$2\frac{2}{3}'' \times \frac{1}{2}''$ CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
0.8	12	1.0	100.0	1.0	100.0	1.0	100.0				
1.2	15	1.0	100.0	1.0	100.0	1.0	100.0				
1.8	18	1.0	100.0	1.0	100.0	1.0	100.0				
2.4	21	1.0	88.5	1.0	100.0	1.0	100.0				
3.1	24	1.0	77.5	1.0	96.8	1.0	100.0	1.0	100.0		
4.0	27	1.0	68.8	1.0	86.0	1.0	100.0	1.0	100.0		
4.9	30	1.0	62.0	1.0	77.4	1.0	100.0	1.0	100.0		
5.9	33			1.0	64.5	1.0	90.4	1.0	100.0		
7.1	36			1.0	64.5	1.0	90.4	1.0	100.0		
9.6	42					1.0	77.4	1.0	99.7		
12.6	48					1.0	66.7	1.0	86.6	1.0	100.0
15.9	54					1.0	54.4	1.0	70.8	1.0	87.6
19.6	60							1.0	57.6	1.0	71.6
23.8	66									1.0	57.7
28.3	72									1.0	45.5

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-01**

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Urenovich 11-15-99
DESIGN STANDARDS ENGINEER — DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER — DATE

ORIGINALLY APPROVED 1-02-98

$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
0.8	12	1.0	50.0	1.0	50.0	1.0	86.6				
1.2	15	1.0	40.0	1.0	40.0	1.0	69.3				
1.6	18	1.0	33.3	1.0	33.3	1.0	57.7				
2.4	21	1.0	28.5	1.0	28.5	1.0	49.5				
3.1	24	1.0	25.0	1.0	25.0	1.0	43.3	1.0	45.0		
4.0	27	1.0	22.2	1.0	22.2	1.0	38.5	1.0	40.0		
4.9	30	1.1	20.0	1.1	20.0	1.0	34.6	1.0	36.0		
5.9	33			1.2	16.6	1.0	28.8	1.0	30.0		
7.1	36			1.2	16.6	1.0	28.8	1.0	30.0		
9.5	42					1.0	50.0	1.0	52.3		
12.6	48					1.0	43.7	1.0	45.8	1.0	47.2
15.9	54					1.0	38.8	1.0	40.7	1.0	41.9
19.6	60							1.0	36.6	1.0	37.7
23.8	66									1.0	34.3
28.3	72									1.0	31.4

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-02**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Pirooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATED ALUMINUM ALLOY PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.060		0.075		0.105		0.135		0.164	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
$3/3\frac{1}{2}$	17	13	1.1	1.5	13.7	1.5	13.7	1.5	13.7				
$3/4\frac{1}{8}$	21	15	1.6	1.6	13.0	1.6	13.0	1.6	13.0				
$3/4\frac{7}{8}$	24	18	2.2	1.5	13.5	1.5	13.5	1.5	13.5				
$3/5\frac{1}{2}$	28	20	2.9	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0		
$3/6\frac{1}{8}$	35	24	4.5			1.6	13.0	1.6	13.0	1.6	13.0		
$3\frac{1}{2}/8\frac{1}{4}$	42	29	6.5			1.6	13.0	1.6	13.0	1.6	13.0		
$4/9\frac{5}{8}$	49	33	8.9			1.6	13.0	1.6	13.0	1.6	13.0		
5/11	57	38	11.6					1.6	12.8	1.6	12.8	1.6	12.8
$6/12\frac{3}{8}$	64	43	14.7							1.6	12.8	1.6	12.8
$7/13\frac{3}{4}$	71	47	18.1									1.6	12.9

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. Dual entries in the "Corner Radius" column, such as $3/3\frac{1}{2}$, represent the following:
   3 - minimum corner radius allowed by AASHTO M 196.
   $3\frac{1}{2}$ - corner radius typically available.

3. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-03**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

3" x 1" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
4.9	30	1.0	71.2	1.0	89.4	1.0	100.0	1.0	100.0		
5.9	33	1.0	59.3	1.0	74.5	1.0	100.0	1.0	100.0		
7.1	36	1.0	59.3	1.0	74.5	1.0	100.0	1.0	100.0		
9.6	42	1.0	50.8	1.0	63.8	1.0	89.1	1.0	100.0		
12.6	48	1.0	44.5	1.0	55.9	1.0	78.0	1.0	100.0	1.0	100.0
15.9	54	1.0	39.5	1.0	49.6	1.0	69.3	1.0	92.8	1.0	90.7
19.6	60	1.0	35.6	1.0	44.7	1.0	62.4	1.0	83.5	1.0	81.6
23.8	66	1.0	32.3	1.0	40.6	1.0	56.7	1.0	75.9	1.0	74.2
28.3	72			1.0	37.2	1.0	52.0	1.0	69.6	1.0	68.0
33.2	78			1.0	34.4	1.0	48.0	1.0	64.2	1.0	62.8
38.5	84					1.0	44.5	1.0	59.6	1.0	58.3
44.2	90					1.0	41.6	1.0	55.6	1.0	54.4
50.3	96					1.0	38.1	1.0	51.3	1.0	51.0
56.7	102							1.1	46.3	1.1	46.0
63.6	108							1.1	41.8	1.1	45.3
70.9	114									1.2	42.9
78.5	120									1.3	40.1

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-04**

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Urenovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

3" x 1" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.060		0.075		0.105		0.135		0.164	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
4.9	30	1.0	36.6	1.0	45.5	1.0	62.2	1.0	93.3		
5.9	33	1.0	30.5	1.0	37.9	1.0	51.8	1.0	77.7		
7.1	36	1.0	30.5	1.0	37.9	1.0	51.8	1.0	77.7		
9.6	42	1.0	26.1	1.0	32.5	1.0	44.4	1.0	66.6		
12.6	48	1.0	22.9	1.0	28.4	1.0	38.8	1.0	58.3	1.0	75.6
15.9	54	1.1	20.3	1.0	25.3	1.0	34.5	1.0	51.8	1.0	67.2
19.6	60	1.1	18.3	1.0	22.7	1.0	31.1	1.0	46.6	1.0	60.5
23.8	66	1.2	16.6	1.1	20.7	1.0	28.2	1.0	42.4	1.0	55.0
28.3	72			1.1	18.9	1.0	25.9	1.0	38.8	1.0	50.4
33.2	78			1.2	17.5	1.0	23.9	1.0	35.8	1.0	46.5
38.5	84					1.0	22.2	1.0	33.3	1.0	43.2
44.2	90					1.1	20.7	1.0	31.1	1.0	40.3
50.3	96					1.1	19.4	1.0	29.1	1.0	37.8
56.7	102							1.1	27.4	1.1	35.6
63.6	108							1.1	25.9	1.1	33.6
70.9	114									1.2	31.8
78.5	120									1.3	30.2

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-05**

ANTHONY L. DRENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THE FORMAT 11-15-99

/s/ Anthony L. Drenovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Pirooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 1-02-98

3" x 1" CORRUGATED ALUMINUM ALLOY PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.060		0.075		0.105		0.135		0.164	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8/18¾	60	46	15.6			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
9/20¾	66	51	19.3			1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
12/22¾	73	55	23.2			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
14/20¾	81	59	27.4					1.2	17.1	1.2	17.1	1.2	17.1
14/22¾	87	63	32.1					1.2	17.3	1.2	17.3	1.2	17.3
16/24¾	95	67	37.0							1.2	17.1	1.2	17.1
16/26¾	103	71	42.4							1.2	16.9	1.2	16.9
18/27¾	112	75	48.0									1.3	16.5

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. Dual entries in the "Corner Radius" column, such as 8/18¾ represent the following:
   8 - minimum corner radius allowed by AASHTO M 196.
   18¾ - corner radius typically available.

3. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-06**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zaidi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

6" x 1" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
12.6	48	1.0	38.7	1.0	48.4	1.0	67.8	1.0	87.2	1.0	100.0
15.9	54	1.0	34.4	1.0	43.0	1.0	60.2	1.0	77.5	1.0	94.8
19.6	60	1.0	31.0	1.0	38.7	1.0	54.2	1.0	69.7	1.0	85.3
23.8	66	1.0	28.1	1.0	35.2	1.0	49.3	1.0	63.4	1.0	77.5
28.3	72			1.0	32.2	1.0	45.2	1.0	58.1	1.0	71.1
33.2	78			1.0	29.7	1.0	41.7	1.0	53.6	1.0	65.6
38.5	84					1.0	38.7	1.0	49.8	1.0	60.9
44.2	90					1.0	36.1	1.0	46.5	1.0	56.8
50.3	96							1.0	43.6	1.0	53.3
56.7	102							1.1	40.0	1.1	49.0
63.6	108									1.1	44.5
70.9	114									1.2	40.3

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-07**

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Urenovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

6" x 1" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft.)

