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

						THICKNI	ESS (in)					
AREA (sft)	DIAMETER (in.)	0.0	60	0.0	75	0.1	05	0.1	35	0.1	64	
, ,	, ,	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
0.8	12	1.0	100.0	1.0	100.0	1.0	100.0	$\geq$	$\mathbf{M}$	$\searrow$		
1.2	15	1.0	100.0	1.0	100.0	1.0	100.0	$>\!\!<$	$\sim$	$\sim$	$\geq \leq$	
1.8	18	1.0	100.0	1.0	100.0	1.0	100.0	$\sim$	$\sim$	$\sim$		
2.4	21	1.0	88.5	1.0	100.0	1.0	100.0	$\sim$	M	$\setminus$	> <	
3.1	24	1.0	77.5	1.0	96.8	1.0	100.0	1.0	100.0	$\mathbf{M}$	><	
4.0	27	1.0	68.8	1.0	86.0	1.0	100.0	1.0	100.0	> <	$\geq \leq$	
4.9	30	1.0	62.0	1.0	77.4	1.0	100.0	1.0	100.0	$\geq$	> <	
5.9	33	M	$\setminus$	1.0	64.5	1.0	90.4	1.0	100.0	$\setminus$	$>\!\!<$	
 7.1	36	>	$\geq$	1.0	64.5	1.0	90.4	1.0	100.0	$\geq$		
9.6	42	$\bigvee$	$\setminus$	$\bigwedge$	$\bigvee$	1.0	77.4	1.0	99.7	$\bigwedge$	$\geq <$	
12.6	48	$\Big/ \Big/$	$\setminus$	$\setminus$	M	1.0	66.7	1.0	86.6	1.0	100.0	
15.9	54	M	$\setminus$	$\setminus$	M	1.0	54.4	1.0	70.8	1.0	87.6	
19.6	60	M	$\setminus$	$\nearrow$	M	$\bigvee$	$\setminus$	1.0	57.6	1.0	71.6	
23.8	66	$\bigwedge$	$\setminus$	$\bigwedge$	$\bigvee$	$\bigvee$	$\setminus$	$\setminus \setminus$	$\bigwedge$	1.0	57.7	
28.3	72	$\setminus$	$\setminus$	$\setminus$	$\setminus$	$\setminus$	$\setminus$	$\setminus$	$\setminus$	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 DETAILS PLACED IN THIS FORMAT 11-15-99

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

/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER

DESIGN STANDARDS ENGINEER

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

						THICKNI	ESS (in.)					
AREA (sft)	DIAMETER (in.)	0.0	60	0.0	)75	0.1	05	0.1	35	0.1	164	
` ′	, ,	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
0.8	12	1.0	50.0	1.0	50.0	1.0	86.6		$\mathbb{N}$			
1.2	15	1.0	40.0	1.0	40.0	1.0	69.3	$\geq$	$\bigvee$	$\searrow$	$\searrow$	
1.8	18	1.0	33.3	1.0	33.3	1.0	57.7	> <	$\setminus$	$\sim$	$\searrow$	
2.4	21	1.0	28.5	1.0	28.5	1.0	49.5	$\sim$	M	$\searrow$	$\searrow$	
3.1	24	1.0	25.0	1.0	25.0	1.0	43.3	1.0	45.0	$\sim$	$\searrow$	
4.0	27	1.0	22.2	1.0	22.2	1.0	38.5	1.0	40.0		$\bigvee$	
4.9	30	1.1	20.0	1.1	20.0	1.0	34.6	1.0	36.0			
 5.9	33	$\searrow$	$\mathbb{N}$	1.2	16.6	1.0	28.8	1.0	30.0			
7.1	36	$\searrow$	$\mathbb{N}$	1.2	16.6	1.0	28.8	1.0	30.0			
 9.6	42	>>	$\nearrow \nearrow$			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	$\searrow$	$\searrow \searrow$	> <	$\sim$	1.0	38.8	1.0	40.7	1.0	41.9	
19.6	60	$\bigvee$	$\searrow$	> <		><	$\sim$	1.0	36.6	1.0	37.7	
23.8	66	$\sim$	$\sim$	><	$\sim$	> <	> <	$\sim$	$\sim$	1.0	34.3	
28.3	72	> <	$\supset \subset$	><	> <	> <	> <	> <	> <	1.0	31.4	
									_			
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-02

