



CALL NO. 302

CONTRACT ID. 151064

FRANKLIN COUNTY

FED/STATE PROJECT NUMBER FD04 SPP 037 0060 009-010

DESCRIPTION KENTUCKY STATE UNIVERSITY PEDESTRIAN BRIDGE(US-60)

WORK TYPE BRIDGE WITH GRADE, DRAIN & SURFACE

PRIMARY COMPLETION DATE 10/15/2016

LETTING DATE: October 23,2015

Sealed Bids will be received electronically through the Bid Express bidding service until 10:00 AM EASTERN DAYLIGHT TIME October 23,2015. Bids will be publicly announced at 10:00 AM EASTERN DAYLIGHT TIME.

PLANS AVAILABLE FOR THIS PROJECT.

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

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PART I

SCOPE OF WORK

ADMINISTRATIVE DISTRICT - 05

CONTRACT ID - 151064
FD04 SPP 037 0060 009-010
COUNTY - FRANKLIN
PCN - DE03700601564
FD04 SPP 037 0060 009-010

KENTUCKY STATE UNIVERSITY PEDESTRIAN BRIDGE(US-60) CONSTRUCT PEDESTRIAN BRIDGE ACROSS
US-60 ON KENTUCKY STATE UNIVERSITY CAMPUS BETWEEN HATHAWAY HALL AND WHITNEY YOUNG
HALL.BRIDGE WITH GRADE, DRAIN & SURFACE SYP NO. 05-08714.00.
GEOGRAPHIC COORDINATES LATITUDE 38:14:00.00 LONGITUDE 84:52:00.00

COMPLETION DATE(S):
COMPLETED BY 10/15/2016 APPLIES TO ENTIRE CONTRACT

CONTRACT NOTES

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 Expedite Bidding Program available on the Internet web site of the Department of Highways, Division of Construction Procurement. (www.transportation.ky.gov/construction-procurement)

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 is advised that the Underground Facility Damage Protection Act of 1994, became law January 1, 1995. It is the contractor's responsibility to determine the impact of the act regarding this project, and take all steps necessary to be in compliance with the provision of the act.

SPECIAL NOTE FOR COMPOSITE OFFSET BLOCKS

Contrary to the Standard Drawings (2012 edition) the Cabinet will allow 6" composite offset blocks in lieu of wooden offset blocks, except as specified on proprietary end treatments and crash cushions. The composite blocks shall be selected from the Cabinet's List of Approved Materials.

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 fax (502) 564-7299 or 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/contract). 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 contractor, as defined in KRS 45A.030 (9) 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 contract for the purpose of financial audit or program review. Records and other prequalification information confidentially disclosed as part of the bid process shall not be deemed as directly pertinent to the contract and shall be exempt from disclosure as provided in KRS 61.878(1)(c). 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.

In the event of a dispute between the contractor and the contracting agency, Attorney General, or the Auditor of Public Accounts over documents that are eligible for production and review, the Finance and Administration Cabinet shall review the dispute and issue a determination, in accordance with Secretary's Order 11-004. (See attachment)

10/29/12



Steven L. Beshear
Governor

Commonwealth of Kentucky
Finance and Administration Cabinet
OFFICE OF THE SECRETARY
Room 383, Capitol Annex
702 Capital Avenue
Frankfort, KY 40601-3462
(502) 564-4240
Fax (502) 564-6785

Lori H. Flanery
Secretary

SECRETARY'S ORDER 11-004

FINANCE AND ADMINISTRATION CABINET

Vendor Document Disclosure

WHEREAS, in order to promote accountability and transparency in governmental operations, the Finance and Administration Cabinet believes that a mechanism should be created which would provide for review and assistance to an Executive Branch agency if said agency cannot obtain access to documents that it deems necessary to conduct a review of the records of a private vendor that holds a contract to provide goods and/or services to the Commonwealth; and

WHEREAS, in order to promote accountability and transparency in governmental operations, the Finance and Administration Cabinet believes that a mechanism should be created which would provide for review and assistance to an Executive Branch agency if said agency cannot obtain access to documents that it deems necessary during the course of an audit, investigation or any other inquiry by an Executive Branch agency that involves the review of documents; and

WHEREAS, KRS 42.014 and KRS 12.270 authorizes the Secretary of the Finance and Administration Cabinet to establish the internal organization and assignment of functions which are not established by statute relating to the Finance and Administration Cabinet; further, KRS Chapter 45A.050 and 45A.230 authorizes the Secretary of the Finance and Administration Cabinet to procure, manage and control all supplies and services that are procured by the Commonwealth and to intervene in controversies among vendors and state agencies; and

NOW, THEREFORE, pursuant to the authority vested in me by KRS 42.014, KRS 12.270, KRS 45A.050, and 45A.230, I, Lori H. Flanery, Secretary of the Finance and Administration Cabinet, do hereby order and direct the following:

- I. Upon the request of an Executive Branch agency, the Finance and Administration Cabinet ("FAC") shall formally review any dispute arising where the agency has requested documents from a private vendor that holds a state contract and the vendor has refused access to said documents under a claim that said documents are not directly pertinent or relevant to the agency's inquiry upon which the document request was predicated.
- II. Upon the request of an Executive Branch agency, the FAC shall formally review any situation where the agency has requested documents that the agency deems necessary to

conduct audits, investigations or any other formal inquiry where a dispute has arisen as to what documents are necessary to conclude the inquiry.

- III. Upon receipt of a request by a state agency pursuant to Sections I & II, the FAC shall consider the request from the Executive Branch agency and the position of the vendor or party opposing the disclosure of the documents, applying any and all relevant law to the facts and circumstances of the matter in controversy. After FAC's review is complete, FAC shall issue a Determination which sets out FAC's position as to what documents and/or records, if any, should be disclosed to the requesting agency. The Determination shall be issued within 30 days of receipt of the request from the agency. This time period may be extended for good cause.
- IV. If the Determination concludes that documents are being wrongfully withheld by the private vendor or other party opposing the disclosure from the state agency, the private vendor shall immediately comply with the FAC's Determination. Should the private vendor or other party refuse to comply with FAC's Determination, then the FAC, in concert with the requesting agency, shall effectuate any and all options that it possesses to obtain the documents in question, including, but not limited to, jointly initiating an action in the appropriate court for relief.
- V. Any provisions of any prior Order that conflicts with the provisions of this Order shall be deemed null and void.

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 Expedite Bidding Program. Submittal of the Affidavit should be done along with the bid in Bid Express.

03/01/2011

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.

DGA BASE

Unless otherwise noted, the Department estimates the rate of application for DGA Base to be 115 lbs/sy per inch of depth.

DGA BASE FOR SHOULDERS

Unless otherwise noted, the Department estimates the rate of application for DGA Base for Shoulders to be 115 lbs/sy per inch of depth. The Department will not measure necessary grading and/or shaping of existing shoulders prior to placing of DGA Base, but shall be incidental to the Contract unit price per ton for DGA Base.

Accept payment at the Contract unit price per ton as full compensation for all labor, materials, equipment, and incidentals for grading and/or shaping of existing shoulders and furnishing, placing, and compacting the DGA Base.

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.

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.

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Frankfort, Kentucky

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SECTION 01 45 00

SPECIAL INSPECTIONS

(Document extracted from SEaOK Guidelines for Owners, Architects, Engineers, Constructors, Code Officials and Inspectors In Accordance With The Kentucky Building Code Requirements, 2013 Edition).

PART 1 GENERAL

1.01 SUMMARY OF WORK INCLUDED

- A. This specification outlines the necessary requirements for Special Inspections and Testing for this project as required by the 2013 Kentucky Building Code (2012 IBC). Work under this section shall be accomplished by a Special Inspector of Record (SIR) and by supplemental Special Inspectors that may be employed by the SIR. The SIR shall be employed by the Owner, subject to approval by Authority Having Jurisdiction (AHJ) and Design Professional in Responsible Charge (DPRC). Work included herein shall be inspected, tested and reported on in conjunction with the requirements of this specification section and utilizing the forms provided in Specification Section 01 45 10.
- B. The General Contractor and all affected Subcontractors have responsibility to coordinate with, work with, supply access, supply data to, and fully cooperate with the Special Inspector of Record and all of his/her agents. The Contractor shall not allow any testing or inspections to take place for any work which is not ready for inspection/testing. All time for jobsite visits, inspections, or testing for which the Contractor failed to cancel in adequate time or failed to reschedule shall be compensated for by the Contractor.
- C. All testing outlined in project specifications shall be performed by the Special Inspector unless specifically noted otherwise. The Special Inspector of Record and all agents within his employ that shall perform Special Inspection or Testing work shall obtain and maintain in their possession a complete set of Contract Documents (drawings and specifications). Throughout the course of the work, project details and requirements are subject to change. It shall be the responsibility of the Special Inspector to obtain all Change Orders from the Architect in order to coordinate Special Inspection work and in order to confirm that the applicable change has been incorporated into the project.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
 - 1. ACI INTERNATIONAL (ACI)
 - a. ACI 318 (2011) Building Code Requirements for Structural Concrete and Commentary.
 - 2. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
 - a. AISC 341 (2010) Seismic Provisions for Structural Steel Buildings.
 - b. AISC 360 (2010) Specifications for Structural Steel Buildings.

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3. ASTM INTERNATIONAL (ASTM)

- a. See Contract Documents (Drawings and Specifications) for applicable ASTM material and testing standards required for each part of the work requiring Special Inspections and Testing.

4. KENTUCKY OFFICE OF HOUSING BUILDINGS AND CONSTRUCTION

- a. KOHBC KBC (2013) The Kentucky Building Code.
- b. ASCE 7-10 - Minimum Design Loads for Buildings and Other Structures.

5. STRUCTURAL ENGINEERS ASSOCIATION OF KENTUCKY (SEAoK)

- a. Guidelines for Owners, Architects, Engineers, Constructors, Code Officials and Inspectors – 2007 Edition.

1.03 SUBMITTALS

- A. The following shall be submitted in accordance with Division 1 sections:

1. Certifications:

- a. Special Inspector of Record (Other Inspectors):

- 1) Certification(s) attesting that the Special Inspector(s) is (are) qualified by knowledge and experience to perform the specified Special Inspections. Information, which provides evidence of the knowledge and experience necessary to qualify a person as a Special Inspector for the category of work being certified, will accompany the qualification. Certifications or evidence of qualifications as required in Section 01 45 10 shall be submitted for all Inspectors.
- 2) Special Inspector of Record and all other Special Inspectors shall obtain and maintain professional liability insurance for errors and omissions to a minimum limit of \$1,000,000.00 per occurrence and shall submit a certificate of insurance along with the qualifications at the time of bidding for approval by the Architect, Engineer and Owner. Qualification submittals not accompanied with the Certificate of Insurance will not be accepted.

2. Reports

- a. Submit periodic reports as outlined elsewhere in Sections 014500 (this section) and Section 01 45 10 – Statement of Special Inspections.

3. Schedule of Inspections

- a. The Special Inspector of Record and all other Inspectors shall submit a schedule of inspections for their discipline to the Owner via the Architect to be performed on various building elements, the type of inspection to be performed (intermittent or continuous), appropriate timing for the inspection, and accessibility requirements in advance of all inspections.

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- b. The SIR shall coordinate all timing of all inspections directly with the Contractor. **THIS COORDINATION EFFORT IS THE SOLE RESPONSIBILITY OF SIR.** A full listing of the planned inspections shall be submitted by the SIR for review by the Architect, Engineer and Owner.

1.04 SPECIAL INSPECTOR

- A. Special Inspector shall be used to perform Special Inspections required by this section. The Special Inspector is a person employed by the Owner (University of Louisville) and approved by the Authority Having Jurisdiction (AHJ), Architect and Engineer as being qualified by knowledge and experience to perform the Special Inspection for the category of work being constructed.
- B. Special Inspections shall be performed by an individual or individuals qualified to perform such inspections in a particular field. The Special Inspector of Record shall be a licensed Professional Engineer, licensed and practicing in the Commonwealth of Kentucky. Certifications from nationally recognized professional organizations, trade associations or technical societies regularly engaging in the field of certifying professionals for Special Inspection work may be acceptable to the Architect, Engineer and Owner. See also "Qualifications of Inspectors and Testing Technicians" in Section 01 45 10 for additional requirements.
- C. Special Inspectors shall perform their duties independent from the construction quality control staff employed by the Contractor. More than one Special Inspector may be required to provide the varied knowledge and experience necessary to adequately inspect all of the categories of work requiring Special Inspection.
- D. The entire scope of Special Inspections shall be the sole responsibility of a single Special Inspector of Record (SIR). This individual shall oversee, administer, review, supervise and be responsible for all work performed under this section and by any other inspectors within the employee of the SIR. The Special Inspector shall maintain an on-going deficiency log and shall be fully responsible for making sure that all deficiencies or "failed test" results are corrected and retested to satisfy the project requirements. The Special Inspector of Record shall complete all final forms and reports submitting same to the Architect, Engineer, Owner and Dept of Housing, Building and Construction. All reports shall bear the signature of the SIR and shall bear his/her Professional Seal.
- E. Inspectors of various construction trades shall possess appropriate Special Inspector Certificate of otherwise show qualification for inspecting that particular trade. (See also "Qualifications of Inspectors and Testing Technicians" in Section 01 45 10.)
- F. Replacement, or substitutions, for the approved Special Inspector(s) under the employee of the SIR shall be upon approval of the Architect, Engineer and Owner.

1.05 SPECIAL INSPECTIONS

- A. The Special Inspection shall be done as specified. Special Inspector personnel shall be in addition to the quality control inspections and inspectors required elsewhere in this section.

1. Continuous Special Inspection

- a. Continuous special inspection is the full time observation of the work by the Special Inspector present in the work area whenever work is being performed.
- b. Continuous special inspection shall be performed where specified for items as shown on the drawings.

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2. Periodic Special Inspection

- a. Periodic special inspection is the intermittent observation of the work by a Special Inspector present in the work area while work is being performed.
- b. The intermittent observation periods shall be at times of significant work, shall be recurrent over the complete work period, and shall total at least 25 percent of the total work time. Periodic special inspection shall be performed where specified for items as shown on the drawings.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 PERFORMANCE OF SPECIAL INSPECTIONS AND TESTING

- A. Special Inspections and Testing shall be performed in accordance with the requirements of this section, Section 01 45 10- Statement of Special Inspections and with other specific sections of the contract. In general, special inspections shall be performed for following parts of the work:

1. Soils/Foundation Work.

- a. See requirements of the Kentucky Transportation Cabinet. All foundation structures and earthwork shall be tested and inspected independently of the Special Inspector by the Kentucky Transportation Cabinet inspectors.

2. Reinforced Concrete - Cast-In-Place (Elevator Shaft Walls and Floor Slabs, Concrete Stair)

- a. Periodic review of reinforcing steel and anchor bolts for adherence to Contract Documents prior to placing concrete.
- b. Periodic review of concrete placement especially when the ambient temperature falls below 40 F or rises above 95 F.
- c. Review control joint and construction joints in concrete flatwork for location, depth, time of cutting, etc.
- d. Review curing and concrete protections procedures.
- e. In addition to the above, all requirements of the 2013 KBC (2012 IBC Table 1704.4) shall be accomplished by the Special Inspector of Record.
- f. The Special Inspector shall verify that all dowels at piers do not stop short of required height within piers and have appropriate lap with anchor bolts.
- g. Field sampling and testing of all concrete materials.
- h. Verify that all foundation elements are "formed" and that no footings are placed "unformed" in earthen side trenches.
- i. Verify proper bar sizes, bar positions and lap splices.
- j. Verify proper spacing of column ties and beam stirrups.
- k. Verify all rebar tie wire are turned inward away from form surfaces.
- l. Verify feet of all chairs or slab supports are plastic.

3. Reinforced Concrete - Precast Concrete. See Requirements of the Kentucky Transportation Cabinet.

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4. Structural Steel

- a. Review of fabricator/erector quality control
 - 1) Review shop and field welder qualifications.
 - 2) Verify fabricator shop quality control procedures.
- b. Material verification of high-strength bolts, nuts, and washers. Perform periodic review of identification markings to conform to ASTM standards specified.
- c. Material verification of weld filler material
 - 1) Perform periodic review of identification markings to conform to ASTM/AWS standards specified.
 - 2) Monitor storage and handling of weld filler material.
- d. Material verification of structural steel
 - 1) Perform review of identification markings to conform to ASTM standards specified.
 - 2) Review Manufacturer's certified mill test reports.
- e. Inspection of welded connections 2013 KBC (2012 IBC 1704.3).
 - 1) Visually inspect all shop-welded connections during fabrication for conformance with approved shop drawings prior to leaving the shop. Visually inspect all field welded connections.
 - 2) Keep records of all welder certifications. Verify that certifications are in compliance with AWS D1.1.
 - 3) All welds shall be visually inspected for discontinuities as applicable and as indicated in AWS D1.1 Table 6.1.
- f. Inspection of bolted connections 2013 KBC (2012 IBC 1704.3). Inspect 25% of all bolted connections. Inspect 100% of all moment connections.
- g. All requirements of the 2013 KBC (2012 IBC 1704.3) shall be accomplished by the Special Inspector.
- h. Headed Studs (shear connectors). Field test and verify all headed studs in accordance with AWS requirements.
- i. Metal Decking.
 - 1. Verify all materials (decking, fasteners, sidelap screws, weld material, etc.) meet specification requirements
 - 2. Verify manufacturer certifications regarding fastener shear strength and pull out strength for pneumatically driven, powder actuated, or screw type fasteners to be used in the work.
 - 3. Keep a record of all welders' qualifications. Qualifications shall be in accordance with AWS D1.3.
 - 4. Contractor to perform and show procedures for fastening equipment
 - 5. Confirm that workers are trained to use installation equipment.

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6. Verify that all fasteners to deck supports and sidelaps are in place, are securely fastened, and are undamaged due to installation techniques. Perform visual inspection verifying that pneumatically driven fasteners have proper embedment.
 7. Verify/test in accordance with specification Section 053000.
5. See also requirements of other Specification Sections as follows:
- 01 45 10 - Statement of Specified Inspections
 - 03 30 00 - Cast-in-Place Concrete
 - 05 12 00 - Structural Steel
 - 05 30 00 - Metal Decking

3.02 REPORTING AND COMPLIANCE PROCEDURES

- A. On the first day of each month, the Special Inspector of Record shall furnish copies of the combined progress reports of the special inspector's observations. These progress reports shall list all special inspections of construction or reviews of testing performed during that month, note all uncorrected deficiencies, and describe the corrections made both to these deficiencies and to previously reported deficiencies.
- B. Distribution of reports shall be made by the Special Inspector of Record directly to each of the following parties:
- a. Kentucky Transportation Cabinet - Project Manager
 - b. Design Team Leader – Palmer Engineering – Project Manager
 - c. Architect – Godsey Associates Architects
 - d. Structural Engineer – Stair Tower – Senler, Campbell and Associates, Inc.
 - e. Structural Engineer – Pedway Steel Framing – Structural Services, Inc.
 - f. Contractor/Applicable Subcontractor
 - g. Department of Housing, Building, and Construction
- C. All special inspectors who performed special inspections of construction or reviewed testing during that month, regardless of whether they reported any deficiencies, shall sign each monthly report. Each monthly report shall be signed by the Special Inspector of Record.
- D. At completion of construction, each special inspector shall prepare and sign a final report attesting that all work they inspected and all testing and test reports they reviewed were completed in accordance with the approved construction documents and that deficiencies identified were satisfactorily corrected.
- E. The Special Inspector of Record (SIR) shall submit a combined final report containing the signed final reports of all the special inspectors. The (SIR) shall sign the combined final report attesting that all final reports of special inspectors that performed work to comply with these construction documents are contained therein, and that the (SIR) has reviewed and approved all of the individual inspector's final reports. No less than 5 copies of the complete final report and all attachments shall be submitted to the parties as listed in paragraph B above.

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- F. Any discrepancies, irregularities, non-compliance with the Contract Documents observed during the inspection work shall be immediately brought to the attention of the Architect, Engineer and Owner in writing by means of a "Deficiency Log". Issues involving on-going construction at the site should be brought to all parties attention immediately by telephone, fax, mail and/or e-mail to avoid possible material and labor waste.
- G. Construction not complying with the Contract Documents and found not in compliance with the Special Inspection program shall be replaced at no cost to the Owner.
- H. Testing and employment of any other testing agency or laboratory by the Contractor shall not relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents.
- I. At completion of the project, the Special Inspector of Record shall complete the Final Report and affix the Professional Registration Seal and Signature. The final report shall be submitted to the Dept. of Housing, Buildings and Construction and to the parties listed above.
- J. Limits on Testing Authority
 - 1. Special Inspector of Record, Agency or laboratory may not release, revoke, alter or enlarge the requirements of the Contract Documents.
 - 2. SIR, Agency, or Laboratory may not approve or accept any portion of the work.
 - 3. SIR, Agency, or Laboratory may not assume the duties of Contractor.
 - 4. SIR, Agency, or Laboratory has no authority to stop Work.
- K. Costs for retesting or reinspection of work required by non-conformance to the Contract Documents shall be the responsibility of the Contractor.

END OF SECTION

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SECTION 01 45 10

STATEMENT OF SPECIAL INSPECTIONS

Project: KSU – Pedestrian Bridge – Stair Tower and Pedway Framing

Location: Kentucky State University
Frankfort, Kentucky

Owner: Kentucky State University

Design Professional (SER) in Responsible Charge:
(Special Inspections)

Joseph A. Lenzi, P.E., SECB
Senler, Campbell and Associates,
Inc.
1311 South 3rd Street
Louisville, Kentucky 40208
(502) 636-3568

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Kentucky Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☒ Structural

The seismic-force-resisting system(s) consists of the following:

- Stair Tower – Ordinary Reinforced Concrete Shear Walls (R=2).
- Stair Tower and Pedway Canopy Steel Framing -
Steel Systems Not Specifically Detailed for Seismic Resistance, excluding Cantilever Column
Systems (R=3).

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Registered Design Professional in Responsible Charge, at the frequency noted below, or as requested by the Registered Design Professional in Responsible Charge or Code Official.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

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Schedule of Inspection and Testing Agencies

This Statement of Special Inspections includes the following building systems:

- ☒ Soils and Foundations
☒ Cast-in-Place Concrete
☐ Masonry
☒ Structural Steel
- ☐ Spray Fire Resistant Material
☐ Wood Construction
☐ Exterior Insulation and Finish System

Special Inspection Agencies		Firm	Address, Telephone, e-mail
1.	Special Inspection Coordinator		
2.	Inspector		
3.	Inspector		
4.	Testing Agency		
5.	Testing Agency		
6.	Other		

Note: The inspectors and testing agencies shall be engaged by the Owner, or by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official and the Owner, prior to commencing work. The Special Inspector shall fill in all information for all agencies under his control and submit same to Architect, Engineer and Owner at time of submission of proposal.

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Contractor’s Statement of Responsibility

In accordance with Kentucky Building Code Section 1705.3, each contractor responsible for the construction or fabrication of a system or component designated as part of the seismic force resisting system and/ or designated seismic systems (see Statement of Special Inspections) must submit a Statement of Responsibility.

This document shall be signed and dated by the contractor responsible for the work. The Plan shall be submitted to the Registered Design Professional in Responsible Charge or the Special Inspector Coordinator and the general contractor / construction manager prior to the commencement of work.

The Contractor’s Statement of Responsibility shall contain the following:

1. Acknowledgement of the special requirements contained in the Special Inspection Program. Provide a brief written description of the designated building systems and components.
2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the building official.
3. Procedures for exercising control within the contractor’s organization the method and frequency of reporting and the distribution of the reports.
4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
5. Signature of an officer, partner or like person in the contractor’s office, who has authority to accept this responsibility on behalf of the company.

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Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Registered Design Professional. The credentials of all Inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule. The RDP must determine what qualifications are appropriate for the particular project and confirm that the selected agency employs individuals with the specified qualifications.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures with a minimum of five years of licensed experience.
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations with a minimum of five years of licensed experience.
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination.

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.
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International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS EIFS	Third Party Inspector
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Soils and Foundations

See requirements of the Kentucky Transportation Cabinet. All foundation structures and earthwork shall be tested and inspected independently of the Special Inspector by the Kentucky Transportation Cabinet inspectors.

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Cast-in-Place Concrete (Elevator Shaft Walls and Floor Slabs, Concrete Stair Only)

Item	Agency # (Qualif.)	Scope
1. Mix Design	ACI-CCI ICC-RCSI	1. Review concrete batch tickets and verify compliance with approved mix design. 2. Verify that no water is added to concrete mix on-site without approval of the Architect/Engineer.
2. Material Certification	PE/SE	1. Verify all reinforcing and concrete materials meet specification requirements.
3. Reinforcement Installation	ACI-CCI ICC-RCSI	1. Inspect size, spacing, cover, positioning and grade of reinforcing steel. 2. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. 3. Verify that bars are adequately tied and supported on chairs or bolsters.
4. Welding of Reinforcing	AWS-CWI	1. Do not allow welding of reinforcing steel for this project.
6. Anchor Rods	PE/SE	1. Inspect size, positioning and embedment of anchor rods. 2. Verify material grades of anchor rods. 3. Inspect concrete placement and consolidation around anchors.
7. Concrete Placement	ACI-CCI ICC-RCSI	1. Inspect placement of concrete. 2. Verify that concrete conveyance and depositing avoids segregation or contamination. 3. Verify that concrete is properly consolidated. 4. Verify that no water is added to on-site concrete.
8. Sampling and Testing of Concrete	ACI-CFTT ACI-STT	1. Test concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064). See also requirements of Specification Section 03 30 00.
9. Curing and Protection	ACI-CCI ICC-RCSI	1. Inspect curing, cold weather protection and hot weather protection procedures for proper practices.
10. Other:	PE/SE	1. Verify all requirements listed on drawings (Sheet S0.0), this Section, Section 01 45 00, and Section 03 30 00 and Table 1704.4 of 2012 IBC have inspected and verified in addition to above requirements.

Note: For Cast-in-Place Concrete at Bridge and Pedway Structures, see requirements of the Kentucky Transportation Cabinet. All foundation structures and earthwork shall be tested and inspected independently of the Special Inspector by the Kentucky Transportation Cabinet inspectors.

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Precast Concrete

See requirements of the Kentucky Transportation Cabinet. All Precast Concrete shall be tested and inspected independently of the Special Inspector by the Kentucky Transportation Cabinet inspectors.

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Structural Steel

Item	Agency # (Qualif.)	Scope
1. Fabricator Certification/ Quality Control Procedures	AWS/AISC- SSI ICC-SWSI	1. Review shop fabrication and quality control procedures. 2. Determine if fabricator has AISC Certification, rendering shop review not required.
2. Material Certification	AWS/AISC- SSI ICC-SWSI	1. Review certified mill test reports and identification markings on wide-flange shapes, high-strength bolts, nuts and welding electrodes. 2. Verify material grades for all steel materials used. 3. Verify material grades for Deformed Bar Anchors (DBA's).
3. Open Web Steel Joists	<div>NOT APPLICABLE</div>	
4. Bolting	AWS/AISC- SSI ICC-SWSI	1. Inspect installation and tightening of high-strength bolts. 2. Verify that splines have separated from tension control bolts. 3. Verify proper tightening sequence. Continuous inspection of bolts in slip-critical connections. 4. Verify all loosened bolts are discarded and not re-used. 5. Verify grade of anchor bolt materials.
5. Welding	AWS-CWI ASNT	1. Visually inspect all welds. Inspect pre-heat, post-heat and surface preparation between passes. 2. Verify size and length of fillet welds. 3. Ultrasonic testing or other methods of all full-penetration welds and multi-pass fillet welds.
6. Shear Connectors	AWS-CWI ASNT	1. Inspect size, number, positioning and welding of sheer connectors. Inspect studs for full 360-degree flash. Ring test all shear connectors with 3 lb hammer. Bend test all questionable studs to 15 degrees. 2. Refer to Section 05 12 00 for additional testing information.
7. Structural Details	PE/SE	1. Inspect steel frame for compliance with structural drawings, including bracing, member configuration and connection details. 2. Verify that all elements of moment frames (including anchor bolts) are per construction documents.
8. Steel Deck	AWS-CWI ASNT	1. Inspect all fastenings of metal decking to verify compliance with design documents. 2. Refer to Section 05 30 00 and drawings for additional information.
9. Other:	AWS-CWI PE/ SE	1. Verify all requirements listed on drawings (Sheet S0.0), this Section, Section 01 45 00, Division 5 Sections and Table 1704.3 of 2012 IBC have inspected and verified in addition to above requirements.

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Final Report of Special Inspections

Special Inspector’s Final Report

Project:

Location:

Owner:

Owner's Address:

Architect of Record:

Structural Engineer of Record:

Special Inspection Coordinator:

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Special Inspector

(type or print name)

Signature Date

Licensed Professional

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Final Report of Special Inspections

Agent's Final Report

Project:
Agent:
Special Inspector:

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

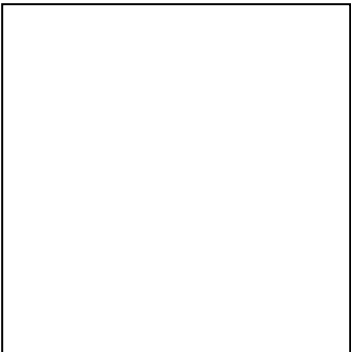
(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Agent of the Special Inspector

(type or print name)

SignatureDate



*Licensed Professional Seal or
Certification*

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Contractor’s Statement of Responsibility

In accordance with the Kentucky Building Code, Section 1706, each contractor responsible for the construction or fabrication of a system or component designated in the Statement of Special Inspections must submit a **Statement of Responsibility**.

Project:
Contractor’s Name:
Contractor’s Trade:
Address:
Phone / Fax / email:
License No., if applicable:

Description of designated building systems and components included in the Statement of Responsibility:

Contractor’s Acknowledgment of Special Requirements

I hereby acknowledge that I have received, read, and understand the Special Inspection program.

I hereby acknowledge that control will be exercised to obtain conformance with the construction documents approved by the Building Official.

_____ Signature	_____ Title	_____ Date
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Contractor’s Provisions for Quality Control

Procedures for exercising control within the contractor’s organization, the method and frequency of reporting and the distribution of reports are attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.

Attachments

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Fabricator’s Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the Kentucky Building Code must submit a ***Fabricator’s Certificate of Compliance*** at the completion of fabrication.

Project Name & Location:

Fabricator’s Name:

Address:

Phone / Fax / email:

Certification or Approval Agency:

Certification Number:

Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

_____ Signature	_____ Title	_____ Date
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Attach copies of fabricator’s certification or building code evaluation service report and fabricator’s quality control manual.

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Additional Special Inspection Forms

- **Special Inspector Evaluation Checklist**
- **Evaluation Checklist for Agents**
- **Special Inspector Daily Report**
- **Special Inspector Weekly Report**
- **Special Inspector Final Report**
- **Steel Construction Inspection Record**
- **Fabricated Steel Inspection Record**
- **Record of Steel Materials Received on Jobsite**
- **Steel Materials Receiving Inspection Report**
- **Steel Operations Inspection for Tightening High-Strength Bolts**
- **Concrete Construction Inspection Record**
- **Concrete Lift Inspection**
- **Record of Field Discrepancies**

Note: The Special Inspector and his Agents shall use any of the additional forms listed on this page as necessary. Copies of these forms may be reproduced from The Structural Engineer's Association of Kentucky Website at www.seaok.org. These forms can be found Appendix G of SEAoK Guidelines for Owners, Architects, Constructors, Code Officials and Inspectors in Accordance With The Kentucky Building Code Requirements, 2007 Edition.

END OF SECTION

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Cast-in-place concrete work including all labor, tools, materials, equipment and services necessary to properly place and complete cast-in-place concrete formwork, reinforcement, joints and embedded items, finishing, curing, grouting and concrete testing.
- B. Foundation concrete is limited to pile caps, retaining walls, piers and foundation walls.
- C. Installation of anchors specified in other sections.

1.02 RELATED WORK

- A. Section 01 45 00 - Special Inspections
- B. Section 01 45 10 - Statement of Special Inspections
- C. Section 05 12 00 - Structural Steel Framing
- D. Section 05 30 00 - Metal Decking
- E. Section 07 92 00 - Joint Sealants

1.03 QUALITY ASSURANCE

- A. Perform concrete work in accordance with all applicable requirements of ACI 301 except as modified in this Section.
- B. Keep copy of ACI 301 in field office for duration of project.
- C. Materials shall be manufactured in the United States of America.
- D. Pre-Construction Meeting: Arrange a pre-construction meeting for concrete work prior to starting any concrete work, to discuss and to establish procedures, with the Testing Agency and the Architect/Engineer. Arrange additional pre-construction meetings for special installations such as flatwork, water repellent sealer, etc.
- E. Materials and installed work may require testing and retesting at anytime during progress of work. See Paragraph 3.14.

1.04 REFERENCES

- A. American Concrete Institute (ACI)
 - 1. 117 Standard Tolerances for Concrete Construction and Materials.
 - 2. 301 Specifications for Structural Concrete for Buildings.
 - 3. 304R Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - 4. 305R Hot Weather Concreting

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5. 306R Cold Weather Concreting
6. 309R Standard Practice for Consolidation of Concrete.
7. 318 Building Code Requirements for Reinforced Concrete.
8. 347R Recommended Practice for Concrete Formwork.
9. 503.2 Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive.
10. SP-66 ACI Detailing Manual

B. American Society for Testing and Materials (ASTM)

1. ASTM A185 Welded Steel Wire Fabric for Concrete Reinforcement.
2. ASTM A497 Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
3. ASTM A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. ASTM A706 Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
5. ASTM C31 Making and Curing Concrete Test Specimens in the Field.
6. ASTM C33 Concrete Aggregates.
7. ASTM C39 Compressive Strength of Cylindrical Concrete Specimens.
8. ASTM C42 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
9. ASTM C94 Ready-Mixed Concrete.
10. ASTM C143 Slump of Portland Cement Concrete.
11. ASTM C150 Portland Cement.
12. ASTM C171 Sheet Materials for Curing Concrete.
13. ASTM C173 Air Content of Freshly Mixed Concrete by the Volumetric Method.
14. ASTM C231 Test Method for Air Content of Freshly Mixed Concrete by Pressure Method.
15. ASTM C260 Air Entraining Admixtures for Concrete.
16. ASTM C309 Liquid Membrane – Forming Compounds for Curing Concrete.
17. ASTM C330 Standard Specification for Lightweight Aggregates for Structural Concrete.
18. ASTM C494 Chemical Admixtures for Concrete.
19. ASTM C567 Test Method for Unit Weight of Structural Lightweight Concrete.
20. ASTM C618 Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
21. ASTM C803 Test Method for Penetration Resistance of Hardened Concrete.
22. ASTM C1107 Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).
23. ASTM D1751 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
24. ASTM D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
25. ASTM D2103 Polyethylene Film and Sheeting.

C. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Standard Practice
2. Placing of Reinforcing Bars.

1.05 SUBMITTALS

- A. Comply with ACI SP-66 "Detailing Manual" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures. Shop drawings shall be checked and approved by the Contractor and submitted to the Architect/Engineer for review in conformance with "Special Provisions" before fabrication.

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- B. Submit, at least 15 days prior to start of concrete work, 10 consecutive certified laboratory test reports made within the last six months sufficient to verify compliance of proposed mix design (proportions) with the specifications for type and strength of concrete.
- C. Material certificates signed by Supplier and Contractor certifying that each material item complies with the specified requirement shall be submitted by the material manufacturer through the Contractor. Provide certification from admixture manufacturers that chloride content complies with specification limits.

1.06 PROJECT CONDITIONS:

- A. Protection of Footings against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.
- B. Protect adjacent finish materials against spatter during concrete placement.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

- A. Portland Cement Type 1 ASTM C150 only.
- B. Flyash - ASTM C618, Type C or Type F. Note: Do not use in architecturally exposed concrete or lightweight concrete.
- C. One brand and type of cement shall be used throughout the project.
- D. Fine aggregate shall meet requirement of ASTM C33 for normal weight concrete. Maximum size as indicated for the class of concrete.
- E. Coarse aggregate dredged gravel meeting requirement of ASTM C33 for normal weight concrete. Maximum size as indicated for the class of concrete.
- F. Water shall be clean and not detrimental to concrete.

2.02 ADMIXTURES

- A. Air entrainment admixture - ASTM C260, certified by manufacturer to be compatible with other required admixtures.
 - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - "Air-Mix"; Euclid Chemical Company
 - "Sika Aer"; Sika Corporation
 - "MB-VR or MB-AE"; Master Builders
 - "Darex AEA" or "Daravair"; W. R. Grace
 - "Edoco 2001 or 2002"; Edoco Technical Products
 - "Air-Tite"; Gifford-Hill/American Admixtures
- B. Water-Reducing Admixtures: ASTM C494, Type A, and containing not more than 0.05 percent chloride ions.

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1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

"WRDA Hycol"; W. R. Grace
"PSI N"; Gifford-Hill/American Admixtures
"Eucon WR-75"; Euclid Chemical Company
"Pozzolith Normal"; Master Builders
"Plastocrete 160"; Sika Chemical Corporation
"Chemtard"; Chem-Masters Corporation
"Pro-Kete-N"; Protex Industries, Incorporated
- C. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G and containing not more than 0.05 percent chloride ions.
 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

"WRDA 19" or "Daracem"; W. R. Grace
"PSP"; Protex Industries, Incorporated
"Super P"; Anti-Hydro
"Sikament"; Sika Chemical Corporation
"Mighty 150"; ICI Americas Corporation
"Eucon 37"; Euclid Chemical Company
"PSI Super"; Gifford-Hill
"Rheobuild"; Master Builders
- D. Water-Reducing, Non-Corrosive, Non-Chloride Accelerator Admixture: ASTM C494, Type C or E and containing not more than 0.05 percent chloride ions.
 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

"Accelguard 80"; Euclid Chemical Company
"Pozzolith High Early"; Master Builders
"Gilco Accelerator"; Gifford-Hill/American Admixtures
- E. Water-Reducing, Retarding Admixture: ASTM C494, Type D and containing not more than 0.05 percent chloride ions.
 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

"Edoco 2006"; Edoco Technical Products
"Pozzolith Retarder"; Master Builders
"Eucon Retarder 75"; Euclid Chemical Company
"Daratard"; W. R. Grace
"PSI R"; Gifford-Hill/American Admixtures
"Plastiment"; Sika Chemical Company
"Protard"; Protex Industries, Incorporated
- F. Use no other admixtures unless written approval is obtained from the Architect/Engineer.
- G. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.

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- H. Certification: Written conformance to the abovementioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the Architect/Engineer.
- I. Admixtures:
 - 1. Use water-reducing admixture or high range water-reducing admixture (super-plasticizer) in concrete as required for placement and workability.
 - 2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg. F.
 - 3. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions. Use no other admixtures without prior written consent of Architect/Engineer.

2.03 PROPORTIONING AND DESIGN OF MIXES:

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318. Submit mix designs on each class of concrete for review. If trial batch method is used, use an independent testing facility acceptable to Architect/Engineer for preparing and reporting proposed mix designs to achieve an average compressive strength 1200 psi higher than the specified strength. The testing facility shall not be the same as used for field quality control testing.
 - 1. Limit use of fly ash to not exceed 25 percent of cement content by weight. Do not use flyash in exposed concrete or in lightweight concrete mixtures.
- B. Concrete Mixing
 - 1. All concrete shall be normal weight, except as specifically noted on the drawings.
 - 2. Ready mixed concrete: Comply with the requirements of ASTM C94.
 - 3. During hot weather, or under conditions contributing to rapid settling of concrete, a shorter mixing time than specified in ASTM C94 may be required.
- C. Concrete Mix Designs: Prior to delivery of concrete to job, the Architect/Engineer shall be furnished a certified statement establishing the standard deviation of concrete supplied from this plant(s). At least 30 consecutive test reports based on each proposed mix design and made within the last six months shall be furnished to the Architect/Engineer to substantiate strength producing properties of each proposed mix design. If the available test results are 15 or higher a correction factor shall be established. The modification factor listed in Table 5.3.1.2 of ACI 318 shall be used.
- D. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:
 - 1. All structural concrete (normal weight) unless noted otherwise: 4000 psi 28-day compressive strength, maximum aggregate size 1", w/c ratio 0.42.
 - 2. All structural concrete for fill on metal decking: 4000 psi, 28-day compressive strength, maximum aggregate size 3/4", w/c ratio 0.42.
 - 3. Structural concrete for elevator shaft walls from top of foundation pier cap (El. 95'-0") to the elevation of the first cold joint or El. 109'-8": 6000 psi, 28-day compressive strength, maximum aggregate size 1", w/c ratio 0.42.
- E. Maximum coarse aggregate size may be increased to 1-1/2" in concrete for foundation elements exceeding 1'-0" thickness.

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- F. Batching system shall be automatic and shall record each material as batched prior to discharge into mixer and zero referenced following discharge. This record shall be marked to permanently identify each batch.
- G. Equipment shall be provided to continuously determine surface moisture in the fine aggregate. Moisture corrections shall be made without use of calculations by the batcher.
- H. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant at no additional cost to Owner and as accepted by the Architect/Engineer before using in work.
- I. Admixtures:
 - 1. Use water-reducing admixture or high range water-reducing admixture (super-plasticizer) in concrete as required for placement and workability.
 - 2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F.
 - 3. Contractor, at his discretion, may use high-range water-reducing admixture in concrete required to be watertight, concrete for structural floor slabs and slabs on grade and concrete with water/cement ratios below 0.40.
 - 4. Use air-entraining admixture in all concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1-1/2 percent within following limits:
 - a. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or subjected to hydraulic pressure: 6.0 percent, 1" max. aggregate.
 - b. Other Concrete (not exposed to freezing, thawing, or hydraulic pressure): 2 percent to 4 percent air.
 - 5. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.
 - 6. Slump limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
 - a. Ramps, slabs, and sloping surfaces: Not more than 4", (+/- 1").
 - b. Reinforced foundation systems: Not more than 4", (+/- 1").
 - c. Concrete containing HRWR admixture (super-plasticizer): Not more than 8" after addition of HRWR to site-verified 2"-3" slump concrete.
 - d. Other concrete: Not more than 4", (+/- 1").

2.04 FORMS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
 - 1. For all exposed foundation and/or retaining walls, joints in plywood formwork shall align with locations of rustication joints as shown on the design drawings. Coordinate all locations with Architect.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

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- D. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units which will leave no metal closer than 1-1/2" to surface.

1. Provide ties which, when removed, will leave holes not larger than 1" diameter in concrete surface. Coordinate pattern of tie holes with Architect on all concrete wall exposed to view.

2.05 REINFORCING STEEL

- A. Reinforcing Steel: 60 KSI yield grade deformed billet steel bars ASTM A615, with Supplementary Requirements S1.
- B. Reinforcing bars to be welded shall comply to ASTM A706, Grade 60 (yield strength of 60,000 psi). Note: All welding of reinforcing bars shall only be allowed upon written approval of the Architect/Engineer or as otherwise indicated on drawings. Welding of any reinforcing bars shall comply with "Structural Welding Code-Reinforcing Steel" AWS D1.4.
- C. Welded Wire Fabric: Plain type, ASTM A185
Deformed type, ASTM A497.
- D. Metal accessories including bolsters, spacers, chairs, ties and other devices necessary for properly assembling, placing, spacing and supporting all reinforcement in place shall be provided. Use wire bar type supports complying with CRSI Specifications.
- E. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
- F. Reinforcing bars for use in formed landing slabs of the Stair/Elevator Tower and the Concrete Stair from the pedway to grade shall be epoxy coated in accordance with ASTM A924. Welded wire fabric for use in stair landings at the Stair/Elevator Tower shall be either epoxy coated in accordance with ASTM A884 or Galvanized at the Contractor's option.

2.06 NON-SHRINK GROUT

- A. The non-shrink grout shall be a factory pre-mixed grout and shall conform to ASTM C1107, "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)". In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95% bearing under a 4' x 4' base plate.
1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
- "Euco NS"; The Euclid Chemical Company
"Masterflow 713"; Master Builders
- B. Where high fluidity and/or increased placing time is required use high flow grout. The factory pre-mixed grout shall conform to ASTM C1107, "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)". In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95% bearing under a 10 ft. base plate.
1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
- "Euco Hi-Flow Grout"; The Euclid Chemical Company
"Masterflow 928"; Master Builders

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2.07 ABSORPTIVE COVER

- A. Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M182, Class 2.

2.08 MOISTURE-RETAINING COVER

- A. One of the following, complying with ASTM C171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. Polyethylene-coated burlap.

2.09 CLEAR LIQUID MEMBRANE-FORMING CURING COMPOUND

- A. Liquid type (clear) membrane forming curing compound complying with ASTM C309, Type I, Class B (VOC Compliant). Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.
 - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

Sonneborn "Kure-N-Seal WB
Euclid "Aqua-Cure VOX"
W.R. Meadows "Seal Cure"
 - 2. Curing compound shall not be used on interior concrete surfaces to remain exposed or on concrete surfaces to be waterproofed; such surfaces shall be wet-cured. The product shall be compatible with subsequent floor finishes or with any adhesives. Coordinate with Division 9 requirements and with Architectural Finish Schedules.

2.10 RETARDERS

- A. Retarders to be used in hot weather concreting shall conform to ASTM C494 Type B or Type D. Brand and quantity to be used shall be approved by the Architect/Engineer prior to application. See Section 2.2, Admixtures.

2.11 COLD JOINT WATERSTOPS

- A. Cold Joint Waterstops: 3/4 inch by 1 inch roll-stock, expanding bentonite based compound, designed to replace conventional dumbbell type waterstops, with concrete primer as required.
 - 1. Paramount "Superstop"
 - 2. CETCO "Waterstop-RX 101"
 - 3. Mirafi "MiraSTOP"

2.12 VAPOR BARRIER

- A. 15 mil; ASTM E1745, Class A.

