bar reinforcement shall be deformed.

B. Smooth dowels shall be plain steel bars conforming to ASTM A-615, Grade 60, or steel pipe conforming to ASTM A-120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap.

C. Reinforcement supports and other -accessories in contact with the forms for members which will be exposed to view in the finished work shall be of stainless steel or shall have approved high-density polyethylene tips so that the metal portion shall be at least one-quarter of an inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks. Particular attention is directed to the requirements of Paragraph 5.5.3 of ACI Standard 301. These requirements apply to all reinforcement, whether in walls or other vertical elements, inclined elements or flatwork.

2.04 OTHER MATERIALS

A. Anchorage items shall be of standard manufacture and of type required to engage with the anchors to be installed therein under other sections of the Specifications and shall be subject to approval by the Engineer.

1. Slots shall be galvanized dovetail-type as specified in Section "Masonry Work".

2. Inserts shall be malleable iron or steel and of sturdy design adequate strength for the load to be carried. All inserts shall be galvanized. Adjustable wedge inserts shall have an integral loop or strap at the back or shall be provided with lugs to take reinforcing bars. They shall be slotted to receive a special-headed bolt not smaller than 5/8-inch in diameter and of the required length and fitted with hexagonal nut. Other inserts shall be either threaded or slotted as required by their usage. Threaded inserts shall have integral lugs to prevent running.

3. Concrete anchors shall be an approved expansion type conforming to Federal Specification FF-S-325, Groups I, II, III, or VIII and shall be installed in strict accordance with the manufacturer's recommendations.

   Material for anchors shall be as specified in Section 05500 - Miscellaneous Metals. Anchors shall develop ultimate shear and pull out loads of not less than the following values in Class A concrete:

BOLT DIAMETER (INCHES)	MINIMUM SHEAR (POUNDS)	MINIMUM PULL-OUT LOAD (POUNDS)
1/2	4,500	4,600
5/8	6,900	7,700
3/4	10,500	9,900

B. Epoxy bonding adhesive used to bond fresh plastic concrete to sound, hardened concrete shall meet the following specification. Contractor shall furnish a notarized certification by the manufacturer that the proposed material meets the specification.

1. Material:

   The epoxy material shall consist of a 2-component system whose components conform to the following requirements:

   a. Component A - Component A shall be a modified epoxy resin of the epichlorohydrin bisphenol A condensation type, containing suitable viscosity control agents and having an epoxide equivalent of 180-200.

   b. Component B - The B component shall be primarily a reaction product of one mole of an aliphatic polyamine and two moles of mono functional epoxide containing compounds modified with 2, 4, 6 tri(dimethylaminomethyl) phenol.

   c. The component ratio of B to A by volume shall be as specified by the manufacturer.

2. Properties of Mixed Components:

   a. Solids Content — 100% by weight

   b. Pot Life — 25-35 min. @ 73 degrees F

   c. Tack-Free Time (thin Film) — 4-51/2 hrs @ 73 degrees F

   d. Final Cure ASTM D-695 (75% ultimate strength) — 3 days at 73 degrees F

   e. Initial Viscosity (A+B) — 2,000 cps. min at 73 degrees F

   f. Color Mixed — Straw

3. Properties of Cured Material (Neat Material):

   a. Tensile Strength — 3,000 psi min. @ 14

	ASTM D-638	days, 73 degrees F
b.	Tensile Elongation ASTM D-638, modified	1/2-2% at 14 days, 73 degrees F cure
c.	Compressive Strength ASTM D-695	12,500 psi min. at 73 degrees F cure
d.	Compressive Modulus ASTM D-695	470,000 psi min. at 28 days, 73 degrees F cure
e.	Compressive Strength ASTM D-695	5,500 psi min. at 24 days, 73 degrees F cure
f.	Water Pick-up ASTM D-570	1.5 max.

C. Flashing reglets shall be as specified in Section 07530. Reglets shall be correctly placed into forms prior to placing concrete in formwork.

D. Premolded expansion-joint filler strips shall conform to ASTM D-1752 and shall be 3/8-inch thick unless otherwise shown.

E. Joint sealants shall conform to ANSI A116.1. The following joint sealants are acceptable:

1. Colma by Sika Chemical Corporation.

2. Hornflex by A.C. Horn, Inc.

3. Sonolastic by Sonneborn Division of Contech, Inc.

F. Nonshrink grout shall be Embeco 885 grout by Master Builders Company, Euco Firmix grout by the Euclid Chemical Company, or equal. The approved product shall be delivered to the site of the work in the original sealed containers, each bearing the trade name of the material and the name of the manufacturer.

G. Porous fill shall be crushed rock or gravel of such size that all will pass a 1-1/2 inch screen and not more than 5 percent will pass a No. 4 screen, free from earth, clay or other foreign substances.

PART 3 - EXECUTION

3.01 FINISHES

A. Exposed to Public View Concrete Surfaces:

1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such quality that only nominal finishing will be required. The provisions of paragraphs 13.3, 13.4, and 13.6 of ACI 301 shall apply to all exterior exposed to public view concrete surfaces, including the outside surfaces of tanks.

2. Forms for exposed concrete surfaces shall be exterior grade, high-density overlay plywood, steel, or wood forms with smooth tempered hard-board form-liners.

3. Forms shall be coated with an approved release agent before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet water prior to placing concrete.

4. Recessed joints in concrete shall be formed using lacquer-coated wood battens or forms, milled to indicated profiles. Battens and corner strips shall be carefully inspected before concrete is placed and damaged pieces replaced.

5. Chamfer strips shall be 1 inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Corp., Vinylex Corp., or equal.

6. Particular attention is directed to the requirements of paragraphs 10.2.2 and 13.3 of ACI 301. Form panels shall be provided in the maximum sizes practicable in order to minimize form joints. Wherever practicable, form joints shall occur at recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining caulking compound. Joints shall not be taped. Form oil or other material which will impart a stain to the concrete shall not be allowed to contact concrete surfaces.

7. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces which may be damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.

8. Form ties shall remain in the walls and shall be equipped with a waterseal to prevent passage of water through the walls. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wires project toward or touch formwork. Minimum set back of form ties shall be 1-1/2-inch from faces of wall. The hole left by removal of tie ends shall be sealed and grouted as per ACI Para. 9.3 and in accordance with the procedure described hereinafter in Para. 3.01.F. Form ties will be permitted to fall within as-cast areas of architecturally treated wall surfaces (ACI Chapter 13); this does not apply to walls receiving textured decorative waterproof masonry coating.

9. All formed exposed to public view concrete surfaces shall have a "smooth rubbed finish". Exterior vertical surfaces shall be rubbed to one foot below grade. Interior exposed to public view vertical surfaces of liquid containers shall be rubbed to one foot below the minimum liquid level that will occur during normal operations.

B. Patching of holes due to removal of tie ends and other repairable defective areas, shall be as follows: Entire contact area of hole shall be coated with two-part moisture insensitive epoxy bonding compound as specified in Para. 2.04.B. in accordance with manufacturer's specifications, and prior to placing of freshly mixed patching mortar. Patching mortar shall be mixed and placed in general accordance with ACI Para. 9.2.2, 9.2.3, and 13.6.

C. For floors and slabs in which drains occur, special care shall be exercised to slope the floors uniformly to the drains. All floors with drains shall be sloped not less than 1/8 inch per foot unless otherwise shown. In all areas where quarry tile or other materials requiring more than 1/4 inch drop are to be overlaid, the concrete base slab shall be depressed as shown to provide a finished floor at the same elevation as surrounding areas.

D. Where not otherwise specified, finishes shall be in accordance with Paragraphs 10.4 and 11.8 of ACI 301.

3.02 TESTING

All testing shall be in accordance with provisions of ACI 301. Testing services listed in ACI Sections 16.3, 16.4 and 16.5 shall be performed by a testing agency acceptable to the Engineer. Testing services of ACI Section 16.5 shall be paid for by the Contractor at his expense. Test shall be made for each 50 cubic yards of concrete and/or each day concrete is placed.

3.03 ADDITIONAL REQUIREMENTS

A. Unless otherwise directed by the Engineer, the vertical surfaces of all footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Engineer before any concrete is placed.

B. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. Fill required to raise the subgrade shall be placed as specified in Section 02211 and 02223. Porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness, or polyethylene-coated burlap shall be laid over all surfaces receiving concrete.

C. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.

D. Concrete mixed in stationary mixers and transported by nonagitating equipment shall be placed in the forms within 45 minutes from the time ingredients are charged into the mixing drum. Concrete that is truck mixed or transported in truck mixers or truck agitators shall be delivered to the site of the work and discharge completed in the forms within the time specified in Paragraph 10.7 of ASTM C-94, except that when the concrete temperature exceeds 85-F, the time shall be reduced to 45 minutes. Transmit-mixed concrete that is completely mixed at the site of concrete placement or batched cement and aggregates transported to mixers shall be placed in the forms within 1-1/2 hours after cement has been added. Concrete shall be placed in the forms within 15 minutes after discharge from the mixer at the job site.

E. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system which contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used. -

F. All concrete surfaces not in contact with forms shall be moist cured by the application of absorptive mats or double thicknesses of fabric kept continuously wet. Forms shall be kept continuously wet. Use of other curing methods will not be permitted unless written authorization is received from the Engineer.

G. Formwork for beam soffits and slabs and other parts that support the weight of concrete shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.

H. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing with nonshrink grout. Concrete surfaces shall be rough, clean, free of oil, grease and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions.

I. Concrete which, in the opinion of the Engineer, has excessive honeycomb, aggregate pockets or depressions will be rejected and the Contractor shall, at his own expense, remove the entire section containing such defects and replace it with acceptable concrete.

J. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased or dowels shall be coated with high density polyethylene with a minimum thickness of 14 mils.

- END OF SECTION -

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, LOUISVILLE DISTRICT
600 DR. MARTIN LUTHER KING JR PL
LOUISVILLE, KY 40202

August 12, 2022

Regulatory Division
South Branch
ID No. LRL-2020-732-ncc

Mr. Greg Preece
Kentucky Transportation Cabinet (KYTC)
Environmental Analysis
200 Mero Street
Frankfort, Kentucky 40622

Dear Mr. Preece:

This is in response to your request for authorization to extend the southern portion of the William Thomason Byway (KY 3155) from the southern intersection of KY 259 westerly to KY 54 through culvert installation and channel changes. The proposed project would impact approximately 1,262 linear feet of ephemeral tributaries and 918 linear feet of intermittent tributaries of Big Run Branch and Taylor Fork, respectively and approximately 0.201 acre of wetland in Leitchfield, Grayson County, Kentucky. The information supplied by you was reviewed to determine whether a Department of the Army (DA) permit will be required under the provisions of Section 404 of the Clean Water Act.

Your project is considered a discharge of backfill or bedding material for a road crossing. The project is authorized under the provisions of 33 CFR 330 Nationwide Permit (NWP) No. 14, Linear Transportation Projects, as published in the Federal Register December 27, 2021. Under the provisions of this authorization, you must comply with the enclosed Terms and General Conditions for NWP No. 14, and the following Special Conditions:

a. All work authorized by this permit shall be performed in strict compliance with the attached plans dated April 21, 2020, which are a part of this permit. Any modification to these plans affecting the authorized work shall be approved by the U.S. Army Corps of Engineers, Louisville District (USACE) prior to implementation.

b. The permittee shall require its contractors and/or agents to comply with the terms and

conditions of this permit in the construction and maintenance of this project and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit. A copy of this permit, including all conditions, drawings and attachments shall be available at the project site during the construction phase of this project. A description of the authorized work, as provided in the DA permit on ENG FORM 4336, shall be displayed at the project site during construction.

c. The Permittee shall comply with all conditions of individual WQC #WQCLOP2021-075-7M1, issued by the Kentucky Division of Water (KDOW) on November 8, 2021, which are incorporated herein by reference.

d. The Permittee shall provide receipt of payment from the KDFWR FILO for the purchase of 1,663 stream AMUs. AMUs must be purchased prior to the discharge of fill material into "waters of the United States." Please note that the cost per credit is determined by KDFWR, in accordance with the requirements set forth in 33 CFR 332.8, and may increase or decrease. Inquiries regarding credit purchase may be made directly to KDFWR by calling Mr. Clifford Scott at (502) 564-5101, by email at: clifford.scott@ky.gov, or in writing at: Kentucky Department of Fish and Wildlife Resources, Division of Fisheries, #1 Sportsman's Lane, Frankfort, Kentucky, 40601.

e. If stream AMUs become available at an approved mitigation bank, and the permittee wishes to purchase those AMUs for this project, the permittee must provide a receipt as proof of stream AMU purchase, or, as in the case of a KYTC mitigation bank, request the debiting of 1,386 stream AMUs from the Corps in writing and must receive the approval from the Corps prior to the discharge of fill material into "waters of the United States." In the case of a purchase from a KYTC mitigation bank, the Corps will update the Regulatory In-lieu Fee and Bank Information Tracking System (RIBITS) by debiting 1,386 stream AMUs from the mitigation bank ledger. This update will confirm the use of the AMUs.

f. Prior to initiating the authorized work, the Permittee shall provide written verification to the U.S. Army Corps of Engineers that 0.4 wetland AMUs have been purchased from the Creek Bankers McNary Mitigation Bank (LRL- 2017-496). The required verification shall reference this project's permit number (LRL-2020-732-ncc).

g. If wetland adjusted mitigation units (AMUs) are no longer available at any approved mitigation bank within the service area of the project, the permittee must provide receipt of payment from the KDFWR FILO for the purchase 0.5 wetland AMU prior to the discharge of fill material into "waters of the United States." Please note that the cost per credit is determined by KDFWR, in accordance with the requirements set forth in 33 CFR 332.8, and may increase or decrease. Inquiries regarding credit purchase may be made directly to KDFWR by calling Mr. Clifford Scott at (502) 564-5101, by email at: clifford.scott@ky.gov, or in writing at: Kentucky Department of Fish and Wildlife Resources, Division of Fisheries, #1 Sportsman's Lane, Frankfort, Kentucky, 40601.

h. The permittee shall comply with the minimization measures provided in Section 6.1 of the project's BA to minimize potential impacts to the gray bat.

i. The Permittee shall implement the processes identified in the FHWA Kentucky Division's 2020 Programmatic Consultation and accompanying biological opinion on the effects of transportation projects on the Indiana bat to minimize impacts to the Indiana bat.

j. The permittee shall rely on the USFWS' programmatic biological opinion for the 4(d) rule and shall report to the USFWS KFO any departures from the submitted plans, results of surveys conducted or any dead, injured, or sick NLEBs that are found in order to minimize impacts to NLEB.

k. The Permittee shall implement all necessary precautions and measures so that any activity will not kill, injure, capture, harass, or otherwise harm any protected federally listed species. If the Permittee discovers or observes an injured/dead listed endangered or threatened species while accomplishing the authorized work, the Permittee shall immediately notify the Corps to initiate the required Federal coordination.

l. You must agree to comply with the enclosed General Conditions.

