

HENDRICKS COUNTY REGIONAL SEWER DISTRICT



STANDARD DETAILS

DIRECTIONS FOR USE

1. THE ENTIRE SET OF FULL SIZE STANDARDS SHALL BE ATTACHED TO THE CONSTRUCTION DRAWINGS AND SHALL BE CONSIDERED PART THEREOF. PARTIAL SET MAY BE USED FOR SMALL PROJECTS WHEN APPROVED BY HENDRICKS COUNTY REGIONAL SEWER DISTRICT.
2. DETAILS PREPARED BY OUTSIDE SOURCES SHALL NOT BE INCLUDED IN THE CONSTRUCTION DRAWINGS WHEN SAID DETAILS COVER WORK WHICH IS COVERED BY HENDRICKS COUNTY REGIONAL SEWER DISTRICT STANDARDS.
3. INDIVIDUAL HENDRICKS COUNTY REGIONAL SEWER DISTRICT STANDARDS THAT DO NOT APPLY MAY BE CROSSED OUT BY DESIGN ENGINEER THROUGH THE PLACEMENT OF A SINGLE LARGE X OVER DETAIL. MINOR REFERENCE NOTATIONS MAY BE PLACED ADJACENT TO INDIVIDUAL STANDARD TITLES FOR COORDINATION. HOWEVER, THE STANDARDS THEMSELVES SHALL NOT BE MODIFIED IN ANY WAY.
4. DETAILS PREPARED BY OUTSIDE SOURCES COVERING WORK WHICH IS NOT COVERED BY HENDRICKS COUNTY REGIONAL SEWER DISTRICT STANDARDS ARE THE SOLE RESPONSIBILITY OF THE DESIGN ENGINEER AND SHALL BE PLACED ON SHEETS OTHER THAN THE HENDRICKS COUNTY REGIONAL SEWER DISTRICT STANDARDS SHEETS.

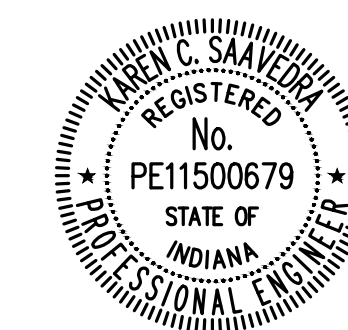
GENERAL NOTES

1. CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF ALL EXISTING UTILITIES AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION OR EXCAVATION. DURING CONSTRUCTION ALL UTILITIES SHALL BE ADEQUATELY SUPPORTED TO MINIMIZE DAMAGE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING OR REPLACING DAMAGED UTILITIES TO THE SATISFACTION OF HENDRICKS COUNTY REGIONAL SEWER DISTRICT AND THE OWNER OF THE AFFECTED UTILITY.
2. INSTALLATION OF OR PROVISIONS FOR THE INSTALLATION OF ALL UNDERGROUND UTILITIES INCLUDING SERVICE LATERALS TO BE PLACED UNDER PAVEMENT AREAS SHALL BE ESTABLISHED PRIOR TO THE CONSTRUCTION OF THE PAVEMENTS.
3. CONTRACTOR SHALL CONTACT HENDRICKS COUNTY REGIONAL SEWER DISTRICT FOR ELECTRICAL STANDARDS, TERMS, AND CONDITIONS DURING PROJECT PLANNING AND AT LEAST 1 MONTH PRIOR TO CONSTRUCTION OR EXCAVATION.

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| REVISIONS | | |
|----------------|---|------------|
| REVISION NO. | DESCRIPTION | DATE |
| 1 | SHEET ADDED | 12/10/2018 |
| 3 | REVISIONS TO AIR RELEASE VALVE LATERAL CONNECTION TO EXISTING SEWER | 01/03/2019 |
| 4 | DETAIL AND LIFT STATION SPECIFICATIONS UPDATES | 01/21/2021 |
| SPECIFICATIONS | | |
| 1 | UPDATED TESTING REQ. PER IDEM COMMENTS | 01/20/2017 |
| 2 | UPDATED TESTING REQ. PER IDEM COMMENTS | 12/10/2018 |
| 3 | GENERAL REVISIONS | 01/03/2019 |
| 4 | ASTM REFERENCE | 08/05/2019 |