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PART 3 EXECUTION

3.01 FORMS:

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts (including dovetail anchors), and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
 - 1. For all exposed foundation and/or retaining walls, joints in plywood formwork shall align with locations of rustication joints as shown on the design drawings. Coordinate all locations with Architect.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set time to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT:

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

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- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. Reinforcement shall be placed within the tolerances given in ACI 117.
- D. Place reinforcement to obtain at least minimum coverage for concrete protection in accordance with ACI 318. Arrange space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- F. All splicing of reinforcement shall be as indicated in the Contract Documents, unless otherwise permitted. Concrete cover and bar spacings shall conform to ACI 318.
- G. Tack welding of rebars is not permitted.

3.03 JOINTS:

- A. Construction Joints: Locate and install construction joints as indicated. Place construction joint at end of placements and at locations where placement operations are stopped for a period of more than 1/2 hour.
- B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.
- D. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use control joint forms 1/8" to 1/4" wide x 1/4 of slab depth, unless otherwise indicated.
 - 1. Saw cut construction joints with powered saws using 3/16 inch blade, within 4 to 12 hours after slab placement and as soon as surface will not be torn, abraded, or otherwise damaged by the cutting action.
 - 2. For slabs-on-grade of 8" thick or less, control joints may be cut by "Wet Cut" methods utilizing proprietary cutting equipment by "Soff-Cut", or approved equal. Depth and width of joint shall be as recommended by manufacturer of approved cutting equipment.

3.04 INSTALLATION OF EMBEDDED ITEMS:

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike off templates or accepted compacting type screeds.

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3.05 PREPARATION OF FORM SURFACES:

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
- B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- C. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form coating material to accumulate in forms or to come into contact with in place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust stained steel formwork is not acceptable.

3.06 CONCRETE PLACEMENT:

- A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.
- B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
- C. General: Comply with ACI 304R "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.
 - 1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 18" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 - 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators, delivery 10,000 vibrations per minutes, vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix (min. 8 seconds after complete submersion).
- E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
 - 1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

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2. Bring slab surfaces to correct level with straightedge and strikeoff. Use highway straightedge, bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position during concrete placement operations.
- F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306R and as herein specified.
1. When air temperature has fallen to or is expected to fall below 40°F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F, and not more than 80°F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Only the specified non-corrosive non-chloride accelerator shall be used. Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.
- G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305R and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
 2. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.
 3. When high temperatures and/or placing conditions dictate, the Engineer may require the use of the water-reducing retarding admixture (Type D) in lieu of the water-reducing admixture (Type A).

3.07 FINISH OF FORMED SURFACES:

- A. Rough Form Finish: For formed concrete surfaces not exposed-to view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Unless directed otherwise, all exposed vertical wall surfaces shall receive a rubbed finish and shall be treated as follows:
1. No rubbing operation shall be undertaken until concrete is placed and cured, all fins removed, all honeycomb patched and all form tie holes filled. Cleaning portions of the surface as the work progresses shall not be permitted.
 2. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint. Gray Portland cement shall be used for all the cement in the grout. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout with brushes or a spray gun uniformly, completely filling air bubbles and holes. Immediately after applying the grout, float the surface with a cork or other suitable float, scouring the wall vigorously. While the grout is still plastic the surface shall be finished with a sponge rubber float removing all excess grout. The finishing shall be done at the time when grout will not be pulled from holes or depressions. Next allow the surface to dry thoroughly, and then rub it vigorously with dry burlap to completely remove any dried grout. There shall be no visible film of grout remaining after this rubbing. The entire cleaning operation for any area must be completed the day it is started. No grout shall be left on the wall overnight.

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- C. Surfaces exposed to view in the finished structure and not indicated to be rubbed on the drawings shall have fins removed, honeycomb areas patched and all surface blemishes larger than 3/4 inch filled with grout to the plain of the formed surface. Grout for this purpose shall be as indicated under Paragraph 3.12.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finished with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.
- E. All finish surfaces exposed to view, including but not limited to slabs, shall have a finished surface free of defects and blemishes as defined by the Architect/Engineer. All finished surfaces shall be free of construction dirt.

3.08 MONOLITHIC SLAB FINISHES:

- A. General: Under no circumstances shall dry cement or mixture of cement and sand be used to absorb surface moisture or to stiffen surface to be finished.
- B. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting in beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
 - 1. After placing slabs, plane surface to a tolerance not exceeding 1/2" in 10' when tested with a 10' straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms, or rakes).
- C. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.
 - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Check and level surface plane so that depressions between high spots do not exceed 1/4" under a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- D. Trowel Finish: Apply hard trowel finish to all monolithic slab surfaces.
 - 1. After floating and after water sheen has disappeared, begin first trowel finish operation using a power driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand troweling operation, free of trowel marks and pin holes, uniform in texture and appearance, and with a level surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.
- E. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

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- F. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated. (This finish is applicable to exposed topping/ wearing slab on this project.)

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.09 CONCRETE CURING AND PROTECTION:

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Start initial curing immediately after final finishing is complete. Keep continuously moist for not less than 7 days.

- B. Curing Methods: Perform curing of concrete by curing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified. Note: Concrete to remain exposed and/or to receive sealer shall be cured by wet curing methods. Concrete to received floor covering may be cured by use of membrane curing compounds. Coordinate locations with Architectural Finishes.

1. Provide moisture curing by following methods.
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.
 - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
2. Provide moisture-cover curing as follows:
 - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Provide curing compound to interior slabs only with resilient flooring, carpet over cushion, or left exposed; and to exterior slabs, walks, and curbs, as follows:
 - a. Apply specified curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor sealer, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Architect.

- C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

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- D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.
- E. Cure concrete surfaces to receive liquid floor sealer or finish flooring or water repellant products by use of wet-curing methods, unless otherwise directed. Following wet curing and prior to application of sealer, concrete shall be protected by appropriate means to prevent any type of damage, chipping or staining. Paint, oil or other stains shall be unacceptable. Concrete finishes shall be remedied in a manner acceptable to the Architect/Engineer.

3.10 REMOVAL OF FORMS:

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 7 days and until concrete has attained 75% of minimum design compressive strength at 28-days. Determine potential compressive strength of in place concrete by testing field-cured specimens representative of concrete location or members.

3.11 RE-USE OF FORMS:

- A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect/Engineer.

3.12 MISCELLANEOUS CONCRETE ITEMS:

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Equipment Bases and Foundations: Set anchor bolts and provide pads for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment. Equipment shop drawings shall be approved by Architect/Engineer prior to placing concrete pads.

3.13 CONCRETE SURFACE REPAIRS:

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect/Engineer.
- B. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

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- C. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- D. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect/Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
- E. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
- G. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets and other objectionable conditions.
- H. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
- I. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect/Engineer.
- J. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- K. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
- L. All structural repairs shall be made with prior approval of the Engineer, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar. Where epoxy injection procedures must be used, an approved low viscosity epoxy made by the manufacturers previously specified shall be used.
- M. Leveling of floors for subsequent finishes shall be achieved by use of the specified underlayment material.

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- N. All exposed floors shall be leveled, where required, with the specified self-leveling repair topping.
- O. Repair methods not specified above may be used, subject to acceptance of Architect/Engineer.

3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION:

- A. The Owner shall retain the services of a Special Inspector to perform tests and to submit test reports. The Contractor shall allow Owner's Special Inspection Testing Agency access to all materials and shall assist in obtaining samples. The Owner shall pay for preparation of 4 cylinders per concrete test, as defined below and 3 cylinder breaks as defined below. If required by the Architect/Engineer, the fourth cylinder shall be tested and the test shall be paid for by the Contractor. All additional cylinders and tests made for the Contractor's convenience shall be at the Contractor's cost.
- B. Sampling and testing for quality control during placement of concrete shall include the following, as directed by Architect/Engineer.
- C. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
 - 1. Slump: ASTM C143; one test at point of discharge for each day's pour of each type of concrete and one test for each 50 cu. yards of each concrete class placed in any one day; additional tests when concrete consistency seems to have changed.
 - 2. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's pour of each type of air entrained concrete and one test for each 50 cu. yards of each concrete class placed in any one day.
 - 3. Concrete Temperature: Test hourly when air temperature is 40°F and below, and when 80°F and above; and each time a set of compression test specimens made.
 - 4. Compression Test Specimen: ASTM C31; one set of 4 standard (6" x 12") cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
 - 5. Compressive Strength Tests: ASTM C39; one set for each day's pour (min.) and one set for each 50 cu. yds. for each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 - 6. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
 - 7. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in place concrete.
 - 8. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test (average of two cylinders) result falls below specified compressive strength by more than 500 psi.
- D. Test results will be reported in writing to Architect, Engineer, Owner and Contractor within 24 hours that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

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- E. Reports of 7 day and 28 day tests shall be made directly by the Special Inspector as follows:

Kentucky Transportation Cabinet - Project Manager
Design Team Leader – Palmer Engineering – Project Manager
Architect – Godsey Associates Architects
Structural Engineer - Stair Tower – Senler, Campbell and Associates, Inc.
Structural Engineer – Pedway Steel Framing – Structural Services, Inc.
Contractor/Applicable Subcontractor
Ready-Mix Producer
Department of Housing, Building, and Construction

- F. In event test results do not meet specification requirements; one or more of the following will be required at no cost to Owner:

1. Windsor Probe test conforming to ASTM C803
2. Core-boring test conforming to ASTM C42
3. Load test in accordance with Chapter 20, ACI 318

- G. In event Windsor Probe, core-boring or load test indicate that concrete does not conform to specifications. Contractor shall take such measures as Architect/Engineer shall prescribe or shall remove defective work as directed by Architect/Engineer.

- H. Test made for Contractor's convenience, to determine when concrete can be placed in service or stripped shall be paid for by Contractor. Such tests shall be made in accordance with ASTM C31 and cured in the field as directed by the Architect/Engineer.

- I. The Special Inspector shall conduct tests and inspection as required by this section, the drawings, and sections 01 45 00 and 01 45 10.

END OF SECTION

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SECTION 05 12 00
STRUCTURAL STEEL

PART 1 GENERAL

1.01 WORK INCLUDED

- A. This section includes furnishing all structural steel, related materials, labor, tools, equipment and services necessary for the fabrication, delivery to the site, unloading, handling, storing and erecting of all structural steel shown on the drawings, and/or specified herein.
- B. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
 - 1. Promptly remove and replace materials or fabricated components which do not comply.
- C. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
 - 1. Promptly notify Engineer whenever design of members and connections for any portion of structure are not clearly indicated.

1.02 RELATED WORK

- A. Section 01 45 00 - Special Inspections
- B. Section 01 45 10 - Statement of Special Inspections
- C. Section 03 30 00 - Cast-In-Place Concrete
- D. Section 05 30 00 - Metal Decking
- E. Section 09 91 00 - Painting
- F. Section 09 96 00 - High Performance Coatings

1.03 REFERENCES

- A. American Institute of Steel Construction (AISC):

Manual of Steel Construction, Thirteenth Edition.
Code of Standard Practice for Steel Buildings and Bridges, March 18, 2005
Specification for Structural Steel Buildings, March 9, 2005.
- B. American Society for Testing and Materials (ASTM)
 - A36 Structural Steel.
 - A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - A307 Carbon Steel Externally Threaded Standard Fasteners.
 - A325 High-Strength Bolts for Structural Steel Joints.

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- A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- A501 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- A572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- A588 Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance.
- A992 Standard Specification for Steel for Structural Shapes Used in Building Framing.

C. American Welding Society (AWS)

A2.4 Symbols for Welding and Nondestructive Testing.
D1.1 Structural Welding Code - Steel.

D. Steel Structures Painting Council (SSPC)

Steel Structures Painting Manual, Volume 2, Systems and Specifications, Second Edition.
SP 2 Hand Tool Cleaning.

E. Research Council on Structural Connection (RCSC), Specification for Structural Joints Using ASTM A325 or A490 Bolts, June 30, 2004.

1.04 SUBMITTALS

A. Shop Drawings; General:

1. Submit newly prepared information, drawn to accurate scale. Except for templates, patterns and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 x 11" but no larger than 30" x 42". Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Bidding/Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
2. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
 - a. Dimensions
 - b. Identification of products, materials, and finishes.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement as applicable.

B. Shop drawings shall be checked by the Contractor and submitted to the Architect/Engineer for review before fabrication is begun.

C. The shop drawings shall be prepared under the supervision of a Registered Professional Structural Engineer, licensed in the Commonwealth of Kentucky, and shall include the following:

1. Complete details and schedules for the fabrication of each member. Include details of cuts, connections, camber, holes and other pertinent data. Indicate welds by standard AWS A2.1 and A2.4 symbols, and show size, length, and type of each weld.
2. Complete details, schedules, procedures and diagrams showing sequence of erection.
3. Each member shown on the shop drawings shall be marked in such manner that the member designations on the drawings coincide with the member designations on the member in the field.
4. Complete anchor bolt setting plan for use in setting anchor bolts and leveling plates or leveling nuts under Section 03 3000.

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- D. Submit certification sufficient to verify that welders, welding operators and tackers to be employed for welding structural steel have been qualified in accordance with AWS D1.1.
- E. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - 1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
 - 2. High-strength bolts (each type), including nuts and washers.
 - 3. Structural steel primer paint.
 - 4. Shrinkage-resistant grout.

1.05 QUALIFICATIONS

- A. The Contractor shall have completed a project of similar scope and shall have adequate facilities, personnel, and equipment to meet production and quality requirements and to maintain proper job progress.
- B. Welding procedures and operations shall be in accordance with the AWS Structural Welding Code, Section 5.

1.06 RESPONSIBILITY FOR DESIGN

- A. AISC Code, Paragraph 1.5.1. Where connections are not shown on drawings, the connections shall be designed by the fabricator in accordance with the requirements of the AISC Paragraph 3.1.3. Where reactions and/or moments are shown on drawings, connections shall be designed to accommodate these, subject to review and approval by the Engineer.
 - 1. Reactions and Moments shown on the drawings are "Working Stress" or "Allowable Stress" forces. As such, connection design shall be in accordance with ASD methods. All forces/moments shown are the result of the controlling load case for each member.
 - 2. Where beam reactions are not posted on the drawings, the connections shall be designed to resist a total/service load shear force equal to 1/2 the "ASD" uniform load capacity as shown in AISC Manual, 13th edition, Part 3, for a given beam and span length of ASTM A992 Steel (GR.50) with continuous support of the compression flange.
 - 3. Connection design shall consider, for slip critical connections, the friction coefficient of specific coatings such as galvanizing or high performance coatings. Calculations substantiating the connection design shall be submitted for the project record to the Engineer as a part of the submittal process.
- B. Bearing plates and anchorages to be embedded in concrete members shall be supplied by the Contractor under this Section for installation under Section 03 30 00.

1.07 FABRICATOR QUALITY ASSURANCE

- A. General: AISC Code, Section 8; and AISC Specification, Chapter M. Maintain a quality assurance program to assure that all work is performed in accordance with these specifications and the AISC Code and Specifications. Quality assurance program shall be submitted to the Architect/Engineer prior to the submitting of shop drawings.

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1. Contractor meeting requirements of AISC Quality Certification Program shall submit Certification information to Architect/Engineer at the time of bidding. Contractors that are not AISC certified shall be subjected to review of shop fabrication procedures by the Owner's Special Inspector.
 - B. Contractor Control: It shall be the responsibility of the Contractor to maintain control of the quality of the materials and workmanship and conformance to the project specifications.
 - C. The Contractor shall use only welders which are certified. An independent testing company shall certify that welders, welding operators, and tack welders to be employed in work have satisfactorily passed AWS qualification tests within previous twelve (12) months prior to starting the work. Certification reports shall be forwarded to the Special Inspector prior to fabrication. If recertification of welders is required, it will be Contractor's responsibility to assure compliance. Each welder working on the project shall mark his identification symbol at each weldment completed whether in shop or field.
 - D. The Contractor shall correct deficiencies in structural steel work which inspections (Special Inspections) and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work and as may be necessary to show compliance of corrected work.
- 1.08 PRODUCT HANDLING
- A. Delivery of materials to be installed under other sections:
 1. Anchor bolts and other anchorage devices which are embedded in cast-in place concrete or masonry construction shall be delivered to the project site in time to be installed before the start of cast-in-place concrete operations or masonry work.
 2. Provide setting drawings, templates, and directions for the installation of the anchor bolts and other devices.
 - B. Storage of materials:
 1. Structural steel members which are stored at the project site shall be above ground on platforms, skids, or other supports.
 2. Steel shall be protected from corrosion.
 3. Other materials shall be stored in a weathertight and dry place until ready for use in the work.
 4. Packaged materials shall be stored in their original, unbroken packages or containers.
 5. Repair or replace damaged materials or structures as directed by Architect/Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. Unless otherwise shown or specified, rolled steel plates, shapes, bars, rods and miscellaneous items shall be structural quality carbon steel complying with ASTM A36 (minimum yield strength of 36,000 psi).

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- C. All rolled structural wide flange shapes and channels shall be of structural quality carbon steel complying with ASTM A992 (minimum yield strength of 50,000 psi).
- D. Cold formed, seamless carbon steel structural tubing shall be structural quality carbon steel complying with requirements of ASTM A500, Grade B (minimum yield strength of 46,000 psi).
- E. Steel pipe of structural quality carbon steel shall comply with the requirements of ASTM A53, Type E or S, Grade B, or ASTM A501. Provide black finish unless otherwise indicated.
- F. Bolts: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers conforming to AISC Specifications, Section A3.4.
 - 1. Unfinished Bolts: ASTM A307.
 - 2. High-Strength Bolts: ASTM A325 or A490.
 - 3. Anchor Bolts and Nuts: ASTM A307, Grade A.
 - 4. Threaded Studs: Nelson Type CPL
 - 5. Headed Studs: Nelson Type H4L (Concrete Anchors not Shear Connectors).
- G. Expansion Anchors: Sleeve or expansion type anchors, zinc plated in accordance with ASTM B633. Anchor size and strength characteristics shall conform to information indicated on design documents. Submit product data for review.
- H. Filler metal and flux for welding: AISC Specifications, Section A3.6.
 - 1. AWS A5.1, E70 unless otherwise approved. Electrodes shall be compatible with the base material being welded. Manufacturer's certification shall constitute evidence of conformance.
- I. Electrodes for manual shield and metal-arc welding shall be covered mild steel electrodes complying with AWS Code.
- J. Electrodes and flux for submerged arc welding shall be bare mild steel electrodes and fluxes complying with AWS Code.
- K. Direct-Tension Indicators: ASTM F959, Compressible Washer Type, Plain.
- L. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, heavy hex head steel structural bolts with splined ends; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.
 - 1. Finish: Galvanized.
- M. Cement Grout: Portland cement (ASTM C150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.
- N. Non-metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland, cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CE-CRD-C621. Submit product literature and test data to Architect/Engineer for approval prior to the beginning of work. Product manufacturer to provide field supervision of the application of the product for setting column bases.
 - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

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"SikaGrout 212"; Sika Corporation
"Euco N.S."; Euclid Chemical Company
"Masterflow 928"; Master Builders

2.2 FINISHES

- A. Before shipping from the shop all steel shall be cleaned. Remove heavy rust and mill scale, spatter, slag or flux deposits. Remove oil, grease and similar contaminants; comply with SSPC SP-1 "Solvent Cleaning". Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning".
- B. Galvanizing: All steel members this project shall be hot-dip galvanized after fabrication. Galvanizing shall be completed for all structural steel framing at the stair/elevator tower, pedway canopy and bridge canopy framing. Members included, but not limited to, embedded connection plates in concrete, stair pans, stair stringers, and railings.
 - 1. All steel this project either exposed directly to moisture or potentially high humidity levels shall be hot dip galvanized.
 - 2. All pieces, parts, bolts, washers, nuts, anchor bolts and similar materials shall be hot dip galvanized products.
 - 3. All steel framing this project shall be hot-dip galvanized, ready to receive primer paint as specified in this section.
- C. Apply zinc-coating by the hot-dip process in compliance with the following requirements:
 - 1. ASTM A153 for galvanizing iron and steel hardware.
 - 2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.
- D. Primer to be applied over hot-dip galvanized steel framing components.
 - 1. Primer shall be Series 66 H.B. Epoxoline by Tnemec Company, Inc. Applied at 3.0 to 5.0 Dry Film Thickness. Apply as per the manufacturer's requirements.
- E. Painting methods used shall insure that all joints, corners, edges and exposed surfaces shall be fully covered. Apply to all surfaces of galvanized steel parts including those to be embedded in concrete, unless otherwise noted.
- F. For intermediate and final paint coats, refer to Sections 09 91 00 – Painting and 09 96 00 – High Performance Coatings.

2.03 FABRICATION AND DELIVERY

- A. Conform to AISC Code, Section 6 and AISC Specifications, Section M2.
- B. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with approved shop drawings. Provide camber in structural members where indicated. Properly mark and match mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials. Verify all dimensions prior to fabrication.

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- C. Architecturally Exposed Structural Steel (AESS): Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed steel. For purposes of this project, all steel members exposed to view in the stair/elevator tower, pedway canopy, and bridge canopy shall be considered to AESS. This includes, but is not limited to, all steel framing tubes, stair stringers, railings, platform framing, roof framing, etc.
 - 1. Fabricate with exposed surfaces smooth, square and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names and roughness.
 - 2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, galvanizing, and shop priming.
- C. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- D. Dimensional and Straightness Tolerances: Conform to AISC Code, Section 6.4.
- E. Provide openings in structural members for other building components as shown on drawings. Locate holes so as not to cause any appreciable reduction in strength of members and reinforce openings with steel plates and/or angles sized and welded in place to restore members to original strength as approved by the Engineer.
- F. All openings through steel floor and roof deck larger than 18" square are to receive supplemental steel framing by this section of the work.
- G. Cut column ends and bearing plates accurately to assure full contact of bearing surfaces prior to welding. Finish or otherwise prepare all column ends or column base plates in accordance with AISC ASD Specification Section M2.8.
- H. Camber: Horizontal members to accommodate dead-plus live load deflections as indicated on the contract drawings. See General Notes on Structural Drawings, AISC Specifications, Section L1 and AISC Code, paragraph 6.4.4.
- I. Clean, prepare, and shop prime structural steel members. For materials galvanized after fabrication, see AISC Specification, section M2-11.
- J. Shop and field connections shall, bolted, welded, or a combination of these as required to conform to AISC Specifications.

Field Connections:

- 1. Bolted in accord with AISC Specifications except where welded connections are required or selected by Contractor.
 - 2. High-strength threaded fasteners shall be used for all bolted connections. Install high strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts".
 - 3. Welded connections shall conform to AWS D1.1. Non-destructive testing will be required on all full-penetration welds. Welding materials shall be of the type required for materials being welded and conforming to applicable AWS Specifications.
- K. Holes for Other Work: Provide holes required for securing other work to structural steel framing as shown on final shop drawings. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning.

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PART 3 EXECUTION

3.01 PREPARATION

- A. Fabricate items of structural steel in accordance with the requirements of AISC Specifications and as indicated on the final shop drawings.
- B. Properly mark and match-mark all materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize the field handling of materials.
- C. Connections:
 - 1. All shop connections for anchors shall be welded to develop the full strength of the anchor elements.
 - 2. Welds shall be made only by operators who are qualified as prescribed in the "Standard Qualifications Procedure" of the American Welding Society. The Contractor shall furnish the Architect with documents establishing the qualifications of welders involved in the work.
 - 3. Holes for the connection of all structural steel work, including slotted holes, shall be punched or drilled in the shop. Any additional holes not shown on the shop drawings shall be approved by the Engineer and shall be drilled in the field. Do not enlarge unfair holes in members by burning or use of drift pins. Ream holes that must be enlarged to admit bolts.
- D. Flame Cutting
 - 1. There shall be no flame cutting in the field without the approval of the Architect/Engineer. If cutting is approved, cut members shall be finished in a manner and to an appearance acceptable to the Architect/Engineer.

3.02 ERECTION

- A. The erection of structural steel and related work shall comply with AISC Specifications, Code of Standard Practice, and as specified herein.
- B. The Contractor under this Section shall furnish all anchoring items, bolts, nuts, washers, leveling plates and other connections required for securing steel structure to other in-place work.
- C. Anchoring items furnished under this Section shall be placed under Section 03 30 00. It shall be the responsibility of the Contractor under Section 03 30 00 to install all embedded items to receive work to be done under Section 05 12 00.
- D. After erection and inspection, welded and bolted connections and abraded areas shall be thoroughly cleaned and covered with "Shop Coat" paint.
- E. Field Assembly:
 - 1. Steel frames and/or members shall be assembled accurately to the lines and elevations indicated and within the erection tolerances specified in AISC Code, Section 7.11.
 - 2. The various members forming parts of a complete frame or structure after being assembled shall be aligned and adjusted accurately before being fastened.
 - 3. Fastening of splices of compression members shall be done after the abutting surfaces have been brought completely into contact.

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4. Bearing surfaces and surfaces which will be in permanent contact shall be cleaned before the members are assembled.
 5. Splices shall be permitted only where indicated or approved in writing by the Engineer.
 6. Do not enlarge unfair holes in members by burning or use of drift pins. Ream holes that must be enlarged to admit bolts.
 7. If bolts must be loosened during erection process, all such bolts which have been previously tightened shall be discarded and replaced with new bolts. **DO NOT** reuse previously tightened bolts.
- F. Bearing plates:
1. Bearing plates for columns, beams, and similar structural members shall be aligned with wedges or shims before grouting.
- G. Make adequate provisions for all erection loads and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of necessary permanent bracing.
- H. Temporary shoring and bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- I. Temporary planking: Provide temporary planking and working platforms as necessary to complete work effectively.
- J. Setting baseplates and bearing plates: Clean concrete and masonry bearing surfaces of bond reducing materials and roughen to improve bond to surfaces. Clean bottom surface of baseplates and bearing plates. Set loose and attached baseplates and bearing plates for structural members on wedges or other adjusting devices.
- K. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of baseplate or bearing plate prior to packing with grout.
- L. Splice members only where indicated and accepted on approved shop drawings unless specifically approved in writing. Erection bolts: On exposed, welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
- 3.03 PROTECTION
- A. Do not use structural units for storage or working platforms until permanently secured in position.
 - B. Assure that construction loads do not exceed carrying capacity of structure.
- 3.04 FIELD PAINTING TOUCH-UP
- A. Immediately after the erection of all structural and miscellaneous steel members, clean field welds, bolted connections and all abrasions. Touch-up paint all such areas including abrasions and unpainted areas with the same paint used for the shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils. Field touch-up painting of connections shall be performed immediately after connections are made to prevent staining of other members. Comply with SSPC-PA 1 for touching up shop painted surfaces. See Division 9 Section 09 91 00 - "Painting" or Section 09 96 00 - "High Performance Coatings".

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- B. For galvanized surfaces clean welds, bolted connections and abraded areas, apply galvanizing repair paint to comply with ASTM A780.
- C. All shelf angles, plates and lintels which will have any part exposed to weather shall be galvanized and prime painted in accordance with paragraph 2.2. After completion of work, these members will receive prior to erection one finish paint coat by Section 09 91 00 – "Painting" or Section 09 96 00 – "High Performance Coatings".

3.05 QUALITY CONTROL

- A. Under the requirements of the 2013 Kentucky Building Code (2012 International Building Code Chapter 17), the Owner shall obtain and pay for the services of a "Special Inspector" to inspect structural steel welding and bolting. During the steel fabrication work, the Owner's Special Inspector shall submit written summaries of the testing results on an ongoing basis commensurate with the progress of work in the shop.
 - 1. Owner's Special Inspector shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
 - 2. For fabrication shops that participate in AISC certification program and maintain applicable certification, inspection of shop fabrication procedures shall not be required.
- B. Provide access for Special Inspector to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- C. For fabrication shop procedures and connections, the Special Inspector shall inspect and report on the following:
 - 1. Verify Fabricator's status of AISC certification. Fabricators with applicable AISC certification shall not be required to undergo inspection of shop fabrication procedures by the Special Inspector. Provide Architect/Engineer with documentation on AISC certification for the Fabricator.
 - 2. Verify that all personal at the fabrication shop, that perform welding are certified in accordance with paragraph 1.7, C, of this section.
 - 3. Inspection of fabricated items at Fabricator's shop. Provide reports indicating quality control procedures, methods of fabrication, etc. as well as any deviations from accepted AISC procedures.
 - 4. Material verification of high-strength bolts, nuts and washers:
 - a. Perform periodic review of identification markings to conform to ASTM Standards specified.
 - b. Manufacturer's certificate of compliance required from fabricator.
 - c. Report noncompliance and counterfeit material.
 - 5. Material verification of weld filler material:
 - a. Perform periodic review of identification markings to conform to ASTM Standards specified.
 - b. Monitor storage and handling of weld filler material.

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6. Material verification of structural steel:
 - a. Perform review of identification markings to conform to ASTM Standards specified.
 - b. Manufacturer's certified mill test reports required.
 - c. Track mill test report and shop drawing piece marks.
7. Verification inspection in the form of visual inspection of all shop welds for discontinuities as indicated in AWS D1.1 Table 6.1.
8. Verification inspection in the form of nondestructive testing of all multi-pass fillet welds, partial penetration and full penetration welds with one or more of the following procedures as required to verify the integrity of the weld:
 - a. Radiographic Testing
 - b. Radiation Imaging Systems
 - c. Ultrasonic Testing
 - d. Magnetic Particle Testing
 - e. Dye Penetrant Testing
- D. The Contractor shall provide the Special Inspector access in the form of operated man lifts, ladders or by any other means necessary to provide access to perform inspections, in the field.
- E. The Special Inspector shall comply with the requirements of Chapter 17 of the 2013 Kentucky Building Code (2012 IBC) and verify items required by Table 1704.3. Reports of all testing and inspections shall be provided in writing, weekly, to the following parties:

Kentucky Transportation Cabinet - Project Manager
Design Team Leader – Palmer Engineering – Project Manager
Architect – Godsey Associates Architects
Structural Engineer - Stair Tower – Senler, Campbell and Associates, Inc.
Structural Engineer – Pedway Steel Framing – Structural Services, Inc.
Contractor/Applicable Subcontractor
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1. The Special Inspector shall review and keep records of all Welder's Certificates for welding to be completed in the field. Verify that all certification is in accordance with AWS D1.1. All welds shall be visually inspected for discontinuities as applicable and indicated in AWS D1.1, Table 6.1, including:
 - a. Crack Prohibition
 - b. Weld/Base-Metal Fusion
 - c. Crater Cross Section
 - d. Weld Profiles
 - e. Underrun
 - f. Undercut
 - g. Porosity
2. The Special Inspector shall perform nondestructive testing of all field multi-pass fillet welds, partial penetration and full penetration welds with one or more of the following procedures as required to verify the integrity of the weld:
 - a. Radiographic Testing
 - b. Radiation Imaging Systems
 - c. Ultrasonic Testing

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- d. Magnetic Particle Testing
 - e. Dye Penetrant Testing
3. Field Installed Shear Connectors (Studs): The Special Inspector shall perform visual and mechanical tests of shear connectors installed in the field as follows:
- a. A percentage of stud welds shall be visually examined. The area of the weld shall be free of lack of fusion or absence of weld.
 - b. For each operator, at least one stud in every 100 production studs shall be bent by hammering to an angle of at least 30 degrees.
 - c. If the stud fails, two additional studs shall be bent.
 - d. If either of the two studs fails, all the studs represented by the tests shall be bend tested or rejected.
 - e. For studs showing less than a 360 degree weld fillet, the direction of bending shall be opposite to the missing weld fillet.
 - f. All required bending shall be done, without heating, before completion of the stud welding operation on the job, except as otherwise provided in the contract. Bent studs shall not be straightened.
4. Field Bolted Connections: The Special Inspector shall test in accordance with the following:
- a. Scope: Unless an alternate test is submitted by the Fabricator/Erector and approved by the Architect/Engineer the following test shall be performed by the Fabricator/Erector and witnessed by the Special Inspector to ensure that bolts will be at or above the specified minimum bolt tension after installation when the direct tension indicator has been compressed to the specified maximum gap and that the bolt will not have excessive plastic deformation when the direct tension indicator is compressed to the specified minimum gap.
 - b. Apparatus:
 - 1. Calibrated (every 12 months) Bolt Tension Measuring Device: (Skidmore-Wilhelm or other approved device)
 - 2. 0.005 inch Tapered Thickness Gage for Coated Fasteners and 0.015 for Plain Finish Head Side Installation. This is the same thickness gage that is to be used to inspect the bolts after installation and is to be supplied by the Washer vendor per the specifications. When Self-Indicating DTI's are used, gap compression can be measured by volume of silicone, after Self-Indicating calibration has been performed.
 - 3. Direct Tension Indicator Assembly (Bolts, Nuts, Washers and Direct Tension Indicators):
 - Pre-Installation Verification: Three direct tension indicator assemblies for each diameter and direct tension indicator lot are required.
 - The direct tension indicators, bolts, nuts and washers shall conform to the project specifications and shall be new and unused. They shall be randomly selected from the material to be used in the work.
 - 4. Wrenches: Tensioning of the bolts in a bolt tension calibrator shall be accomplished with a hand wrench such that tension readings can be recorded exactly. The use of a torque multiplier or a handle extension may be necessary and is acceptable. The use of an impact wrench for this testing is not allowed. A second wrench is required to prevent rotation of the bolt head while the nut is tightened or a slotted backing plate when the DTI is installed on the nut end.

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- c. The Special Inspector shall visually inspect bolted connections. Prior to pre-tensioning, it shall be reviewed by the Special Inspector that the appropriate feeler gage is accepted in at least half of the spaces between the protrusions of the DTI and that the protrusions are properly oriented away from the work. If not, the bolt assembly will be removed and replaced. After pre-tensioning, it shall be reviewed by the Special Inspector that the appropriate feeler gage is refused entry into at least half of the spaces between the protrusions. If not the bolt assembly shall be replaced.
 - F. Deficiencies in structural steel work which the Special Inspector or laboratory test reports have indicated to be not in compliance with requirements shall be corrected. Additional tests required shall be performed at the Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work as directed by the Architect/Engineer
- 3.06 CLEAN-UP
- A. Remove from the work site all debris caused by this work.

END OF SECTION

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SECTION 05 30 00
METAL DECKING

PART 1 GENERAL

- 1.01 SCOPE OF WORK
- A. Furnishing of and paying for all labor, materials, services, appliances, and equipment necessary for the execution, installation, and completion of all work specified herein.

B. Work included:

1. Steel roof deck and accessories.

2. Composite floor deck and accessories.

3. Framed openings up to 18 inches.
- 1.02 RELATED WORK SPECIFIED ELSEWHERE
- A. Section 01 45 00 - Special Inspections

B. Section 01 45 10 - Statement of Special Inspections

C. Section 03 30 00 - Cast-In-Place Concrete

D. Section 05 12 00 - Structural Steel

E. Section 09 91 00 – Painting

F. Section 09 96 00 – High Performance Coatings
- 1.03 REFERENCE STANDARDS
- A. American Iron and Steel Institute, (AISI):

1. Specification for the Design of Cold-Formed Steel Structural Members.

B. American Society for Testing of Materials, (ASTM):

1. ASTM A36, Structural Steel.

2. ASTM A653, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.

C. American Welding Society, (AWS):

1. AWS D1.1, Structural Welding Code, AWS Specification for Welding Sheet Steel in Structures.

D. Steel Deck Institute, (SDI):

1. Design Manual for Composite Decks, Form Decks, Roof Decks, Include:

a. Code of Recommended Standard Practice.

b. Specs and Commentary for Steel Roof Deck.

2. SDI, Diaphragm Design Manual, Second Edition.

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1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as may be required to show compliance with these specifications.
- B. Shop Drawings: Submit detailed drawings showing layout and types of deck panels, anchorage details, and conditions requiring closure panels, supplementary framing, cant strips, cut openings, special jointing or other accessories.

1.05 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated or specified:
 - 1. AISI "Specification for the Design of Cold-Formed Steel Structural Members".
 - 2. AWS "Structural Welding Code".
 - 3. SDI "Design Manual for Floor Decks and Roof Decks", No. 26.
- B. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I" fire rated construction. Fastening of roof deck units shall be capable of resisting FM I-90 uplift requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect decking from corrosion, deformation and other damage during delivery, storage and handling.
- B. Store decking on wood sleepers with slope for positive drainage. Decking shall be free of corrosion prior to installation.
- C. Replace damaged decking units.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Basic steel shall be flat rolled, galvanized sheets of structural quality, meeting the requirements of ASTM A653. Galvanizing shall meet ASTM A924, G90 coating.
- B. Sheet Metal Accessories: ASTM A611 commercial quality galvanized.
- C. Bearing Plates and Angles: ASTM A36 steel.
- D. Welding Materials: AWS D1.1.
- E. Cell Closures: Closed cell foam rubber, one inch thick, profiled to decking.
- F. Metal Closure Strips, Cover Plates, and Related Accessories: Same gage sheet steel as deck of required profiles and size.

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2.02 FABRICATION

- A. Floor decking (Stair Landings) shall be 20 gage Composite Metal Deck (see plans for locations), with a fabricated depth of 1.5 inches and a valley spacing of 6 inches. Form deck units in lengths to span 3 or more supports (where possible), with flush, telescoped or nested 2" laps at ends and interlocking or side laps, unless otherwise indicated. Steel section properties shall be equal to or exceed:

Deck Type	= 1.5 VLI 20 (20 gage)
Design Thickness	= 0.0295 in.
Ip	= 0.143 in ⁴ /ft.
In	= 0.173 in ⁴ /ft.
Sp	= 0.187 in ³ /ft.
Sn	= 0.197 in ³ /ft.
Fy	= 40 ksi

- B. Roof decking (Stair Tower) shall be 20 gage Type B roof deck, with a fabricated depth of 1 ½". Form deck units in lengths to span 3 or more supports, with flush, telescoped or nested 2" laps at ends and interlocking or side laps, unless otherwise indicated. Steel section properties shall be equal to or exceed:

Deck Type	= 1.5B20 (20 gage)
Design Thickness	= 0.0358 in.
I	= 0.212 in ⁴ /ft.
Sp	= 0.234 in ³ /ft.
Sn	= 0.247 in ³ /ft.
Fy	= 33 ksi

- C. Roof decking (Bridge) shall be 20/20 gage Type BP cellular roof deck, with a fabricated depth of 1 ½". Form deck units in lengths to span 3 or more supports, with flush, telescoped or nested 2" laps at ends and interlocking or side laps, unless otherwise indicated. Steel section properties shall be equal to or exceed:

Deck Type	= 1.5BP20 (20/20 gage)
Design Thickness	= 0.0358 in. – pan and hat materials
I	= 0.357 in ⁴ /ft.
Sp	= 0.301 in ³ /ft.
Sn	= 0.394 in ³ /ft.
Fy	= 33 ksi

- D. Fabricate metal decking in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks to accommodate maximum working stress of 0.6 x Fy and maximum span deflection of L/240. All floor and roof decking shall be hot-dip galvanized in accordance with ASTM A924, G90 coating.
- E. Primer Paint: All galvanized floor and roof decking and accessories shall be shop painted on the bottom or exposed to view surface with manufacturer's primer paint which is compatible with galvanizing. Paint shall be a fast curing, lead free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with alkyd finish paint systems, and for the capability of providing a sound foundation for field-applied topcoats despite prolonged exposure. Application shall be in two coats and shall not be less than 1.5 mil dry film thickness.
- F. Technical literature showing the configuration, load capacity, section properties and other pertinent data shall be submitted as a part of the shop drawings.

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- G. Follow guidelines of the Steel Deck Institute (SDI) subject to the requirements, manufacturers offering products which may be incorporated into the work include, but are not limited to the following:
1. Bowman/E. G. Smith, Division of Cyclops Corporation
 2. Consolidated Systems, Incorporated
 3. Epic Metals Corporation
 4. Mac-Fab Products, Incorporated
 5. Roll-Form Products, Incorporated
 6. United Steel Deck, Incorporated
 7. Vulcraft/Division of Nucor Corporation
 8. Wheeling Corrugating Company
 9. Wolverine Deck Company

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Erect and attach metal decking in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks, as well as with manufacturer's recommendations and final shop drawings. Provide welding in accordance with SDI Specifications and AWS D1.1.
- B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
- C. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units. Any decking not placed in straight alignment or normal (perpendicular) to supporting members shall be cause for rejection and shall be replaced as directed by the Architect/Engineer and at no cost to the Owner. Out of alignment tolerance shall not exceed 1/2" in 20 feet.
- D. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
- E. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members. DO NOT use deck units for storage or working platform until permanently secured.
- F. On steel support members provide 1-1/2 inches minimum bearing. Align and level on supports.

3.02 FLOOR DECK

- A. Attachments: Steel floor deck units shall be permanently fastened to steel supporting members by welding or by powder-actuated fasteners spaced not more than 6 inches on center (see also drawings).
1. Fasteners shall be Hilti X-ENP-19 L15.
 2. Provide side laps at 12 inches on center using HILTI # 10 HWH screws.

3.03 ROOF DECK

- A. Attachments: Steel roof deck units shall be anchored to supporting steel members to provide lateral stability to the top flange of the supporting structural members and to resist the following gross uplifts - 45 lbs./psf for eave overhang and 30 lbs./psf for all other roof areas. The dead load of the roof deck construction shall be deducted from the above uplift forces. Fasteners shall be powder actuated fasteners, pneumatically actuated fasteners or self-drilling fasteners

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appropriate for this use, spaced not more than 12" on center at every support. Deck shall be secured to each supporting member in ribs when side laps occur. See fastening detail and notes on design drawings for specific fastening requirements.

- B. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.
- C. Reinforce deck openings from 6 to 12 inches in size with 2 inch x 2 inch x 1/4 inch steel angles. Place angles perpendicular to flutes. Extend minimum two flutes each side of opening and weld to deck. For longer openings, reinforce with 3" x 3" x 1/4" steel angles supported by roof joists or as otherwise indicated on the drawings.
- D. Install 6-inch wide sheet steel cover plates where deck changes direction. Spot weld in place 12 inches on center maximum.
- E. Touch-Up Painting: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.
 - 1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions. Touch-up paint all primed surfaces with compatible primer.

3.04 QUALITY CONTROL

- A. The Owner shall engage a Special Inspector to inspect connections of metal decking. Frequency of testing shall be such that the testing agency will certify all decking connections. See drawing notes and Specification Sections 01 45 00 and 01 45 10.
- B. Special Inspector shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
- C. Provide access for Special Inspector to places where metal deck work is being installed so that required inspection and testing shall be accomplished.
- D. Correct deficiencies in metal deck placement and fastenings for which inspection reports have indicated to not be in compliance with requirements. Perform additional tests or inspections, at Contractor's expense, as may be necessary to show compliance of corrected work.
- E. Special Inspection Requirements:
 - 1. Visual inspection by the Special Inspector of all metal deck fasteners in the field shall be required. Verify that all fasteners to deck are in place, are securely fastened, and are undamaged due to installation techniques. Reports shall discuss fastening deficiencies on a bay by bay basis and shall recommend locations where additional fasteners shall be installed. Field verify that all sidelap fasteners are in place.
 - 2. Special Inspector shall, prior to installation, perform the following tests and shall provide a written report on these tests:
 - a. Verify all materials (decking, fasteners, sidelap screws, etc.) meet specified ASTM requirements.
 - b. Perform applicable testing on strength of pneumatically driven, powder actuated, or screw type fasteners to be used in the work. In lieu of testing, provide manufacturer's test reports prepared by independent testing agencies used to substantiate manufacturer's reported shear strengths and pull out strengths.
 - c. Verify proper calibration of all fastening equipment to be used for pneumatically driven, powder-actuated, or screw type fasteners. Verify all welding equipment operation and materials.

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3. All written reports shall be distributed directly by the Special Inspector to the following persons:

Kentucky Transportation Cabinet - Project Manager
Design Team Leader – Palmer Engineering – Project Manager
Architect – Godsey Associates Architects
Structural Engineer - Stair Tower – Senler, Campbell and Associates, Inc.
Structural Engineer – Pedway Steel Framing – Structural Services, Inc.
Contractor/Applicable Subcontractor
Department of Housing, Building, and Construction

END OF SECTION

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SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes cold-formed metal framing, furring and accessories.

1.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Deflection Limits: Design wall framing systems to withstand design loads without horizontal deflections greater than 1/600 of the wall height.
 - 2. Live Load Deflection: Upward and downward movement of 1/2 inch.

1.03 SUBMITTALS

- A. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Welding Certificates
- C. Qualification Data
- D. Research/Evaluation Reports

1.04 QUALITY ASSURANCE

- A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- C. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- D. AISI Specifications: Comply with AISI S211 "North American Standard for Cold-Formed Steel Framing - Wall Stud Design" for calculating structural characteristics of cold-formed metal framing.

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PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

- A. Steel Sheet: ASTM A1003, structural steel, zinc coated, of grade and coating as follows:

1. Grade: ST50H.
2. Coating: G60.

2.02 FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of base-metal thickness required and web depths indicated, punched, with stiffened flanges.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of base-metal thickness required and web depths indicated, unpunched, with unstiffened flanges.

2.03 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories of the same material and finish used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
 2. Deflection tracks.
 3. Bracing, bridging, and solid blocking.
 4. End clips.
 5. Foundation clips.