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 CHIEF HIGHWAY ENGINEER

#### 22/3" x 2" CORRUGATED ALUMINUM ALLOY PIPE-ARCH (RIVETED OR LOCK SEAM) HEIGHT OF COVER LIMITS (ft.)

CORNER								THICKN	ESS (in.)				
RADIUS	SPAN (in.)	RISE (in.)	AREA (sft)	0.0	)60	0.0	75	0.1	105	0.1	.35	0.1	164
(in.)	, ,	, ,		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		$\setminus$		$\sim$
$3/4\frac{1}{8}$	21	15	1.6	1.6	13.0	1.6	13.0	1.6	13.0	$\geq <$	$\setminus$	$\searrow$	$\rightarrow$
$3/4\frac{7}{8}$	24	18	2.2	1.5	13.5	1.5	13.5	1.5	13.5	> <	$\setminus$	$\searrow$	$\sim$
$3/5\frac{1}{2}$	28	20	2.9	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0	$\searrow$	$\searrow$
$3/6\frac{7}{8}$	35	24	4.5	$\sim$	$\setminus$	1.6	13.0	1.6	13.0	1.6	13.0	$\sim$	
$3\frac{1}{2}/8\frac{1}{4}$	42	29	6.5	$\searrow$	$\bigwedge$	1.6	13.0	1.6	13.0	1.6	13.0	$\searrow$	$\sim$
$4/9\frac{5}{8}$	49	33	8.9	$\searrow$	$\bigwedge$	1.6	13.0	1.6	13.0	1.6	13.0	$\searrow$	$\sim$
5/11	57	38	11.6	$\sim$	$\bigvee$	M	M	1.6	12.8	1.6	12.8	1.6	12.8
6/123	64	43	14.7	> <	$\searrow$	$\bigwedge$	$\mathcal{N}$	$\sim$		1.6	12.8	1.6	12.8
$7/13\frac{3}{4}$	71	47	18.1	$\searrow$	$\searrow$	$\bigvee$	$\bigvee$	$\setminus$	$\bigwedge$		$\setminus$	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

DESIGN STANDARDS ENGINEER

/s/Anthony L. Uremovich 11-15-99

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Firooz Zandi

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

						THICKN	ESS (in.)				
AREA (sft)	DIAMETER (in.)	0.	060	0.	075	0.10	)5	0.	135	0.	164
(3.0)	()	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	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	$\nearrow$	><	$\searrow$		1.0	44.5	1.0	59.6	1.0	58.3
44.2	90	>>	><	$\nearrow$		1.0	41.6	1.0	55.6	1.0	54.4
50.3	96	$\nearrow$	><	$\setminus$		1.0	38.1	1.0	51.3	1.0	51.0
56.7	102	>>	><	$\nearrow$		> <		1.1	46.3	1.1	48.0
63.6	108							1.1	41.8	1.1	45.3
70.9	114									1.2	42.9
78.5	120	$\overline{}$		$\geq$		$\geq$		$\geq$		1.3	40.1

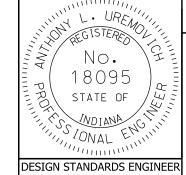
#### NOTE:

