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**COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET**

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DESIGN MEMORANDUM NO. 02-17 AND CONSTRUCTION MEMORANDUM NO. 01-17

TO: Chief District Engineers
Design Engineers
Active Consultants

FROM: William S. Gulick, P.E., Director
Division of Highway Design

Ryan C. Griffith, P.E., Director
Division of Construction

DATE: January 24, 2017

SUBJECT: Revision of Special Provision 69
Standard Drawing RGX-100
Standard Drawing, RGX-105

Special Provision 69, Standard Drawing RGX-100, and Standard Drawing RGX-105 have been revised as included with this memo. Design Engineers should review and start implementing these changes immediately. The changes primarily concern the Pile Cores and placement of the Structure Granular Backfill. Pile Cores of any type will no longer be a separate pay item, but included with the embankment in place, roadway excavation, or other earthwork/granular items as applicable to each project. The material and construction requirements for the pile core are outlined in Special Provision 69 and are dependent on the material used to construct the embankments unless otherwise specified in the plans. At bridge end bents, Roadway Design Engineers should consistently calculate the volume of fill material out to the toe of slope in front of the bent.

As the volume of Pile Core is now included with earthwork items; Perforated Pipe-4 IN, Fabric-Geotextile Type I and Fabric-Geotextile Type IV are all now incidental items relative to work items under Special Provision 69.

The pay items now associated with Special Provision 69 work items are Granular Embankment (only when called for in the plans, such as when required for slope stability), Structural Granular Backfill, Perforated Pipe-8 IN, and Perforated Pipe Headwall-8 IN.



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The revised drawings for Standard Drawings RGX-100 and RGX-105 will become sepias until the next Standard Drawings are issued. They may be obtained from the sepia list here:

<http://transportation.ky.gov/Highway-Design/Pages/Sepias2016.aspx>

Special Provision 69 can be obtained here:

<http://transportation.ky.gov/Construction/Pages/Special-Notes--Special-Provisions.aspx>

WSG/RCG/jjf

Attachments

SPECIAL PROVISION FOR EMBANKMENT AT BRIDGE END BENT STRUCTURES

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

1.0 DESCRIPTION. Construct a soil, granular, or rock embankment with soil, granular or cohesive pile core and place structure granular backfill, as the Plans require. Construct the embankment according to the requirements of this Special Provision, the Plans, Standard Drawings RGX 100 and 105, and the Standard Specifications, Current Edition.

2.0 MATERIALS.

2.1 Granular Embankment. Conform to Subsection 805.10. When Granular Embankment materials are erodible or unstable according to Subsection 805.03.04, use the Special Construction Methods found in 3.2 of the Special Provision.

2.2 Rock Embankment. Provide durable rock from roadway excavation that consists principally of Unweathered Limestone, Durable Shale (SDI equal to or greater than 95 according to KM 64-513), or Durable Sandstone.

2.3 Pile Core. Provide a pile core in the area of the embankments where deep foundations are to be installed unless otherwise specified. The Pile Core is the zone indicated on Standard Drawings RGX 100 and 105 designated as Pile Core. Material control of the pile core area during embankment construction is always required. Proper Pile Core construction is required for installation of foundation elements such as drilled or driven piles or drilled shafts. The type of material used to construct the pile core is as directed in the plans or below. Typically, the pile core area will be constructed from the same material used to construct the surrounding embankment. Pile Core can be classified as one of three types:

A) Pile Core - Conform to Section 206 of the Standard Specifications. Provide pile core material consisting of the same material as the adjacent embankment except the material in the pile core area shall be free of boulders or particle sizes larger than 4 inches in any dimension or any other obstructions that may hinder pile driving operations. If the pile core material hinders pile driving operations, take the appropriate means necessary to reach the required pile tip elevation, at no expense to the Department.

B) Granular Pile Core. Granular pile core is required only when specified in the plans. Select a gradation of durable rock to facilitate pile driving that conforms to Subsection 805.11. If granular pile core material hinders pile driving operations, take appropriate means necessary to reach the required pile tip elevation, at no expense to the Department.