2.04 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by hot-dip process according to ASTM A123.
- B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

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2.05 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and 30-minute working time.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
- E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

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- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
 - H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
 - I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
 - J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - K. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
 - L. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs at 16 inches o.c.
 - M. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
 - N. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.
- 3.03 REPAIRS AND PROTECTION
- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.
 - B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Steel railings and infill panels.
- B. Stair nosings.
- C. Miscellaneous fabrications and hardware.

1.02 SUBMITTALS

- A. Product data for products used in miscellaneous metal fabrications, including paint products and grout.
- B. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.
- C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

1.03 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firms experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.
- B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.
- C. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel," and D1.3 "Structural Welding Code - Sheet Steel."

1.04 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.
 - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

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PART 2 PRODUCTS

2.01 METALS

- A. For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A992 for W-shapes (A36 for other shapes).
- C. Steel Pipe: ASTM A53; galvanized, type, and weight class as follows:
 - 1. Type F, standard weight (Schedule 40), unless otherwise indicated, or another weight, type, and grade required by structural loads; or,
 - 2. Type S, Grade A, standard weight (Schedule 40), unless otherwise indicated, or another grade or weight or both required by structural loads.
- D. Gray Iron Castings: ASTM A48, Class 30.
- E. Malleable Iron Castings: ASTM A47, grade 32510.
- F. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- G. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A153.
- H. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.02 GROUT AND ANCHORING CEMENT

- A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

"Bonsal Construction Grout"; W.R. Bonsal Co.
"Conspec 100 Nonmetallic Grout"; Dayton Superior.
"NS Grout"; Euclid Chemical Co.
"Kemset"; Chem-Masters Corp.
"Crystex"; L & M Construction Chemicals, Inc.
"Masterflow 713"; Master Builders.
"Sealtight 588 Grout"; W.R. Meadows, Inc.
"Stoncrete NM1"; Stonhard, Inc.
"Five Star Grout"; U.S. Grout Corp.
"Vibropruf #11"; Lambert Corp.

2.03 FASTENERS

- A. Provide plated fasteners complying with ASTM B633, Class Fe/Zn 25 for electro-deposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

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- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A, with hex nuts, ASTM A563, and, where indicated, flat washers.
 - C. Machine Screws: ANSI B18.6.3.
 - D. Lag Bolts: ANSI B18.2.1.
 - E. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.
 - F. Plain Washers: Round, carbon steel, ANSI B18.22.1.
 - G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
 - H. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
 - 1. Material: Carbon steel components zinc-plated to comply with ASTM B633, Class Fe/Zn5.
 - 2. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F593 and ASTM F594.
 - I. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.
- 2.04 PAINT
- A. Shop Primer for Ferrous Metal
 - 1. Surface Preparation: SSPC-SP 6
 - 2. Primer: Equal to Tnemec Series 90-97 Tneme-Zinc. DFT 2.5 to 3.5 mils.
 - a. Provide a standard color acceptable to the Architect.
 - B. Shop Primer for Galvanized Metal
 - 1. Surface Preparation: SSPC-SP 7
 - 2. Primer: Equal to Tnemec Series 66 H.B. Epoxoline. DFT 3.0 to 5.0 mils.
 - a. Provide a standard color acceptable to the Architect.
 - C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.
- 2.05 FABRICATION, GENERAL
- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
 - B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

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- C. Allow for thermal movement resulting from a 100 deg. F maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - D. Shear and punch metals cleanly and accurately. Remove burrs.
 - E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 - F. Remove sharp or rough areas on exposed traffic surfaces.
 - G. Weld corners and seams continuously to comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
 - H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
 - I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
 - J. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
 - K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
 - L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- 2.06 ROUGH HARDWARE
- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.
 - B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

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2.07 MISCELLANEOUS FRAMING AND SUPPORTS

- A. Provide steel framing and supports for applications indicated or which are not a part of building framework, as required to complete work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- C. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

2.08 STEEL PIPE RAILINGS

- A. Fabricate pipe and tube railings and handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.
- B. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
 - 1. At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.
- C. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.
- D. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.
- E. Close exposed ends of pipe by welding a plate (same as pipe wall thickness) in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch or less.
- F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

2.09 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:
 - 1. ASTM A153 for galvanizing iron and steel hardware.
 - 2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

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2.10 STAIR NOSINGS

- A. Extruded Units: 6063-T5 extruded aluminum ribbed units with integral anchors, with abrasive filler strips consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder; filler color selected by Architect. Nosings shall be one of the following:

	Steel Pan Stairs:	Concrete Stairs:
1. American Safety Tread	Type 9511	Type 3511
2. Amstep	238A	231A
3. Balco	R-315LP	R-315P
4. Wooster	238	131
5. or equivalent		

2.11 PERFORATED METAL INFILL PANELS

- A. 10 gauge steel, 1/4" diameter holes @ 3/8" centers, staggered; field paint.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

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2. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

3.03 INSTALLATION OF PIPE RAILINGS AND HANDRAILS

- A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as indicated.
- B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2 inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction.

3.04 STAIR NOSINGS

- A. Center nosings on tread widths unless otherwise indicated.
- B. Align nosings flush with riser faces and flush with the top of the traffic surface.

END OF SECTION

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SECTION 05 51 00

STEEL STAIRS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. The extent of the steel stairs work is shown on the drawings, which includes all items fabricated from iron and steel shapes, plates, bars, strips, tubes, pipes and castings for the stair systems which are not a part of other metal systems in other sections of these specifications.

1.02 RELATED WORK

- A. Division 03 Section "Cast-In-Place Concrete".
- B. Division 05 Section "Metal Fabrications".

1.03 QUALITY ASSURANCE

- A. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.04 SUBMITTALS

- A. Submit anchor details and installation instructions for products used.
- B. Submit shop drawings for fabrication and erection. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

PART 2 PRODUCTS

2.01 MATERIALS

- A. For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Steel Plates, Shapes and Bars: ASTM A36.
- C. Steel Tubing: Cold-formed, ASTM A500; or hot-rolled, ASTM A501.
- D. Structural Steel Sheet: Hot-rolled, ASTM A570; or cold-rolled ASTM A611, Class 1; of grade required for design loading.
- E. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A153.

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2.02 FASTENERS

- A. Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
- B. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.
- C. Lag Bolts: Square head type, ANSI B18.2.1.
- D. Machine Screws: Cadmium plated steel, ANSI B18.6.3.
- E. Plain Washers: Round, carbon steel, ANSI B18.22.1.
- F. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
- G. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
- H. Lock Washers: Helical spring type, carbon steel, ANSI B 18.21.1.

2.03 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to all steel according to ASTM A123.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.04 PAINT

- A. Shop Primer for Ferrous Metal
 - 1. Surface Preparation: SSPC-SP 6
 - 2. Primer: Equal to Tnemec Series 90-97 Tneme-Zinc. DFT 2.5 to 3.5 mils.
 - a. Provide a standard color acceptable to the Architect.
- B. Shop Primer for Galvanized Metal
 - 1. Surface Preparation: SSPC-SP 7
 - 2. Primer: Equal to Tnemec Series 66 H.B. Epoxoline. DFT 3.0 to 5.0 mils.
 - a. Provide a standard color acceptable to the Architect.

2.05 CONCRETE FILL

- A. Comply with requirements of Section "Cast-In-Place Concrete", normal weight, ready-mix concrete with minimum 28-day compressive strength of 2500 psi, 440 lbs. cement per cu. ft. minimum and W/C ratio of 0.65 maximum.

2.06 FABRICATION

- A. Use welding for joining pieces together, unless otherwise shown or specified. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight, and make connections between parts light-proof tight. Provide continuous welds, ground smooth where exposed.

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- B. Construct stair units to conform to sizes and arrangements as shown. Provide metal framing, hangers, columns, clips, brackets, bearing plates and other components for the support of stairs and platforms. Erect stair work to line, plumb, square, and true with runs registering level with floor and platform levels.
- C. Where masonry walls support the steel stair work, provide temporary supporting struts, designed for the erection of steel stair components before installation of masonry.
- D. Fabricate stringers of structural steel channels, or plates, or a combination thereof, as shown. Provide closures for exposed ends of stringers.
- E. Construct platforms of structural steel channel headers and miscellaneous framing members, as shown.
- F. Unless otherwise indicated, form metal pans of cold rolled structural steel sheets. Shape pans to conform to the configuration shown.
- G. Construct riser and subread metal pans with steel angle supporting brackets, welded to strings. Secure metal pans to brackets with rivets or welds. Provide platforms of the same metal as specified for pans, unless otherwise indicated.
- H. Secure subplatform metal pans to platform frames with welds.

PART 3 EXECUTION

3.01 PREPARATION

- A. Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 INSTALLATION

- A. Provide anchorage devices and fasteners where necessary for securing steel stairs to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as required.
- B. Perform cutting, drilling and fitting required for installation. Set work accurately in location, alignment and elevation, plus, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.
- C. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat.
- D. Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

END OF SECTION

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SECTION 05 58 13

FORMED METAL COLUMN COVERS

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes furnishing and installing:
 - 1. Round, aluminum plate column covers, preformed, pre-finished.

1.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide assemblies capable of withstanding the effects of load and stresses from dead loads, wind loads, snow loads and normal thermal movement without evidence of permanent defects of assemblies or components.
 - 1. Thermal Movements: Provide assemblies that allow for thermal movements resulting from the following maximum changes (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components and other detrimental effects:
 - a. Temperature Change (range): 120 deg F, ambient; 180 deg F, material surfaces.
 - 2. Sealed joints shall allow free and silent movement of metal during expansion and contraction while preventing uncontrolled penetration of moisture.
 - 3. Manufacturing, installation, and sealing shall prevent deformation of exposed surfaces.
 - 4. Design to accommodate substructure tolerance of +0 to -1/8 inch.
 - 5. Design the system to effect a positive mechanically fastened assembly to substructure, not dependent on adhesives.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's product literature.
- B. Shop Drawings: For aluminum plate assemblies and accessories. Include plans; elevations; sections and details.
- C. Samples for initial selections: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. Samples for verification: Provide color samples of selected color. Samples shall involve normal color and texture variations, include sample sets showing the full range of variations expected.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum of 5 years experience in manufacturing ornamental metals similar to those specified.
- B. Installer Qualifications: Acceptable to manufacturer.

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1.05 DELIVERY, STORAGE & HANDLING

- A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials in accordance with manufacturer's recommendations.
- C. Handle materials carefully to avoid damage to materials and finishes.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual supporting and adjoining construction by field measurements before fabrication, and indicate recorded measurements on final shop drawings. Coordinate construction to ensure that work fits properly to supporting and adjoining construction and coordinate schedule with construction progress to avoid delaying the work.
- B. Established dimensions: Where field measurements can not be made without delaying the work, guarantee dimensions and proceed with fabrication corresponding to the established dimensions.

1.07 WARRANTY

- A. Manufacturer shall warrant the materials to be free of faults and defects in accordance with the General Conditions. The warranty shall be in writing.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Manufacturers: Subject to compliance with requirements, provide products manufactured by:
 - Atas International
 - Firestone Metal Products
 - Peterson Aluminum
 - Fry Reglet
 - MM Systems
 - or equivalent

2.02 MATERIALS

- A. Aluminum Plate: ASTM B209, alloy 3003-H14/3105-H14.
 - 1. Thickness: 0.125 inch.

2.03 FABRICATION, GENERAL

- A. Form from metal of type and thickness indicated. Form returns at vertical joints to provide reveals; horizontal joints shall be hairline. Fabricate to fit tightly to adjoining construction.

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- B. Reinforce with stiffeners where applicable to meet design criteria.
- C. Lines, breaks, and angles shall be sharp and true, and surfaces shall be free from warp or buckle.
- D. Surfaces shall be free of scratches or marks caused during fabrication.

2.04 ACCESSORIES

- A. Fasteners: As recommended by the manufacturer.
- B. All fasteners shall be stainless steel.

2.05 FINISHES, GENERAL

- A. Comply with NAAMM's Metal Finishes Manual for architectural metal products recommendations for applying and designating finishes.

2.06 ALUMINUM FINISHES

- A. One of the following:
 - 1. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 or AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range of available colors.
 - 2. Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range of available colors.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation. Support structure shall be level, plumb, and structurally sound.

3.02 INSTALLATION

- A. Erect work level and plumb, in proper alignment in relation to substructure framing, established lines and adjacent work.
- B. Erect in accordance with final shop drawings.
- C. Anchorage shall be structurally sound.
- D. Where aluminum materials come in contact with dissimilar materials, an isolation shim or tape shall be installed at fastening locations.

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3.03 CLEANING AND PROTECTING

- A. Clean exposed surfaces of metal that are not protected by temporary covering to remove fingerprints and soil during construction period.
- B. Clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Protect from damage during construction. Use temporary protective coverings where needed as approved by the manufacturer. Damaged units shall be subject to rejection.
- D. Clean and touch up minor abrasions in finished with air-dried coating that matches color and gloss of, and is compatible with factory applied finish coating.

END OF SECTION

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SECTION 06 10 53

MISCELLANEOUS CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Dimension lumber wood blocking, grounds and nailers.

1.02 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Provide dressed lumber, S4S, unless otherwise indicated.
 - 3. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
- B. Wood Structural Panels:
 - 1. Plywood: DOC PS 1; thickness as indicated.

2.02 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP C2 (lumber) and AWP C9 (plywood).
- B. Kiln-dry material after treatment to maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

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D. Application: Treat items indicated on Drawings, and the following:

1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.03 DIMENSION LUMBER

- A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. Load-Bearing and Non-Load-Bearing Partitions: Construction, Stud, or No. 2 and of the following species:
1. Mixed southern pine; SPIB.
 2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

2.04 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153 or Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1.
- G. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing and inspecting agency.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

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PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
 - 1. Provide concealed blocking for support and securement of cabinets, toilet accessories, fire extinguisher cabinets, etc.
- C. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.

END OF SECTION

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SECTION 07 13 13

SELF-ADHERING SHEET WATERPROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes furnishing and installing modified bituminous sheet waterproofing at below grade walls of stair tower.

1.02 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required for this Project.
- B. Source Limitations: Obtain waterproofing materials and protection course through one source from a single manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.

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1.06 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.
 - 1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
 - 2. Warranty Period: Three years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Not less than 60-mil thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil thick, polyethylene film with release liner on adhesive side.
 - 1. Subject to compliance with requirements, provide one of the following:
 - American Hydrotech, Inc.; VM60.
 - Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
 - CETCO Building Materials Group; Envirosheet.
 - Grace, W. R. & Co.; Bituthene 3000.
 - Henry Company; Blueskin WP 200.
 - Meadows, W. R., Inc.; SealTight Mel-Rol.
 - Polyguard Products; Polyguard 650.
 - Tamko Roofing Products, Inc.; TW-60.

2.02 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid, primer recommended for substrate by manufacturer of sheet waterproofing material.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.
- D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.
- E. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.
- F. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

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- G. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.
- H. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.
- I. Protection Course: ASTM D6506, semi-rigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
 - 1. Thickness: 1/4 inch, nominal.
 - 2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 - 2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.

3.02 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions.
- B. Provide clean, dust-free, and dry substrates for waterproofing application.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D4258.
- F. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D6135. Allow primer to dry. Reprime areas exposed for more than 24 hours.
 - 1. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.
- G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D6135.

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3.03 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D6135.
- B. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
 - 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
- C. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.
- D. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.
- E. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.
- F. Install protection course with butted joints over waterproofing membrane immediately.
- G. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.04 PROTECTION AND CLEANING

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Protect installed materials from damage due to UV light, harmful weather exposures, physical abuse, and other causes.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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SECTION 07 41 00

METAL ROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes standing seam metal roof panels, accessories, and all exposed sheet metal items.

1.02 PERFORMANCE REQUIREMENTS

- A. Provide manufactured roofing panel assemblies complying with the following performance requirements and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.
 - 1. Air Infiltration: Provide manufactured roofing panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. of fixed area when tested according to ASTM E1680 at a static-air-pressure difference of 4.0 lbf/sq. ft.
 - 2. Water Penetration: Provide manufactured roofing panel assemblies with no water penetration as defined in the test method when tested according to ASTM E1646 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb/sq. ft. and not more than 12.0 lb/sq. ft.
 - 3. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance.

1.03 SUBMITTALS

- A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.
- B. Shop Drawings: Show layouts of panels, details of edge conditions, joints, panel profiles, supports, anchorages, gutters, downspouts, trim, flashings, underlayment, closures, snow/ice guards, and special details. Distinguish between factory- and field-assembled work.
- C. Product Test Reports: Indicate compliance of manufactured panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.

1.04 QUALITY ASSURANCE

- A. Engage an experienced installer who has completed metal roofing panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing components so they will not be damaged or deformed. Package components for protection against damage during transportation or handling.

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- B. Exercise care in handling, storing and erecting roofing components to prevent bending, warping, twisting, and surface damage.

1.06 PROJECT CONDITIONS

- A. Roofing panels shall be factory formed.

1.07 WARRANTY

- A. Finish Warranty: Submit a written warranty executed by manufacturer agreeing to repair or replace metal roof panel assembly that fails to retain factory finish for a period of not less than twenty (20) years from date of Substantial Completion.
- B. Weathertight Roof Warranty: Submit a written warranty executed by manufacturer, and co-signed by the installer, agreeing to repair or replace metal roof panel assembly that fails to remain weathertight for a period of not less than ten (10) years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:

Centria
Fabral
Dimension Metals
Metal Sales
Petersen Aluminum
or equivalent

2.02 METALS AND FINISHES

- A. Metallic-Coated Steel Sheet: Steel sheet metallic coated by the hot-dip process to comply with ASTM A755 and the following requirements:
 - 1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, Class AZ-50 coating, Grade 40; structural quality; mill finish; 24-gage unless otherwise indicated.
- B. Finish: Apply the following organic coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.
 - 1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin (Kynar 500 or Hylar 5000) by weight with a total minimum dry film thickness of 0.9 mil and 30 percent reflective gloss when tested according to ASTM D523. Color as selected by Architect.
 - a. Durability: Provide coating field tested under normal range of weather conditions for a minimum of 20 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of a chalk rating of 8 according to ASTM D4214; and without fading in excess of 5 Hunter units.

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2.03 ROOF PANEL ASSEMBLIES

- A. Standing-Seam Roof Panels: Manufacturer's standard structural standing-seam roof panel assembly designed for concealed mechanical attachment of panels to insulated roof deck; with double-locked seams at nominal 16-inch centers, 2-inch nominal in height.
- B. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

2.04 SUBSTRATE

- A. 5/8" plywood or OSB, mechanically fastened to metal deck.

2.05 UNDERLAYMENT MATERIALS

- A. Fabric Underlayment - One of the following:
 - 1. Manufacturer's standard nonwoven polyester fabric, weighing 6.0 oz./sq. yd., white, nonswelling, rot and mildew resistant.
 - 2. ASTM E1677; made from polyolefins; either cross-laminated films, woven strands, or spunbonded fibers; coated or uncoated; with or without perforations to transmit water vapor but not liquid water; and as follows:
 - a. Minimum Thickness: 3 mils.
 - b. Minimum Water-Vapor Transmission: 10 perms when tested according to ASTM E96, Procedure A.
- B. Polyethylene Underlayment: Minimum 6-mil thick polyethylene sheeting complying with ASTM D4397.
- C. Self-Adhering, Polymer-Modified, Bituminous Sheet Underlayment: ASTM D1970, minimum of 40 mils thick.
- D. Felts: ASTM D226 or D4869, Type II (No. 30), or Type I (No. 15) asphalt-saturated organic felts. Synthetic (non-organic) felts are not acceptable.

2.06 MISCELLANEOUS MATERIALS

- A. Provide materials and accessories required for a complete assembly and as recommended by panel manufacturer, unless otherwise indicated.
- B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
 - 1. Use stainless-steel fasteners for exterior applications.
 - 2. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels, where exposed fastening is necessary.
- C. Accessories: Unless otherwise specified, provide components required for a complete assembly including trim, copings, fascias, claddings, corner units, closures, clips, seam covers, flashings, sealants, gaskets, fillers, gutters, downspouts, and similar items. Match material and finish of roofing panels; minimum 24 gauge.

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- D. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked, polyolefin-foam flexible closure strips. Cut or premold to match configuration of panels. Provide closure strips where indicated or necessary to ensure weathertight construction.
- E. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- F. Elastomeric Joint Sealant: ASTM C920, of base polymer, type, grade, class, and use classifications required to seal joints in panel roofing, and remain weathertight. Provide sealant recommended by panel manufacturer.
- G. Furnish and install roof manufacturer's recommended seam-mounted, linear ice and snow guards. Ice/Snow guards shall maintain a minimum of 40 PSF snow load and shall be installed in a non-penetrating manner, finished to match roof panel system.
- H. Soffit Panels: 26 gauge steel, flush profile, non-perforated, 12" wide with square interlocking flush joints; finish same as roofing panels.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate metal panel roofing with rain drainage work; flashing; trim; and construction of decks, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
- B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

3.02 ROOF PANEL INSTALLATION, GENERAL

- A. Comply with roofing manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cutting exterior panels by torch is not permitted.
 - 2. Install panels with concealed fasteners, unless otherwise indicated.

3.03 SUBSTRATE INSTALLATION

- A. Apply a vapor barrier over metal decking, type as recommended by roofing manufacturer, but not less than 6-mil poly with taped seams.
- B. Install plywood or OSB with tightly butted joints, per manufacturer's recommendations and according to manufacturer's fastening requirements and patterns. Mechanically attach to metal deck with screws, to meet 1-90 uplift requirements.

3.04 ROOF INSTALLATION

- A. Install all necessary underlayments and slip sheets (if required), in shingle fashion, as required by the roofing manufacturer for performance and weathertight warranty.

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- B. Commence metal roof panel installation and install minimum of 300 sq. ft. in the presence of factory-authorized representative. Make adjustments as directed by representative.
- C. Locate and space concealed clips and fastenings in uniform vertical and horizontal alignment.
- D. Install accessory and related components required for a complete assembly.
- E. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
- F. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.
 - 1 Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
- G. Seaming: Complete seaming of roof panel joints with equipment of type recommended by panel manufacturer to provide a weathertight joint.
 - 1. Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

3.05 ACCESSORY INSTALLATION

- A. Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c.. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at a maximum of 60 inches o.c. in between.
- E. Install ice/snow guards per manufacturer's written installation instructions. Do not use fasteners that will penetrate metal roof panels.

3.06 CLEANING AND PROTECTING

- A. Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION

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SECTION 07 42 43

COMPOSITE ALUMINUM PANELS

PART 1 GENERAL

1.01 SCOPE

A. Section Includes

1. The extent of composite aluminum wall panel work is indicated on the drawings and in these specifications.

1.02 QUALITY ASSURANCE

A. Composite aluminum manufacturer shall have a minimum of 5 years experience in the manufacture of this product.

B. Fabricator/Installer shall be approved by the composite aluminum manufacturer.

1. Fabricator/Installer shall have a minimum 5 years experience, similar in scope and size to this project.
2. Fabricator/Installer shall assume undivided responsibility for all components of the system including; but not limited to, attachment to sub-construction, joinery, dissimilar material joinery, and joint seals associated with the system.

C. Field measurements should be taken prior to the completion of shop fabrication whenever possible. However, coordinate fabrication schedule with construction progress as directed by the Contractor to avoid delay of work. Field fabrication may be allowed to ensure proper fit. However, field fabrication shall be kept to an absolute minimum with the majority of the fabrication being done under controlled shop conditions.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. E330: Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads.
2. E283: Rate of Leakage Through Exterior Windows, Curtain Walls, and Doors.
3. D1781: Climbing Drum Peel Test for Adhesive Materials.
4. E84: Surface Burning Characteristics of Building Materials.
5. E162: Surface Flammability of Materials Using a Radiant Heat Energy Source.
6. D3363: Method for Film Hardness by Pencil Test.
7. D2794: Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
8. D3359: Methods for Measuring Adhesion by Tape Test.
9. D2247: Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
10. B117: Method of Salt Spray (Fog) Testing.

1.04 SUBMITTALS

A. Submittals shall be in conformance with Section, and Section 01330 - Submittals.

B. Samples

1. Two samples of each type of assembly; 12" x 12" minimum.
2. Two samples of each color or finish selected, 3" x 4" minimum.

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- C. Shop Drawings: Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.
 - D. Affidavit certifying material meets requirements specified.
 - E. Manufacturer's literature.
- 1.05 DELIVERY, STORAGE AND HANDLING
- A. Protect finish and edges in accordance with manufacturer's recommendations.
 - B. Store material in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 COMPOSITE ALUMINUM MANUFACTURERS

- A. ALUCOBOND by Alcan Composites USA
- B. REYNOBOND by Alcoa Architectural Products
- C. ALPOLIC by Mitsubishi Chemical America, Inc.
- D. ENVELOPE 2000 by Citadel Architectural Products
- E. or equal

2.02 COMPOSITE ALUMINUM

- A. Composition: Two sheets of 0.020-inch (nominal) aluminum sandwiching a core of extruded thermoplastic material formed in a continuous process. Laminated products are not permitted.
 - 1. Thickness: Minimum 4mm.
- B. Basic Product Performance: Composites shall be capable of withstanding building movements and weather exposures based on the following test standards:
 - 1. Panels and corners shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 25 pounds per square foot (psf; inward and outward). Wind load testing shall be conducted in accordance with ASTM E330.
 - a. Normal to the plane of the wall between supports, deflection of the secured perimeter framing members shall not exceed $L/175$ or $3/4"$, whichever is less.
 - b. Normal to the plane of the wall, the maximum panel deflection shall not exceed $L/60$ of the full span.
 - c. Maximum anchor deflection shall not exceed $1/16"$.
 - 2. Bond Integrity: When tested for bond integrity, in accordance with ASTM D1781 (simulating resistance to delamination), there shall be no adhesive failure of the bond (a) between the core and the skin nor (b) cohesive failure of the core itself below the following values.
 - a. Bond Strength: 214 psi (Vertical Pull; ASTM C297).

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b. Peel Strength: 22.5 in lb./in. as manufactured.

- 1) 22.5 in lb./in. after 8 hours in water at 200°F.
- 2) 22.5 in lb./in after 21 days soaking in water at 70°F.

- C. Provide attachment system components including subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C754 and metal-faced composite wall panel manufacturer's written instructions.
- D. Provide flashing, trims, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar accessories necessary for a complete weathertight wall system.
- E. Aluminum Extrusions: ASTM B221, alloy and temper recommended by manufacturer for type of use indicated.

2.03 FINISHES

- A. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 or 2605 and with coating and resin manufacturers' written instructions. Colors to be selected.

2.04 FABRICATION

- A. Tolerances:
1. Bow: Maximum 0.8% of panel dimension in width and length.
 2. Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.
 3. Lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.
 4. Maximum deviation from flatness (other than curved surfaces) shall be 1/8" in 5'0" in any direction for assembled units. (Non-accumulative)

2.05 SYSTEM CHARACTERISTICS

- A. Plans, elevations, details, characteristics, and other requirements indicated on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction.
- B. System must provide a wet seal (caulked) reveal joint as detailed on drawings.
- C. System must not generally have any visible fasteners, telegraphing or fastening on the faces or any other compromise of a neat and flat appearance.
- D. System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.

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- E. Fabricate units to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F.
 - 1. Fabricate system so that no restraints can be placed on the panel which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature changes and at all times remain air and water tight.
 - 2. The finish side of the panel shall have a removable plastic film applied prior to fabrication which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

PART 3 EXECUTION

3.01 INSPECTION

- A. Surfaces to receive composite aluminum shall be even, smooth, sound, clean, dry and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected.
- B. Surfaces to receive composite aluminum shall be structurally sound.

3.02 INSTALLATION

- A. Erect units plumb, level, and true.
 - 1. Maximum deviation from vertical and horizontal alignment of erected units: 1/4" in 20' non-accumulative.
- B. Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of 120°F. Buckling, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement will be considered as a defect in materials or workmanship, or both. Fabrication, assembly, and erection procedure shall account for the ambient temperature at the time of the respective operation. Components shall be erected in accordance with an approved set of shop drawings.
- C. Anchor units securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.
- D. Conform to fabricator's instructions for installation of concealed fasteners.
- E. Do not install component parts which are observed to be defective, including; warped, bowed, dented, abraded, and broken members.
- F. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in a visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement for new parts.
- G. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

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- H. Install sealant according to Shop Drawings. Comply with requirements of Section 07900 "Joint Sealers", using Dow Silicone 795 or approved equal, as recommended by the fabricator.

3.03 ADJUSTING AND CLEANING

- A. Remove and replace units damaged beyond repair as a direct result of installation.
 - 1. Damage includes, but not limited to, dents and creases, and scratches and abrasions of the finish.
- B. Remove masking film (if used) as soon as possible after installation.
- C. Provide additional protection as required to preserve finish, after installation, shall be the responsibility of the General contractor.
- D. Final cleaning of panels shall be part of the work of this section.

END OF SECTION

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SECTION 07 54 00

SINGLE PLY PVC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes furnishing and installing an adhered membrane roofing system.

1.02 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. Provide roof covering materials which have been UL listed and labeled for Class A fire hazard classification and FM Class 1A-75.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
 - 1. Base flashings and membrane terminations.
- C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- D. Maintenance Data: For roofing system to include in maintenance manuals.
- E. Warranties: Special warranties specified in this Section.
- F. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- B. Source Limitations: Obtain components for membrane roofing system from or approved by roofing membrane manufacturer.

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- C. Pre-Roofing Conference: Before starting roof construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:
1. Meet with Owner, Architect, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions, and weather limitations
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.
 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 7. Review temporary protection requirements for roofing system during and after installation.
 8. Review roof observation and repair procedures after roofing installation.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.06 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system, from the roof deck up, that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover boards and other components of membrane roofing system.
 2. Warranty Period: 20 years from date of Substantial Completion.

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- B. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, for the following warranty period:

- 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PVC ROOFING MEMBRANE

- A. PVC Sheet: ASTM D4434, Type II or III, reinforced, unbacked, as follows:
 - 1. Product: Subject to compliance with requirements, provide products by one of the following:
 - Sarnafil Inc.
 - GAF Materials Corporation
 - Carlisle SynTec Inc.
 - Johns Manville
 - Versico
 - or equivalent
 - 2. Thickness: 60 mils, minimum.
 - 3. Exposed Face Color: To be selected by Architect from standard color offerings.

2.02 ROOF INSULATION

- A. Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C1289; facer as recommended by membrane manufacturer for the application.
 - 1. Insulation shall meet FM4450 or UL 1256, requiring no thermal barrier between insulation and metal roof deck.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to provide an in-place slope of 1/4 inch per 12 inches, unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain.
- E. Where no insulation is indicated, provide 5/8" glass-mat gypsum board, Dens-Deck Prime or equivalent, as substrate for adhered membrane in accordance with 3.02 below.

2.03 INSULATION ACCESSORIES

- A. Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

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2.04 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.
- C. Bonding Adhesive: Manufacturer's standard solvent or water-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
- D. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- E. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories as required to complete the installation.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Provide and install wood insulation stops and nailers at edges of deck, around all projections and penetrations through the deck. Stops shall be of pressure treated wood of same thickness as insulation and be mechanically fastened to the deck. Mechanical fasteners shall be submitted for approval.

3.02 INSULATION INSTALLATION

- A. Steel Decks: Starting at the low edge of the roof, mechanically attach roof insulation using fasteners at the prescribed rate to achieve the FM 1A-75 Uplift resistance. Use additional fasteners at perimeters and corners as prescribed in the Factory Mutual 1-28 publication. Fasteners shall be no closer than 6-inches to the board edge. Fasteners must be sized to engage only the top flange of the deck
- B. Install no more insulation than can be roofed watertight the same day.

3.03 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
 - 1. Install sheet according to ASTM D5036.

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- B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.
- C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
- H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.04 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with sheet flashing.
- D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings.
- F. Coordinate with metal flashings.

3.05 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

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- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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SECTION 07 90 00

JOINT SEALERS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide materials, labor, equipment and related items required to complete the application of all sealants. Work includes cleaning and preparation of joint surface.
- B. Application of sealant and backing materials including but not limited to:
 - 1. Control joints.
 - 2. Perimeter of door and window frames.
 - 3. Threshold sealant bed.

1.02 SUBMITTALS

- A. Submit product data for certification of compliance with the products specified.
- B. Submit manufacturer's surface preparation and installation instructions.
- C. Submit manufacturer's color chart/samples.

PART 2 PRODUCTS

2.01 ELASTOMERIC SEALANT TYPE I

- A. One-part, polyurethane based, non-sag, gun grade.
- B. Acceptable Products:
 - 1. BASF/Sonneborn "Sonolastic NP1"
 - 2. Pecora "Dynatrol I".
 - 3. Tremco "Dymonic"
 - 4. or equal
- C. Color to be selected from manufacturer's standard range

2.02 ELASTOMERIC SEALANT TYPE 2

- A. Multi-part, polyurethane based, non-sag, gun grade.
- B. Acceptable Products:
 - 1. BASF/Sonneborn "Sonolastic NP2"
 - 2. Pecora "Dynatrol II"
 - 3. Tremco "Dymeric"
 - 4. or equal
- C. Color to be selected from manufacturer's standard range.

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2.03 ELASTOMERIC SEALANT TYPE 3

- A. One-part, polyurethane based, self-leveling.
- B. Acceptable Products:
 - 1. Sonneborn "Sonolastic SL1"
 - 2. Pecora "NR-201"
 - 3. Tremco "Tremflex S/L"
 - 4. or equivalent
- C. Color to be selected from manufacturer's standard range.

2.04 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint filling materials.
- C. Joint Filler: ASTM D1056, round, closed cell polyethylene foam rod; non-outgassing, oversized 30 to 50 percent.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify joint dimensions, physical and environmental conditions are acceptable to receive work of this Section.
- B. Commencement of installation constitutes acceptance of conditions under which the work will be performed.

3.02 PREPARATION

- A. Clean, prepare and size joints in accordance with manufacturer's instructions. Remove loose materials and other foreign matter which might impair adhesion of sealant. Metal surfaces shall be free of corrosion.
- B. Verify that joint shaping materials and release tapes are compatible with sealant.
- C. Examine joint dimensions and size materials to achieve required width/depth relations. Contact surfaces of sealant shall not be less than 1/4". Material shall be 1/4" deep for 1/4" wide joints, 3/8" deep for 3/8" to 1/2" wide joints, and 1/2" deep for 5/8" to 1" wide joints. Joints to be caulked shall not be less than 1/4" deep nor more than 1/2" deep.
- D. Install joint filler rod to proper depth by rolling material into the joint without lengthwise stretching or twisting. Do not puncture or prime filler rod.
- E. Use bond breaker tape where required.

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3.03 APPLICATION OF SEALANTS

- A. Sealant application shall be performed in strict accordance with manufacturer's written specifications by tradesmen skilled in the work. Use masking tape to protect adjacent surfaces as necessary.
- B. Sealant shall be forced into the joint with hand or air powered caulking gun so as to fill voids completely. Guns shall have nozzle of proper size to fit the joint.
- C. All sealing shall be done with neat, smooth tooled beads. Any excess material and droppings shall be promptly cleaned from adjoining surfaces in such a manner as not to damage the surface. Damaged work shall be repaired or replaced.
- D. Joints shall be free of air pockets, foreign embedded matter, ridges and sags, in firm full contact with interfaces.
- E. Work adjacent to joints shall be cleaned free of smears of sealant compound as work progresses.
- F. Maintain continuity of compression fillers with end joints held to a minimum. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction. Adhere filler materials with manufacturer's adhesive.

3.04 SEALANT LOCATIONS

- A. Type 1 Sealant
 - 1. Thresholds (as setting bed)
 - 2. Concealed joints around pipe, conduit and duct work, and where dissimilar materials adjoin.
- B. Type 2 Sealant
 - 1. All exposed joints other than pavements
 - a. Around perimeter of metal door, window and louver frames, both sides of each frame.
 - b. Joints around pipes, conduit and ducts which penetrate interior walls and partitions.
 - c. Joints where unlike materials meet, such as metal to concrete and metal to masonry.
 - d. Interior and exterior sides of control joints.
 - e. All other locations indicated, or required for weathertightness.
 - f. Under drip edge of all exposed exterior metal flashings and trims.
- C. Type 3 Sealant
 - 1. Horizontal paving joints
 - 2. Control joints in concrete paving
 - 3. Joints in exterior concrete pavements

END OF SECTION

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SECTION 08 11 13

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide all materials, labor, equipment and related items to complete the swinging steel doors and door frames.

1.02 QUALITY ASSURANCE

- A. Doors and frames shall be by the same manufacturer.
- B. Doors and frames shall be manufactured by a company specialized in manufacturing standard and/or custom steel doors and frames for a minimum of ten years.

1.03 SUBMITTAL

- A. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, profiles, and finishes.
- B. Submit shop drawings including a Schedule of Doors and Frames using same reference numbers for details and openings as those on Contract Documents. Shop drawings shall show fabrication and installation of steel doors and frames. Include details of each frame type, elevations of each door design type, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

1.04 DELIVERY STORAGE AND PROTECTION

- A. Deliver steel doors and frames cardboard-wrapped, crated or other approved resilient packaging for protection during transit and job storage. Strap welded frames in pairs, with one frame inverted, or provide temporary steel spreaders securely fastened to the bottom of each frame.
- B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided finish items are equal in all respects to the new work and acceptable to Architect. Remove and replace damaged items as directed with new materials.
- C. Store doors and frames at building site under cover. Place units in an upright position on wood sills at least 4" high or otherwise store on floors in manner that will prevent rust and damage. Avoid use of non-vented plastic or canvas shelter which could create humidity chambers. Provide 1/4" space between stacked doors to promote air circulation.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B; with minimum G60 or A60 zinc-iron-alloy coating designation.
- B. Supports and anchors: Fabricate from a minimum of 16 gauge galvanized sheet steel.

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- C. Inserts, Bolts and Fasteners: Manufacturer's standard, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A153, Class C or D as applicable.
- D. Shop applied primer: Universal rust-inhibitive baked-on enamel, suitable as base for any finish coat(s).

2.02 DOOR AND FRAME FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at project site. Fabricator shall be a current member of the Steel Door Institute or HMMA/NAAMM.

2.03 STEEL DOORS

- A. Face Material: Per 2.01 A. above; shop primed.
- B. Door Thickness: 1-3/4"
- C. Door Faces: 16 Gauge (0.0598"). No face seams permitted.
- D. Door shall have 1/8" bevel in 2" on lock edge; no exceptions.
- E. Face sheets shall be stiffened with continuous 20 gauge vertical steel ribs. Stiffeners shall be spaced not more than 4" apart, and spot welded to face sheets not more than 4" O.C.
- F. Edge seams shall welded or filled, ground and dressed smooth to make them invisible and provide a smooth flush surface. No open, visible edge seams permitted.
- G. Acoustical/Thermal Materials - Spaces between edges of door and stiffeners, and spaces between stiffeners shall be insulated with 0.6 pound density mineral wool insulation.
- H. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel extending the full width of the door and spot welded to both faces. Top channel shall be inverted or capped to finish flush.
 - 1. Provide openings in the bottom closure of exterior doors to permit the escape of entrapped moisture.

2.04 STEEL FRAMES

- A. Material: Per 2.01 A. above; shop primed.
- B. Frames: 16 Gauge (0.0598").
- C. Corner joints shall have all contact edges closed tight, with trim faces and stops mitered, and continuously welded.
 - 1. Joints shall be continuously inside welded. Face welding only will not be permitted.
- D. Minimum depth of stop - 5/8".
- E. Jamb depth, integral trim and profile shall be as indicated on drawings.

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- F. Door silencers: Drill stop of single doors to receive three rubber silencers on strike jamb; two rubber silencers on head of double doors. "Stick-on" silencers are not acceptable. Deliver silencers and installation tool for installation after frames are finish painted. Provide plastic plugs to keep holes clear during construction.
- G. Provide "tee" anchors at each jamb, adjacent to hinge locations at hinge jamb and at corresponding locations at strike jamb.
 - 1. Frames up to 7'-6" 3 anchors per jamb
 - 2. Frames up to 8'-0" 4 anchors per jamb
- H. Floor anchors shall be 12 gauge galvanized steel. Provide floor anchors drilled for 3/8-inch anchor bolts at bottom of each jamb member. Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.

2.05 HARDWARE REINFORCEMENTS

- A. Doors and frames shall be mortised, reinforced, drilled and tapped at the factory for fully templated mortised hardware only in accordance with approved Hardware Schedule, and templates provided by the Hardware Supplier(s) where surface mounted hardware is to be applied, frames and door shall have reinforcing plates drilled and tapped to receive surface mounted hardware. Comply with SDI 107 and ANSI A115, and as supplemented herein.
- B. Plaster Guards: Provide minimum 0.016-inch thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- C. Locate finish hardware as shown on approved shop drawings, or if not shown, in accordance with the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames".
- D. Reinforcements shall be as herein after specified. Items requiring reinforcement not specified shall be in accordance to NAAMM-HMMA 861, but not less than the following:
- E. Door Reinforcements
 - 1. Butts 7 gauge x 1/4" x 12" minimum
 - 2. Exit Devices 12 gauge
 - 3. Closers 12 gauge (both faces of door)
 - 4. All other concealed/
surface mounted hardware 12 gauge
- F. Frame Reinforcements
 - 1. Butts 7 gauge x 1-1/2" wide x 12" minimum
 - 2. Closers 7 gauge head reinforcement
 - 3. Strike 12 gauge
 - 4. Mortar Guards 26 gauge at back of all finish
hardware cutouts where mortar or
other materials could obstruct
hardware operation or installation.

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- G. Exit device back-set shall be verified with Hardware Supplier for proper location. Exit device strike, at doors equipped with surface mounted weatherstripping shall be installed after weatherstripping is applied.

2.06 FINISH

- A. After fabrication, all tool marks and surface imperfections shall be eliminated, and all welded joints shall be dressed smooth. In galvanized construction, all welds and abraded areas shall be treated with galvanizing repair paint to comply with ASTM A780 containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20, and complying with ANSI A250.10 acceptance criteria.
- B. Doors and frames shall be chemically treated to insure maximum paint adhesion and shall be coated on all accessible surfaces with a baked on rust-inhibitive primer which is fully cured before shipment.

2.07 LABELS

- A. Fire doors and frames shall bear the label of Underwriters Laboratories, Inc. (UL), Factory Mutual Engineering Corporation (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing shall be in accordance with NFPA 252 or UL 10B. Labels shall be metal with raised letters, and shall bear the name or file number of the door and frame manufacturer. Labels shall be permanently affixed at the factory to frames and to the hinge edge of the door. Door labels shall not be painted.
- B. Where paired fire doors occur, provide units which have been tested and labeled without the use of overlapping astragals. No coordinating hardware is specified.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install doors and frames in accordance with NAAMM HMMA 840, SDI-100, SDI-105 and as supplemented in this Section.
- B. Prior to installation, all frames must be checked and corrected for rack twist and out of square.
- C. Frames must be set true and plumb and remain in alignment. Brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Heads, jambs and fixed mullions shall be grouted solid.
- D. Maximum clearances shall be maintained as follows
 - 1. Between Door and Frame - 1/8".
 - 2. Between Doors (Pairs) - 1/8" at fire rated doors; 1/4" at non-rated doors.
 - 3. Door sills with out thresholds - 3/8"
 - 4. Door with thresholds - 3/4" Max.
- E. Install doors and frame with a maximum diagonal distortion of 1/16".

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- F. Install door to fit frames closely without binding. Door to come into full, continuous contact with stops when closed.

3.02 ADJUSTING AND CLEANING

- A. Doors shall swing quietly and easily and not strike floors at point of swing. Doors not equipped with closers shall remain stationary in any intermediate position in which they are left.
- B. After erection, sand smooth all rusted or damaged areas of prime coat, and re-coat with a compatible air-drying primer. Leave in clean condition for field finish painting.

END OF SECTION

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SECTION 08 42 00

ALUMINUM DOORS, ENTRANCES AND GLAZING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This Section includes a stick-framed aluminum glazing frames, entrance framing systems and aluminum doors.
- B. Furnish and install all primary components, including:
 - 1. Aluminum entrances and glazing framing systems.
 - 2. Entrance doors. Hardware shall be furnished and installed under this Section.
 - 3. Internal steel reinforcement as required for performance, anchors, shims, fasteners, inserts, accessories, and support brackets.

1.02 SYSTEM DESCRIPTION

- A. Aluminum stick-type system: The glazed aluminum systems shall consist of individual members erected separately. Major components consist of aluminum perimeter frames, vertical mullions, horizontal rails, trim shapes, and vision glass.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide the manufacturer's stock systems, adapted to the application indicated, that complies with performance requirements specified as demonstrated by testing the manufacturers corresponding stock systems according to test methods indicated.
- B. Design Wind Velocity: 90 mph (Kentucky Building Code).
- C. Air and Water Infiltration: Design and install the glazing systems for permanent resistance to air and water leakage through the system in accordance with the following:
 - 1. Air leakage through fixed systems shall not exceed 0.06 cfm per sq. ft. of wall area when tested in accordance with ASTM E283 at a minimum static air pressure differential of 1.57 lbf per sq. ft.
 - 2. There shall be no uncontrolled water leakage through fixed systems, as defined in AAMA 501, when tested in accordance with ASTM E331 at a minimum differential pressure of 20 percent of inward design wind load but not less than 6.24 lbf per sq. ft. or more than 12 lbf per sq. ft.
- D. Structural Performance: Design, engineer, fabricate, and install the glazing systems to withstand the effects of a wind load of 35 psf acting inward and 30 psf acting outward, normal to the plane of the wall, when tested in accordance with ASTM E330, with no material failures or permanent deformation of structural members.
 - 1. Structural test pressure shall be equal to 150 percent of the inward and outward acting design wind pressures.
 - 2. The glazing systems shall be capable of withstanding building movements including wind loading and of performing within the following limitations:

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- a. Deflection of framing members perpendicular to the plane of the wall shall not exceed 1/240 of its clear span or 3/4 inch, whichever is less.
 - b. Deflection of members parallel to the plane of the wall, when carrying its full dead load, shall not exceed an amount that will reduce glass bite by less than 75 percent of the design dimension and shall not reduce edge clearance between itself and the panel, glass, or other fixed member immediately below to less than 1/8 inch.
- E. Thermal Movements: The glazed aluminum systems shall be capable of withstanding thermal movements resulting from an ambient temperature differential of 120 deg F, which may result in a metal surface temperature range of 180 deg F within the framing without causing buckling, stresses on glass, failure of joint sealants, damaging loads on fasteners, or other detrimental effects.

