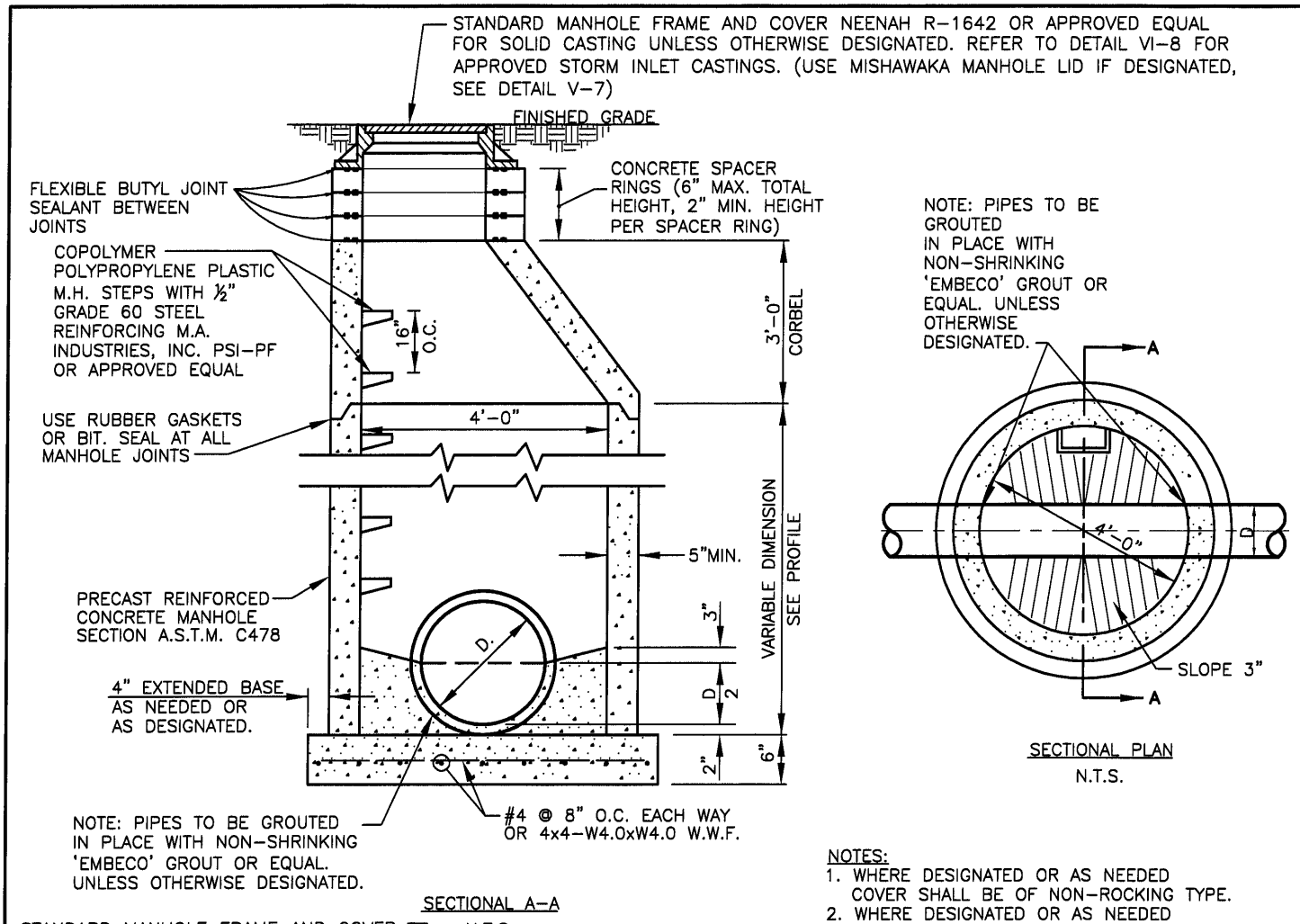
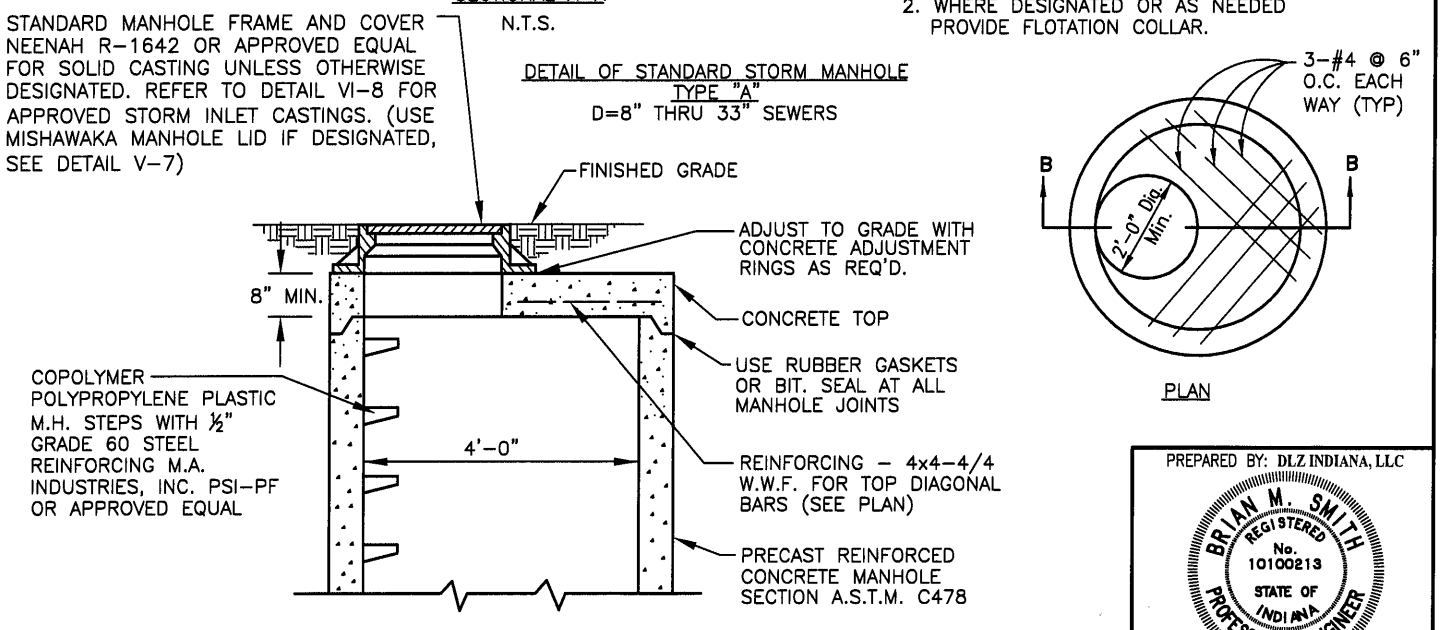


SECTIONAL A-A
N.T.S.

SECTIONAL PLAN
N.T.S.

NOTES:
1. WHERE DESIGNATED OR AS NEEDED COVER SHALL BE OF NON-ROCKING TYPE.
2. WHERE DESIGNATED OR AS NEEDED PROVIDE FLOTATION COLLAR.