C) Cohesive Pile Core. Cohesive Pile Core is required only when specified in the plans. Conform to Section 206 of the Standard Specifications and use soil with at least 50 percent passing a No. 4 sieve having a minimum Plasticity Index (PI) of 10. In addition, keep the cohesive pile core free of boulders, larger than 4 inches in any dimension, or any other obstructions, which would interfere with drilling operations. If cohesive pile core material interferes with drilling operations, take appropriate means necessary to maintain

excavation stability, at no expense to the Department.

2.4 Structure Granular Backfill. Conform to Subsection 805.11

2.5 Geotextile Fabric. Conform to Type I or Type IV in Section 214 and 843.

3.0 CONSTRUCTION.

3.1 General. Construct roadway embankments at end bents according to Section 206 and in accordance with the Special Provision, the Plans, and Standard Drawings for the full embankment section. In some instances, granular or rock embankment will be required for embankment construction for stability purposes, but this Special Provision does not prevent the use of soil when appropriate. Refer to the plans for specific details regarding material requirements for embankment construction.

Place and compact the pile core and structure granular backfill according to the applicable density requirements for the project. If the embankment and pile core are dissimilar materials (i.e., a granular pile core is used with a soil embankment or a cohesive pile core is used with a granular embankment), a Geotextile Fabric, Type IV, will be required between the pile core and embankment in accordance with Sections 214 and 843 of the Standard Specifications.

When granular or rock embankment is required for embankment construction, conform to the general requirements of Subsection 206.03.02 B. In addition, place the material in no greater than 2-foot loose lifts and compact with a vibrating smooth wheel roller capable of producing a minimum centrifugal force of 15 tons. Apply these requirements to the full width of the embankment for a distance of half the embankment height or 50 feet, whichever is greater, as shown on Standard Drawing RGX-105.

When using granular pile core, install 8-inch perforated underdrain pipe at or near the elevation of the original ground in the approximate locations depicted on the standard drawing, and as the Engineer directs, to ensure positive drainage of the embankment. Wrap the perforated pipe with a fabric of a type recommended by the pipe manufacturer.

After constructing the embankment, excavate for the end bent cap, drive piling, install shafts or other foundation elements, place the mortar bed, construct the end bent, and complete the embankment to finish grade according to the construction sequence shown on the Plans or Standard Drawings and as specified hereinafter.

Certain projects may require widening of existing embankments and the removal of substructures. Construct embankment according to the plans. Substructure removal shall be completed according to the plans and Section 203. Excavation may be required at the existing embankment in order to place the structure granular backfill as shown in the Standard Drawings.

After piles are driven or shafts installed (see design drawings), slope the bottom of the excavation towards the ends of the trench as noted on the plans for drainage. Using a separate pour, place concrete mortar, or any class concrete, to provide a base for forming and placing the cap. Place side forms for the end bent after the mortar has set sufficiently to support workmen and forms without being disturbed.

Install 4-inch perforated pipe in accordance with the plans and Standard Drawings. In the event slope protection extends above the elevation of the perforated pipe, extend the pipe through the slope protection.

After placing the end bent cap and achieving required concrete cylinder strengths, remove adjacent forms and fill the excavation with compacted structure granular backfill material (maximum 1' loose lifts) to the level of the berm prior to placing beams for the bridge. Place Type IV geotextile fabric between embankment material and structure granular backfill. After completing the end bent backwall, or after completing the span end

wall, place the compacted structure granular backfill (maximum 1' loose lifts) to subgrade elevation. If the original excavation is enlarged, fill the entire volume with compacted structure granular backfill (maximum 1' loose lifts) at no expense to the Department. Do not place backfill before removing adjacent form work. Place structure granular backfill material in trench ditches at the ends of the excavation. Place Geotextile Fabric, Type IV over the surface of the compacted structure granular backfill prior to placing aggregate base course.

Tamp the backfill with hand tampers, pneumatic tampers, or other means approved by the Engineer. Thoroughly compact the backfill under the overhanging portions of the structure to ensure that the backfill is in intimate contact with the sides of the structure.

Do not apply seeding, sodding, or other vegetation to the exposed granular embankment.