1.04 SUBMITTALS

- A. Product Data: Include manufacturer's specifications for materials and fabrication, installation instructions, and recommendations for maintenance. Include test reports showing compliance with project requirements where test method is indicated.
- B. Shop Drawings: Show adaptation of manufacturer's systems to the project; include typical unit elevations at 1/4-inch scale and details at 3-inch scale. Show dimensions, profiles of members, anchorage system, interface with building construction, and glazing.
- C. Indicate where and how the system deviates from contract drawings and specifications. Show section moduli of wind-load-bearing members and calculations of stresses and deflections. Provide material properties and other information needed for structural analysis including computations, prepared, signed, or, and sealed by a professional engineer licensed to practice in the state where the project is located.
- D. Samples: Provide pairs of samples of each aluminum finish type and color on 12-inch-long sections of extrusions or formed shapes and on 6-inch-squares of aluminum sheet or plate.
- E. Test Reports: Provide test reports from a qualified independent testing laboratory that show compliance of the manufacturer's stock glazed systems with performance requirements indicated based on comprehensive testing of the system by the laboratory within the last 3 years current production of the system by the manufacturer.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has successfully completed installation of glazed systems similar in material, design, and extent to that indicated for the Project and who is acceptable to the aluminum framing manufacturer.
- B. Glazing Standards: Comply with recommendations of Glass Association of North America (GANA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or referenced standards.
- C. Design Criteria: The drawings indicate sizes, profiles, and dimensional requirements of the system. Systems having equal performance characteristics with deviations from indicated dimensions and profiles may be considered, provided deviations do not change the aesthetics or design concept of intended performance.

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1.06 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.07 SEQUENCING AND SCHEDULING

- A. Schedule installation of the glazing systems in sequence with related elements of the Work specified in other Sections to ensure that wall assemblies, including flashing, trim, and joint sealers, are protected against damage from effects of weather, age, corrosion, and other causes.

1.08 WARRANTY

- A. Submit a written warranty signed by authorized representatives of the Contractor and installer warranting that portions of the Work involving glazed aluminum systems are of good quality, free from defects, and in conformance with the requirements of the Contract Documents and further promising to repair or replace defective Work during a 3-year period following completion of that portion of the Work.
- B. Defective is defined to include the following:
 - 1. Glass breakage.
 - 2. Deterioration or discoloration of finishes.
 - 3. Failure of the system to meet performance requirements.
- C. The Warranty submitted under this Section shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following:

Trulite Glass and Aluminum Solutions, LLC	EFCO Corporation.
Kawneer North America - Basis of Design	Tubelite, Inc.
PITTCO Architectural Metals, Inc.	CRL - U. S. Aluminum Corp.
Oldcastle	YKK AP America
or equivalent	

2.02 MATERIALS

- A. Aluminum: Provide alloy, temper, and thickness recommended by the manufacturer for the type of use and finish indicated and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.
 - 1. Extruded Bar and Shapes: Per ASTM B221. Provide main extrusions of not less than 0.125-inch wall thickness.
 - 2. Plate and Sheet: Comply with requirements of ASTM B209, 0.050" minimum.

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- B. Glazing System: Retained mechanically with gaskets on four sides.
- C. Glazing Gaskets: Manufacturer's standard sealed-corner pressure- glazing or wedge-lock dry glazing system of black, resilient elastomeric glazing gaskets, setting blocks and shims or spacers as required, hardness as selected by manufacturer.
 - 1. Gasket Materials:
 - a. Extruded polyvinyl chloride gaskets complying with requirements of ASTM D2287.
 - b. Extruded or molded neoprene gaskets complying with requirements of ASTM D2000, classification as selected by the manufacturer for performance and permanence.
 - c. Extruded or molded EPDM synthetic rubber gaskets, compound as recommended by the manufacturer.
- D. Framing System Gaskets and Joint Fillers: Manufacturer's standard permanent framing system gaskets and joint fillers, depending on joint movement and sealing requirements, such as sliding joints, compression joint translation, or nonmoving joints.
- E. Concealed Flashing: Dead-soft 26-gage stainless steel concealed flashing of type selected for compatibility by the manufacturer.
- F. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum units or nonmagnetic stainless steel.
 - 1. Brackets not exposed to weather or abrasion may be hot-dip galvanized steel complying with ASTM A386.
 - 2. Provide nonstaining, nonferrous shims for installation and alignment of work.
- G. Stile-and-Rail Type Entrance Doors: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts.
 - 1. Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for nonremoval.
 - 2. Provide 1-3/4 inch thick doors of design indicated.
 - 3. Provide for pile weatherstripping of all doors, 3 sides.
 - 4. Where insulating glass is indicated, fabricate exterior doors to receive 5/8" to 3/4" insulating glass.
- H. Fasteners and Accessories: Provide manufacturer's standard non-corrosive fasteners and accessories compatible with materials used in the framing system and with exposed portions that match finish of the aluminum framing system. Where movement is expected, provide slip-joint linings of sheets, pads, shims, or washers of fluorocarbon resin or a similar material recommended by the manufacturer.
 - 1. Where fasteners anchor into aluminum less than 0.125-inch thick, provide noncorrosive pressed-in splined grommet nuts or other type reinforcement to receive fastener threads.

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2.03 FABRICATION

- A. Fabricate aluminum entrance and glazing systems at the manufacturer's shop to the fullest extent possible and before applying finishes. Provide concealed fasteners. Make provisions to weep penetrating water and condensation to the exterior.
 - 1. Match exposed work to produce continuity of line. Fit joints accurately and secure rigidly.
 - 2. Provide flashings and trim to match framing.
- B. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- C. Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

2.04 FINISHES

- A. Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
 - 1. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker; black.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's instructions for protecting, handling, and installing fabricated components, with particular care and attention to preservation of applied finishes. Discard or remove and replace damaged members.
- B. Anchor components securely in place in the manner indicated. Shim and allow for movement resulting from changes in thermal conditions. Provide separators and isolators to prevent corrosion, electrolytic deterioration, and freeze-up of moving joints.
- C. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
- D. Erection Tolerances: Install components plumb, level, accurately aligned, and located in reference to column lines and floor levels. Adjust work to conform to the tolerances indicated below. Tolerances indicated below are maximum and are not cumulative.
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.

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2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment: Limit offset of member alignment to 1/16 inch where surfaces are flush or less than 1/2 inch out of flush and separated by less than 2 inches by a reveal or protruding work; otherwise limit offsets to 1/8 inch.
4. Location: 3/8-inch maximum deviation from the measured theoretical location of any member at any location.

3.02 ADJUSTING

- A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.

3.03 CLEANING

- A. Clean the completed system, inside and out, promptly after erection and installation of glass and sealants, allowing for nominal curing of liquid sealants. The installer shall advise the Contractor of proper and adequate procedures for protection and cleaning during the remainder of the construction period so that the system will be without damage and deterioration at the time of acceptance.
- B. At the time of Substantial Completion, clean aluminum entrance and glazing systems thoroughly and polish glass. Demonstrate proper cleaning methods and materials to the Owner's maintenance personnel.

END OF SECTION

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SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass and glazing for interior and exterior doors, and for interior and exterior fixed glazing frames where indicated.

1.02 SYSTEM DESCRIPTION

- A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.
 - 1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120 deg. F and from a consequent temperature range within glass and glass framing members of 180 deg. F.
 - 2. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

1.03 RELATED WORK

- A. Section 08 42 00 - Aluminum Doors, Entrances, and Glazing Systems

1.04 REFERENCES

- A. Glass Association of North America (GANA): Glazing Manual
- B. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.

1.05 SUBMITTALS

- A. Submit manufacturer's technical data for each glazing material and fabrication glass product required, including installation and maintenance instructions.
- B. Submit, for initial verification purposes, 12" square samples of each type of glass indicated except for clear single pane units, and 12" long samples of each color required for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color.
- C. Submit certificates from respective manufacturers attesting that glass and glazing materials furnished for project comply with requirements.
 - 1. Separate certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.

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1.06 QUALITY ASSURANCE

- A. Comply with recommendations of GANA "Glazing Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.
- B. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.
 - 1. "Safety" glass may be laminated or tempered, except where laminated is indicated.
- C. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of the Insulating Glass Certification Council (IGCC).
- D. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.
- B. Where insulating glass units will be exposed to substantial altitude changes, avoid hermetic seal ruptures by complying with insulating glass fabricator's recommendations for venting and sealing.

1.08 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.
 - 1. Liquid sealants: Ambient and substrate temperatures above 40 deg. F.

1.09 WARRANTY

- A. Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
 - 1. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure or hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.

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- a. Warranty Period: Manufacturer's standard but not less than 10 years after date of substantial completion of the project.

PART 2 PRODUCTS

2.01 GLAZING

- A. Acceptable Manufacturers/Fabricators; Glass:

Cardinal Glass Industries	AGC Glass Co. North America
Pilkington North America	Louisville Plate Glass
PPG Industries, Inc.	Oldcastle BuildingEnvelope
Guardian Industries	Saint Gobain
Viracon, Inc.	Trulite Glass & Aluminum Solutions

2.02 GLASS PRODUCTS, GENERAL

- A. Primary Glass Standard: Provide primary glass which complies with ASTM C1036 requirements, including those indicated by reference to type, class, quality, and if applicable, form, finish, mesh and pattern.
- B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.
- C. Laminated Glass: Comply with ASTM C1172.
- D. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

2.03 PRIMARY GLASS PRODUCTS

- A. Clear Float Glass: Type I, (transparent glass, flat), Class 1, Quality q3 (glazing select).
 - 1. "Safety" [laminated (ASTM C1172) or tempered (ASTM C1048)] where indicated or required by code. If not indicated, provide laminated glass.
- B. Coated Tinted Heat-Strengthened Float Glass: Condition A (uncoated surfaces), Kind HS (heat strengthened) or Kind FT (fully tempered) where indicated or required for performance; PPG "SolarCool® (1) Solexia" or equivalent (verify color with Architect).

2.04 SEALED INSULATING GLASS UNITS

- A. Provide preassembled units consisting of organically sealed panes of 1/4" glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E774 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and dessicant. System shall be low-E; #2 or #3 surface per glass fabricator; with performance equivalent to PPG Solarban 60 (3).
 - 1. For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section applicable to types, classes, kinds and conditions of glass products indicated.

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2. Provide heat-treated panes of kind and at locations indicated or, if not indicated, provide heat-strengthened panes where recommended by manufacturer for application indicated and tempered where indicated or where safety glass is designated or required.
- B. Sealing System: Dual seal; primary and secondary sealant; manufacturer's standard materials.
 - C. Spacer Material: Manufacturer's standard metal.
 - D. Dessicant: Manufacturer's standard; either molecular sieve or silica gel or blend of both.
 - E. Corner Construction: Manufacturer's standard corner construction.

2.05 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES

- A. Provide products complying with the following requirements:
 1. Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 2. Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
 3. Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those for Type, Grade, Class and Uses.
 4. Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.
 - a. Two-Part Polysulfide Glazing Sealant: Type M; Grade NS; Class 25; Uses NT, M, G, A and, as applicable to uses indicated, O.

"Sonolastic Polysulfide Sealant "; BASF Building Systems
"Synthacalk GC-2+"; Pecora Corp.
or equal
 - b. One-Part Acid-Curing Silicone Glazing Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to uses indicated, O.

"Dow Corning 999-A"; Dow Corning Corp.
"SCS1200"; General Electric Corp.
"860"; Pecora Corp.
"Proglaze"; Tremco.
or equal
 - c. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with a solids content of 100 percent; complying with AAMA A 804.1; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.

"Extru-Seal"; Pecora Corp.
"PTI 303"; Parr Technologies

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"TremGlaze 400 Tape"; Tremco Inc.
or equal

2.06 MISCELLANEOUS GLAZING MATERIALS

- A. Provide materials with proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.
- D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.
- E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.
- F. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.03 GLAZING, GENERAL

- A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.
- B. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

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3.04 GLAZING

- A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.
- B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
- D. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
- E. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.
- F. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
 - 1. Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, to eliminate dirt and moisture pockets.
- G. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.
 - 1. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.05 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer.
- D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

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- E. Wash glass (on both faces in public spaces; exterior face in non-public areas) not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glass by method recommended by glass manufacturer.

END OF SECTION

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SECTION 09 91 00
PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This Section includes surface preparation, painting and finishing of exposed interior and exterior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.
- B. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
- C. Painting is not required on prefinished items, finished metal surfaces, plastics, concealed surfaces, operating parts, and labels.
 - 1. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.02 DEFINITIONS

- A. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats. All new surfaces shall receive one coat of primer (unless factory/shop primed), and two coats of finish paint

1.03 SUBMITTALS

- A. Manufacturer's product by name and number, technical information, label analysis, and application instructions for each material proposed for use. Identify which product is proposed for each specific surface.
- B. Samples for verification purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Define each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
- C. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.

1.04 QUALITY ASSURANCE

- A. Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

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- B. Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
- C. Except as otherwise specified, proposed manufacturer and paint materials shall be as listed in Master Painters Institute (MPI) "Approved Product List".

<http://www.paintinfo.com/mpi/approved/index.htm>.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

Product name or title of material.

Product description (generic classification or binder type).

Manufacturer's stock number and date of manufacture.

Contents by volume, for pigment and vehicle constituents.

Thinning instructions.

Application instructions.

Color name and number.

- 1. Paint material containers not displaying manufacturer's product identification will not be acceptable.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.06 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F. Do not apply water-based paints over existing oil-based paints without a bonding primer.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 deg F above the dew point, or to damp or wet surfaces.

PART 2 PRODUCTS

2.01 PAINT FOR CONCRETE MASONRY UNITS

- A. Block Filler: Water-based, latex block filler.
 - 1. MPI #4 Interior/Exterior Latex Block Filler

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B. Interior Semi-gloss Alkyd Enamel Finish Coats.

1. MPI #47 Interior Alkyd, Semi-Gloss, MPI Gloss Level 5

2.02 PAINT FOR HOLLOW METAL DOORS AND FRAMES; MISCELLANEOUS FERROUS METALS

A. Rust-Inhibiting Primer: Alkyd, rust-inhibiting primer for priming galvanized metals.

1. MPI #135 Non-Cementitious Galvanized Primer

B. Alkyd Gloss Enamel Finish Coats: Weather-resistant high-gloss urethane enamel.

1. MPI #72 Polyurethane, 2 Component, Pigmented, Gloss

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.

1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.02 PREPARATION

A. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
2. Rooms or spaces being painted shall be reasonably free of dirt, dust and debris.

B. Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.
 - a. Verify and assure compatibility of new paints with materials, and newly applied or previously applied primers and finishes.
2. Prepare concrete, concrete masonry block, and other cementitious surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

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- a. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
3. Clean galvanized surfaces with non-petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
4. Carefully mix and prepare paint materials in accordance with manufacturer's directions.
 - a. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
 - b. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 - c. Use only thinners approved by the paint manufacturer, and only within recommended limits.
5. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.03 APPLICATION

- A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
- C. Provide finish coats that are compatible with primers used.
- D. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required, to produce an even smooth surface in accordance with the manufacturer's directions.
 1. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 2. Finish all painted doors on tops, bottoms, and side edges same as exposed faces.
 3. Sand lightly between each succeeding enamel or varnish coat.
 4. Omit specified primer on metal surfaces that have been factory or shop-primed. Touch up missing or abraded prime coats before painting.
- E. Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- F. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

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- G. Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.
- H. Before application of finish coats, apply a prime coat of material as recommended by the manufacturer to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.
- K. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

3.04 CLEANING

- A. At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
- B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.05 PROTECTION

- A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.
- B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

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SECTION 09 96 00
HIGH PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This Section includes surface preparation and painting of interior and exterior surfaces.

1.02 SUBMITTALS

- A. Manufacturer's product by name and number, technical information, label analysis, and application instructions for each material proposed for use. Identify which product is proposed for each specific surface.
- B. Samples for verification purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Define each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
- C. Provide a list of material and application for each coat of each sample. Label each sample as to proposed location or substrate, and application.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

Product name or title of material.
Product description (generic classification or binder type).
Manufacturer's stock number and date of manufacture.
Contents by volume, for pigment and vehicle constituents.
Thinning instructions.
Application instructions.
Color name and number.

1. Paint material containers not displaying manufacturer's product identification will not be acceptable.
- B. Store materials not in use in tightly covered containers in a well-ventilated area. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Only paint materials needed for a day's work shall be stored within the building. Keep storage area neat and orderly. Remove oily rags and waste from the building on a daily basis. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

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PART 2 PRODUCTS

2.01 HIGH PERFORMANCE COATINGS FOR EXPOSED STRUCTURAL AND NON-STRUCTURAL STEEL

- A. Metal Surface Preparation and Primer: Under various Division 5 Sections. Intermediate and finish coats shall be same manufacturer as primer.
- B. Intermediate Coat: Tnemec Series 1075 Endura-Shield; DFT 2.0 to 3.0.0 mils.
- C. Finish Coat: Tnemec Series 1075 Endura-Shield; DFT 2.0 to 3.0.0 mils.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.
 - 1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.02 PREPARATION

- A. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
 - 1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
 - 2. Provide barrier coats over incompatible paints.
 - 3. Carefully mix and prepare paint materials in accordance with manufacturer's directions.
 - a. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
 - b. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 - c. Use only thinners approved by the paint manufacturer, and only within recommended limits.
 - 4. Tint first coat to match the color of the finish coat, but provide sufficient differences in shade to distinguish each separate coat.
- B. Primers may be omitted except where surfaces are bare.

3.03 APPLICATION

- A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

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- B. Do not paint over dirt, rust, scale, oil, grease, moisture, scuffed or blistered surfaces, or conditions detrimental to formation of a durable paint film.
- C. The number of coats and film thickness required is the same regardless of the application method.
- D. Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. New and bare surfaces shall receive a minimum of 1 coat of primer and 2 finish coats.
- E. Allow sufficient time between successive coats to permit proper drying and curing. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause lifting or loss of adhesion of the previous coat.
- F. Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.
- G. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

3.04 CLEANING

- A. At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
- B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.05 PROTECTION

- A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.
- B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

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SECTION 10 73 16

TRANSLUCENT CANOPY SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Curved, translucent roof panels over pedestrian walkway. Structural support system is specified and detailed elsewhere.
 - 1. Work includes necessary design, engineering, manufacturing, and installation.
 - 2. Provide all anchors, brackets, and hardware attachments necessary to complete the roof assembly, weatherability and water-tightness performance requirements. Provided all trim and flashing to adjoining work.

1.02 DESIGN REQUIREMENTS

- A. Basic Wind Speed: 90 mph.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, including materials, components, fabrication, finish, and installation instructions.
- B. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, profiles, anchorage, connections, fasteners, hardware, provisions for expansion and contraction, drainage, flashings, finish, and attachments to supports.
- C. Samples: Submit manufacturer's samples for proposed glazing type.
- D. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Able to demonstrate successful performance on comparable projects.
 - 2. Responsible for glazing components, including structural design.
- B. Installer's Qualifications: Authorized by manufacturer to install translucent glazing products.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, and location of installation.

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B. Storage:

1. Store materials in a clean, dry area indoors in accordance with manufacturer's instructions.
2. Keep temporary protective liners in place.
3. Do not expose panels to direct sunlight for extended periods.

1.06 WARRANTY

- A. Warranty Period: Ten years on weatherization beginning on date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Subject to compliance with requirements, provide roof panel system one of the following:

Duo-Gard Industries Inc.
CPI Daylighting
Major Industries
Wasco Products
or equivalent

2.02 MATERIALS

- A. Trim Members: Extruded Aluminum shall be ASTM B221, alloy as required for performance; clear anodized finish.
- B. Flashing: 5005 H34 aluminum 0.04" minimum thickness. Provide expansion joint at existing construction as detailed.
- C. Glazing: Multi-cellular, structural polycarbonate panels; clear. Glass fiber reinforced thermoset resin (fiberglass) faces are not acceptable.
1. Flame Spread, ASTM E84: Class A.
 2. Smoke Density, ASTM E84: Class A.
- D. Factory-Applied Sealant: Gunnable, nonhardening, elastomeric sealant, ASTM C920, Type S, Class 12, Grade NS.
- E. Field-Applied Sealant: Approved by translucent canopy manufacturer.
- G. Fasteners: Stainless steel or cadmium plated steel.

2.03 FABRICATION

- A. Expansion and Contraction: Design and install components with provisions based on temperature variations for specified geographic location.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install translucent canopy in accordance with manufacturer's instructions at locations indicated on the drawings.

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- B. Install canopy panels accurately aligned, correctly located, and without warp.
- C. Anchor canopy securely in place to supports. Use attachment methods permitting adjustment for construction tolerances, irregularities, alignment, and expansion and contraction.
- D. Install canopy including aluminum flashing, fasteners, hardware, gaskets, joint sealants, and glazing materials required for a complete, weathertight installation.
- E. Remove temporary protective liners at time of installation (interior) and after installation is complete (exterior).
- F. Clean component surfaces in accordance with manufacturer's instructions. Remove excess joint sealant in accordance with sealant manufacturer's instructions.
- G. Protect installed translucent canopy from damage during construction.
- H. Remove and replace damaged canopy components.

End of Section

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SECTION 14 21 00
ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Electric traction elevator, complete.

1.02 INDUSTRY AND GOVERNMENT STANDARDS

- A. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
- B. NFPA 70, National Electrical Code
- C. NFPA 80, Standard for Fire Doors and Fire Windows
- D. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.03 PERFORMANCE REQUIREMENTS

- A. Car Speed: +/- 5% of contract speed under any loading condition or direction of travel.
- B. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.
- C. Vertical Vibration (maximum): 25 mg
- D. Horizontal Vibration (maximum): 25 mg
- E. Jerk Rate (maximum): 1.3 ft/sec³
- F. Acceleration (maximum) 1.3 ft/sec²
- G. In Car Noise: = 55 dB(A)
- H. Leveling Accuracy: +/- 0.2 inches
- I. Starts per hour (maximum): 120

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature for each proposed system.
 - 1. Layout, finishes, and accessories and available options.
 - 2. Controls, signals and operating system.
 - 3. Color selection charts for cab and entrances.
- B. Shop Drawings:
 - 1. Cab design, dimensions and layout.
 - 2. Clearances and travel of car.
 - 3. Clear inside hoistway and pit dimensions.
 - 4. Location and layout of equipment and signals.
 - 5. Car, guide rails, buffers and other components in hoistway.

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6. Maximum rail bracket spacing.
 7. Maximum loads imposed on building structure.
 8. Hoist beam requirements.
 9. Location and sizes of any access doors.
 10. Location and details of hoistway door and frames.
 11. Electrical characteristics and connection requirements.
- C. Operation and maintenance data: Provide manufacturer's standard maintenance and operation manual.
- D. Diagnostic Tools
1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the completed project. During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.
- 1.05 QUALITY ASSURANCE
- A. Manufacturer: Minimum of fifteen years experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.
 - B. Installer: The equipment manufacturer shall install the elevator.
 - C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.
- 1.06 DELIVERY, STORAGE AND HANDLING
- A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the Contractor shall be responsible to provide a safe, dry, and easily accessible storage area on or off the premises.

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- B. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations.

1.07 WARRANTY

- A. Provide manufacturer warranty for a period of one year. The warranty period shall begin upon Substantial Completion of the Contract. Warranty shall cover defects in materials and workmanship.

1.08 MAINTENANCE SERVICE

- A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 after date of substantial completion. Replacement parts shall be produced by the original equipment manufacturer.
- B. Maintenance service be performed during regular working hours of regular working days and shall include regular time call back service.
- C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:
 - 1. EcoSpace™ traction elevators by KONE, Inc.; basis of design.
 - 2. Otis Elevator Co.
 - 3. ThyssenKrupp Elevator
 - 4. Schindler Elevator Corp.

2.02 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microcomputer based control system to perform all of the functions.
- B. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
- C. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
- D. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
- E. Variable field parameters and adjustments shall be contained in a non-volatile memory module.
- F. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.

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- F. Controller Location: Refer to drawings.

2.03 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway. Drive shall be non-regenerative.
- B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.
- C. Buffers, Car and Counterweight: Polyurethane buffer.
- D. Hoistway Operating Devices:
- E. Emergency stop switch in the pit
- F. Terminal stopping switches.
- G. Emergency stop switch on the machine
- H. Positioning System: System consisting of magnets and proximity switches.
- I. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.04 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Entrances
 - 1. Sills: Extruded.
 - 2. Doors: Hollow metal construction with vertical internal channel reinforcements.
 - 3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
 - 4. Entrance Finish: Brushed Stainless Steel.
 - 5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors.

2.05 EQUIPMENT: CAR COMPONENTS

- A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.
 - 1. Platform: Platform shall be all steel construction.
- B. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- C. Steel Cab
 - 1. Car Wall, Front and Door Finish: Brushed stainless steel.
- D. Ceiling: Translucent three-panel suspended ceiling with T-5 Fluorescent lighting and brushed aluminum frame.
- E. Handrail: Round tube brushed aluminum - 1.5 in.; located on side walls of car enclosure.

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- F. Flooring: 12 x 12 rubber tile; ASTM F344, Class I-B (homogeneous rubber tile, through mottled); color selected by Architect.
 - G. Threshold: Aluminum
 - H. Emergency Car Signals
 - 1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.
 - I. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 - J. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
- 2.06 EQUIPMENT: SIGNAL DEVICES AND FIXTURES
- A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation.
 - B. Flush mounted car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have amber illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be amber DOT-matrix. All texts, when illuminated, shall be amber. The car operating panel shall have a brushed stainless steel finish.
 - C. Additional features of car operating panel shall include:
 - 1. Car position indicator within operating panel.
 - 2. Elevator data plate marked with elevator capacity and car number on car top.
 - 3. Help buttons with raised markings.
 - 4. In car stop switch per local code.
 - 5. Firefighter's hat.
 - 6. Firefighter's Phase II Key-switch.
 - 7. Call Cancel Button.
 - 8. Pre-programmed integrated ADA phone; connected to KSU Security.
 - 9. Help Button/Communicator. Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
 - 10. Firefighter's Phase II emergency in-car operating instructions.
 - D. Hall Fixtures: Wall mounted hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Wall mounted hall fixtures shall have a brushed stainless steel finish.
 - 1. Hall fixtures shall feature round, illuminated, mechanical, buttons in applied mount face frame. Hall fixtures shall correspond to options available from that landing. Buttons shall be in a vertically mounted fixture. Hall fixtures shall not be jamb-mounted.

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- E. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down.

2.07 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation

- 1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

B. Zoned Car Parking.

C. Relative System Response Dispatching.

D. Standard Operating Features to include:

- 1. Full Collective Operation
- 2. Fan and Light Control.
- 3. Load Weighing Bypass.
- 4. Ascending Car Uncontrolled Movement Protection
- 5. Top of Car Inspection Station.

E. Additional Operating Features to include:

- 1. Elevator Control System for Inspections and Emergency
- 2. Provide devices within controller to run the elevator in inspection operation.
- 3. Provide devices on car top to run the elevator in inspection operation.
- 4. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
- 5. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
- 6. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
- 7. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
- 8. Provide the means for the control to reset elevator earthquake operation.

2.08 EQUIPMENT: DOOR OPERATOR AND CONTROL

- A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
- B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.

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- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.
- E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.02 INSTALLATION

- A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.
- B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.
- C. Hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.
- D. Lubricate operating system components in accordance with manufacturer's recommendations.
- E. Perform final adjustments, and necessary service prior to substantial completion.

3.03 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
 - 2. Ensure adequate support for entrance attachment points at all landings.
 - 3. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.
 - 4. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
 - 5. Coordinate interface of elevators and fire alarm system.
 - 6. Coordinate interface of dedicated telephone line.

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3.04 TESTING AND INSPECTIONS

- A. Perform recommended and required testing in accordance with authority having jurisdiction.
- B. Obtain operation approvals and provide originals to Owner and Architect.

3.05 DEMONSTRATION

- A. Prior to substantial completion, instruct Owner's Representative on the proper function and required periodic maintenance of elevators. Instruct personnel on emergency procedures.

3.06 ELEVATOR SCHEDULE

Quantity of Elevators: 1

Landings: 3

Openings: 1 Front Openings, 2 Rear Openings

Travel: 46' - 1" (field verify)

Rated Capacity: 2500 lbs

Rated Speed: 150 fpm

Clear Inside Dimensions (W x D): 6' - 8" x 4' - 3"

Cab Height: 8' - 0"

Clear height under suspended ceiling: +/- 7' - 7"

Entrance Width: 3' - 6"

Entrance Height: 7' - 0"

Main Power Supply: 208 Volts + 5%, three-phase

Operation: Simplex

Machine Location: Inside the hoistway mounted on car guide rail

End of Section

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SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Waste, Force-Main Piping: 50 psig.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 GALVANIZED-STEEL PIPE AND FITTINGS

- A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.
- B. Steel Pipe Pressure Fittings:
 - 1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
 - 2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
 - 3. Galvanized-Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.

2.3 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.

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B. Copper Pressure Fittings:

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.4 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
- D. Solvent Cement: ASTM D 2564.

2.5 SPECIALTY PIPE FITTINGS

A. Dielectric Fittings:

1. Dielectric Unions:

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Capitol Manufacturing Company.
 - 2) Central Plastics Company.
 - 3) Hart Industries International, Inc.
 - 4) Jomar International Ltd.
 - 5) Matco-Norca, Inc.
 - 6) McDonald, A. Y. Mfg. Co.
 - 7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 8) Wilkins; a Zurn company.
- b. Description:
 - 1) Standard: ASSE 1079.
 - 2) Pressure Rating: 150 psig.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.

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2.6 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Material: high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.
- B. Form: Sheet or tube.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install fittings for changes in direction and branch connections.
- C. Install steel piping according to applicable plumbing code.
- D. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- E. Install aboveground PVC piping according to ASTM D 2665.
- F. Install underground PVC piping according to ASTM D 2321.
- G. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."
 - 1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.
- H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- I. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

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3.3 JOINT CONSTRUCTION

- A. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Dielectric Fittings:
 - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - 2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.

3.6 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Exposed ABS Piping: Protect plumbing piping exposed to sunlight with two coats of water-based latex paint.

3.7 PIPING SCHEDULE

- A. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 shall be any of the following:
 - 1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 - 2. Galvanized-steel pipe, pressure fittings, and threaded joints.
 - 3. Solid-wall PVC pipe; PVC socket fittings; and solvent-cemented joints.
- B. Underground sanitary-sewage force mains NPS 4 and smaller shall be any of the following:
 - 1. Hard copper tube, Type L; wrought-copper pressure fittings; and soldered joints.
 - 2. Solid-wall PVC pipe; PVC socket fittings; and solvent-cemented joints.

END OF SECTION 221316

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SECTION 221429 - SUMP PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Submersible sump pumps.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written rigging instructions for handling.

PART 2 - PRODUCTS

2.1 SUBMERSIBLE SUMP PUMPS

- A. Submersible, Fixed-Position, Single-Seal Sump Pumps:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Weil Pump Company, Inc.
 - b. Zoeller Company.

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2. Description: Factory-assembled and -tested sump-pump unit.
3. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
4. Controls:
 - a. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - b. Retain first subparagraph below for duplex pump units. Revise if unit includes three or more pumps.
5. Controls:
 - a. Oil Smart Liquid alarm switch
 - b. Oil Smart pump switch
 - c. NEMA 4X water tight enclosure with lockable latch
 - d. Red alarm beacon and 83+/- decibel rated alarm horn
 - e. Alarm Panel Enclosure: Type 4X; wall-mounted.
 - f. Audible light alarms and dry contacts.
 - g. Alarm test and silence switch.
 - h. Switch Type: Mechanical-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
6. Control-Interface Features:
 - a. Remote Alarm Contacts: For remote alarm interface.

2.2 MOTORS

- A. Motors for submersible pumps shall be hermetically sealed.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation and filling are specified in Section 312000 "Earth Moving."

3.2 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of storm drainage piping connections before sump pump installation.

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3.3 INSTALLATION

- A. Pump Installation Standards: Comply with HI 1.4 for installation of sump pumps.

3.4 ADJUSTING

- A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust control set points.

END OF SECTION 221429

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SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

2.2 SLEEVE-SEAL FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Presealed Systems.
 - 2. .
- B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

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PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 - 2. Cut sleeves to length for mounting flush with both surfaces.
 - 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

3.2 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves Sleeve-seal fittings.

END OF SECTION 230517

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SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

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1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

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PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.

2.2 FIRE-RATED INSULATION SYSTEMS

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.

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- b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-03/11-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.5 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 491 AWF FSK.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - c. Compac Corporation; 110 and 111.
 - d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.6 SECUREMENTS

- A. Bands:
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

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- a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
- 2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, [1/2 inch] [3/4 inch] wide with [**wing seal**] [**or**] [**closed seal**].
 - 3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.

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- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches] [4 inches] o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

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1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping" firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

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- a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

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- c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
- 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

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- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:

- 1. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Exp, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be one of the following:

- 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
 - 2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

- B. Exposed, rectangular, exhaust-air duct insulation shall be one of the following:

- 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
 - 2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

- C. Exposed, exhaust-air plenum insulation shall be the following:

- 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
 - 2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

END OF SECTION 230713

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SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- 1.2 SUMMARY
- A. Section includes insulating the following HVAC piping systems:
1. Refrigerant suction and hot-gas piping, indoors and outdoors.
- 1.3 ACTION SUBMITTALS
- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For qualified Installer.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

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1. Products: Subject to compliance with requirements, provide one of the following:

- a. Aeroflex USA, Inc.; Aerocel.
- b. Armacell LLC; AP Armaflex.
- c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Aeroflex USA, Inc.; Aeroseal.
- b. Armacell LLC; Armaflex 520 Adhesive.
- c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
- d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

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- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.

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2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

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2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

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3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 FINISHES

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

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- B. Color: Black Vary first and second coats to allow visual inspection of the completed Work.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping:
 - 1. All Pipe Sizes: Insulation shall be[**one of**] the following:
 - a. Flexible Elastomeric: 1 inch thick.

3.11 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping:
 - 1. All Pipe Sizes: Insulation shall be one of the following:

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- a. Flexible Elastomeric: 2 inches thick. Extend 2 inch thick insulation from exterior to 6 inches beyond inside interior wall surface.

END OF SECTION 230719

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SECTION 230923.12 - CONTROL DAMPERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes control dampers and actuators.

1.3 DEFINITIONS

- A. DDC: Direct-digital control.
- B. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including the following:
 - 1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
 - 3. Product description with complete technical data, performance curves, and product specification sheets.
 - 4. Installation instructions, including factors affecting performance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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- B. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.
- C. Backup Power Source: Systems and equipment served by a backup power source shall have associated control damper actuators served from a backup power source.
- D. Environmental Conditions:
 - 1. Provide electric control-damper actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric control-damper actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.
 - a. Hazardous Locations: Explosion-proof rating for condition.
- E. Selection Criteria:
 - 1. Control dampers shall be suitable for operation at following conditions:
 - a. Exhaust Air: 2" in W.G.; 20 deg F - 120 deg F.
 - 2. Fail positions unless otherwise indicated:
 - a. Exhaust Air: Close.
 - 3. Two-position dampers shall be full size of duct or equipment connection unless otherwise indicated.

2.2 RECTANGULAR CONTROL DAMPERS

- A. General Requirements:
 - 1. Unless otherwise indicated, use parallel blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed blade configuration.
 - 2. Factory assemble multiple damper sections to provide a single damper assembly of size required by the application.
 - 3. Damper actuator shall be factory installed by damper manufacturer as integral part of damper assembly. Coordinate actuator location and mounting requirements with damper manufacturer.
- B. Insulated Rectangular Dampers:
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. TAMCO; 9000ECT series.
 - b. RUSKIN; TED50

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2. Performance:

- a. Leakage: AMCA 511, Class 1A. Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg differential static pressure and shall not exceed 4.9 cfm/sq. ft. against 4-in. wg differential static pressure at minus 40 deg F.
- b. Pressure Drop: 0.1-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
- c. Velocity: Up to 4000 fpm.
- d. Temperature: Minus 100 to plus 185 deg F.
- e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.
- f. Damper shall have AMCA seal for both air leakage and air performance.
- g. Damper shall be approved by the manufacturer for use with vertical blades with the shaft and actuator located at the bottom of the damper.

3. Construction:

a. Frame:

- 1) Material: ASTM B 211, Alloy 6063 T5 extruded-aluminum profiles, 0.08 inch thick.
- 2) C-shaped channel with integral flange(s). Mating face shall be a minimum of 1 inch.
- 3) Width not less than 4 inches.
- 4) Entire frame shall be thermally broken by means of polyurethane resin pockets, complete with thermal cuts.
- 5) Damper frame shall be insulated with polystyrofoam on four sides.

b. Blades:

- 1) Hollow shaped, extruded aluminum.
- 2) Blades shall be internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.
- 3) Parallel or opposed blade configuration as required by application.
- 4) Material: ASTM B 211, Alloy 6063 T5 aluminum, 0.08 inch thick.
- 5) Width not to exceed 6 inches.
- 6) Length as required by close-off pressure, not to exceed 48 inches.
- 7) Blades shall be vertical.

c. Seals: Blade and frame seals shall be of flexible silicone and secured in an integral slot within the aluminum extrusions.

d. Axles: 0.44-inch- diameter stainless steel, mechanically attached to blades.

e. Bearings:

- 1) Bearings shall be composed of a Celcon inner bearing fixed to axle, rotating within a polycarbonate outer bearing inserted in the frame, resulting in no metal-to-metal or metal-to-plastic contact.
- 2) Where blade axles are installed in vertical position, provide thrust bearings.
- 3) Bearings shall be manufactured for use in vertical blade configurations.

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f. Linkage:

- 1) Concealed in frame.
- 2) Constructed of aluminum and stainless steel.
- 3) Hardware: Stainless steel.

2.3 GENERAL CONTROL-DAMPER ACTUATORS REQUIREMENTS

- A. Actuators shall operate related damper(s) with sufficient reserve power to provide smooth modulating action or two-position action and proper speed of response at velocity and pressure conditions to which the damper is subjected.
- B. Actuators shall produce sufficient power and torque to close off against the maximum system pressures encountered. Actuators shall be sized to close off against the fan shutoff pressure as a minimum requirement.
- C. The total damper area operated by an actuator shall not exceed 80 percent of manufacturer's maximum area rating.
- D. Provide one actuator for each damper assembly where possible. Multiple actuators required to drive a single damper assembly shall operate in unison.
- E. Avoid the use of excessively oversized actuators which could overdrive and cause linkage failure when the damper blade has reached either its full open or closed position.
- F. Use jackshafts and shaft couplings in lieu of blade-to-blade linkages when driving axially aligned damper sections.
- G. Provide mounting hardware and linkages for connecting actuator to damper.
- H. Select actuators to fail in desired position in the event of a power failure.
- I. Actuator Fail Positions: See Drawings.

2.4 ELECTRIC AND ELECTRONIC ACTUATORS

- A. Type: Motor operated, with or without gears, electric and electronic.
- B. Voltage:
 1. See Drawings.
 2. Actuator shall deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
 3. Actuator shall function properly within a range of 85 to 120 percent of nameplate voltage.
- C. Construction:

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1. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
 2. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
 3. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.
- D. Field Adjustment:
1. Spring return actuators shall be easily switchable from fail open to fail closed in the field without replacement.
 2. Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.
- E. Two-Position Actuators: Single direction, spring return or reversing type.
- F. Integral Overload Protection:
1. Provide against overload throughout the entire operating range in both directions.
 2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.
- G. Damper Attachment:
1. Unless otherwise required for damper interface, provide actuator designed to be directly coupled to damper shaft without need for connecting linkages.
 2. Attach actuator to damper drive shaft in a way that ensures maximum transfer of power and torque without slippage.
 3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.
- H. Temperature and Humidity:
1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
 2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.
- I. Enclosure:
1. Suitable for ambient conditions encountered by application.
 2. NEMA 250, Type 2 for indoor and protected applications.
 3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
 4. Provide actuator enclosure with a heater and controller where required by application.
- J. Stroke Time:

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1. Operate damper from fully closed to fully open within 15 seconds.
2. Operate damper from fully open to fully closed within 15 seconds.
3. Move damper to failed position within 15 seconds.
4. Select operating speed to be compatible with equipment and system operation.
5. Actuators operating in smoke control systems comply with governing code and NFPA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for dampers and instruments installed in duct systems to verify actual locations of connections before installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONTROL-DAMPER APPLICATIONS

- A. Control Dampers:
- B. Select from damper types indicated in "Control Dampers" Article to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.
 1. Rectangular Exhaust Air Duct Applications with SMACNA Construction Class C and Velocities to 4000 fpm: Insulated rectangular dampers .

3.3 INSTALLATION, GENERAL

- A. Furnish and install products required to satisfy most stringent requirements indicated.
- B. Properly support dampers and actuators, tubing, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a force.
- C. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.
- D. Seal penetrations made in fire-rated and acoustically rated assemblies.

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E. Fastening Hardware:

1. Stillson wrenches, pliers, or other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

F. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

3.4 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

3.5 CONTROL DAMPERS

A. Install smooth transitions, not exceeding 30 degrees, to dampers smaller than adjacent duct. Install transitions as close to damper as possible but at distance to avoid interference and impact to performance. Consult manufacturer for recommended clearance.

B. Clearance:

1. Locate dampers for easy access and provide separate support of dampers that cannot be handled by service personnel without hoisting mechanism.
2. Install dampers with at least 24 inches of clear space below dampers requiring service access.

C. Service Access:

1. Dampers and actuators shall be accessible for visual inspection and service.
2. Install access door(s) in duct or equipment located upstream of damper to allow service personnel to hand clean any portion of damper, linkage, and actuator. Comply with requirements in Section 233300 "Air Duct Accessories."

D. Install dampers straight and true, level in all planes, and square in all dimensions. Install supplementary structural steel reinforcement for large multiple-section dampers if factory support alone cannot handle loading.

E. Attach actuator(s) to damper drive shaft.

F. For duct-mounted and equipment-mounted dampers installed outside of equipment, install a visible and accessible indication of damper position from outside.

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3.6 CONNECTIONS

- A. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems." Section 16075 "Electrical Identification."
- B. Install engraved phenolic nameplate with damper identification on damper.

3.8 CHECKOUT PROCEDURES

- A. Control-Damper Checkout:
 - 1. Check installed products before continuity tests, leak tests, and calibration.
 - 2. Check dampers for proper location and accessibility.
 - 3. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material, and support.
 - 4. For pneumatic products, verify air supply for each product is properly installed.
 - 5. For pneumatic dampers, verify that pressure gages are provided in each air line to damper actuator and positioner.
 - 6. Verify that control dampers are installed correctly for flow direction.
 - 7. Verify that proper blade alignment, either parallel or opposed, has been provided.
 - 8. Verify that damper frame attachment is properly secured and sealed.
 - 9. Verify that damper actuator and linkage attachment are secure.
 - 10. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
 - 11. Verify that damper blade travel is unobstructed.

3.9 ADJUSTMENT, CALIBRATION, AND TESTING:

- A. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.
- B. Stroke control dampers with pilot positioners. Adjust damper and positioner following manufacturer's recommended procedure, so damper is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressure.

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- C. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.
- D. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.12

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SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Refrigerant pipes and fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.7 PRODUCT STORAGE AND HANDLING

- A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

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GAA Project No. 12026

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PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or L.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8/A5.8M.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
 - 4. Working Pressure Rating: Factory test at minimum 500 psig.
 - 5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, annealed-or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- B. Comply with manufacturers material, sizing, and installation requirements.
- C. Install valves and specialties per the split-system manufacturers requirements. All components to be provided by the split system manufacturer.

3.2 PIPING INSTALLATION

- A. Install valves and specialties per the split-system manufacturers requirements. All components to be provided by the split system manufacturer.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion,

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pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

- C. Install refrigerant piping according to ASHRAE 15.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Install piping adjacent to machines to allow service and maintenance.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Install refrigerant piping in protective conduit where installed belowground.
- M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- N. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- P. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:
 - 1. Shot blast the interior of piping.
 - 2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
 - 3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
 - 4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.

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5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

- Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- R. Install sleeve seals for piping penetrations of concrete walls and slabs.
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
 2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.4 HANGERS AND SUPPORTS

- A. All hangars shall be installed around the outside of the piping insulation. Installation to protect insulation from long term damage.
- B. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
 3. Spring hangers to support vertical runs.
 4. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.
 2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
 3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.
 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod, 3/8 inch.
 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod, 3/8 inch.
 6. NPS 2: Maximum span, 96 inches; minimum rod, 3/8 inch.
 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod, 3/8 inch.
 8. NPS 3: Maximum span, 10 feet; minimum rod, 3/8 inch.