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**

STANDARD DRAWING NO. E 715-PHCL-04



#### JANUARY 1998

DETAILS PLACED IN THIS FORMAT ON 11/15/99

/s/Anthony L. Uremovich

11/15/99

DESIGN STANDARDS ENGINEER

DATE

/s/ Firooz Zandi

11/15/99

DATE

CHIEF HIGHWAY ENGINEER DESIGN STANDARDS ENGINEER

ORIGINALLY APPROVED 1/02/98

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

						THICKN	ESS (in.)					
AREA (sft)	DIAMETER (in.)	0.0	60	0.0	75	0.1	05	0.1	35	0.1	64	
, ,	, ,	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	$\rightarrow$		
5.9	33	1.0	30.5	1.0	37.9	1.0	51.8	1.0	77.7	$\setminus$	$\geq \sim$	
7.1	36	1.0	30.5	1.0	37.9	1.0	51.8	1.0	77.7	$\searrow$	> <	
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		$\searrow$	1.1	18.9	1.0	25.9	1.0	38.8	1.0	50.4	
33.2	78	$\geq$	$\sim$	1.2	17.5	1.0	23.9	1.0	35.8	1.0	46.5	
38.5	84	$\setminus$	$\Big/ \Big/$	$\bigvee$	M	1.0	22.2	1.0	33.3	1.0	43.2	
44.2	90	$\setminus$	M	$\setminus$	M	1.1	20.7	1.0	31.1	1.0	40.3	
50.3	96	$\geq$	$\bigvee$	$\bigvee$	M	1.1	19.4	1.0	29.1	1.0	37.8	
56.7	102	><	$\bigwedge$	$\setminus \setminus$	$\setminus$	$\bigvee$	$\bigvee$	1.1	27.4	1.1	35.6	
63.6	108	><	$\searrow$	$\bigvee$	$\searrow$	$\nearrow$	$\sim$	1.1	25.9	1.1	33.6	
70.9	114	$\setminus$	M	$\setminus$	M	M	M	$\setminus$	M	1.2	31.8	
78.5	120	$\geq$	$\bigvee$	$\setminus$	M	$\bigg / \bigg /$	$\bigwedge$	$\setminus$	M	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

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 CHIEF HIGHWAY ENGINEER

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

CODNED								THICKN	ESS (in.)				
CORNER RADIUS	SPAN (in.)	RISE (in.)	AREA (sft)	0.0	)60	0.0	75	0.1	.05	0.1	35	0.1	164
(in.)	(111.)	(111.)	(510)	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8/183	60	46	15.6		$\overline{}$	1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
9/203	66	51	19.3	$\sim$	$\bigvee$	1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
$12/22\frac{7}{8}$	73	55	23.2		$\bigvee$	1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
$14/20\frac{7}{8}$	81	59	27.4	$\sim$	M	$\setminus$	M	1.2	17.1	1.2	17.1	1.2	17.1
$14/22\frac{5}{8}$	87	63	32.1		M	$\bigvee$	$\bigvee$	1.2	17.3	1.2	17.3	1.2	17.3
16/24 8	95	67	37.0	$\sim$	$\setminus$	$\bigwedge$	$\bigvee$	$\searrow$	$\setminus$	1.2	17.1	1.2	17.1
16/26 <sup>1</sup> 8	103	71	42.4	$\searrow$	$\setminus \setminus$	$\bigvee$	$\bigvee$	$\searrow$	$\setminus$	1.2	16.9	1.2	16.9
$18/27\frac{3}{4}$	112	75	48.0	$\sim$	M	$\bigvee$	$\bigvee$	$\searrow$	$\setminus$	$\setminus$	$\Big / \Big /$	1.3	16.5
													igwdown

#### 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  $8/18\frac{3}{4}$ represent the following:
  - 8 minimum corner radius allowed by AASHTO M 196.  $18\frac{3}{4}$  - 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

DETAILS PLACED IN THIS FORMAT 11-15-99

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

/s/ Firooz Zandi

ORIGINALLY APPROVED

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

						THICKN	ESS (in.)					
AREA (sft)	DIAMETER (in.)	0.0	)60	0.0	075	0.1	105	0.1	35	0.	164	
, ,		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	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	$\searrow$	><	1.0	32.2	1.0	45.2	1.0	58.1	1.0	71.1	
33.2	78	$\sim$	$\sim$	1.0	29.7	1.0	41.7	1.0	53.6	1.0	65.6	
38.5	84	$\sim$	$\searrow$	$\sim$	$\sim$	1.0	38.7	1.0	49.8	1.0	60.9	
44.2	90	$\geq \leq$	$\geq$			1.0	36.1	1.0	46.5	1.0	56.8	
50.3	96	><		$\geq$	$\geq$			1.0	43.6	1.0	53.3	
56.7	102	><		><		> <		1.1	40.0	1.1	49.0	
63.6	108	$\geq \leq$	$\geq \leq$			$\geq \leq$			$\geq$	1.1	44.5	
70.9	114	$\geq \leq$	><	$\geq \leq$	$\geq \leq$	><	$\geq \leq$	$\geq \leq$	>><	1.2	40.3	
											<u> </u>	
									Гī	NDIANA DEPART	MENT OF TRA	NSPORTATIO
											HEIGHT	
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#### NOTE:

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

### COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. E 715-PHCL-07

DETAILS PLACED IN THIS FORMAT 11-15-99

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

/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER ORIGINALLY APPROVED

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

						THICKNI	ESS (in.)					
AREA (sft)	DIAMETER (in.)	0.0	)60	0.0	)75	0.1	.05	0.1	.35	0.1	.64	
(===)	()	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
12.6	48	1.0	22.2	1.0	26.3	1.0	38.7	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	M	M	1.2	17.5	1.0	25.8	1.0	33.2	1.0	40.2	
33.2	78	$\bigvee$	$\setminus$	1.3	16.2	1.0	23.8	1.0	30.6	1.0	37.1	
38.5	84	$\searrow$	$\geq \leq$		> <	1.0	22.1	1.0	28.4	1.0	34.5	
44.2	90	$\nearrow$	$\geq <$		$\geq$	1.1	20.6	1.0	26.5	1.0	32.2	
50.3	96	$\sim$	$\geq$					1.0	24.9	1.0	30.2	
56.7	102	$\bigvee$	M	$\searrow \searrow$	$\searrow$	$\searrow$	M	1.1	23.4	1.1	28.4	
63.6	108	$\bigvee$	$\bigvee$	$\searrow$	$\setminus$	$\setminus$	$\mathbb{N}$	M	$\setminus \setminus$	1.1	26.8	
70.9	114	$\bigwedge$	$\sim$	><	$\sim$	> <	> <	$\bigwedge$	$\sim$	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

DETAILS PLACED IN THIS FORMAT 11-15-99

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

/s/ Firooz Zandi
CHIEF HIGHWAY ENGINEER

ORIGINALLY APPROVED

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

						THICKN	ESS (in.)					
AREA (sft)	DIAMETER (in.)	0.0	)64	0.0	)79	0.1	109	0.1	138	0.:	168	
, ,		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	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	$\sim$		$\supset \subset$		
1.8	18	1.0	100.0	1.0	100.0	1.0	100.0	$\sim$	$\searrow$	$\supset\!$		
2.4	21	1.0	100.0	1.0	100.0	1.0	100.0	$\sim$	$\searrow$		><	
3.1	24	1.0	100.0	1.0	100.0	1.0	100.0			$\supset \!$		
4.0	27	1.0	94.7	1.0	100.0	1.0	100.0	><	$\sim$	$\supset <$		
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	><	$\sim$	1.0	59.1	1.0	82.8	1.0	100.0	1.0	100.0	
19.6	60	$\geq$	$\geq$			1.0	87.8	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					$\geq$				1.0	75.1	
									l lin	DIANA DEPART	MENT OF TRA	NSPORTATIO!
									. F		HEIGHT (	
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#### NOTE:

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

### COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. E 715-PHCL-09

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT

/s/Anthony L. Uremovich 11-15-99

/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER

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

							` '					
						THICKN	ESS (in.)					
AREA (sft)	DIAMETER (in.)	0.0	)64	0.0	)79	0.1	109	0.1	138	0.	168	
, ,	, ,	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
0.8	12	1.0	92.7	1.0	100.0			$\sim$	$\sim$	$\supset \subset$		
1.2	15	1.0	74.2	1.0	80.8	1.0	100.0	$\sim$	$\searrow$	$\bigcirc$	$\geq <$	
1.8	18	1.0	61.8	1.0	67.4	1.0	86.6	><	$\searrow$	$\supset \sim$		
2.4	21	1.0	53.0	1.0	57.7	1.0	74.2	$\geq$	$\searrow$	$\bigcirc\!$		
3.1	24	1.0	46.3	1.0	50.5	1.0	65.0			$\supset \!$		
4.0	27	1.0	41.2	1.0	44.9	1.0	57.7	$\sim$	$\searrow$	$\searrow$		
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		$\geq \leq$	
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	$\geq \leq$	$\geq \leq$	1.0	36.7	1.0	57.7	1.0	60.4	1.0	63.3	
19.6	60	$\geq \leq$				1.0	52.0	1.0	54.4	1.0	57.0	
23.8	66	$\geq \leq$	$\geq \leq$	$\geq \leq$	$\geq \leq$		$\geq \leq$	1.0	49.4	1.0	51.8	
28.3	72	$\geq \leq$	1.0	45.3	1.0	47.5						
33.2	78									1.0	43.8	
38.5	84	><								1.0	40.7	
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	1									PIPE	HEIGHT (	OF