DETAIL OF STANDARD STORM MANHOLE TYPE "A"
D=8" THRU 33" SEWERS



SECTION B-B

PLAN

DETAIL OF MANHOLE TOP WHERE RESTRICTED HEADROOM WILL NOT PERMIT TAPERED WALLS

PREPARED BY: DLZ INDIANA, LLC

BRIAN M. SMITH REGISTERED No. 10100213 STATE OF INDIANA PROFESSIONAL ENGINEER

3-26-13

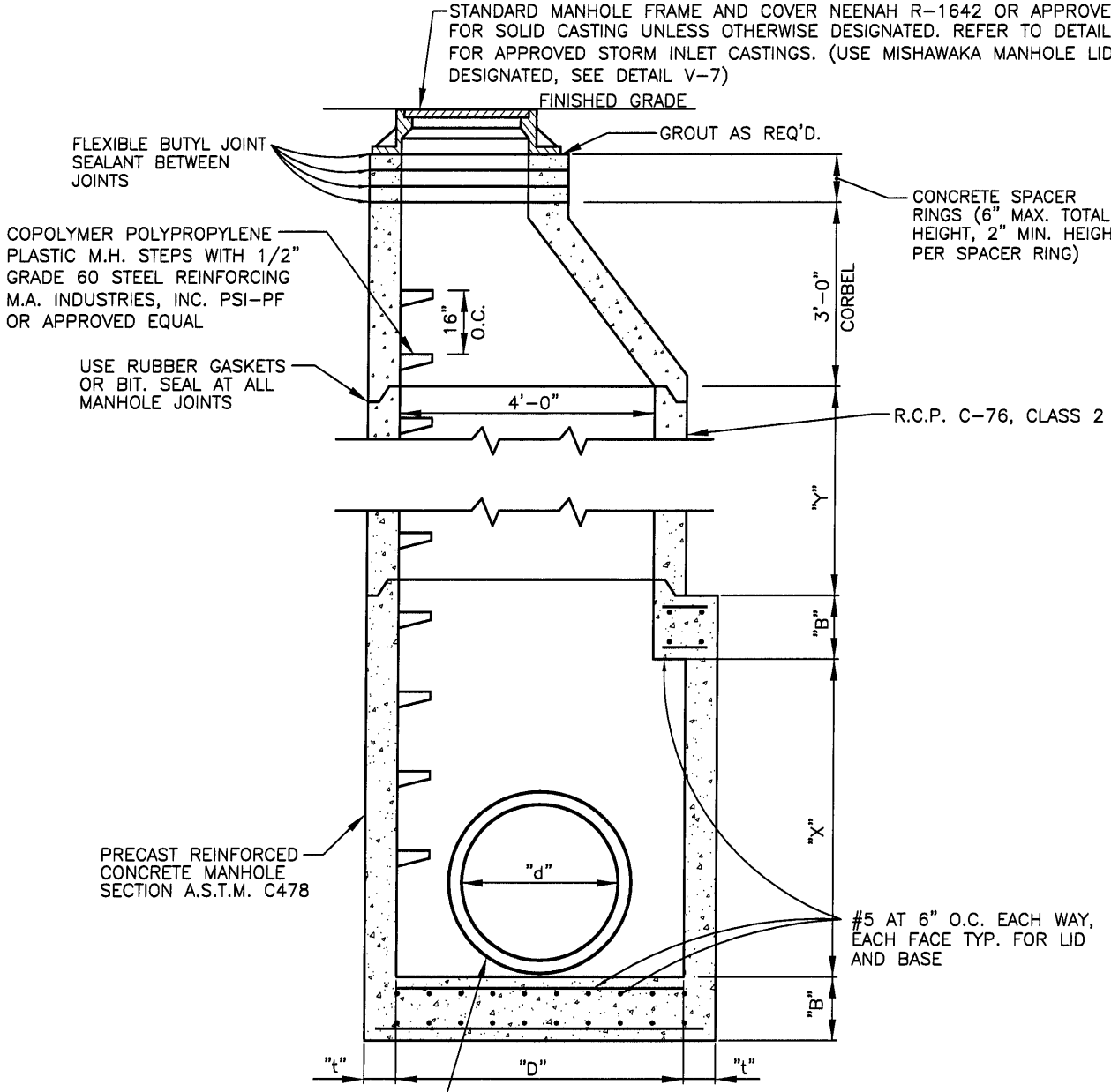
APPROVED/REVISED BY THE BOARD OF PUBLIC WORKS & SAFETY		
ITEM	REVISION	APPROVED DATE
	ADOPTED: NEW	MARCH 2013

CITY OF MISHAWAKA, INDIANA

ENGINEERING STANDARDS

TYPE "A" STORM MANHOLE

SHT. NO. VI-1



"d"	"D"	"B"	"t"	"X"	"Y"
36"	60"	8"	6"	60"	AS REQUIRED
42"	72"	8"	7"	72"	"
48"	72"	8"	7"	72"	"
54"	84"	10"	8"	84"	"
60"	84"	10"	8"	84"	"
66"	96"	12"	9"	96"	"
72"	96"	12"	9"	96"	"
78"	108"	12"	10"	108"	"
84"	108"	12"	10"	108"	AS REQUIRED

NOTE: MANHOLE DIAMETER "D" REQUIREMENT MAY INCREASE DUE TO THE LOCATIONS OF THE PIPE.

NOTE:
MANHOLES 72" AND SMALLER SHALL HAVE AN INTEGRALLY POURED BASE. MANHOLES 78" AND LARGER SHALL HAVE AN INTEGRALLY POURED BASE OR A WATERTIGHT GASKETED JOINT.

PREPARED BY: DLZ INDIANA, LLC

BRIAN M. SMITH REGISTERED No. 10100213 STATE OF INDIANA PROFESSIONAL ENGINEER

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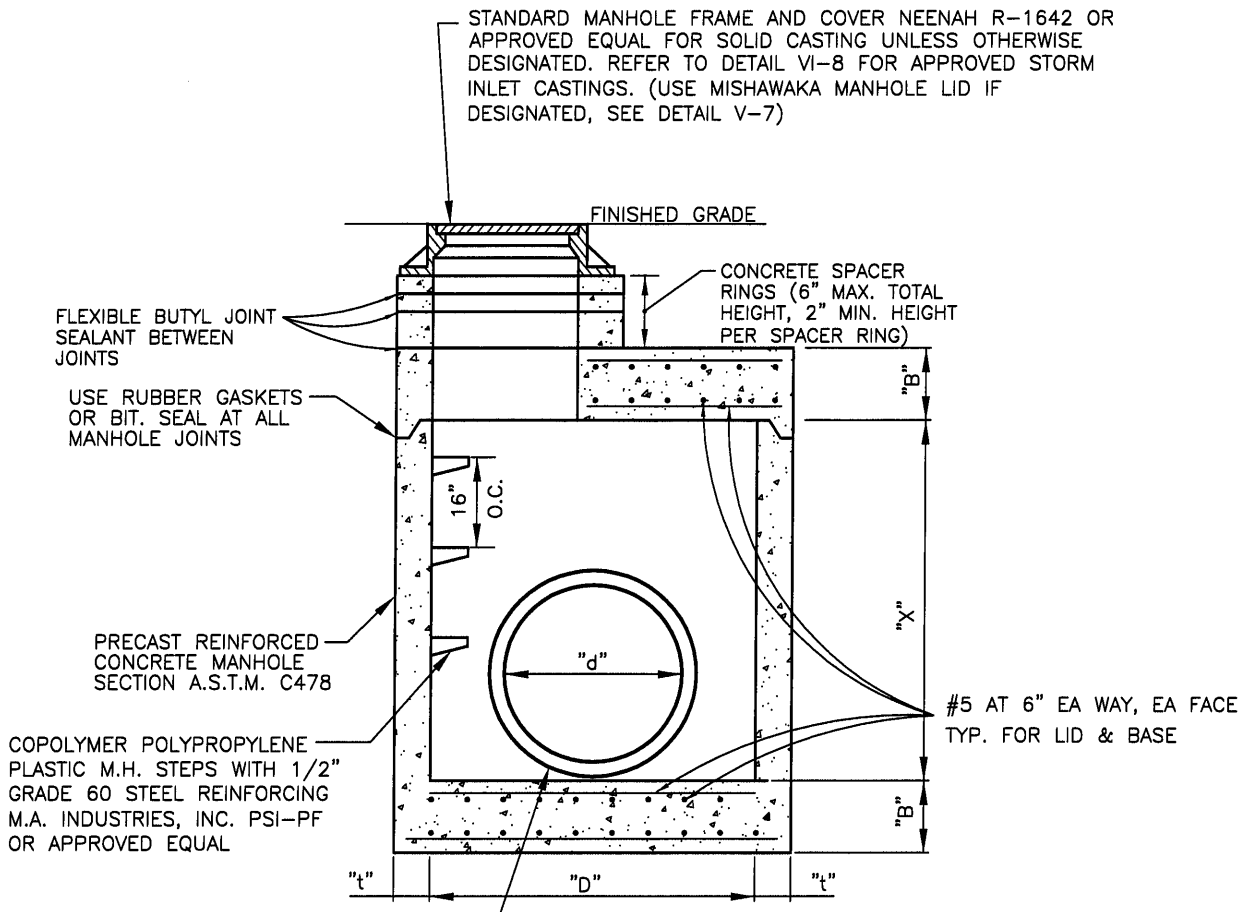
CITY OF MISHAWAKA, INDIANA

ENGINEERING STANDARDS

TYPE "B" STORM MANHOLE

SHT. NO. VI-2



NOTE: PIPES TO BE GROUTED IN PLACE WITH NON-SHRINKING 'EMBECO' GROUT OR EQUAL. UNLESS OTHERWISE DESIGNATED.

"d"	"D"	"B"	"t"	"X"	"Y"
36"	60"	8"	6"	60"	AS REQUIRED
42"	72"	8"	7"	72"	"
48"	72"	8"	7"	72"	"
54"	84"	10"	8"	84"	"
60"	84"	10"	8"	84"	"
66"	96"	12"	9"	96"	"
72"	96"	12"	9"	96"	"
78"	108"	12"	10"	108"	"
84"	108"	12"	10"	108"	AS REQUIRED

NOTE: MANHOLE DIAMETER "D" REQUIREMENT MAY INCREASE DUE TO THE LOCATIONS OF THE PIPE.

STANDARD STORM MANHOLE TYPE "B"
36" SEWER & LARGER
(RESTRICTED HEADROOM)

PREPARED BY: DLZ INDIANA, LLC

BRIAN M. SMITH REGISTERED No. 10100213 STATE OF INDIANA PROFESSIONAL ENGINEER

3-26-13

NOTE:
MANHOLES 72" AND SMALLER SHALL HAVE AN INTEGRALLY POURED BASE. MANHOLES 78" AND LARGER SHALL HAVE AN INTEGRALLY POURED BASE OR A WATERTIGHT GASKETED JOINT.