Representatives from this office inspected the site on September 9, 2020. Based on the information provided to this office, the site contains Ephemeral Quarry Rd Station 65+00, Station 917+00, Station 918+50, Station 939+00, Station 965+75, and Station 966+00; Intermittent Station 916+00, Station 943+50, Station 955+00, and Station 965+00; and Wetland Station 918+75. Click here to enter text that may be considered jurisdictional "waters of the U.S.," in accordance with the Regulatory Guidance Letter for Jurisdictional Determinations issued by the U.S. Army Corps of Engineers on October 31, 2016 (RGL No. 16-01).

In addition, the site contains isolated waters. The specific isolated Wetlands 923+00, 929+75 and 957+75, Ponds 923+50 and 957+50, and ephemeral feature 958+00 do not appear to be used or be susceptible to use in interstate or foreign commerce. As such, these waters are not considered to be "waters of the U.S." Therefore, a Department of the Army permit is not required in this instance, for any impacts to the above listed isolated features. This jurisdictional determination is valid for a period of five years from the date of this letter unless new information warrants revision of the determination before the expiration date. However, this determination does not relieve you of the responsibility to comply with applicable state law. We urge you to contact the Choose an item to determine the applicability of state law to your project.

This letter contains an approved jurisdictional determination and a preliminary jurisdictional determination for the aforementioned site. If you object to the approved jurisdictional determination, you may request an administrative appeal under Corps regulations

at 33 C.F.R. Part 331. However, as indicated in the guidance, the Preliminary Jurisdictional Determination is non-binding and cannot be appealed and only provides a written indication that "waters of the U.S.," including wetlands, may be present on-site. For purposes of computation of impacts, compensatory mitigation requirements, and other resource protection measures, a permit decision made on the basis of a Preliminary Jurisdictional Determination will treat all waters and wetlands on the form as if they are jurisdictional "waters of the U.S." Impacting "waters of the U.S." identified in the preliminary jurisdictional determination will result in you waiving the right to request an approved jurisdictional determination at a later date. An approved JD may be requested (which may be appealed), by contacting me for further instruction.

Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal the approved jurisdictional determination, you must submit a completed RFA form to the Lakes and Rivers Division Office at the following address:

Regulatory Administrative Appeals Officer
ATTN: Ms. Katherine A. McCafferty
U.S. Army Corps of Engineers,
Great Lakes and Ohio River Division
550 Main Street, Room 10780
Cincinnati, Ohio 45202-3222
Office Phone: 513-684-2699, FAX: 513-684-2460
e-mail: katherine.a.mccafferty@usace.army.mil

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **September 9, 2022**.

It is not necessary to submit an RFA form to the Division office if you do not object to the determination in this letter.

The delineation included herein has been conducted to identify the location and extent of the aquatic resource boundaries and/or the jurisdictional status of aquatic resources for purposes of the Clean Water Act for the particular site identified in this request. This delineation and/or jurisdictional determination may not be valid for the Wetland Conservation Provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should discuss the applicability of a certified wetland determination with the local USDA service center prior to starting work.

This verification is valid until the NWP is modified, reissued, or revoked. NWP No. 14 will be modified, reissued, or revoked on **March 14, 2026**. It is incumbent upon KYTC to

remain informed of changes to the NWPs. If KYTC commences or is under contract to commence this activity before the date that the relevant NWP is modified or revoked, you will have 12 months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this NWP. After the 12-month period, the permittee is responsible for obtaining a new authorization if work has not been completed.

The enclosed Compliance Certification must be submitted to the District Engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later. Please note that we also perform periodic inspections to ensure compliance with our permit conditions and applicable Federal laws. A copy of this letter will be forwarded to your agent and to the KDOW.

If you have any questions, please contact us by writing to the District Regulatory Office at the above address, ATTN: CELRL-RDS, or contact Norma Condra directly at (502) 315-6680 or norma.c.condra@usace.army.mil. Any correspondence on this matter should refer to our ID Number LRL-2020-732-ncc.
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Sincerely,

David Baldridge
Chief, South Branch
Regulatory Division

Enclosures

SPECIAL NOTE

For Water Quality Certification Commitments

Grayson County
KY 3155 Road Improvements
Item No.4-8954

THE CONTRACTOR WILL NOTIFY DIVISION OF ENVIRONMENTAL ANALYSIS TWO WEEKS BEFORE THE START OF CONSTRUCTION. THE COTRACTOR WILL ALSO NOTIFY DIVISION OF ENVIRONMENTAL ANALYSIS NO LATER THAN TWO WEEKS POST-CONSTRUCTION. THE CONTRACTOR WILL ALSO SUBMIT AS-BUILT DRAWINGS TO DIVISION OF ENVIRONMENTAL ANALYSIS WITHIN 90-DAYS AFTER COMPLETION OF CONSTRUCTION. NOTIFICATIONS AND AS-BUILT PLANS SHOULD BE SENT TO ANDREW.LOGSDON@KY.GOV

If there are any questions regarding this note, please contact Division of Environmental Analysis, 200 Mero Street, Frankfort, KY 40601, Phone: (502) 564-7250.

Kentucky Transportation Cabinet

Highway District 4

And

_____(2), Construction

Kentucky Pollutant Discharge Elimination System Permit KYR10 Best Management Practices (BMP) plan

Groundwater protection plan

For Highway Construction Activities

For

EXTEND THE WILLIAM THOMASON BYWAY (KY 3155) FROM THE SOUTHERN INTERSECTION AT KY 259 WESTERLY TO KY 54.

Project: CID ## -

Revised 3/4/2016

Project information

Note – (1) = Design (2) = Construction (3) = Contractor

1. Owner – Kentucky Transportation Cabinet, District __ (1)

2. Resident Engineer: (2)

3. Contractor name: (2)
   Address: (2)

   Phone number: (2)
   Contact: (2)
   Contractors agent responsible for compliance with the KPDES permit requirements (3):

4. Project Control Number (2)

5. Route (Address)
   KY 3155
   Leitchfield, KY

6. Latitude/Longitude (project mid-point) dd/mm/ss, dd/mm/ss
   37.473056
   -86.308889

7. County (project mid-point)
   Grayson

8. Project start date (date work will begin): (2)

9. Projected completion date: (2)

KyTC BMP Plan for Project CID ## - ####

A. Site description:

1. Nature of Construction Activity (from letting project description)

2. EXTEND THE WILLIAM THOMASON BYWAY (KY 3155) FROM THE SOUTHERN INTERSECTION AT KY 259 WESTERLY TO KY 54. (16CCN)(18CCN)(2020CCR) (2022CCR) (2024CCR)

3. Order of major soil disturbing activities (2) and (3)

4. Projected volume of material to be moved
   33,690 CU YD

5. Estimate of total project area (acres)
   51

6. Estimate of area to be disturbed (acres)
   51

7. Post construction runoff coefficient will be included in the project drainage folder. Persons needing information pertaining to the runoff coefficient will contact the resident engineer to request this information.(1)

8. Data describing existing soil condition
   Soil profile data may be found in the Geotechnical Notes of the plan set and attached.

9. Data describing existing discharge water quality (if any) (2)
   No existing Water quality data exist

10. Receiving water name (1)
    Big Run Branch and Taylor Fork

11. TMDLs and Pollutants of Concern in Receiving Waters:
    No TMDL Streams

12. Site map – Project layout sheet plus the erosion control sheets in the project plans that depict Disturbed Drainage Areas (DDAs) and related information. These sheets depict the existing project conditions with areas delineated by DDA (drainage area bounded by watershed breaks and right of way limits), the storm water discharge locations (either as a point discharge or as overland flow) and the areas that drain to each

discharge point. These plans define the limits of areas to be disturbed and the location of control measures. Controls will be either site specific as designated by the designer or will be annotated by the contractor and resident engineer before disturbance commences. The project layout sheet shows the surface waters and wetlands.

13. Potential sources of pollutants:

The primary source of pollutants is solids that are mobilized during storm events. Other sources of pollutants include oil/fuel/grease from servicing and operating construction equipment, concrete washout water, sanitary wastes and trash/debris. (3)

B. Sediment and Erosion Control Measures:

1. Plans for highway construction projects will include erosion control sheets that depict Disturbed Drainage Areas (DDAs) and related information. These plan sheets will show the existing project conditions with areas delineated by DDA within the right of way limits, the discharge points and the areas that drain to each discharge point. Project managers and designers will analyze the DDAs and identify Best Management Practices (BMPs) that are site specific. The balance of the BMPs for the project will be listed in the bid documents for selection and use by the contractor on the project with approval by the resident engineer.

   Projects that do not have DDAs annotated on the erosion control sheets will employ the same concepts for development and managing BMP plans.

2. Following award of the contract, the contractor and resident engineer will annotate the erosion control sheets showing location and type of BMPs for each of the DDAs that will be disturbed at the outset of the project. This annotation will be accompanied by an order of work that reflects the order or sequence of major soil moving activities. The remaining DDAs are to be designated as “Do Not Disturb” until the contractor and resident engineer prepare the plan for BMPs to be employed. The initial BMP’s shall be for the first phase (generally Clearing and Grubbing) and shall be modified as needed as the project changes phases. The BMP Plan will be modified to reflect disturbance in additional DDA’s as the work progresses. <u>All DDA’s will have adequate BMP’s in place before being disturbed.</u>

3. As DDAs are prepared for construction, the following will be addressed for the project as a whole or for each DDA as appropriate:

   - Construction Access – This is the first land-disturbing activity. As soon as construction begins, bare areas will be stabilized with gravel and temporary mulch and/or vegetation.
   - At the beginning of the project, all DDAs for the project will be inspected for areas that are a source of storm water pollutants. Areas that are a source of pollutants will receive appropriate cover or BMPs to arrest the introduction of pollutants into storm water. Areas that have not been opened by the contractor will be inspected periodically (once per month) to determine if there is a need to employ BMPs to keep pollutants from entering storm water.
   - Clearing and Grubbing – The following BMP's will be considered and used where appropriate.
     - Leaving areas undisturbed when possible.
     - Silt basins to provide silt volume for large areas.
     - Silt Traps Type A for small areas.
     - Silt Traps Type C in front of existing and drop inlets which are to be saved
     - Diversion ditches to catch sheet runoff and carry it to basins or traps or to divert it around areas to be disturbed.
     - Brush and/or other barriers to slow and/or divert runoff.
     - Silt fences to catch sheet runoff on short slopes. For longer slopes, multiple rows of silt fence may be considered.
     - Temporary Mulch for areas which are not feasible for the fore mentioned types of protections.
     - Non-standard or innovative methods.
   - Cut & Fill and placement of drainage structures - The BMP Plan will be modified to show additional BMP's such as:
     - Silt Traps Type B in ditches and/or drainways as they are completed
     - Silt Traps Type C in front of pipes after they are placed
     - Channel Lining
     - Erosion Control Blanket
     - Temporary mulch and/or seeding for areas where construction activities will be ceased for 21 days or more.
     - Non-standard or innovative methods
   - Profile and X-Section in place – The BMP Plan will be modified to show elimination of BMP's which had to be removed and the addition of new BMP's as the roadway was shaped. Probably changes include:
     - Silt Trap Type A, Brush and/or other barriers, Temporary Mulch, and any other BMP which had to be removed for final grading to take place.

- Additional Silt Traps Type B and Type C to be placed as final drainage patterns are put in place.
- Additional Channel Lining and/or Erosion Control Blanket.
- Temporary Mulch for areas where Permanent Seeding and Protection cannot be done within 21 days.
- Special BMP's such as Karst Policy

➢ Finish Work (Paving, Seeding, Protect, etc.) – A final BMP Plan will result from modifications during this phase of construction. Probably changes include:

- Removal of Silt Traps Type B from ditches and drainways if they are protected with other BMP's which are sufficient to control erosion, i.e. Erosion Control Blanket or Permanent Seeding and Protection on moderate grades.
- Permanent Seeding and Protection
- Placing Sod
- Planting trees and/or shrubs where they are included in the project

➢ BMP's including Storm Water Management Devices such as velocity dissipation devices and Karst policy BMP's to be installed during construction to control the pollutants in storm water discharges that will occur after construction has been completed are : No permanent BMPs are being proposed.

C. Other Control Measures

1. No solid materials, including building materials, shall be discharged to waters of the commonwealth, except as authorized by a Section 404 permit.

2. Waste Materials

All waste materials that may leach pollutants (paint and paint containers, caulk tubes, oil/grease containers, liquids of any kind, soluble materials, etc.) will be collected and stored in appropriate covered waste containers. Waste containers shall be removed from the project site on a sufficiently frequent basis as to not allow wastes to become a source of pollution. All personnel will be instructed regarding the correct procedure for waste disposal. Wastes will be disposed in accordance with appropriate regulations. Notices stating these practices will be posted in the office.

3. Hazardous Waste

All hazardous waste materials will be managed and disposed of in the manner specified by local or state regulation. The contractor shall notify the Section Engineer if there any hazardous wastes being generated at the

project site and how these wastes are being managed. Site personnel will be instructed with regard to proper storage and handling of hazardous wastes when required. The Transportation Cabinet will file for generator, registration when appropriate, with the Division of Waste Management and advise the contractor regarding waste management requirements.