	AREA (sft)	DIAMETER (in.)	THICKNESS (in.)										
			0.060		0.075		0.105		0.135		0.164		
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
	12.6	48	1.0	22.2	1.0	26.3	1.0	36.7	1.0	49.8	1.0	60.4	
	15.9	54	1.1	19.7	1.0	23.4	1.0	34.4	1.0	44.3	1.0	53.7	
	19.6	60	1.2	17.7	1.1	21.1	1.0	31.0	1.0	39.8	1.0	48.3	
	23.8	66	1.3	16.1	1.1	19.1	1.0	28.1	1.0	36.2	1.0	43.9	
	28.3	72			1.2	17.5	1.0	25.8	1.0	33.2	1.0	40.2	
	33.2	78			1.3	16.2	1.0	23.8	1.0	30.6	1.0	37.1	
	38.5	84					1.0	22.1	1.0	28.4	1.0	34.5	
	44.2	90					1.1	20.6	1.0	26.5	1.0	32.2	
	50.3	96							1.0	24.9	1.0	30.2	
	56.7	102							1.1	23.4	1.1	28.4	
	63.6	108									1.1	26.8	
	70.9	114									1.2	25.4	

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-08**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoos Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
0.8	12	1.0	100.0	1.0	100.0						
1.2	15	1.0	100.0	1.0	100.0	1.0	100.0				
1.8	18	1.0	100.0	1.0	100.0	1.0	100.0				
2.4	21	1.0	100.0	1.0	100.0	1.0	100.0				
3.1	24	1.0	100.0	1.0	100.0	1.0	100.0				
4.0	27	1.0	94.7	1.0	100.0	1.0	100.0				
4.9	30	1.0	85.2	1.0	100.0	1.0	100.0	1.0	100.0		
5.9	33	1.0	71.0	1.0	88.7	1.0	100.0	1.0	100.0		
7.1	36	1.0	71.0	1.0	88.7	1.0	100.0	1.0	100.0	1.0	100.0
9.6	42	1.0	60.8	1.0	76.0	1.0	100.0	1.0	100.0	1.0	100.0
12.6	48	1.0	53.2	1.0	66.5	1.0	93.2	1.0	100.0	1.0	100.0
15.9	54			1.0	59.1	1.0	82.8	1.0	100.0	1.0	100.0
19.6	60					1.0	87.0	1.0	95.9	1.0	100.0
23.8	66							1.0	87.2	1.0	100.0
28.3	72							1.0	79.9	1.0	97.7
33.2	78									1.0	86.7
38.5	84									1.0	75.1

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-09**

ANTHONY L. DREMOVITCH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Dremovitch 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Pandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 1-02-98

$2\frac{2}{3}'' \times \frac{1}{2}''$ CORRUGATED STEEL PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
0.8	12	1.0	92.7	1.0	100.0						
1.2	15	1.0	74.2	1.0	80.8	1.0	100.0				
1.8	18	1.0	61.8	1.0	67.4	1.0	86.6				
2.4	21	1.0	53.0	1.0	57.7	1.0	74.2				
3.1	24	1.0	46.3	1.0	50.5	1.0	65.0				
4.0	27	1.0	41.2	1.0	44.9	1.0	57.7				
4.9	30	1.0	37.1	1.0	40.4	1.0	52.0	1.0	54.4		
5.9	33	1.0	30.9	1.0	33.7	1.0	43.3	1.0	45.3		
7.1	36	1.0	30.9	1.0	33.7	1.0	43.3	1.0	45.3	1.0	47.4
9.6	42	1.0	34.2	1.0	47.3	1.0	74.2	1.0	77.7	1.0	81.4
12.6	48	1.0	30.0	1.0	41.3	1.0	65.0	1.0	68.0	1.0	71.2
15.9	54			1.0	36.7	1.0	57.7	1.0	60.4	1.0	63.3
19.6	60					1.0	52.0	1.0	54.4	1.0	57.0
23.8	66							1.0	49.4	1.0	51.8
28.3	72							1.0	45.3	1.0	47.5
33.2	78									1.0	43.8
38.5	84									1.0	40.7