APPROVED BY



Karen C. Skavedra 4/30/2021
KAREN C. SKAVEDRA
PROFESSIONAL ENGINEER No. PE11500679
STATE OF INDIANA

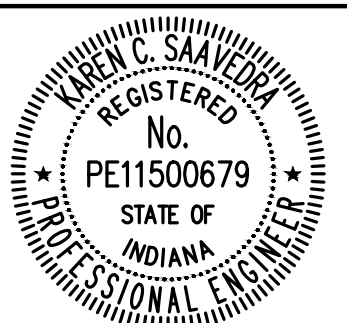
DATE OF ISSUANCE: 4/30/2021



HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

STANDARD DETAILS



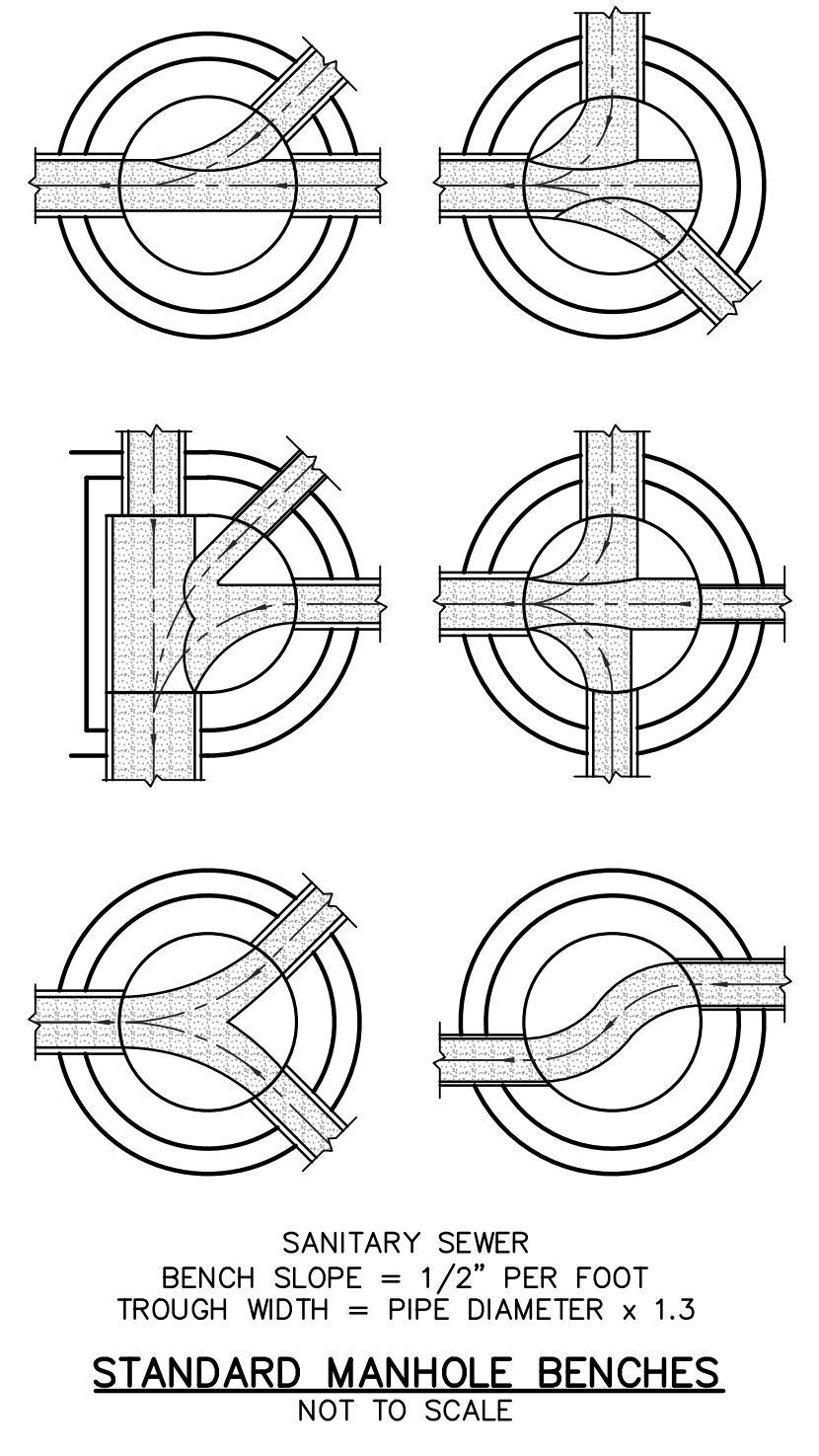
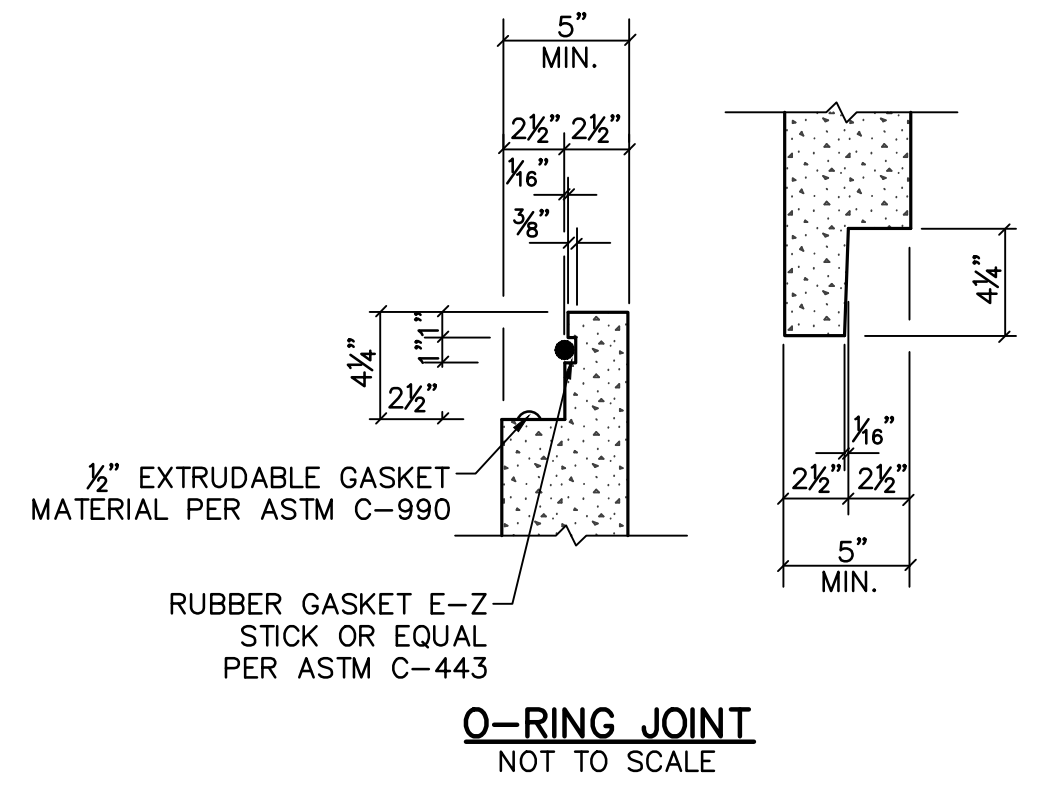
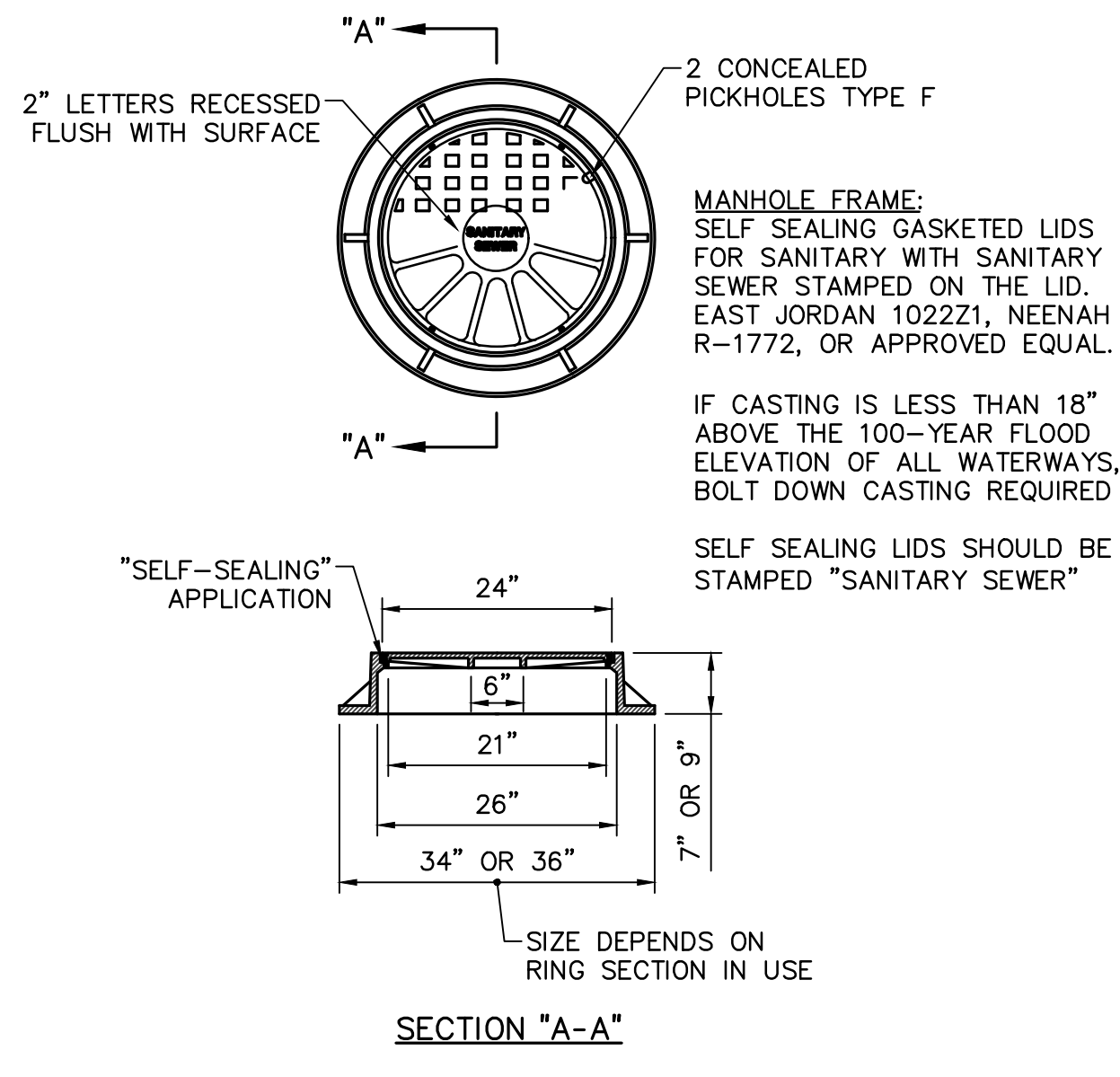
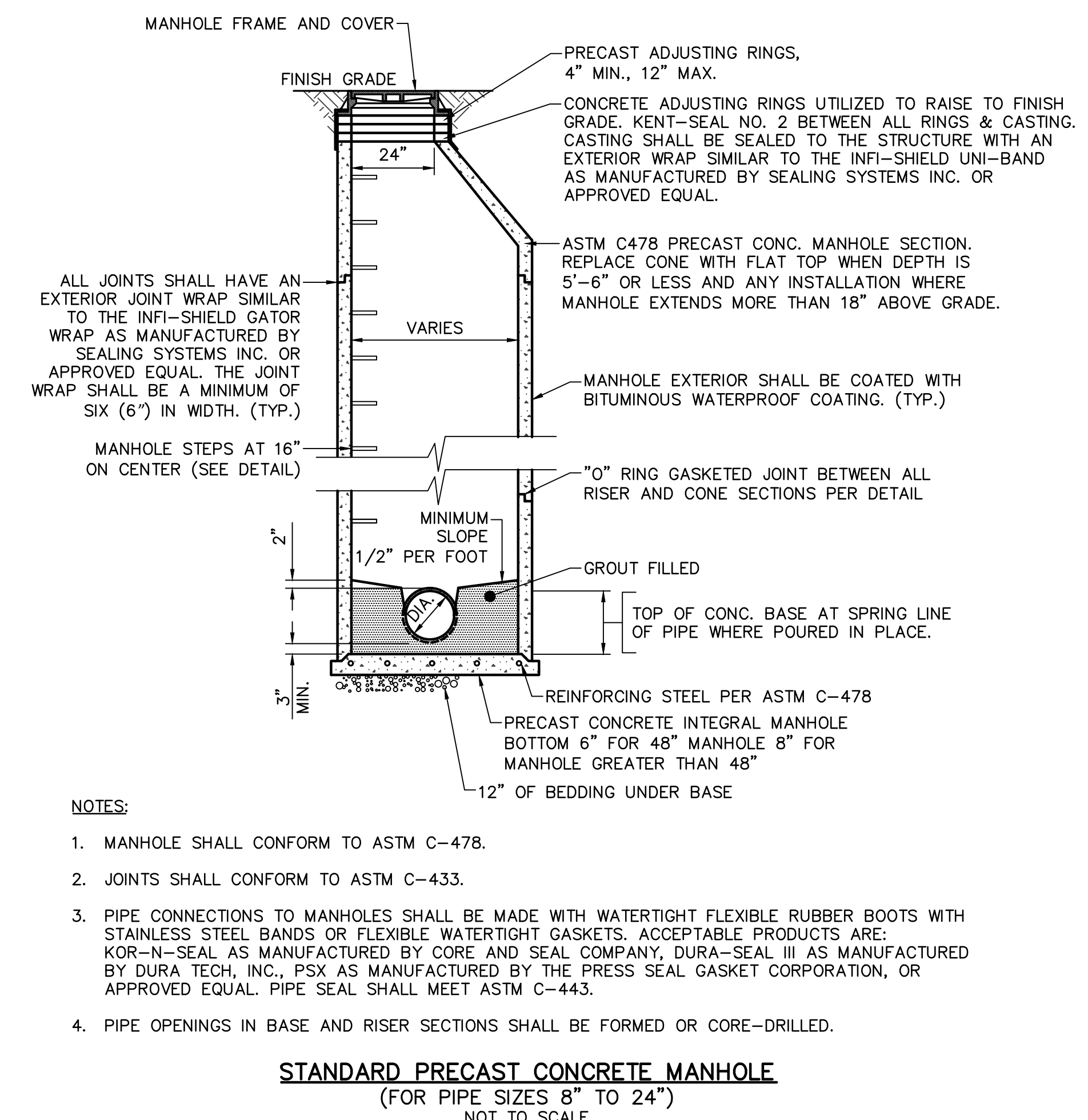