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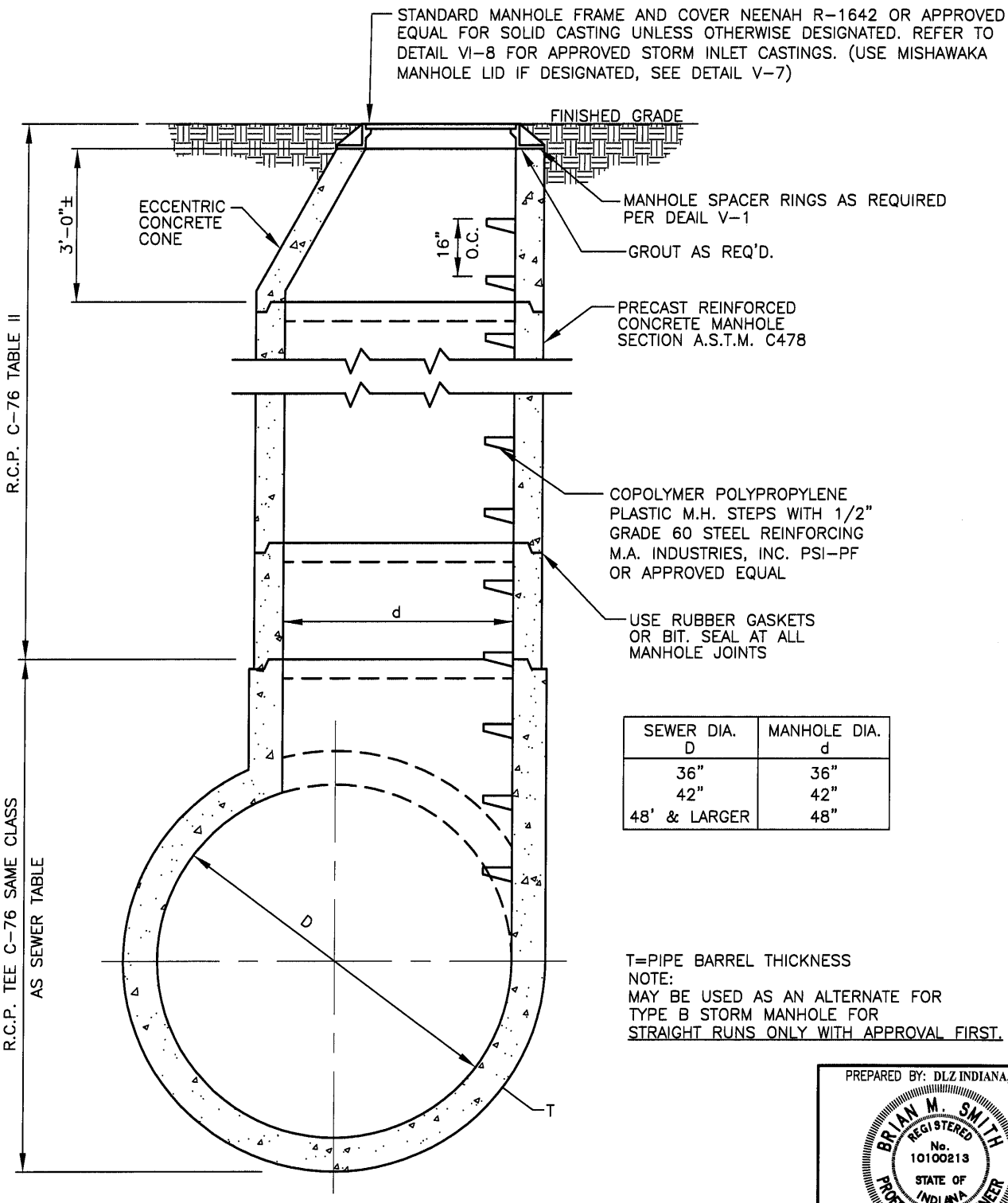
CITY OF MISHAWAKA, INDIANA

ENGINEERING STANDARDS

TYPE "B" STORM MANHOLE (RESTRICTED HEADROOM)

SHT. NO. VI-3



SEWER DIA. D	MANHOLE DIA. d
36"	36"
42"	42"
48' & LARGER	48"

T=PIPE BARREL THICKNESS
NOTE:
MAY BE USED AS AN ALTERNATE FOR TYPE B STORM MANHOLE FOR STRAIGHT RUNS ONLY WITH APPROVAL FIRST.

STANDARD STORM MANHOLE TYPE "C"
36" SEWERS & LARGER (STRAIGHT RUNS)

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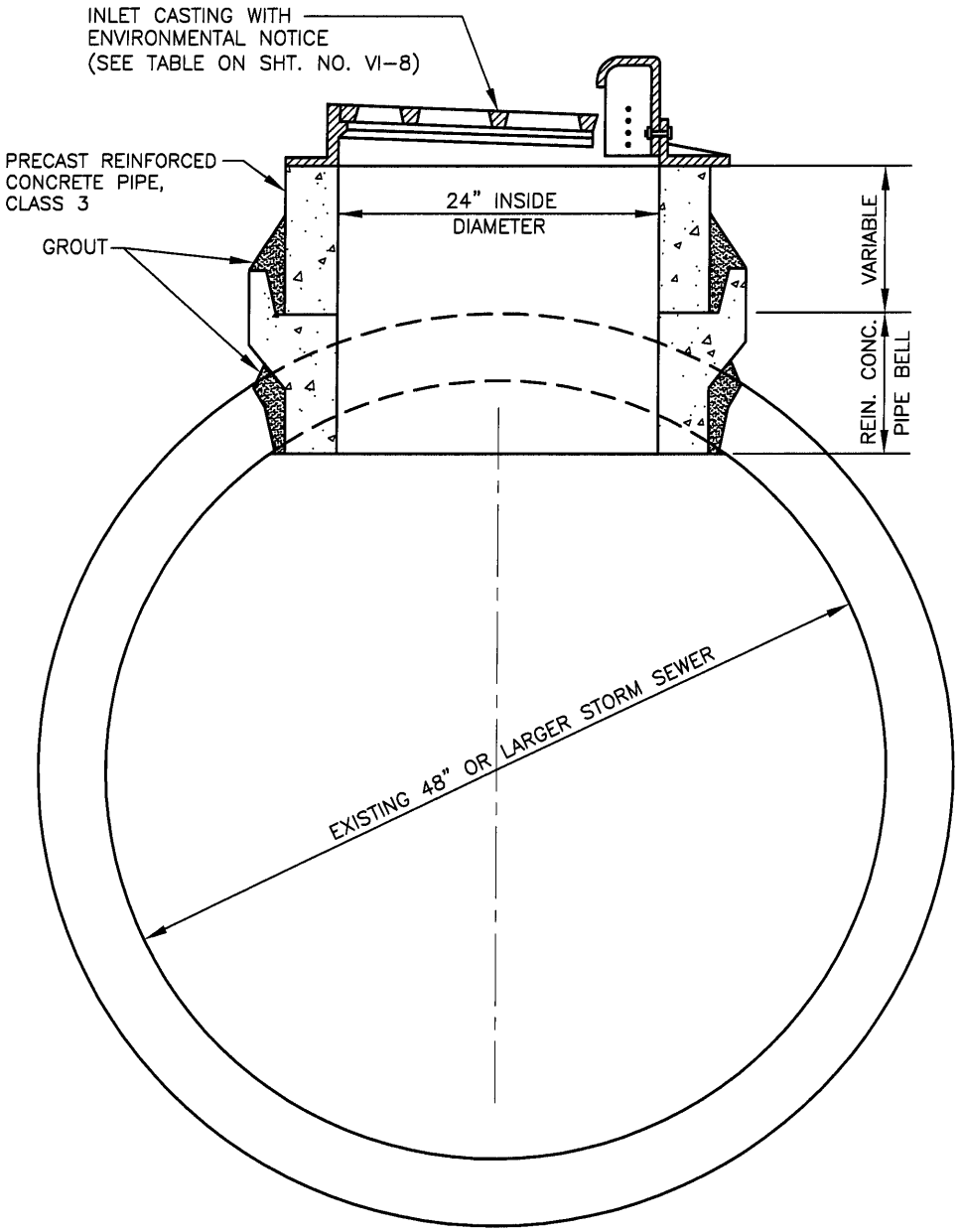
CITY OF MISHAWAKA, INDIANA

ENGINEERING STANDARDS

TYPE "C" STORM MANHOLE

SHT. NO. VI-4



INLET TYPE "V"

NOTE:
MINIMUM OF 1/2" CEMENT MORTAR SHALL BE UTILIZE TO SEAL EACH JOINT BETWEEN FRAME AND MANHOLE CASTING OR RISERS. (TYPICAL ON ALL STORM MANHOLES AND INLETS).