4. Spill Prevention

The following material management practices will be used to reduce the risk of spills or other exposure of materials and substances to the weather and/or runoff.

- **Good Housekeeping:**

The following good housekeeping practices will be followed onsite during the construction project.

- An effort will be made to store only enough product required to do the job
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure
- Products will be kept in their original containers with the original manufacturer's label
- Substances will not be mixed with one another unless recommended by the manufacturer
- Whenever possible, all of the product will be used up before disposing of the container
- Manufacturers' recommendations for proper use and disposal will be followed
- The site contractor will inspect daily to ensure proper use and disposal of materials onsite

- **Hazardous Products:**

These practices will be used to reduce the risks associated with any and all hazardous materials.

- Products will be kept in original containers unless they are not resealable
- Original labels and material safety data sheets (MSDS) will be reviewed and retained
- Contractor will follow procedures recommended by the manufacturer when handling hazardous materials
- If surplus product must be disposed of, manufacturers' or state/local recommended methods for proper disposal will be followed

The following product-specific practices will be followed onsite:

- **Petroleum Products:**

Vehicles and equipment that are fueled and maintained on site will be monitored for leaks, and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products onsite will be stored in tightly sealed containers, which are clearly labeled and will be protected from exposure to weather.

The contractor shall prepare an Oil Pollution Spill Prevention Control and Countermeasure plan when the project that involves the storage of petroleum products in 55 gallon or larger containers with a total combined storage capacity of 1,320 gallons. This is a requirement of 40 CFR 112.

This project (will / will not) (3) have over 1,320 gallons of petroleum products with a total capacity, sum of all containers 55 gallon capacity and larger.

- **Fertilizers:**

Fertilizers will be applied at rates prescribed by the contract, standard specifications or as directed by the resident engineer. Once applied, fertilizer will be covered with mulch or blankets or worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

- **Paints:**

All containers will be tightly sealed and stored indoors or under roof when not being used. Excess paint or paint wash water will not be discharged to the drainage or storm sewer system but will be properly disposed of according to manufacturers' instructions or state and local regulations.

- **Concrete Truck Washout:**

Concrete truck mixers and chutes will not be washed on pavement, near storm drain inlets, or within 75 feet of any ditch, stream, wetland, lake, or sinkhole. Where possible, excess concrete and wash water will be discharged to areas prepared for pouring new concrete, flat areas to be paved that are away from ditches or drainage system features, or other locations that will not drain off site. Where this approach is not possible, a shallow earthen wash basin will be excavated away from ditches to receive the wash water

- **Spill Control Practices**

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup**:**

- Manufacturers' recommended methods for spill cleanup will be clearly posted. All personnel will be made aware of procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area. Equipment and materials will include as appropriate, brooms, dust pans, mops, rags, gloves, oil absorbents, sand, sawdust, and plastic and metal trash containers.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contract with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate state/local agency as required by KRS 224 and applicable federal law.
- The spill prevention plan will be adjusted as needed to prevent spills from reoccurring and improve spill response and cleanup.
- Spills of products will be cleaned up promptly. Wastes from spill clean up will be disposed in accordance with appropriate regulations.

D. Other State and Local Plans

This BMP plan shall include any requirements specified in sediment and erosion control plans, storm water management plans or permits that have been approved by other state or local officials. Upon submittal of the NOI, other requirements for surface water protection are incorporated by reference into and are enforceable under this permit (even if they are not specifically included in this BMP plan). This provision does not apply to master or comprehensive plans, non-enforceable guidelines or technical guidance documents that are not identified in a specific plan or permit issued for the construction site by state or local officials. (1)

E. Maintenance

1. The BMP plan shall include a clear description of the maintenance procedures necessary to keep the control measures in good and effective operating condition.

- Maintenance of BMPs during construction shall be a result of weekly and post rain event inspections with action being taken by the contractor to correct deficiencies.

- Post Construction maintenance will be a function of normal highway maintenance operations. Following final project acceptance by the cabinet, district highway crews will be responsible for identification and correction of deficiencies regarding ground cover and cleaning of storm water BMPs. The project manager shall identify any BMPs that will be for the purpose of post construction storm water management with specific guidance for any non-routine maintenance. (1)

F. Inspections

Inspection and maintenance practices that will be used to maintain erosion and sediment controls:

- All erosion prevention and sediment control measures will be inspected at least once each week and following any rain of one-half inch or more.
- Inspections will be conducted by individuals that have successfully completed the KEPSC-RI course as required by Section 213.02.02 of the Standard Specifications for Road and Bridge Construction, current edition.
- Inspection reports will be written, signed, dated, and kept on file.
- Areas at final grade will be seeded and mulched within 14 days.
- Areas that are not at final grade where construction has ceased for a period of 21 days or longer and soil stock piles shall receive temporary mulch no later than 14 days from the last construction activity in that area.
- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of being reported.
- Built-up sediment will be removed from behind the silt fence before it has reached halfway up the height of the fence.
- Silt fences will be inspected for bypassing, overtopping, undercutting, depth of sediment, tears, and to ensure attachment to secure posts.

- Sediment basins will be inspected for depth of sediment, and built-up sediment will be removed when it reaches 50 percent of the design capacity and at the end of the job.
- Diversion dikes and berms will be inspected and any breaches promptly repaired. Areas that are eroding or scouring will be repaired and re-seeded / mulched as needed.
- Temporary and permanent seeding and mulching will be inspected for bare spots, washouts, and healthy growth. Bare or eroded areas will be repaired as needed.
- All material storage and equipment servicing areas that involve the management of bulk liquids, fuels, and bulk solids will be inspected weekly for conditions that represent a release or possible release of pollutants to the environment.

G. Non – Storm Water discharges

It is expected that non-storm water discharges may occur from the site during the construction period. Examples of non-storm water discharges include:

- Water from water line flushings.
- Water form cleaning concrete trucks and equipment.
- Pavement wash waters (where no spills or leaks of toxic or hazardous materials have occurred).
- Uncontaminated groundwater and rain water (from dewatering during excavation).

All non-storm water discharges will be directed to the sediment basin or to a filter fence enclosure in a flat vegetated infiltration area or be filtered via another approved commercial product.

H. Groundwater Protection Plan (3)

This plan serves as the groundwater protection plan as required by 401 KAR 5:037.

- Contractors statement: (3)

The following activities, as enumerated by 401 KAR 5:037 Section 2 that require the preparation and implementation of a groundwater protection plan, will or may be may be conducted as part of this construction project:

_____ 2. (e) land treatment or land disposal of a pollutant;

_____ 2. (f) Storing, …, or related handling of hazardous waste, solid waste or special waste, …, in tanks, drums, or other containers, or in piles, (This does not include wastes managed in a container placed for collection and removal of municipal solid waste for disposal off site);

_____ 2. (g) …. Handling of materials in bulk quantities (equal or greater than 55 gallons or 100 pounds net dry weight transported held in an individual container) that, if released to the environment, would be a pollutant;

_____ 2. (j) Storing or related handling of road oils, dust suppressants, …., at a central location;

_____ 2. (k) Application or related handling of road oils, dust suppressants or deicing materials, (does not include use of chloride-based deicing materials applied to roads or parking lots);

_____ 2. (m) Installation, construction, operation, or abandonment of wells, bore holes, or core holes, (this does not include bore holes for the purpose of explosive demolition);

Or, check the following only if there are no qualifying activities

_____ There are no activities for this project as listed in 401 KAR 5:037 Section 2 that require the preparation and implementation of a groundwater protection plan.

The contractor is responsible for the preparation of a plan that addresses the

401 KAR 5:037 Section 3. (3) Elements of site specific groundwater protection plan:

(a) General information about this project is covered in the Project information;
(b) Activities that require a groundwater protection plan have been identified above;
(c) Practices that will protect groundwater from pollution are addressed in section C. Other control measures.
(d) Implementation schedule – all practices required to prevent pollution of groundwater are to be in place prior to conducting the activity;
(e) Training is required as a part of the ground water protection plan. All employees of the contractor, sub-contractor and resident engineer personnel will be trained to understand the nature and requirements of this plan as they pertain to their job

function(s). Training will be accomplished within one week of employment and annually thereafter. A record of training will be maintained by the contractor with a copy provide to the resident engineer.

(f) Areas of the project and groundwater plan activities will be inspected as part of the weekly sediment and erosion control inspections

(g) Certification (see signature page.)

KyTC BMP Plan for Project CID ## -

Contractor and Resident Engineer Plan certification

The contractor that is responsible for implementing this BMP plan is identified in the Project Information section of this plan.

The following certification applies to all parties that are signatory to this BMP plan:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. Further, this plan complies with the requirements of 401 KAR 5:037. By this certification, the undersigned state that the individuals signing the plan have reviewed the terms of the plan and will implement its provisions as they pertain to ground water protection.

Resident Engineer and Contractor Certification:

(2) Resident Engineer signature

Signed _____title_____, _____
Typed or printed name[2] signature

(3) Signed _____title_____, _____
Typed or printed name[1] signature

1. Contractors Note: to be signed by a person who is the owner, a responsible corporate officer, a general partner or the proprietor or a person designated to have the authority to sign reports by such a person in accordance with 401 KAR 5:060 Section 9. This delegation shall be in writing to: Manager, KPDES Branch, Division of Water, 14 Reilly Road, Frankfort Kentucky 40601. Reference the Project Control Number (PCN) and KPDES number when one has been issued.

2. KyTC note: to be signed by the Chief District Engineer or a person designated to have the authority to sign reports by such a person (usually the resident engineer) in accordance with 401 KAR 5:060 Section 9. This delegation shall be in writing to: Manager, KPDES Branch, Division of Water, 14 Reilly Road, Frankfort Kentucky 40601 Reference the Project Control Number (PCN) and KPDES number when one has been issued.

Sub-Contractor Certification

The following sub-contractor shall be made aware of the BMP plan and responsible for implementation of BMPs identified in this plan as follows:

Subcontractor

Name:
Address:
Address:

Phone:

The part of BMP plan this subcontractor is responsible to implement is:

I certify under penalty of law that I understand the terms and conditions of the general Kentucky Pollutant Discharge Elimination System permit that authorizes the storm water discharges, the BMP plan that has been developed to manage the quality of water to be discharged as a result of storm events associated with the construction site activity and management of non-storm water pollutant sources identified as part of this certification.

Signed _____title_____, _____
Typed or printed name[1] signature

1. Sub Contractor Note: to be signed by a person who is the owner, a responsible corporate officer, a general partner or the proprietor or a person designated to have the authority to sign reports by such a person in accordance with 401 KAR 5:060 Section 9. This delegation shall be in writing to: Manager, KPDES Branch, Division of Water, 14 Reilly Road, Frankfort Kentucky 40601. Reference the Project Control Number (PCN) and KPDES number when one has been issued.

SPECIAL NOTE

Filing of eNOI for KPDES Construction Stormwater Permit

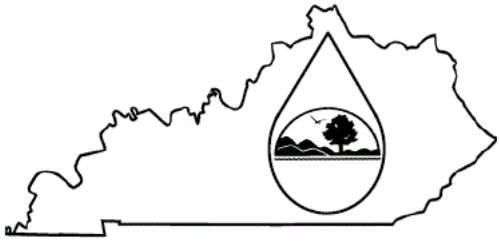
County: Grayson
Item No.: 4-8954

Route: New Route
KDOW Submittal ID: 471658
27fe6f88-33ab-422f-81c8-6eeff44406f9

Project Description:
EXTEND THE WILLIAM THOMASON BYWAY (KY 3155) FROM THE SOUTHERN INTERSECTION AT KY 259 WESTERLY TO KY 54

A Notice of Intent for obtaining coverage under the Kentucky Pollutant Discharge Elimination System (KPDES) General Permit for Stormwater Discharges Associated with Construction Activities (KYR10) has been drafted, copy of which is attached. Upon award, the Contractor will be identified in Section III of the form as the "Building Contractor" and it will be submitted for approval to the Kentucky Division of Water. The Contractor shall be responsible for advancing the work in a manner that is compliant with all applicable and appropriate KYTC specifications for sediment and erosion control as well as meeting the requirements of the KYR10 permit and the KDOW.

If there are any questions regarding this note, please contact Danny Peake, Director, Division of Environmental Analysis, TCOB, 200 Mero Street, Frankfort, KY 40622, Phone: (502) 564-7250.



KENTUCKY POLLUTION DISCHARGE ELIMINATION SYSTEM (KPDES)

Notice of Intent (NOI) for coverage of Storm Water Discharge Associated with Construction Activities Under the KPDES Storm Water General Permit KYR100000

Click here for Instructions (Controls/KPDES_FormKYR10_Instructions.htm)

Click here to obtain information and a copy of the KPDES General Permit. (https://eec.ky.gov/Environmental-Protection/Water/PermitCert/KPDES/Documents/KYR10PermitPage.pdf)

(*) indicates a required field; (✓) indicates a field may be required based on user input or is an optionally required field

Reason for Submittal:(*)	Agency Interest ID:	Permit Number:(✓)
Application for New Permit Coverage	Agency Interest ID	KPDES Permit Number

If change to existing permit coverage is requested, describe the changes for which modification of coverage is being sought:(✓)

ELIGIBILITY:
Stormwater discharges associated with construction activities disturbing individually one (1) acre or more, including, in the case of a common plan of development, contiguous construction activities that cumulatively equal one (1) acre or more of disturbance.

EXCLUSIONS:
The following are excluded from coverage under this general permit:
1) Are conducted at or on properties that have obtained an individual KPDES permit for the discharge of other wastewaters which requires the development and implementation of a Best Management Practices (BMP) plan;
2) Any operation that the DOW determines an individual permit would better address the discharges from that operation;
3) Any project that discharges to an Impaired Water listed in the most recent Integrated Report, §305(b) as impaired for sediment and for which an approved TMDL has been developed.