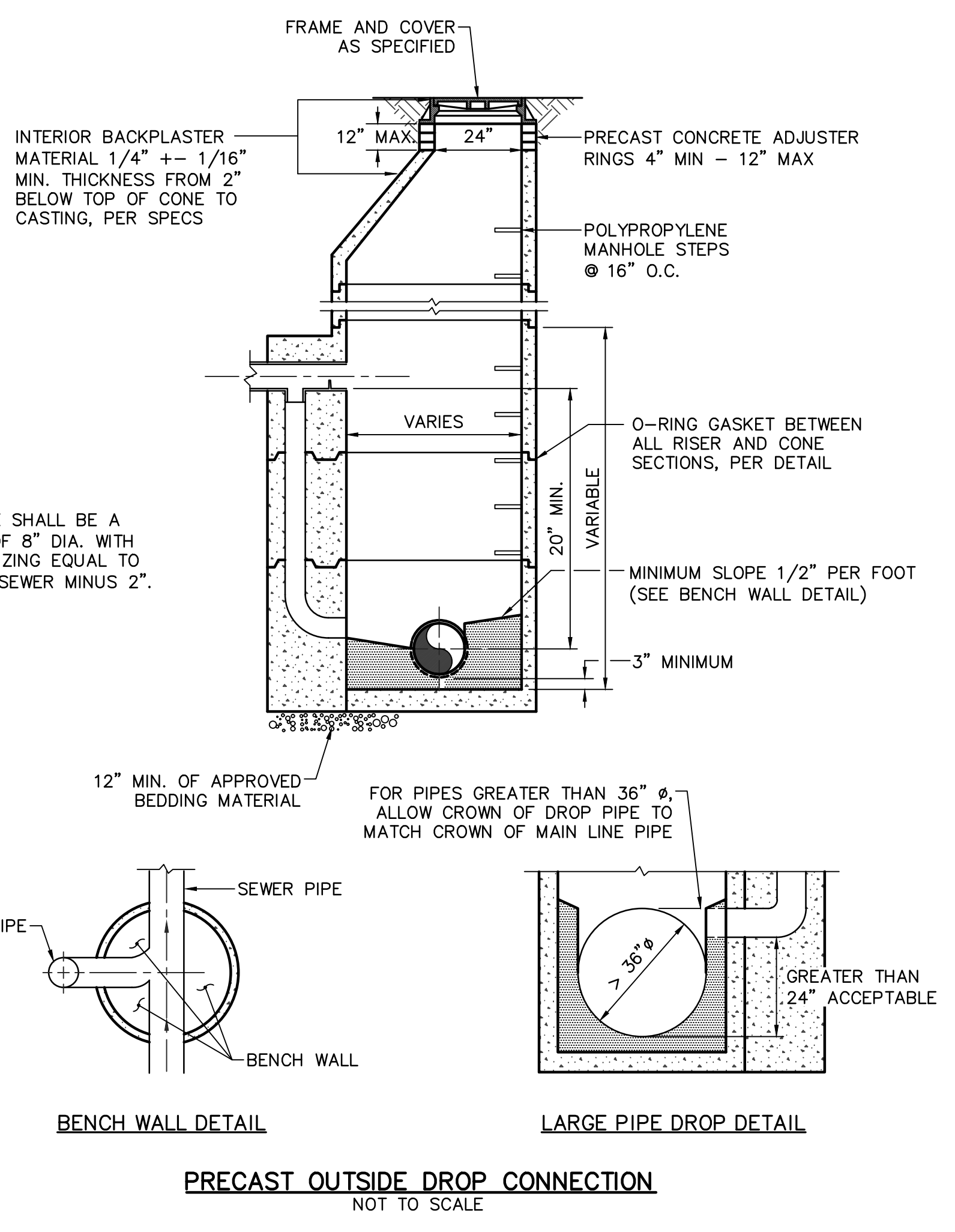
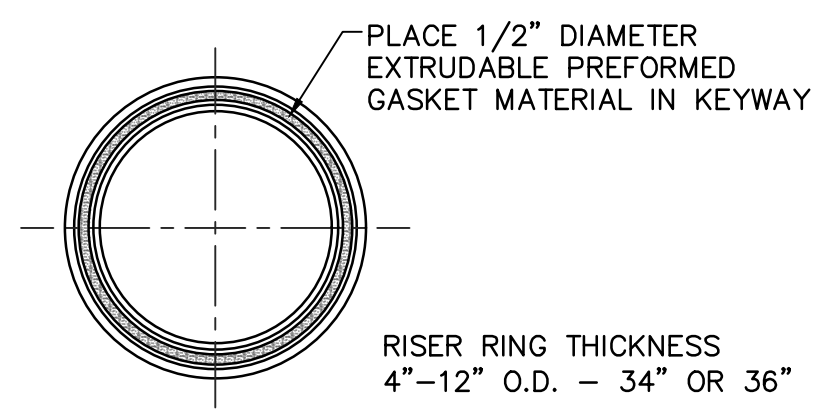
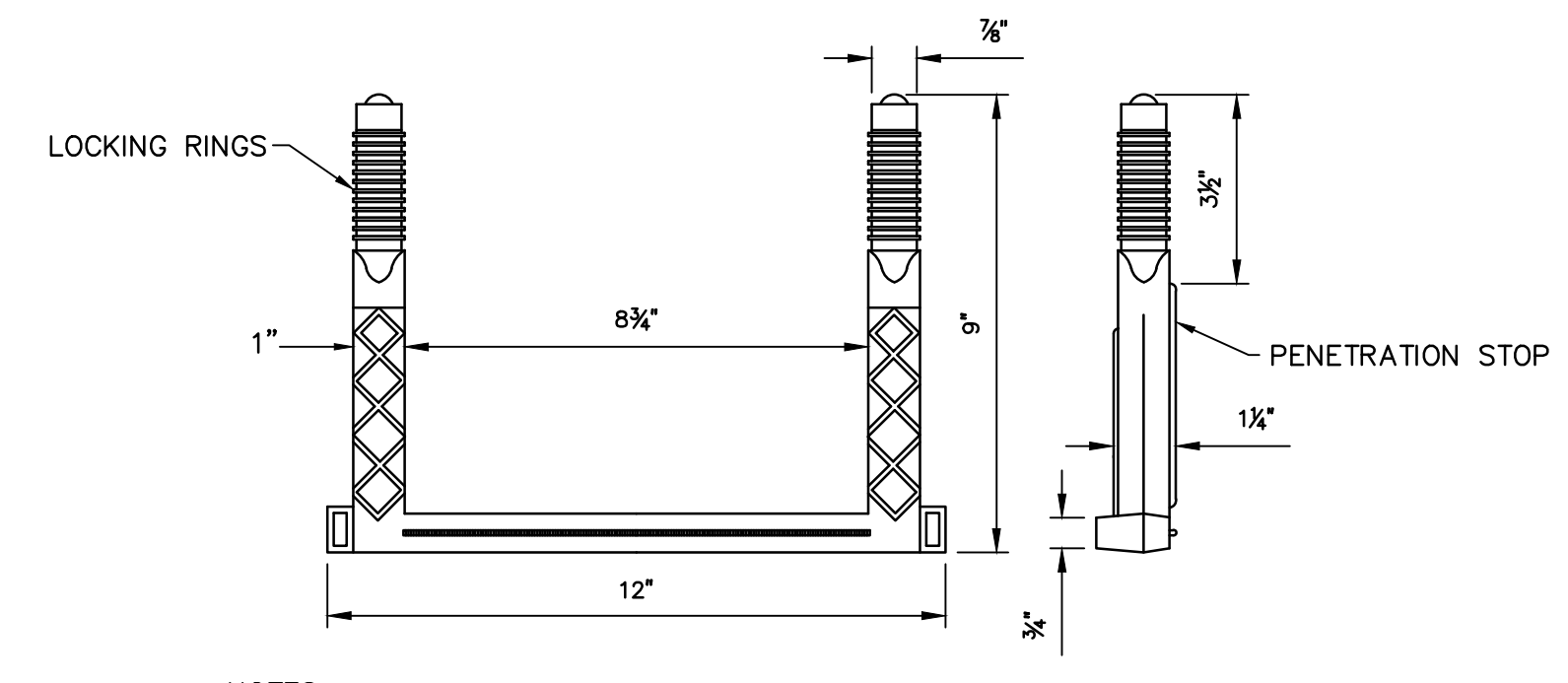
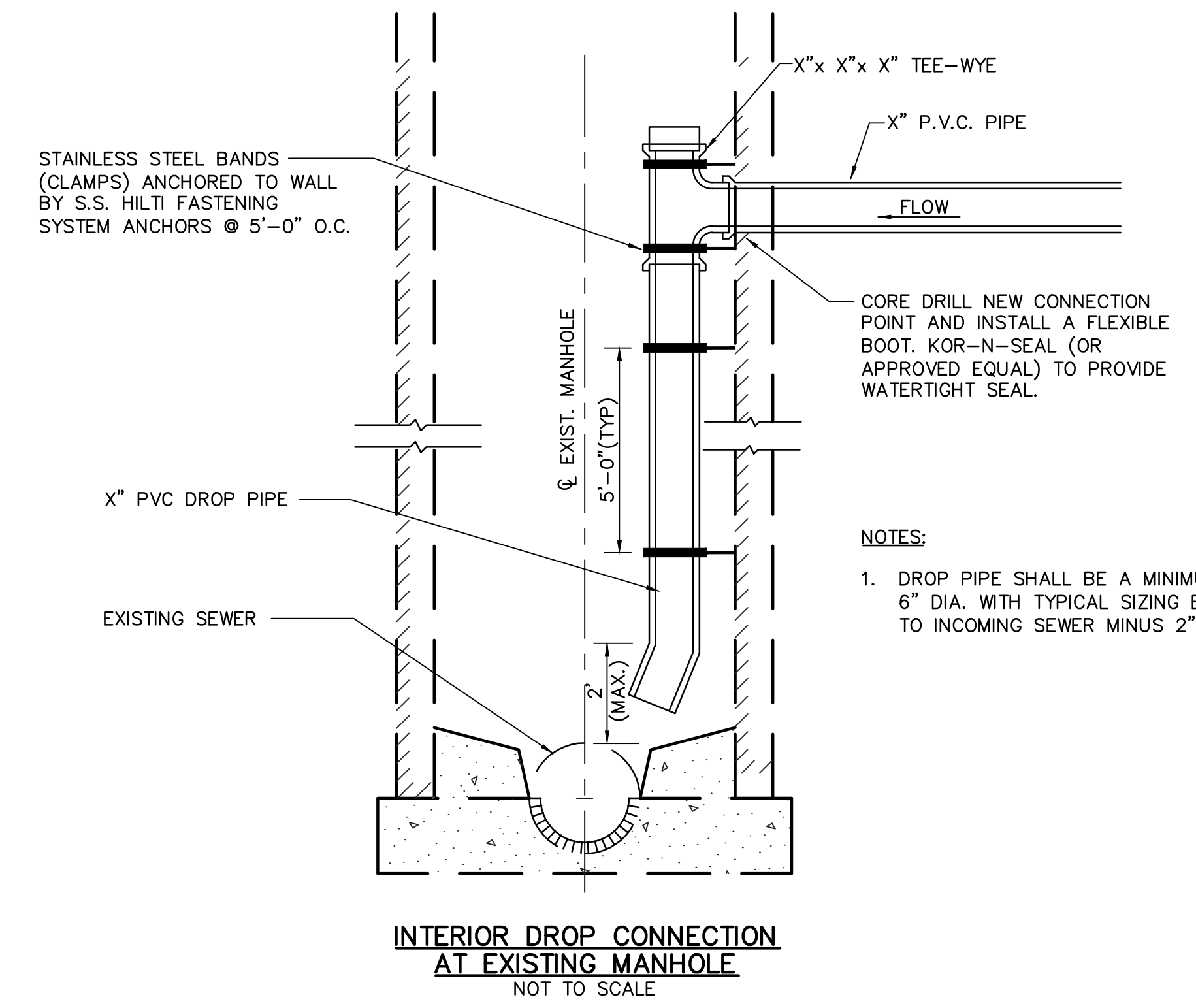
Kevin C. Saalbach
REGISTERED PROFESSIONAL ENGINEER
CERTIFIED BY