3.2 Special Construction Methods. Erodible or unstable materials may erode even when protected by riprap or channel lining; use the special construction method described below when using these materials.

Use fine aggregates or friable sandstone granular embankment at "dry land" structures only. Do not use them at stream crossings or locations subject to flood waters.

For erodible or unstable materials having 50 percent or more passing the No. 4 sieve, protect with geotextile fabric. Extend the fabric from the original ground to the top of slope over the entire area of the embankment slopes on each side of, and in front of, the end bent. Cover the fabric with at least 12 inches of non-erodible material.

For erodible or unstable materials having less than 50 percent passing a No. 4 sieve, cover with at least 12 inches of non-erodible material.

Where erodible or unstable granular embankment will be protected by riprap or channel lining, place Type I geotextile fabric between the embankment and the specified slope protection.

4.0 MEASUREMENT.

4.1 Granular Embankment. The Department will measure the quantity in cubic yards using the plan quantity, increased or decreased by authorized adjustments as specified in Section 204. The Department will not measure for payment any Granular Embankment that is not called for in the plans.

The Department will not measure for payment any special construction caused by using erodible or unstable materials and will consider it incidental to the Granular Embankment regardless of whether the erodible or unstable material was specified or permitted.

4.2 Rock Embankment. The Department will not measure for payment any rock embankment and will consider it incidental to roadway excavation or embankment in place, as applicable. Rock embankments will be constructed using granular embankment on projects where there is no available rock present within the excavation limits of the project.

4.3 Pile Core. Pile core will be measured and paid under roadway excavation, embankment in place, or other earthwork/granular items, as applicable. The Department will not measure the pile core for separate payment. The Department will measure for payment the 8-inch perforated underdrain pipes including headwalls. See Roadway Plans.

4.4 Structure Granular Backfill. The Department will measure the quantity in cubic yards using the plan quantity, increased or decreased by authorized adjustments as specified in Section 204. The Department will not measure any additional material required for backfill outside the limits shown on the Plans and Standard Drawings for payment and will

consider it incidental to the work.

The Department will not measure for payment the 4-inch perforated underdrain pipe and will consider it incidental to the Structure Granular Backfill.

4.5 Geotextile Fabric. The Department will not measure the quantity of fabric used for separating dissimilar materials when constructing the embankment and pile core and will consider it incidental to embankment construction.

The Department will not measure for payment the Geotextile Fabric used to separate the Structure Granular Backfill from the embankment and aggregate base course and will consider it incidental to Structure Granular Backfill.

The Department will not measure for payment the Geotextile Fabric required for construction with erodible or unstable materials and will consider it incidental to embankment construction.

4.6 End Bent. The Department will measure the quantities according to the Contract. The Department will not measure furnishing and placing the 2-inch mortar or concrete bed for payment and will consider it incidental to the end bent construction.

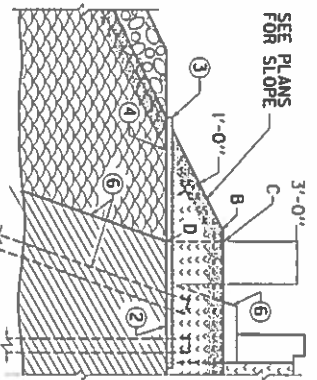
4.7 Structure Excavation. The Department will not measure structure excavation on new embankments for payment and will consider it incidental to the Structure Granular Backfill or Concrete as applicable.