SECTION I -- FACILITY OPERATOR INFORMATION (PERMITTEE)

Company Name:(✓)	First Name:(✓)	M.I.:	Last Name:(✓)
KYTC District 4	Bradley	MI	Bottoms

Mailing Address:(*)	City:(*)	State:(*)	Zip:(*)
634 East Dixie Ave	Elizabethtown	Kentucky	42701

eMail Address:(*)	Business Phone:(*)	Alternate Phone:
bradley.bottoms@ky.gov	2707665066	Phone

SECTION II -- GENERAL SITE LOCATION INFORMATION

Project Name:(*)	Status of Owner/Operator(*)	SIC Code(*)
CID 25-XXXX Extend the William Thomason Byway (KY 3155)	State Government	1611 Highway and Street Const

Company Name:(✓)	First Name:(✓)	M.I.:	Last Name:(✓)
KYTC District 4	Bradley	MI	Bottoms

Site Physical Address:(*)
KY 3155

City:(*)	State:(*)	Zip:(*)
Leitchfield	Kentucky	42754

County:(*)	Latitude(decimal degrees)(*)DMS to DD Converter (https://www.fcc.gov/media/radio/dms-decimal)	Longitude(decimal degrees)(*)
Grayson	37.473056	-86.38889

SECTION III -- SPECIFIC SITE ACTIVITY INFORMATION

Project Description:(*)
EXTEND THE WILLIAM THOMASON BYWAY (KY 3155) FROM THE SOUTHERN INTERSECTION AT KY 259 WESTERLY TO KY 54

a. For single projects provide the following information

Total Number of Acres in Project:(✓)	Total Number of Acres Disturbed:(✓)
51	51
Anticipated Start Date:(✓)	Anticipated Completion Date:(✓)

b. For common plans of development provide the following information

Total Number of Acres in Project:(✓)	Total Number of Acres Disturbed:(✓)
# Acre(s)	# Acre(s)
Number of individual lots in development, if applicable:(✓)	Number of lots in development:(✓)
# lot(s)	# lot(s)
Total acreage of lots intended to be developed:(✓)	Number of acres intended to be disturbed at any one time:(✓)
Project Acres	Disturbed Acres
Anticipated Start Date:(✓)	Anticipated Completion Date:(✓)

List Building Contractor(s) at the time of Application:(*)

	Company Name	
+		

SECTION IV -- IF THE PERMITTED SITE DISCHARGES TO A WATER BODY THE FOLLOWING INFORMATION IS REQUIRED

Discharge Point(s):

	Unnamed Tributary?	Latitude	Longitude	Receiving Water Name	
+					

SECTION V -- IF THE PERMITTED SITE DISCHARGES TO A MS4 THE FOLLOWING INFORMATION IS REQUIRED

Name of MS4:

Date of application/notification to the MS4 for construction site permit coverage:	Discharge Point(s):(*)
Date	

	Latitude	Longitude	
+			

SECTION VI -- WILL THE PROJECT REQUIRE CONSTRUCTION ACTIVITIES IN A WATER BODY OR THE RIPARIAN ZONE?

Will the project require construction activities in a water body or the riparian zone?: (*)	Yes
If Yes, describe scope of activity: (✓)	construct culvert pipes
Is a Clean Water Act 404 permit required?:(*)	Yes

Is a Clean Water Act 401 Water Quality Certification required?:(*)	Yes

SECTION VII -- NOI PREPARER INFORMATION

First Name:(*)	M.I.:	Last Name:(*)	Company Name:(*)
Joseph	MI	Ferguson	KYTC District 4

Mailing Address:(*)	City:(*)	State:(*)	Zip:(*)
634 East Dixie Ave	Elizabethtown	Kentucky	42701

eMail Address:(*)	Business Phone:(*)	Alternate Phone:
joseph.ferguson@ky.gov	2707665066	Phone

SECTION VIII -- ATTACHMENTS

Facility Location Map:(*)	Upload file
Supplemental Information:	Upload file

SECTION IX -- CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature:(*)	Title:(*)
Signature	Title

First Name:(*)	M.I.:	Last Name:(*)
First Name	MI	Last Name

eMail Address:(*)	Business Phone:(*)	Alternate Phone:	Signature Date:(*)
eMail Address	Phone	Phone	Date

Click to Save Values for Future Retrieval | Click to Submit to EEC

COMMONWEALTH OF KENTUCKY

TRANSPORTATION CABINET

CONSENT AND RELEASE

County of, **Grayson** Item # **04-8954.00**

Project # **12F0 FD52 043 93621 01R; STP 5374 (011)**

Project: **KY 3155**

Parcel No. **033**

WHEREAS, the Transportation Cabinet, Commonwealth of Kentucky, finds it necessary to do the following work: entrance construction. Real property is owned by Watkins Development, Inc. located in **Grayson** County, Kentucky, identified by the Parcel 033 on the plan set and located on KY 3155.

It is understood that said property will be returned to the same or better condition as present..

NOW, THEREFORE, in consideration of the above and the incidental benefits accruing to the property, I hereby consent and agree that the Transportation Cabinet may come upon the above property and do the work set out above, and do further agree that I will assert no claim for damages against the Transportation Cabinet by reason of said work, but these presents shall be forever barred.

This the 3rd day of February, 2021.

Garry Watkins, President

TRANSPORTATION CABINET By: Mabonie Smith

KENTUCKY TRANSPORTATION CABINET
Department of Highways
DIVISION OF RIGHT OF WAY AND UTILITIES

TC 62-227
Rev. 05/2019
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CONSENT & RELEASE

COUNTY	ITEM NO.	PARCEL	NAME
Grayson	04-8954.00	055	Honacres, LLC
PROJECT NO.	**FEDERAL NUMBER**		**PROJECT**
12F0 FD52 043 93621 01R	STP 5374 (011)		**William Thomason Byway**

WHEREAS, the Transportation Cabinet, Commonwealth of Kentucky, finds it necessary to do the following work within, along, and/or adjacent to the existing right of way and has requested permission to:
create and tie in an entrance to the property off of the Rhodes Street cul-de-sac (approximately at station number left 54+50.00), as well as an entrance on the North side of the automatic car wash for garbage pick up (approximately station number left 52+00.00)

On the Real Property of Property Owner(s):	Honacres, LLC
Address of Property where work is to be done:	520 South Main Street, Leitchfield, KY 42754

WHEREAS, the Transportation Cabinet is willing to maintain the property owner's reasonable access or other property rights, the above mentioned property owner(s) are voluntarily allowing the Transportation Cabinet to enter upon the above referenced property and do work set out above;

The Transportation Cabinet agrees that reasonable care will be taken by itself and its authorized contractors to avoid damage during this operation and to correct, within reason, any damage done to the property.

I hereby agree that I will assert no claim for damages against the Transportation Cabinet by reason of said work, but these presents shall be forever barred.

This Consent and Release was signed on the 24 day of June 20 21.

SIGNATURES OF AGENTS FOR TRANSPORTATION CABINET	SIGNATURES OF PROPERTY OWNERS

KENTUCKY TRANSPORTATION CABINET
Department of Highways
DIVISION OF RIGHT OF WAY AND UTILITIES

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MEMORANDUM OF UNDERSTANDING

COUNTY	ITEM NO.	PARCEL	NAME
Grayson	04-8954.00	08	SCOTTY'S CONTRACTING AND STONE, LLC
PROJECT NO.	**FEDERAL NUMBER**		**PROJECT**
12FO FD52 043 93621 01R	STP 5374 (011)		KY 3155

Property Owners: Scotty's Contracting And Stone, LLC

This Memorandum of Understanding contains all the representations and agreements made between the parties hereto and upon which they relied in executing a Deed of Conveyance, Deed of Easement, or Grant of Easement dated May 3, 2022.

The related deed conveys the following interests and amounts of real property as shown on the official plans:

	Amount	Square feet	Acres
Fee simple	9.965	☐	☒
Permanent easement		☐	☐
Temporary easement	5,139	☒	☐
Excess property in fee simple		☐	☐

The total consideration to be paid for the property conveyed is $ 0.00 Donation.

This consideration includes payment for any and all reacquisition or reversion rights of the property owners or their heirs or assigns, which may arise pursuant to KRS 416.670.

☐ This is a total acquisition.

☒ This is a partial acquisition. The remaining property will have the following access to the proposed highway improvement:

- ☐ Access as provided by the Department's permit. Access not designated on the plans will be the sole responsibility of the Property Owners (proposed highway access is by permit).
- ☒ Access at designated points as shown on the plans (proposed highway access is limited).
- ☐ No access (proposed highway access is fully controlled).
- ☐ The remaining property will be landlocked by this acquisition.

☒ No improvements are being acquired.

☐ Improvements are being acquired. The disposition of the acquired improvements will be as follows:

- ☐ The Cabinet receives titles to the improvements.
- ☐ The Cabinet receives titles to the improvements, but for the salvage value of $ _____ the Property Owners agree to remove the same from the right of way as outlined in the building removal contract. When the structure has been moved clear of the right of way and easement areas, the Property Owners regain the titles. Where tenants occupy improvements, the tenants must be afforded ample time to relocate prior to the Property Owners' being authorized to start the removal.

SIGNS

☒ No sign is being acquired.

☐ One or more signs are being acquired.

- ☐ The Cabinet receives and retains title to each sign.
- ☐ The Cabinet receives title to each sign, but for the salvage value of $ _____ the Property Owners agree to remove the same from the right of way by _____ or forfeit both the recovery of each sign and the salvage value paid.

The Property Owners understand that they will not be required to vacate or move personal property from any improvement in less than 90 days from the date of receiving the written offer of relocation assistance. The Property Owners further understand that before being required to vacate or move personal property, they will be given a 30-day written notice that will specify the date they must be completely clear of the improvement.

The Property Owners will assist in obtaining necessary releases of all mortgages, liens, or other encumbrances on the property conveyed. They will pay direct all taxes due for the year in which the Cabinet receives title to the property and, upon submission of the paid receipt, will be reimbursed a pro-rata portion of these property taxes. Also, they will pay direct any penalty costs for prepayment of an existing recorded mortgage and similar expenses incidental to conveying real property to the Cabinet and, upon submission of properly supported paid receipts, will be reimbursed. All reimbursement claims must be deemed fair, necessary, and properly supported for payment.

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Unless otherwise stated, Property Owners state that no drainage outlets such as pipes, sump pump outlets, gutter downspouts, or septic system drainage of any kind, currently extend onto the existing right of way.

In addition, the parties agree as follows:

See permit number and plat referenced in Deed.

-A future commercial access will be granted by encroachment permit at approximately KY54 STA 40+00 LT.
-Widen KY54 STA 45+60 LT entrance to 36ft commercial
-Widen KY54 STA 55+70 LT entrance to 36ft commercial
-Add 36ft commercial entrance to Quarry Rd STA 56+50 RT
-Widen Quarry Rd STA 72+42 RT entrance to 36ft commercial
-Any additional area required to construct the above entrances outside of proposed Right of Way on plans will be granted by consent and release.

As owners of the property to be conveyed, we request payment be made as follows:

Name: Donation		Name:	
Address:		Address:	
SSN or Tax ID:	Amount of Check: $	SSN or Tax ID:	Amount of Check: $
Telephone Number:		Telephone Number:	
Name:		Name:	
Address:		Address:	
SSN or Tax ID:	Amount of Check: $	SSN or Tax ID:	Amount of Check: $
Telephone Number:		Telephone Number:	

Note: Attach additional pages, as needed.

The Property Owners acknowledge that if the agreed consideration for this transaction was negotiated based upon a waiver valuation/Minor Acquisition Review (MAR) amount of at least $10,000.00 but not more than $25,000.00, the Property Owners were offered the option of having the Cabinet obtain an appraisal of the property and have hereby waived that option.

This Memorandum of Understanding, together with the Right of Way Plans, the Deed of Conveyance, Deed of Easement, or Grant of Easement, and any other documents referenced in these instruments, represent all the terms and conditions of the agreement between the Transportation Cabinet and the Property Owners, which was reached without coercion, threats, or other promises by either party.

By their signatures on this document, the agents representing the Transportation Cabinet certify that they have no direct, indirect, present, or contemplated future interest in this property and in no way will benefit from this acquisition.

This Memorandum of Understanding was signed 05-02-2022.

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MEMORANDUM OF UNDERSTANDING

Signature of Agents for Transportation Cabinet Mabrie Sarver.

Signatures of Property Owners		Signatures of Property Owners
Mike Law, Vice President Of Materials		

Note: Attach additional pages, as needed.

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MEMORANDUM OF UNDERSTANDING

COUNTY	ITEM NO.	PARCEL	NAME
Grayson	04-8954.00	055	Honacres, LLC
PROJECT NO.	**FEDERAL NUMBER**		**PROJECT**
12F0 FD52 043 93621 01R	STP 5374 (011)		**William Thomason Byway**

Property Owners: Honacres, LLC

This Memorandum of Understanding contains all the representations and agreements made between the parties hereto and upon which they relied in executing a Deed of Conveyance, Deed of Easement, or Grant of Easement dated 5/20/2021.

The related deed conveys the following interests and amounts of real property as shown on the official plans:

	Amount	Square feet	Acres
Fee simple	0.150	☐	☒
Permanent easement	NA	☐	☐
Temporary easement	8,638	☒	☐
Excess property in fee simple	NA	☐	☐

The total consideration to be paid for the property conveyed is $ 200,000.00.

This consideration includes payment for any and all reacquisition or reversion rights of the property owners or their heirs or assigns, which may arise pursuant to KRS 416.670.

☐ This is a total acquisition.

☒ This is a partial acquisition. The remaining property will have the following access to the proposed highway improvement:

- ☐ Access as provided by the Department's permit. Access not designated on the plans will be the sole responsibility of the Property Owners (proposed highway access is by permit).
- ☒ Access at designated points as shown on the plans (proposed highway access is limited).
- ☐ No access (proposed highway access is fully controlled).
- ☐ The remaining property will be landlocked by this acquisition.

