

See 2/1/2008 design memo: Implementation of Revised MDOT Pipe Culvert Material Design Criteria

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

Inter-Departmental Memorandum

TO: Design Team Leaders

DATE: May 9, 2001

FROM: John Pickering
Roadway Design Division Engr.

SUBJECT OR PROJECT NO: Pipe Policy

INFORMATION COPY TO:

COUNTY:

Assistant Roadway Design Division Engineer (Purvis)
Roadway Design Section Engineers
Active Consultants
State Construction Engineer (Russell)
Specifications Engineer (Funchess)
Engineer Division Administrator (Brumfield)
Assistant Chief Engineer - Pre-Construction (McMahen)
Assistant Chief Engineer – Operations (Ruff)
State Research Engineer (Portera)
District Engineers
Files

Please find a copy of the revised MDOT Pipe Culvert Material Design Criteria attached to this memo. All projects which have not had the drainage recapped shall adhere to this policy. All other projects shall be revised on a case by case basis. Please see attached fact sheet, which outlines the changes to the policy, which will affect the design of projects.

Examples of how to illustrate the policy changes on the plan/profile, estimated quantities and summary of quantities sheets have been attached. If you have any questions concerning the examples, please contact Mr. Steve Reeves in RWD's Quality Control section

If you have any questions, please advise.

JBP/swr
Attachments

FACT SHEET

1. Poly vinyl chloride (PVC) pipe has been added to alternate pipe.
2. Alternate pipes may be used as cross-drains on rural collectors and local roads where the Design Hourly Volume (DHV) is less than or equal to 200 and the pipe size is less than or equal to 36”.
3. PVC pipe may be used as an alternative side-drain pipe provided the exposed ends are protected from ultra-violet light exposure. This provision is part of the new pipe policy and the protection shall be provided by either contractor or supplier.
4. Alternate pipes may be used as storm-drains in locations outside the travel and auxiliary lanes and beyond the alignment of the curb and gutter inlets and the pipe size is less than or equal to 36”.
5. Pay item 907-603-ALT will be used for alternate pipes.
6. Roadway Design’s CADD files (English only) have been updated to include the new alternate pipe symbols and notes. Consultants can download these updated files from <ftp.its.state.ms.us/pub/mdot/ROADWAY/rwd/group> (Read about the update in the file jan01.txt). MDOT employees can view the details about the update at <http://rwdsrv001/mstation.htm> (January 2001) and follow the appropriate download instructions. CADD files have already been updated for Roadway Design employees.
7. Summary of quantities, estimated drainage, side drain recap and plan/profile sheets are included in this packet that show the changes in symbology and notes required to design plans in accordance with the revised pipe policy.
8. Pipe locations will be shown on the plan/profiles as they have been shown in the past. The difference will be that alternate pipes will be striped to differentiate between alternate pipe locations and concrete pipe locations. See plan/profile example sheets.

I. CROSS-DRAINS

- A. Design Life: 50 years
- B. Alternates to be considered
 - 1. Rural Collectors - where Design Hourly Volume (DHV) \leq 200 **and** pipe size \leq 36 inch (900 mm) diameter, alternates to be considered are:
 - a. Concrete
 - b. Galvanized steel (AASHTO Designation: M 36)
 - c. Galvanized steel bituminous-coated (AASHTO Designation: M 190)
 - d. Aluminized type 2 steel (AASHTO Designation: M 36)
 - e. Polymer-coated [250 μ m (10 mils) x 250 μ m (10 mils)] (AASHTO Designation: M 245)
 - f. Aluminum alloy (AASHTO Designation: M 196)
 - g. High Density Polyethylene (AASHTO Designation: M 294, Type S)
 - h. Poly (Vinyl Chloride) (PVC) (ASTM Designation: F 949)Minimum cover for alternates b-h shall be 12 inch (300 mm).
Alternates b-h shall be joined with systems approved by the standard specifications for cross-drain applications.
All alternates shall have concrete end sections.
 - 2. All other Collectors, urban or rural, where DHV and/or pipe size exceeds limits shown in number 1 above: concrete, but special design applications of metal structures may be considered when approved by the Chief Engineer.
 - 3. All other functional classifications: concrete only.