#### NOTE:

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

#### PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. E 715-PHCL-10 DETAILS PLACED IN THIS FORMAT

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

/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER

ORIGINALLY APPROVED

#### $2\frac{2}{3}$ x ½" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM) HEIGHT OF COVER LIMITS (ft.)

								THICKN	ESS (in.)				
Re (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	0.0	064	0.0	79	0.1	109	0.1	138	0.	168
()	(/	()	(310)	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			$\sim$	>
$3/4\frac{1}{8}$	21	15	1.6	1.6	13.0	1.6	13.0	1.6	13.0	$\geq$	$\searrow$	$\sim$	> <
$3/4\frac{7}{8}$	24	18	2.2	1.5	13.5	1.5	13.5	1.5	13.5	><	$\searrow$	$\searrow$	> <
$3/5\frac{1}{2}$	28	20	2.9	1.6	13.0	1.6	13.0	1.6	13.0	$\geq \leq$	$\geq \leq$	$\geq \leq$	$\geq \leq$
3/67	35	24	4.5	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0	$\sim$	><
$3\frac{1}{2}/8\frac{1}{4}$	42	29	6.5	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0
$4/9\frac{5}{8}$	49	33	8.9	$\sim$	$\searrow$	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0
5/11	57	38	11.6	><	$\sim$	$\sim$	M	1.6	12.8	1.6	12.8	1.6	12.8
6/128	64	43	14.7	> <	$\searrow$	$\geq <$	$\bigwedge$	1.6	12.8	1.6	12.8	1.6	12.8
$7/13\frac{3}{4}$	71	47	18.1	> <	$>\!\!<$	$>\!\!<$	$\bigwedge$	> <	$\sim$	1.6	12.9	1.6	12.9
$8/15\frac{1}{8}$	77	52	21.9	> <	$\sim$	$\sim$	$\sim$	> <	> <	><	><	1.6	13.0
$9/16\frac{1}{2}$	83	57	26.0	$>\!\!<$	$>\!\!<$	$\geq \leq$	M	$>\!\!<$	$\sim$	$>\!\!<$	$>\!\!<$	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  $3/3\frac{1}{2}$ , represent the following:
  - 3 minimum corner radius allowed by AASHTO M 36.
  - $3\frac{1}{2}$  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-11 DETAILS PLACED IN THIS FORMAT 11-15-99

DESIGN STANDARDS ENGINEER

/s/Anthony L. Uremovich 11-15-99

/s/ Firooz Zandi

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

						THICKN	ESS (in.)					
AREA (sft)	DIAMETER (in.)	0.0	)64	0.0	)79	0.1	109	0.1	.38	0.	168	
	, ,	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
7.1	36	1.0	81.5						$\sim$			
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	$\sim$	$\searrow$	1.0	38.2	1.0	53.6	1.0	69.0	1.0	84.4	
56.7	102	$\searrow$	$\setminus$	1.1	36.0	1.1	50.4	1.1	64.9	1.1	79.5	
63.6	108	$\sim$	> <			1.1	47.6	1.1	61.3	1.1	75.1	
70.9	114	>	$\searrow$		$\sim$	1.2	45.1	1.2	58.1	1.2	71.1	
78.5	120	$\sim$	$\setminus$	><	$\searrow$	1.3	42.9	1.3	55.2	1.3	67.5	
86.6	126	><	><	><	><	><	$\geq <$	1.3	52.5	1.3	64.3	
95.0	132	><	$\geq$		$\sim$			1.4	50.2	1.4	61.4	
103.9	138	>			><	>	$\sim$	1.4	48.0	1.4	58.7	
113.1	144	><	><	$\geq <$	><	> <	><	><	$>\!\!<$	1.5	56.3	
									l lī	INDIANA DEPART	MENT OF TRA	NSPORTATION
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#### NOTE:

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

### **COVER LIMITS**

JANUARY 1998

STANDARD DRAWING NO. E 715-PHCL-12

DETAILS PLACED IN THIS FORMAT 11-15-99

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

/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER

ORIGINALLY APPROVED

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

						THICKNI	ESS (in.)					
AREA (sft)	DIAMETER (in.)	0.0	64	0.0	)79	0.1	09	0.1	38	0.1	168	
, ,	, ,	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
7.1	36	1.0	53.1	M	$\sim$	$\bigvee$	$\sim$	$\sim$	$\bigvee$	$\bigvee$		
9.6	42	1.0	45.5	1.0	56.6	1.0	84.1	1.0	100.0	$\bigvee$		
12.6	48	1.0	39.8	1.0	49.5	1.0	73.6	1.0	88.4	$\sim$	><	
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	$\geq \leq$	$\geq \leq$	1.0	24.7	1.0	36.8	1.0	44.2	1.0	49.0	
56.7	102	$\geq \leq$	$\geq \leq$	1.1	23.3	1.1	34.6	1.1	41.6	1.1	46.2	
63.6	108	$\geq \leq$	$\geq \leq$	$\geq \leq$		1.1	32.7	1.1	39.3	1.1	43.6	
70.9	114	$\geq \leq$	$\geq \leq$	$\geq \leq$	$\geq \leq$	1.2	30.9	1.2	37.2	1.2	41.3	
78.5	120	$\geq \leq$	$\sim$	$\geq \leq$	$\geq \leq$	1.3	29.4	1.3	35.3	1.3	39.2	
86.6	126	$\geq \leq$	$\sim$	$\geq \leq$		$\geq \leq$	$\geq \leq$	1.3	33.7	1.3	37.4	
95.0	132	$\geq \leq$	$\sim$	$\sim$	$\geq \leq$	$\sim$	$\geq \leq$	1.4	32.1	1.4	35.7	
103.9	138	$\geq \leq$	$\sim$	$\sim$	$\geq \leq$	$\sim$	$\geq \leq$	1.4	30.7	1.4	34.1	
113.1	144		$\sim$	$\sim$	$\geq$	$\sim$	$\geq$	$\sim$	$\setminus$	1.5	32.7	
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#### 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 DETAILS PLACED IN THIS FORMAT 11-15-99

/s/Anthony L. Uremovich #1-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER DESIGN STANDARDS ENGINEER

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

					THICKNESS (in.)								
Re (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	0.0	0.064		0.079 0.109		0.138		0.168		
, ,	, ,	, ,		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
$8/18\frac{3}{4}$	60	46	15.6	$\sim$	$\searrow$	1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
$9/20\frac{3}{4}$	66	51	19.3	> <	$\bigwedge$	1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
$12/22\frac{7}{8}$	73	55	23.2	$\searrow$	$\bigwedge$	1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
$14/20\frac{7}{8}$	81	59	27.4	$\geq \leq$	><	1.2	17.1	1.2	17.1	1.2	17.1	1.2	17.1
14/22 8	87	63	32.1	$\geq \leq$	$>\!\!<$	1.2	17.3	1.2	17.3	1.2	17.3	1.2	17.3
16/24 8	95	67	37.0	> <	$>\!\!<$	1.2	17.1	1.2	17.1	1.2	17.1	1.2	17.1
$16/26\frac{1}{8}$	103	71	42.4	> <	$\sim$	$\sim$	$\bigwedge$	1.2	16.9	1.2	16.9	1.2	16.9
$18/27\frac{3}{4}$	112	75	48.0	><	> <	$\mathbf{M}$	$\bigwedge$	1.3	16.5	1.3	16.5	1.3	16.5
$18/29\frac{1}{2}$	117	79	59.2	> <	$\sim$	$\mathbf{M}$	$\bigwedge$	1.2	16.8	1.2	16.8	1.2	16.8
$18/31\frac{1}{4}$	128	83	60.5	><	> <	$\sim$	$\bigwedge$	> <	><	1.3	16.2	1.3	16.2
18/33	137	87	67.4	> <	$\sim$	$\sim$	$\sim$	> <	$\sim$	1.3	16.0	1.3	16.0
$18/34\frac{3}{4}$	142	91	74.5	$\geq \leq$		$\sim$	$\geq$	$\geq \leq$		$\geq \leq$	><	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  $8/18\frac{3}{4}$ , represent the following:
  - 8 minimum corner radius allowed by AASHTO M 36.  $18\frac{3}{4}$  - 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