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

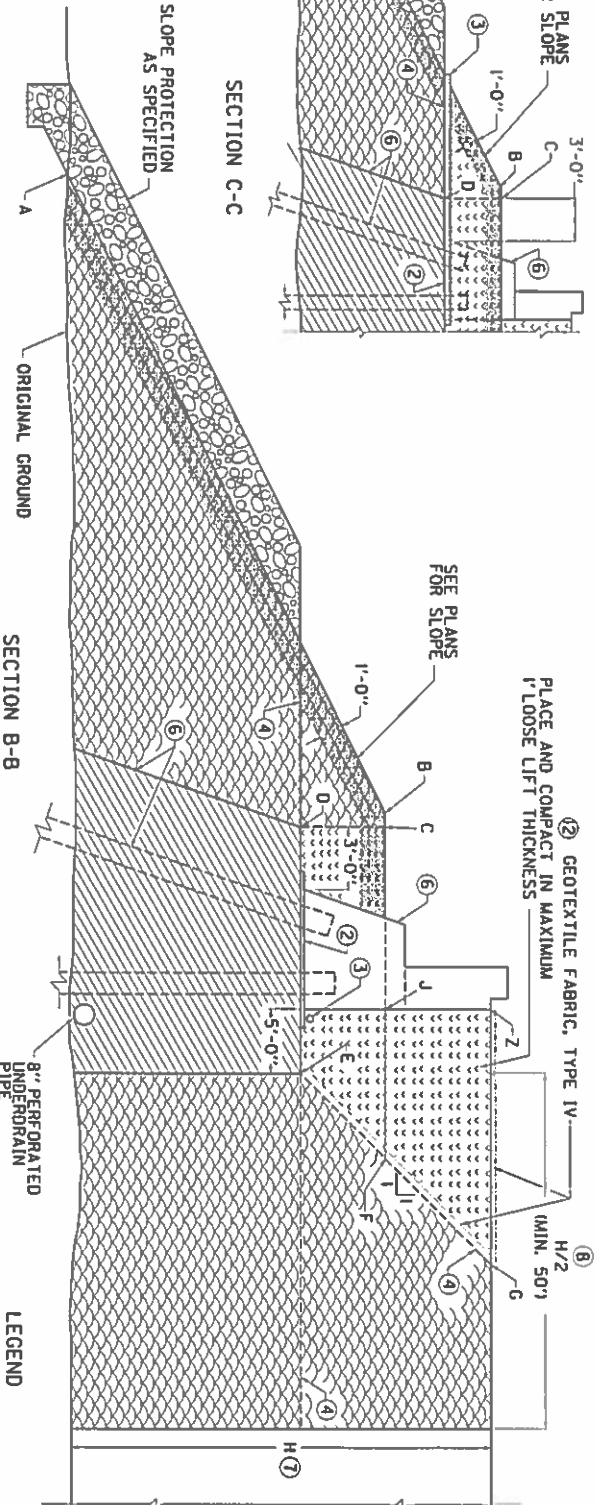
<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
02223	Granular Embankment	Cubic Yards
02231	Structure Granular Backfill	Cubic Yards
01002	Perforated Pipe – 8 IN	Linear Feet
01022-01034	Perforated Pipe Headwall, TY, Size	Each

The Department will consider payment as full compensation for all work required in this provision.