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-10**

ANTHONY L. DREMOVICH REGISTERED No. 19095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Dremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Pirooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.064		0.079		0.109		0.138		0.168	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
3/3½	17	13	1.1	1.5	13.7	1.5	13.7	1.5	13.7				
3/4⅙	21	15	1.6	1.6	13.0	1.6	13.0	1.6	13.0				
3/4⅙	24	18	2.2	1.5	13.5	1.5	13.5	1.5	13.5				
3/5½	28	20	2.9	1.6	13.0	1.6	13.0	1.6	13.0				
3/6⅙	35	24	4.5	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0		
3½/8¼	42	29	6.5	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0
4/9⅝	49	33	8.9			1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0
5/11	57	38	11.6					1.6	12.8	1.6	12.8	1.6	12.8
6/12⅜	64	43	14.7					1.6	12.8	1.6	12.8	1.6	12.8
7/13¾	71	47	18.1							1.6	12.9	1.6	12.9
8/15⅙	77	52	21.9									1.6	13.0
9/16½	83	57	26.0									1.5	13.2

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. Dual entries in the "Corner Radius" column, such as 3/3½, represent the following:
   3 - minimum corner radius allowed by AASHTO M 36.
   3½- corner radius typically available.

3. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-11**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoos Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 1-02-98

3" x 1" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
7.1	36	1.0	81.5								
9.6	42	1.0	69.9	1.0	87.4	1.0	100.0	1.0	100.0		
12.6	48	1.0	61.1	1.0	76.5	1.0	100.0	1.0	100.0		
15.9	54	1.0	54.3	1.0	68.0	1.0	95.3	1.0	100.0	1.0	100.0
19.6	60	1.0	48.9	1.0	61.2	1.0	85.8	1.0	100.0	1.0	100.0
23.8	66	1.0	44.5	1.0	55.6	1.0	78.0	1.0	100.0	1.0	100.0
28.3	72	1.0	40.7	1.0	51.0	1.0	71.5	1.0	92.0	1.0	100.0
33.2	78	1.0	37.6	1.0	47.0	1.0	66.0	1.0	84.9	1.0	100.0
38.5	84	1.0	34.9	1.0	43.7	1.0	61.2	1.0	78.8	1.0	96.5
44.2	90	1.0	32.6	1.0	40.8	1.0	57.2	1.0	73.6	1.0	90.1
50.3	96			1.0	38.2	1.0	53.6	1.0	69.0	1.0	84.4
56.7	102			1.1	36.0	1.1	50.4	1.1	64.9	1.1	79.5
63.6	108					1.1	47.6	1.1	61.3	1.1	75.1
70.9	114					1.2	45.1	1.2	58.1	1.2	71.1
78.5	120					1.3	42.9	1.3	55.2	1.3	67.5
86.6	126							1.3	52.5	1.3	64.3
95.0	132							1.4	50.2	1.4	61.4
103.9	138							1.4	48.0	1.4	58.7
113.1	144									1.5	56.3

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-12**

ANTHONY L. UREMOVICH REGISTERED No. 18055 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

3" x 1" CORRUGATED STEEL PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.064		0.079		0.109		0.138		0.168	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
7.1	36	1.0	53.1								
9.6	42	1.0	45.5	1.0	56.6	1.0	84.1	1.0	100.0		
12.6	48	1.0	39.8	1.0	49.5	1.0	73.6	1.0	88.4		
15.9	54	1.0	35.4	1.0	44.0	1.0	65.4	1.0	78.6	1.0	87.2
19.6	60	1.0	31.8	1.0	39.6	1.0	58.8	1.0	70.7	1.0	78.5
23.8	66	1.0	28.9	1.0	36.0	1.0	53.5	1.0	64.3	1.0	71.4
28.3	72	1.0	26.5	1.0	33.0	1.0	49.0	1.0	58.9	1.0	65.4
33.2	78	1.0	24.5	1.0	30.5	1.0	45.2	1.0	54.4	1.0	60.4
38.5	84	1.0	22.7	1.0	28.3	1.0	42.0	1.0	50.5	1.0	56.1
44.2	90	1.1	21.2	1.0	26.4	1.0	39.2	1.0	47.1	1.0	52.3
50.3	96			1.0	24.7	1.0	36.8	1.0	44.2	1.0	49.0
56.7	102			1.1	23.3	1.1	34.6	1.1	41.6	1.1	46.2
63.6	108					1.1	32.7	1.1	39.3	1.1	43.6
70.9	114					1.2	30.9	1.2	37.2	1.2	41.3
78.5	120					1.3	29.4	1.3	35.3	1.3	39.2
86.6	126							1.3	33.7	1.3	37.4
95.0	132							1.4	32.1	1.4	35.7
103.9	138							1.4	30.7	1.4	34.1
113.1	144									1.5	32.7

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-13**

ANTHONY L. URSEMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Ursemovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