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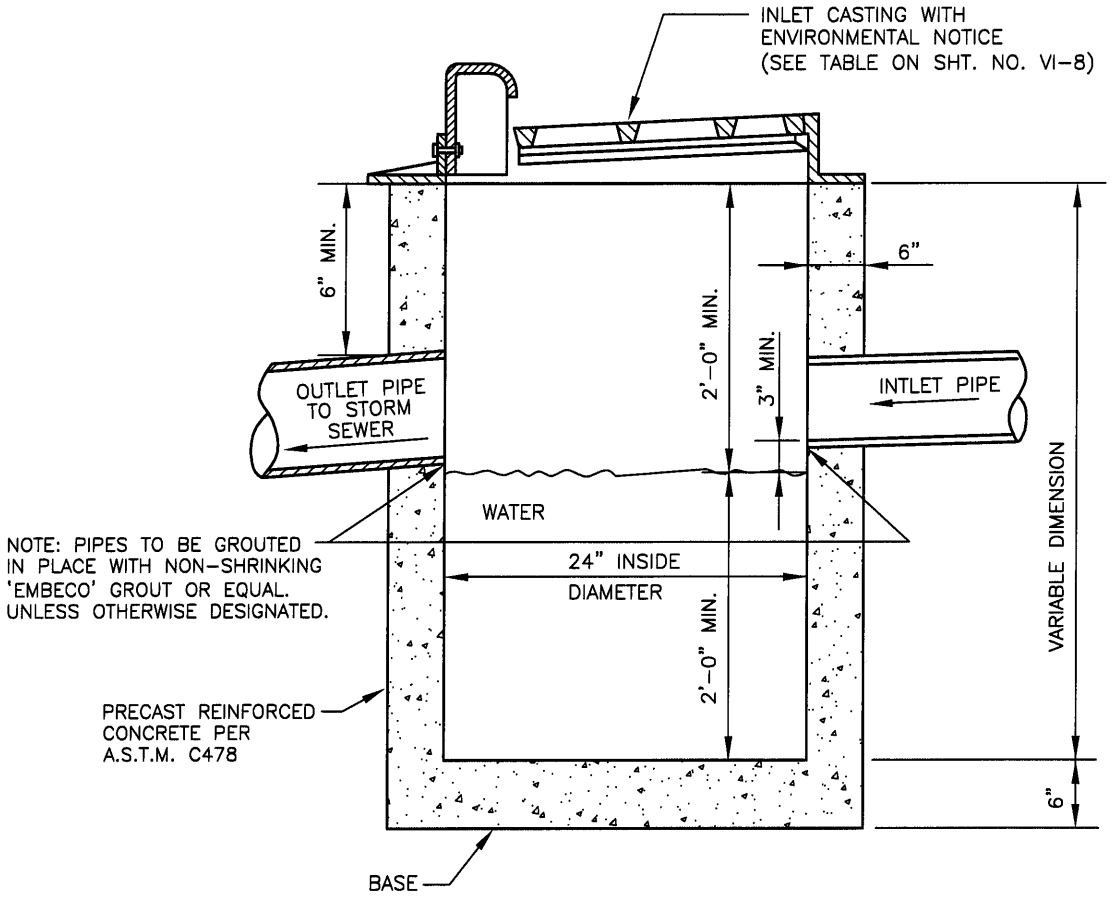
CITY OF MISHAWAKA, INDIANA

ENGINEERING STANDARDS

TYPE "V"
STORM MANHOLE

SHT. NO.
VI-5



CATCH BASIN

NOTE:
MINIMUM OF 1/2" CEMENT MORTAR SHALL BE UTILIZE TO SEAL EACH JOINT BETWEEN FRAME AND MANHOLE CASTING OR RISERS. (TYPICAL ON ALL MANHOLES AND INLETS).

HIGH VOLUME/MAJOR THOROUGHFARE

HYDRAULIC CALCULATIONS FOR HIGH VOLUME / MAJOR THOROUGHFARE ROADWAYS MAY REQUIRE THE USE OF INDOT STANDARD CATCH BASINS, TYPE J, WITH TYPE 10 (NEENAH R-3287-10V) CASTINGS AS APPROVED BY CITY ENGINEER.

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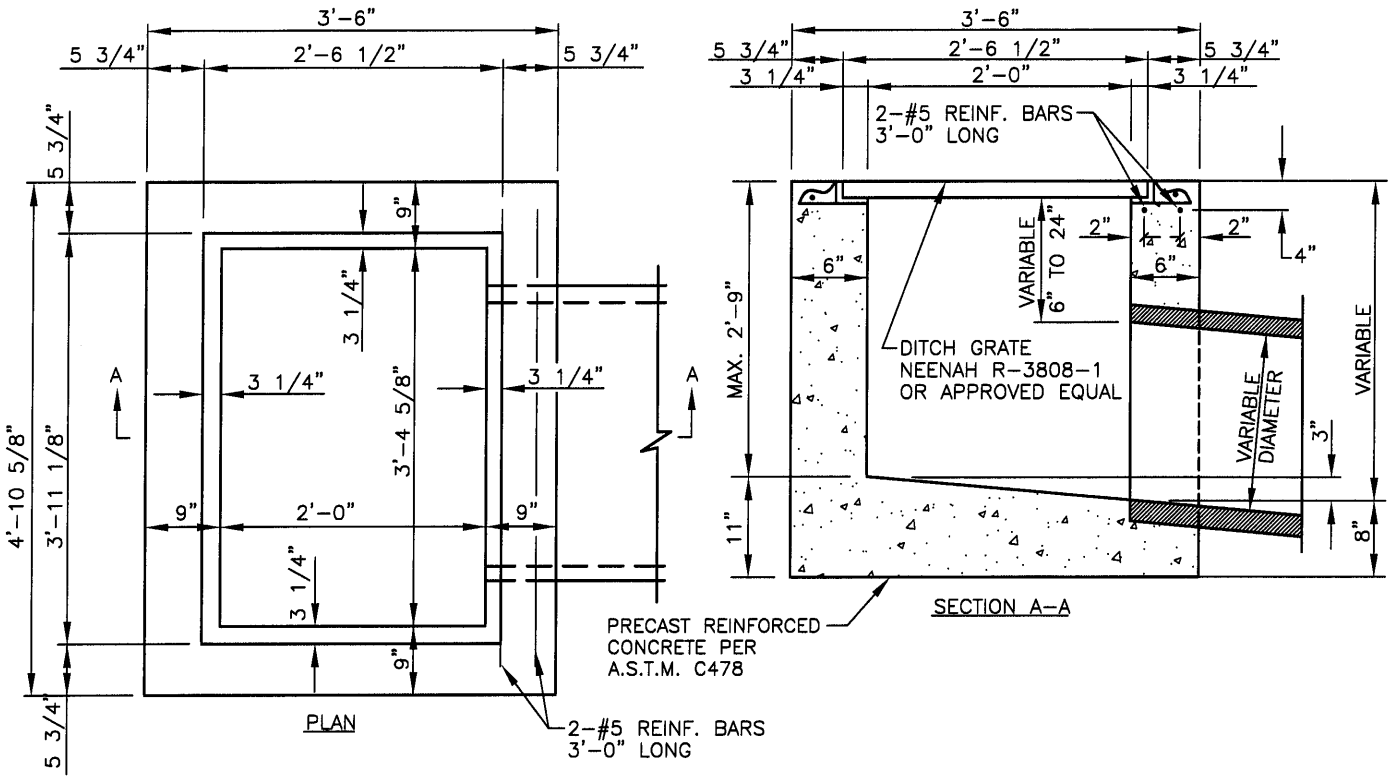
CITY OF MISHAWAKA, INDIANA

ENGINEERING STANDARDS

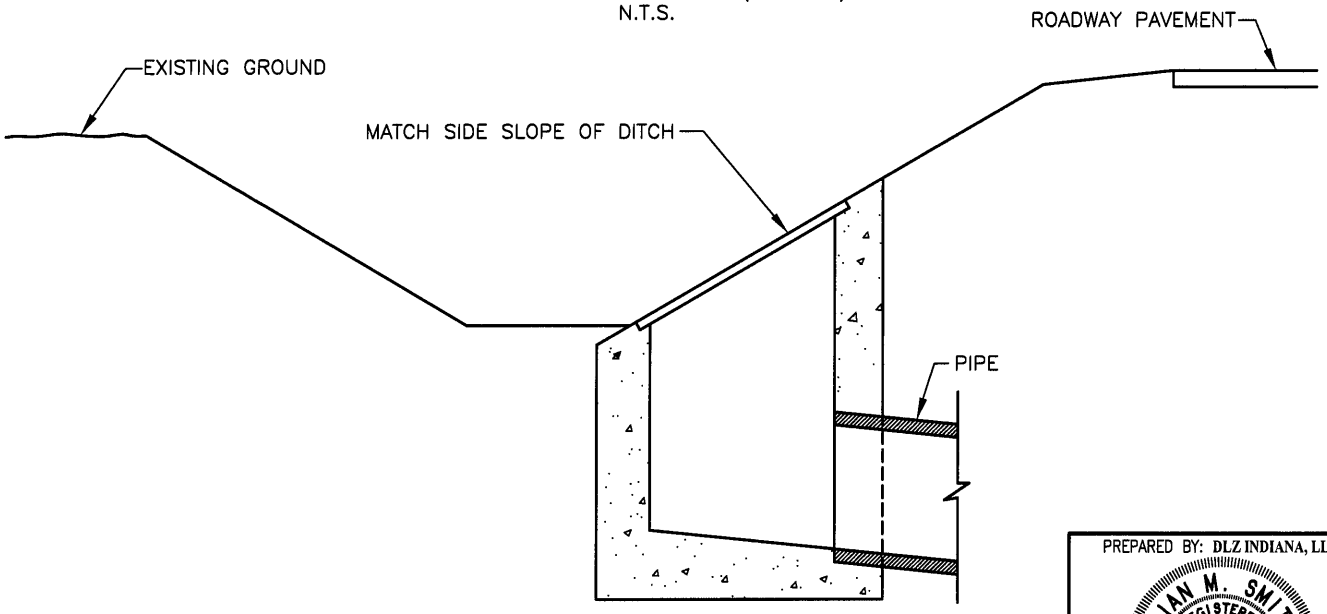
CATCH BASIN

SHT. NO. VI-6



INLET TYPE "E" (CONC.)

N.T.S.



TYPICAL DITCH INSTALLATION – INLET TYPE "E"

N.T.S.