II. SIDE-DRAINS

- A. Design Life for all functional classifications:
Urban: 50 years Rural: 25 years
- B. Alternates to be considered are:
 - 1. Concrete
 - 2. Galvanized steel (AASHTO Designation: M 36)
 - 3. Galvanized steel bituminous-coated (AASHTO Designation: M 190)
 - 4. Aluminized type 2 steel (AASHTO Designation: M 36)
 - 5. Polymer-coated [250 μ m (10 mils) x 250 μ m (10 mils)] (AASHTO Designation: M 245)
 - 6. Aluminum alloy (AASHTO Designation: M 196)
 - 7. High Density Polyethylene (AASHTO Designation: M 294, Type S), \leq 36 inch (900 mm) diameter
 - 8. Poly (Vinyl Chloride) (PVC) (ASTM Designation: F 949)Minimum cover for alternates 2-8 shall be 12 inch (300 mm).
Alternates 2-8 shall be joined with systems approved by the standard specifications for side-drain applications.
Exposed ends of alternate 8 shall be protected from ultra-violet light exposure at no additional cost to the MDOT.

III. STORM-DRAINS

- A. Design Life: 50 years.
- B. For pipe sizes \leq 36 inch (900 mm) diameter, in locations outside the travel and auxiliary lanes **and** beyond the alignment of the curb and gutter inlets, alternates to be considered are:
 - 1. Concrete
 - 2. Galvanized steel (AASHTO Designation: M 36)
 - 3. Galvanized steel bituminous-coated (AASHTO Designation: M 190)
 - 4. Aluminized type 2 steel (AASHTO Designation: M 36)
 - 5. Polymer-coated [250 μ m (10 mils) x 250 μ m (10 mils)] (AASHTO Designation: M 245)
 - 6. Aluminum alloy (AASHTO Designation: M 196)
 - 7. High Density Polyethylene (AASHTO Designation: M 294, Type S)
 - 8. Poly (Vinyl Chloride) (PVC) (ASTM Designation: F 949)Minimum cover for alternates 2-8 shall be 12 inch (300 mm) where storm drain crosses a side street.
Alternates 2-8 shall be joined with systems approved by the standard specifications for storm drain applications.
All alternates shall have concrete end sections.
- C. For pipe sizes $>$ 36 inch (900 mm) diameter **and/or** locations under the travel and auxiliary lanes **and/or** locations within the alignment of the curb and gutter inlets, alternates to be considered: concrete only.

IV. UNDER-DRAINS

- A. Design Life: 50 years.
- B. For pipe sizes \leq 6 inch (150 mm) diameter:
 - 1. Concrete
 - 2. Galvanized steel (AASHTO Designation: M 36, Type III)
 - 3. Galvanized steel bituminous-coated (AASHTO Designation: M 190, Type A)
 - 4. Aluminized type 2 steel (AASHTO Designation: M 36, Type III)
 - 5. Polymer-coated [250 μ m (10 mils) x 250 μ m (10 mils)](AASHTO Designation: M 245, Type III)
 - 6. Aluminum alloy (AASHTO Designation: M 196, Type III)
 - 7. Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe (ASTM Designation: D 3034, for the pipe SDR number specified)
 - 8. Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe (ASTM Designation: D 2751, for the pipe SDR number specified)
 - 9. Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe (ASTM Designation: F 949, when the pipe SDR number is specified as 35 or greater)
 - 10. Corrugated Polyethylene (AASHTO Designation: M 252, Type S and/or Type SP)Alternates 2-10 shall be joined with systems approved by the standard specifications for under-drain applications.
For alternates 2-6, manufacturer must repair coating damage resulting from perforating pipe.

IV. UNDER-DRAINS (continued)

- C. For pipe sizes > 6 inch (150 mm) and ≤ 36 inch (900 mm) diameter and in locations outside the travel and auxiliary lanes, alternates to be considered are:
1. Concrete
 2. Galvanized steel (AASHTO Designation: M 36, Type III)
 3. Galvanized steel bituminous-coated (AASHTO Designation: M 190, Type A)
 4. Aluminized type 2 steel (AASHTO Designation: M 36, Type III)
 5. Polymer-coated [250 μm (10 mils) x 250 μm (10 mils)] (AASHTO Designation: M 245, Type III)
 6. Aluminum alloy (AASHTO Designation: M 196, Type III)
 7. High Density Polyethylene (AASHTO Designation: M 294, Type S and Type SP)
 8. Poly (Vinyl Chloride) (PVC) (ASTM Designation: F 949)
- Minimum cover for alternates 2-8 shall be 12 inch (300 mm).
Alternates 2-8 shall be joined with systems approved by the standard specifications for under-drain applications.
For alternates 2-6, manufacturer must repair coating damage resulting from perforating pipe.
All alternates shall have concrete end sections.