3" x 1" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.064		0.079		0.109		0.138		0.168	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8/18¾	60	46	15.6			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
9/20¾	66	51	19.3			1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
12/22⅞	73	55	23.2			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
14/20⅞	81	59	27.4			1.2	17.1	1.2	17.1	1.2	17.1	1.2	17.1
14/22⅞	87	63	32.1			1.2	17.3	1.2	17.3	1.2	17.3	1.2	17.3
16/24⅜	95	67	37.0			1.2	17.1	1.2	17.1	1.2	17.1	1.2	17.1
16/26⅜	103	71	42.4					1.2	16.9	1.2	16.9	1.2	16.9
18/27¾	112	75	48.0					1.3	16.5	1.3	16.5	1.3	16.5
18/29½	117	79	53.2					1.2	16.8	1.2	16.8	1.2	16.8
18/31½	128	83	60.5							1.3	16.2	1.3	16.2
18/33	137	87	67.4							1.3	16.0	1.3	16.0
18/34¾	142	91	74.5									1.3	16.3

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. 2. Dual entries in the ,Corner Radius, column, such as 8/18¾, represent the following:
   8 - minimum corner radius allowed by AASHTO M 36.
   18¾ - corner radius typically available.

3. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-14**

ANTHONY L. URSEMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Ursemovich 11-15-99
DESIGN STANDARDS ENGINEER — DATE

/s/ Pirooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER — DATE

ORIGINALLY APPROVED 1-02-98

5" x 1" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
7.1	36			1.0	90.9	1.0	100.0				
9.6	42			1.0	77.9	1.0	100.0				
12.6	48	1.0	54.5	1.0	68.2	1.0	95.5	1.0	100.0		
15.9	54	1.0	48.5	1.0	60.6	1.0	84.9	1.0	100.0		
19.6	60	1.0	43.6	1.0	54.5	1.0	76.4	1.0	98.3		
23.8	66	1.0	39.7	1.0	49.6	1.0	69.5	1.0	89.4		
28.3	72	1.0	36.3	1.0	45.4	1.0	63.7	1.0	81.9	1.0	100.0
33.2	78	1.0	33.5	1.0	41.9	1.0	58.8	1.0	75.6	1.0	92.4
38.5	84	1.0	31.1	1.0	38.9	1.0	54.6	1.0	70.2	1.0	85.8
44.2	90	1.0	29.1	1.0	36.3	1.0	50.9	1.0	65.5	1.0	80.1
50.3	96			1.0	34.1	1.0	47.7	1.0	61.4	1.0	75.1
56.7	102			1.1	32.0	1.1	44.9	1.1	57.8	1.1	70.7
63.6	108					1.1	42.4	1.1	54.6	1.1	66.7
70.9	114					1.2	40.2	1.2	51.7	1.2	63.2
78.5	120					1.3	38.2	1.3	49.1	1.3	60.1
86.6	126							1.3	46.8	1.3	57.2
95.0	132							1.4	44.7	1.4	54.6
103.9	138							1.4	42.7	1.4	52.2
113.1	144									1.5	50.0

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-15**

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Urenovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoos Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

5" x 1" CORRUGATED STEEL PIPE-ARCH (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.064		0.079		0.109		0.135		0.168	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8/18¾	60	46	15.6					1.1	20.8	1.1	20.8		
9/20¾	66	51	19.3					1.1	20.9	1.1	20.9		
12/22⅞	73	55	23.2					1.1	20.8	1.1	20.8		
14/20⅚	81	59	27.4					1.2	17.1	1.2	17.1	1.2	17.1
14/22⅞	87	63	32.1					1.2	17.3	1.2	17.3	1.2	17.3
16/24⅛	95	67	37.0					1.2	17.1	1.2	17.1	1.2	17.1
16/26⅛	103	71	42.4					1.2	16.9	1.2	16.9	1.2	16.9
18/27¾	112	75	48.0					1.3	16.5	1.3	16.5	1.3	16.5
18/29½	117	79	54.2					1.2	16.8	1.2	16.8	1.2	16.8
18/31¼	128	83	60.5							1.3	16.2	1.3	16.2
18/33	137	87	67.4							1.3	16.0	1.3	16.0
18/34¾	142	91	74.5									1.3	16.3

NOTES:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. Dual entries in the "Corner Radius" column, such as 8/18¾, represent the following:
   8 - minimum corner raduis allowed by AASHTO M 36.
   18¾- corner radius typically available.

3. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. E 715-PHCL-16

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

NON-REINFORCED CONCRETE PIPE CLASS 3 HEIGHT OF COVER LIMITS (ft.)		
DIAMETER (in.)	MINIMUM (ft.)	MAXIMUM (ft.)
12	1.3	14.1
15	1.4	13.1
18	1.5	12.8
21	1.5	13.4
24	1.5	13.5
27	1.6	12.1
30	1.8	10.7
33	1.9	9.8
36	2.1	9.0

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. E 715-PHCL-17

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Pirooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

CORRUGATED POLYETHYLENE PIPE, TYPES
HEIGHT OF COVER LIMITS (ft.)

PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft.)	MAXIMUM (ft.)
12	12	2.0	11.0
15	15	2.0	11.0
18	18	2.0	11.0
21	21	2.0	11.0
24	24	2.0	11.0
30	30	2.0	11.0
36	36	2.0	11.0

RIBBED POLYETHYLENE PIPE
HEIGHT OF COVER LIMITS (ft.)

PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft.)	MAXIMUM (ft.)
18	18	2.0	18.0
21	21	2.0	22.0
24	24	2.0	21.0
27	27	2.0	24.0
30	30	2.0	22.0
33	33	2.0	23.0
36	36	2.0	25.0

SMOOTH WALL POLYETHYLENE PIPE
HEIGHT OF COVER LIMITS (ft.)

PAY ITEM DIA. (in.)	NOMINAL DIA. (in.)	DIMENSION RATIO (NOM. DIA./WALL THICKNESS)							
		26		21		17		11	
		MIN.	MAX. (ft.)	MIN. (ft.)	MAX. (ft.)	MIN. (ft.)	MAX. (ft.)	MIN. (ft.)	MAX. (ft.)
12	13	2.0	40.0	2.0	57.0				
12	14					2.0	81.0		
15	18	2.0	40.0	2.0	57.0	2.0	81.0		
18	20	2.0	40.0	2.0	57.0	2.0	81.0		
18	22					2.0	81.0	2.0	100.0
21	24	2.0	40.0	2.0	57.0	2.0	81.0		
24	28	2.0	40.0	2.0	57.0	2.0	81.0		
27	32	2.0	40.0	2.0	57.0	2.0	81.0		
30	34	2.0	40.0	2.0	57.0	2.0	81.0		
36	42	2.0	40.0	2.0	57.0	2.0	81.0		

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.
2. The pay item diameter reflects the minimum required inside diameter.
3. Because the nominal size of smooth wall polyethylene pipe is based on the outside diameter, different dimension ratios may require different nominal diameters to satisfy the pay item diameter requirements.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. E 715-PHCL-18

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

PROFILE WALL POLYVINYL CHLORIDE PIPE HEIGHT OF COVER LIMITS (ft.)		
DIAMETER (in.)	MINIMUM (ft.)	MAXIMUM (ft.)
12	2.0	35.3
15	2.0	34.2
18	2.0	34.0
21	2.0	33.0
24	2.0	31.0
27	2.0	30.0
30	2.0	29.0
36	2.0	27.0

SMOOTH WALL POLYVINYL CHLORIDE PIPE HEIGHT OF COVER LIMITS (ft.)			
PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft.)	MAXIMUM (ft.)
12	12	2.0	64.0
15	15	2.0	64.0
18	18	2.0	61.0
21	21	2.0	61.0
24	24	2.0	61.0
27	27	2.0	61.0

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the concrete or asphalt pavement to the top of the pipe.

2. The pay item diameter reflects the minimum required inside diameter.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

MAY 1999

STANDARD DRAWING NO. **E 715-PHCL-19**

ANTHONY L. UREMOVICH REGISTERED No. 19095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoze Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 5-03-99

VITRIFIED CLAY PIPE, EXTRA STRENGTH HEIGHT OF COVER LIMITS (ft.)		
DIAMETER (in)	MINIMUM (ft.)	MAXIMUM (ft.)
12	1.2	16.0
15	1.4	14.0
18	1.4	13.0
21	1.4	14.0
24	1.4	15.0
27	1.5	14.0
30	1.6	13.0
33	1.5	13.0
36	1.5	14.0

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-20**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

REINFORCED CONCRETE CIRCULAR PIPE
HEIGHT OF COVER LIMITS (ft.)