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9. NPS 4: Maximum span, 12 feet; minimum rod, 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures or the split system manufacturers requirements, use whichever method is more stringent:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.7 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

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1. Open shutoff valves in condenser water circuit.
 2. Verify that compressor oil level is correct.
 3. Open compressor suction and discharge valves.
 4. Open refrigerant valves except bypass valves that are used for other purposes.
 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

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SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Single-wall rectangular ducts and fittings.
 - 2. Sheet metal materials.
 - 3. Sealants and gaskets.
 - 4. Hangers and supports.
- B. Related Sections:
 - 1. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Sealants and gaskets.
- B. Shop Drawings:

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1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment[, **seismic restraints,**] and vibration isolation.

1.5 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

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2.2 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.

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- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.4 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

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- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.

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- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Test the following systems:
 - a. Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher:
 - 3. Test for leaks before applying external insulation.
- C. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.
 - 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- D. Duct system will be considered defective if it does not pass tests and inspections.

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- E. Prepare test and inspection reports.

3.7 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
 - 7. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:
 - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 - 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has

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- friable material, mold, or fungus growth.
- 5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
- 6. Provide drainage and cleanup for wash-down procedures.

3.8 DUCT SCHEDULE

A. Supply Ducts:

- 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, Terminal Units, and unit heaters:
 - a. Pressure Class: Positive 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.

B. Return Ducts:

- 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, unit heaters, and Terminal Units :
 - a. Pressure Class: Positive or negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.

C. Exhaust Ducts:

- 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 24.

D. Elbow Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

END OF SECTION 233113

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SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Duct-mounted access doors.
 - 2. Flexible connectors.
 - 3. Duct accessory hardware.
- B. Related Requirements:

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.

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2. Exposed-Surface Finish: Mill phosphatized.

- B. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- C. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
- C. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

- a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
- a. Access Door: Continuous hinge and 3 shash locks.

2.4 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. Elgen Manufacturing.

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4. Ventfabrics, Inc.
 5. Ward Industries, Inc.; a division of Hart & Cooley, In
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd..
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install test holes at fan inlets and outlets and elsewhere as indicated.
- D. Connect ducts to duct silencers with flexible duct connectors.
- E. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
1. On both sides of duct coils.
 2. Upstream and downstream from duct filters.
 3. At outdoor-air intakes and mixed-air plenums.
 4. At drain pans and seals.
 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 6. At each change in direction and at maximum 50-foot spacing.
 7. Control devices requiring inspection.
 8. Elsewhere as indicated.
- F. Access Door Sizes:
1. Head and Hand Access: Minimum 18 by 10 inches.
- G. Install flexible connectors to connect ducts to equipment.

END OF SECTION 233300

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SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on actual Project site elevations sea level.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material thickness and finishes, including color charts.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Roof framing and support members relative to duct penetrations.
 - 2. Ceiling suspension assembly members.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

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1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.8 COORDINATION

- A. Coordinate size and location of structural-steel support members.

PART 2 - PRODUCTS

2.1 IN-LINE CENTRIFUGAL FANS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Carnes Company.
 - 2. Greenheck Fan Corporation.
 - 3. Hartzell Fan Incorporated.
 - 4. Loren Cook Company.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: ECM Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- E. Accessories:
 - 1. Motor Mounted Variable-Speed Control
 - 2. Companion Flanges: For inlet and outlet duct connections.

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F. Capacities and Characteristics:

1. See Drawings
2. Vibration Isolators:
 - a. Type: Elastomeric hangers.
 - b. Static Deflection: 1 inch.

2.2 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Enclosure Type: Totally enclosed, fan cooled.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Equipment Mounting:
1. Comply with manufactureres requirements.
- C. Support suspended units from structure using threaded steel rods and elastomeric hangers.
- D. Install units with clearances for service and maintenance.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

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3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust fan speed to appropriate set point.

END OF SECTION 233423

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SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied color finishes.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE Compliance:

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1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.6 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
 1. Warranty Period:
 - a. For Compressor: Six year(s) from date of Substantial Completion.
 - b. For Parts: Two year(s) from date of Substantial Completion.
 - c. For Labor: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
 2. SANYO North America Corporation; SANYO Fisher Company.
 3. DaikinMcquay North America

2.2 INDOOR UNITS (5 TONS OR LESS)

- A. Concealed Evaporator-Fan Components:

Godsey Associates Architects
GAA Project No. 12026

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1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; with a two-position control valve.
5. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
6. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
7. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Wiring Terminations: Connect motor to chassis wiring with plug connection.
8. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
9. Filters: Permanent, cleanable.
10. Condensate Drain Pans:
 - a. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

B. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Enclosure Type: Totally enclosed, fan cooled.
 - d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
 - e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
 - f. Mount unit-mounted disconnect switches on exterior of unit.

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5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:
 - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
 - b. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on both ends of pan.
7. Air Filtration Section:
 - a. General Requirements for Air Filtration Section:
 - 1) Comply with NFPA 90A.
 - 2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
 - 3) Filters shall be provided by the unit manufacturer.

2.3 ACCESSORIES

- A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.
- B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- C. Drain Hose: For condensate.

2.4 CAPACITIES AND CHARACTERISTICS

- A. Cooling Capacity: See Drawings.
- B. Heating Capacity: See Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

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- C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.
- D. Equipment Mounting:
 - 1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s).
 - 2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.
 - 3. Install per manufacturers recommendations.
- E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections and by manufacturer. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

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3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:

1.3 DEFINITIONS

- A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. Alpha Wire Company.
 - 3. Belden Inc.
 - 4. Encore Wire Corporation.

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5. General Cable Technologies Corporation.
6. Southwire Incorporated.

- C. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- D. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2 Type THHN/THWN-2 Type UF.
- E. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for armored cable, Type AC [metal-clad cable, Type MC, mineral-insulated, metal-sheathed cable, Type MI, nonmetallic-sheathed cable, Type NM and Type USE with ground wire.
- F. VFC Cable:
1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
 2. Type TC-ER with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.
 3. Comply with UL requirements for cables in direct burial applications.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. 3M.
 2. AFC Cable Systems, Inc.
 3. Gardner Bender.
 4. Hubbell Power Systems, Inc.
 5. Ideal Industries, Inc.
 6. ILSCO.
 7. NSi Industries LLC.
 8. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
 9. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

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PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type XHHW-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: [Type THHN/THWN-2, single conductors in raceway] [Type XHHW-2, single conductors in raceway] [Underground feeder cable, Type UF].
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.4 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 3 - EXECUTION

3.1 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.

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3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.

3.2 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 2. For grounding electrode system, install at least three rods spaced at least 10'-0" from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- D. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
 1. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
- E. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

3.3 FIELD QUALITY CONTROL

- A. Report measured ground resistances that exceed the following values:
 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 25 ohms.

END OF SECTION 260526

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SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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- a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Atkore International.
 - g. Wesanco, Inc.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 10 percent in future without exceeding specified design load limits.

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1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.3 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

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SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Related Requirements:
 - 1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
 - 2. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

1.3 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit.
 - 3. Anamet Electrical, Inc.
 - 4. Electri-Flex Company.
 - 5. O-Z/Gedney.
 - 6. Picoma Industries.
 - 7. Republic Conduit.
 - 8. Robroy Industries.
 - 9. Southwire Company.
 - 10. Thomas & Betts Corporation.
 - 11. Western Tube and Conduit Corporation.
 - 12. Wheatland Tube Company.

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- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 BOXES, ENCLOSURES, AND CABINETS

- A. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- B. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

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- K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- O. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- Q. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- R. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- S. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to **[center]** **[top]** **[bottom]** of box unless otherwise indicated.
- U. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- W. Locate boxes so that cover or plate will not span different building finishes.

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- X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

3.2 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.3 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Colors for Cables Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.

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2.2 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.3 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
 - 2. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,

2.4 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Baked-Enamel Warning Signs:
 - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4-inch grommets in corners for mounting.
 - 3. Nominal size, 7 by 10 inches.
- C. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.5 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- B. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch .

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2.6 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black except where used for color-coding.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label or self-adhesive vinyl tape applied in bands. Install labels at 30-foot maximum intervals.
- B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded conductors.
 - a. Color shall be factory applied.

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- b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
- C. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.

END OF SECTION 260553

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SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. SPD: Surge protective device.
- G. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For each panelboard and related equipment.
 - 1. Include evidence of NRTL listing for SPD as installed in panelboard.

1.4 INFORMATIONAL SUBMITTALS

- A. Panelboard Schedules: For installation in panelboards.[Submit final versions after load balancing.]

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Keys: Two spares for each type of panelboard cabinet lock.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.7 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet.
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of electric service.
 - 2. Do not proceed with interruption of electric service without Owner's written permission.
 - 3. Comply with NFPA 70E.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
 - 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.
 - 1. SPD Warranty Period: Five years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Flush -mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Height: 84 inches maximum.
 - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
 - 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
 - 5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
 - 6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
 - 7. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Same finish as panels and trim.
 - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
 - 8. .
- F. Incoming Mains:
 - 1. Location: Convertible between top and bottom.
 - 2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

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G. Phase, Neutral, and Ground Buses:

1. Material: Tin-plated aluminum.
 - a. Plating shall run entire length of bus.
 - b. Bus shall be fully rated the entire length.
2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
6. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled by an NRTL acceptable to authority having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors shall be sized for double-sized or parallel conductors as indicated on Drawings. Do not mount neutral bus in gutter.
7. Split Bus: Vertical buses divided into individual vertical sections.
8. .

H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Tin-plated aluminum.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.
9. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.
10. .

I. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

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- J. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
 - 1. Percentage of Future Space Capacity: 20 percent.
- K. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.
 - 1. Panelboards rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
 - 2. Panelboards rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.
- L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
 - 1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
 - 2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
 - 1. Eaton Electrical Sector; Eaton Corporation.
 - 2. General Electric Company; GE Energy Management - Electrical Distribution.
 - 3. Siemens Energy.
 - 4. Square D; by Schneider Electric.
- C. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- D. Mains: Circuit breaker.
- E. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

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2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
 - 1. Eaton Electrical Sector; Eaton Corporation.
 - 2. General Electric Company; GE Energy Management - Electrical Distribution.
 - 3. Siemens Energy.
 - 4. Square D; by Schneider Electric.
- C. MCCB: Comply with UL 489, with [series-connected rating] [interrupting capacity] to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. MCCB Features and Accessories:
 - a. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

2.4 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.
- D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NEMA PB 1.1.
- D. Equipment Mounting:
 - 1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
 - 2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- F. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- G. Mount panelboard cabinet plumb and rigid without distortion of box.
- H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- I. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.

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- J. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.
- K. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
 - 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- L. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- M. Install filler plates in unused spaces.
- N. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- O. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- P. Mount spare fuse cabinet in accessible location.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

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- B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.
1. Measure loads during period of normal facility operations.
 2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
 4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.5 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

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SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Interior solid-state luminaires that use LED technology.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of luminaire.

1.5 QUALITY ASSURANCE

- A. Provide luminaires from a single manufacturer for each luminaire type.
- B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.7 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. CRI of minimum 80. CCT of 3000 K.
- C. Nominal Operating Voltage: 120 V ac.
- D. Housings:
 - 1. Extruded-aluminum housing and heat sink.

2.2 SURFACE MOUNT, NONLINEAR

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Cooper Lighting.
 - 2. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 3. Peerless; Acuity Brands Lighting, Inc.
- B. Integral junction box with conduit fittings.

2.3 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.

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2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Housings:

1. Extruded-aluminum housing and heat sink.

D. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

- A. Comply with NECA 1.

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- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- E. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

- A. Comply with requirements for startup specified in Section 260943.16 "Addressable-Fixture Lighting Controls."
- B. Comply with requirements for startup specified in Section 260943.23 "Relay-Based Lighting Controls."

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to

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two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

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SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- C. Complete pathway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

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- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
- K. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.
- L. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- M. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- N. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
- O. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lbtensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.
- P. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.
- Q. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service pathway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- R. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.
- S. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to **[center]** **[top]** **[bottom]** of box unless otherwise indicated.

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- T. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- U. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

3.2 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage or deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528

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SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FACP: Fire Alarm Control Panel.
- C. HLI: High Level Interface.
- D. NICET: National Institute for Certification in Engineering Technologies.
- E. PC: Personal computer.
- F. VESDA: Very Early Smoke-Detection Apparatus.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including furnished options and accessories.
 - 1. Include construction details, material descriptions, dimensions, profiles, and finishes.
- B. Shop Drawings: For fire-alarm system.
 - 1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following[and deliver copies to authorities having jurisdiction]:

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- a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

1.5 QUALITY ASSURANCE

- A. NFPA Certification: Obtain certification according to NFPA 72 by .

1.6 PROJECT CONDITIONS

- A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.
- B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
 - 1. Notify Owner no fewer than seven days in advance of proposed interruption of fire-alarm service.
 - 2. Do not proceed with interruption of fire-alarm service without Owner's written permission.
- C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.7 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.
- B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

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- C. Automatic sensitivity control of certain smoke detectors.
- D. All components provided shall be listed for use with the selected system.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
 - 1. Manual stations.
 - 2. Smoke detectors.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Continuously operate alarm notification appliances.
 - 2. Identify alarm and specific initiating device at fire-alarm control unit.
 - 3. Transmit an alarm signal to the remote alarm receiving station.
 - 4. Unlock electric door locks in designated egress paths.
 - 5. Release fire and smoke doors held open by magnetic door holders.
 - 6. Activate voice/alarm communication system.
 - 7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 - 8. Activate smoke-control system (smoke management) at firefighters' smoke-control system panel.
 - 9. Activate stairwell and elevator-shaft pressurization systems.
 - 10. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 - 11. Recall elevators to primary or alternate recall floors.
 - 12. Activate elevator power shunt trip.
 - 13. Activate emergency lighting control.
 - 14. Activate emergency shutoffs for gas and fuel supplies.
 - 15. Record events in the system memory.
 - 16. Indicate device in alarm on the graphic annunciator.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
 - 1. Valve supervisory switch.
 - 2. Elevator shunt-trip supervision.
 - 3. User disabling of zones or individual devices.
 - 4. Loss of communication with any panel on the network.
 - 5. .
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
 - 1. Open circuits, shorts, and grounds in designated circuits.
 - 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 - 3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.

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4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Voice signal amplifier failure.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit, connected network control panels, off-premises network control panels,.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.
6. Display system status on graphic annunciator.

2.3 FIRE-ALARM CONTROL UNIT

A. Elevator Recall:

1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:
 - a. Elevator lobby detectors except the lobby detector on the designated floor.
 - b. Smoke detector in elevator machine room.
 - c. Smoke detectors in elevator hoistway.
2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.

B. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

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- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
 - 1. Devices placed in service before all other trades have completed cleanup shall be replaced.
 - 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
 - 1. Connect new equipment to existing control panel in existing part of the building.
 - 2. Connect new equipment to existing monitoring equipment at the supervising station.
 - 3. Expand, modify, and supplement existing monitoring equipment as necessary to extend existing monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.
 - 1. Comply with requirements for seismic-restraint devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- E. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
 - 1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

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1. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
2. Smoke dampers in air ducts of designated HVAC duct systems.
3. Magnetically held-open doors.
4. Electronically locked doors and access gates.
5. Alarm-initiating connection to elevator recall system and components.
6. Alarm-initiating connection to activate emergency lighting control.
7. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
8. Supervisory connections at valve supervisory switches.
9. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
10. Supervisory connections at elevator shunt-trip breaker.
11. Data communication circuits for connection to building management system.
12. Data communication circuits for connection to mass notification system.
13. Supervisory connections at fire-extinguisher locations.
14. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
15. Supervisory connections at fire-pump engine control panel.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

END OF SECTION 283111

Special Note for Erosion Prevention and Sediment Control **___Franklin___ County / Item No ___5-8714.00**

The Contractor shall be responsible for filing the Kentucky Pollution Discharge Elimination System (KPDES) KYR10 permit Notice of Intent (NOI) with the Kentucky Division of Water (DOW) and any KPDES local Municipal Separate Storm Sewer System (MS4) program that has jurisdiction. The NOI shall name the contractor as the Facility Operator and include the KYTC Contract ID Number (CID) for reference.

The Contractor shall perform all temporary erosion/sediment control functions including: providing a Best Management Practice (BMP) Plan, conducting required inspections, modifying the BMP plan documents as construction progresses and documenting the installation and maintenance of BMPs in conformance with the KPDES KYR10 permit dated September 30, 2003 or a permit re-issued to replace the KYR10 permit. This work shall be conducted in conformance with the requirements of Section 213 of KYTC 2008 Department of Highways, Standard Specifications for Road and Bridge Construction.

Contrary to Section 213.03.03, paragraph 2, the Engineer shall conduct inspections as needed to verify compliance with Section 213 of KYTC 2012 Department of Highways, Standard Specifications for Road and Bridge Construction. The Engineer's inspections shall be performed a minimum of once per month and within seven days after a storm of ½ inch or greater. Copies of the Engineer's inspections shall not be provided to the contractor unless improvements to the BMP's are required. The contractor shall initiate corrective action within 24 hours of any reported deficiency and complete the work within 5 days. The Engineer shall use Form TC 63-61 A for this report. Inspections performed by the Engineer do not relieve the Contractor of any responsibility for compliance with the KPDES permit.

Contrary to Section 213.05, bid items for temporary BMPs will not be listed and will be replaced with one lump sum item for the services. Payment will be pro-rated based on the Project Schedule as submitted by the Contractor and as agreed to by the Engineer.

The contractor shall be responsible for applying "good engineering practices" as required by the KPDES permit. The contractor may use any temporary BMPs with the approval of the KYTC Engineer.

The contractor shall provide the Engineer copies of all documents required by the KPDES permit at the time they are prepared.

The contractor shall be responsible for the examination of the soils to be encountered and make his own independent determination of the temporary BMPs that will be required to accomplish effective erosion prevention and sediment control.

The Contractor shall be responsible for filing the KPDES permit Notice of Termination (NOT) with the Kentucky DOW and any local MS4 program that has jurisdiction. The NOT shall be filed after the Engineer agrees that the project is stabilized or the project has been formally accepted.



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

TC 62-226
Rev. 07/2015
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RIGHT OF WAY CERTIFICATION

ITEM #	COUNTY	PROJECT #	FEDERAL PROJECT #
5-8714.00	FRANKLIN	FD04 SPP 037 0060	
PROJECT DESCRIPTION KSU PEDESTRIAN BRIDGE & BUS PULL OFF			
<input type="checkbox"/> 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 with FHWA regulations under the Uniform Relocation Assistance and Real Property Acquisitions Policy Act of 1970, as amended. No additional rights of way or relocation assistance were required for this project.			
<input checked="" type="checkbox"/> ADDITIONAL RIGHT OF WAY REQUIRED AND CLEARED			
TOTAL NUMBER OF PARCELS ON PROJECT		1	IMPROVEMENTS
NUMBER OF PARCELS THAT HAVE BEEN ACQUIRED BY:			
Signed Deed	1	<input checked="" type="checkbox"/>	There were no improvements within the required right of way
Condemnation	0	<input type="checkbox"/>	All improvements have been removed from the required right of way
Signed Right of Entry Agreement	0		
RELOCATION ASSISTANCE			
Relocation Assistance was not required for this project	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Improvements are currently being removed and it is anticipated that right of way will be cleared prior to the letting date
All parties have been relocated in accordance with FHWA regulations	<input type="checkbox"/>	<input type="checkbox"/>	Improvement removal will be included in the construction contract
<input type="checkbox"/> ADDITIONAL RIGHT OF WAY REQUIRED WITH EXCEPTION			
TOTAL NUMBER OF PARCELS ON PROJECT			
Number of parcels acquired by Deed, Condemnation or Signed Right of Entry Agreement			
EXCEPTION(S)	ANTICIPATED DATE OF POSSESSION	IMPROVEMENTS	
		<input type="checkbox"/>	There were no improvements within the required right of way
		<input type="checkbox"/>	All improvements have been removed from the required right of way
		<input type="checkbox"/>	Improvements are currently being removed and it is anticipated that right of way will be cleared prior to the letting date
		<input type="checkbox"/>	Improvement removal will be included in the construction contract
RELOCATION ASSISTANCE			
Relocation assistance was not required for this project			<input type="checkbox"/>
All parties have been relocated in accordance with FHWA regulations			<input type="checkbox"/>
Notes/Comments:			
LPA		Right of Way Director	
Printed Name		Printed Name	DM Loy
Signature		Signature	<i>[Signature]</i>
Date		Date	15 Sept 15
Right of Way Supervisor		FHWA	
Printed Name	Travis Thompson	Printed Name	
Signature	<i>[Signature]</i>	Signature	
Date	7-14-2015	Date	

UTILITIES AND RAIL CERTIFICATION NOTE

FRANKLIN COUNTY
FD04 037 87511 01U)
PEDESTRIAN BRIDGE BETWEEN HATHAWAY
HALL AND WHITNEY YOUNG HALL
ITEM NUMBER 5-8714.00

GENERAL PROJECT NOTE ON UTILITY PROTECTION

Utility coordination efforts determined that no significant utility relocation work is required to complete the project. Any work pertaining to these utility facilities is defined in the bid package and is to be carried out as instructed by the Kentucky Transportation Cabinet. The contractor will be responsible for any coordination or adjustments that are discussed or quantified in the proposal.

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

Columbia Gas, Frankfort Plant Board-Water, Frankfort Plant Board-Electric, Frankfort Plant Board-Cable, and Frankfort Sewer have facilities that are within the project area. Please see the notes below pertaining to their locations and relocations.

Unless otherwise noted stations are based on US 60 centerline.

Columbia Gas – has exiting gas facilities that shall remain in place as described below.

*The following stations are based on the US 60 roadway baseline.

Existing low pressure gas main begins out of project limits and runs along the south side of US 60 to approximately Sta 103+44 12 ft Rt of the roadway baseline. The gas main continues along the south side of US 60 to approximately Sta 105+00 6ft Rt then goes to approximately Sta 105+74 7ft Rt then turns slightly south to a gas meter at approximately Sta 105+80 11ft Rt. The gas main then turns north, crossing under the US 60 approximately perpendicular to the road to a gas meter at approximately 105+80 57 ft Lt. The gas main then continues west along the North side of US 60 to a gas meter at approximately Sta 106+20 57ft Lt, then goes to approximately Sta 106+72 49ft Lt, then turns slightly and goes to Sta 106+86 49ft Lt. The main then goes to approximately Sta 107+11 58ft Lt then turns and goes to Sta 107+11 52ft Lt. The gas main them continues west along the North side of US 60 at approximately 52ft Lt to approximately Sta 107+95. The gas main the turns north and goes to approximately Sta 108+17 183 Lt then turns slightly and goes to approximately Sta 108+16 216ft Lt then continues under the sky bridge between Hathaway Hall and the Hill Student Center and out of project limits.

A gas main also runs along the east side of Douglas Avenue, beginning out of project limits approaching from the north. This gas main runs south to approximately Sta 514+65 144ft Lt, then turns 90 degrees to the east and runs out of sanitary sewer relocation project limits.

This gas main is to remain in place and shall not be disturbed.

Frankfort Plant Board-Water – has existing water facilities that shall remain in place as described below.

An existing 12” DIP water main begins out of project limits along the South side of US 60. This pipe runs at approximately 26-28ft Rt off the roadway centerline and continues for the length of the project and out of project limits at the East end of the project.

There is one 8” water main road crossing at approximately Sta 503+40 where the 8” water main runs under and perpendicular to US 60, crossing to the North Side of the Road.

At approximately Sta 507+45 an 8” water main connects to the main running parallel to US 60 and runs south, perpendicular to US 60 through the project area.

UTILITIES AND RAIL CERTIFICATION NOTE

<p>FRANKLIN COUNTY FD04 037 87511 01U) PEDESTRIAN BRIDGE BETWEEN HATHAWAY HALL AND WHITNEY YOUNG HALL ITEM NUMBER 5-8714.00</p>
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An existing 6" DIP water main connects to the 12" water main at approximately Sta 514+24 28ft Lt and runs south along Langford Avenue at approximately 8ft Rt of Langford Avenue centerline.

An existing 8" DIP water main runs along existing Douglas Avenue, approaching from the north. This line runs along the west side of existing Douglas Avenue approximately parallel to Douglas Avenue to approximately US 60 centerline Sta 513+75 131ft Lt, then turns 90 degrees to a fire hydrant at approximately Sta 513+63 137ft Lt.

These facilities are to remain in place and shall not be disturbed.

Frankfort Plant Board-Electric – has existing overhead facilities throughout the entire project limits.

There is an existing pole route that runs along the south side of US 60 approximately 25-30 ft Rt of the roadway centerline. Existing poles are located at approximately Sta 506+48, Sta 508+44, Sta 510+50, Sta 512+40, Sta 513+56, Sta 514+64, Sta 515+50, Sta 516+60, Sta 517+52, and Sta 518+76.

There is an existing pole route that runs along the north side of US 60 approximately 20-30ft Lt of the roadway centerline. Existing poles are located at approximately Sta 507+20, Sta 508+46, Sta 510+50, Sta 513+56, Sta 516+70, and Sta 517+84.

There are existing overhead road crossings at approximately Sta 508+22, Sta 510+50, 513+70, Sta 516+60, Sta 517+72, Sta 518+75.

There is an existing pole route that runs along the west side of Langford Ave at approximately 12ft Rt. Existing poles are located at approximately Sta 50+70, Sta 51+82, and Sta 53+04. There is an existing pole route that runs along the west side of the existing Douglas Street.

These facilities will be removed or relocated by Frankfort Plant Board or their contractors.

Frankfort Plant Board-Cable – has existing overhead facilities throughout the entire project limits.

Existing overhead fiber and coax lines following the Frankfort Plant Board-Electric pole route along the south side of US 60. There is an existing aerial crossing at approximately Sta 508+44. There is an existing aerial crossing at approximately Sta 513+72 then the route continues east along the North side of US 60.

These facilities will be removed or relocated by Frankfort Plant Board or their contractors.

AT&T – has existing overhead facilities throughout the entire project limits.

An existing overhead pole route runs along the South side of US 60 at approximately 25 – 30 ft Rt along Frankfort Plant Board route from Sta 510+50 to Sta 515+50. An existing pole route runs along the north side of US 60 at approximately 25 – 30 ft Lt with existing poles at: Sta 512+72, Sta 513+90, Sta 515+30, Sta 516+68, and Sta 517+94.

There is an existing overhead crossing at approximately Sta 513+66 from a pole on the south side of US 60 to a pole on the north side of US 60 at approximately Sta 513+87 75ft Lt; the existing overhead route then continues along existing Douglas Street to a pole at approximately Sta 514+05 144ft Lt, then continues along a pole route that is approximately 15ft Rt of the Douglas Street centerline. An existing overhead route runs along the west side of Langford Avenue at approximately 10ft Lt.

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An existing underground clay duct bank (6 – 4”) and a concrete duct bank (18 – 4”) run along US 60 at approximately 6ft Rt and 20ft Rt, respectively, from out of project limits approaching from the west to a telephone manhole at approximately Sta 513+60. From this manhole two existing underground ducts continue east along US 60, south of the US 60 centerline. From the manhole an existing set of 4-4” ducts rung north along the center of existing Douglas Street.

These facilities will be removed or relocated by AT&T or their contractors.

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

THE FOLLOWING COMPANIES ARE RELOCATING/ADJUSTING THEIR UTILITIES WITHIN THE PROJECT LIMITS AND WILL BE COMPLETE PRIOR TO CONSTRUCTION

N/A

THE FOLLOWING COMPANIES HAVE FACILITIES TO BE RELOCATED/ADJUSTED BY THE COMPANY OR THE COMPANY’S SUBCONTRACTOR AND IS TO BE COORDINATED WITH THE ROAD CONTRACT

Frankfort Plant Board-electric – has existing and proposed overhead facilities in the project area.

Along the existing pole route on the south side of US 60 all of the existing overhead lines are to be removed from the west outside of project limits to the pole at Sta 515+50. Along the existing pole route on the North side of US 60 all of the existing overhead lines are to be removed from the pole at Sta 507+20 to the pole at Sta 516+60.

There is a proposed pole at approximately Sta 515+5028ft Rt with proposed overhead lines running west to a proposed pole at approximately Sta 510+66 28ft Rt. There is a proposed pole at approximately Sta 510+42 40ft Lt with a proposed anchor to the North. From this pole there is a proposed overhead route running approximately south, crossing over US 60 to the proposed pole at Sta 510+66 28ft Rt and continuing on a proposed pole route south of project limits. There is a proposed pole at approximately Sta 516+38 50ft Lt and a proposed crossing from this pole to the existing pole at Sta 516+60 26ft Rt.

The existing pole at approximately Sta 514+08 144ft Lt is to be removed. The existing overhead crossings at approximately Sta 516+60 and Sta 517+72 are to be removed.

This work is anticipated to be complete by June 1, 2016.

Frankfort Plant Board-Cable – has existing and proposed overhead and underground facilities in the project area.

Existing overhead fiber and coax are to be removed. Proposed overhead lines will follow the proposed Frankfort Plant Electric pole route. Proposed underground ducts run along the south side of US 60 from approximately Sta 512+40 40ft Rt heading west along US 60 to approximately Sta 507+80 70ft Rt. From here the underground duct splits, one going north under US 60 to approximately Sta 507+80 200ft Lt, and another duct line heading south-west out of project limits.

This work is anticipated to be completed by March 1st, 2016.

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AT&T – has existing and proposed overhead and underground facilities in the project area.

Along the pole route that runs along the north side of US 60 existing poles are to be removed: Sta 512+72, Sta 513+90, Sta 515+30, Sta 516+68, and Sta 517+94. New overhead facilities are to be placed along proposed power poles at Sta 516+38 50ft Lt and Sta 518+00 38ft Lt. Two existing poles along Douglas Street are to be removed at Sta 513+87 75ft Lt and Sta 514+05 144ft Lt. Along the south side of US 60 overhead facilities from the pole at Sta 510+50 to Sta 515+50 are to be removed. Along Langford Avenue the following poles are to be removed: (based on Langford avenue stations) Sta 50+70 10ft Rt and Sta 51+84 11ft Rt. A new down guy is to be placed at the pole at Sta 53+05 11ft Rt. A proposed underground duct is to be placed along the west side of Langford Avenue approximately 10-11ft Rt which runs from the pole at Sta 53+05 north to US 60 then turns west to the telephone junction box at approximately Sta 513+60.

This work is anticipated to be completed by March 1, 2016.

The Department will consider submission of a bid as the Contractor's agreement to not make any claims for additional compensation due to delays or other conditions created by the operations of **Frankfort Plant Board** and/or **AT&T**. Working days will not be charged for those days on which work on **Frankfort Plant Board** and/or **AT&T** facilities is delayed, as provided in the current edition of the KY Standard Specifications for Road and Bridge Construction. Should a difference of opinion arise as to the rights of the Contractor and others working within the limits of, or adjacent to the project, the KYTC Resident Engineer will decide as to the respective rights of the various parties involved in order to assure the completion of the Department's work in general harmony and in a satisfactory manner, and his decision shall be final and binding upon the Contractor.

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

Frankfort Sewer – has existing sanitary sewer that will be abandoned;

The existing 8" sanitary sewer begins out of project limits, south of the project area, running northerly perpendicular to US 60 to a manhole at approximately Sta 507+38 115ft Rt of the roadway baseline. From this manhole the sewer is to be abandoned. From the manhole the sewer turns west slightly and goes to a manhole at approximately Sta 506+76 62ft Lt, then crossed under US 60, perpendicular to the roadway to a manhole on the north side of the road at approximately Sta. 506+80 60ft Lt; from this manhole the sanitary sewer splits. One direction goes to a manhole at approximately Sta 508+55 230ft Lt then to a manhole at approximately Sta 508+48 238ft Lt. The other sanitary sewer line connecting the manhole at Sta 506+80 60ft Lt continues to a manhole at approximately Sta 507+80 39ft Lt. The sanitary sewer then continues along the North side of US 60 to a manhole at approximately Sta 511+47 30ft Lt, then to a manhole at approximately Sta 513+42 35ft Lt, then to a manhole at approximately Sta 514+94 36ft Lt, then continues along US 60 at approximately 36ft Lt.

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From the Manhole at Sta 513+42 35ft Lt another 8” sanitary sewer runs north to a manhole at approximately Sta 513+83 105ft Lt, then continues along Douglas street o a manhole at approximately Sta 514+30 273ft Lt, then continues along Douglas Street and out of project limits.

There is another 8” sanitary sewer lint which runs along Langford avenue beginning out of project limits and running approximately northwest at approximately 3ft Lt of Langford Avenue centerline to a manhole at approximately Sta 51+69 2ft Lt then turns 90 and goes to a manhole at approximately Sta 51+78 148ft Lt then to a manhole at approximately Sta 51+84 167ft Lt.

Has proposed sanitary sewer line to be installed by the contractor as part of the project;

The existing manhole at Sta 507+38 115ft Rt is to be replaced. A proposed 8” sewer will then go from the replaced manhole to a proposed manhole at Sta 506+84 55ft Rt, then goes to a proposed manhole at Sta 506+87 54ft Lt. From this manhole one proposed 8” sewer goes to a proposed manhole at approximately Sta 508+26 190ft Lt then to a proposed manhole at approximately Sta 508+30 235ft Lt. From the manhole at Sta 506+87 54 ft Lt another proposed 8” sewer continues along US 60 to a proposed manhole at approximately Sta 509+16, then goes to a proposed manhole at approximately Sta 510+44 40ft Lt, then to a proposed manhole at approximately Sta 512+39 50ft Lt, then to a proposed manhole at approximately Sta 513+21 50ft Lt, then to a proposed manhole at approximately Sta 516+60 41ft Lt.

From the manhole at Sta 513+21 there is another proposed 8” sewer that heads north along Douglas Street to a proposed manhole at approximately Sta 513+82 151ft Lt, then crosses under Douglas Street to a proposed manhole at approximately Sta 514+40 185ft Lt, then goes to a proposed manhole at approximately Sta 514+30 227ft Lt, then to a proposed manhole at 514+48 282ft Lt, then to a proposed manhole at approximately Sta 514+94 434ft Lt.

Along Langford Avenue the existing manhole at approximately Sta 51+69 1ft Lt and an existing manhole at approximately Sta 51+78 147ft Lt are to be replaced along with the existing 8” sewer pipe connecting them. The proposed 8” PVC pipe sewer then continues perpendicular to Langford Avenue to a proposed manhole at approximately Sta 51+80 166 ft Lt.

THE FOLLOWING RAIL COMPANIES HAVE FACILITIES IN CONJUNCTION WITH THIS PROJECT AS NOTED

- ☒ No Rail Involved
- ☐ Minimal Rail Involved (See Below)
- ☐ Rail Involved (See Below)

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SPECIAL CAUTION NOTE – PROTECTION OF UTILITIES

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 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.

BEFORE YOU DIG

The contractor is instructed to call 1-800-752-6007 to reach KY 811, the one-call system for information on the location of existing underground utilities. The call is to be placed a minimum of two (2) and no more than ten (10) business days prior to excavation. The contractor should be aware that owners of underground facilities are not required to be members of the KY 811 one-call Before-U-Dig (BUD) service. The contractor must coordinate excavation with the utility owners, including those whom do not subscribe to KY 811. It may be necessary for the contractor to contact the County Court Clerk to determine what utility companies have facilities in the area.

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

UTILITIES AND RAIL CERTIFICATION NOTE

FRANKLIN COUNTY FD04 037 87511 01U) PEDESTRIAN BRIDGE BETWEEN HATHAWAY HALL AND WHITNEY YOUNG HALL ITEM NUMBER 5-8714.00

AREA UTILITIES CONTACT LIST

<u>Utility Company/Agency</u>	<u>Contact Name</u>	<u>Contact Information</u>
1. AT&T KY 894 East Main Street, ext Georgetown, KY 40324		Frank Ambrose FA2207@ATT.com office (502)867-8240 cell (859)753-8377
2. Frankfort Plant Board - Electric P O Box 308 Frankfort, KY 40601		Vent Foster (502) 352-4402 VFoster@FEWPB.com or Jim Carter (502)352-4401 JCarter@FEWPB.com
3. Frankfort Plant Board - CATV P O Box 308 Frankfort, KY 40601		Shane Holt (502) 352-4546 SHolt@FEWPB.com and/or Adam Hellard (502) 352-4551 AHellard@FEWPB.com
4. Frankfort Plant Board - Water P O Box 308 Frankfort, KY 40601 (502) 875-4501		David Billings (502) 352-4468 DBillings@FEWPB.com
5. Frankfort Sewer Department 1200 Kentucky Ave. Frankfort, KY 40601		William Scalf WScalf@Frankfort.ky.gov (502) 875-2448 Or Bob Peterson BPeterson@Frankfort.ky.gov Cell (502)229-6313

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- | | | |
|---|----|---|
| 6. Bluegrass Energy
P O Box 990
1201 Lexington Rd.
Nicholasville, KY 40356 | | Jim Kendrick
jim.kendrick@bgenergy.com
859.885.2114
859.806.5066 |
| 7. Peaks Mill Water District
7165 US Highway 127 N
Frankfort, KY 40601 | | Dale Gatewood
(502) 227-5740
(502) 695-2641 – Maint. Office |
| 8. Farmdale Water District
100 Highwood Drive
Frankfort, KY 40601
FWD@fewpb.net | | David Robinson or
Clifford Toles
(502) 223-3562
Does not participate in BUD; call
David Robinson for locate
assistance. |
| 10. Columbia Gas of Kentucky, Inc.
2001 Mercer Rd., PO Box 14241
Lexington, KY 40512 | | David Lemons
DNLemons@NiSource.com
cell – (859) 940-9210
Office-(859) 288-0249

or

Bryan Slone
BKSlone@NiSource.com
Office-(859)221-2185 |
| 11. LG&E KU
820 West Broadway
Louisville, KY 40202
LG&E Emergency Number (502) 589-1444
KU Emergency Number 1-800-331-7370 | | Greg Geiser
work: (502) 627-3708
Greg.Geiser@lge-ku.com |
| 12. Elkhorn Water District
P.O.Box 67
Frankfort, KY 40602
Telephone (502) 695-2641(maint. office) | OR | Dale Gatewood
Jolene Parris (office manager)
(502)695-4431 |

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- | | |
|---|---|
| 13. Atmos Energy
105 Hudson Boulevard
Shelbyville, KY 40065
(502) 633-2831 ext. 104 | Bernie Anderson
cell: 502-321-8073
Bernie.Anderson@AtmosEnergy.com
Ryne White
270-929-1706
Ryne.white@atmosenergy.com |
| 14. North Shelby Water
North Shelby Water District
P O Box 97
Bagdad, KY 40003 | Pete Hedges
PeteHedges@bellsouth.net
(502) 747-8942 |
| 15. Kentucky Data Link (KDL now Windstream)
3701 Communications Way
Evansville, IN 47715
(Address envelopes ATTN LaDon Haley) | John McDowell
John.McDowell@windstream.com
Office (606)329-6196
Cell (606)369-3623
Timothy Gibson (Fiber
location/relocation)
Timothy.Gibson@Windstream.com
(812) 454-6756 |
| Windstream Kentucky East, LLC
130 West New Circle Road
Suite 170
Lexington, KY 40505 | Larry Brashear
Larry.Brashear@Windstream.com
Office (859) 357-6255
Cell (859) 490-0555
Lezlie Allison
Lezlie.Allison@Windstream.com |
| 16. East Kentucky Power Coop
4775 Lexington Road
Winchester, KY 40391

P O Box 707
Winchester, KY 40391 | Garry Harvey
Garry.Harvey@EKPC.coop
(859)745-9601
Jason Witt
Jason.Witt@EKPC.coop
Cell: (859) 749-9110
Office (859) 745-9596
Barry Warner
Barry.Warner@EKPC.coop
(859)745-9304 |

OR

OR

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17.

Windstream Kentucky, Inc.
229 Lees Valley Road
Shepherdsville, KY 40165
OR
Barry Roberts
111 S. Main St.
Elizabethtown, KY 42071

Roger Redford
cell – (502) 264-2053
Roger.Redford@Windstream.com
(502) 957-7127

(270) 723-7358
18.

Insight Communications Company
4701 Commerce Crossings Dr.
Louisville, KY 40229

Deno Barbour
Cell: (502) 664-7395
Office(502) 357-4376
Dwight.Barbour@TWCable.com
19.

Sprint - Fiber Optics
11370 Enterprise Park Dr.
Sharonville, OH 45241

Joe Thomas
Joe.Thomas@Ericsson.com
Office (513) 612-4204
Cell (937) 209-9754
20.

AT&T Legacy
7555 E. Pleasant Valley Rd. – Suite 140
Independence, OH 44131

Mike Diederich
MD4145@att.com
Phone - (216) 750.0135
Cell - (216) 212-8556
Don Garr
DRGarr@Hughes.net
Cell: (502) 741-8374
21.

Kentucky American Water Company
2300 Richmond Rd
Lexington, KY 40502

Wes Felts
Jon.Felts@AMWater.com
(859) 537-0762 cell
(859) 268-6360 office
22.

Shelby Energy Cooperative
P.O. Box 311, 620 Old Finchville Road
Shelbyville, KY 40065
(502) 633-4420

Jason Ginn
Jason@ShelbyEnergy.com
cell: 502-643-2778

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- 23.** Crown Castle Network Operations
10170 Linn Station Road
Suite 525
Louisville, KY 40223
(builds cell towers and leases space on them)

Brian Watkins
Brian.Watkins@CrownCastle.com
(502)318-1323
Brandy Bowling (Brian's supervisor)
Brandy.Bowling@CrownCastle.com
(502)318-1322
Cindy Shaffer
Cynthia.Shaffer@CrownCastle.com
(502) 318-1313
Chris Gladstone
Chris.Gladstone@CrownCastle.com
(502)689-2162

Railroad Companies

- 1. C.S.X. Transportation, Inc.**
Contacts:
David Hall, KY Liaison, (502) 815-1865
Milton Holder – crossings – cell (502) 817-2011
John Williams – crossings – cell (502) 376-8745, Office (502) 364-1133
Joe Malandruco (Florida) – signals (904) 245-1160

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 Standard 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. Those utility owners with a prequalification or preapproval requirement are as follows:

(The district utility agent shall list here utility owners requiring prequalified or preapproved contractors to perform work on their facilities. The utility agent shall place appropriate list(s) of prequalified or preapproved contractors at the end of these notes with each list identified with the utility owner name, utility type and appropriate heading at the top. If there are some utility owners that require prequalified or preapproved contractors and others that do not within this same contract, it may be prudent to list here each utility owner with utility work in the road contract and state if they require prequalified or preapproved contractors or not. If no utility owner prequalifies or preapproves contractors, the following statement shall be placed here: "No contractors are required to be prequalified or preapproved by the utility owner(s) to perform utility relocation work under this contract.")

The bidding contractor needs to review the above list and look for a list of preapproved or prequalified contractors at the end of these general notes as identified above before bidding. Only contractors shown to be prequalified or preapproved by the utility owner on the following list(s) will be allowed to work on that utility as a part of this contract.

Any utility contractor that is not listed as prequalified or preapproved when the project is advertised for bid and wishes to be added must make request through the KYTC Contract Procurement website. The request should be made at least one week prior to the bidding deadline to allow for review and posting on the KYTC Contract Procurement website. A contractor is only considered prequalified or preapproved when published on the KYTC Contract Procurement website. Contractors that contact the utility owner directly for preapproval or prequalification without contacting KYTC will not be considered for preapproval or prequalification for this contract. Contractors that are not prequalified or preapproved through KYTC before the bidding deadline will not be considered for prequalification or preapproval after bidding.

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.

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 Standard 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:

*(List here utility owner name(s) and specific materials that will be provided to the contractor. If there are some utility owners that will be supplying materials and others that will not, it may be prudent to also list each utility owner that will not be supplying materials for clarity of the contract. If no utility owner intends to supply materials, the following statement shall be placed here: “**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 Sanitary Sewer Bid Item Descriptions

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 is 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/confined space requirements and 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 in 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 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 bid 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 and 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 Includes all labor, equipment, excavation, concrete, reinforcing

steel, backfill, restoration, and 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 encasement 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 description shall apply to all PVC and 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 boxes (if required by specification), polyethylene wrap (when specified), labor, equipment, excavation, bedding, restoration, testing, backfill, and 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 bid 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, 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 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 locations shown on the plans. This bid item is to be used to relocate 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, 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 specification 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 bid 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.

S FORCE MAIN VALVE This 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, and 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 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, and 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 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 variances. 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 LONG SIDE This bid 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 bid item description shall apply to all service lateral installations of every size up to and including 6 inch, 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. Payment shall be made under this item even if the lateral 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. 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 ground level 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 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. 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. 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 ABANDON/REMOVE Payment under this item is for the partial removal and/or filling of any sanitary sewer manhole regardless of size or depth that no longer serves any purpose. Payment shall be made regardless of whether the manhole is or is not in conflict with other work. Any manhole requiring partial removal, but not total removal, in order to clear a conflict with other work shall be paid under this item. All manholes partially removed shall be removed to a point at least one foot below final grade, one foot below roadway subgrade, or one foot clear of any other underground infrastructure, whichever is lowest. If partial removal of an abandoned manhole is elected by the contractor, the remaining manhole structure shall be refilled with flowable fill. Payment for disposal of a sanitary sewer manhole will be made under this item only. 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 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 bid items is for furnishing of a new standard traffic baring casting for sanitary manholes meeting 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 bid item is for furnishing of a new watertight traffic baring casting for sanitary manholes meeting 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 RECONSTRUCT INVERT This bid item is to pay for all labor, equipment, and material for rework of the 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 specification, standard drawing or plan. 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 bid 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 bid 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, 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. The 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, 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 each 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. 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 LINING Payment under this item is for the installation of new 4 foot interior diameter sanitary sewer manhole with corrosion resistant lining. Payment for 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. Manholes shall include concrete base, barrel sections, cone section or slab top, steps, lining, excavation, backfilling, air testing, restoration, and cleanup in accordance with the standard drawings. 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. 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 PIPE This description shall apply to all PVC and ductile iron gravity sewer pipe bid items of every size and type 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, restoration, pressure or vacuum testing, temporary testing materials, video inspection, backfill, and 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 lamp holes. 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. 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 PUMP STATION This item is for payment for installation of sanitary pump stations including 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) 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 time 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 restoration complete. 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.