☐ No improvements are being acquired.

☒ Improvements are being acquired. The disposition of the acquired improvements will be as follows:

- ☒ The Cabinet receives titles to the improvements.
- ☐ The Cabinet receives titles to the improvements, but for the salvage value of $ _____ the Property Owners agree to remove the same from the right of way as outlined in the building removal contract. When the structure has been moved clear of the right of way and easement areas, the Property Owners regain the titles. Where tenants occupy improvements, the tenants must be afforded ample time to relocate prior to the Property Owners' being authorized to start the removal.

SIGNS

☒ No sign is being acquired.

☐ One or more signs are being acquired.

- ☐ The Cabinet receives and retains title to each sign.
- ☐ The Cabinet receives title to each sign, but for the salvage value of $ _____ the Property Owners agree to remove the same from the right of way by _____ or forfeit both the recovery of each sign and the salvage value paid. _____

The Property Owners understand that they will not be required to vacate or move personal property from any improvement in less than 90 days from the date of receiving the written offer of relocation assistance. The Property Owners further understand that before being required to vacate or move personal property, they will be given a 30-day written notice that will specify the date they must be completely clear of the improvement.

The Property Owners will assist in obtaining necessary releases of all mortgages, liens, or other encumbrances on the property conveyed. They will pay direct all taxes due for the year in which the Cabinet receives title to the property and, upon submission of the paid receipt, will be reimbursed a pro-rata portion of these property taxes. Also, they will pay direct any penalty costs for prepayment of an existing recorded mortgage and similar expenses incidental to conveying real property to the Cabinet and, upon submission of properly supported paid receipts, will be reimbursed. All reimbursement claims must be deemed fair, necessary, and properly supported for payment.

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MEMORANDUM OF UNDERSTANDING

Unless otherwise stated, Property Owners state that no drainage outlets such as pipes, sump pump outlets, gutter downspouts, or septic system drainage of any kind, currently extend onto the existing right of way.

In addition, the parties agree as follows:
The KYTC also agrees to create an entrance to the property off of the Rhodes Street cul-de-sac (approximately at station number left 54+50.00), as well as an entrance on the North side of the automatic car wash for garbage pick up (approximately station number left 52+00.00).

As owners of the property to be conveyed, we request payment be made as follows:

Name: Honacres, LLC		Name:	
Address: 7001 Airport Drive Sellersburg, IN 47172		Address:	
SSN or Tax ID:	Amount of Check: $200,000	SSN or Tax ID:	Amount of Check: $
Telephone Number: 270-202-3064		Telephone Number:	
Name:		Name:	
Address:		Address:	
SSN or Tax ID:	Amount of Check: $	SSN or Tax ID:	Amount of Check: $
Telephone Number:		Telephone Number:	

Note: Attach additional pages, as needed.

The Property Owners acknowledge that if the agreed consideration for this transaction was negotiated based upon a waiver valuation/Minor Acquisition Review (MAR) amount of at least $10,000.00 but not more than $25,000.00, the Property Owners were offered the option of having the Cabinet obtain an appraisal of the property and have hereby waived that option.

This Memorandum of Understanding, together with the Right of Way Plans, the Deed of Conveyance, Deed of Easement, or Grant of Easement, and any other documents referenced in these instruments, represent all the terms and conditions of the agreement between the Transportation Cabinet and the Property Owners, which was reached without coercion, threats, or other promises by either party.

By their signatures on this document, the agents representing the Transportation Cabinet certify that they have no direct, indirect, present, or contemplated future interest in this property and in no way will benefit from this acquisition.

This Memorandum of Understanding was signed 5/20/2021.

Signature of Agents for Transportation Cabinet Shawna S Ruffett.

Signatures of Property Owners		Signatures of Property Owners
Joshua Honaker, Member		

Note: Attach additional pages, as needed.

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MEMORANDUM OF UNDERSTANDING

COUNTY	ITEM NO.	PARCEL	NAME
Grayson	04-8954.00	067	Gregory Scott Higdon
PROJECT NO.	**FEDERAL NUMBER**		**PROJECT**
12F0 FD52 043 93621 01R	STP 5374 (011)		**William Thomason Byway**

Property Owners: Gregory Scott Higdon

This Memorandum of Understanding contains all the representations and agreements made between the parties hereto and upon which they relied in executing a Deed of Conveyance, Deed of Easement, or Grant of Easement dated 4-14-21.

The related deed conveys the following interests and amounts of real property as shown on the official plans:

	Amount	Square feet	Acres
Fee simple	NA	☐	☐
Permanent easement	NA	☐	☐
Temporary easement	2,452	☒	☐
Excess property in fee simple	NA	☐	☐

The total consideration to be paid for the property conveyed is $ 500.00.

This consideration includes payment for any and all reacquisition or reversion rights of the property owners or their heirs or assigns, which may arise pursuant to KRS 416.670.

☐ This is a total acquisition.

☒ This is a partial acquisition. The remaining property will have the following access to the proposed highway improvement:

- ☐ Access as provided by the Department's permit. Access not designated on the plans will be the sole responsibility of the Property Owners (proposed highway access is by permit).
- ☒ Access at designated points as shown on the plans (proposed highway access is limited).
- ☐ No access (proposed highway access is fully controlled).
- ☐ The remaining property will be landlocked by this acquisition.

☒ No improvements are being acquired.

☐ Improvements are being acquired. The disposition of the acquired improvements will be as follows:

- ☐ The Cabinet receives titles to the improvements.
- ☐ The Cabinet receives titles to the improvements, but for the salvage value of $ _____ the Property Owners agree to remove the same from the right of way as outlined in the building removal contract. When the structure has been moved clear of the right of way and easement areas, the Property Owners regain the titles. Where tenants occupy improvements, the tenants must be afforded ample time to relocate prior to the Property Owners' being authorized to start the removal.

SIGNS

☒ No sign is being acquired.

☐ One or more signs are being acquired.

- ☐ The Cabinet receives and retains title to each sign.
- ☐ The Cabinet receives title to each sign, but for the salvage value of $ _____ the Property Owners agree to remove the same from the right of way by _____ or forfeit both the recovery of each sign and the salvage value paid. _____

The Property Owners understand that they will not be required to vacate or move personal property from any improvement in less than 90 days from the date of receiving the written offer of relocation assistance. The Property Owners further understand that before being required to vacate or move personal property, they will be given a 30-day written notice that will specify the date they must be completely clear of the improvement.

The Property Owners will assist in obtaining necessary releases of all mortgages, liens, or other encumbrances on the property conveyed. They will pay direct all taxes due for the year in which the Cabinet receives title to the property and, upon submission of the paid receipt, will be reimbursed a pro-rata portion of these property taxes. Also, they will pay direct any penalty costs for prepayment of an existing recorded mortgage and similar expenses incidental to conveying real property to the Cabinet and, upon submission of properly supported paid receipts, will be reimbursed. All reimbursement claims must be deemed fair, necessary, and properly supported for payment.

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Unless otherwise stated, Property Owners state that no drainage outlets such as pipes, sump pump outlets, gutter downspouts, or septic system drainage of any kind, currently extend onto the existing right of way.

In addition, the parties agree as follows: Remove all tress in the Temporary Easement Area

As owners of the property to be conveyed, we request payment be made as follows:

Name: Gregory Scott Higdon		Name:	
Address: 506 Alexander Drive Leitchfield, KY 42754		Address:	
SSN or Tax ID:	Amount of Check: $500.00	SSN or Tax ID:	Amount of Check: $
Telephone Number: 270-230-3030		Telephone Number:	
Name:		Name:	
Address:		Address:	
SSN or Tax ID:	Amount of Check: $	SSN or Tax ID:	Amount of Check: $
Telephone Number:		Telephone Number:	

Note: Attach additional pages, as needed.

The Property Owners acknowledge that if the agreed consideration for this transaction was negotiated based upon a waiver valuation/Minor Acquisition Review (MAR) amount of at least $10,000.00 but not more than $25,000.00, the Property Owners were offered the option of having the Cabinet obtain an appraisal of the property and have hereby waived that option.

This Memorandum of Understanding, together with the Right of Way Plans, the Deed of Conveyance, Deed of Easement, or Grant of Easement, and any other documents referenced in these instruments, represent all the terms and conditions of the agreement between the Transportation Cabinet and the Property Owners, which was reached without coercion, threats, or other promises by either party.

By their signatures on this document, the agents representing the Transportation Cabinet certify that they have no direct, indirect, present, or contemplated future interest in this property and in no way will benefit from this acquisition.

This Memorandum of Understanding was signed 4-14-2021.

Signature of Agents for Transportation Cabinet Sherrie Duffett

Signatures of Property Owners		Signatures of Property Owners
Gregory Scott Higdon		

Note: Attach additional pages, as needed.

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MEMORANDUM OF UNDERSTANDING

COUNTY	ITEM NO.	PARCEL	NAME
Grayson	04-8954.00	33	Watkins Development, Inc.
PROJECT NO.	**FEDERAL NUMBER**		**PROJECT**
12FO FD52 043 93621 01R	STP 5374 (011)		KY 3155

Property Owners: Watkins Development, Inc.

This Memorandum of Understanding contains all the representations and agreements made between the parties hereto and upon which they relied in executing a Deed of Conveyance, Deed of Easement, or Grant of Easement dated February 2nd, 2021.

The related deed conveys the following interests and amounts of real property as shown on the official plans:

	Amount	Square feet	Acres
Fee simple	4.026	☐	☒
Permanent easement		☐	☐
Temporary easement	38,056	☒	☐
Excess property in fee simple		☐	☐

The total consideration to be paid for the property conveyed is $ 0.00 Donation.

This consideration includes payment for any and all reacquisition or reversion rights of the property owners or their heirs or assigns, which may arise pursuant to KRS 416.670.

☐ This is a total acquisition.

☒ This is a partial acquisition. The remaining property will have the following access to the proposed highway improvement:

- ☐ Access as provided by the Department's permit. Access not designated on the plans will be the sole responsibility of the Property Owners (proposed highway access is by permit).
- ☒ Access at designated points as shown on the plans (proposed highway access is limited).
- ☐ No access (proposed highway access is fully controlled).
- ☐ The remaining property will be landlocked by this acquisition.

☒ No improvements are being acquired.

☐ Improvements are being acquired. The disposition of the acquired improvements will be as follows:

- ☐ The Cabinet receives titles to the improvements.
- ☐ The Cabinet receives titles to the improvements, but for the salvage value of $ _____ the Property Owners agree to remove the same from the right of way as outlined in the building removal contract. When the structure has been moved clear of the right of way and easement areas, the Property Owners regain the titles. Where tenants occupy improvements, the tenants must be afforded ample time to relocate prior to the Property Owners' being authorized to start the removal.

SIGNS

☒ No sign is being acquired.

☐ One or more signs are being acquired.

- ☐ The Cabinet receives and retains title to each sign.
- ☐ The Cabinet receives title to each sign, but for the salvage value of $ _____ the Property Owners agree to remove the same from the right of way by _____ or forfeit both the recovery of each sign and the salvage value paid.

The Property Owners understand that they will not be required to vacate or move personal property from any improvement in less than 90 days from the date of receiving the written offer of relocation assistance. The Property Owners further understand that before being required to vacate or move personal property, they will be given a 30-day written notice that will specify the date they must be completely clear of the improvement.

The Property Owners will assist in obtaining necessary releases of all mortgages, liens, or other encumbrances on the property conveyed. They will pay direct all taxes due for the year in which the Cabinet receives title to the property and, upon submission of the paid receipt, will be reimbursed a pro-rata portion of these property taxes. Also, they will pay direct any penalty costs for prepayment of an existing recorded mortgage and similar expenses incidental to conveying real property to the Cabinet and, upon submission of properly supported paid receipts, will be reimbursed. All reimbursement claims must be deemed fair, necessary, and properly supported for payment.

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Unless otherwise stated, Property Owners state that no drainage outlets such as pipes, sump pump outlets, gutter downspouts, or septic system drainage of any kind, currently extend onto the existing right of way.

In addition, the parties agree as follows:

The design of the frontage road does meet city specification, however there is no agreement in place with the city, nor has KYTC, discussed said roadway with them on this road becoming a city road. Therefore, this will not be a city road upon construction completion. For this frontage road to be in the city system, Mr. Watkins will have to finalize this with the city upon the time of development. KYTC does not guarantee this to happen in any way.

As owners of the property to be conveyed, we request payment be made as follows:

Name: Donation		Name:	
Address:		Address:	
SSN or Tax ID:	Amount of Check: $	SSN or Tax ID:	Amount of Check: $
Telephone Number:		Telephone Number:	
Name:		Name:	
Address:		Address:	
SSN or Tax ID:	Amount of Check: $	SSN or Tax ID:	Amount of Check: $
Telephone Number:		Telephone Number:	

Note: Attach additional pages, as needed.

The Property Owners acknowledge that if the agreed consideration for this transaction was negotiated based upon a waiver valuation/Minor Acquisition Review (MAR) amount of at least $10,000.00 but not more than $25,000.00, the Property Owners were offered the option of having the Cabinet obtain an appraisal of the property and have hereby waived that option.

This Memorandum of Understanding, together with the Right of Way Plans, the Deed of Conveyance, Deed of Easement, or Grant of Easement, and any other documents referenced in these instruments, represent all the terms and conditions of the agreement between the Transportation Cabinet and the Property Owners, which was reached without coercion, threats, or other promises by either party.

By their signatures on this document, the agents representing the Transportation Cabinet certify that they have no direct, indirect, present, or contemplated future interest in this property and in no way will benefit from this acquisition.

This Memorandum of Understanding was signed February 2nd 2021.

Signature of Agents for Transportation Cabinet Mabrie Sutton

Signatures of Property Owners		Signatures of Property Owners
Garry Watkins, President		

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Note: Attach additional pages, as needed.

