To:		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 03-008

SUPERSEDED BY EB 03-029
EFFECTIVE 6/6/03

Title: **HIGHWAY DESIGN MANUAL**
CHAPTER 8 HIGHWAY DRAINAGE
TABLE 8-35 STRUCTURAL CRITERIA FOR REINFORCED CONCRETE PIPE
TABLE 8-36 STRUCTURAL CRITERIA FOR REINFORCED CONCRETE ELLIPTICAL PIPE

Distribution:
- ☒ Manufacturers (18)
- ☒ Main Office (30)
- ☐ Local Govt. (31)
- ☒ Regions/Agencies (32)
- ☐ Surveyors (33)
- ☒ Consultants (34)
- ☒ Contractors (39)
- ☐ _____( )

Approved:

Philip J. Clark, Deputy Chief Engineer, Design — Date: 02/13/03

ADMINISTRATIVE INFORMATION:

- **Effective Date:** This Engineering Instruction (EI) is effective with projects submitted for the letting of September 11, 2003.
- **Superseded Issuances:** This EI supersedes Highway Design Manual (HDM) Chapter 8, Appendix A, Table 8-35, Structural Criteria for Reinforced Concrete Pipe, and Table 8-36, Structural Criteria for Reinforced Concrete Elliptical Pipe, dated 6/23/97.
- **Disposition of Issued Materials:** Tables 8-35 and 8-36, transmitted with this EI, will be incorporated into a future revision to the HDM Chapter 8. In the interim, use the attached tables as indicated in this EI under Technical Information.

PURPOSE: This EI issues a table of revised values for Maximum Allowable Height of Cover for reinforced concrete pipe.

TECHNICAL INFORMATION:

- Actions: Use the attached tables until a revision to Chapter 8 of the HDM is issued.
- Guidance: Reinforced Concrete Pipe is to be installed in accordance with Standard Sheet M203-4R1, issued by EB 03-010.
- Information: The increased height of cover values for various sizes and classes of circular reinforced concrete pipe given in Table 8-35 result from favorable earth pressure distribution around the pipe where the material in the middle and outer bedding areas, the haunch areas and lower side areas are properly placed in accordance with Standard Sheet M203-4R1. Height of cover values are included for Controlled Low Strength Material (CLSM) backfill installed in accordance with Standard Sheet M204-1.
- Cost Impact: Reduced costs for circular reinforced concrete pipe are anticipated because greater heights of cover can be achieved with lower pipe classes; excavation quantities and associated labor costs are reduced when using CLSM backfill.
- Changes: Nonstandard practices (Method C - induced trench, and the concrete cradle bedding) are eliminated. Note that site-specific designs are still available through the Geotechnical Engineering Bureau for conditions where cover heights exceed the maximum allowable shown in the attached tables, and for shallow installations with less than minimum cover.

TRANSMITTED MATERIALS: Revised structural criteria for reinforced concrete pipe.

BACKGROUND: The revised criteria are based on Standard Installation criteria from Section 17 of the 16th Edition of the AASHTO Standard Specifications for Highway Bridges using the Heger pressure distribution. The new pressure distribution allows greater heights of cover in both trench and embankment conditions for circular pipe. The loose middle bedding must be properly prepared in order for the distribution to be valid.

CONTACT: Direct any questions concerning these changes to Gary E. Douglas in the Geotechnical Engineering Bureau at (518) 457-4791 or gdouglas@dot.state.ny.us.