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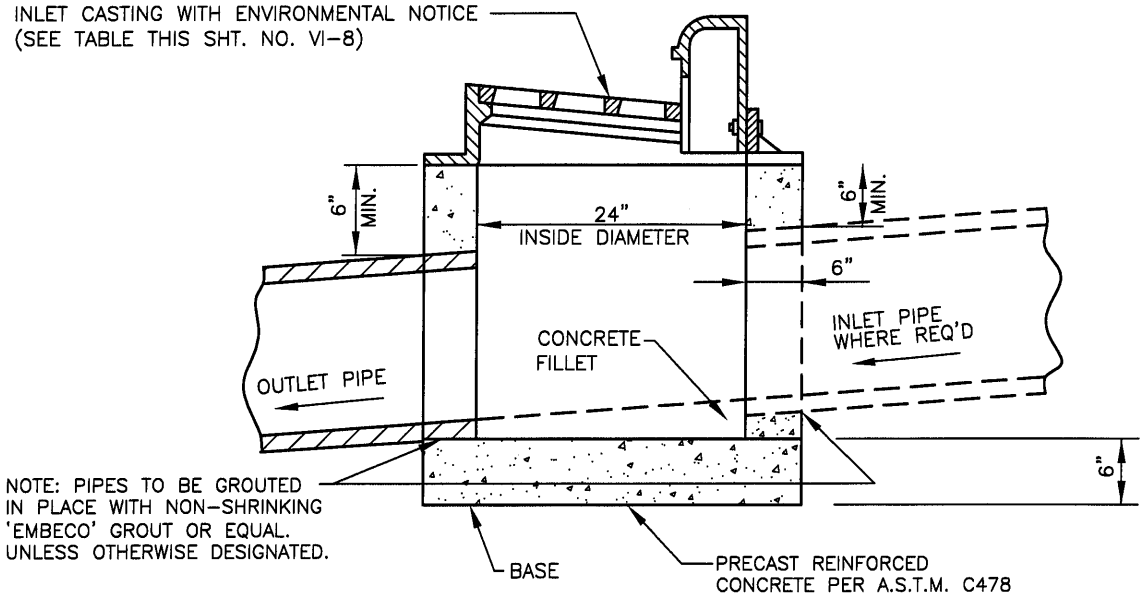
CITY OF MISHAWAKA, INDIANA

ENGINEERING STANDARDS

TYPE "E" INLET

SHT. NO. VI-7



STANDARD INLET

HIGH VOLUME/MAJOR THOROUGHFARE

HYDRAULIC CALCULATIONS FOR HIGH VOLUME / MAJOR THOROUGHFARE ROADWAYS MAY REQUIRE THE USE OF INDOT STANDARD INLETS, TYPE J OR M, WITH TYPE 10 (NEENAH R-3287-10V) CASTINGS AS APPROVED BY CITY ENGINEER.

APPROVED INLET CASTINGS

COMB. CONC. CURB & GUTTER	NEENAH R-3010
COMB. CONC CURB & GUTTER TYPE "A" (ROLL)	NEENAH R-3501-N EJIW 7490-M1
COMB. CONC. CURB & GUTTER TYPE "C" (8")	NEENAH R-3010

NOTES:
(1) OTHER INLET CASTINGS MAY BE ACCEPTABLE AS APPROVED BY CITY ENGINEER.
(2) ALL INLET GRATES SHALL BE BICYCLE SAFE.
(3) ENVIRONMENTAL NOTICE REQUIRED ON ALL STORM SEWER CASTINGS, E.G., "DUMP NO WASTE! DRAINS TO WATERWAYS!" MESSAGE WITH FISH IMAGE.

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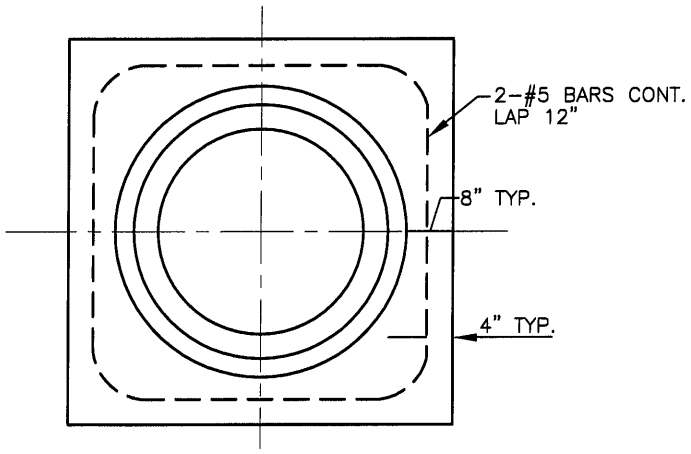
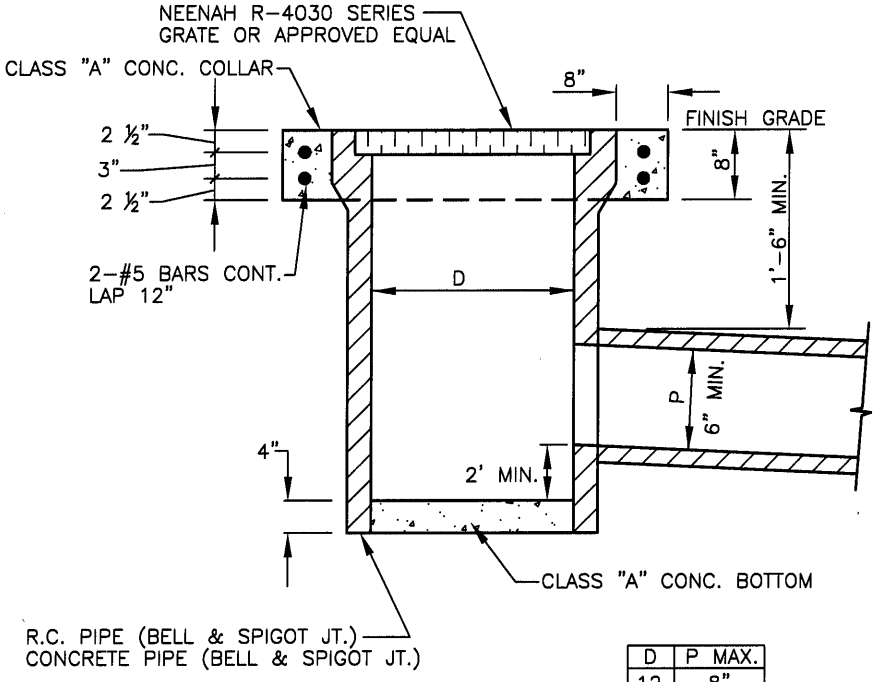
CITY OF MISHAWAKA, INDIANA

ENGINEERING STANDARDS

INLET

SHT. NO. VI-8





D	P MAX.
12	8"
15	10"
18	12"
24	12"

PIPE CATCH BASIN

NOTES:

1. CLASS "A" CONCRETE IN COLLAR AND BOTTOM TO BE INCLUDED IN THE PRICE OF THE ITEM.
2. USE OF A PIPE CATCH BASIN SHALL BE APPROVED BY THE CITY ENGINEER PRIOR TO PLACEMENT.

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BRIAN M. SMITH
REGISTERED
No. 10100213
STATE OF INDIANA
PROFESSIONAL ENGINEER

3-26-13

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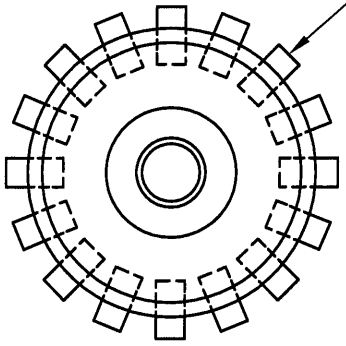
CITY OF MISHAWAKA, INDIANA

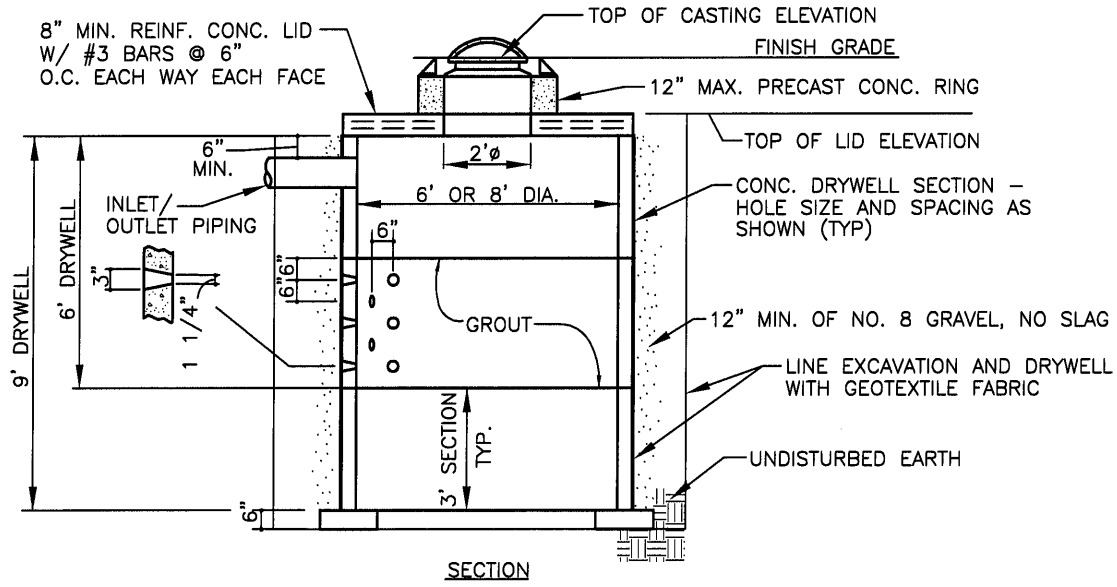
ENGINEERING STANDARDS

PIPE CATCH BASIN

SHT. NO. VI-9



PLAN



SECTION

NOTE:

1. A LAYER OF GEOTEXTILE FABRIC, PROPEX 4545 BY AMOCO OR APPROVED EQUAL SHALL BE PLACED BETWEEN THE DRYWELL AND THE NO. 8 AGGREGATE AND SHALL LINE THE EXCAVATION. ANY FABRIC JOINTS SHALL HAVE AN OVERLAP OF 18". THE NO. 8 AGGREGATE, THE GEOTECHNICAL FABRIC LAYERS AND THE FRAME AND GRATE TO BE INCLUDED IN THE COST OF THE DRYWELL.
2. AFTER INSTALLATION OF THE DRYWELLS AND BACKFILLING WITH THE NO. 8 AGGREGATE, THE CONTRACTOR WILL SURCHARGE EACH DRYWELL WITH A MINIMUM OF 3,000 GALLONS OF WATER PRIOR TO ANY PAVEMENT PLACEMENT. SURCHARGE WATER SHALL BE APPLIED AT A RATE THAT WILL COMPLETELY FILL THE DRYWELL.
3. WHERE NO CASTING IS REQ'D. PROVIDE CONCRETE REMOVABLE LID FOR THE 2' DIA. OPENING.
4. IN GRASS, AN OPEN GRATE CASTING SHALL BE NEENAH R–2561–A OR APPROVED EQUAL.
5. IN PAVEMENT, AN OPEN GRATE CASTING SHALL BE NEENAH R–2390 OR APPROVED EQUAL.
6. IN CURB, SEE TABLE ON SHT. NO. VI–8.
7. DRYWALLS ARE NOT PERMITTED WITHIN WELLHEAD PROTECTION AREAS.

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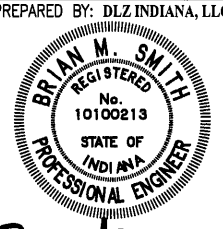

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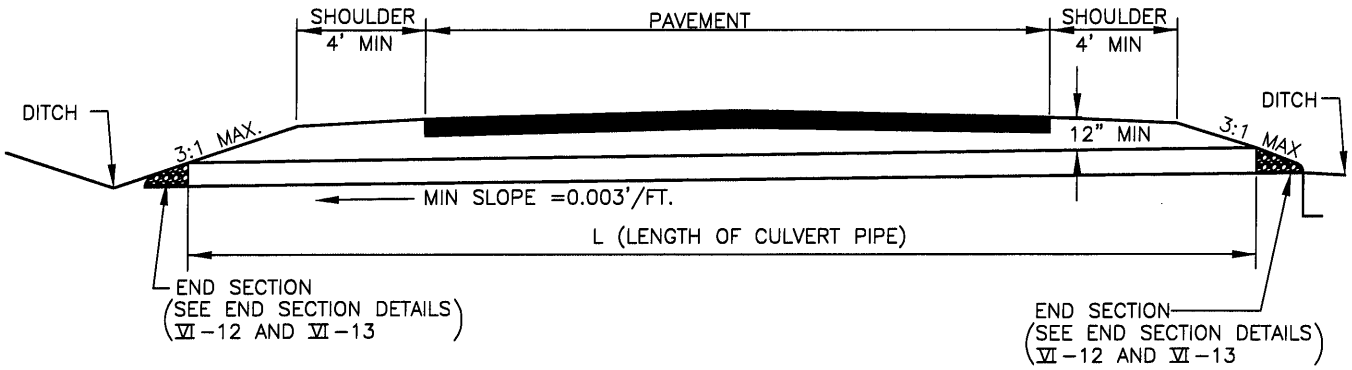
CITY OF MISHAWAKA, INDIANA

ENGINEERING STANDARDS

PRECAST PERFORATED DRYWELL

SHT. NO. VI-10



TYPICAL CULVERT INSTALLATION

NOTES

1. INSTALL MIN 15" DIA OR NECESSARY SIZE AND SLOPED DRAINAGE PATTERNS.
2. LOCATIONS UPON ENGINEERS APPROVAL ON NON-CURBED PAVEMENT SECTIONS.

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BRIAN M. SMITH
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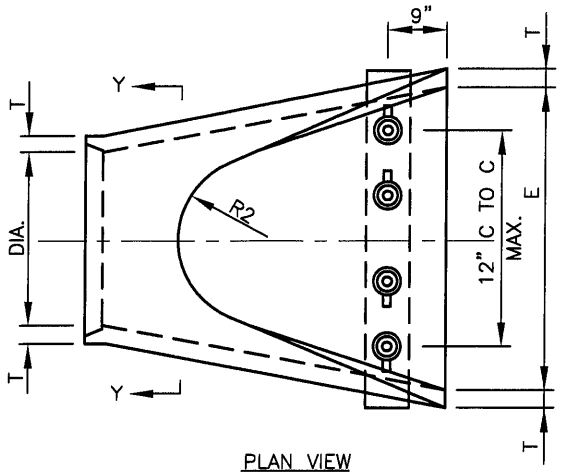
CITY OF MISHAWAKA, INDIANA

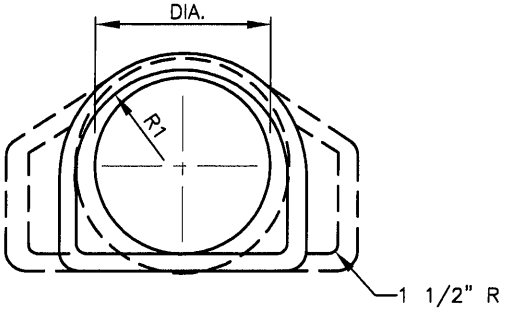
ENGINEERING STANDARDS

CULVERT INSTALLATION

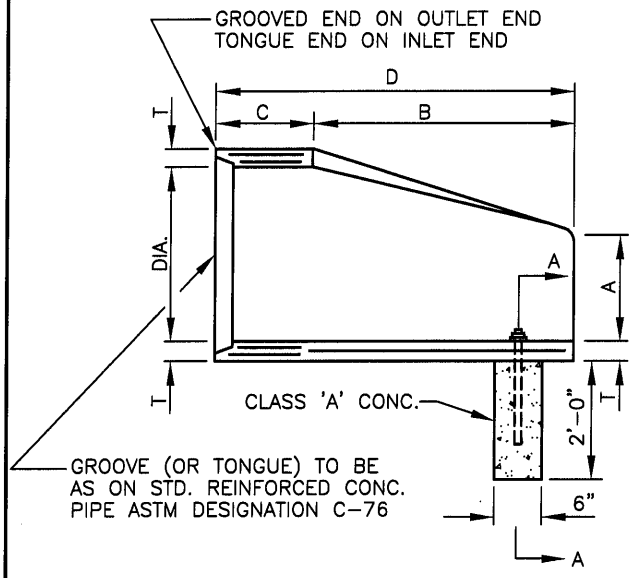
SHT. NO. VI-11



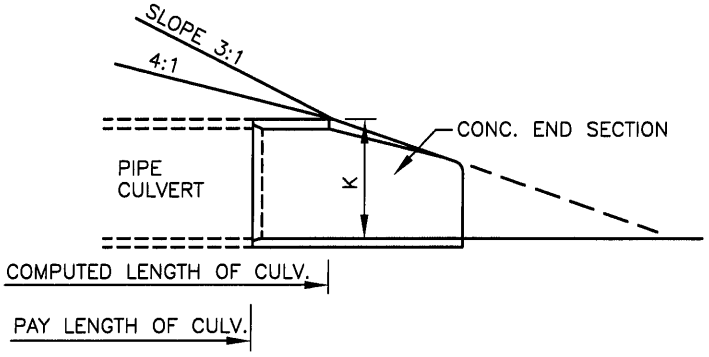
PLAN VIEW



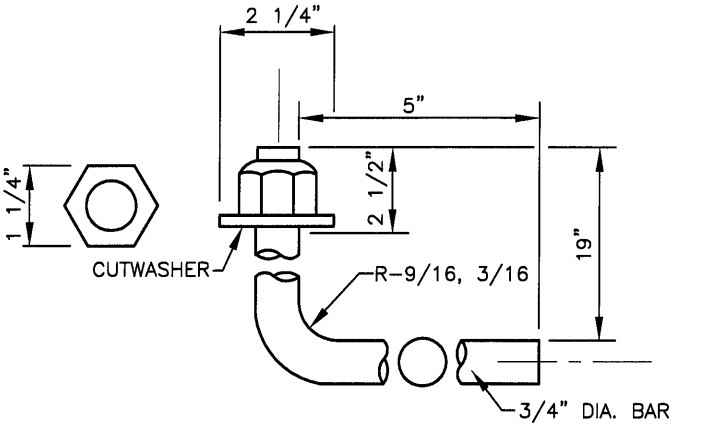
SECTION Y–Y



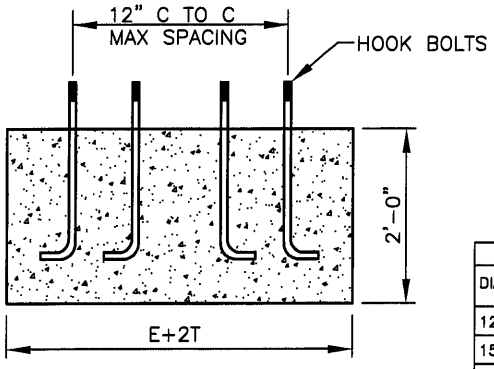
LONGITUDINAL SECTION



SLOPE DETAIL



HOOK BOLT & NUT



SECTION A–A

CONCRETE END SECTION

TABLE OF DIMENSIONS									
DIA.	T (MIN.)	A (±1")	C (±1")	D (±1")	E (±1")	K	R1	R2	APPROX. WEIGHT lb.
12"	2"	5"	4'–3"	6'–2"	2'–0"	1.3	10 1/8"	9"	800
15"	2 1/4"	7"	4'–0"	6'–3"	2'–6"	1.5	12 1/2"	11"	1100
18"	2 1/2"	11"	4'–1"	6'–2"	3'–0"	1.8	15 1/2"	12"	1300
21"	2 3/4"	11"	3'–6"	6'–3"	3'–6"	2.1	16 1/8"	13"	1500
24"	3"	1'–0"	2'–8"	6'–3"	4'–0"	2.3	16 3/16"	14"	1800
27"	3 1/4"	1'–1"	2'–5"	6'–3"	4'–6"	2.6	18 9/16"	14 1/2"	2100
30"	3 1/2"	1'–2"	1'–10"	6'–3"	5'–0"	2.9	18 1/2"	15"	2400
33"	3 3/4"	1'–3"	3'–6"	8'–3"	5'–6"	3.1	23 3/4"	17 1/2"	4100
36"	4"	1'–5"	3'–1"	8'–3"	6'–0"	3.4	24 5/16"	20"	4200