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, and etc. Payment under this time 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 structure 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 restoration complete. 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.

KENTUCKY TRANSPORTATION CABINET (1)

And

_____ (2), Construction

Kentucky Pollutant Discharge Elimination System

Permit KYR10

Best Management Practices (BMP) plan

Groundwater protection plan

For Highway Construction Activities

For

[KSU Pedestrain Bridge](1)

Project: 5-8714.00

Project information

Note – (1) = Design (2) = Construction (3) = Contractor

Owner – KENTUCKY TRANSPORTATION CABINET (1)

Resident Engineer: (2)

Contractor name: (2)

Address: (2)

Phone number: (2)

Contact: (2)

Contractors agent responsible for compliance with the KPDES permit requirements (3):

Project Control Number (2)

Route (Address) US 60 (1)

Latitude/Longitude (project mid-point) 38/11, 84/51/ (1)

County (project mid-point) Franklin County(1)

Project start date (date work will begin): (2)

Projected completion date: (2)

A. Site description:

1. Nature of Construction Activity (from letting project description) **CONSTRUCT Kentucky State University Pedestrian Bridge (1)**
2. Order of major soil disturbing activities (2) and (3)
3. Projected volume of material to be moved **5,669 CY(1)**
4. Estimate of total project area (acres) **3.0 (1)**
5. Estimate of area to be disturbed (acres) **3.0 (1)**
6. 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)
7. Data describing existing soil condition (1) & (2)
8. No information describing existing discharge water quality is available(1) & (2)
9. Receiving water name: **NO Tributary(1)**
10. TMDLs and Pollutants of Concern in Receiving Waters: **NO TMDLS INVOLVED ON THIS PROJECT(1)**
11. 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.
12. 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. All DDA's will have adequate BMP's in place before being disturbed.**

- 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 : PROJECT DOES NOT INCLUDE STORM WATRT BMPS OR FLOW CONTROLS (1)

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 Resident Engineer if there are 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 contact 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 received KyTC Grade Level II training or other qualification as prescribed by the cabinet that includes instruction concerning sediment and erosion control.
- 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 70 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 from 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.)

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 name²signature

(3) Signed _____title_____, _____

Typed or printed name¹signature

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 name¹signature

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.

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.

PART II

SPECIFICATIONS AND STANDARD DRAWINGS

SPECIFICATIONS REFERENCE

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 2012* and *Standard Drawings, Edition of 2012 with the 2012 Revision*.

**Supplemental Specifications to the
Standard Specifications for Road and Bridge Construction, 2012 Edition
Effective with the July 31, 2015 Letting**

Subsection:	102.15 Process Agent.
Revision:	Replace the 1st paragraph with the following: Every corporation doing business with the Department shall submit evidence of compliance with KRS Sections 14A.4-010, 271B.11-010, 271B.11-070, 271B.11-080, 271B.5-010 and 271B.16-220, and file with the Department the name and address of the process agent upon whom process may be served.
Subsection:	105.13 Claims Resolution Process.
Revision:	Delete all references to TC 63-34 and TC 63-44 from the subsection as these forms are no longer available through the forms library and are forms generated within the AASHTO SiteManager software.
Subsection:	108.03 Preconstruction Conference.
Revision:	Replace 8) Staking with the following: 8) Staking (designated by a Professional Engineer or Land Surveyor licensed in the Commonwealth of Kentucky.
Subsection:	109.07.02 Fuel.
Revision:	Revise item Crushed Aggregate Used for Embankment Stabilization to the following: Crushed Aggregate Used for Stabilization of Unsuitable Materials Used for Embankment Stabilization
	Delete the following item from the table. Crushed Sandstone Base (Cement Treated)
Subsection:	110.02 Demobilization.
Revision:	Replace the first part of the first sentence of the second paragraph with the following: Perform all work and operations necessary to accomplish final clean-up as specified in the first paragraph of Subsection 105.12;
Subsection:	112.03.12 Project Traffic Coordinator (PTC).
Revision:	Replace the last paragraph of this subsection with the following: Ensure the designated PTC has sufficient skill and experience to properly perform the task assigned and has successfully completed the qualification courses.
Subsection:	112.04.18 Diversions (By-Pass Detours).
Revision:	Insert the following sentence after the 2nd sentence of this subsection. The Department will not measure temporary drainage structures for payment when the contract documents provide the required drainage opening that must be maintained with the diversion. The temporary drainage structures shall be incidental to the construction of the diversion. If the contract documents fail to provide the required drainage opening needed for the diversion, the cost of the temporary drainage structure will be handled as extra work in accordance with section 109.04.
Subsection:	201.03.01 Contractor Staking.
Revision:	Replace the first paragraph with the following: Perform all necessary surveying under the general supervision of a Professional Engineer or Land Surveyor licensed in the Commonwealth of Kentucky.

**Supplemental Specifications to the
Standard Specifications for Road and Bridge Construction, 2012 Edition
Effective with the July 31, 2015 Letting**

Subsection:	201.04.01 Contractor Staking.
Revision:	Replace the last sentence of the paragraph with the following: Complete the general layout of the project under the supervision of a Professional Engineer or Land Surveyor licensed in the Commonwealth of Kentucky.
Subsection:	206.04.01 Embankment-in-Place.
Revision:	Replace the fourth paragraph with the following: The Department will not measure suitable excavation included in the original plans that is disposed of for payment and will consider it incidental to Embankment-in-Place.
Subsection:	208.02.01 Cement.
Revision:	Replace paragraph with the following: Select Type I or Type II cement conforming to Section 801. Use the same type cement throughout the work.
Subsection:	208.03.06 Curing and Protection.
Revision:	Replace the fourth paragraph with the following: Do not allow traffic or equipment on the finished surface until the stabilized subgrade has cured for a total of 7-days with an ambient air temperature above 40 degrees Fahrenheit. A curing day consists of a continuous 24-hour period in which the ambient air temperature does not fall below 40 degrees Fahrenheit. Curing days will not be calculated consecutively, but must total seven (7) , 24-hour days with the ambient air temperature remaining at or above 40 degrees Fahrenheit before traffic or equipment will be allowed to traverse the stabilized subgrade. The Department may allow a shortened curing period when the Contractor requests. The Contractor shall give the Department at least 3 day notice of the request for a shortened curing period. The Department will require a minimum of 3 curing days after final compaction. The Contractor shall furnish cores to the treated depth of the roadbed at 500 feet intervals for each lane when a shortened curing time is requested. The Department will test cores using an unconfined compression test. Roadbed cores must achieve a minimum strength requirement of 80 psi.
Subsection:	208.03.06 Curing and Protection.
Revision:	Replace paragraph eight with the following: At no expense to the Department, repair any damage to the subgrade caused by freezing.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	A) Seed Mixtures for Permanent Seeding.
Revision:	Revise Seed Mix Type I to the mixture shown below: 50% Kentucky 31 Tall Fescue (<i>Festuca arundinacea</i>) 35% Hard Fescue (<i>Festuca (Festuca longifolia)</i>) 10% Ryegrass, Perennial (<i>Lolium perenne</i>) 5% White Dutch Clover (<i>Trifolium repens</i>)
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	A) Seed Mixtures for Permanent Seeding.
Number:	2)
Revision:	Replace the paragraph with the following: Permanent Seeding on Slopes Greater than 3:1 in Highway Districts 4, 5, 6, and 7. Apply seed mix Type II at a minimum application rate of 100 pounds per acre. If adjacent to a golf course replace the crown vetch with Kentucky 31 Tall Fescue.

**Supplemental Specifications to the
Standard Specifications for Road and Bridge Construction, 2012 Edition
Effective with the July 31, 2015 Letting**

Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	A) Seed Mixtures for Permanent Seeding.
Number:	3)
Revision:	Replace the paragraph with the following: Permanent Seeding on Slopes Greater than 3:1 in Highway Districts 1, 2, 3, 8, 9, 10, 11, and 12. Apply seed mix Type III at a minimum application rate of 100 pounds per acre. If adjacent to crop land or golf course, replace the Sericea Lespedeza with Kentucky 31 Fescue.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	B) Procedures for Permanent Seeding.
Revision:	Delete the first sentence of the section.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	B) Procedures for Permanent Seeding.
Revision:	Replace the second and third sentence of the section with the following: Prepare a seedbed and apply an initial fertilizer that contains a minimum of 100 pounds of nitrogen, 100 pounds of phosphate, and 100 pounds of potash per acre. Apply agricultural limestone to the seedbed when the Engineer determines it is needed. When required, place agricultural limestone at a rate of 3 tons per acre.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	D) Top Dressing.
Revision:	Change the title of part to D) Fertilizer.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	D) Fertilizer.
Revision:	Replace the first paragraph with the following: Apply fertilizer at the beginning of the seeding operation and after vegetation is established. Use fertilizer delivered to the project in bags or bulk. Apply initial fertilizer to all areas prior to the seeding or sodding operation at the application rate specified in 212.03.03 B). Apply 20-10-10 fertilizer to the areas after vegetation has been established at a rate of 11.5 pounds per 1,000 square feet. Obtain approval from the Engineer prior to the 2nd fertilizer application. Reapply fertilizer to any area that has a streaked appearance. The reapplication shall be at no additional cost to the Department. Re-establish any vegetation severely damaged or destroyed because of an excessive application of fertilizer at no cost to the Department.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	D) Fertilizer.
Revision:	Delete the second paragraph.
Subsection:	212.04.04 Agricultural Limestone.
Revision:	Replace the entire section with the following: The Department will measure the quantity of agricultural limestone in tons.
Subsection:	212.04.05 Fertilizer.
Revision:	Replace the entire section with the following: The Department will measure fertilizer used in the seeding or sodding operations for payment. The Department will measure the quantity by tons.

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Subsection:	212.05 PAYMENT.		
Revision:	Delete the following item code:		
	<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
	05966	Topdressing Fertilizer	Ton
Subsection:	212.05 PAYMENT.		
Revision:	Add the following pay items:		
	<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
	05963	Initial Fertilizer	Ton
	05964	20-10-10 Fertilizer	Ton
	05992	Agricultural Limestone	Ton
Subsection:	213.03.02 Progress Requirements.		
Revision:	Replace the last sentence of the third paragraph with the following: Additionally, the Department will apply a penalty equal to the liquidated damages when all aspects of work are not coordinated in an acceptable manner within 7 calendar days after written notification.		
Subsection:	213.03.05 Temporary Control Measures.		
Part:	E) Temporary Seeding and Protection.		
Revision:	Delete the second sentence of the first paragraph.		
Subsection:	304.02.01 Physical Properties.		
Table:	Required Geogrid Properties		
Revision:	Replace all references to Test Method "GRI-GG2-87" with ASTM D 7737.		
Subsection:	402.03.02 Contractor Quality Control and Department Acceptance.		
Part:	B) Sampling.		
Revision:	Replace the second sentence with the following: The Department will determine when to obtain the quality control samples using the random-number feature of the mix design submittal and approval spreadsheet. The Department will randomly determine when to obtain the verification samples required in Subsections 402.03.03 and 402.03.04 using the Asphalt Mixture Sample Random Tonnage Generator.		
Subsection:	402.03.02 Contractor Quality Control and Department Acceptance.		
Part:	D) Testing Responsibilities.		
Number:	3) VMA.		
Revision:	Add the following paragraph below Number 3) VMA: Retain the AV/VMA specimens and one additional corresponding G _{mm} sample for 5 working days for mixture verification testing by the Department. For Specialty Mixtures, retain a mixture sample for 5 working days for mixture verification testing by the Department. When the Department's test results do not verify that the Contractor's quality control test results are within the acceptable tolerances according to Subsection 402.03.03, retain the samples and specimens from the affected subplot(s) for the duration of the project.		
Subsection:	402.03.02 Contractor Quality Control and Department Acceptance.		
Part:	D) Testing Responsibilities.		
Number:	4) Density.		
Revision:	Replace the second sentence of the Option A paragraph with the following: Perform coring by the end of the following work day.		

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Subsection:	402.03.02 Contractor Quality Control and Department Acceptance.
Part:	D) Testing Responsibilities.
Number:	5) Gradation.
Revision:	Delete the second paragraph.
Subsection:	402.03.02 Contractor Quality Control and Department Acceptance.
Part:	H) Unsatisfactory Work.
Number:	1) Based on Lab Data.
Revision:	Replace the second paragraph with the following: When the Engineer determines that safety concerns or other considerations prohibit an immediate shutdown, continue work and the Department will make an evaluation of acceptability according to Subsection 402.03.05.
Subsection:	402.03.03 Verification.
Revision:	Replace the first paragraph with the following: 402.03.03 Mixture Verification. For volumetric properties, the Department will perform a minimum of one verification test for AC, AV, and VMA according to the corresponding procedures as given in Subsection 402.03.02. The Department will randomly determine when to obtain the verification sample using the Asphalt Mixture Sample Random Tonnage Generator. For specialty mixtures, the Department will perform one AC and one gradation determination per lot according to the corresponding procedures as given in Subsection 402.03.02. However, Department personnel will not perform AC determinations according to KM 64-405. The Contractor will obtain a quality control sample at the same time the Department obtains the mixture verification sample and perform testing according to the procedures given in Subsection 402.03.02. If the Contractor's quality control sample is verified by the Department's test results within the tolerances provided below, the Contractor's sample will serve as the quality control sample for the affected subplot. The Department may perform the mixture verification test on the Contractor's equipment or on the Department's equipment.
Subsection:	402.03.03 Verification.
Part:	A) Evaluation of Subplot(s) Verified by Department.
Revision:	Replace the third sentence of the second paragraph with the following: When the paired t -test indicates that the Contractor's data and Department's data are possibly not from the same population, the Department will investigate the cause for the difference according to Subsection 402.03.05 and implement corrective measures as the Engineer deems appropriate.
Subsection:	402.03.03 Verification.
Part:	B) Evaluation of Subplots Not Verified by Department.
Revision:	Replace the third sentence of the first paragraph with the following: When differences between test results are not within the tolerances listed below, the Department will resolve the discrepancy according to Subsection 402.03.05.

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Subsection:	402.03.03 Verification.
Part:	B) Evaluation of Sublots Not Verified by Department.
Revision:	Replace the third sentence of the second paragraph with the following: When the <i>F</i> -test or <i>t</i> -test indicates that the Contractor's data and Department's data are possibly not from the same population, the Department will investigate the cause for the difference according to Subsection 402.03.05 and implement corrective measures as the Engineer deems appropriate.
Subsection:	402.03.03 Verification.
Part:	C) Test Data Patterns.
Revision:	Replace the second sentence with the following: When patterns indicate substantial differences between the verified and non-verified sublots, the Department will perform further comparative testing according to subsection 402.03.05.
Subsection:	402.03 CONSTRUCTION.
Revision:	Add the following subsection: 402.03.04 Testing Equipment and Technician Verification. For mixtures with a minimum quantity of 20,000 tons and for every 20,000 tons thereafter, the Department will obtain an additional verification sample at random using the Asphalt Mixture Sample Random Tonnage Generator in order to verify the integrity of the Contractor's and Department's laboratory testing equipment and technicians. The Department will obtain a mixture sample of at least 150 lb at the asphalt mixing plant according to KM 64-425 and split it according to AASHTO R 47. The Department will retain one split portion of the sample and provide the other portion to the Contractor. At a later time convenient to both parties, the Department and Contractor will simultaneously reheat the sample to the specified compaction temperature and test the mixture for AV and VMA using separate laboratory equipment according to the corresponding procedures given in Subsection 402.03.02. The Department will evaluate the differences in test results between the two laboratories. When the difference between the results for AV or VMA is not within ± 2.0 percent, the Department will investigate and resolve the discrepancy according to Subsection 402.03.05.
Subsection:	402.03.04 Dispute Resolution.
Revision:	Change the subsection number to 402.03.05.
Subsection:	402.05 PAYMENT.
Part:	Lot Pay Adjustment Schedule Compaction Option A Base and Binder Mixtures
Table:	AC
Revision:	Replace the Deviation from JMF(%) that corresponds to a Pay Value of 0.95 to ± 0.6 .
Subsection:	403.02.10 Material Transfer Vehicle (MTV).
Revision:	Replace the first sentence with the following: In addition to the equipment specified above, provide a MTV with the following minimum characteristics:
Subsection:	412.02.09 Material Transfer Vehicle (MTV).
Revision:	Replace the paragraph with the following: Provide and utilize a MTV with the minimum characteristics outlined in section 403.02.10.

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Subsection:	412.03.07 Placement and Compaction.
Revision:	Replace the first paragraph with the following: Use a MTV when placing SMA mixture in the driving lanes. The MTV is not required on ramps and/or shoulders unless specified in the contract. When the Engineer determines the use of the MTV is not practical for a portion of the project, the Engineer may waive its requirement for that portion of pavement by a letter documenting the waiver.
Subsection:	412.04 MEASUREMENT.
Revision:	Add the following subsection: 412.04.03. Material Transfer Vehicle (MTV). The Department will not measure the MTV for payment and will consider its use incidental to the asphalt mixture.
Subsection:	501.03.05 Weather Limitations and Protection.
Revision:	Replace the reference to Subsection 501.03.19 in Paragraph 5, with Subsection 501.03.20.
Subsection:	501.03.19 Surface Tolerances and Testing Surface.
Part:	B) Ride Quality.
Revision:	Add the following to the end of the first paragraph: The Department will specify if the ride quality requirements are Category A or Category B when ride quality is specified in the Contract. Category B ride quality requirements shall apply when the Department fails to classify which ride quality requirement will apply to the Contract.
Subsection:	603.03.06 Cofferdams.
Revision:	Replace the seventh sentence of paragraph one with the following: Submit drawings that are stamped by a Professional Engineer licensed in the Commonwealth of Kentucky.
Subsection:	605.03.04 Tack Welding.
Revision:	Insert the subsection and the following: 605.03.04 Tack Welding. The Department does not allow tack welding.
Subsection:	606.03.17 Special Requirements for Latex Concrete Overlays.
Part:	A) Existing Bridges and New Structures.
Number:	1) Prewetting and Grout-Bond Coat.
Revision:	Add the following sentence to the last paragraph: Do not apply a grout-bond coat on bridge decks prepared by hydrodemolition.
Subsection:	609.03 Construction.
Revision:	Replace Subsection 609.03.01 with the following: 609.03.01 A) Swinging the Spans. Before placing concrete slabs on steel spans or precast concrete release the temporary erection supports under the bridge and swing the span free on its supports. 609.03.01 B) Lift Loops. Cut all lift loops flush with the top of the precast beam once the beam is placed in the final location and prior to placing steel reinforcement. At locations where lift loops are cut, paint the top of the beam with galvanized or epoxy paint.

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Subsection:	611.03.02 Precast Unit Construction.
Revision:	Replace the first sentence of the subsection with the following: Construct units according to ASTM C1577, replacing Table 1 (Design Requirements for Precast Concrete Box Sections Under Earth, Dead and HL-93 Live Load Conditions) with KY Table 1 (Precast Culvert KYHL-93 Design Table) , and Section 605 with the following exceptions and additions:
Subsection:	613.03.01 Design.
Number:	2)
Revision:	Replace "AASHTO Standard Specifications for Highway Bridges" with "AASHTO LRFD Bridge Design Specifications"
Subsection:	615.06.02
Revision:	Add the following sentence to the end of the subsection. The ends of units shall be normal to walls and centerline except exposed edges shall be beveled $\frac{3}{4}$ inch.
Subsection:	615.06.03 Placement of Reinforcement in Precast 3-Sided Units.
Revision:	Replace the reference of 6.6 in the section to 615.06.06.
Subsection:	615.06.04 Placement of Reinforcement for Precast Endwalls.
Revision:	Replace the reference of 6.7 in the section to 615.06.07.
Subsection:	615.06.06 Laps, Welds, and Spacing for Precast 3-Sided Units.
Revision:	Replace the subsection with the following: Tension splices in the circumferential reinforcement shall be made by lapping. Laps may not be tack welded together for assembly purposes. For smooth welded wire fabric, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.5.2 and AASHTO 2012 Bridge Design Guide Section 5.11.6.3. For deformed welded wire fabric, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.5.1 and AASHTO 2012 Bridge Design Guide Section 5.11.6.2. The overlap of welded wire fabric shall be measured between the outer most longitudinal wires of each fabric sheet. For deformed billet-steel bars, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.1. For splices other than tension splices, the overlap shall be a minimum of 12" for welded wire fabric or deformed billet-steel bars. The spacing center to center of the circumferential wires in a wire fabric sheet shall be no less than 2 inches and no more than 4 inches. The spacing center to center of the longitudinal wires shall not be more than 8 inches. The spacing center to center of the longitudinal distribution steel for either line of reinforcing in the top slab shall be not more than 16 inches.
Subsection:	615.06.07 Laps, Welds, and Spacing for Precast Endwalls.
Revision:	Replace the subsection with the following: Splices in the reinforcement shall be made by lapping. Laps may not be tack welded together for assembly purposes. For smooth welded wire fabric, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.5.2 and AASHTO 2012 Bridge Design Guide Section 5.11.6.3. For deformed welded wire fabric, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.5.1 and AASHTO 2012 Bridge Design Guide Section 5.11.6.2. For deformed billet-steel bars, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.1. The spacing center-to-center of the wire fabric sheet shall not be less than 2 inches or more than 8 inches.

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Subsection:	615.08.01 Type of Test Specimen.
Revision:	Replace the subsection with the following: Start-up slump, air content, unit weight, and temperature tests will be performed each day on the first batch of concrete. Acceptable start-up results are required for production of the first unit. After the first unit has been established, random acceptance testing is performed daily for each 50 yd ³ (or fraction thereof). In addition to the slump, air content, unit weight, and temperature tests, a minimum of one set of cylinders shall be required each time plastic property testing is performed.
Subsection:	615.08.02 Compression Testing.
Revision:	Delete the second sentence.
Subsection:	615.08.04 Acceptability of Core Tests.
Revision:	Delete the entire subsection.
Subsection:	615.12 Inspection.
Revision:	Add the following sentences to the end of the subsection: Units will arrive at jobsite with the "Kentucky Oval" stamped on the unit which is an indication of acceptable inspection at the production facility. Units shall be inspected upon arrival for any evidence of damage resulting from transport to the jobsite.
Subsection:	701.04.16 Deduction for Pipe Deflection.
Revision:	Insert the following at the end of the paragraph: The section length is determined by the length of the pipe between joints where the failure occurred.
Subsection:	716.02.02 Paint.
Revision:	Replace sentence with the following: Conform to Section 821.
Subsection:	716.03 CONSTRUCTION.
Revision:	Replace bullet 5) with the following: 5) AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims,
Subsection:	716.03.02 Lighting Standard Installation.
Revision:	Replace the second sentence with the following: Regardless of the station and offset noted, locate all poles/bases behind the guardrail a minimum of four feet from the front face of the guardrail to the front face of the pole base.
Subsection:	716.03.02 Lighting Standard Installation.
Part:	A) Conventional Installation.
Revision:	Replace the third sentence with the following: Orient the transformer base so the door is positioned on the side away from on-coming traffic.
Subsection:	716.03.02 Lighting Standard Installation.
Part:	A) Conventional Installation.
Number:	1) Breakaway Installation and Requirements.
Revision:	Replace the first sentence with the following: For breakaway supports, conform to Section 12 of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims.
Subsection:	716.03.02 Lighting Standard Installation.
Part:	B) High Mast Installation
Revision:	Replace the first sentence with the following: Install each high mast pole as noted on plans.

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Subsection:	716.03.02 Lighting Standard Installation.																																																																
Part:	B) High Mast Installation																																																																
Number:	2) Concrete Base Installation																																																																
Revision:	Modification of Chart and succeeding paragraphs within this section:																																																																
	<table><tr><th colspan="8">Drilled Shaft Depth Data</th></tr><tr><th colspan="2">Level Ground</th><th colspan="2">3:1 Ground Slope</th><th colspan="2">2:1 Ground Slope</th><th colspan="2">1.5:1 Ground Slope ⁽²⁾</th></tr><tr><th>Soil</th><th>Rock</th><th>Soil</th><th>Rock</th><th>Soil</th><th>Rock</th><th>Soil</th><th>Rock</th></tr><tr><td>17 ft</td><td>7 ft</td><td>19 ft</td><td>7 ft</td><td>20 ft</td><td>7 ft</td><td>(1)</td><td>7 ft</td></tr><tr><th colspan="4">Steel Requirements</th><th colspan="4"></th></tr><tr><th colspan="2">Vertical Bars</th><th colspan="2">Ties or Spiral</th><th colspan="4"></th></tr><tr><th>Size</th><th>Total</th><th>Size</th><th>Spacing or Pitch</th><th colspan="4"></th></tr><tr><td>#10</td><td>16</td><td>#4</td><td>12 inch</td><th colspan="4"></th></tr></table> <p>(1): Shaft length is 22' for cohesive soil only. For cohesionless soil, contact geotechnical branch for design.</p> <p>(2): Do not construct high mast drilled shafts on ground slopes steeper than 1.5:1 without the approval of the Division of Traffic.</p> <p>If rock is encountered during drilling operations and confirmed by the engineer to be of sound quality, the shaft is only required to be further advanced into the rock by the length of rock socket shown in the table. The total length of the shaft need not be longer than that of soil alone. Both longitudinal rebar length and number of ties or spiral length shall be adjusted accordingly.</p> <p>If a shorter depth is desired for the drilled shaft, the contractor shall provide, for the state's review and approval, a detailed column design with individual site specific soil and rock analysis performed and approved by a Professional Engineer licensed in the Commonwealth of Kentucky</p> <p>Spiral reinforcement may be substituted for ties. If spiral reinforcement is used, one and one-half closed coils shall be provided at the ends of each spiral unit. Subsurface conditions consisting of very soft clay or very loose saturated sand could result in soil parameters weaker than those assumed. Engineer shall consult with the geotechnical branch if such conditions are encountered.</p> <p>The bottom of the drilled hole shall be firm and thoroughly cleaned so no loose or compressible materials are present at the time of the concrete placement. If the drilled hole contains standing water, the concrete shall be placed using a tremie to displace water. Continuous concrete flow will be required to insure full displacement of any water.</p> <p>The reinforcement and anchor bolts shall be adequately supported in the proper positions so no movement occurs during concrete placement. Welding of anchor bolts to the reinforcing cage is unacceptable, templates shall be used. Exposed portions of the foundation shall be formed to create a smooth finished surface. All forming shall be removed upon completion of foundation construction.</p>	Drilled Shaft Depth Data								Level Ground		3:1 Ground Slope		2:1 Ground Slope		1.5:1 Ground Slope ⁽²⁾		Soil	Rock	Soil	Rock	Soil	Rock	Soil	Rock	17 ft	7 ft	19 ft	7 ft	20 ft	7 ft	(1)	7 ft	Steel Requirements								Vertical Bars		Ties or Spiral						Size	Total	Size	Spacing or Pitch					#10	16	#4	12 inch				
Drilled Shaft Depth Data																																																																	
Level Ground		3:1 Ground Slope		2:1 Ground Slope		1.5:1 Ground Slope ⁽²⁾																																																											
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#10	16	#4	12 inch																																																														
Subsection:	716.03.03 Trenching.																																																																
Part:	A) Trenching of Conduit for Highmast Ducted Cables.																																																																
Revision:	Add the following after the first sentence: If depths greater than 24 inches are necessary, obtain the Engineer's approval and maintain the required conduit depths coming into the junction boxes. No payment for additional junction boxes for greater depths will be allowed.																																																																

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Subsection:	716.03.03 Trenching.
Part:	B) Trenching of Conduit for Non-Highmast Cables.
Revision:	Add the following after the second sentence: If depths greater than 24 inches are necessary for either situation listed previously, obtain the Engineer's approval and maintain the required conduit depths coming into the junction boxes. No payment for additional junction boxes for greater depths will be allowed.
Subsection:	716.03.10 Junction Boxes.
Revision:	Replace subsection title with the following: Electrical Junction Box.
Subsection:	716.04.07 Pole with Secondary Control Equipment.
Revision:	Replace the paragraph with the following: The Department will measure the quantity as each individual unit furnished and installed. The Department will not measure mounting the cabinet to the pole, backfilling, restoration, any necessary hardware to anchor pole, or electrical inspection fees, and will consider them incidental to this item of work. The Department will also not measure furnishing and installing electrical service conductors, specified conduits, meter base, transformer, service panel, fused cutout, fuses, lighting arrestors, photoelectrical control, circuit breaker, contactor, manual switch, ground rods, and ground wires and will consider them incidental to this item of work.
Subsection:	716.04.08 Lighting Control Equipment.
Revision:	Replace the paragraph with the following: The Department will measure the quantity as each individual unit furnished and installed. The Department will not measure constructing the concrete base, excavation, backfilling, restoration, any necessary anchors, or electrical inspection fees, and will consider them incidental to this item of work. The Department will also not measure furnishing and installing electrical service conductors, specified conduits, meter base, transformer, service panel, fused cutout, fuses, lighting arrestors, photoelectrical control, circuit breakers, contactor, manual switch, ground rods, and ground wires and will consider them incidental to this item of work.
Subsection:	716.04.09 Luminaire.
Revision:	Replace the first sentence with the following: The Department will measure the quantity as each individual unit furnished and installed.
Subsection:	716.04.10 Fused Connector Kits.
Revision:	Replace the first sentence with the following: The Department will measure the quantity as each individual unit furnished and installed.
Subsection:	716.04.13 Junction Box.
Revision:	Replace the subsection title with the following: Electrical Junction Box Type Various.
Subsection:	716.04.13 Junction Box.
Part:	A) Junction Electrical.
Revision:	Rename A) Junction Electrical to the following: A) Electrical Junction Box.
Subsection:	716.04.14 Trenching and Backfilling.
Revision:	Replace the second sentence with the following: The Department will not measure excavation, backfilling, underground utility warning tape (if required), the restoration of disturbed areas to original condition, and will consider them incidental to this item of work.

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Subsection:	716.04.18 Remove Lighting.															
Revision:	Replace the paragraph with the following: The Department will measure the quantity as a lump sum for the removal of lighting equipment. The Department will not measure the disposal of all equipment and materials off the project by the contractor. The Department also will not measure the transportation of the materials and will consider them incidental to this item of work.															
Subsection:	716.04.20 Bore and Jack Conduit.															
Revision:	Replace the paragraph with the following: The Department will measure the quantity in linear feet. This item shall include all work necessary for boring and installing conduit under an existing roadway. Construction methods shall be in accordance with Sections 706.03.02, paragraphs 1, 2, and 4.															
Subsection:	716.05 PAYMENT.															
Revision:	Replace items 04810-04811, 20391NS835 and, 20392NS835 under <u>Code</u> , <u>Pay Item</u> , and <u>Pay Unit</u> with the following: <table><tr><td><u>Code</u></td><td><u>Pay Item</u></td><td><u>Pay Unit</u></td></tr><tr><td>04810</td><td>Electrical Junction Box</td><td>Each</td></tr><tr><td>04811</td><td>Electrical Junction Box Type B</td><td>Each</td></tr><tr><td>20391NS835</td><td>Electrical Junction Box Type A</td><td>Each</td></tr><tr><td>20392NS835</td><td>Electrical Junction Box Type C</td><td>Each</td></tr></table>	<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>	04810	Electrical Junction Box	Each	04811	Electrical Junction Box Type B	Each	20391NS835	Electrical Junction Box Type A	Each	20392NS835	Electrical Junction Box Type C	Each
<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>														
04810	Electrical Junction Box	Each														
04811	Electrical Junction Box Type B	Each														
20391NS835	Electrical Junction Box Type A	Each														
20392NS835	Electrical Junction Box Type C	Each														
Subsection:	723.02.02 Paint.															
Revision:	Replace sentence with the following: Conform to Section 821.															
Subsection:	723.03 CONSTRUCTION.															
Revision:	Replace bullet 5) with the following: 5) AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims,															
Subsection:	723.03.02 Poles and Bases Installation.															
Revision:	Replace the first sentence with the following: Regardless of the station and offset noted, locate all poles/bases behind the guardrail a minimum of four feet from the front face of the guardrail to the front face of the pole base.															
Subsection:	723.03.02 Poles and Bases Installation.															
Part:	A) Steel Strain and Mastarm Poles Installation															
Revision:	Replace the second paragraph with the following: For concrete base installation, see Section 716.03.02, B), 2), Paragraphs 2-7. Drilled shaft depth shall be based on the soil conditions encountered during drilling and slope condition at the site. Refer to the design chart below:															
Subsection:	723.03.02 Poles and Bases Installation.															
Part:	B) Pedestal or Pedestal Post Installation.															
Revision:	Replace the fourth sentence of the paragraph with the following: For breakaway supports, conform to Section 12 of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims.															

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Subsection:	723.03.03 Trenching.
Part:	A) Under Roadway.
Revision:	Add the following after the second sentence: If depths greater than 24 inches are necessary, obtain the Engineer's approval and maintain either required conduit depths coming into the junction boxes. No payment for additional junction boxes for greater depths will be allowed.
Subsection:	723.03.11 Wiring Installation.
Revision:	Add the following sentence between the fifth and sixth sentences: Provide an extra two feet of loop wire and lead-in past the installed conduit in poles, pedestals, and junction boxes.
Subsection:	723.03.12 Loop Installation.
Revision:	Replace the fourth sentence of the 2nd paragraph with the following: Provide an extra two feet of loop wire and lead-in past the installed conduit in poles, pedestals, and junction boxes.
Subsection:	723.04.02 Junction Box.
Revision:	Replace subsection title with the following: Electrical Junction Box Type Various.
Subsection:	723.04.03 Trenching and Backfilling.
Revision:	Replace the second sentence with the following: The Department will not measure excavation, backfilling, underground utility warning tape (if required), the restoration of disturbed areas to original condition, and will consider them incidental to this item of work.
Subsection:	723.04.10 Signal Pedestal.
Revision:	Replace the second sentence with the following: The Department will not measure excavation, concrete, reinforcing steel, specified conduits, fittings, ground rod, ground wire, backfilling, restoring disturbed areas, or other necessary hardware and will consider them incidental to this item of work.
Subsection:	723.04.15 Loop Saw Slot and Fill.
Revision:	Replace the second sentence with the following: The Department will not measure sawing, cleaning and filling induction loop saw slot, loop sealant, backer rod, and grout and will consider them incidental to this item of work.
Subsection:	723.04.16 Pedestrian Detector.
Revision:	Replace the paragraph with the following: The Department will measure the quantity as each individual unit furnished, installed and connected to pole/pedestal. The Department will not measure installing R10-3e (with arrow) sign, furnishing and installing mounting hardware for sign and will consider them incidental to this item of work.
Subsection:	723.04.18 Signal Controller- Type 170.
Revision:	Replace the second sentence with the following: The Department will not measure constructing the concrete base or mounting the cabinet to the pole, connecting the signal and detectors, excavation, backfilling, restoration, any necessary pole mounting hardware, electric service, or electrical inspection fees and will consider them incidental to this item of work. The Department will also not measure furnishing and connecting the induction of loop amplifiers, pedestrian isolators, load switches, model 400 modem card; furnishing and installing electrical service conductors, specified conduits, anchors, meter base, fused cutout, fuses, ground rods, ground wires and will consider them incidental to this item of work.

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Subsection:	723.04.20 Install Signal Controller - Type 170.
Revision:	Replace the paragraph with the following: The Department will measure the quantity as each individual unit installed. The Department will not measure constructing the concrete base or mounting the cabinet to the pole, connecting the signal and detectors, and excavation, backfilling, restoration, any necessary pole mounting hardware, electric service, or electrical inspection fees and will consider them incidental to this item of work. The Department will also not measure connecting the induction loop amplifiers, pedestrian, isolators, load switches, model 400 modem card; furnishing and installing electrical service conductors, specified conduits, anchors, meter base, fused cutout, fuses, ground rods, ground wires and will consider them incidental to this item of work.
Subsection:	723.04.22 Remove Signal Equipment.
Revision:	Replace the paragraph with the following: The Department will measure the quantity as a lump sum removal of signal equipment. The Department will not measure the return of control equipment and signal heads to the Department of Highways as directed by the District Traffic Engineer. The Department also will not measure the transportation of materials of the disposal of all other equipment and materials off the project by the contractor and will consider them incidental to this item of work.
Subsection:	723.04.28 Install Pedestrian Detector Audible.
Revision:	Replace the second sentence with the following: The Department will not measure installing sign R10-3e (with arrow) and will consider it incidental to this item of work.
Subsection:	723.04.29 Audible Pedestrian Detector.
Revision:	Replace the second sentence with the following: The Department will not measure furnishing and installing the sign R10-3e (with arrow) and will consider it incidental to this item of work.
Subsection:	723.04.30 Bore and Jack Conduit.
Revision:	Replace the paragraph with the following: The Department will measure the quantity in linear feet. This item shall include all work necessary for boring and installing conduit under an existing roadway. Construction methods shall be in accordance with Sections 706.03.02, paragraphs 1, 2, and 4.
Subsection:	723.04.31 Install Pedestrian Detector.
Revision:	Replace the paragraph with the following: The Department will measure the quantity as each individual unit installed and connected to pole/pedestal. The Department will not measure installing sign R 10-3e (with arrow) and will consider it incidental to this item of work.
Subsection:	723.04.32 Install Mast Arm Pole.
Revision:	Replace the second sentence with the following: The Department will not measure arms, signal mounting brackets, anchor bolts, or any other necessary hardware and will consider them incidental to this item of work.
Subsection:	723.04.33 Pedestal Post.
Revision:	Replace the second sentence with the following: The Department will not measure excavation, concrete, reinforcing steel, anchor bolts, conduit, fittings, ground rod, ground wire, backfilling, restoration, or any other necessary hardware and will consider them incidental to this item of work.

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Subsection:	723.04.36 Traffic Signal Pole Base.															
Revision:	Replace the second sentence with the following: The Department will not measure excavation, reinforcing steel, anchor bolts, specified conduits, ground rods, ground wires, backfilling, or restoration and will consider them incidental to this item of work.															
Subsection:	723.04.37 Install Signal Pedestal.															
Revision:	Replace the second sentence with the following: The Department will not measure excavation, concrete, reinforcing steel, anchor bolts, specified conduits, fittings, ground rod, ground wire, backfilling, restoration, or any other necessary hardware and will consider them incidental to this item of work.															
Subsection:	723.04.38 Install Pedestal Post.															
Revision:	Replace the second sentence with the following: The Department will not measure excavation, concrete, reinforcing steel, anchor bolts, specified conduits, fittings, ground rod, ground wire, backfilling, restoration, or any other necessary hardware and will consider them incidental to this item of work.															
Subsection:	723.05 PAYMENT.															
Revision:	Replace items 04810-04811, 20391NS835 and, 20392NS835 under <u>Code</u> , <u>Pay Item</u> , and <u>Pay Unit</u> with the following: <table><tr><td><u>Code</u></td><td><u>Pay Item</u></td><td><u>Pay Unit</u></td></tr><tr><td>04810</td><td>Electrical Junction Box</td><td>Each</td></tr><tr><td>04811</td><td>Electrical Junction Box Type B</td><td>Each</td></tr><tr><td>20391NS835</td><td>Electrical Junction Box Type A</td><td>Each</td></tr><tr><td>20392NS835</td><td>Electrical Junction Box Type C</td><td>Each</td></tr></table>	<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>	04810	Electrical Junction Box	Each	04811	Electrical Junction Box Type B	Each	20391NS835	Electrical Junction Box Type A	Each	20392NS835	Electrical Junction Box Type C	Each
<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>														
04810	Electrical Junction Box	Each														
04811	Electrical Junction Box Type B	Each														
20391NS835	Electrical Junction Box Type A	Each														
20392NS835	Electrical Junction Box Type C	Each														
Subsection:	804.01.02 Crushed Sand.															
Revision:	Delete last sentence of the section.															
Subsection:	804.01.06 Slag.															
Revision:	Add subsection and following sentence. Provide blast furnace slag sand where permitted. The Department will allow steel slag sand only in asphalt surface applications.															
Subsection:	804.04 Asphalt Mixtures.															
Revision:	Replace the subsection with the following: Provide natural, crushed, conglomerate, or blast furnace slag sand, with the addition of filler as necessary, to meet gradation requirements. The Department will allow any combination of natural, crushed, conglomerate or blast furnace slag sand when the combination is achieved using cold feeds at the plant. The Engineer may allow other fine aggregates.															
Subsection:	806.03.01 General Requirements.															
Revision:	Replace the second sentence of the paragraph with the following: Additionally, the material must have a minimum solubility of 99.0 percent when tested according to AASHTO T 44 and PG 76-22 must exhibit a minimum recovery of 60 percent, with a J _{NR} (nonrecoverable creep compliance) between 0.1 and 0.5, when tested according to AASHTO TP 70.															

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Subsection:	806.03.01 General Requirements.						
Table:	PG Binder Requirements and Price Adjustment Schedule						
Revision:	Replace the Elastic Recovery, % ⁽³⁾ (AASHTO T301) and all corresponding values in the table with the following:						
	<u>Test</u>	<u>Specification</u>	<u>100% Pay</u>	<u>90% Pay</u>	<u>80% Pay</u>	<u>70% Pay</u>	<u>50% Pay</u> ⁽¹⁾
	MSCR recovery, % ⁽³⁾ (AASHTO TP 70)	60 Min.	≥58	56	55	54	<53
Subsection:	806.03.01 General Requirements.						
Table:	PG Binder Requirements and Price Adjustment Schedule						
Superscript:	(3)						
Revision:	Replace ⁽³⁾ with the following: Perform testing at 64°C.						
Subsection:	813.04 Gray Iron Castings.						
Revision:	Replace the reference to "AASHTO M105" with "ASTM A48".						
Subsection:	813.09.02 High Strength Steel Bolts, Nuts, and Washers.						
Number:	A) Bolts.						
Revision:	Delete first paragraph and "Hardness Number" Table. Replace with the following: A) Bolts. Conform to ASTM A325 (AASHTO M164) or ASTM A490 (AASHTO 253) as applicable.						
Subsection:	814.04.02 Timber Guardrail Posts.						
Revision:	Third paragraph, replace the reference to "AWPA C14" with "AWPA U1, Section B, Paragraph 4.1".						
Subsection:	814.04.02 Timber Guardrail Posts.						
Revision:	Replace the first sentence of the fourth paragraph with the following: Use any of the species of wood for round or square posts covered under AWPA U1.						
Subsection:	814.04.02 Timber Guardrail Posts.						
Revision:	Fourth paragraph, replace the reference to "AWPA C2" with "AWPA U1, Section B, Paragraph 4.1".						
Subsection:	814.04.02 Timber Guardrail Posts.						
Revision:	Delete the second sentence of the fourth paragraph.						
Subsection:	814.05.02 Composite Plastic.						
Revision:	1) Add the following to the beginning of the first paragraph: Select composite offset blocks conforming to this section and assure blocks are from a manufacturer included on the Department's List of Approved Materials. 2) Delete the last paragraph of the subsection.						
Subsection:	816.07.02 Wood Posts and Braces.						
Revision:	First paragraph, replace the reference to "AWPA C5" with "AWPA U1, Section B, Paragraph 4.1".						
Subsection:	816.07.02 Wood Posts and Braces.						
Revision:	Delete the second sentence of the first paragraph.						
Subsection:	818.07 Preservative Treatment.						
Revision:	First paragraph, replace all references to "AWPA C14" with "AWPA U1, Section A".						

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Subsection:	834.14 Lighting Poles.
Revision:	Replace the first sentence with the following: Lighting pole design shall be in accordance with loading and allowable stress requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims, with the exception of the following: The Cabinet will waive the requirement stated in the first sentence of Section 5.14.6.2 – Reinforced Holes and Cutouts for high mast poles (only). The minimum diameter at the base of the pole shall be 22 inches for high mast poles (only).
Subsection	834.14.03 High Mast Poles.
Revision:	Remove the second and fourth sentence from the first paragraph.
Subsection	834.14.03 High Mast Poles.
Revision:	Replace the third paragraph with the following: Provide calculations and drawings that are stamped by a Professional Engineer licensed in the Commonwealth of Kentucky.
Subsection:	834.14.03 High Mast Poles.
Revision:	Replace paragraph six with the following: Provide a pole section that conforms to ASTM A 595 grade A with a minimum yield strength of 55 KSI or ASTM A 572 with a minimum yield strength of 55 KSI. Use tubes that are round or 16 sided with a four inch corner radius, have a constant linear taper of .144 in/ft and contain only one longitudinal seam weld. Circumferential welded tube butt splices and laminated tubes are not permitted. Provide pole sections that are telescopically slip fit assembled in the field to facilitate inspection of interior surface welds and the protective coating. The minimum length of the telescopic slip splices shall be 1.5 times the inside diameter of the exposed end of the female section. Use longitudinal seam welds as commended in Section 5.15 of the AASHTO 2013 Specifications. The thickness of the transverse base shall not be less than 2 inches. Plates shall be integrally welded to the tubes with a telescopic welded joint or a full penetration groove weld with backup bar.The handhole cover shall be removable from the handhole frame. One the frame side opposite the hinge, provide a mechanism on the handhole cover/frame to place the Department’s standard padlock as specified in Section 834.25. The handhole frame shall have two stainless studs installed opposite the hinge to secure the handhole cover to the frame which includes providing stainless steel wing nuts and washers. The handhole cover shall be manufactured from 0.25 inch thick galvanized steel (ASTM A 153) and have a neoprene rubber gasket that is permanently secured to the handhole frame to insure weather-tight protection. The hinge shall be manufactured from 7-guage stainless steel to provide adjustability to insure weather-tight fit for the cover. The minimum clear distance between the transverse plate and the bottom opening of the handhole shall not be less than the diameter of the bottom tube of the pole but needs to be at least 15 inches. Provide products that are hot-dip galvanized to the requirements of either ASTM A123 (fabricated products) or ASTM A 153 (hardware items).
Subsection:	834.16 ANCHOR BOLTS.
Revision:	Insert the following sentence at the beginning of the paragraph: The anchor bolt design shall follow the NCHRP Report 494 Section 2.4 and NCHRP 469 Appendix A Specifications.