/s/Anthony L. Uremovich #1-45-99
DESIGN STANDARDS ENGINEER DATE

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Firooz Zandi

ORIGINALLY APPROVED

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

			` '									
						THICKN	ESS (in.)					
AREA (sft)	DIAMETER (in.)	0.0	164	0.0	)79	0.1	109	0.1	38	0.1	168	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
7.1	36	$\searrow$	$\setminus \setminus$	1.0	90.9	1.0	100.0	$\sim$	$\bigwedge$			
9.6	42	$\sim$	$\setminus$	1.0	77.9	1.0	100.0	> <	$\bigwedge$	$\sim$		
12.6	48	1.0	54.5	1.0	68.2	1.0	95.5	1.0	100.0	$\sim$		
15.9	54	1.0	48.5	1.0	60.6	1.0	84.9	1.0	100.0	$\sim$		
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	$\sim$		
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	$\searrow$	M	1.0	34.1	1.0	47.7	1.0	61.4	1.0	75.1	
56.7	102	$\sim$	$\sim$	1.1	32.0	1.1	44.9	1.1	57.8	1.1	70.7	
63.6	108	$\sim$	$\nearrow$	><		1.1	42.4	1.1	54.6	1.1	66.7	
70.9	114	$\sim$	M	$\nearrow$	$\sim$	1.2	40.2	1.2	51.7	1.2	63.2	
78.5	120	> <	$\sim$	><	> <	1.3	38.2	1.3	49.1	1.3	60.1	
86.6	126	> <	$\nearrow$	><	><	> <	><	1.3	46.8	1.3	57.2	
95.0	132	$\nearrow$	$\setminus$	><	><	$\sim$		1.4	44.7	1.4	54.6	
103.9	138	$\searrow$	M	$\searrow$	$\setminus$	$\searrow$	$\searrow$	1.4	42.7	1.4	52.2	
113.1	144	><	$\sim$	><	><	><	><	><	$\setminus$	1.5	50.0	
									П	NDIANA DEPART	MENT OF TRA	NSPORTATION
											HEIGHT (	
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#### NOTE:

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

### **COVER LIMITS**

JANUARY 1998

STANDARD DRAWING NO. E 715-PHCL-15

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 CHIEF HIGHWAY ENGINEER

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

				THICKNESS (in.)									
Re (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	0.0	)64	0.0	)79	0.	109	0.138		0.168	
, ,	, ,	, ,	, ,	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
$8/18\frac{3}{4}$	60	46	15.6	><	$\sim$	> <		1.1	20.8	1.1	20.8	>>	> <
$9/20\frac{3}{4}$	66	51	19.3	$\searrow$	$\searrow$		><	1.1	20.9	1.1	20.9	$\setminus$	$\sim$
$12/22\frac{7}{8}$	73	55	23.2	$\sim$	$\searrow$	> <	> <	1.1	20.8	1.1	20.8	$\nearrow$	$\geq$
$14/20\frac{7}{8}$	81	59	27.4	$\sim$	$\setminus$	$\searrow$	> <	1.2	17.1	1.2	17.1	1.2	17.1
$14/22\frac{5}{8}$	87	63	32.1		$\sim$	> <		1.2	17.3	1.2	17.3	1.2	17.3
16/24 है	95	67	37.0	> <	$\setminus$	$\geq$	$\searrow$	1.2	17.1	1.2	17.1	1.2	17.1
$16/26\frac{1}{8}$	103	71	42.4	>	$\setminus$	$\searrow$	$\sim$	1.2	16.9	1.2	16.9	1.2	16.9
$18/27\frac{3}{4}$	112	75	48.0	$\sim$	$\setminus$	$\sim$	><	1.3	16.5	1.3	16.5	1.3	16.5
$18/29\frac{1}{2}$	117	79	54.2		$\sim$			1.2	16.8	1.2	16.8	1.2	16.8
$18/31\frac{1}{4}$	128	83	60.5	> <	$\searrow$	$\geq$	$\sim$	$\setminus$	$\searrow$	1.3	16.2	1.3	16.2
18/33	137	87	67.4	><	><		><	><	><	1.3	16.0	1.3	16.0
$18/34\frac{3}{4}$	142	91	74.5	><	$\geq$			><	$\geq$	$\geq$	M	1.3	16.3
													<del>                                     </del>
									1				
-													<del>                                     </del>

#### 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  $8/18\frac{3}{4}$ , represent the following:
  - 8 minimum corner raduis allowed by AASHTO M 36.  $18\frac{3}{4}$  - 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

DESIGN STANDARDS ENGINEER

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

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Firooz Zandi 11-15-99

### 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



DETAILS PLACED IN THIS FORMAT 11-15-99

/s/Anthony L. Uremovich #1-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER

ORIGINALLY APPROVED

# CORRUGATED POLYETHYLENE PIPE, TYPES HEIGHT OF COVER LIMITS (ft.) AY ITEM NOMINAL MINIMUM MAXIM

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

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

		D	DIMENSION RATIO (NOM. DIA./WALL THICKNESS)									
PAY ITEM	NOMINAL	26		2	21	1	7	11				
DIA. (in.)	DIA. (in.)	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	> <	$\supset <$	> <	> <			
12	14	$\geq <$	$\geq <$	$\geq <$	$\geq <$	2.0	81.0	$\geq <$	><			
15	18	2.0	40.0	2.0	57.0	2.0	81.0	$\geq \leq$	$\geq \leq$			
18	20	2.0	40.0	2.0	57.0	2.0	81.0	> <	$\supset <$			
18	22	$\geq <$	$\geq <$	$\geq \leq$	$\geq <$	2.0	81.0	2.0	100.0			
21	24	2.0	40.0	2.0	57.0	2.0	81.0	$\geq <$	$\geq <$			
24	28	2.0	40.0	2.0	57.0	2.0	81.0	$\geq <$	$\geq <$			
27	32	2.0	40.0	2.0	57.0	2.0	81.0	$\geq \leq$	$\geq \leq$			
30	34	2.0	40.0	2.0	57.0	2.0	81.0	$\geq <$	$\geq <$			
36	42	2.0	40.0	2.0	57.0	2.0	81.0	$\supset \subset$	$\supset \subset$			

### 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

#### NOTE:

- 1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.
- The pay item diameter reflects the minimum required inside diameter.
- 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



DETAILS PLACED IN THIS FORMAT 11-15-99

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

/s/ Firooz Zandi fi

DESIGN STANDARDS ENGINEER ORIGINALLY APPROVED

### 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.
- 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



DETAILS PLACED IN THIS FORMAT 11-15-99

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

/s/ Firooz Zandi i

ORIGINALLY APPROVED

#### VITRIFIED CLAY PIPE, EXTRA STRENGTH HEIGHT OF COVER LIMITS (ft.) DIAMETER MINIMUM MAXIMUM (in) (ft.) (ft.) 12 1.2 16.0 15 14.0 1.4

1.4

1.4

1.4

1.5

1.6

1.5

1.5

#### NOTE:

18

21

24

27

30

33

36

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

13.0

14.0

15.0

14.0

13.0

13.0

14.0

#### INDIANA DEPARTMENT OF TRANSPORTATION PIPE HEIGHT OF

COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. E 715-PHCL-20

MOIANA ENC.

/s/Anthony L. Uremovich #1-15-99
DESIGN STANDARDS ENGINEER DATE

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Firooz Zandi
CHIEF HIGHWAY ENGINEER

DESIGN STANDARDS ENGINEER

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

	Strength Class/D-load Rating											
DIAMETER (in.)	Class II: D	0.01 = 1000	Class III: D	0.01 = 1250	Class III: D	0.01 = 1350	Class IV: D	0.01 = 1500	Class IV: 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:

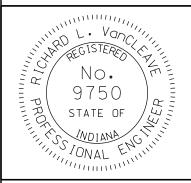
1. The tabulated cover depths shall be measured from the bottom of the bituminous or concrete pavement to the top of the pipe.

### INDIANA DEPARTMENT OF TRANSPORTATION

# PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2009

STANDARD DRAWING NO. E 715-PHCL-21



/s/ Richard L. VanCleave 09/01/09
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/09
CHIEF HIGHWAY ENGINEER DATE

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

	Strength Class/D-load Rating										
DIAMETER (in.)	Class V: D	).01 = 2250	Class V: D	).01 = 2500	Class V: D	<sub>0.01</sub> = 2750	Class V: D	).01 = 3000	Class Special:	D <sub>0.01</sub> = 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:

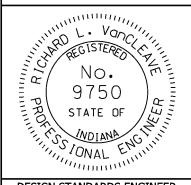
1. The tabulated cover depths shall be measured from the bottom of the bituminous or concrete pavement to the top of the pipe.

### INDIANA DEPARTMENT OF TRANSPORTATION

# PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2009

STANDARD DRAWING NO. E 715- PHCL-22



/s/ Richard L. VanCleave 09/01/09
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller
CHIEF HIGHWAY ENGINEER

09/01/09 DATE

#### 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 <sub>0.01</sub> = 600		Class HE-I: D <sub>0.01</sub> = 800		Class HE-II: D 0.01 = 1000		Class HE-III: D <sub>0.01</sub> = 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 DETAILS PLACED IN THIS FORMAT 11-15-99

/s/Anthony L. Uremovich #1-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER

ORIGINALLY APPROVED DESIGN STANDARDS ENGINEER