Make the following changes to the *Highway Design Manual.*
Chapter 8, Appendix A, **delete** Table 8-35 dated 6/23/97 and **replace** with the following:

Table 8-35 Structural Criteria for Reinforced Concrete Pipe [1] (Page 1 of 2)

Diameter (mm)	Maximum Allowable Height of Cover [2,4] (m)											
	Trench Installation Methods A1 & A2 [3]								Embankment Installation Methods B1 & B2 [3]			
	Class II		Class III		Class IV		Class V		Class II	Class III	Class IV	Class V
	SGF	CLSM	SGF	CLSM	SGF	CLSM	SGF	CLSM				
300	4.5	6.0	6	7	9	10.75	11.5	12.75	5	6.5	10	14
375	4.5	6.5	6	8	9	11.00	11.5	14.00	5	6.5	10	14
450	4.5	6.75	6	8.5	9	11.75	11.5	15.25	5	6.5	10	14
525	4.5	6.75	6	9	9	12.50	11.5	16.00	5	6.5	10	14
600	4.5	7.00	6	9	9	13.00	11.5	16.75	5	6.5	10	14
675	4.5	7.00	6	9	9	13.00	11.5	16.75	5	6.5	10	14
750	4.5	7.00	6	9	9	13.00	11.5	16.75	5	6.5	10	14
825	4.5	7.00	6	9	9	12.75	11.5	16.75	5	6.5	10	14
900	4.5	7.00	6	9	9	12.75	11.5	16.50	5	6.5	10	14
1050	4.5	7.00	6	9	9	12.50	11.5	16.50	5	6.5	10	14
1200	4.5	7.00	6	8.75	9	12.50	11.5	16.25	5	6.5	10	14
1350	4.5	7.00	6	8.75	9	12.25	11.5	16.25	5	6.5	10	14
1500	4.5	7.00	6	8.5	9	12.25	11.5	16.00	5	6.5	10	14
1650	4.5	6.75	6	8.5	9	12.0	11.5	16.00	5	6.5	10	14

1. MS-23 Live Loading. The minimum distance between the top of the pavement and the top of the pipe shall be 0.6 m, to provide protection from live loading.
2. Maximum vertical distance between the top of the pipe and finished or surcharged grade.
3. Refer to Standard Sheet M203-4R1 "Installation Details for Reinforced Concrete Pipes."
4. Fill-height tables have been generated for the following conditions:
   a. Trenches backfilled with select granular fill (SGF), Vertical Arching Factor (VAF) =1.2 and Installation Type 2.
   b. Trenches backfilled with Controlled Low Strength Material (CLSM), Vertical Arching Factor (VAF) =1.2 and Installation Type 1.
   c. For embankment conditions, Vertical Arching Factor (VAF) =1.4 and Installation from average of Type 1 & Type 2.
5. Contact the Regional Geotechnical Engineer for site-specific designs (heights of cover greater than shown above, or shallow height of cover).

Make the following changes to the *Highway Design Manual.*
Chapter 8, Appendix A, **delete** Table 8-35 dated 6/23/97 and **replace** with the following:

Table 8-35 Structural Criteria for Reinforced Concrete Pipe [1] (Page 2 of 2)

Diameter (mm)	Maximum Allowable Height of Cover [2, 4] (m)											
	Trench Installation Methods A1 & A2 [3]								Embankment Installation Methods B1 & B2 [3]			
	Class II		Class III		Class IV		Class V		Class II	Class III	Class IV	Class V
	SGF	CLSM	SGF	CLSM	SGF	CLSM	SGF	CLSM				
1800	4.5	6.75	6	8.25	9	12.0	11.5	16.0	5	6.5	10	14
1950	4.5	6.5	6	8.25	9	12.00	11.5	15.75	5	6.5	10	14
2100	4.5	6.5	6	8	9	11.75	11.5	15.50	5	6.5	10	14
2250	4.5	6.5	6	8	9	11.75	11.5	15.50	5	6.5	10	14
2400	4.5	6.25	6	8	9	11.50	11.5	15.50	5	6.5	10	14
2550	4.5	6.25	6	8	9	11.50	11.5	15.25	5	6.5	10	14
2700	4.5	6.25	6	7.75	9	11.25	11.5	15.25	5	6.5	10	14
2850	Not Rec [6]		6	7.75	9	11.25	11.5	15.25	Not Rec [6]	6.5	10	14
3000	Not Rec [6]		6	7.75	9	11.25	11.5	15.25	Not Rec [6]	6.5	10	14
3150	Not Rec [6]		6	7.75	9	11.25	11.5	15.25	Not Rec [6]	6.5	10	14
3300	Not Rec [6]		6	7.75	9	11.25	11.5	15.00	Not Rec [6]	6.5	10	14
3450	Not Rec [6]		6	7.50	9	11.00	11.5	15.00	Not Rec [6]	6.5	10	14
3600	Not Rec [6]		6	7.50	9	11.00	11.5	15.00	Not Rec [6]	6.5	10	14