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Subsection:	834.17.01 Conventional.
Revision:	Add the following sentence after the second sentence: Provide a waterproof sticker mounted on the bottom of the housing that is legible from the ground and indicates the wattage of the fixture by providing the first two numbers of the wattage.
Subsection:	834.21.01 Waterproof Enclosures.
Revision:	Replace the last five sentences in the second paragraph with the following sentences: Provide a cabinet door with a louvered air vent, filter-retaining brackets and an easy to clean metal filter. Provide a cabinet door that is keyed with a factory installed standard no. 2 corbin traffic control key. Provide a light fixture with switch and bulb. Use a 120-volt fixture and utilize a L.E.D. bulb (equivalent to 60 watts minimum). Fixture shall be situated at or near the top of the cabinet and illuminate the contents of the cabinet. Provide a 120 VAC GFI duplex receptacle in the enclosure with a separate 20 amp breaker.
Subsection:	835.07 Traffic Poles.
Revision:	Replace the first sentence of the first paragraph with the following: Pole diameter and wall thickness shall be calculated in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims.
Subsection:	835.07 Traffic Poles.
Revision:	*Replace the first sentence of the fourth paragraph with the following: Ensure transverse plates have a thickness ≥ 2 inches. *Add the following sentence to the end of the fourth paragraph: The bottom pole diameter shall not be less than 16.25 inches.
Subsection:	835.07 Traffic Poles.
Revision:	Replace the third sentence of the fifth paragraph with the following: For anchor bolt design, pole forces shall be positioned in such a manner to maximize the force on any individual anchor bolt regardless of the actual anchor bolt orientation with the pole.
Subsection:	835.07 Traffic Poles.
Revision:	Replace the first and second sentence of the sixth paragraph with the following: The pole handhole shall be 25 inches by 6.5 inches. The handhole cover shall be removable from the handhole frame. On the frame side opposite the hinge, provide a mechanism on the handhole cover/frame to place the Department's standard padlock as specified in Section 834.25. The handhole frame shall have two stainless studs installed opposite the hinge to secure the handhole cover to the frame which includes providing stainless steel wing nuts and washers. The handhole cover shall be manufactured from 0.25 inch thick galvanized steel (ASTM 153) and have a neoprene rubber gasket that is permanently secured to the handhole frame to insure weather-tight protection. The hinge shall be manufactured from 7 gauge stainless steel to provide adjustability to insure a weather-tight fit for the cover. The minimum clear distance between the transverse plate and the bottom opening of the handhole shall not be less than the diameter of the bottom tube but needs to be at least 12 inches.

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Subsection:	835.07 Traffic Poles.		
Revision:	*Replace the first sentence of the last paragraph with the following: Provide calculations and drawings that are stamped by a Professional Engineer licensed in the Commonwealth of Kentucky. *Replace the third sentence of the last paragraph with the following: All tables referenced in 835.07 are found in the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims.		
Subsection:	835.07.01 Steel Strain Poles.		
Revision:	Replace the second sentence of the second paragraph with the following: The detailed analysis shall be certified by a Professional Engineer licensed in the Commonwealth of Kentucky.		
Subsection:	835.07.01 Steel Strain Poles.		
Revision:	Replace number 7. after the second paragraph with the following: 7. Fatigue calculations should be shown for all fatigue related connections. Provide the corresponding detail, stress category and example from table 11.9.3.1-1.		
Subsection:	835.07.02 Mast Arm Poles.		
Revision:	Replace the second sentence of the fourth paragraph with the following: The detailed analysis shall be certified by a Professional Engineer licensed in the Commonwealth of Kentucky.		
Subsection:	835.07.02 Mast Arm Poles.		
Revision:	Replace number 7) after the fourth paragraph with the following: 7) Fatigue calculations should be shown for all fatigue related connections. Provide the corresponding detail, stress category and example from table 11.9.3.1-1.		
Subsection:	835.07.03 Anchor Bolts.		
Revision:	Add the following to the end of the paragraph: There shall be two steel templates (one can be used for the headed part of the anchor bolt when designed in this manner) provided per pole. Templates shall be contained within a 26.5 inch diameter. All templates shall be fully galvanized (ASTM A 153).		
Subsection:	835.16.05 Optical Units.		
Revision:	Replace the 3rd paragraph with the following: The list of certified products can be found on the following website: http://www.intertek.com .		
Subsection:	835.19.01 Pedestrian Detector Body.		
Revision:	Replace the first sentence with the following: Provide a four holed pole mounted aluminum rectangular housing that is compatible with the pedestrian detector.		
Subsection:	843.01.01 Geotextile Fabric.		
Table:	TYPE I FABRIC GEOTEXTILES FOR SLOPE PROTECTION AND CHANNEL LINING		
Revision:	Add the following to the chart:		
	<u>Property</u>	<u>Minimum Value⁽¹⁾</u>	<u>Test Method</u>
	CBR Puncture (lbs)	494	ASTM D6241
	Permittivity (1/s)	0.7	ASTM D4491

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Subsection:	843.01.01 Geotextile Fabric.		
Table:	TYPE II FABRIC GEOTEXTILES FOR UNDERDRAINS		
Revision:	Add the following to the chart:		
	<u>Property</u>	<u>Minimum Value⁽¹⁾</u>	<u>Test Method</u>
	CBR Puncture (lbs)	210	ASTM D6241
	Permittivity (1/s)	0.5	ASTM D4491
Subsection:	843.01.01 Geotextile Fabric.		
Table:	TYPE III FABRIC GEOTEXTILES FOR SUBGRADE OR EMBANKMENT STABILIZATION		
Revision:	Add the following to the chart:		
	<u>Property</u>	<u>Minimum Value⁽¹⁾</u>	<u>Test Method</u>
	CBR Puncture (lbs)	370	ASTM D6241
	Permittivity (1/s)	0.05	ASTM D4491
Subsection:	843.01.01 Geotextile Fabric.		
Table:	TYPE IV FABRIC GEOTEXTILES FOR EMBANKMENT DRAINAGE BLANKETS AND PAVEMENT EDGE DRAINS		
Revision:	Add the following to the chart:		
	<u>Property</u>	<u>Minimum Value⁽¹⁾</u>	<u>Test Method</u>
	CBR Puncture (lbs)	309	ASTM D6241
	Permittivity (1/s)	0.5	ASTM D4491
Subsection:	843.01.01 Geotextile Fabric.		
Table:	TYPE V HIGH STRENGTH GEOTEXTILE FABRIC		
Revision:	Make the following changes to the chart:		
	<u>Property</u>	<u>Minimum Value⁽¹⁾</u>	<u>Test Method</u>
	CBR Puncture (lbs)	618	ASTM D6241
	Apparent Opening Size	U.S. #40 ⁽³⁾	ASTM D4751
	⁽³⁾ Maximum average roll value.		

SPECIAL NOTE FOR PORTABLE CHANGEABLE MESSAGE SIGNS

This Special Note will apply when indicated on the plans or in the proposal.

1.0 DESCRIPTION. Furnish, install, operate, and maintain variable message signs at the locations shown on the plans or designated by the Engineer. Remove and retain possession of variable message signs when they are no longer needed on the project.

2.0 MATERIALS.

2.1 General. Use LED Variable Message Signs Class I, II, or III, as appropriate, from the Department's List of Approved Materials.

Unclassified signs may be submitted for approval by the Engineer. The Engineer may require a daytime and nighttime demonstration. The Engineer will make a final decision within 30 days after all required information is received.

2.2 Sign and Controls. All signs must:

- 1) Provide 3-line messages with each line being 8 characters long and at least 18 inches tall. Each character comprises 35 pixels.
- 2) Provide at least 40 preprogrammed messages available for use at any time. Provide for quick and easy change of the displayed message; editing of the message; and additions of new messages.
- 3) Provide a controller consisting of:
 - a) Keyboard or keypad.
 - b) Readout that mimics the actual sign display. (When LCD or LCD type readout is used, include backlighting and heating or otherwise arrange for viewing in cold temperatures.)
 - c) Non-volatile memory or suitable memory with battery backup for storing pre-programmed messages.
 - d) Logic circuitry to control the sequence of messages and flash rate.
- 4) Provide a serial interface that is capable of supporting complete remote control ability through land line and cellular telephone operation. Include communication software capable of immediately updating the message, providing complete sign status, and allowing message library queries and updates.
- 5) Allow a single person easily to raise the sign to a satisfactory height above the pavement during use, and lower the sign during travel.
- 6) Be Highway Orange on all exterior surfaces of the trailer, supports, and controller cabinet.
- 7) Provide operation in ambient temperatures from -30 to + 120 degrees Fahrenheit during snow, rain and other inclement weather.
- 8) Provide the driver board as part of a module. All modules are interchangeable, and have plug and socket arrangements for disconnection and reconnection. Printed circuit boards associated with driver boards have a conformable coating to protect against moisture.
- 9) Provide a sign case sealed against rain, snow, dust, insects, etc. The lens is UV stabilized clear plastic (polycarbonate, acrylic, or other approved material) angled to prevent glare.
- 10) Provide a flat black UV protected coating on the sign hardware, character PCB, and appropriate lens areas.
- 11) Provide a photocell control to provide automatic dimming.

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- 12) Allow an on-off flashing sequence at an adjustable rate.
- 13) Provide a sight to aim the message.
- 14) Provide a LED display color of approximately 590 nm amber.
- 15) Provide a controller that is password protected.
- 16) Provide a security device that prevents unauthorized individuals from accessing the controller.
- 17) Provide the following 3-line messages preprogrammed and available for use when the sign unit begins operation:

/KEEP/RIGHT/⇒⇒⇒/	/MIN/SPEED/**MPH/
/KEEP/LEFT/⇐⇐⇐/	/ICY/BRIDGE/AHEAD/ /ONE
/LOOSE/GRAVEL/AHEAD/	LANE/BRIDGE/AHEAD/
/RD WORK/NEXT/**MILES/	/ROUGH/ROAD/AHEAD/
/TWO WAY/TRAFFIC/AHEAD/	/MERGING/TRAFFIC/AHEAD/
/PAINT/CREW/AHEAD/	/NEXT/***/MILES/
/REDUCE/SPEED/**MPH/	/HEAVY/TRAFFIC/AHEAD/
/BRIDGE/WORK/***() FT/	/SPEED/LIMIT/**MPH/
/MAX/SPEED/**MPH/	/BUMP/AHEAD/
/SURVEY/PARTY/AHEAD/	/TWO/WAY/TRAFFIC/

*Insert numerals as directed by the Engineer.

Add other messages during the project when required by the Engineer.

2.3 Power.

- 1) Design solar panels to yield 10 percent or greater additional charge than sign consumption. Provide direct wiring for operation of the sign or arrow board from an external power source to provide energy backup for 21 days without sunlight and an on-board system charger with the ability to recharge completely discharged batteries in 24 hours.

3.0 CONSTRUCTION. Furnish and operate the variable message signs as designated on the plans or by the Engineer. Ensure the bottom of the message panel is a minimum of 7 feet above the roadway in urban areas and 5 feet above in rural areas when operating. Use Class I, II, or III signs on roads with a speed limit less than 55 mph. Use Class I or II signs on roads with speed limits 55 mph or greater.

Maintain the sign in proper working order, including repair of any damage done by others, until completion of the project. When the sign becomes inoperative, immediately repair or replace the sign. Repetitive problems with the same unit will be cause for rejection and replacement.

Use only project related messages and messages directed by the Engineer, unnecessary messages lessen the impact of the sign. Ensure the message is displayed in either one or 2 phases with each phase having no more than 3 lines of text. When no message is needed, but it is necessary to know if the sign is operable, flash only a pixel.

When the sign is not needed, move it outside the clear zone or where the Engineer directs. Variable Message Signs are the property of the Contractor and shall be removed from the project when no longer needed. The Department will not assume ownership of these signs.

4.0 MEASUREMENT. The final quantity of Variable Message Sign will be

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the actual number of individual signs acceptably furnished and operated during the project. The Department will not measure signs replaced due to damage or rejection.

5.0 PAYMENT. The Department will pay for the Variable Message Signs at the unit price each. The Department will not pay for signs replaced due to damage or rejection. Payment is full compensation for furnishing all materials, labor, equipment, and service necessary to, operate, move, repair, and maintain or replace the variable message signs. The Department will make payment for the completed and accepted quantities under the following:

<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
02671	Portable Changeable Message Sign	Each

Effective June 15, 2012

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SPECIAL NOTE FOR DRILLED SHAFTS

1.0 DESCRIPTION. Furnish all equipment, materials and labor necessary for constructing reinforced concrete drilled shafts in cylindrically excavated holes according to the details shown on the plans or as the Engineer directs. Construct the shaft to the lines and dimensions shown on the plans, or as the Engineer directs. Section references herein are to the Department's 2012 Standard Specifications for Road and Bridge Construction.

2.0 MATERIALS.

2.1 Concrete. Use Class A Modified concrete unless otherwise shown on the plans. The slump at the time of placement shall be 6.5 to 9.5 inches, the coarse aggregate shall be size 67, 68, 78, 8 or 9M, and the water/cementitious material ratio shall not exceed 0.45. Include water reducing and retarding admixtures. Type F high range water reducers used in combination with retarding admixtures or Type G high range water reducers fully meeting trial batch requirements are permitted and Class F fly ash is permitted in conformance with Section 601. Design the mix such that the concrete slump exceeds 4 inches at 4 hours after batching. If the estimated concrete transport, plus time to complete placement, exceeds 4 hours, design the concrete to have a slump that exceeds 4 inches or more for the greater time after batching and demonstrate that the slump requirement can be achieved after the extended time period using a trial batch.

Perform trial batches prior to beginning drilled shaft construction in order to demonstrate the adequacy of the proposed concrete mix. Demonstrate that the mix to be used will meet the requirements for temperature, slump, air content, water/cementitious material ratio, and compressive strength. Use the ingredients, proportions and equipment (including batching, mixing, and delivery) to be used on the project. Make at least 2 independent consecutive trial batches of 3 cubic yards each using the same mix proportions and meeting all specification requirements for mix design approval. Submit a report containing these results for slump, air content, water/cement ratio, temperature, and compressive strength and mix proportions for each trial batch to the Engineer for review and approval. Failure to demonstrate the adequacy of the concrete mix, methods, or equipment to the Engineer is cause for the Engineer to require appropriate alterations in concrete mix, equipment, and/or method by the Contractor to eliminate unsatisfactory results. Perform additional trial batches required to demonstrate the adequacy of the concrete mix, method, or equipment.

2.2 Steel Reinforcement. Provide Grade 60 deformed bars conforming to Section 811 of the Standard Specifications. Rail steel is permitted for straight bars only. Place according to Section 602 of the Standard Specifications, this Special Note, and the plans. Use non-corrosive centering devices and feet to maintain the specified reinforcement clearances.

2.3 Casings. Provide casing meeting the requirements of ASTM A 252 Grade 2 or better unless otherwise specified. Ensure casing is smooth, clean, watertight, true and straight, and of ample strength to withstand handling, installation, and extraction stresses and the pressure of both concrete and the surrounding earth materials. Ensure the outside diameter of casing is not less than the specified diameter of shaft.

Use only continuous casings. Cut off the casing at the prescribed elevation and trim to within tolerances prior to acceptance. Extend casing into bedrock a sufficient distance to stabilize the shaft excavation against collapse, excessive deformation, and/or flow of water if required and/or shown on the plans.

Install from the work platform continuous casing meeting the design thickness requirements, but not less than 3/8 inch, to the elevations shown on the plans. When drilled

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shafts are located in open water areas, extend casings above the water elevation to the plan tip elevation to protect the shaft concrete from water action during concrete placement and curing. All casing is permanent unless temporary casing is specified in the contract drawings or documents. Permanent casing is incidental to the applicable drilled shaft unit bid price unless noted otherwise in the contract. Temporary casing may be required for drilled shafts not socketed into bedrock. If temporary surface casings are used, extend each casing up to the work platform. Remove all temporary surface casing prior to final acceptance unless otherwise permitted by the Central Office Construction Engineer.

Ensure casing splices have full penetration butt welds conforming to the current edition of AWS D1.1 with no exterior or interior splice plates and produce true and straight casing.

2.4 Slurry. When slurry is to be used for installation of the Drilled Shaft, submit a detailed plan for its use and disposal. The plan should include, but not be limited to the following:

- 1) Material properties
- 2) Mixing requirements and procedures
- 3) Testing requirements
- 4) Placement procedures
- 5) Disposal techniques

Obtain the Central Office Division of Construction's approval for the slurry use and disposal plan before installing drilled shafts.

2.5 Tremies. Provide tremies of sufficient length, weight, and diameter to discharge concrete at the shaft base elevation. Ensure the tremie diameter is least 6 times the maximum size coarse aggregate to be used in the concrete mix and no less than 10 inches. Provide adequate wall thickness to prevent crimping or sharp bends that restrict concrete placement. Support tremies used for depositing concrete in a dry drilled shaft excavation so that the free fall of the concrete does not cause the shaft excavation to cave or slough. Maintain a clean and smooth tremie surface to permit both flow of concrete and unimpeded withdrawal during concrete placement. Do not allow any aluminum parts to contact the concrete. Construct tremies used to deposit concrete for wet excavations so that they are watertight and will readily discharge concrete.

2.6 Concrete Pumps. Provide pump lines with a minimum diameter of 5 inches and watertight joints.

2.7 Drop Chutes. Do not use aluminum drop chutes.

3.0 CONSTRUCTION.

3.1 Preconstruction.

3.1.1 Prequalification. The Department will require prequalification by the Division of Construction Procurement before accepting a bid for the construction of Drilled Shafts.

3.1.2 Pre-Bid Inspection. Inspect both the project site and all subsurface information, including any soil or rock samples, prior to submitting a bid. Contact the Geotechnical Branch (502-564-2374) to schedule a viewing of the subsurface information. Failure to inspect the project site and view the

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subsurface information will result in the forfeiture of the right to file a claim based on site conditions and may result in disqualification from the project.

3.1.3 Drilled Shaft Installation Plan. Upon request, the Department will review a Drilled Shaft Installation Plan. Submit the plan no later than 45 calendar days prior to constructing drilled shafts. Items covered in this plan should include, but not be limited to the following:

- 1) Name and experience record of jobsite drilled shaft superintendent and foremen in charge of drilled shaft operations for each shift.
- 2) List and size of proposed equipment including cranes, drills, augers, bailing buckets, final cleaning equipment, de-sanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casings, etc.
- 3) Details of overall construction operation sequence and the sequence of shaft construction in the bents or groups.
- 4) Details of shaft excavation methods including methods to over-ream or roughen shaft walls, if necessary.
- 5) Details of slurry when the use of slurry is anticipated. Include methods to mix, circulate, and de-sand the proposed slurry. Provide details of proposed testing, test methods, sampling methods, and test equipment.
- 6) Details of proposed methods to clean shaft and inside of casing after initial excavation.
- 7) Details of reinforcement handling, lifting, and placement including support and method to center in shaft. Also include rebar cage support during concrete placement and temporary casing removal.
- 8) Details of concrete placement including procedures for concrete tremie or pump. Include initial placement, raising during placement, and overfilling of the shaft to expel contaminated concrete.
- 9) Required submittals including shop drawings and concrete design mixes.
- 10) Other information shown in the plans or requested by the Engineer.
- 11) Special considerations for wet construction.
- 12) Details of environmental control procedures to protect the environment from discharge of excavation spoil, slurry (natural and mineral), and concrete over-pour.

The Division of Construction will review the submitted procedure and provide comments and recommendations. The Contractor is responsible for satisfactory construction and ultimate performance of the Drilled Shaft.

3.2 General Construction. Construct drilled shafts as indicated in the plans or described in this Special Note by either the dry or wet method. When the plans describe a particular method of construction, use this method unless the Engineer permits otherwise. When the plans do not describe a particular method, propose a method on the basis of its suitability to the site conditions. Approval of this proposed method is contingent upon the satisfactory results of the technique shaft.

The construction of the first drilled shaft or technique shaft will be used to determine if the methods and equipment used by the contractor are sufficient to produce a completed shaft meeting the requirements of the plans and specifications. Ability to control dimensions and alignment of excavations within tolerances; to seal the casing into impervious materials; to prevent caving or deterioration of subsurface materials by the use of slurry or other means; to

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properly clean the completed shaft excavation; to construct excavations in open water areas when required by the plans; to establish methods for bellling or over-reaming when required by the plans; to determine the elevation of ground water; to satisfactorily handle, lift, place, and support the reinforcement cage; to satisfactorily place concrete meeting the specifications within the prescribed time frame; and to satisfactorily execute any other necessary construction operations will be evaluated during construction of the first shaft(s). Revise the methods and equipment as necessary at any time during the construction of the first shaft when unable to satisfactorily carry out any of the necessary operations described above or unable to control the dimensions and alignment of the shaft excavation within tolerances. Accurately locate technique so they may be used in the finished structure unless directed otherwise in the contract document or by the Engineer.

If at any time the Contractor fails to satisfactorily demonstrate, to the satisfaction of the Engineer, the adequacy of methods or equipment and alterations are required, additional technique shafts will be required at no additional cost to the Department and with no extension of contract time. Additional technique shafts shall be located as near as possible to the proposed production shafts but in a location as not to interfere with other construction activities. Once approval has been given to construct production shafts, no changes will be permitted in the methods or equipment used to construct the satisfactory shaft without written approval of the Engineer.

Do not make a claim against the Department for costs of construction delays, or any materials, labor, or equipment that may be necessary due to the Contractor's failure to furnish drilled shafts of a length sufficient to obtain the required bearing values, or for variations in length due to subsurface conditions that may be encountered. Soundings, boring logs, soil profiles, or other subsurface data included in the Contract documents are used by the Department for design and making preliminary estimates of quantities and should be used only at the risk of the Contractor for determining equipment, materials, or labor necessary for drilling shafts as required by the contract.

When necessary, set temporary removable surface casing. Use surface casing of sufficient length to prevent caving of the surface soils and to aid in maintaining shaft position and alignment. Pre-drilling with slurry and/or over-reaming to the outside diameter of the casing may be required to install the surface casing at some sites.

Provide equipment capable of constructing shafts to the deepest shaft depth shown in the plans plus 15 feet, 20 percent greater than the longest shaft (measured from the ground or water surface to the tip of the shaft), or 3 times the shaft diameter, whichever is greater. Blasting excavation methods are not permitted.

Use permanent casing unless otherwise noted in the Contract. Place casing as shown on the plans before beginning excavation. If full penetration cannot be attained, the Engineer may direct that excavation through the casing be accomplished and the casing advanced until reaching the plan tip elevation. In some cases, over-reaming to the outside diameter of the casing may be required before placing the casing. Cut off the casing at the prescribed elevation and leave the remainder of the casing in place. Do not use vibratory hammers for casing installation within 50 feet of shafts that have been completed less than 24 hours.

3.2.1 Dry Construction Method. Use the dry construction method only at sites where the ground water table and soil conditions (generally stiff to hard clays or rock above the water table) make it feasible to construct the shaft in a relatively dry excavation and where the sides and bottom of the shaft are stable and may be visually inspected by the Engineer prior to placing the concrete. The dry construction method consists of drilling the shaft excavation, removing accumulated seepage water and loose material from the excavation, and placing the shaft concrete in a relatively dry excavation.

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3.2.2 Wet Construction Method. Use the wet construction method at all sites where it is impractical to excavate by the dry method. The wet construction method consists of drilling the shaft excavation below the water table, keeping the shaft filled with water (including natural slurry formed during the drilling process) or slurry as defined in part 2.4 of this Special Note, desanding and cleaning the slurry as required, final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump or other approved devices and placing the shaft concrete (with a tremie or concrete pump beginning at the shaft bottom) which displaces the water or slurry as concrete is placed.

Where drilled shafts are located in open water areas, construct the shafts by the wet method using casings extending from above water elevation to the plan casing tip elevation to protect the shaft concrete from water action during placement and curing. Install the casing in a manner that will produce a positive seal at the bottom of the casing.

3.3 Slurry. When the Contractor elects to use slurry, adjust construction operations so that the slurry is in contact with the bottom 5 feet of the shaft for less than 4 hours unless the Engineer approves otherwise. If the 4-hour limit is exceeded, over-ream the bottom 5 feet of shaft.

3.4 Cleaning. Over-reaming, cleaning, or wire brushing the sidewalls of the shaft excavation and permanent casings may be necessary to remove the depth of softening or to remove excessive slurry cake buildup as indicated by sidewall samples or other test methods employed by the Engineer. Over-ream around the perimeter of the excavation a minimum depth of 1/2 inch and maximum depth of 3 inches.

3.5 Subsurface Exploration. Take subsurface exploration borings when shown on the plans or as the Engineer directs to determine the character of the material that the shaft extends through and the material directly below the shaft excavation. Complete subsurface exploration borings prior to beginning excavation for any drilled shaft in a group. Unless directed otherwise, extend subsurface exploration borings a minimum depth of 3 shaft diameters but not less than 10 feet below the bottom of the anticipated tip of drilled shaft excavation as shown on the plans. For subsurface exploration borings where soil sampling is required use thin-wall tube samples and perform standard penetration tests according to the Department's current Geotechnical Manual. When shafts extend into bedrock, soil samples are not required unless otherwise specified. Perform rock core drilling according to the Department's Geotechnical Manual. When the Engineer directs, perform additional subsurface exploration borings prior to drilled shaft construction. Measure soil samples and/or rock cores and visually identify and describe them on the subsurface log according to the Department's current Geotechnical Manual. Subsurface exploration borings must be performed by contractors/consultants prequalified by the Department's Division of Professional Services for Geotechnical Drilling Services at the time that field work begins.

The Engineer or geotechnical branch representative may be on-site during the subsurface exploration process to evaluate the soil and/or rock core samples. The Engineer or geotechnical branch representative will determine the need to extend the borings to depths greater than the depths previously specified. Handle, label, identify, and store soil and/or rock samples according to the Department's current Geotechnical Manual and deliver them with the subsurface logs to the geotechnical branch's rock core lab in Frankfort within 24-hours of completing the borings, unless directed otherwise.

The Engineer will inspect the soil samples and/or cores and determine the final depth of required excavation (final drilled shaft tip elevation) based on evaluation of the material's suitability. The Engineer will establish the final tip elevations for shaft locations, other than

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those for which subsurface exploration borings have been performed, based on the results of the subsurface exploration. Within 15 calendar days after completion of the subsurface exploration borings, the Engineer will notify the contractor of the final tip elevations for shaft locations.

3.6 Excavations. The plans indicate the expected depths, the top of shaft elevations, and the estimated bottom of shaft elevations between which the drilled shaft are to be constructed. Drilled shafts may be extended deeper when the Engineer determines that the material encountered while drilling the shaft excavation is unsuitable and/or is not the same as anticipated in the design of the drilled shaft. Drilled shafts may be shortened when the Engineer determines the material encountered is better than that anticipated.

Begin drilled shaft excavation the excavation, excavation inspection, reinforcement placement, and concrete placement can be completed as one continuous operation. Do not construct new shafts within 24 hours adjacent to recently completed shafts if the center-to-center spacing is less than 3 shaft diameters.

Dispose of excavated material removed from the shaft according to the Standard Specifications or the contract documents.

Do not allow workmen to enter the shaft excavation for any reason unless both a suitable casing has been installed and adequate safety equipment and procedures have been provided to the workmen entering the excavation. Recommended Procedures for the Entry of Drilled Shaft Foundation Excavations, prepared by ADSC: The International Association of Foundation Drilling provides guideline recommendations for down-hole entry of drilled excavations.

3.7 Obstructions. Remove subsurface obstructions at drilled shaft locations. Such obstructions may include man-made materials such as old concrete foundations or natural materials such as boulders. Blasting is not permitted.

3.8 Inspections of Excavations. Provide equipment for checking the dimensions and alignment of each shaft excavation. Determine the dimensions and alignment of the shaft excavation under the observation and direction of the Engineer. Provide equipment necessary to verify shaft cleanliness for the method of inspection selected by the Engineer.

Measure final shaft depths with a weighted tape or other approved methods after final cleaning. Ensure the base of each shaft has less than ½ inch of sediment at the time of concrete placement. For dry excavations, do not allow the depth of water to exceed 3 inches for tremie or pump methods of concrete placement. Verify shaft cleanliness to the Engineer using direct visual inspection or other method the Engineers determines acceptable. Video camera or underwater inspection procedures may be used if specified in the plans. Inspect the side surfaces of rock sockets to ensure they are rough and of such condition to ensure bond between the shaft concrete and the rock. Calipers, bent rods, or other devices may be used to inspect the diameter and roughness of rock sockets. When the Engineer directs, mechanically roughen surfaces found to be smooth.

3.9 Reinforcing Steel Cage Fabrication and Placement. Assemble the reinforcing steel cage, consisting of longitudinal bars, ties, spirals, cage stiffener bars, spacers, centering devices, and other necessary appurtenances and place as a prefabricated unit immediately after the shaft excavation is inspected and accepted, and just prior to concrete placement.

Tie the reinforcing steel with 100 percent double-wire ties and provide support so that it will remain within allowable tolerances for position. Locate splices as shown on the plans. Splice no more than 50 percent of the longitudinal reinforcing within 2-lap splice lengths of any location or within 3 feet of the splice location if approved mechanical connectors are used. All splices are to be in accordance with plan details. Use bands, temporary cross ties,

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etc. as required to provide a reinforcement cage of sufficient rigidity to prevent racking, permanent deformations, etc. during installation.

Use concrete centering devices or other approved non-corrosive centering devices at sufficient intervals along the length of the reinforcement cage to ensure concentric spacing for the entire cage length. As a minimum, provide a set of non-corrosive centering devices at intervals not exceeding 5 feet throughout the length of the shaft. When the size of the longitudinal reinforcement exceeds one inch in diameter the minimum spacing may be increased to 10 feet. As a minimum, provide a set of centering devices within 2 feet of the top and 2 feet of the bottom of the shaft. In addition provide one set of centering devices 2 feet above and 2 feet below each change in shaft diameter. Provide feet (bottom supports) at the bottom of the shaft on vertical bars. As a minimum, provide non-corrosive centering devices at 60 degree intervals around the circumference of the shaft to maintain the required reinforcement clearances. Ensure the centering devices maintain the specified annular clearance between the outside of the reinforcing cage and the side of the excavated hole or casing.

Concrete centering devices and feet will be constructed of concrete equal in quality and durability to the concrete specified for the shaft. Use epoxy coated centering devices fabricated from reinforcing steel. Use feet (bottom supports) of adequate size and number to assure the rebar cage is the proper distance above the bottom as determined by part 3.11 3) of this Special Note. The feet are not intended to support the weight of the cage. In the event that the shaft has been excavated below the anticipated tip elevation, extend the reinforcing cage at the tip (low) end by lap splices, mechanical connectors, or welded splices conforming to the Standard Specifications. In this instance, splices need not be staggered and 100 percent of the reinforcing bars may be spliced at a given location. The bottom 12 inches of the shaft may not be reinforced when below plan tip elevation.

During concrete placement, support the reinforcing cage at or near the top of shaft such that the concrete feet are positioned approximately one inch above the bottom of shaft excavation. Not sooner than 24 hours after the completion of concrete placement, remove temporary supports. Provide the needed equipment, including extra cranes if necessary, to provide this cage support.

Prior to placing the reinforcement cage, demonstrate to the satisfaction of the Engineer that the fabrication and handling methods to be used will result in a reinforcing cage placed in the proper position, with the proper clearances, and without permanent bending, squashing, or racking of the reinforcement cage. During this demonstration bring the cage to an upright position, lower into a shaft excavation, and support as if for concrete placement.

Check the elevation of the top of the reinforcing cage before and after the concrete is placed. If the reinforcing cage is not maintained within the specified tolerances, correct to the satisfaction of the Engineer. Do not construct additional shafts until the contractor has modified his reinforcing cage support to obtain the required tolerances.

3.10 Concrete Placement. Place concrete according to the applicable portions of the Standard Specifications and with the requirements set forth herein. Do not apply the provisions of the Special Note 6U for Structural Mass Concrete.

Place concrete as soon as practical after reinforcing steel placement but no later than 4 hours after completion of the shaft excavation. Place concrete continuously from the bottom to above the top elevation of the shaft. For shafts that extend above ground or water surface, place concrete continuously after the shaft is full until good quality concrete is evident at the top of the shaft. Form any portion of the shaft above ground with a removable form or other approved method to the dimensions shown on the plans.

For shafts constructed in the wet with the top of the shaft below the water surface and below top of casing, place concrete to approximately one shaft diameter but no less than 2 feet above the top of shaft elevation. Remove contaminated concrete and deleterious material, as

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determined by the Engineer, accumulated above the top of shaft elevation immediately after completing concrete placement. Deleterious material and contaminated concrete may be airlifted under a head of water or slurry provided that the head is maintained at or near the exterior water surface elevation. Carefully remove any concrete remaining above plan top of shaft after curing and excess casing removal.

Place concrete either by free fall, through a tremie, or concrete pump. Use the free fall placement method in dry holes only. The maximum height of free fall placement is 20 feet. Do not allow concrete placed by free fall to contact either the reinforcing cage or hole sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

Place concrete in the shaft in one continuous operation. Maintain a minimum slump of 4 inches or more throughout the placement for 4 hours after batching. Adjust approved admixtures in the concrete mix for the conditions encountered on the job so that the concrete remains in a workable plastic state throughout the placement. Perform slump loss tests to demonstrate that the concrete will maintain a 4-inch or greater slump for a period of time equal to the estimated transport plus the 2-hour placement time, but not less than 4 hours.

When the Engineer determines the concrete placement methods and/or equipment during construction of any technique and/or production shafts to be inadequate, make appropriate alterations to eliminate unsatisfactory results.

Drilled shafts not meeting the concrete placement requirements of this Special Note or contract plans are unacceptable. Correct all unacceptable completed shafts to the satisfaction of the Engineer.

3.10.1 Tremie Placement. Tremies may be used for concrete placement in either wet or dry holes. Extend the tremie to the shaft base elevation before starting underwater placement. Valves, bottom plates, or plugs may be used only if concrete discharge can begin approximately 2 inches above the excavation bottom. Remove plugs from the excavation unless otherwise approved by the Engineer. Maintain tremie discharge at or near the bottom of excavation as long as practical during concrete placement. Immerse tremie discharge end as deep as practical in the concrete but not less than 10 feet.

If at any time during the concrete pour the tremie line orifice is removed from the fluid concrete column and discharges concrete above the rising concrete surface, the entire drilled shaft is considered defective. In such case, remove the reinforcing cage and concrete, complete any necessary sidewall cleaning or over-reaming as directed by the Engineer, and repour the shaft.

3.10.2 Pumped Concrete. Concrete pumps and lines may be used for concrete placement in either wet or dry excavations. Do not begin concrete placement until the pump line discharge orifice is at the shaft base elevation.

For wet excavations, use a plug or similar device to separate the concrete from the fluid in the hole until pumping begins. Remove the plug unless otherwise approved by the engineer.

Ensure the discharge orifice remains at least 10 feet below the surface of the fluid concrete. When lifting the pump line during concrete placement, reduce the line pressure until the orifice has been repositioned at a higher level in the excavation.

If at any time during the concrete pour the pump line orifice is removed from the fluid concrete column and discharges concrete above the rising concrete level, the Department will consider the shaft defective. In such case, remove the reinforcing cage and concrete, complete any necessary sidewall cleaning or over-reaming as the Engineer directs, and repour the shaft.

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3.10.3 Drop Chutes. Drop chutes may be used to direct placement of free fall concrete in excavations where the maximum depth of water does not exceed one inch. Do not use the free fall method of placement in wet excavations. Concrete may be placed through either a hopper at the top of the tube or side openings as the drop chute is retrieved during concrete placement. Reduce the height of free fall and/or reduce the rate of concrete flow into the excavation if the concrete placement causes the shaft excavation to cave or slough, or if the concrete strikes the reinforcing cage or sidewall. When the Engineer determines free fall placement cannot be accomplished satisfactorily, use either tremie or pumping to accomplish the pour.

3.11 Construction Tolerances. The following construction tolerances apply to drilled shafts unless otherwise stated in the contract document:

- 1) Construct drilled shaft within 3 inches of plan position in the horizontal plane at the top of the shaft.
- 2) Do not vary the vertical alignment of a shaft excavation from the plan alignment by more than 1/4 inch per foot of depth or 6 inches total.
- 3) Maintain the top of the reinforcing steel cage no more than 6 inches above and no more than 3 inches below plan position.
- 4) All casing diameters shown on the plans refer to O.D. (outside diameter) dimensions. The casing dimensions are subject to American Pipe Institute tolerances applicable to regular steel pipe. A casing larger in diameter than shown in the plans may be used, at no additional cost, with prior approval by the Department.
- 5) Maintain the top of shaft concrete within ± 3 inches from the plan top of shaft elevation, measured after excess shaft concrete has been removed.
- 6) Design excavation equipment and methods so that the completed shaft excavation will have a planar bottom. Maintain the cutting edges of excavation equipment normal to the vertical axis of the equipment within a tolerance of $\pm 3/8$ inch per foot of diameter. The tip elevation of the shaft has a tolerance of ± 6 inches from final shaft tip elevation unless otherwise specified in the plans.

Drilled shaft excavations and completed shafts not constructed within the required tolerances are unacceptable. Correct all unacceptable shaft excavations and completed shafts to the satisfaction of the Engineer. When a shaft excavation is completed with unacceptable tolerances, present corrective measures designed by a registered Professional Engineer for approval.

4.0 MEASUREMENT.

4.1 Drilled Shafts. The Department will not measure for payment any trial batches required to demonstrate the adequacy of the concrete mix, method, or equipment; concrete required to fill an oversized casing or oversized excavation; obstruction removal; over-reaming or sidewall cleaning; inspection work or inspection equipment; materials or work necessary, including engineering analyses and redesign, to alter unacceptable work methods or to complete corrections for unacceptable work; and will consider them incidental to the Drilled Shaft. Unless noted otherwise in the contract documents, casing is incidental to the drilled shaft.

4.1.1 Drilled Shaft, Common. The Department will measure the length, in linear feet, of drilled shaft above the top of rock elevation shown on the plans. The

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Department will consider this quantity Drilled Shaft, Common regardless of the character of material actually encountered.

4.1.2 Drilled Shafts, Solid Rock. The Department will measure the length, in linear feet, of drilled shaft below the top of rock elevation shown on plans. The Department will consider this quantity Drilled Shafts, Solid Rock regardless of the character of material actually encountered during excavation.

4.2 Technique Shaft. The Department will pay for technique shaft at the contract unit price per each as detailed on the plans or as directed by the Engineer. This will constitute full compensation for all costs incurred during installation as described herein for ‘Drilled Shaft’ or in the contract documents. No additional compensation beyond the number of technique shafts allowed for in the plans will be permitted for additional technique shafts required because of failure to demonstrate adequacy of methods.

4.3 Rock Coring and Rock Sounding. The Department will measure Rock Sounding and Rock Coring shown on the plans, as specified in part 3.5 of this Special Note, and as the Engineer directs, in linear feet to the nearest 0.1-foot. If soil samples are specified in the contract documents they will be incidental to the unit price bid for Rock Sounding. The Department will not measure or pay for subsurface exploration performed deeper than the elevations indicated on the plans and/or in this Special Note, unless directed by the Engineer, and will consider it incidental to these items of work. Additionally, the Department will consider all mobilization, equipment, labor, incidental items, and operations necessary to complete the boring operations incidental to these items of work.

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

<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
----	Drilled Shaft, Diameter*, Common	Linear Foot
----	Drilled Shaft, Diameter*, Solid Rock	Linear Foot
----	Technique Shaft	Each
20745ED	Rock Sounding	Linear Foot
20746ED	Rock Coring	Linear Foot

** See Plan Sheets for sizes of shafts.*

The Department will consider payment as full compensation for all work required in this note.

June 15, 2012

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**SPECIAL NOTE FOR BORING AND JACKING STEEL PIPE
WITHOUT CARRIER PIPE**

This Special Note will apply where indicated on the plans or in the proposal. Section references herein are to the Department’s 2012 Standard Specifications for Road and Bridge Construction.

1.0 DESCRIPTION. Bore and jack steel pipe. Use this note when no carrier pipe will be encased.

2.0 MATERIALS.

2.1 Pipe. Provide plain end steel pipe with a specific minimum yield strength, SMYS, of at least 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 well process as specified in API –5L. Certification of 35,000 psi SMYS shall be furnished by the supplier through the Contractor to the Engineer to retain 3 copies.

MINIMUM WALL THICKNESS FOR STEEL PIPE	
Nominal Diameter (Inches)	Wall Thickness (Inches)
18 or less	0.375
24	0.500
30	0.500
36	0.532
42	0.625

2.2 Grout. Conform to Subsection 601.03.03.

2.3 High Grade Bentonite. Conform to the following:

API 13A Section 4		
Requirement	Specification	Result
Viscometer Dial Reading at 600 rpm	30, minimum	40
Yield Point/Plastic Viscosity Ratio	3, maximum	3.00 maximum
Filtrate Volume	15 cm3, maximum	14.50 maximum
Residue greater than 75 micrometers	4.0 wt percent maximum	1.0-1.5 %
Moisture	10.0 wt percent maximum	9.0-9.5%

3.0 CONSTRUCTION. Perform the following:

1. Locate a suitable pit and obtain the Engineer’s approval.
2. Excavate the pit or trenches for the BORE AND JACK operation and for placing the end joints of pipe, when required. Securely sheet and brace the pits or trenches to prevent caving, where necessary.

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3. When installing pipe under railroads, highways, streets, or other facilities by Bore and Jack, perform construction without interfering with the facility operation or weakening the roadbed or structure.
4. Place excavated material near the top of the working pit and dispose of it as required. Use water or other fluids with the boring operation to lubricate the cuttings. Do not perform jetting.
5. In unconsolidated soil formations, use a gel-forming colloidal drilling fluid with at least 10 percent of high grade bentonite to consolidate excavated material, seal the walls of the hole, and lubricate subsequent removal of material and immediate pipe installation.
6. Ensure that the diameter of the excavation conforms to the outside diameter of the pipe as closely as possible.
7. Pressure grout voids that develop during the installation operation and that the Engineer determines are detrimental to the Work.
8. To force the pipe through the roadbed into the bored space, use a jack with a head constructed to apply uniform pressure around the ring of the pipe, which shall be square cut.
9. Set the pipe to be jacked on guides, braced together to properly support the pipe section and to direct it to the proper line and grade.
10. When the installation is made by concurrent boring and jacking, solidly weld all joints. Ensure the weld is strong enough to withstand the forces exerted from the boring and jacking operations as well as the vertical loading imposed on the pipe after installation and that it provides a smooth, non-obstructing joint in the interior of the pipe.
11. When the pipe is installed in open trench, bed and backfill according to Section 701.
12. The line and grade from the pipe's final position, as shown on plans, may vary no more than 2 percent in lateral alignment and one percent in vertical grade. Ensure that the final grade of the flow line is in the direction indicated on the Plans.
13. Use a cutting edge around the head end. Extend it a short distance beyond the pipe end with inside angles or lugs to keep the cutting edge from slipping back into the pipe.
14. Once the pipe installation begins, proceed with the operation without interruption to prevent the pipe from becoming firmly set in the embankment.
15. Remove and replace pipe damaged in jacking operations.
16. After completing the installation, backfill the excavated pits and trenches with flowable fill according to Section 601.03.03 B) 5 a) if the pit is in median area where it will have pavement over it.

4.0 MEASUREMENT. The Department will measure the completed length of Bore and Jacked pipe through the flowline from end to end in linear feet. The Department will not measure pressure grouting voids or removal and replacement of pipe damaged in jacking operations for payment and will consider it incidental to Bore and Jack. When abandoning a bore hole due to mechanical malfunction, improper alignment, or other problems due to construction operations, the Department will not measure the backfill and relocation for payment and will consider it incidental to this item of work. When abandoning a bore hole due to an unforeseen physical obstruction or situation, the Department will measure the work according to a negotiated supplemental agreement.

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

11E

<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
----	Bore and Jack, Size Pipe	Linear Foot

The Department will consider payment as full compensation for all materials, earthwork, shoring, pipe and work required under this section.

June 15, 2012

SPECIAL NOTE FOR TURF REINFORCING MAT

1.0 DESCRIPTION. Install turf reinforcement mat at locations specified in the Contract or as the Engineer directs. Section references herein are to the Department's 2008 Standard Specifications for Road and Bridge Construction.