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MEMORANDUM OF UNDERSTANDING

COUNTY	ITEM NO.	PARCEL	NAME
Grayson	04-8954.00	058	Gregory Scott Higdon
PROJECT NO.	**FEDERAL NUMBER**		**PROJECT**
12F0 FD52 043 93621 01R	STP 5374 (011)		**William Thomason Byway**

Property Owners: Gregory Scott Higdon

This Memorandum of Understanding contains all the representations and agreements made between the parties hereto and upon which they relied in executing a Deed of Conveyance, Deed of Easement, or Grant of Easement dated 1-26-2021.

The related deed conveys the following interests and amounts of real property as shown on the official plans:

	Amount	Square feet	Acres
Fee simple	0.04	☐	☒
Permanent easement	NA	☐	☐
Temporary easement	3,968	☒	☐
Excess property in fee simple	NA	☐	☐

The total consideration to be paid for the property conveyed is $ 93,500.00.

This consideration includes payment for any and all reacquisition or reversion rights of the property owners or their heirs or assigns, which may arise pursuant to KRS 416.670.

☐ This is a total acquisition.

☒ This is a partial acquisition. The remaining property will have the following access to the proposed highway improvement:

- ☐ Access as provided by the Department's permit. Access not designated on the plans will be the sole responsibility of the Property Owners (proposed highway access is by permit).
- ☒ Access at designated points as shown on the plans (proposed highway access is limited).
- ☐ No access (proposed highway access is fully controlled).
- ☐ The remaining property will be landlocked by this acquisition.

☐ No improvements are being acquired.

☒ Improvements are being acquired. The disposition of the acquired improvements will be as follows:

- ☐ The Cabinet receives titles to the improvements.
- ☒ The Cabinet receives titles to the improvements, but for the salvage value of $ 0.00 the Property Owners agree to remove the same from the right of way as outlined in the building removal contract. When the structure has been moved clear of the right of way and easement areas, the Property Owners regain the titles. Where tenants occupy improvements, the tenants must be afforded ample time to relocate prior to the Property Owners' being authorized to start the removal.

SIGNS

☒ No sign is being acquired.

☐ One or more signs are being acquired.

- ☐ The Cabinet receives and retains title to each sign.
- ☐ The Cabinet receives title to each sign, but for the salvage value of $ _____ the Property Owners agree to remove the same from the right of way by _____ or forfeit both the recovery of each sign and the salvage value paid. _____

The Property Owners understand that they will not be required to vacate or move personal property from any improvement in less than 90 days from the date of receiving the written offer of relocation assistance. The Property Owners further understand that before being required to vacate or move personal property, they will be given a 30-day written notice that will specify the date they must be completely clear of the improvement.

The Property Owners will assist in obtaining necessary releases of all mortgages, liens, or other encumbrances on the property conveyed. They will pay direct all taxes due for the year in which the Cabinet receives title to the property and, upon submission of the paid receipt, will be reimbursed a pro-rata portion of these property taxes. Also, they will pay direct any penalty costs for prepayment of an existing recorded mortgage and similar expenses incidental to conveying real property to the Cabinet and, upon submission of properly supported paid receipts, will be reimbursed. All reimbursement claims must be deemed fair, necessary, and properly supported for payment.

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Unless otherwise stated, Property Owners state that no drainage outlets such as pipes, sump pump outlets, gutter downspouts, or septic system drainage of any kind, currently extend onto the existing right of way.

In addition, the parties agree as follows:

Property Owner retains the building, owner is allowed to keep the apartment side of the building intact and remove the 3 bay garage to KYTC standards of building removal. DND will be added to the plans on the apartment side of the building in which the owner is allowed to keep intact.

As owners of the property to be conveyed, we request payment be made as follows:

Name: Gregory Scott Higdon		Name:	
Address: 506 Alexander Drive Leitchfield, KY 42754		Address:	
SSN or Tax ID:	Amount of Check: $93,500	SSN or Tax ID:	Amount of Check: $
Telephone Number: 270-230-3030		Telephone Number:	
Name:		Name:	
Address:		Address:	
SSN or Tax ID:	Amount of Check: $	SSN or Tax ID:	Amount of Check: $
Telephone Number:		Telephone Number:	

Note: Attach additional pages, as needed.

The Property Owners acknowledge that if the agreed consideration for this transaction was negotiated based upon a waiver valuation/Minor Acquisition Review (MAR) amount of at least $10,000.00 but not more than $25,000.00, the Property Owners were offered the option of having the Cabinet obtain an appraisal of the property and have hereby waived that option.

This Memorandum of Understanding, together with the Right of Way Plans, the Deed of Conveyance, Deed of Easement, or Grant of Easement, and any other documents referenced in these instruments, represent all the terms and conditions of the agreement between the Transportation Cabinet and the Property Owners, which was reached without coercion, threats, or other promises by either party.

By their signatures on this document, the agents representing the Transportation Cabinet certify that they have no direct, indirect, present, or contemplated future interest in this property and in no way will benefit from this acquisition.

This Memorandum of Understanding was signed 1-26-2021.

Signature of Agents for Transportation Cabinet Sherri Shuffett.

Signatures of Property Owners		Signatures of Property Owners
Gregory Scott Higdon Gregory Scott Higdon		

Note: Attach additional pages, as needed.

GUARDRAIL DELIVERY VERIFICATION SHEET

Contract Id: _____ **Contractor: _____**

Section Engineer: _____ **District & County: _____**

DESCRIPTION	UNIT	QTY LEAVING PROJECT	QTY RECEIVED@BB YARD
GUARDRAIL (Includes End treatments & crash cushions)	LF	_____	_____
STEEL POSTS	EACH	_____	_____
STEEL BLOCKS	EACH	_____	_____
WOOD OFFSET BLOCKS	EACH	_____	_____
BACK UP PLATES	EACH	_____	_____
CRASH CUSHION	EACH	_____	_____
NUTS, BOLTS, WASHERS	BAG/BCKT	_____	_____
DAMAGED RAIL TO MAINT. FACILITY	LF	_____	_____
DAMAGED POSTS TO MAINT. FACILITY	EACH	_____	_____

****Required Signatures before Leaving Project Site***

Printed Section Engineer's Representative_____ & Date_____

Signature Section Engineer's Representative_____& Date_____

Printed Contractor's Representative_____& Date_____

Signature Contractor's Representative_____& Date_____

****Required Signatures after Arrival at Bailey Bridge Yard (All material on truck must be counted & the quantity received column completed before signatures)***

Printed Bailey Bridge Yard Representative_____ & Date_____

Signature Bailey Bridge Yard Representative_____& Date_____

Printed Contractor's Representative_____& Date_____

Signature Contractor's Representative_____& Date_____

**Payment for the bid item remove guardrail will be based upon the quantities shown in the Bailey Bridge Yard received column. Payment will not be made for guardrail removal until the guardrail verification sheets are electronically submitted to the Section Engineer by the Bailey Bridge Yard Representative.

Completed Form Submitted to Section Engineer Date: _____ By: _____

PART II

SPECIFICATIONS AND STANDARD DRAWINGS

STANDARD SPECIFICATIONS

Any reference in the plans or proposal to previous editions of the *Standard Specifications for Road and Bridge Construction* and *Standard Drawings* are superseded by *Standard Specifications for Road and Bridge Construction, Edition of 2019* and *Standard Drawings, Edition of 2020.*

SUPPLEMENTAL SPECIFICATIONS

The contractor shall use the Supplemental Specifications that are effective at the time of letting. The Supplemental Specifications can be found at the following link:
http://transportation.ky.gov/Construction/Pages/Kentucky-Standard-Specifications.aspx

11N

SPECIAL NOTE FOR LONGITUDINAL PAVEMENT JOINT ADHESIVE

1. DESCRIPTION. This specification covers the requirements and practices for applying an asphalt adhesive material to the longitudinal joint of the surface course of an asphalt pavement. Apply the adhesive to the face of longitudinal joint between driving lanes for the first lane paved. Then, place and compact the adjacent lane against the treated face to produce a strong, durable, waterproof longitudinal joint.

2. MATERIALS, EQUIPMENT, AND PERSONNEL.

2.1 Joint Adhesive. Provide material conforming to Subsection 2.1.1.

2.1.1 Provide an adhesive conforming to the following requirements:

Property	Specification	Test Procedure
Viscosity, 400 ° F (Pa·s)	4.0 – 10.0	ASTM D 4402
Cone Penetration, 77 ° F	60 – 100	ASTM D 5329
Flow, 140 ° F (mm)	5.0 max.	ASTM D 5329
Resilience, 77 ° F (%)	30 min.	ASTM D 5329
Ductility, 77 ° F (cm)	30.0 min.	ASTM D 113
Ductility, 39 ° F (cm)	30.0 min.	ASTM D 113
Tensile Adhesion, 77 ° F (%)	500 min.	ASTM D 5329, Type II
Softening Point, ° F	171 min.	AASHTO T 53
Asphalt Compatibility	Pass	ASTM D 5329

Ensure the temperature of the pavement joint adhesive is between 380 and 410 °F when the material is extruded in a 0.125-inch-thick band over the entire face of the longitudinal joint.

2.2. Equipment.

2.2.1 Melter Kettle. Provide an oil-jacketed, double-boiler, melter kettle equipped with any needed agitation and recirculating systems.

2.2.2 Applicator System. Provide a pressure-feed-wand applicator system with an applicator shoe attached.

2.3 Personnel. Ensure a technical representative from the manufacturer of the pavement joint adhesive is present during the initial construction activities and available upon the request of the Engineer.

3. CONSTRUCTION.

3.1 Surface Preparation. Prior to the application of the pavement joint adhesive, ensure the face of the longitudinal joint is thoroughly dry and free from dust or any other debris that would inhibit adhesion. Clean the joint face by the use of compressed air.

Ensure this preparation process occurs shortly before application to prevent the return of debris on the joint face.

3.2 Pavement Joint Adhesive Application. Ensure the ambient temperature is a minimum of 40 ^{o} F during the application of the pavement joint adhesive. Prior to applying the adhesive, demonstrate competence in applying the adhesive according to this note to the satisfaction of the Engineer. Heat the adhesive in the melter kettle to the specified temperature range. Pump the adhesive from the melter kettle through the wand onto the vertical face of the cold joint. Apply the adhesive in a continuous band over the entire face of the longitudinal joint. Do not use excessive material in either thickness or location. Ensure the edge of the extruded adhesive material is flush with the surface of the pavement. Then, place and compact the adjacent lane against the joint face. Remove any excessive material extruded from the joint after compaction (a small line of material may remain).

3.3 Pavement Joint Adhesive Certification. Furnish the joint adhesive's certification to the Engineer stating the material conforms to all requirements herein prior to use.

3.4 Sampling and Testing. The Department will require a random sample of pavement joint adhesive from each manufacturer's lot of material. Extrude two 5 lb. samples of the heated material and forward the sample to the Division of Materials for testing. Reynolds oven bags, turkey size, placed inside small cardboard boxes or cement cylinder molds have been found suitable. Ensure the product temperature is 400°F or below at the time of sampling.

4. MEASUREMENT. The Department will measure the quantity of Pavement Joint Adhesive in linear feet. The Department will not measure for payment any extra materials, labor, methods, equipment, or construction techniques used to satisfy the requirements of this note. The Department will not measure for payment any trial applications of Pavement Joint Adhesive, the cleaning of the joint face, or furnishing and placing the adhesive. The Department will consider all such items incidental to the Pavement Joint Adhesive.

5. PAYMENT. The Department will pay for the Pavement Joint Adhesive at the Contract unit bid price and apply an adjustment for each manufacturer's lot of material based on the degree of compliance as defined in the following schedule. When a sample fails on two or more tests, the Department may add the deductions, but the total deduction will not exceed 100 percent.

11N

Pavement Joint Adhesive Price Adjustment Schedule						
Test	Specification	100% Pay	90% Pay	80% Pay	50% Pay	0% Pay
Joint Adhesive Referenced in Subsection 2.1.1						
Viscosity, 400 ° F (Pa•s)			3.0-3.4	2.5-2.9	2.0-2.4	≤1.9
ASTM D 3236	4.0-10.0	3.5-10.5	10.6-11.0	11.1-11.5	11.6-12.0	≥ 12.1
Cone Penetration, 77 ° F			54-56	51-53	48-50	≤ 47
ASTM D 5329	60-100	57-103	104-106	107-109	110-112	≥ 113
Flow, 140 ° F (mm) ASTM D 5329	≤ 5.0	≤ 5.5	5.6-6.0	6.1-6.5	6.6-7.0	≥ 7.1
Resilience, 77 ° F (%) ASTM D 5329	≥ 30	≥ 28	26-27	24-25	22-23	≤ 21
Tensile Adhesion, 77 ° F (%) ASTM D 5329	≥ 500	≥ 490	480-489	470-479	460-469	≤ 459
Softening Point, ° F AASHTO T 53	≥ 171	≥ 169	166-168	163-165	160-162	≤ 159
Ductility, 77 ° F (cm) ASTM D 113	≥ 30.0	≥ 29.0	28.0-28.9	27.0-27.9	26.0-26.9	≤ 25.9
Ductility, 39 ° F (cm) ASTM D 113	≥ 30.0	≥ 29.0	28.0-28.9	27.0-27.9	26.0-26.9	≤ 25.9

Code	Pay Item	Pay Unit
20071EC	Joint Adhesive	Linear Foot

May 7, 2014

PART III

EMPLOYMENT, WAGE AND RECORD REQUIREMENTS

TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS

LABOR AND WAGE REQUIREMENTS
APPLICABLE TO OTHER THAN FEDERAL-AID SYSTEM PROJECTS

I. Application
II. Nondiscrimination of Employees (KRS 344)

I. APPLICATION

1. These contract provisions shall apply to all work performed on the contract by the contractor with his own organization and with the assistance of workmen under his immediate superintendence and to all work performed on the contract by piecework, station work or by subcontract. The contractor's organization shall be construed to include only workmen employed and paid directly by the contractor and equipment owned or rented by him, with or without operators.

2. The contractor shall insert in each of his subcontracts all of the stipulations contained in these Required Provisions and such other stipulations as may be required.

3. A breach of any of the stipulations contained in these Required Provisions may be grounds for termination of the contract.