V. “ADD-ON” LIFE

The following “ADD-ON” life for protective or barrier coating will be:

<u>TYPE</u>	<u>YEARS</u>
A. Bituminous coated	3
B. Aluminized Type 2	10
C. Polymer Coated (0.25 μm [10 mils] each side)	20

VI. ADDITIONAL REQUIREMENTS FOR METAL PIPE

- A. The California Department of Transportation (CALTRANS) method is to be used to determine the life of steel culverts. The pipe life is time to first perforation.
- B. Aluminum Alloy Pipe is restricted to soil and water pH ranges between 5 and 9. The estimated life is as follows:
 1. Resistivity above 10,000 ohm centimeters 50 year life
 2. Resistivity between 1,500 to 10,000 25 year life
- C. Do not use steel pipe in marshy areas or other areas where standing water will be a common occurrence.
- D. Do not use steel pipe as cross-drains in locations where the pH is less than 4 and/or the resistivity is less than 10,000 ohm centimeters.
- E. Do not use Aluminum Alloy or Aluminized Type 2 Steel Pipe as cross-drains in locations where the pH is less than 5 or greater than 9 and/or the resistivity is less than 10,000 ohm centimeters.
- F. If the pH is less than 4 and/or the resistivity is less than 1000 ohm centimeters, steel pipe will not be considered for side-drains.
- G. If the slope of side-drains is greater than 4 percent and the velocity of flow through cross-drains is computed to be greater than 8 ft/sec (2.4 meters per second), specify paved inverts.

VII. BEDDING AND BACKFILL REQUIREMENTS FOR FLEXIBLE PIPE IN CROSS-DRAIN AND STORM-DRAIN APPLICATIONS

- A. When flexible pipe (pipes other than reinforced concrete) is used in these applications, material for pipe bedding and for backfill to a point 12 inch (300 mm) above the top of the pipe shall consist of granular material meeting the requirements of Classes 1 through 9 with the additional requirement that 100% of the material shall pass the 1.5 inch (37.5 mm) sieve.
- B. The cost of furnishing and placing granular material indicated in paragraph A above shall be included in the unit cost of the pipe, i.e., there will be no separate payment for flexible pipe bedding and backfill material.

		SIDE DRAINS								
WK. SH. NO.	STATION	SIZES								REMARKS
		LESS THAN 4 % (A)				4 % OR MORE (B)				
		18"	24"	30"	36"	18"	24"	30"	36"	
7	245+00						156'			LT
7	255+00		80'							RT.
7	263+20	76'								RT.
11	249+49	48'								LT
11	250+97					52'				RT.
11	255+65	52'								LT.
		L.F.	L.F.			L.F.	L.F.			
		176'	80'			52'	156'			

(A) ZINC COATED CORRUGATED METAL PIPE, 12 GAUGE (2 2/3" x 1/2") OR BITUMINOUS COATED CORRUGATED METAL PIPE, 14 GAUGE (2 2/3" x 1/2") OR ALUMINUM COATED CORRUGATED METAL PIPE, 16 GAUGE (2 2/3" x 1/2") OR REINFORCED CONCRETE PIPE, CLASS "III" OR CORRUGATED POLYETHYLENE PIPE OR POLY VINYL CHLORIDE (PVC) PIPE

(B) BITUMINOUS COATED PAVED INVERT CORRUGATED METAL PIPE, 14 GAUGE (2 2/3" x 1/2") OR ALUMINUM COATED PAVED INVERT CORRUGATED METAL PIPE, 16 GAUGE (2 2/3" x 1/2") OR REINFORCED CONCRETE PIPE, CLASS "III" OR CORRUGATED POLYETHYLENE PIPE OR POLY VINYL CHLORIDE (PVC) PIPE

		MISSISSIPPI DEPARTMENT OF TRANSPORTATION	
		ESTIMATED QUANTITY : SIDE DRAINS	
		WORKING NUMBER	EQ-3
DATE	DESIGN TEAM	CHECKED	DATE