PREPARED BY: DLZ INDIANA, LLC

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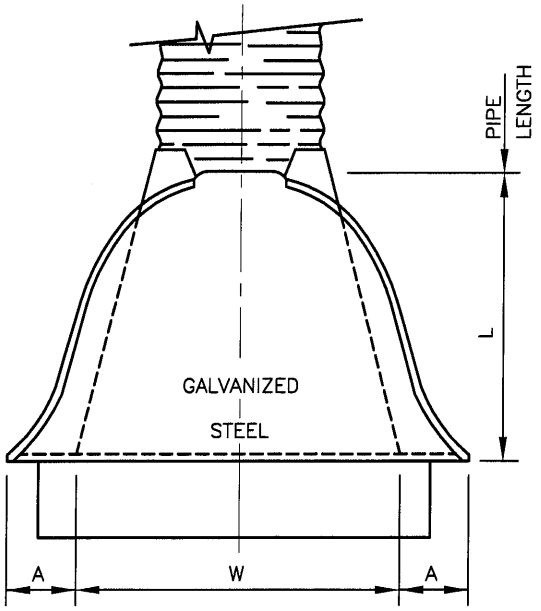
CITY OF MISHAWAKA, INDIANA

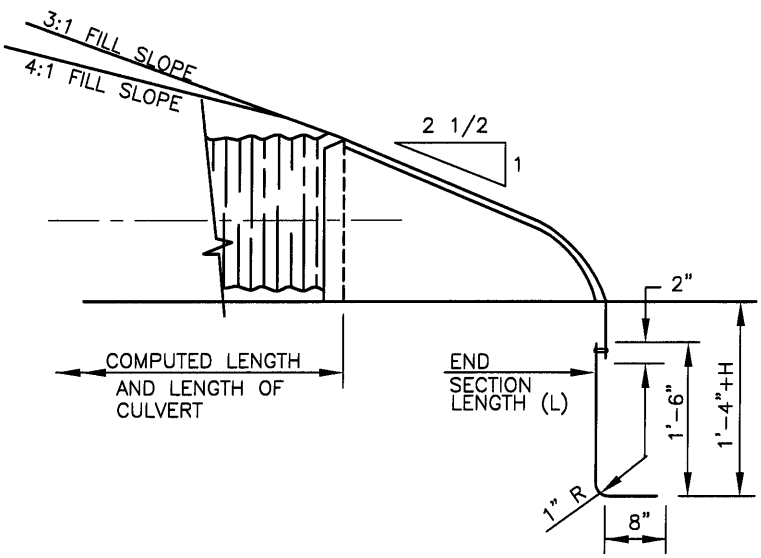
ENGINEERING STANDARDS

CONCRETE END SECTIONS

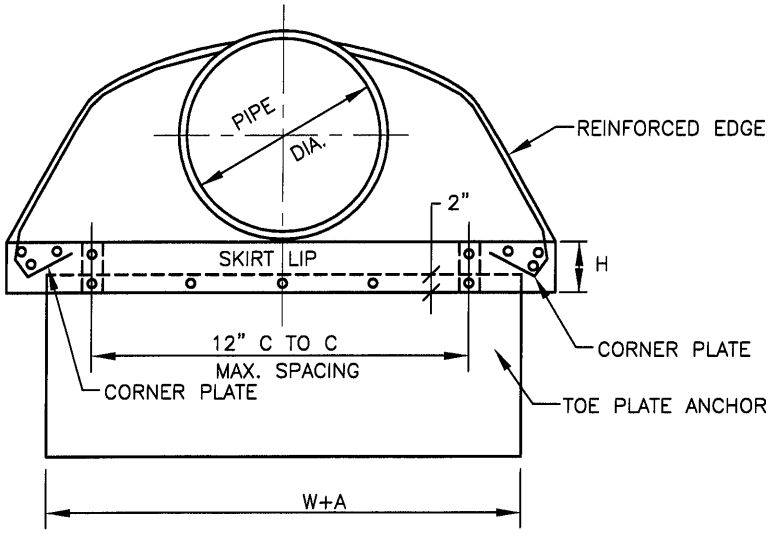
SHT. NO. VI-12



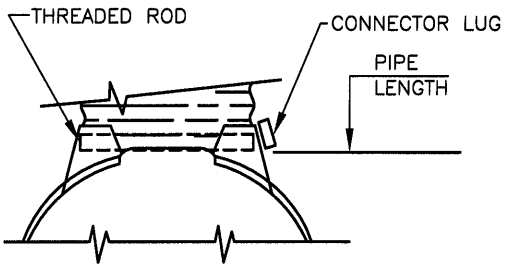
PLAN VIEW



SIDE VIEW



END VIEW



TYPE #3
FOR 12" THRU 24"

METAL END SECTION

PIPE DIA.	END SECTION THICK. (IN.)	A (±1")	B (MAX.)	H (±1")	L (±1 1/2")	W (±2")	APPROX. SLOPE	BODY
12"	.064	6"	6"	6"	21"	24"	2 1/2":1	1 PC.
15"	.064	7"	8"	6"	26"	30"	2 1/2":1	1 PC.
18"	.064	8"	10"	6"	31"	36"	2 1/2":1	1 PC.
21"	.064	9"	12"	6"	36"	42"	2 1/2":1	1 PC.
24"	.064	10"	13"	6"	41"	48"	2 1/2":1	1 PC.
30"	.079	12"	16"	8"	51"	60"	2 1/2":1	1 PC.
36"	.079	14"	19"	9"	60"	72"	2 1/2":1	2 PC.