II. NONDISCRIMINATION OF EMPLOYEES

AN ACT OF THE KENTUCKY
GENERAL ASSEMBLY TO PREVENT
DISCRIMINATION IN EMPLOYMENT
KRS CHAPTER 344
EFFECTIVE JUNE 16, 1972

The contract on this project, in accordance with KRS Chapter 344, provides that during the performance of this contract, the contractor agrees as follows:

1. The contractor shall not fail or refuse to hire, or shall not discharge any individual, or otherwise discriminate against an individual with respect to his compensation, terms, conditions, or privileges of employment, because of such individual's race, color, religion, national origin, sex, disability or age (forty and above); or limit, segregate, or classify his employees in any way which would deprive or tend to deprive an individual of employment opportunities or otherwise adversely affect his status as an employee, because of such individual's race, color, religion, national origin, sex, disability or age forty (40) and over. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The contractor shall not print or publish or cause to be printed or published a notice or advertisement relating to employment by such an employer or membership in or any classification or referral for employment by the employment agency, indicating any preference, limitation, specification, or discrimination, based on race, color, religion, national origin, sex, or age forty (40) and over, or because the person is a qualified individual with a disability, except that such a notice or advertisement may indicate a preference, limitation, or specification based on religion, national origin, sex, or age forty (40) and over, or because the person is a qualified individual with a disability, when religion, national origin, sex, or age forty (40) and over, or because the person is a qualified individual with a disability, is a bona fide occupational qualification for employment.

3. If the contractor is in control of apprenticeship or other training or retraining, including on-the-job training programs, he shall not discriminate against an individual because of his race, color, religion, national origin, sex, disability or age forty (40) and over, in admission to, or employment in any program established to provide apprenticeship or other training.

4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representative of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment. The contractor will take such action with respect to any subcontract or purchase order as the administrating agency may direct as a means of enforcing such provisions, including sanctions for non-compliance.

Revised: January 25, 2017

EXECUTIVE BRANCH CODE OF ETHICS

In the 1992 regular legislative session, the General Assembly passed and Governor Brereton Jones signed Senate Bill 63 (codified as KRS 11A), the Executive Branch Code of Ethics, which states, in part:

KRS 11A.040 (7) provides:

No present or former public servant shall, within six (6) months following termination of his office or employment, accept employment, compensation, or other economic benefit from any person or business that contracts or does business with, or is regulated by, the state in matters in which he was directly involved during the last thirty-six (36) months of his tenure. This provision shall not prohibit an individual from returning to the same business, firm, occupation, or profession in which he was involved prior to taking office or beginning his term of employment, or for which he received, prior to his state employment, a professional degree or license, provided that, for a period of six (6) months, he personally refrains from working on any matter in which he was directly involved during the last thirty-six (36) months of his tenure in state government. This subsection shall not prohibit the performance of ministerial functions, including but not limited to filing tax returns, filing applications for permits or licenses, or filing incorporation papers, nor shall it prohibit the former officer or public servant from receiving public funds disbursed through entitlement programs.

KRS 11A.040 (9) states:

A former public servant shall not represent a person or business before a state agency in a matter in which the former public servant was directly involved during the last thirty-six (36) months of his tenure, for a period of one (1) year after the latter of:

a) The date of leaving office or termination of employment; or
b) The date the term of office expires to which the public servant was elected.

This law is intended to promote public confidence in the integrity of state government and to declare as public policy the idea that state employees should view their work as a public trust and not as a way to obtain private benefits.

If you have worked for the executive branch of state government within the past six months, you may be subject to the law's prohibitions. The law's applicability may be different if you hold elected office or are contemplating representation of another before a state agency.

Also, if you are affiliated with a firm which does business with the state and which employs former state executive-branch employees, you should be aware that the law may apply to them.

In case of doubt, the law permits you to request an advisory opinion from the Executive Branch Ethics Commission, 1025 Capital Center Drive, Suite 104, Frankfort, Kentucky 40601; telephone (502) 564-7954.

Revised: May 23, 2022

Kentucky Equal Employment Opportunity Act of 1978

The requirements of the Kentucky Equal Employment Opportunity Act of 1978 (KRS 45.560-45.640) shall apply to this Contract. The apparent low Bidder will be required to submit EEO forms to the Division of Construction Procurement, which will then forward to the Finance and Administration Cabinet for review and approval. No award will become effective until all forms are submitted and EEO/CC has certified compliance. The required EEO forms are as follows:

- EEO-1: Employer Information Report
- Affidavit of Intent to Comply
- Employee Data Sheet
- Subcontractor Report

These forms are available on the Finance and Administration's web page under ***Vendor Information, Standard Attachments and General Terms*** at the following address: **https://www.eProcurement.ky.gov**.

Bidders currently certified as being in compliance by the Finance and Administration Cabinet may submit a copy of their approval letter in lieu of the referenced EEO forms.

For questions or assistance please contact the Finance and Administration Cabinet by email at **finance.contractcompliance@ky.gov** or by phone at 502-564-2874.

EMPLOYEE RIGHTS
UNDER THE FAIR LABOR STANDARDS ACT

THE UNITED STATES DEPARTMENT OF LABOR WAGE AND HOUR DIVISION

FEDERAL MINIMUM WAGE
$7.25 PER HOUR
BEGINNING JULY 24, 2009

OVERTIME PAY

At least 1½ times your regular rate of pay for all hours worked over 40 in a workweek.

CHILD LABOR

An employee must be at least **16** years old to work in most non-farm jobs and at least **18** to work in non-farm jobs declared hazardous by the Secretary of Labor.

Youths **14** and **15** years old may work outside school hours in various non-manufacturing, non-mining, non-hazardous jobs under the following conditions:

No more than

- **3** hours on a school day or **18** hours in a school week;
- **8** hours on a non-school day or **40** hours in a non-school week.

Also, work may not begin before **7 a.m.** or end after **7 p.m.**, except from June 1 through Labor Day, when evening hours are extended to **9 p.m.** Different rules apply in agricultural employment.

TIP CREDIT

Employers of "tipped employees" must pay a cash wage of at least $2.13 per hour if they claim a tip credit against their minimum wage obligation. If an employee's tips combined with the employer's cash wage of at least $2.13 per hour do not equal the minimum hourly wage, the employer must make up the difference. Certain other conditions must also be met.

ENFORCEMENT

The Department of Labor may recover back wages either administratively or through court action, for the employees that have been underpaid in violation of the law. Violations may result in civil or criminal action.

Employers may be assessed civil money penalties of up to $1,100 for each willful or repeated violation of the minimum wage or overtime pay provisions of the law and up to $11,000 for each employee who is the subject of a violation of the Act's child labor provisions. In addition, a civil money penalty of up to $50,000 may be assessed for each child labor violation that causes the death or serious injury of any minor employee, and such assessments may be doubled, up to $100,000, when the violations are determined to be willful or repeated. The law also prohibits discriminating against or discharging workers who file a complaint or participate in any proceeding under the Act.

ADDITIONAL INFORMATION

- Certain occupations and establishments are exempt from the minimum wage and/or overtime pay provisions.
- Special provisions apply to workers in American Samoa and the Commonwealth of the Northern Mariana Islands.
- Some state laws provide greater employee protections; employers must comply with both.
- The law requires employers to display this poster where employees can readily see it.
- Employees under 20 years of age may be paid $4.25 per hour during their first 90 consecutive calendar days of employment with an employer.
- Certain full-time students, student learners, apprentices, and workers with disabilities may be paid less than the minimum wage under special certificates issued by the Department of Labor.

For additional information:

1-866-4-USWAGE
(1-866-487-9243) TTY: 1-877-889-5627

WHD U.S. Wage and Hour Division

WWW.WAGEHOUR.DOL.GOV

U.S. Department of Labor | Wage and Hour Division

WHD Publication 1088 (Revised July 2009)

PART IV

INSURANCE

Refer to
Kentucky Standard Specifications for Road and Bridge Construction,
current edition

PART V

BID ITEMS

PART IV

BID ITEMS

251002

PROPOSAL BID ITEMS

Report Date 12/19/24

Section: 0001 - PAVING

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0010	00003		CRUSHED STONE BASE	46,843.00	TON		$	
0020	00013		LIME STABILIZED ROADBED	49,911.00	SQYD		$	
0030	00014		LIME	1,402.00	TON		$	
0040	00078		CRUSHED AGGREGATE SIZE NO 2	13,182.00	TON		$	
0050	00100		ASPHALT SEAL AGGREGATE	456.00	TON		$	
0060	00103		ASPHALT SEAL COAT	63.00	TON		$	
0070	00190		LEVELING & WEDGING PG64-22	738.00	TON		$	
0080	00212		CL2 ASPH BASE 1.00D PG64-22	9,893.00	TON		$	
0090	00216		CL3 ASPH BASE 1.00D PG76-22	635.00	TON		$	
0100	00221		CL2 ASPH BASE 0.75D PG64-22	6,861.00	TON		$	
0110	00301		CL2 ASPH SURF 0.38D PG64-22	4,813.00	TON		$	
0120	00307		CL2 ASPH SURF 0.38B PG64-22	1,313.00	TON		$	
0130	00356		ASPHALT MATERIAL FOR TACK	70.00	TON		$	
0140	00358		ASPHALT CURING SEAL	51.00	TON		$	
0150	00387		CL3 ASPH SURF 0.38B PG76-22	317.00	TON		$	
0160	02084		JPC PAVEMENT-8 IN	825.00	SQYD		$	
0170	02602		FABRIC-GEOTEXTILE CLASS 1	14,917.00	SQYD		$	
0180	02604		FABRIC-GEOTEXTILE CLASS 1A	17,302.00	SQYD		$	
0190	02702		SAND FOR BLOTTER	126.00	TON		$	
0200	08100		CONCRETE-CLASS A	221.00	CUYD		$	
0210	20071EC		JOINT ADHESIVE	39,397.00	LF		$	

Section: 0002 - ROADWAY

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0220	01000		PERFORATED PIPE-4 IN	1,476.00	LF		$	
0230	01010		NON-PERFORATED PIPE-4 IN	1,039.00	LF		$	
0240	01020		PERF PIPE HEADWALL TY 1-4 IN	3.00	EACH		$	
0250	01024		PERF PIPE HEADWALL TY 2-4 IN	8.00	EACH		$	
0260	01028		PERF PIPE HEADWALL TY 3-4 IN	13.00	EACH		$	
0270	01691		FLUME INLET TYPE 2	3.00	EACH		$	
0280	01740		CORED HOLE DRAINAGE BOX CON-4 IN	7.00	EACH		$	
0290	01810		STANDARD CURB AND GUTTER	1,872.00	LF		$	
0300	01820		LIP CURB AND GUTTER	895.00	LF		$	
0310	01875		STANDARD HEADER CURB	1,597.00	LF		$	
0320	01891		ISLAND HEADER CURB TYPE 2	1,082.00	LF		$	
0330	01982		DELINEATOR FOR GUARDRAIL MONO DIRECTIONAL WHITE	49.00	EACH		$	
0340	02014		BARRICADE-TYPE III	31.00	EACH		$	
0350	02091		REMOVE PAVEMENT	2,667.00	SQYD		$	
0360	02159		TEMP DITCH	10,890.00	LF		$	
0370	02160		CLEAN TEMP DITCH	5,445.00	LF		$	
0380	02223		GRANULAR EMBANKMENT	20,222.00	CUYD		$	
0390	02230		EMBANKMENT IN PLACE	350,460.00	CUYD		$	
0400	02242		WATER	820.00	MGAL		$	
0410	02262		FENCE-WOVEN WIRE TYPE 1	11,203.00	LF		$	

PROPOSAL BID ITEMS

251002

Report Date 12/19/24

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0420	02274		FENCE-6 FT CHAIN LINK	171.00	LF		$	
0430	02287		DOUBLE VEHICULAR CHAIN LINK GATE	2.00	EACH		$	
0440	02360		GUARDRAIL TERMINAL SECTION NO 1	6.00	EACH		$	
0450	02381		REMOVE GUARDRAIL	1,106.00	LF		$	
0460	02391		GUARDRAIL END TREATMENT TYPE 4A	10.00	EACH		$	
0470	02397		TEMP GUARDRAIL	2,062.50	LF		$	
0480	02429		RIGHT-OF-WAY MONUMENT TYPE 1	104.00	EACH		$	
0490	02432		WITNESS POST	3.00	EACH		$	
0500	02483		CHANNEL LINING CLASS II	8,655.00	TON		$	
0510	02484		CHANNEL LINING CLASS III	1,964.00	TON		$	
0520	02545		CLEARING AND GRUBBING 70 ACRES	1.00	LS		$	
0530	02555		CONCRETE-CLASS B	25.00	CUYD		$	
0540	02562		TEMPORARY SIGNS	770.00	SQFT		$	
0550	02585		EDGE KEY	496.00	LF		$	
0560	02603		FABRIC-GEOTEXTILE CLASS 2	14,000.00	SQYD		$	
0570	02607		FABRIC-GEOTEXTILE CLASS 2 FOR PIPE	9,543.00	SQYD	$2.00	$	$19,086.00
0580	02650		MAINTAIN & CONTROL TRAFFIC	1.00	LS		$	
0590	02651		DIVERSIONS (BY-PASS DETOURS) SOUTH ENGLISH ST.	1.00	LS		$	
0600	02651		DIVERSIONS (BY-PASS DETOURS) US-62	1.00	LS		$	
0610	02671		PORTABLE CHANGEABLE MESSAGE SIGN	6.00	EACH		$	
0620	02690		SAFELOADING	42.00	CUYD		$	
0630	02697		EDGELINE RUMBLE STRIPS	19,112.00	LF		$	
0640	02701		TEMP SILT FENCE	10,890.00	LF		$	
0650	02703		SILT TRAP TYPE A	70.00	EACH		$	
0660	02704		SILT TRAP TYPE B	70.00	EACH		$	
0670	02705		SILT TRAP TYPE C	70.00	EACH		$	
0680	02706		CLEAN SILT TRAP TYPE A	70.00	EACH		$	
0690	02707		CLEAN SILT TRAP TYPE B	70.00	EACH		$	
0700	02708		CLEAN SILT TRAP TYPE C	70.00	EACH		$	
0710	02720		SIDEWALK-4 IN CONCRETE	780.00	SQYD		$	
0720	02726		STAKING	1.00	LS		$	
0730	05950		EROSION CONTROL BLANKET	16,962.00	SQYD		$	
0740	05952		TEMP MULCH	223,808.00	SQYD		$	
0750	05953		TEMP SEEDING AND PROTECTION	167,856.00	SQYD		$	
0760	05963		INITIAL FERTILIZER	8.20	TON		$	
0770	05964		MAINTENANCE FERTILIZER	13.70	TON		$	
0780	05985		SEEDING AND PROTECTION	264,652.00	SQYD		$	
0790	05990		SODDING	696.00	SQYD		$	
0800	05992		AGRICULTURAL LIMESTONE	164.00	TON		$	
0810	06510		PAVE STRIPING-TEMP PAINT-4 IN	17,200.00	LF		$	
0820	06514		PAVE STRIPING-PERM PAINT-4 IN	19,001.00	LF		$	
0830	06542		PAVE STRIPING-THERMO-6 IN W	23,437.00	LF		$	
0840	06543		PAVE STRIPING-THERMO-6 IN Y	28,114.00	LF		$	
0850	06568		PAVE MARKING-THERMO STOP BAR-24IN	264.00	LF		$	
0860	06569		PAVE MARKING-THERMO CROSS-HATCH	1,896.00	SQFT		$	
0870	06574		PAVE MARKING-THERMO CURV ARROW	42.00	EACH		$	
0880	10020NS		FUEL ADJUSTMENT	185,590.00	DOLL	$1.00	$	$185,590.00