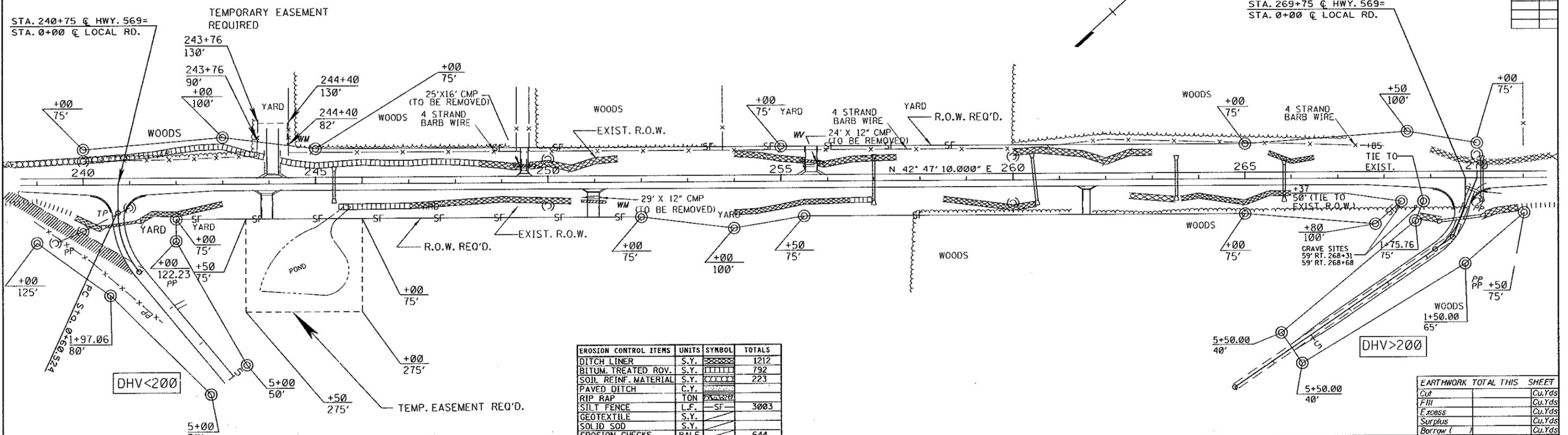
COUNTY:

PROJECT NO.:

DESIGN TEAM:

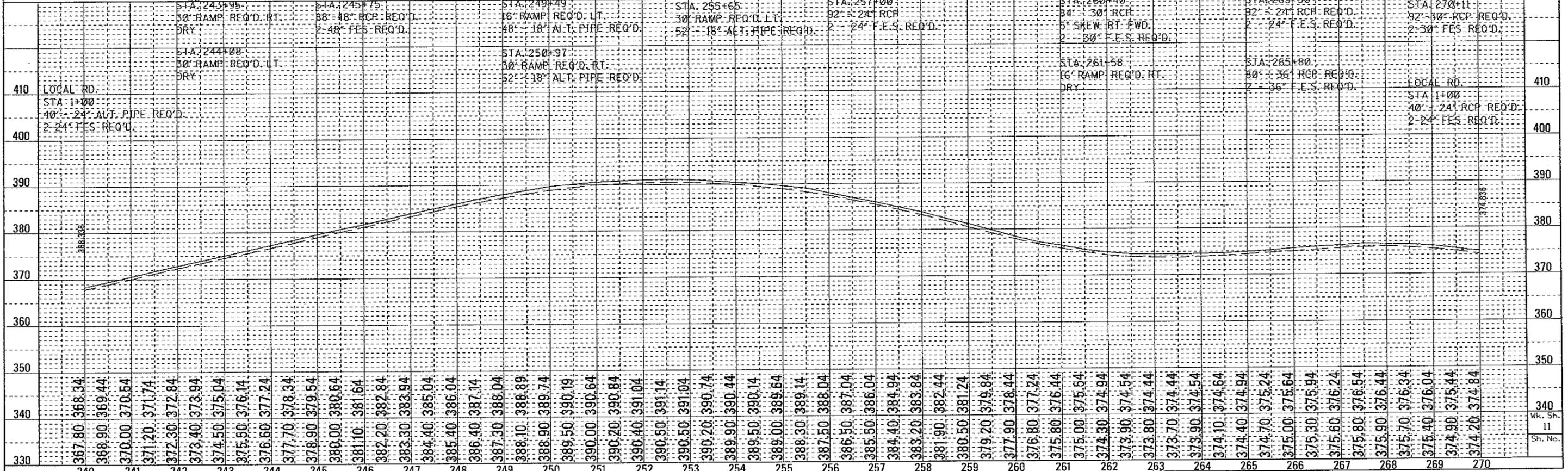
FILENAME:

REVISIONS	DATE	BY



EROSION CONTROL ITEMS	UNITS	SYMBOL	TOTALS
DITCH LINER	S.Y.	[Symbol]	1212
BITUM. TREATED ROV.	S.Y.	[Symbol]	792
SOIL REINF. MATERIAL	S.Y.	[Symbol]	223
PAVED DITCH	C.Y.	[Symbol]	
RIP RAP	TON	[Symbol]	
SILT FENCE	L.F.	SF	3003
GEOTEXTILE	S.Y.	[Symbol]	
SOLID SOD	S.Y.	[Symbol]	
EROSION CHECKS	BALE	[Symbol]	644

EARTHWORK TOTAL THIS SHEET	
Cut	Cu.Yds
Fill	Cu.Yds
Excess	Cu.Yds
Surplus	Cu.Yds
Borrow ()	Cu.Yds



PLAN-PROFILE
ROADWAY DESIGN DIVISION C.A.D.D. SECTION
MISSISSIPPI DEPARTMENT OF TRANSPORTATION

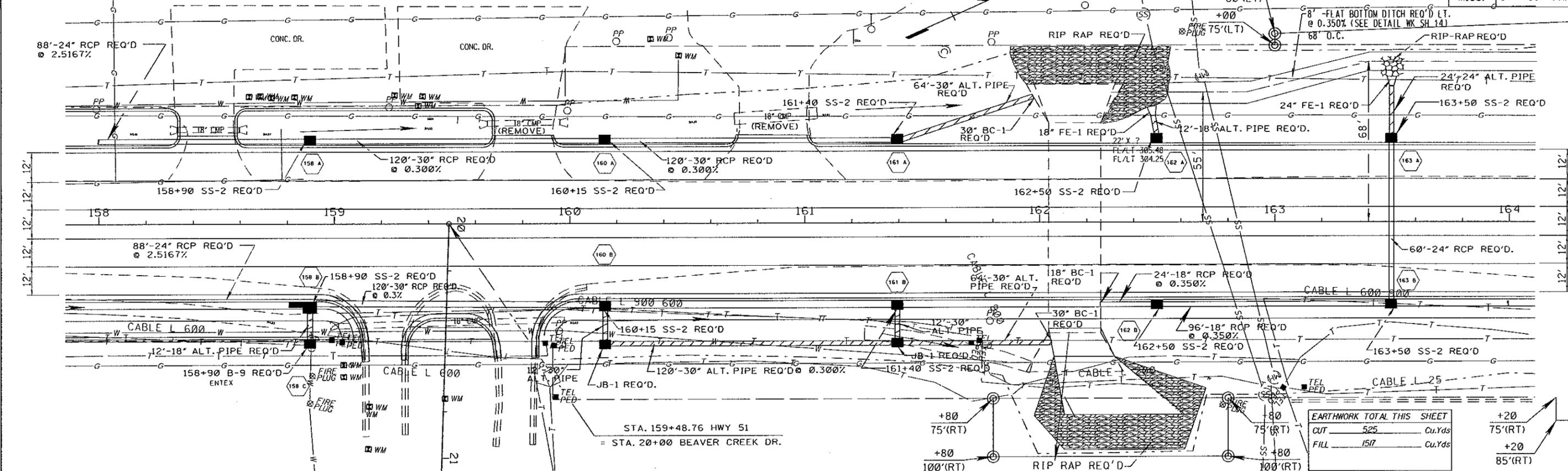
COUNTY: AMITE

PROJECT NO.: STP-0242-00(004)

DESIGN TEAM:

FILENAME: WK11.DGN

340
11
Sh. No.



EARTHWORK TOTAL THIS SHEET	
CUT	525 Cu.Yds
FILL	1517 Cu.Yds



Station	Description	Material	Quantity	Station	Description	Material	Quantity	Station	Description	Material	Quantity
158	88'-24" RCP REQ'D @ 2.5167%			159	120'-30" RCP REQ'D @ 0.300%			160	120'-30" RCP REQ'D @ 0.300%		
158	158+90 SS-2 REQ'D			159	158+90 SS-2 REQ'D			160	160+15 SS-2 REQ'D		
158	158+90 SS-2 REQ'D			160	160+15 SS-2 REQ'D			161	161+40 SS-2 REQ'D		
158	158+90 SS-2 REQ'D			161	161+40 SS-2 REQ'D			162	162+50 SS-2 REQ'D		
158	158+90 SS-2 REQ'D			162	162+50 SS-2 REQ'D			163	163+50 SS-2 REQ'D		
158	158+90 SS-2 REQ'D			163	163+50 SS-2 REQ'D			164	164+50 SS-2 REQ'D		
158	158+90 SS-2 REQ'D			164	164+50 SS-2 REQ'D						