PREPARED BY: DLZ INDIANA, LLC

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PROFESSIONAL ENGINEER

3-26-13

APPROVED/REVISED BY THE BOARD OF PUBLIC WORKS & SAFETY

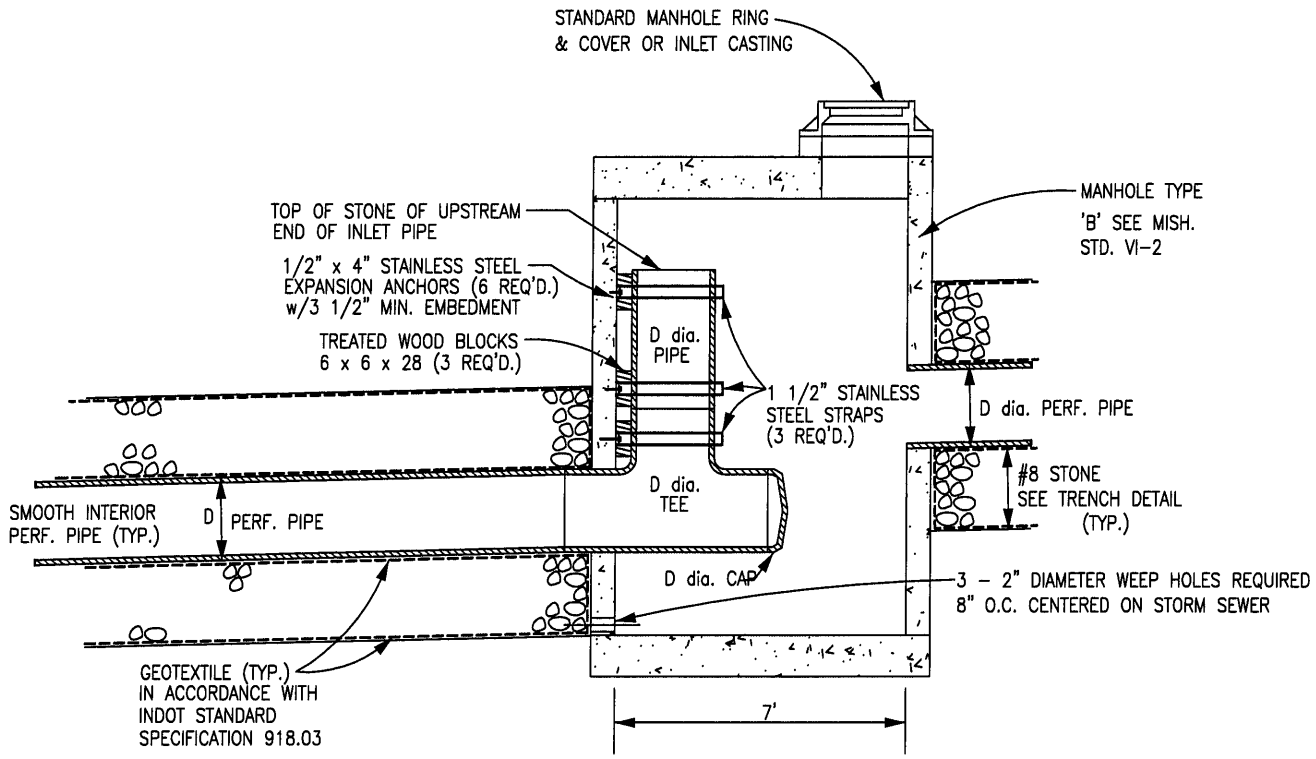
ITEM	REVISION	APPROVED DATE
	REISSUED/REVISED (FORMERLY VI-9)	MARCH 2013

CITY OF MISHAWAKA, INDIANA

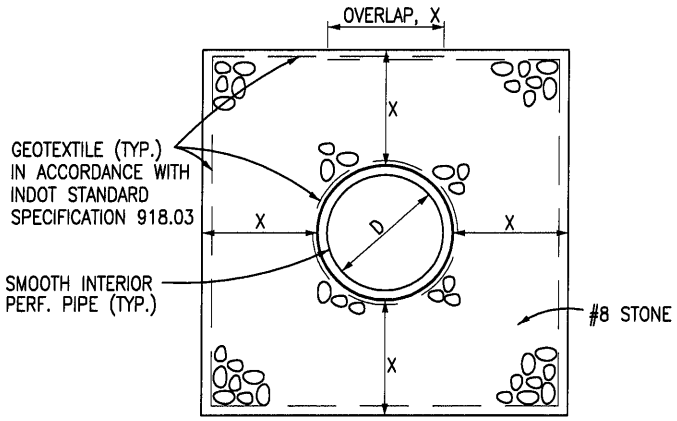
ENGINEERING STANDARDS

METAL END SECTIONS

SHT. NO. VI-13



TYPE 'R' MANHOLE DETAIL
MODIFIED TYPE 'B' MANHOLE



D, PIPE SIZE (IN)	X (IN)
12	12
15	15
18	18
24	24

TRENCH DETAIL

NOTES:
1. THIS SYSTEM IS NOT APPROVED FOR INSTALLATION UNDER STREET PAVEMENT
2. PERFORATED PIPES ARE NOT PERMITTED WITHIN WELLHEAD PROTECTION AREAS.
3. STONE SIZE TO BE DEPENDENT UPON DESIGN REQUIREMENTS.

PREPARED BY: DLZ INDIANA, LLC

BRIAN M. SMITH
REGISTERED
No. 10100213
STATE OF INDIANA
PROFESSIONAL ENGINEER

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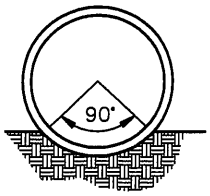
CITY OF MISHAWAKA, INDIANA

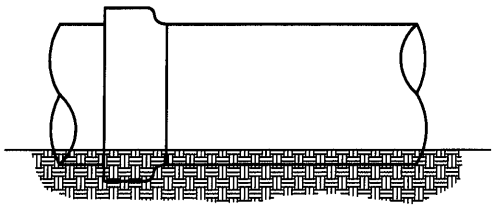
ENGINEERING STANDARDS

PERFORATED PIPE DETAIL

SHT. NO. VI-14

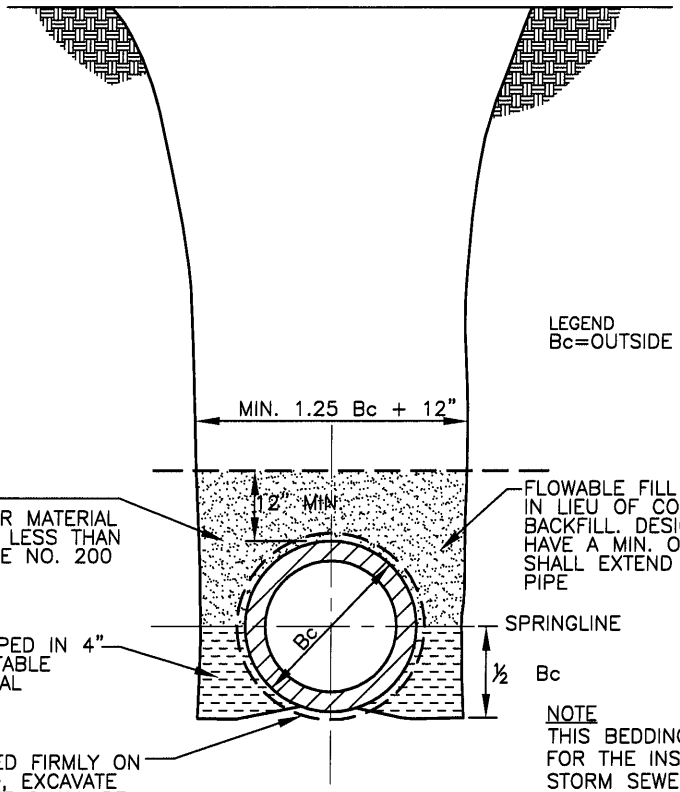


THE LOWER 90 ARC OF THE BARREL OF THE PIPE SHOULD BE IN FIRM CONTACT WITH UNDISTURBED EARTH.



SMALL EXCAVATIONS SHOULD BE MADE FOR THE BELLS. THESE SHOULD BE NO LARGER THAN NECCESSARY TO CLEAR THE BELL.

NOTE: IF NATIVE MATERIAL IS GREATER THAN 15% PASSING THE NO. 200 SIEVE THEN BEDDING DETAIL 'B' WILL BE USED EXCLUSIVELY.



NOTE
THIS BEDDING DETAIL IS NOT PERMITTED FOR THE INSTALLATION OF ANY FLEXIBLE STORM SEWER PIPE. REFER TO SHEET NUMBER VI-16 FOR THE STORM SEWER PIPE INSTALLATION DETAIL FOR FLEXIBLE PIPE.

BACK-FILL - IN STREETS, ALLEYS, SIDEWALKS OR DRIVING AREAS:
6" LAYERS, SOLIDLY TAMPED TO SUB-GRADE OF STREET BASE.

BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR

BACK-FILL - IN EASEMENT OR OPEN AREAS:
12" LAYERS SOLIDLY TAMPED.

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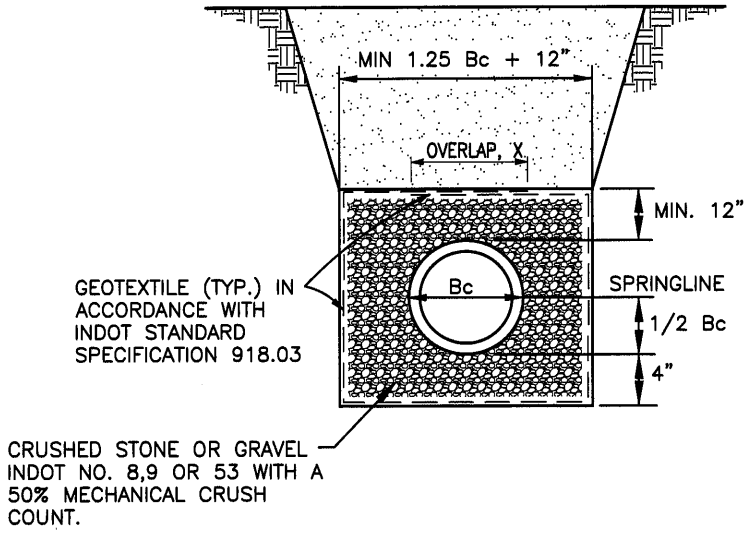
ENGINEERING STANDARDS

STORM SEWER BEDDING DETAIL "A"

SHT. NO. VI-15



GEOTEXTILE OVERLAP

D, PIPE SIZE (IN)	X (IN)
12	12
15	15
18	18
24	24

LEGEND
Bc=OUTSIDE DIAMETER OF PIPE

NOTES:

1. ALL BEDDING AND INITIAL BACKFILL SHALL BE INSTALLED IN 4" TO 6" BALANCED LIFTS AND MECHANICALLY TAMPED.
2. BEDDING MATERIAL SHALL BE HAND PLACED AROUND THE HAUNCH AND SIDES OF THE PIPE TO ENSURE PROPER COMPACTION AND COMPLETE FILLING OF ALL VOIDS.
3. BACK-FILL – IN STREETS, ALLEYS, SIDEWALKS OR DRIVING AREAS:
   a. 6" LAYERS, SOLIDLY TAMPED TO SUB-GRADE OF STREET BASE.
   b. BACKFILL WILL BE GRANULAR MATERIAL WITH LESS THAN 15% PASSING THE NO. 200 SIEVE.
   c. BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR
4. BACK-FILL – IN EASEMENT OR OPEN AREAS:
   a. 12" LAYERS SOLIDLY TAMPED.
   b. FOR BACKFILL IN EASEMENTS OR OPEN AREAS NATIVE MATERIAL WILL BE ACCEPTABLE.
5. THIS BEDDING DETAIL SHALL BE USED FOR THE INSTALLATION OF ALL FLEXIBLE STORM SEWER PIPE MATERIALS.

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STORM SEWER BEDDING DETAIL "B"

SHT. NO. VI-16