2.0 MATERIALS.

2.1 Turf Reinforcement Mat (TRM). Use a Turf Reinforcement Mat defined as permanent rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh and/or other elements, processed into a three-dimensional matrix of sufficient thickness and from the Department's List of Approved Materials. Mats must be 100% UV stabilized materials. For TRMs containing degradable components, all physical property values must be obtained on the non-degradable portion of the matting exclusively. Ensure product labels clearly show the manufacturer or supplier name, style name, and roll number. Ensure labeling, shipment and storage follows ASTM D-4873. The Department will require manufacturer to provide TRMs that are machine constructed web of mechanically or melt bonded nondegradable fibers entangled to form a three dimensional matrix. The Department will require all long term performance property values in table below to be based on non degradable portion of the matting alone. Approved methods include polymer welding, thermal or polymer fusion, or placement of fibers between two high strength biaxially oriented nets mechanically bound by parallel stitching with polyolefin thread. Ensure that mats designated in the plans as Type 4 mats, are not to be manufactured from discontinuous or loosely held together by stitching or glued netting or composites. Type 4 mats shall be composed of geosynthetic matrix that exhibits a very high interlock and reinforcement capacities with both soil and root systems and with high tensile modulus. The Department will require manufacturer to use materials chemically and biologically inert to the natural soil environments conditions. Ensure the blanket is smolder resistant without the use of chemical additives. When stored, maintain the protective wrapping and elevate the mats off the ground to protect them from damage. The Department will not specify these materials for use in heavily acidic coal seam areas or other areas with soil problems that would severally limit vegetation growth.

- A) Dimensions. Ensure TRMs are furnished in strips with a minimum width of 4 feet and length of 50 feet.
- B) Weight. Ensure that all mat types have a minimum mass per unit area of 7 ounces per square yard according to ASTM D 6566.
- C) Performance Testing: The Department will require AASHTO's NTPEP index testing. The Department will also require the manufacturer to perform internal MARV testing at a Geosynthetic Accreditation Institute – Laboratory Accreditation Program (GAI-LAP) accredited laboratory for tensile strength, tensile elongation, mass per unit area, and thickness once every 24,000 yds of production or whatever rate is required to ensure 97.7% confidence under ASTM D4439& 4354. The Department will require Full scale testing for slope and channel applications shear stress shall be done under ASTM D 6459, ASTM D 6460-07 procedures.

2.2 Classifications

The basis for selection of the type of mat required will be based on the long term shear stress level of the mat of the channel in question or the degree of slope to protect and will be designated in the contract. The Type 4 mats are to be used at structural backfills protecting critical

11F

structures, utility cuts, areas where vehicles may be expected to traverse the mat, channels with large heavy drift, and where higher factors of safety, very steep slopes and/or durability concerns are needed as determined by project team and designer and will be specified in the plans by designer.

Turf Reinforcement Matting					
Properties ¹	Type 1	Type 2	Type 3	Type 4	Test Method
Minimum tensile Strength lbs/ft	125	150	175	3000 by 1500	ASTM D6818 ²
UV stability (minimum % tensile retention)	80	80	80	90	ASTM D4355 ³ (1000-hr exposure)
Minimum thickness (inches)	0.25	0.25	0.25	0.40	ASTM D6525
Slopes applications	2H:1V or flatter	1.5H:1V or flatter	1H:1V or flatter	1 H: 1V or greater	
Shear stress lbs/ft ² Channel applications	6.0 ⁴	8.0 ⁴	10.0 ⁴	12.0 ⁴	ASTM D6459 ASTM D6460-07

¹ For TRMs containing degradable components, all physical property values must be obtained on the non-degradable portion of the matting alone.

²Minimum Average Roll Values for tensile strength of sample material machine direction.

³Tensile Strength percentage retained after stated 1000 hr duration of exposure under ASTM D4355 testing. Based on nondegradable components exclusively.

⁴Maximum permissible shear design values based on short-term (0.5 hr) vegetated data obtained by full scale flume testing ASTM D6459, D6460-07. Based on nondegradable components exclusively. Testing will be done at Independent Hydraulics Facility such as Colorado State University hydraulics laboratory, Utah State University hydraulics laboratory, Texas Transportation Institute (TTI) hydraulics and erosion control laboratory.

2.3 Quality Assurance Sampling, Testing, and Acceptance

- A) Provide TRM listed on the Department's List of Approved Materials. Prior to inclusion on the LAM, the manufacturer of TRM must meet the physical and performance criteria as outlined in the specification and submit a Letter Certifying compliance of the product under the above ASTM testing procedures and including a copy of report from Full Scale Independent Hydraulics Facility that Fully Vegetated Shear Stress meets shear stress requirements tested under D6459 and D6460-07.
- B) Contractors will provide a Letter of Certification from Manufacturer stating the product name, manufacturer, and that the product MARV product unit testing results meets Department criteria. Provide Letters once per project and for each product.
- C) Acceptance shall be in accordance with ASTM D-4759 based on testing performed by a Geosynthetic Accreditation Institute – Laboratory Accreditation Program (GAI-LAP) accredited laboratory using Procedure A of ASTM D-4354.

Current mats meeting the above criteria are shown on the Department’s List of Approved Materials.

2.4 Fasteners. When the mat manufacturer does not specify a specific fastener, use steel wire U-shaped staples with a minimum diameter of 0.09 inches (11 gauge), a minimum width of one inch and a minimum length of 12 inches. Use a heavier gauge when working in rocky or clay soils and longer lengths in sandy soils as directed by Engineer or Manufacturer’s Representative. Provide staples with colored tops when requested by the Engineer.

3.0 CONSTRUCTION. When requested by the Engineer, provide a Manufacturer’s Representative on-site to oversee and approve the initial installation of the mat. When requested by the Engineer, provide a letter from the Manufacturer approving the installation. When there is a conflict between the Department’s criteria and the Manufacturer’s criteria, construct using the more restrictive. The Engineer and Manufacturer’s Representative must approve all alternate installation methods prior to execution. Construct according to the Manufacturer’s recommendations and the following as minimum installation technique:

3.1 Site Preparation. Grade areas to be treated with matting and compact. Remove large rocks, soil clods, vegetation, roots, and other sharp objects that could keep the mat from intimate contact with subgrade. Prepare seedbed by loosening the top 2 to 3 inch of soil.

3.2 Installation. Install mats according to Standard Drawing Sepias “Turf Mat Channel Installation” and “Turf Mat Slope Installation.” Install mats at the specified elevation and alignment. Anchor the mats with staples with a minimum length of 12 inches. Use longer anchors for installations in sandy, loose, or wet soils as directed by the Engineer or Manufacturer’s Representative. The mat should be in direct contact with the soil surface.

4.0 MEASUREMENT. The Department will measure the quantity of Turf Reinforcement Mat by the square yard of surface covered. The Department will not measure preparation of the bed, providing a Manufacturer’s Representative, topsoil, or seeding for payment and will consider them incidental to the Turf Reinforcement Mat. The Department will not measure any reworking of slopes or channels for payment as it is considered corrective work and incidental to the Turf Reinforcement Mat. Seeding and protection will be an incidental item.

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

<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
23274EN11F	Turf Reinforcement Mat 1	Square Yard
23275EN11F	Turf Reinforcement Mat 2	Square Yard
23276EN11F	Turf Reinforcement Mat 3	Square Yard
23277EN11F	Turf Reinforcement Mat 4	Square Yard

April 18, 2009

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)
- III. Payment of Predetermined Minimum Wages
- IV. Statements and Payrolls

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 (between forty and seventy); 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 (between forty and seventy). 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, disability or age (between forty and seventy), except that such notice or advertisement may indicate a preference, limitation, or specification based on religion, or national origin when religion, or national origin 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 (between forty and seventy), 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 administering agency may direct as a means of enforcing such provisions, including sanctions for non-compliance.

III. PAYMENT OF PREDETERMINED MINIMUM WAGES

1. These special provisions are supplemented elsewhere in the contract by special provisions which set forth certain predetermined minimum wage rates. The contractor shall pay not less than those rates.

2. The minimum wage determination schedule shall be posted by the contractor, in a manner prescribed by the Department of Highways, at the site of the work in prominent places where it can be easily seen by the workers.

IV. STATEMENTS AND PAYROLLS

1. All contractors and subcontractors affected by the terms of KRS 337.505 to 337.550 shall keep full and accurate payroll records covering all disbursements of wages to their employees to whom they are required to pay not less than the prevailing rate of wages. Payrolls and basic records relating thereto will be maintained during the course of the work and preserved for a period of one (1) year from the date of completion of this contract.

2. The payroll records shall contain the name, address and social security number of each employee, his correct classification, rate of pay, daily and weekly number of hours worked, itemized deductions made and actual wages paid.

3. The contractor shall make his daily records available at the project site for inspection by the State Department of Highways contracting office or his authorized representative.

Periodic investigations shall be conducted as required to assure compliance with the labor provisions of the contract. Interrogation of employees and officials of the contractor shall be permitted during working hours.

Aggrieved workers, Highway Managers, Assistant District Engineers, Resident Engineers and Project Engineers shall report all complaints and violations to the Division of Contract Procurement.

The contractor shall be notified in writing of apparent violations. The contractor may correct the reported violations and notify the Department of Highways of the action taken or may request an informal hearing. The request for hearing shall be in writing within ten (10) days after receipt of the notice of the reported violation. The contractor may submit

records and information which will aid in determining the true facts relating to the reported violations.

Any person or organization aggrieved by the action taken or the findings established as a result of an informal hearing by the Division of Contract Procurement may request a formal hearing.

4. The wages of labor shall be paid in legal tender of the United States, except that this condition will be considered satisfied if payment is made by a negotiable check, on a solvent bank, which may be cashed readily by the employee in the local community for the full amount, without discount or collection charges of any kind. Where checks are used for payments, the contractor shall make all necessary arrangements for them to be cashed and shall give information regarding such arrangements.

5. No fee of any kind shall be asked or accepted by the contractor or any of his agents from any person as a condition of employment on the project.

6. No laborers shall be charged for any tools used in performing their respective duties except for reasonably avoidable loss or damage thereto.

7. Every employee on the work covered by this contract shall be permitted to lodge, board, and trade where and with whom he elects and neither the contractor nor his agents, nor his employees shall directly or indirectly require as a condition of employment that an employee shall lodge, board or trade at a particular place or with a particular person.

8. Every employee on the project covered by this contract shall be an employee of either the prime contractor or an approved subcontractor.

9. No charge shall be made for any transportation furnished by the contractor or his agents to any person employed on the work.

10. No individual shall be employed as a laborer or mechanic on this contract except on a wage basis, but this shall not be construed to prohibit the rental of teams, trucks or other equipment from individuals.

No Covered employee may be employed on the work except in accordance with the classification set forth in the schedule mentioned above; provided, however, that in the event additional classifications are required, application shall be made by the contractor to the Department of Highways and (1) the Department shall request appropriate classifications and rates from the proper agency, or (2) if there is urgent need for additional classification to avoid undue delay in the work, the contractor may employ such workmen at rates deemed comparable to rates established for similar classifications provided he has made written application through the Department of Highways, addressed to the proper agency, for the supplemental rates. The contractor shall retroactively adjust, upon receipt of the supplemental rates schedule, the wages of any employee paid less than the established rate and may adjust the wages of any employee overpaid.

11. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any laborer or mechanic in any work-week in which he is employed on such work, to work in excess of eight hours in any calendar day or in excess of forty hours in such work-week unless such laborer or mechanic receives compensation at a rate not less than one and one half times his basic rate of pay for all hours worked in excess of eight hours in any calendar day or in excess of forty hours in such work-week. A laborer, workman or mechanic and an employer may enter into a written agreement or a collective bargaining agreement to work more than eight (8) hours a calendar day but not more than ten (10) hours a calendar day for the straight time hourly rate. This agreement shall be in writing and shall be executed prior to the employee working in excess of eight (8) hours, but not more than ten (10) hours, in any one (1) calendar day.

12. Payments to the contractor may be suspended or withheld due to failure of the contractor to pay any laborer or

mechanic employed or working on the site of the work, all or part of the wages required under the terms of the contract. The Department may suspend or withhold payments only after the contractor has been given written notice of the alleged violation and the contractor has failed to comply with the wage determination of the Department of Highways.

13. Contractors and subcontractors shall comply with the sections of Kentucky Revised Statutes, Chapter 337 relating to contracts for Public Works.

Revised 2-16-95

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 (6) provides:

No present or former public servant shall, within six (6) months of 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 the state in matters in which he was directly involved during 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, provided that, for a period of six (6) months, he personally refrains from working on any matter in which he was directly involved 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.

KRS 11A.040 (8) states:

A former public servant shall not represent a person in a matter before a state agency in which the former public servant was directly involved, 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, Room 136, Capitol Building, 700 Capitol Avenue, Frankfort, Kentucky 40601; telephone (502) 564-7954.

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.

General Decision Number: KY150100 09/25/2015 KY100

Superseded General Decision Number: KY20140100

State: Kentucky

Construction Type: Highway

Counties: Anderson, Bath, Bourbon, Boyd, Boyle, Bracken, Breckinridge, Bullitt, Carroll, Carter, Clark, Elliott, Fayette, Fleming, Franklin, Gallatin, Grant, Grayson, Greenup, Hardin, Harrison, Henry, Jefferson, Jessamine, Larue, Lewis, Madison, Marion, Mason, Meade, Mercer, Montgomery, Nelson, Nicholas, Oldham, Owen, Robertson, Rowan, Scott, Shelby, Spencer, Trimble, Washington and Woodford Counties in Kentucky.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Executive Order (EO) 13658 establishes an hourly minimum wage of \$10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/02/2015
1	01/23/2015
2	01/30/2015
3	02/20/2015
4	05/01/2015
5	05/22/2015
6	06/05/2015
7	06/12/2015
8	06/19/2015
9	08/21/2015
10	09/04/2015
11	09/11/2015
12	09/25/2015

BRIN0004-003 06/01/2011

BRECKENRIDGE COUNTY

	Rates	Fringes
BRICKLAYER.....	\$ 24.11	10.07

BRKY0001-005 06/01/2015

BULLITT, CARROLL, GRAYSON, HARDIN, HENRY, JEFFERSON, LARUE,
MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER, & TRIMBLE
COUNTIES:

	Rates	Fringes
BRICKLAYER.....	\$ 25.96	10.64

BRKY0002-006 06/01/2011

BRACKEN, GALLATIN, GRANT, MASON & ROBERTSON COUNTIES:

	Rates	Fringes
BRICKLAYER.....	\$ 26.57	10.26

BRKY0007-004 06/01/2014

BOYD, CARTER, ELLIOT, FLEMING, GREENUP, LEWIS & ROWAN COUNTIES:

	Rates	Fringes
BRICKLAYER.....	\$ 30.57	17.94

BRKY0017-004 06/01/2009

ANDERSON, BATH, BOURBON, BOYLE, CLARK, FAYETTE, FRANKLIN,
HARRISON, JESSAMINE, MADISON, MERCER, MONTGOMERY, NICHOLAS,
OWEN, SCOTT, WASHINGTON & WOODFORD COUNTIES:

	Rates	Fringes
BRICKLAYER.....	\$ 24.11	9.97

CARP0064-001 05/01/2015

	Rates	Fringes
CARPENTER.....	\$ 27.50	16.06
Diver.....	\$ 41.63	16.06
PILEDRIVERMAN.....	\$ 27.75	16.06

ELEC0212-008 06/01/2015

BRACKEN, GALLATIN and GRANT COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 27.03	17.02

ELEC0212-014 12/01/2014

BRACKEN, GALLATIN & GRANT COUNTIES:

Rates	Fringes
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Sound & Communication Technician.....	\$ 22.75	10.08
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ELEC0317-012 05/28/2014

BOYD, CARTER, ELLIOT & ROWAN COUNTIES:

	Rates	Fringes
ELECTRICIAN		
Cable Splicer.....	\$ 32.68	18.13
Electrician.....	\$ 32.62	21.45

ELEC0369-007 05/27/2015

ANDERSON, BATH, BOURBON, BOYLE, BRECKINRIDGE, BULLITT, CARROLL,
CLARK, FAYETTE, FRAONKLIN, GRAYSON, HARDIN, HARRISON, HENRY,
JEFFERSON, JESSAMINE, LARUE, MADISON, MARION, MEADE, MERCER,
MONTGOMERY, NELSON, NICHOLAS, OLDHAM, OWEN, ROBERTSON, SCOTT,
SHELBY, SPENCER, TRIMBLE, WASHINGTON, & WOODFORD COUNTIES:

	Rates	Fringes
ELECTRICIAN.....	\$ 30.01	15.65

ELEC0575-002 06/02/2014

FLEMING, GREENUP, LEWIS & MASON COUNTIES:

	Rates	Fringes
ELECTRICIAN.....	\$ 31.70	14.21

ENGI0181-018 07/01/2015

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1.....	\$ 29.95	14.40
GROUP 2.....	\$ 27.26	14.40
GROUP 3.....	\$ 27.68	14.40
GROUP 4.....	\$ 26.96	14.40

OPERATING ENGINEER CLASSIFICATIONS

GROUP 1 - A-Frame Winch Truck; Auto Patrol; Backfiller;
Batcher Plant; Bituminous Paver; Bituminous Transfer
Machine; Boom Cat; Bulldozer; Mechanic; Cableway; Carry-All
Scoop; Carry Deck Crane; Central Compressor Plant; Cherry
Picker; Clamshell; Concrete Mixer (21 cu. ft. or Over);
Concrete Paver; Truck-Mounted Concrete Pump; Core Drill;
Crane; Crusher Plant; Derrick; Derrick Boat; Ditching &
Trenching Machine; Dragline; Dredge Operator; Dredge
Engineer; Elevating Grader & Loaders; Grade-All; Gurries;
Heavy Equipment Robotics Operator/Mechanic; High Lift;
Hoe-Type Machine; Hoist (Two or More Drums); Hoisting
Engine (Two or More Drums); Horizontal Directional Drill
Operator; Hydrocrane; Hyster; KeCal Loader; LeTourneau;
Locomotive; Mechanic; Mechanically Operated Laser Screed;

Mechanic Welder; Mucking Machine; Motor Scraper; Orangepeel Bucket; Overhead Crane; Piledriver; Power Blade; Pumpcrete; Push Dozer; Rock Spreader, attached to equipment; Rotary Drill; Roller (Bituminous); Rough Terrain Crane; Scarifier; Scoopmobile; Shovel; Side Boom; Subgrader; Tailboom; Telescoping Type Forklift; Tow or Push Boat; Tower Crane (French, German & other types); Tractor Shovel; Truck Crane; Tunnel Mining Machines, including Moles, Shields or similar types of Tunnel Mining Equipment

GROUP 2 - Air Compressor (Over 900 cu. ft. per min.); Bituminous Mixer; Boom Type Tamping Machine; Bull Float; Concrete Mixer (Under 21 cu. ft.); Dredge Engineer; Electric Vibrator; Compactor/Self-Propelled Compactor; Elevator (One Drum or Buck Hoist); Elevator (When used to Hoist Building Material); Finish Machine; Firemen & Hoist (One Drum); Flexplane; Forklift (Regardless of Lift Height); Form Grader; Joint Sealing Machine; Outboard Motor Boat; Power Sweeper (Riding Type); Roller (Rock); Ross Carrier; Skid Mounted or Trailer Mounted Concrete Pump; Skid Steer Machine with all Attachments; Switchman or Brakeman; Throttle Valve Person; Tractair & Road Widening Trencher; Tractor (50 H.P. or Over); Truck Crane Oiler; Tugger; Welding Machine; Well Points; & Whirley Oiler

GROUP 3 - All Off Road Material Handling Equipment, including Articulating Dump Trucks; Greaser on Grease Facilities servicing Heavy Equipment

GROUP 4 - Bituminous Distributor; Burlap & Curing Machine; Cement Gun; Concrete Saw; Conveyor; Deckhand Oiler; Grout Pump; Hydraulic Post Driver; Hydro Seeder; Mud Jack; Oiler; Paving Joint Machine; Power Form Handling Equipment; Pump; Roller (Earth); Steerman; Tamping Machine; Tractor (Under 50 H.P.); & Vibrator

CRANES - with booms 150 ft. & Over (Including JIB), and where the length of the boom in combination with the length of the piling leads equals or exceeds 150 ft. - \$1.00 over Group 1 rate

EMPLOYEES ASSIGNED TO WORK BELOW GROUND LEVEL ARE TO BE PAID 10% ABOVE BASIC WAGE RATE. THIS DOES NOT APPLY TO OPEN CUT WORK.

IRON0044-009 06/01/2015

BRACKEN, GALLATIN, GRANT, HARRISON, ROBERTSON,
BOURBON (Northern third, including Townships of Jackson, Millersburg, Ruddel Mills & Shawhan);
CARROLL (Eastern third, including the Township of Ghent);
FLEMING (Western part, excluding Townships of Beechburg, Colfax, Elizaville, Flemingsburg, Flemingsburg Junction, Foxport, Grange City, Hillsboro, Hilltop, Mount Carmel, Muses Mills, Nepton, Pecksridge, Plummerts Landing, Plummerts Mill, Poplar Plains, Ringos Mills, Tilton & Wallingford);
MASON (Western two-thirds, including Townships of Dover, Lewisburg, Mays Lick, Maysville, Minerva, Moranburg, Murphysville, Ripley, Sardis, Shannon, South Ripley &

Washington);
NICHOLAS (Townships of Barefoot, Barterville, Carlisle, Ellisville, Headquarters, Henryville, Morningglory, Myers & Oakland Mills);
OWEN (Townships of Beechwood, Bromley, Fairbanks, Holbrook, Jonesville, Long Ridge, Lusby's Mill, New, New Columbus, New Liberty, Owenton, Poplar Grove, Rockdale, Sanders, Teresita & Wheatley);
SCOTT (Northern two-thirds, including Townships of Biddle, Davis, Delaplain, Elmville, Longlick, Muddy Ford, Oxford, Rogers Gap, Sadieville, Skinnersburg & Stonewall)

	Rates	Fringes
IRONWORKER		
Fence Erector.....	\$ 23.76	19.15
Structural.....	\$ 26.40	19.15

IRON0070-006 06/01/2015		

ANDERSON, BOYLE, BRECKINRIDGE, BULLITT, FAYETTE, FRANKLIN, GRAYSON, HARDIN, HENRY, JEFFERSON, JESSAMINE, LARUE, MADISON, MARION, MEADE, MERCER, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE, WASHINGTON & WOODFORD
BOURBON (Southern two-thirds, including Townships of Austerlity, Centerville, Clintonville, Elizabeth, Hutchison, Littlerock, North Middletown & Paris);
CARROLL (Western two-thirds, including Townships of Carrollton, Easterday, English, Locust, Louis, Prestonville & Worthville);
CLARK (Western two-thirds, including Townships of Becknerville, Flanagan, Ford, Pine Grove, Winchester & Wyandotte);
OWEN (Eastern eighth, including Townships of Glenmary, Gratz, Monterey, Perry Park & Tacketts Mill);
SCOTT (Southern third, including Townships of Georgetown, Great Crossing, Newtown, Stampling Ground & Woodlake);

	Rates	Fringes
IRONWORKER.....	\$ 27.56	20.30

IRON0372-006 06/15/2015		

BRACKEN, GALLATIN, GRANT, HARRISON and ROBERTSON
BOURBON (Northern third, including Townships of Jackson, Millersburg, Ruddel Mills & Shawhan);
CARROLL (Eastern third, including the Township of Ghent);
FLEMING (Western part, Excluding Townships of Beechburg, Colfax, Elizaville, Flemingsburg, Flemingsburg Junction, Foxport, Grange City, Hillsboro, Hilltop, Mount Carmel, Muses Mills, Nepton, Pecksridge, Plummers Landing, Plummers Mill, Poplar Plains, Ringos Mills, Tilton & Wallingford);
MASON (Western two-thirds, including Townships of Dover, Lewisburg, Mays Lick, Maysville, Minerva, Moranburg, Murphysville, Ripley, Sardis, Shannon, South Ripley & Washington);
NICHOLAS (Townships of Barefoot, Barterville, Carlisle, Ellisville, Headquarters, Henryville, Morningglory, Myers &

Oakland Mills);
OWEN (Townships of Beechwood, Bromley, Fairbanks, Holbrook,
Jonesville, Long Ridge, Lusby's Mill, New, New Columbus, New
Liberty, Owenton, Poplar Grove, Rockdale, Sanders, Teresita &
Wheatley);
SCOTT (Northern two-thirds, including Townships of Biddle,
Davis, Delaplain, Elmville, Longlick, Muddy Ford, Oxford, Rogers
Gap, Sadieville, Skinnersburg & Stonewall) COUNTIES

	Rates	Fringes
IRONWORKER, REINFORCING.....	\$ 27.00	19.00

IRON0769-007 06/01/2015		

BATH, BOYD, CARTER, ELLIOTT, GREENUP, LEWIS, MONTGOMERY & ROWAN
CLARK (Eastern third, including townships of Bloomingdale,
Hunt, Indian Fields, Kiddville, Loglick, Rightangele & Thomson);
FLEMING (Townships of Beechburg, Colfax, Elizaville,
Flemingsburg, Flemingsburg Junction, Foxport, Grange City,
Hillsboro, Hilltop, Mount Carmel, Muses Mills, Nepton,
Pecksridge, Plummers Landing, Plummers Mill, Poplar Plains,
Ringos Mills, Tilton & Wallingford);
MASON (Eastern third, including Townships of Helena, Marshall,
Orangeburg, Plumville & Springdale);
NICHOLAS (Eastern eighth, including the Township of Moorefield
Sprout)

	Rates	Fringes
IRONWORKER		
ZONE 1.....	\$ 31.33	22.39
ZONE 2.....	\$ 31.73	22.39
ZONE 3.....	\$ 33.33	22.39
ZONE 1 - Up to 10 mile radius of Union Hall, Ashland, Ky., 1643 Greenup Ave.		
ZONE 2 - 10 to 50 mile radius of Union Hall, Ashland, Ky., 1643 Greenup Ave.		
ZONE 3 - 50 mile radius & over of Union Hall, Ashland, Ky., 1643 Greenup Ave.		

LABO0189-003 07/01/2014

BATH, BOURBON, BOYD, BOYLE, BRACKEN, CARTER, CLARK, ELLIOTT,
FAYETTE, FLEMING, FRANKLIN, GALLATIN, GRANT, GREENUP, HARRISON,
JESSAMINE, LEWIS, MADISON, MASON, MERCER, MONTGOMERY, NICHOLAS,
OWEN, ROBERTSON, ROWAN, SCOTT, & WOOLFORD COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 21.80	11.96
GROUP 2.....	\$ 22.05	11.96

GROUP 3.....	\$ 22.10	11.96
GROUP 4.....	\$ 22.70	11.96

LABORERS CLASSIFICATIONS

GROUP 1 - Aging & Curing of Concrete; Asbestos Abatement Worker; Asphalt Plant; Asphalt; Batch Truck Dump; Carpenter Tender; Cement Mason Tender; Cleaning of Machines; Concrete; Demolition; Dredging; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level D; Flagperson; Grade Checker; Hand Digging & Hand Back Filling; Highway Marker Placer; Landscaping, Mesh Handler & Placer; Puddler; Railroad; Rip-rap & Grouter; Right-of-Way; Sign, Guard Rail & Fence Installer; Signal Person; Sound Barrier Installer; Storm & Sanitary Sewer; Swamper; Truck Spotter & Dumper; Wrecking of Concrete Forms; General Cleanup

GROUP 2 - Batter Board Man (Sanitary & Storm Sewer); Brickmason Tender; Mortar Mixer Operator; Scaffold Builder; Burner & Welder; Bushhammer; Chain Saw Operator; Concrete Saw Operator; Deckhand Scow Man; Dry Cement Handler; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level C; Forklift Operator for Masonary; Form Setter; Green Concrete Cutting; Hand Operated Grouter & Grinder Machine Operator; Jackhammer; Pavement Breaker; Paving Joint Machine; Pipelayer; Plastic Pipe Fusion; Power Driven Georgia Buggy & Wheel Barrow; Power Post Hole Digger; Precast Manhole Setter; Walk-Behind Tamper; Walk-Behind Trencher; Sand Blaster; Concrete Chipper; Surface Grinder; Vibrator Operator; Wagon Driller

GROUP 3 - Asphalt Luteman & Raker; Gunnite Nozzleman; Gunnite Operator & Mixer; Grout Pump Operator; Side Rail Setter; Rail Paved Ditches; Screw Operator; Tunnel (Free Air); Water Blaster

GROUP 4 - Caisson Worker (Free Air); Cement Finisher; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Levels A & B; Miner & Driller (Free Air); Tunnel Blaster; & Tunnel Mucker (Free Air); Directional & Horizontal Boring; Air Track Drillers (All Types); Powdermen & Blasters; Troxler & Concrete Tester if Laborer is Utilized

LABO0189-008 07/01/2014

ANDERSON, BULLITT, CARROLL, HARDIN, HENRY, JEFFERSON, LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE & WASHINGTON COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 22.71	11.05
GROUP 2.....	\$ 22.96	11.05
GROUP 3.....	\$ 23.01	11.05
GROUP 4.....	\$ 23.61	11.05

LABORERS CLASSIFICATIONS

GROUP 1 - Aging & Curing of Concrete; Asbestos Abatement Worker; Asphalt Plant; Asphalt; Batch Truck Dump; Carpenter Tender; Cement Mason Tender; Cleaning of Machines; Concrete; Demolition; Dredging; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level D; Flagperson; Grade Checker; Hand Digging & Hand Back Filling; Highway Marker Placer; Landscaping, Mesh Handler & Placer; Puddler; Railroad; Rip-rap & Grouter; Right-of-Way; Sign, Guard Rail & Fence Installer; Signal Person; Sound Barrier Installer; Storm & Sanitary Sewer; Swamper; Truck Spotter & Dumper; Wrecking of Concrete Forms; General Cleanup

GROUP 2 - Batter Board Man (Sanitary & Storm Sewer); Brickmason Tender; Mortar Mixer Operator; Scaffold Builder; Burner & Welder; Bushhammer; Chain Saw Operator; Concrete Saw Operator; Deckhand Scow Man; Dry Cement Handler; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level C; Forklift Operator for Masonary; Form Setter; Green Concrete Cutting; Hand Operated Grouter & Grinder Machine Operator; Jackhammer; Pavement Breaker; Paving Joint Machine; Pipelayer; Plastic Pipe Fusion; Power Driven Georgia Buggy & Wheel Barrow; Power Post Hole Digger; Precast Manhole Setter; Walk-Behind Tamper; Walk-Behind Trencher; Sand Blaster; Concrete Chipper; Surface Grinder; Vibrator Operator; Wagon Driller

GROUP 3 - Asphalt Luteman & Raker; Gunnite Nozzleman; Gunnite Operator & Mixer; Grout Pump Operator; Side Rail Setter; Rail Paved Ditches; Screw Operator; Tunnel (Free Air); Water Blaster

GROUP 4 - Caisson Worker (Free Air); Cement Finisher; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Levels A & B; Miner & Driller (Free Air); Tunnel Blaster; & Tunnel Mucker (Free Air); Directional & Horizontal Boring; Air Track Drillers (All Types); Powdermen & Blasters; Troxler & Concrete Tester if Laborer is Utilized

LABO0189-009 07/01/2014

BRECKINRIDGE & GRAYSON COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 22.66	11.10
GROUP 2.....	\$ 22.91	11.10
GROUP 3.....	\$ 22.96	11.10
GROUP 4.....	\$ 23.56	11.10

LABORERS CLASSIFICATIONS

GROUP 1 - Aging & Curing of Concrete; Asbestos Abatement Worker; Asphalt Plant; Asphalt; Batch Truck Dump; Carpenter Tender; Cement Mason Tender; Cleaning of Machines; Concrete; Demolition; Dredging; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level D; Flagperson; Grade Checker; Hand Digging & Hand Back Filling; Highway

Marker Placer; Landscaping, Mesh Handler & Placer; Puddler; Railroad; Rip-rap & Grouter; Right-of-Way; Sign, Guard Rail & Fence Installer; Signal Person; Sound Barrier Installer; Storm & Sanitary Sewer; Swamper; Truck Spotter & Dumper; Wrecking of Concrete Forms; General Cleanup

GROUP 2 - Batter Board Man (Sanitary & Storm Sewer); Brickmason Tender; Mortar Mixer Operator; Scaffold Builder; Burner & Welder; Bushhammer; Chain Saw Operator; Concrete Saw Operator; Deckhand Scow Man; Dry Cement Handler; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level C; Forklift Operator for Masonary; Form Setter; Green Concrete Cutting; Hand Operated Grouter & Grinder Machine Operator; Jackhammer; Pavement Breaker; Paving Joint Machine; Pipelayer; Plastic Pipe Fusion; Power Driven Georgia Buggy & Wheel Barrow; Power Post Hole Digger; Precast Manhole Setter; Walk-Behind Tamper; Walk-Behind Trencher; Sand Blaster; Concrete Chipper; Surface Grinder; Vibrator Operator; Wagon Driller

GROUP 3 - Asphalt Luteman & Raker; Gunnite Nozzleman; Gunnite Operator & Mixer; Grout Pump Operator; Side Rail Setter; Rail Paved Ditches; Screw Operator; Tunnel (Free Air); Water Blaster

GROUP 4 - Caisson Worker (Free Air); Cement Finisher; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Levels A & B; Miner & Driller (Free Air); Tunnel Blaster; & Tunnel Mucker (Free Air); Directional & Horizontal Boring; Air Track Drillers (All Types); Powdermen & Blasters; Troxler & Concrete Tester if Laborer is Utilized

PAIN0012-005 06/11/2005

BATH, BOURBON, BOYLE, CLARK, FAYETTE, FLEMING, FRANKLIN, HARRISON, JESSAMINE, MADISON, MERCER, MONTGOMERY, NICHOLAS, ROBERTSON, SCOTT & WOODFORD COUNTIES:

	Rates	Fringes
PAINTER		
Bridge/Equipment Tender and/or Containment Builder..	\$ 18.90	5.90
Brush & Roller.....	\$ 21.30	5.90
Elevated Tanks; Steeplejack Work; Bridge & Lead Abatement.....	\$ 22.30	5.90
Sandblasting & Waterblasting.....	\$ 22.05	5.90
Spray.....	\$ 21.80	5.90

PAIN0012-017 05/01/2015

BRACKEN, GALLATIN, GRANT, MASON & OWEN COUNTIES:

	Rates	Fringes
PAINTER (Heavy & Highway		

Bridges - Guardrails -
Lightpoles - Striping)

Bridge Equipment Tender and Containment Builder.....	\$ 20.73	9.06
Brush & Roller.....	\$ 23.39	9.06
Elevated Tanks; Steeplejack Work; Bridge & Lead Abatement.....	\$ 24.39	9.06
Sandblasting & Water Blasting.....	\$ 24.14	9.06
Spray.....	\$ 23.89	9.06

PAIN0118-004 06/01/2014

ANDERSON, BRECKINRIDGE, BULLITT, CARROLL, GRAYSON, HARDIN,
HENRY, JEFFERSON, LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY,
SPENCER, TRIMBLE & WASHINGTON COUNTIES:

	Rates	Fringes
PAINTER		
Brush & Roller.....	\$ 18.50	11.97
Spray, Sandblast, Power Tools, Waterblast & Steam Cleaning.....	\$ 19.50	11.97

PAIN1072-003 12/01/2014

BOYD, CARTER, ELLIOTT, GREENUP, LEWIS and ROWAN COUNTIES

	Rates	Fringes
Painters:		
Bridges; Locks; Dams; Tension Towers & Energized Substations.....	\$ 31.83	15.30
Power Generating Facilities.	\$ 28.59	15.30

* PLUM0248-003 06/01/2015

BOYD, CARTER, ELLIOTT, GREENUP, LEWIS & ROWAN COUNTIES:

	Rates	Fringes
Plumber and Steamfitter.....	\$ 34.00	19.04

PLUM0392-007 06/01/2014

BRACKEN, CARROLL (Eastern Half), GALLATIN, GRANT, MASON, OWEN &
ROBERTSON COUNTIES:

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 29.80	17.79

PLUM0502-003 08/01/2013

BRECKINRIDGE, BULLITT, CARROLL (Western Half), FRANKLIN

(Western three-fourths), GRAYSON, HARDIN, HENRY, JEFFERSON,
LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE &
WASHINGTON COUNTIES

	Rates	Fringes
PLUMBER.....	\$ 32.00	17.17

SUKY2010-160 10/08/2001		

	Rates	Fringes
Truck drivers:		
GROUP 1.....	\$ 16.57	7.34
GROUP 2.....	\$ 16.68	7.34
GROUP 3.....	\$ 16.86	7.34
GROUP 4.....	\$ 16.96	7.34

TRUCK DRIVER CLASSIFICATIONS

- GROUP 1 - Mobile Batch Truck Tender
- GROUP 2 - Greaser; Tire Changer; & Mechanic Tender
- GROUP 3 - Single Axle Dump; Flatbed; Semi-trailer or Pole Trailer when used to pull building materials and equipment; Tandem Axle Dump; Distributor; Mixer; & Truck Mechanic
- GROUP 4 - Euclid & Other Heavy Earthmoving Equipment & Lowboy; Articulator Cat; 5-Axle Vehicle; Winch & A-Frame when used in transporting materials; Ross Carrier; Forklift when used to transport building materials; & Pavement Breaker

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.
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END OF GENERAL DECISION

Fringe benefit amounts are applicable for all hours worked except when otherwise noted.

These rates are listed pursuant to the Kentucky Determination No. CR-15-III- HWY dated July 20, 2015.

No laborer, workman or mechanic shall be paid at a rate less than that of a Journeyman except those classified as bona fide apprentices.

Apprentices or trainees shall be permitted to work as such subject to Administrative Regulations adopted by the Commissioner of Workplace Standards. Copies of these regulations will be furnished upon request from any interested person.

Before using apprentices on the job the contractor shall present to the Contracting Officer written evidence of registration of such employees in a program of a State apprenticeship and training agency approved and recognized by the U. S. Bureau of Apprenticeship and Training. In the absence of such a State agency, the contractor shall submit evidence of approval and registration by the U. S. Bureau of Apprenticeship and Training.

The contractor shall submit to the Contracting Officer, written evidence of the established apprenticeship-journeyman ratios and wage rates in the project area, which will be the basis for establishing such ratios and rates for the project under the applicable contract provisions.

TO: EMPLOYERS/EMPLOYEES

PREVAILING WAGE SCHEDULE:

The wages indicated on this wage schedule are the least permitted to be paid for the occupations indicated. When an employee works in more than one classification, the employer must record the number of hours worked in each classification at the prescribed hourly base rate.

OVERTIME:

Overtime is to be paid after an employee works eight (8) hours a day or forty (40) hours a week, whichever gives the employee the greater wages. At least time and one-half the base rate is required for all overtime. A laborer, workman or mechanic and an employer may enter into a written agreement or a collective bargaining agreement to work more than eight (8) hours a calendar day but not more than ten (10) hours a calendar day for the straight time hourly rate. Wage violations or questions should be directed to the designated Engineer or the undersigned.

Director
Division of Construction Procurement
Frankfort, Kentucky 40622
502-564-3500

PART IV

INSURANCE

INSURANCE

The Contractor shall procure and maintain the following insurance in addition to the insurance required by law:

- 1) Commercial General Liability-Occurrence form – not less than \$2,000,000 General aggregate, \$2,000,000 Products & Completed Aggregate, \$1,000,000 Personal & Advertising, \$1,000,000 each occurrence.
- 2) Automobile Liability- \$1,000,000 per accident
- 3) Employers Liability:
 - a) \$100,000 Each Accident Bodily Injury
 - b) \$500,000 Policy limit Bodily Injury by Disease
 - c) \$100,000 Each Employee Bodily Injury by Disease
- 4) The insurance required above must be evidenced by a Certificate of Insurance and this Certificate of Insurance must contain one of the following statements:
 - a) "policy contains no deductible clauses."
 - b) "policy contains _____ (amount) deductible property damage clause but company will pay claim and collect the deductible from the insured."
- 5) KENTUCKY WORKMEN'S COMPENSATION INSURANCE. The contractor shall furnish evidence of coverage of all his employees or give evidence of self-insurance by submitting a copy of a certificate issued by the Workmen's Compensation Board.

The cost of insurance is incidental to all contract items. All subcontractors must meet the same minimum insurance requirements.

PART V

BID ITEMS

Section: 0001 - PAVING

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0010	00003		CRUSHED STONE BASE	270.00	TON		\$	
0020	00212		CL2 ASPH BASE 1.00D PG64-22	104.00	TON		\$	
0030	00301		CL2 ASPH SURF 0.38D PG64-22	22.00	TON		\$	

Section: 0002 - ROADWAY

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0040	00524		STORM SEWER PIPE-24 IN	164.00	LF		\$	
0050	01756		MANHOLE TYPE A	3.00	EACH		\$	
0060	01791		ADJUST MANHOLE FRAME TO GRADE	1.00	EACH		\$	
0070	01810		STANDARD CURB AND GUTTER	347.00	LF		\$	
0080	01812		REMOVE CURB AND GUTTER	345.00	LF		\$	
0090	02242		WATER	1.00	MGAL		\$	
0100	02351		GUARDRAIL-STEEL W BEAM-S FACE	362.50	LF		\$	
0110	02367		GUARDRAIL END TREATMENT TYPE 1	1.00	EACH		\$	
0120	02381		REMOVE GUARDRAIL	39.00	LF		\$	
0130	02545		CLEARING AND GRUBBING 3.0 ACRES	1.00	LS		\$	
0140	02562		TEMPORARY SIGNS	54.00	SQFT		\$	
0150	02650		MAINTAIN & CONTROL TRAFFIC	1.00	LS		\$	
0160	02701		TEMP SILT FENCE	1,086.00	LF		\$	
0170	02703		SILT TRAP TYPE A	2.00	EACH		\$	
0180	02704		SILT TRAP TYPE B	2.00	EACH		\$	
0190	02705		SILT TRAP TYPE C	3.00	EACH		\$	
0200	02706		CLEAN SILT TRAP TYPE A	6.00	EACH		\$	
0210	02707		CLEAN SILT TRAP TYPE B	6.00	EACH		\$	
0220	02708		CLEAN SILT TRAP TYPE C	6.00	EACH		\$	
0230	02720		SIDEWALK-4 IN CONCRETE	189.00	SQYD		\$	
0240	02721		REMOVE CONCRETE SIDEWALK	185.00	SQYD		\$	
0250	02726		STAKING	1.00	LS		\$	
0260	02775		ARROW PANEL	1.00	EACH		\$	
0270	05952		TEMP MULCH	8,088.00	SQYD		\$	
0280	05953		TEMP SEEDING AND PROTECTION	809.00	SQYD		\$	
0290	05963		INITIAL FERTILIZER	.12	TON		\$	
0300	05964		20-10-10 FERTILIZER	.20	TON		\$	
0310	05985		SEEDING AND PROTECTION	8,088.00	SQYD		\$	
0320	05992		AGRICULTURAL LIMESTONE	2.40	TON		\$	
0330	21289ED		LONGITUDINAL EDGE KEY	341.00	LF		\$	
0340	40026		EMBANKMENT IN PLACE	5,669.00	CUYD		\$	

Section: 0003 - BRIDGE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0350	02998		MASONRY COATING	1,908.00	SQYD		\$	
0360	08001		STRUCTURE EXCAVATION-COMMON	342.00	CUYD		\$	

Report Date 9/29/15

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0370	08100		CONCRETE-CLASS A	332.00	CUYD		\$	
0380	08104		CONCRETE-CLASS AA	125.00	CUYD		\$	
0390	08150		STEEL REINFORCEMENT	52,281.00	LB		\$	
0400	08151		STEEL REINFORCEMENT-EPOXY COATED	33,206.00	LB		\$	
0410	08672		PRECAST PC BOX BEAM SB42	795.00	LF		\$	
0420	20743ED		DRILLED SHAFT 54 IN-SOLID ROCK	40.00	LF		\$	
0430	20744ED		DRILLED SHAFT 60 IN-COMMON	14.00	LF		\$	
0440	20745ED		ROCK SOUNDINGS	144.00	LF		\$	
0450	20746ED		ROCK CORINGS	330.00	LF		\$	
0460	22839NN		CSL TESTING	7.00	EACH		\$	
0470	23000EX		DRILLED SHAFT-66 IN (ROCK) SOLID ROCK	70.00	LF		\$	
0480	23248EC		DRILLED SHAFT-36 IN COMMON	39.00	LF		\$	
0490	23249EC		DRILLED SHAFT-72 IN COMMON	84.00	LF		\$	
0500	23768EC		DRILLED SHAFT-30 IN-SOLID ROCK	15.00	LF		\$	

Section: 0004 - SEWERLINE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0510	02220		FLOWABLE FILL	6.00	CUYD		\$	
0520	02701		TEMP SILT FENCE	1,200.00	LF		\$	
0530	02705		SILT TRAP TYPE C	4.00	EACH		\$	
0540	15000		S BYPASS PUMPING	1.00	EACH		\$	
0550	15023		S ENCASEMENT STEEL OPEN CUT RANGE 4	310.00	LF		\$	
0560	15092		S MANHOLE	18.00	EACH		\$	
0570	15093		S MANHOLE ABANDON/REMOVE	3.00	EACH		\$	
0580	15112		S PIPE PVC 08 INCH	2,017.00	LF		\$	

Section: 0005 - MISCELLANEOUS - PED WALKWAY

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0590	50001		PEDESTRIAN WALKWAY	1.00	LS		\$	
0600	50003		ELECTRICAL	1.00	LS		\$	

Section: 0006 - MISCELLANEOUS - TOWER

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0610	50000		TOWER ELEVATOR STRUCTURE	1.00	LS		\$	

Section: 0007 - MISCELLANEOUS - HVAC MECH

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0620	50002		HVAC MECHANICAL	1.00	LS		\$	

151064

PROPOSAL BID ITEMS

Report Date 9/29/15

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Section: 0008 - DEMOBILIZATION & MOBILIZATION

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0630	02568		MOBILIZATION	1.00	LS		\$	
0640	02569		DEMOBILIZATION	1.00	LS		\$	