1. MS-23 Live Loading. The minimum distance between the top of the pavement and the top of the pipe shall be 0.6 m, to provide protection from live loading.
2. Maximum vertical distance between the top of the pipe and finished or surcharged grade.
3. Refer to Standard Sheet M203-4R1 "Installation Details for Reinforced Concrete Pipes."
4. Fill-height tables have been generated for the following conditions:
   a. Trenches backfilled with select granular fill (SGF), Vertical Arching Factor (VAF) =1.2 and Installation Type 2.
   b. Trenches backfilled with Controlled Low Strength Material (CLSM), Vertical Arching Factor (VAF) =1.2 and Installation Type 1.
   c. For embankment conditions, Vertical Arching Factor (VAF) =1.4 and Installation from average of Type 1 & Type 2.
5. Contact the Regional Geotechnical Engineer for site-specific designs (heights of cover greater than shown above, or shallow height of cover).
6. Pipe class and diameter combinations do not meet structural criteria, or are not manufactured.

Make the following changes to the *Highway Design Manual.*
Chapter 8, Appendix A, **delete** Table 8-36 dated 6/23/97 and **replace** with the following:

Table 8-36 Structural Criteria for Reinforced Concrete Elliptical Pipe[1]

Vertical Elliptical Pipe				Horizontal Elliptical Pipe				Equiv. Dia. (mm)
Rise X Span (mm)	Maximum Allowable Height of Cover[2] (m)			Rise X Span (mm)	Maximum Allowable Height of Cover[2](m)			
	Class VE-IV	Class VE-V	Class VE-VI		Class HE-II	Class HE-III	Class HE-IV	
Non-standard Shape				365 x 575	3	4	5	450
				490 x 770	3	4	5	600
				550 x 865	3	4	5	675
				610 x 960	3	4	5	750
				670 x 1 055	3	4	5	825
1 150 x 730	5	7	9	730 x 1 150	3	4	5	900
1 250 x 795	5	7	9	795 x 1 250	3	4	5	975
1 345 x 855	5	7	9	855 x 1 345	3	4	5	1 050
1 535 x 975	5	7	9	975 x 1 535	3	4	5	1 200
1 730 x 1 095	5	7	9	1 095 x 1 730	3	4	5	1 350
1 920 x 1 220	5	7	9	1 220 x 1 920	3	4	5	1 500
2 110 x 1 340	5	7	9	1 340 x 2 110	3	4	5	1 650
2 305 x 1 465	5	7	9	1 465 x 2 305	3	4	5	1 800
2 495 x 1 585	5	7	9	1 585 x 2 495	3	4	6	1 950
2 690 x 1 705	5	7	10	1 705 x 2 690	3	4	6	2 100
2 880 x 1 830	5	7	10	1 830 x 2 880	3	4	6	2 250
3 070 x 1 950	5	7	10	1 950 x 3 070	3	4	6	2 400
3 265 x 2 075	5	7	10	2 075 x 3 265	3	4	6	2 550
3 455 x 2 195	5	7	10	2 195 x 3 455	3	4	6	2 700

1. MS-23 Live Loading. The minimum distance between the top of the pavement and the top of the pipe shall be 0.6 m. (To provide protection for live loading.)
2. Maximum vertical distance between the top of the pipe and finished or surcharge grade for Installation Methods A, B-1, & B-2.
3. Refer to Standard Sheet M203-4R1 "Installation Details for Reinforced Concrete Pipes".
4. Contact the Regional Geotechnical Engineer for site-specific designs (heights of cover greater than shown above, or shallow height of cover).