September 16, 2016





SECTION C-C



SECTION B-B

~ NOTES ~

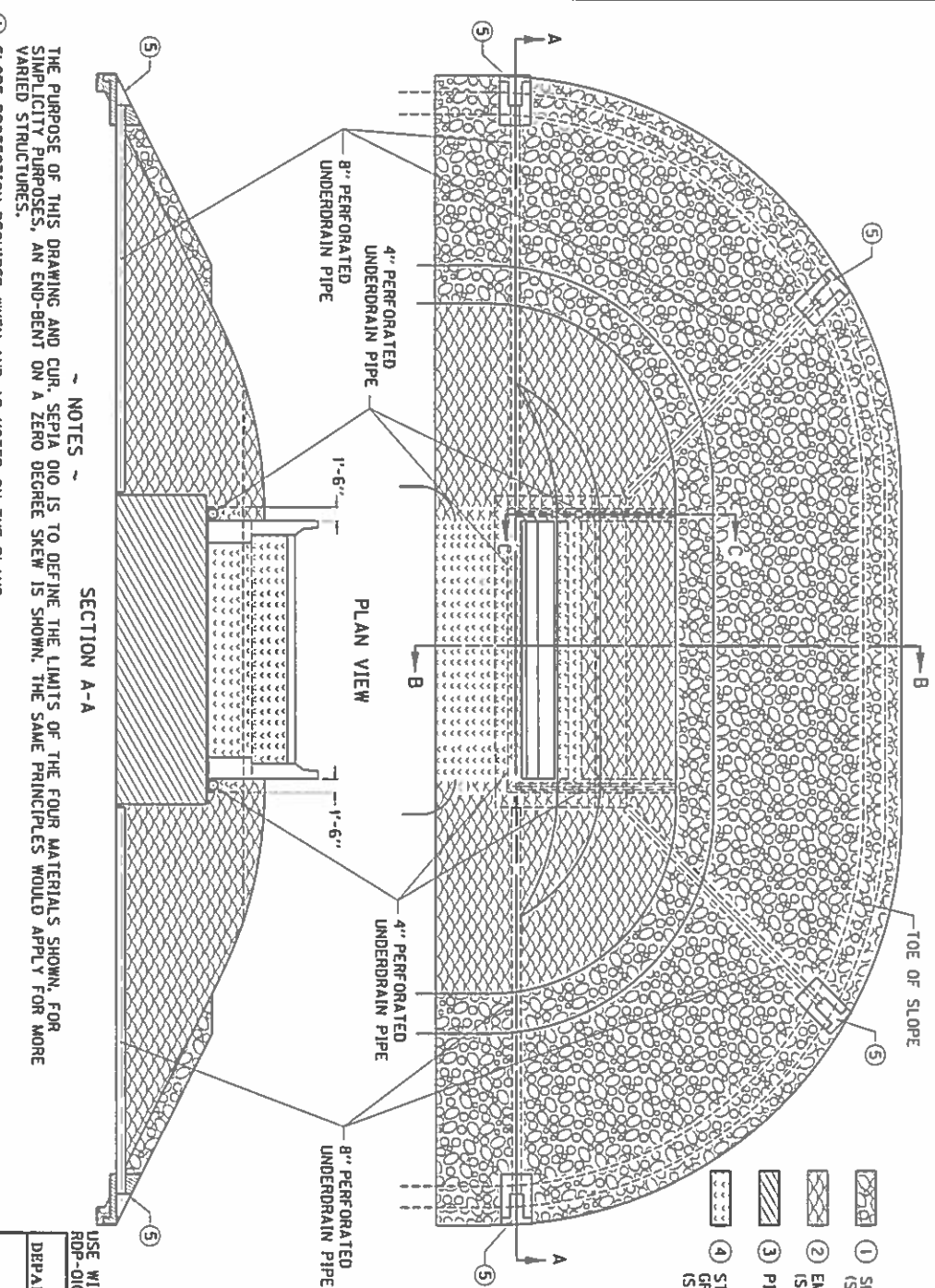
- BID ITEMS AND UNIT TO BID
 GRANULAR EMBANKMENT CU YD
 STRUCTURE GRANULAR BACKFILL CU YD
- CONSTRUCTION SEQUENCE "A"**
1. CONSTRUCT EMBANKMENT TO SLOPES A, B, F, AND G SUCH THAT NO UNCOMPACTED OR LOOSE MATERIAL SHALL REMAIN.
 2. EXCAVATE FOR END-BENT TO C, D, E, AND F.
 3. INSTALL PILES FOR OTHER FOUNDATION.
 4. PLACE 2" MORTAR BED OR ANY CLASS CONCRETE.
 5. CONSTRUCT CONCRETE END-BENT.
 6. INSTALL 4" PERFORATED UNDERDRAIN PIPE AND BACKFILL.
 7. BACKFILL TO C, D, E, F, G, Z, AND J WITH COMPACTED STRUCTURE GRANULAR BACKFILL.
- ① CONSTRUCTION SEQUENCE "B"**
1. CONSTRUCT EMBANKMENT TO TEMPORARY SLOPE ④.
 2. INSTALL PILES FOR OTHER FOUNDATION.
 3. PLACE 2" MORTAR BED OR ANY CLASS CONCRETE.
 4. CONSTRUCT CONCRETE END-BENT.
 5. INSTALL 4" PERFORATED UNDERDRAIN PIPE AND BACKFILL.
 6. BACKFILL TO FINISHED GRADE IN ACCORDANCE WITH SPECIAL PROVISION NO. 69.