251002

PROPOSAL BID ITEMS

Report Date 12/19/24

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0890	10030NS		ASPHALT ADJUSTMENT	95,293.00	DOLL	$1.00	$	$95,293.00
0900	20191ED		OBJECT MARKER TY 3	10.00	EACH		$	
0910	20458ES403		CENTERLINE RUMBLE STRIPS	8,874.00	LF		$	
0920	20629NS719		THRIE BEAM TO W BEAM CONNECTOR	4.00	EACH		$	
0930	21289ED		LONGITUDINAL EDGE KEY	2,780.00	LF		$	
0940	21802EN		G/R STEEL W BEAM-S FACE (7 FT POST)	4,762.50	LF		$	
0950	22520EN		PAVE MARKING-THERMO YIELD BAR-36 IN	60.00	LF		$	
0960	23158ES505		DETECTABLE WARNINGS	102.00	SQFT		$	
0970	23649EC		DRAIN POND KY 3155 STA. 923+50	1.00	LS		$	
0980	23649EC		DRAIN POND KY 3155 STA. 958+00	1.00	LS		$	
0990	23864EC		CHANNEL LINING CLASS III-MOD	1,887.00	TON		$	
1000	24540		R/W MONUMENT TYPE 3	85.00	EACH		$	
1010	24683ED		PAVE MARKING-THERMO DOTTED LANE EXTEN	40.00	LF		$	
1020	26239EC		RAILROAD FLAGGER	20.00	DAY		$	

Section: 0003 - DRAINAGE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1030	00440		ENTRANCE PIPE-15 IN	1,195.00	LF		$	
1040	00441		ENTRANCE PIPE-18 IN	340.00	LF		$	
1050	00443		ENTRANCE PIPE-24 IN	188.00	LF		$	
1060	00462		CULVERT PIPE-18 IN	578.00	LF		$	
1070	00466		CULVERT PIPE-30 IN	613.00	LF		$	
1080	00468		CULVERT PIPE-36 IN	1,080.00	LF		$	
1090	00469		CULVERT PIPE-42 IN	367.00	LF		$	
1100	00470		CULVERT PIPE-48 IN	289.00	LF		$	
1110	00521		STORM SEWER PIPE-15 IN	369.00	LF		$	
1120	00522		STORM SEWER PIPE-18 IN	597.00	LF		$	
1130	00524		STORM SEWER PIPE-24 IN	187.00	LF		$	
1140	01204		PIPE CULVERT HEADWALL-18 IN	2.00	EACH		$	
1150	01210		PIPE CULVERT HEADWALL-30 IN	5.00	EACH		$	
1160	01212		PIPE CULVERT HEADWALL-36 IN	8.00	EACH		$	
1170	01214		PIPE CULVERT HEADWALL-42 IN	4.00	EACH		$	
1180	01216		PIPE CULVERT HEADWALL-48 IN	4.00	EACH		$	
1190	01450		S & F BOX INLET-OUTLET-18 IN	13.00	EACH		$	
1200	01452		S & F BOX INLET-OUTLET-30 IN	3.00	EACH		$	
1210	01456		CURB BOX INLET TYPE A	9.00	EACH		$	
1220	01490		DROP BOX INLET TYPE 1	4.00	EACH		$	
1230	01568		DROP BOX INLET TYPE 13S	1.00	EACH		$	
1240	01577		DROP BOX INLET TYPE 14	2.00	EACH		$	
1250	01634		CAP CURB BOX INLET	1.00	EACH		$	
1260	01756		MANHOLE TYPE A	2.00	EACH		$	
1270	01762		MANHOLE TYPE B MOD	1.00	EACH		$	
1280	21541NN		CORED HOLE DRAINAGE BOX CON- 18 IN	1.00	EACH		$	
1290	23126EN		BORE AND JACK PIPE-18 IN	103.00	LF		$	
1300	23610NC		CORED HOLE DRAINAGE BOX CON	1.00	EACH		$	

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PROPOSAL BID ITEMS

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1310	24814EC		PIPELINE INSPECTION	5,524.00	LF		$	

Section: 0004 - BRIDGE - P&L RAILROAD - DWG. 28382

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1320	02231		STRUCTURE GRANULAR BACKFILL	1,557.00	CUYD		$	
1330	02612		HANDRAIL-TYPE A-2	71.33	LF		$	
1340	02998		MASONRY COATING	449.00	SQYD		$	
1350	08002		STRUCTURE EXCAV-SOLID ROCK	489.00	CUYD		$	
1360	08003		FOUNDATION PREPARATION	1.00	LS		$	
1370	08104		CONCRETE-CLASS AA	1,056.40	CUYD		$	
1380	08105		CONCRETE-CLASS AAA	59.70	CUYD		$	
1390	08150		STEEL REINFORCEMENT	135,813.00	LB		$	
1400	08151		STEEL REINFORCEMENT-EPOXY COATED	8,935.00	LB		$	
1410	08160		STRUCTURAL STEEL 107,071 LB	1.00	LS		$	
1420	24848EC		DECK WATERPROOFING	1.00	LS		$	
1430	24849EC		DECK DRAIN SYSTEM	1.00	LS		$	
1440	25028ED		RAIL SYSTEM SINGLE SLOPE - 40 IN	65.20	LF		$	

Section: 0005 - BRIDGE- CULVERT - CREEK - DWG. 28383

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1450	08003		FOUNDATION PREPARATION	1.00	LS		$	
1460	08100		CONCRETE-CLASS A	208.10	CUYD		$	
1470	08150		STEEL REINFORCEMENT	27,693.00	LB		$	

Section: 0006 - UTILITY - GAS LINE RELOCATION

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1480	16000		G DIRECTIONAL BORE	245.00	LF		$	
1490	16008		G ENCASEMENT STEEL OPEN CUT RANGE 1	228.00	LF		$	
1500	16009		G ENCASEMENT STEEL OPEN CUT RANGE 2	1,243.00	LF		$	
1510	16010		G ENCASEMENT STEEL OPEN CUT RANGE 3	185.00	LF		$	
1520	16015		G PIPE POLYETHYLENE/PLASTIC 02 INCH	4,575.00	LF		$	
1530	16017		G PIPE POLYETHYLENE/PLASTIC 04 INCH	4,205.00	LF		$	
1540	16018		G PIPE POLYETHYLENE/PLASTIC 06 INCH	455.00	LF		$	
1550	16034		G SERVICE LONG SIDE 3/4 INCH	6.00	EACH		$	
1560	16039		G SERVICE SHORT SIDE 3/4 INCH	10.00	EACH		$	
1570	16041		G TIE-IN POLYETHYLENE/PLASTIC 02 INCH	9.00	EACH		$	
1580	16043		G TIE-IN POLYETHYLENE/PLASTIC 04 INCH	3.00	EACH		$	
1590	16044		G TIE-IN POLYETHYLENE/PLASTIC 06 INCH	4.00	EACH		$	
1600	16049		G VALVE POLYETHYLENE/PLASTIC 02 INCH	16.00	EACH		$	
1610	16051		G VALVE POLYETHYLENE/PLASTIC 04 INCH	6.00	EACH		$	
1620	16052		G VALVE POLYETHYLENE/PLASTIC 06 INCH	4.00	EACH		$	
1630	16071		G METER AND REGULATOR 2 INCH	1.00	EACH		$	

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PROPOSAL BID ITEMS

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1640	16072		G METER AND REGULATOR 3/4 INCH	1.00	EACH		$	
1650	16607		G CAP EXISTING MAIN	15.00	EACH		$	
1660	16611		G SERVICE TEST AND RELIGHT	16.00	EACH		$	

Section: 0007 - SEWER - CITY OF LEITCHFIELD

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1670	15000		S BYPASS PUMPING	3.00	EACH		$	
1680	15023		S ENCASEMENT STEEL OPEN CUT RANGE 4	100.00	LF		$	
1690	15057		S FORCE MAIN PVC 02 INCH	265.00	LF		$	
1700	15060		S FORCE MAIN PVC 06 INCH	495.00	LF		$	
1710	15069		S FORCE MAIN TAP SLEEVE/VALVE RNG 1	2.00	EACH		$	
1720	15071		S FORCE MAIN TIE-IN 02 INCH	2.00	EACH		$	
1730	15084		S FORCE MAIN VALVE GATE	2.00	EACH		$	
1740	15090		S LATERAL SHORT SIDE 06 INCH	2.00	EACH		$	
1750	15092		S MANHOLE	11.00	EACH		$	
1760	15094		S MANHOLE ADJUST TO GRADE	1.00	EACH		$	
1770	15099		S MANHOLE TAP EXISTING	1.00	EACH		$	
1780	15112		S PIPE PVC 08 INCH GRAVITY	1,160.00	LF		$	
1790	15155		S CAP EXISTING MAIN	8.00	EACH		$	

Section: 0008 - LIGHTING - CITY OF LEITCHFIELD

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1800	04701		POLE 40 FT MTG HT	12.00	EACH		$	
1810	04724		BRACKET 12 FT	8.00	EACH		$	
1820	04725		BRACKET 15 FT	4.00	EACH		$	
1830	04740		POLE BASE	12.00	EACH		$	
1840	04750		TRANSFORMER BASE	12.00	EACH		$	
1850	04761		LIGHTING CONTROL EQUIPMENT	1.00	EACH		$	
1860	04780		FUSED CONNECTOR KIT	24.00	EACH		$	
1870	04820		TRENCHING AND BACKFILLING	1,950.00	LF		$	
1880	04832		WIRE-NO. 12	2,050.00	LF		$	
1890	20391NS835		ELECTRICAL JUNCTION BOX TYPE A	5.00	EACH		$	
1900	21543EN		BORE AND JACK CONDUIT	480.00	LF		$	
1910	23778EC		WIRE-NO. 10	8,700.00	LF		$	
1920	24589ED		LED LUMINAIRE	12.00	EACH		$	
1930	24900EC		PVC CONDUIT-1 1/4 IN-SCHEDULE 80	1,705.00	LF		$	
1940	24901EC		PVC CONDUIT-2 IN-SCHEDULE 80	700.00	LF		$	

Section: 0009 - WATERLINE - CITY OF LEITCHFIELD

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1950	14003		W CAP EXISTING MAIN	9.00	EACH		$	
1960	14014		W ENCASEMENT STEEL OPEN CUT RANGE 3	640.00	LF		$	

PROPOSAL BID ITEMS

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1970	14019		W FIRE HYDRANT ASSEMBLY	2.00	EACH		$	
1980	14021		W FIRE HYDRANT REMOVE	2.00	EACH		$	
1990	14028		W METER 3/4 INCH	4.00	EACH		$	
2000	14059		W PIPE PVC 06 INCH	2,350.00	LF		$	
2010	14060		W PIPE PVC 08 INCH	500.00	LF		$	
2020	14080		W SERV PE/PLST LONG SIDE 3/4 IN	1.00	EACH		$	
2030	14085		W SERV PE/PLST SHORT SIDE 3/4 IN	6.00	EACH		$	
2040	14089		W TAPPING SLEEVE AND VALVE SIZE 1	10.00	EACH		$	
2050	14105		W VALVE 06 INCH	3.00	EACH		$	
2060	14158		W BLOWOFF ASSEMBLY LEITCHFIELD	5.00	EACH		$	

Section: 0010 - WATERLINE - GRAYSON COUNTY

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
2070	14003		W CAP EXISTING MAIN	1.00	EACH		$	
2080	14009		W ENCASEMENT STEEL BORED RANGE 4	35.00	LF		$	
2090	14060		W PIPE PVC 08 INCH	1,731.00	LF		$	
2100	14081		W SERVICE RELOCATE	2.00	EACH		$	
2110	14086		W SERVICE SPECIAL	1.00	EACH		$	
2120	14089		W TAPPING SLEEVE AND VALVE SIZE 1	1.00	EACH		$	
2130	14095		W TIE-IN 08 INCH	1.00	EACH		$	
2140	14507		W ENCASEMENT STEEL OPEN CUT RANGE 4 INST	190.00	LF		$	

Section: 0011 - DEMOBILIZATION &/OR MOBILIZATION

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
2150	02568		MOBILIZATION	1.00	LS		$	
2160	02569		DEMOBILIZATION	1.00	LS		$	