| ISSUANCE INDEX | | |
|----------------|------------|-------------|
| NO. | DATE | DESCRIPTION |
| 1 | 04/30/2021 | ISSUED |

| REVISION SCHEDULE | | |
|-------------------|--|------------|
| NO. | DESCRIPTION | DATE |
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Project Number 2000.00103

SANITARY SEWER
STANDARD DETAILS



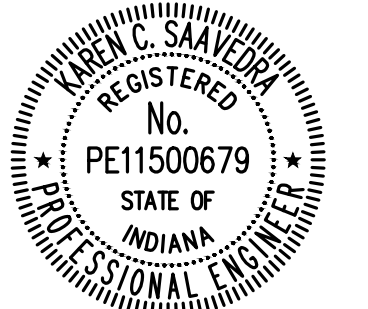
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PLOT SCALE: 1:1
EDIT DATE: 3/22/2021
EDITED BY: PTRAWINSKI



HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

STANDARD DETAILS



Kevin C. Saavik
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ISSUANCE INDEX

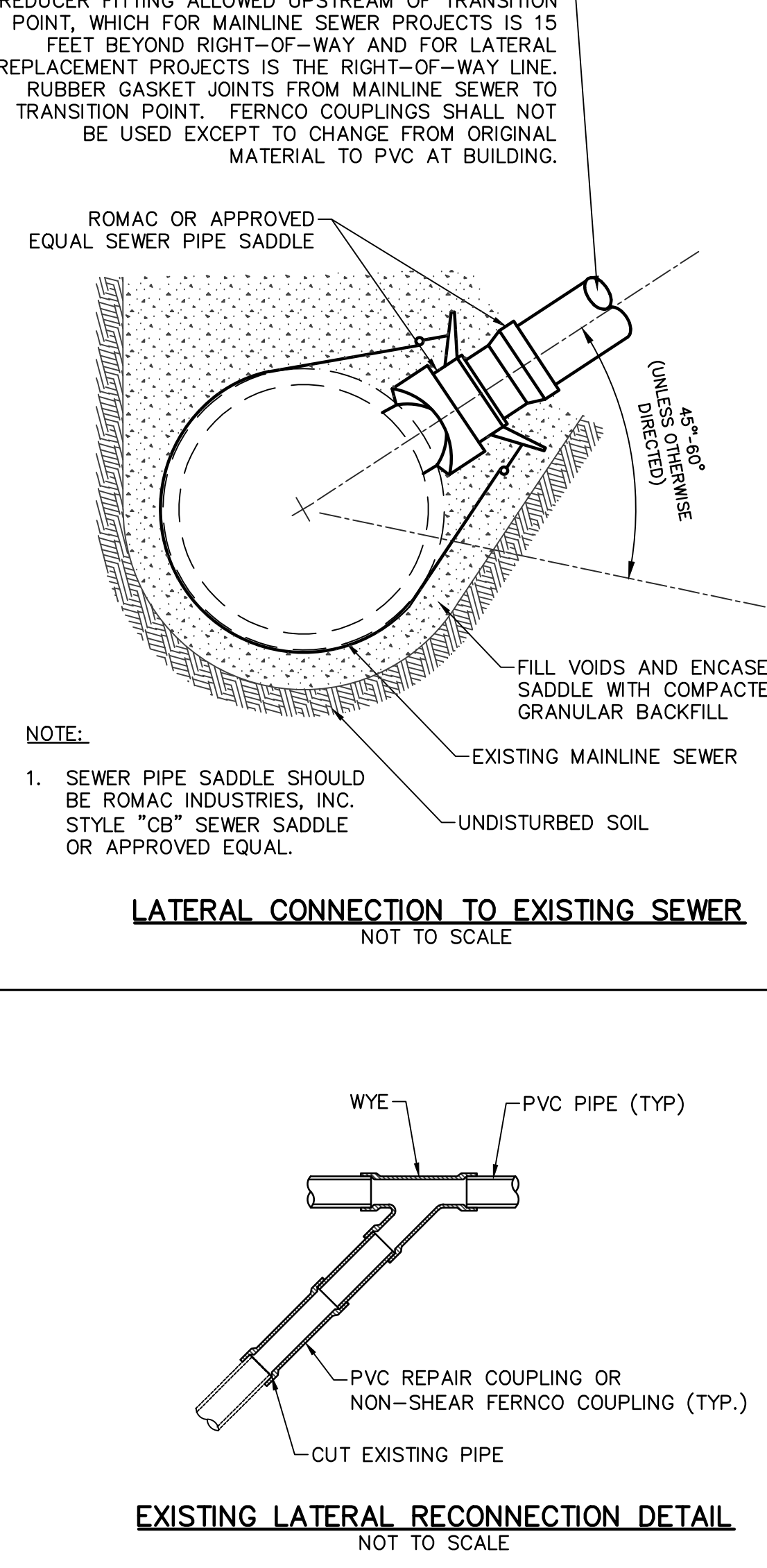
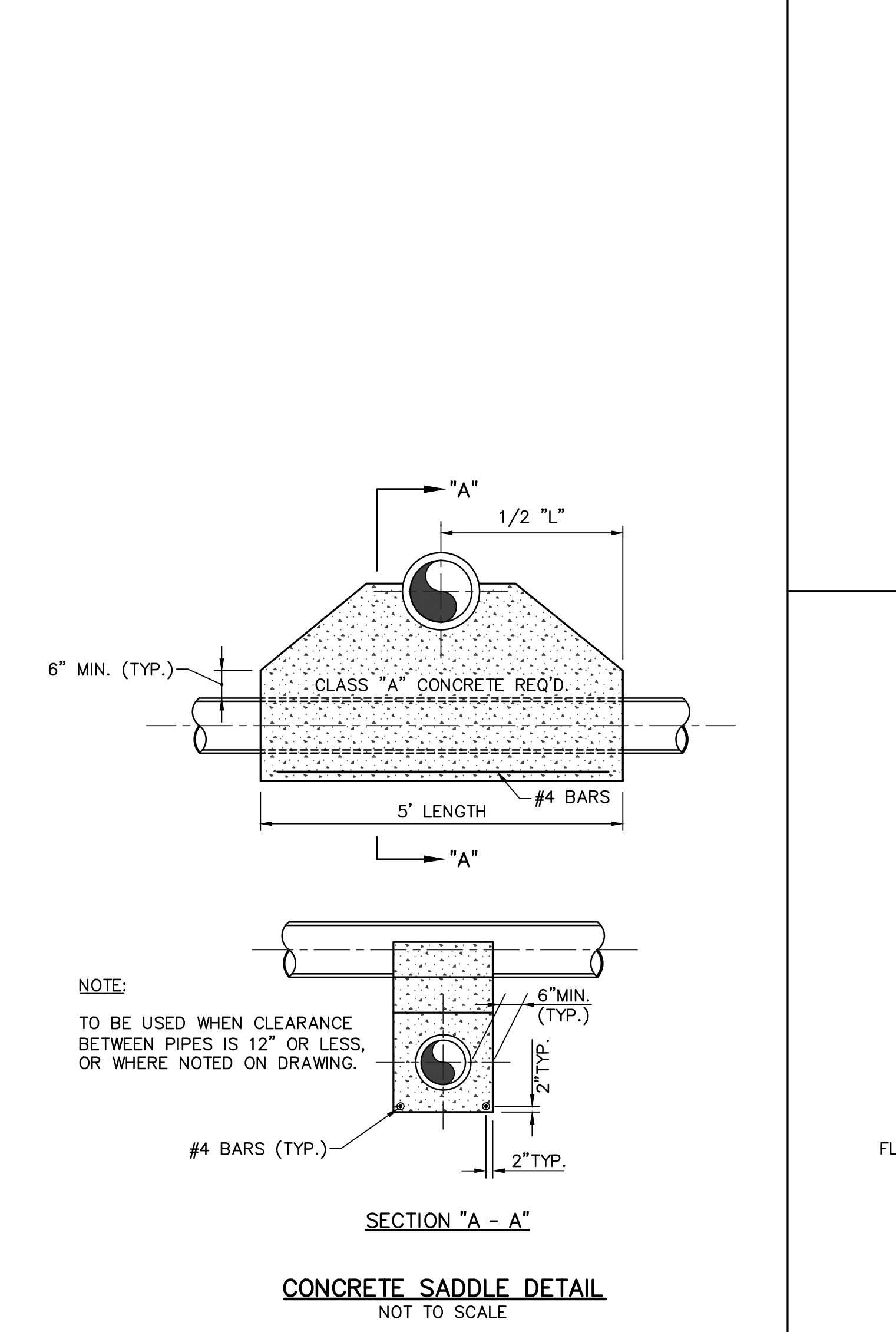
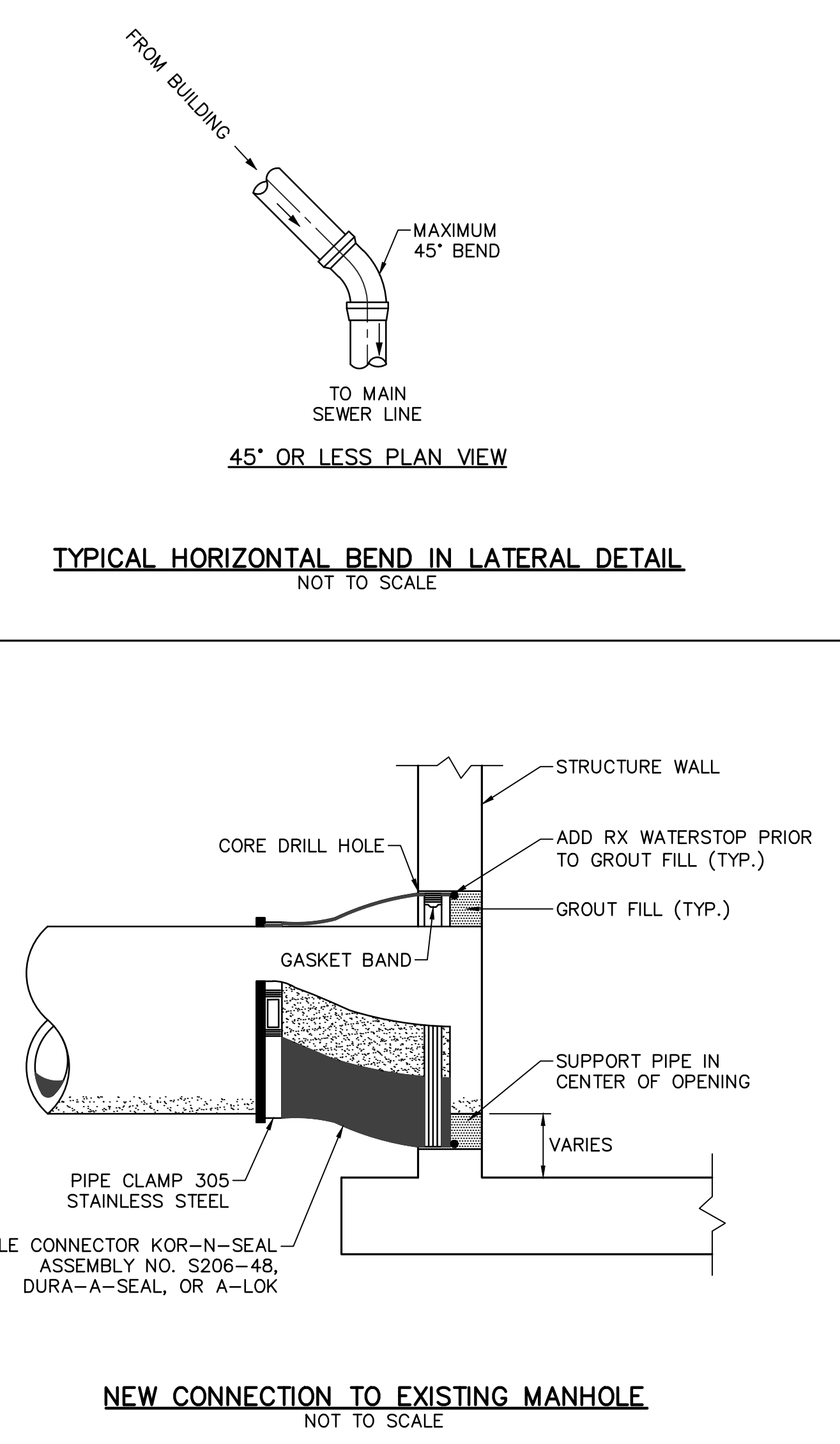
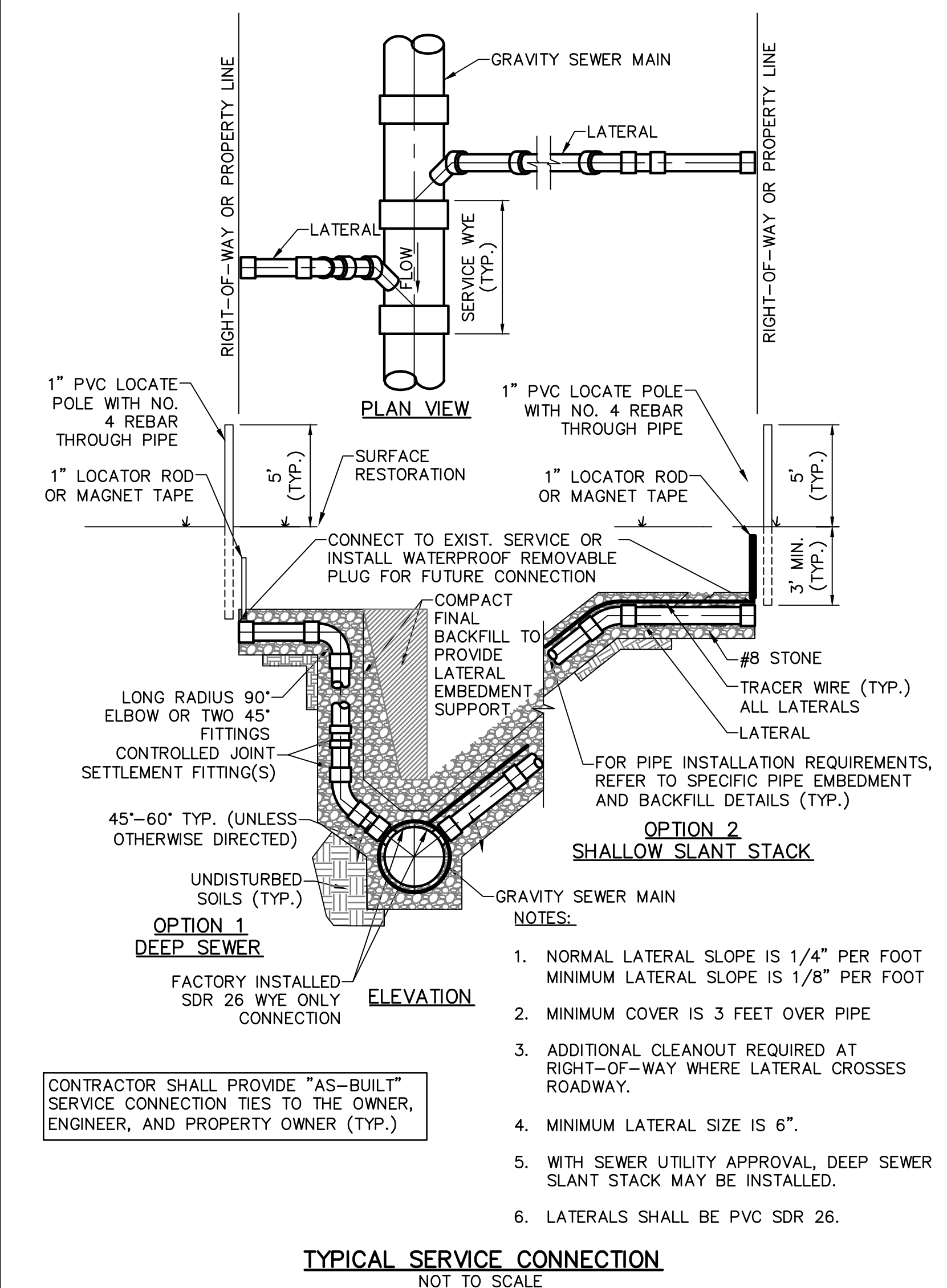
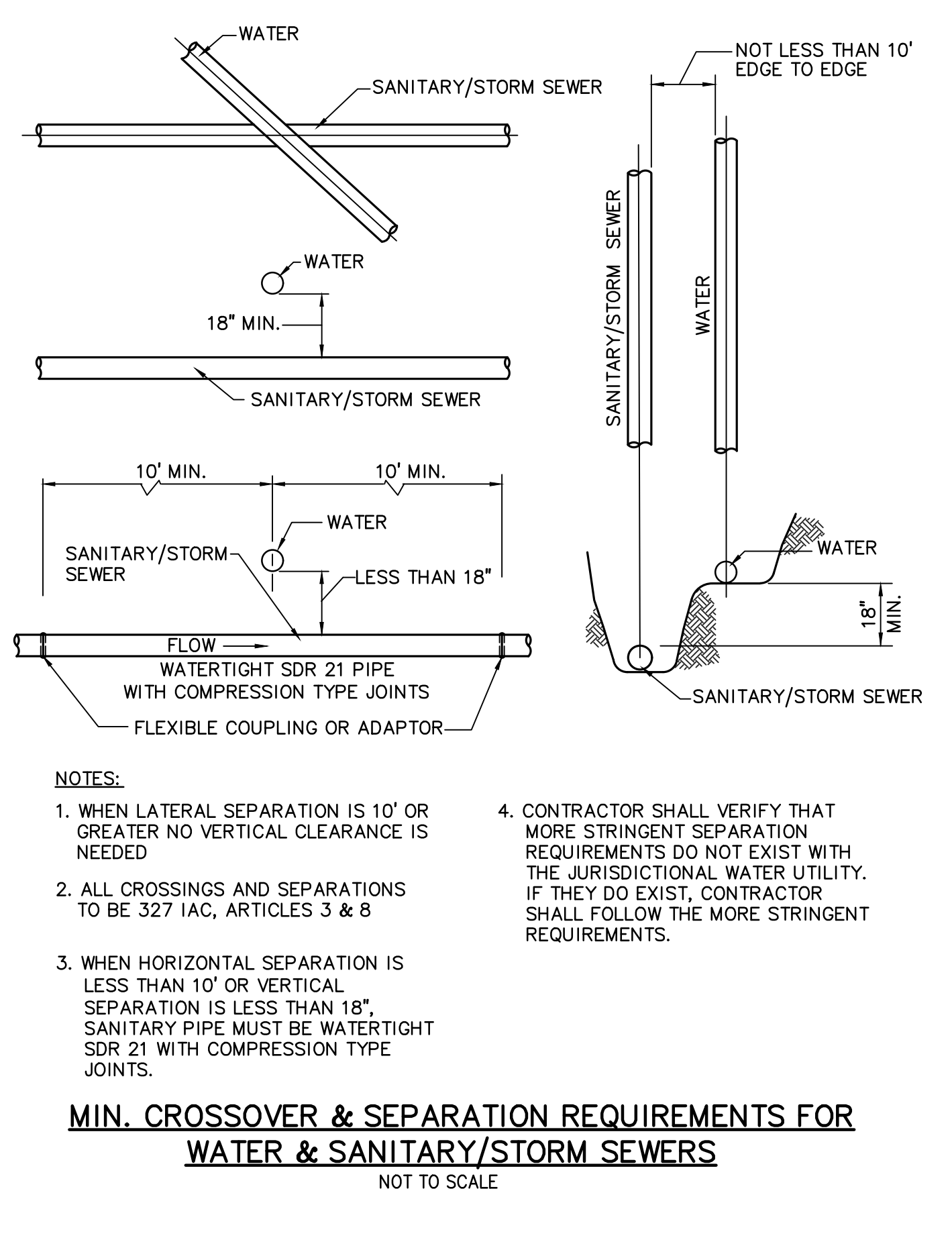
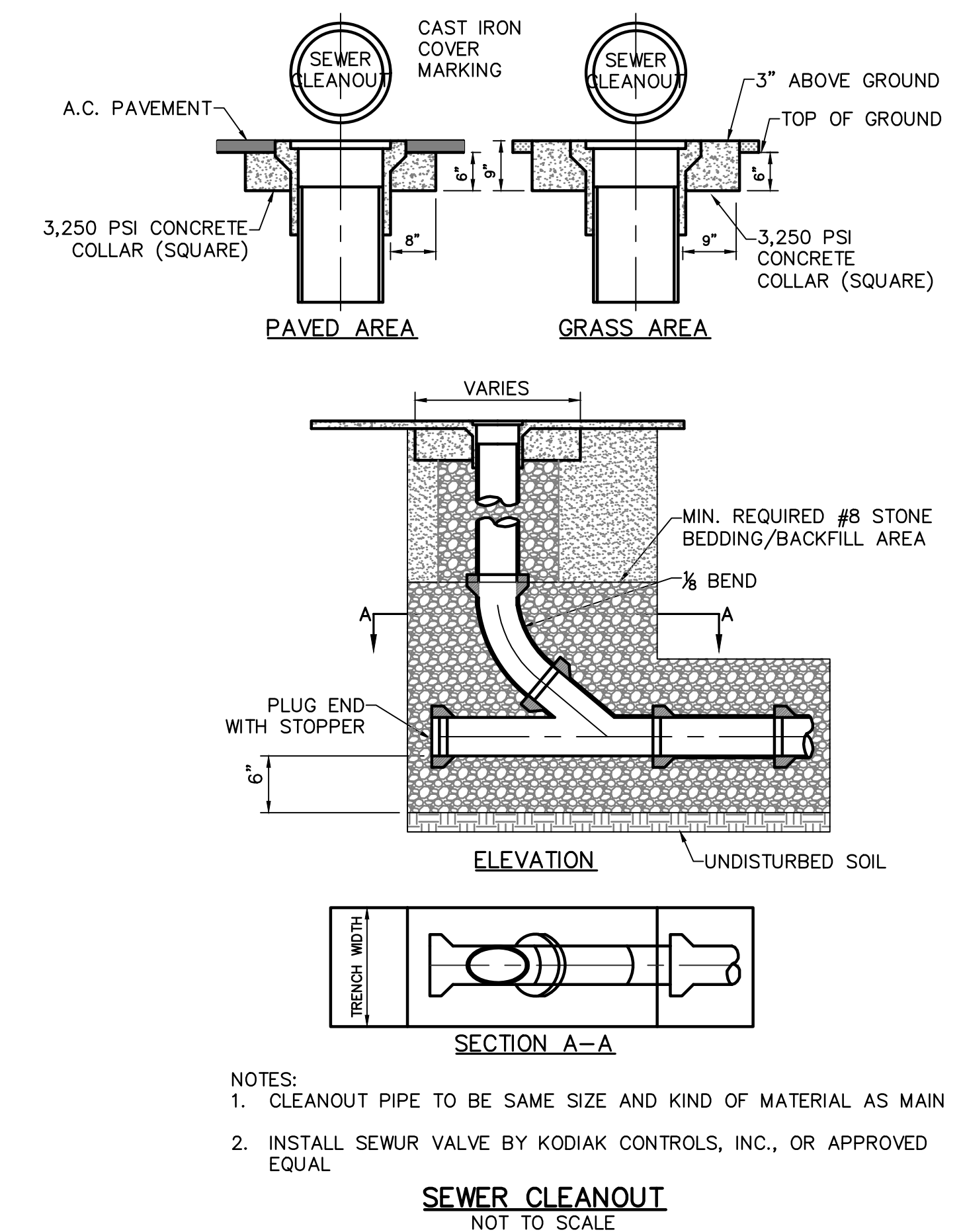
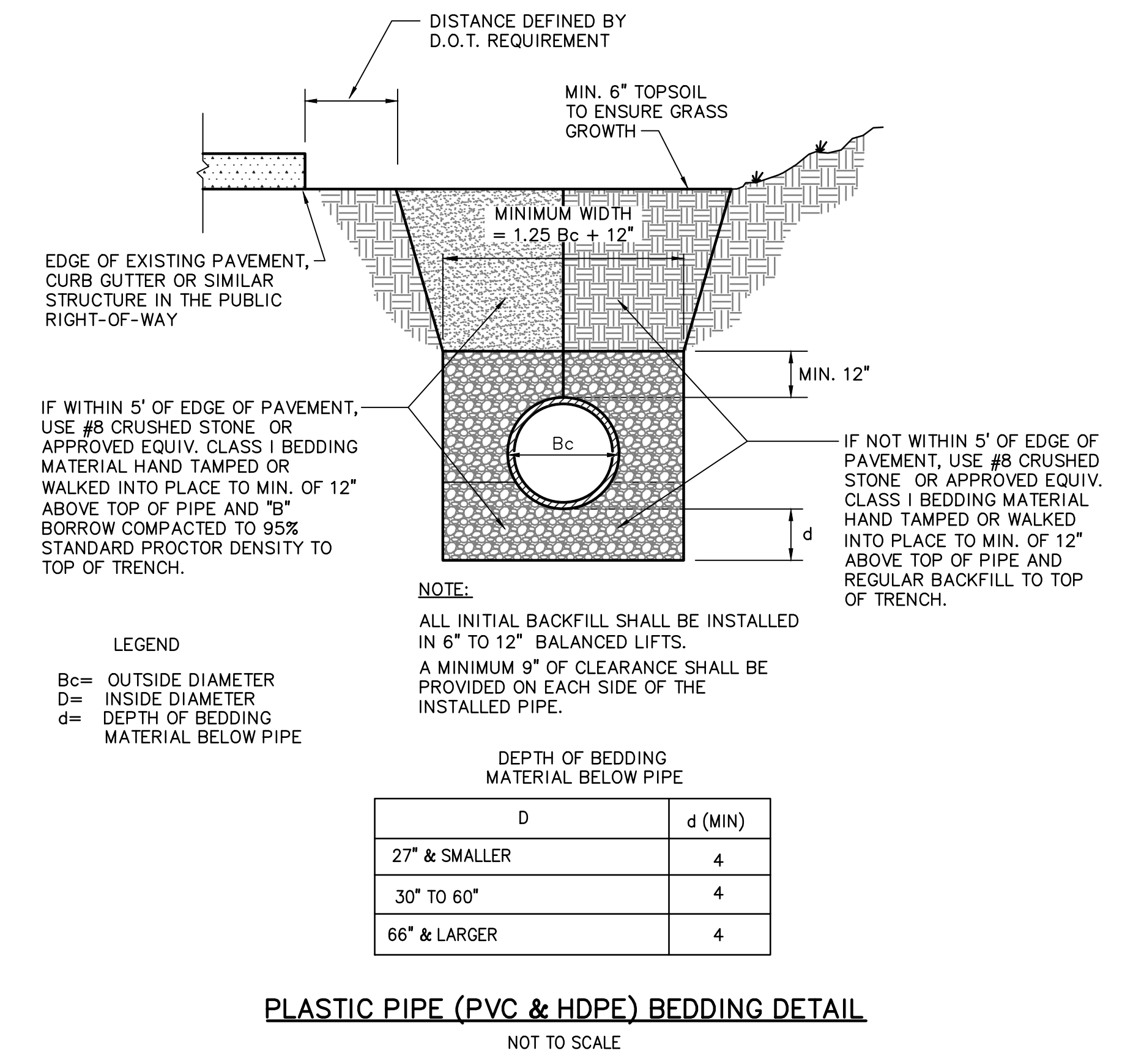
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04/30/2021