- ① CONSTRUCTION SEQUENCE "B" IS A PERMITTED ALTERNATE ONLY WHEN GRANULAR OR ROCK EMBANKMENT IS UTILIZED.
- ② 2" MORTAR BED OR ANY CLASS CONCRETE.
- ③ 4" PERFORATED UNDERDRAIN PIPE WRAPPED WITH GEOTEXTILE FABRIC FOR DRAINING THE EXCAVATED TRENCH AND STRUCTURE GRANULAR BACKFILL.
- ④ ACCEPTABLE ALTERNATES FOR TEMPORARY SLOPE (CONSTRUCTION SEQUENCE "B").
5. SHADED PORTIONS  AND  REPRESENT LIMITS OF NON-ERODIBLE GRANULAR EMBANKMENT IN ACCORDANCE WITH SPECIAL PROVISION NO. 69.
- ⑥ SLOPES ARE EQUAL.
- ⑦ "H" = EMBANKMENT HEIGHT MEASURED FROM SUBGRADE ELEVATION AT POINT (D) TO THE LOWEST ELEVATION AT THE TOE OF THE SLOPE.
- ⑧ LIMITS OF EMBANKMENT CONSTRUCTION (H/2 OR 50' MIN.) REQUIRING 2" MAXIMUM LIFT THICKNESS FOR GRANULAR OR ROCK EMBANKMENTS.
9. SEE CURRENT SPECIAL PROVISION NO. 69 FOR CONSTRUCTION AND MATERIAL REQUIREMENTS, METHOD OF MEASUREMENT AND BASIS OF PAYMENT.
10. STRUCTURE GRANULAR BACKFILL PLACED AS A COMPLETE SEPARATE OPERATION AFTER CONSTRUCTION OF ALL OTHER EMBANKMENT.
11. *NO INDIVIDUAL FRAGMENTS LARGER THAN 4 INCHES IN ANY DIMENSION PERMITTED WITHIN 3'-0" OF THE STRUCTURE.*
- ⑫ PLACE GEOTEXTILE FABRIC, TYPE IV PRIOR TO PLACING STRUCTURE GRANULAR BACKFILL AND AGGREGATE BASE COURSE.

LEGEND

-  SLOPE PROTECTION (SEE BRIDGE PLANS)
-  PILE CORE
-  STRUCTURE GRANULAR BACKFILL
-  EMBANKMENT

USE WITH SEP1A 009
DEPARTMENT OF HIGHWAYS KENTUCKY
TREATMENT OF EMBANKMENTS AT END-BENTS - DETAILS
DATE
SCALE
PROJECT NUMBER
DATE
010



SECTION A-A

THE PURPOSE OF THIS DRAWING AND CUR, SEPIA 010 IS TO DEFINE THE LIMITS OF THE FOUR MATERIALS SHOWN, FOR SIMPLICITY PURPOSES, AN END-BENT ON A ZERO DEGREE SKEW IS SHOWN. THE SAME PRINCIPLES WOULD APPLY FOR MORE VARIED STRUCTURES.

- ① SLOPE PROTECTION REQUIRED WHEN AND AS NOTED ON THE PLANS.
- ② GRANULAR OR ROCK EMBANKMENT REQUIRED WHEN AND AS NOTED ON THE PLANS.
- ③ PILE CORE IN ACCORDANCE WITH SPECIAL PROVISION NO. 69.
- ④ STRUCTURE GRANULAR BACKFILL REQUIRED AT ALL TIMES.
- ⑤ FOR HEADWALL CONSTRUCTION SEE CUR, STD. DWG RDP-010. (SEE ROADWAY PLANS)

- LEGEND
- ① SLOPE PROTECTION (SEE BRIDGE PLANS)
 - ② EMBANKMENT (SEE ROADWAY PLANS)
 - ③ PILE CORE
 - ④ STRUCTURE GRANULAR BACKFILL (SEE BRIDGE PLANS)

USE WITH CUR, STD. DWG. RDP-010, SEPIA 010 KENTUCKY DEPARTMENT OF HIGHWAYS

TREATMENT OF EMBANKMENTS AT END-BENTS

009