DIAMETER (in.)	Strength Class/D-load Rating											
	Class II: $D_{0.01}$ = 1000		Class II: $D_{0.01}$ = 1250		Class III: $D_{0.01}$ = 1350		Class III: $D_{0.01}$ = 1500		Class III: $D_{0.01}$ = 1750		Class IV: $D_{0.01}$ = 2000	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12	1.4	6.0	1.1	10.0	1.1	12.0	1.0	15.0	1.0	24.0	1.0	100.0
15	1.1	8.0	1.0	12.0	1.0	14.0	1.0	19.0	1.0	35.0	1.0	100.0
18	1.0	9.0	1.0	14.0	1.0	17.0	1.0	22.0	1.0	52.0	1.0	100.0
21	1.0	10.0	1.0	15.0	1.0	18.0	1.0	24.0	1.0	84.0	1.0	100.0
24	1.0	11.0	1.0	17.0	1.0	20.0	1.0	26.0	1.0	85.0	1.0	100.0
27	1.0	10.0	1.0	13.0	1.0	15.0	1.0	19.0	1.0	26.0	1.0	42.0
30	1.0	10.0	1.0	14.0	1.0	16.0	1.0	20.0	1.0	28.0	1.0	44.0
33	1.0	10.0	1.0	15.0	1.0	17.0	1.0	20.0	1.0	29.0	1.0	45.0
36	1.0	11.0	1.0	15.0	1.0	17.0	1.0	21.0	1.0	29.0	1.0	45.0
42	1.0	11.0	1.0	16.0	1.0	18.0	1.0	22.0	1.0	30.0	1.0	44.0
48	1.0	12.0	1.0	17.0	1.0	19.0	1.0	22.0	1.0	30.0	1.0	43.0
54	1.0	12.0	1.0	17.0	1.0	19.0	1.0	23.0	1.0	31.0	1.0	42.0
60	1.0	10.0	1.0	13.0	1.0	14.0	1.0	17.0	1.0	21.0	1.0	26.0
66	1.0	10.0	1.0	14.0	1.0	15.0	1.0	17.0	1.0	21.0	1.0	26.0
72	1.0	11.0	1.0	14.0	1.0	15.0	1.0	18.0	1.0	22.0	1.0	27.0
78	1.0	11.0	1.0	14.0	1.0	16.0	1.0	18.0	1.0	22.0	1.0	27.0
84	1.0	11.0	1.0	15.0	1.0	16.0	1.0	19.0	1.0	23.0	1.0	28.0
90	1.0	11.0	1.0	15.0	1.0	16.0	1.0	19.0	1.0	23.0	1.0	28.0
96	1.0	11.0	1.0	15.0	1.0	17.0	1.0	19.0	1.0	23.0	1.0	28.0
102	1.1	12.0	1.1	15.0	1.1	17.0	1.1	19.0	1.1	24.0	1.1	29.0
108	1.2	12.0	1.2	15.0	1.2	17.0	1.2	20.0	1.2	24.0	1.2	29.0
114	1.2	12.0	1.2	16.0	1.2	17.0	1.2	20.0	1.2	24.0	1.2	29.0
120	1.3	12.0	1.3	16.0	1.3	17.0	1.3	20.0	1.3	24.0	1.3	29.0
126	1.4	12.0	1.4	16.0	1.4	18.0	1.4	20.0	1.4	24.0	1.4	29.0
132	1.4	12.0	1.4	16.0	1.4	18.0	1.4	20.0	1.4	25.0	1.4	29.0
138	1.5	12.0	1.5	16.0	1.5	18.0	1.5	20.0	1.5	25.0	1.5	29.0
144	1.5	12.0	1.5	16.0	1.5	18.0	1.5	20.0	1.5	25.0	1.5	29.0

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-21**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Ferone Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 1-02-98

REINFORCED CONCRETE CIRCULAR PIPE
HEIGHT OF COVER LIMITS (ft.)

DIAMETER (in.)	Strength Class/D-load Rating												
	Class IV : $D_{0.01}$ = 2250		Class IV : $D_{0.01}$ = 2500		Class IV : $D_{0.01}$ = 2750		Class V : $D_{0.01}$ = 3000		Class V : $D_{0.01}$ = 3250				
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.			
12	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
15	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
18	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
21	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
24	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
27	1.0	92.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
30	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
33	1.0	89.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
36	1.0	79.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
42	1.0	68.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
48	1.0	61.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
54	1.0	57.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5			
60	1.0	30.0	1.0	100.0	1.0	45.0	1.0	57.0	1.0	75.0			
66	1.0	31.0	1.0	100.0	1.0	46.0	1.0	57.0	1.0	74.0			
72	1.0	32.0	1.0	37.0	1.0	47.0	1.0	57.0	1.0	73.0			
78	1.0	32.0	1.0	39.0	1.0	47.0	1.0	57.0	1.0	72.0			
84	1.0	33.0	1.0	39.0	1.0	47.0	1.0	57.0	1.0	70.0			
90	1.0	33.0	1.0	40.0	1.0	47.0	1.0	57.0	1.0	69.0			
96	1.0	33.0	1.0	40.0	1.0	47.0	1.0	57.0	1.0	68.0			
102	1.1	34.0	1.1	40.0	1.1	47.0	1.1	57.0	1.1	67.0			
108	1.2	34.0	1.2	40.0	1.2	47.0	1.2	55.0	1.2	66.0			
114	1.2	34.0	1.2	40.0	1.2	47.0	1.2	55.0	1.2	65.0			
120	1.3	34.0	1.3	40.0	1.3	47.0	1.3	55.0	1.3	64.0			
126	1.4	34.0	1.4	40.0	1.4	47.0	1.4	54.0	1.4	63.0			
132	1.4	34.0	1.4	40.0	1.4	46.0	1.4	54.0	1.4	63.0			
138	1.5	34.0	1.5	40.0	1.5	46.0	1.5	54.0	1.5	62.0			
144	1.5	34.0	1.5	40.0	1.5	46.0	1.5	53.0	1.5	61.0			

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the bituminous or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 715-PHCL-22**

ANTHONY L. URENOVITCH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Urenovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

REINFORCED CONCRETE HORIZONTAL ELLIPICAL PIPE
HEIGHT OF COVER LIMITS (ft.)

SPAN (in.)	RISE (in.)	AREA (sft)	Strength Class/D-load Rating									
			Class HE-A: $D_{0.01}$ = 600		Class HE-I: $D_{0.01}$ = 800		Class HE-II: $D_{0.01}$ = 1000		Class HE-III: $D_{0.01}$ = 1350		Class HE-IV: $D_{0.01}$ = 2000	
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
23	14	1.8	1.3	4.0	1.0	8.0	1.0	11.0	1.0	20.0	1.0	100.0
30	19	3.3	1.1	5.0	1.0	7.0	1.0	10.0	1.0	16.0	1.0	47.0
34	22	4.1	1.0	5.0	1.0	8.0	1.0	11.0	1.0	17.0	1.0	48.0
38	24	5.1	1.0	5.0	1.0	8.0	1.0	11.0	1.0	18.0	1.0	49.0
42	27	6.3	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	50.0
45	29	7.4	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	45.0
49	32	8.8	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	45.0
53	34	10.2	1.0	6.0	1.0	9.0	1.0	12.0	1.0	20.0	1.0	44.0
60	38	12.9	1.0	5.0	1.0	8.0	1.0	10.0	1.0	15.0	1.0	26.0
68	43	16.6	1.0	6.0	1.0	8.0	1.0	10.0	1.0	15.0	1.0	27.0
76	48	20.5	1.0	6.0	1.0	8.0	1.0	11.0	1.0	16.0	1.0	28.0
83	53	24.8	1.0	6.0	1.0	9.0	1.0	11.0	1.0	16.0	1.0	29.0
91	58	29.5	1.0	6.0	1.0	9.0	1.0	12.0	1.0	17.0	1.0	29.0
98	63	34.6	1.1	6.0	1.1	9.0	1.1	12.0	1.1	17.0	1.1	29.0
106	68	40.1	1.2	6.0	1.2	9.0	1.2	12.0	1.2	17.0	1.2	30.0
113	72	46.1	1.2	7.0	1.2	9.0	1.2	12.0	1.2	18.0	1.2	30.0
121	77	52.4	1.3	7.0	1.3	9.0	1.3	12.0	1.3	18.0	1.3	30.0
128	82	59.2	1.4	7.0	1.4	10.0	1.4	13.0	1.4	18.0	1.4	30.0
136	87	66.4	1.5	7.0	1.5	10.0	1.5	13.0	1.5	18.0	1.5	31.0
143	92	74.0	1.5	7.0	1.5	10.0	1.5	13.0	1.5	18.0	1.5	31.0
151	97	82.0	1.6	7.0	1.6	10.0	1.6	13.0	1.6	19.0	1.6	31.0
166	106	99.2	1.7	7.0	1.8	10.0	1.8	13.0	1.8	19.0	1.8	31.0
180	116	118.6	1.8	7.0	1.9	10.0	1.9	13.0	1.9	19.0	1.9	31.0

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. E 715-PHCL-23

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER — DATE

/s/ Firoos Zandi 11-15-99
CHIEF HIGHWAY ENGINEER — DATE

ORIGINALLY APPROVED 1-02-98