REVISION SCHEDULE

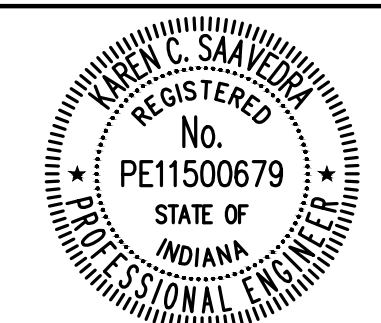
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Project Number 2000.00103

SANITARY SEWER
STANDARD DETAILS



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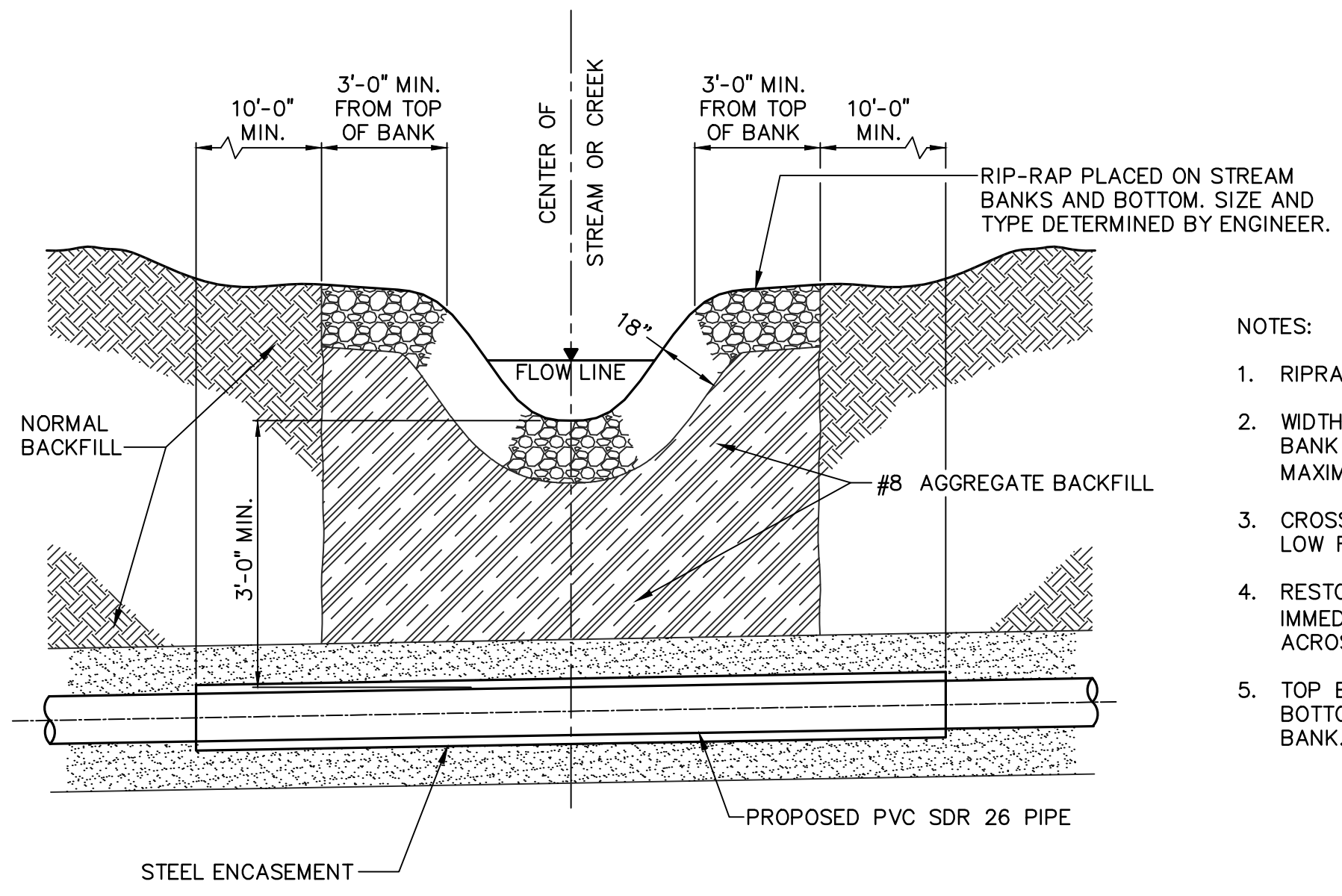
Kevin C. Saalbach
CERTIFIED BY

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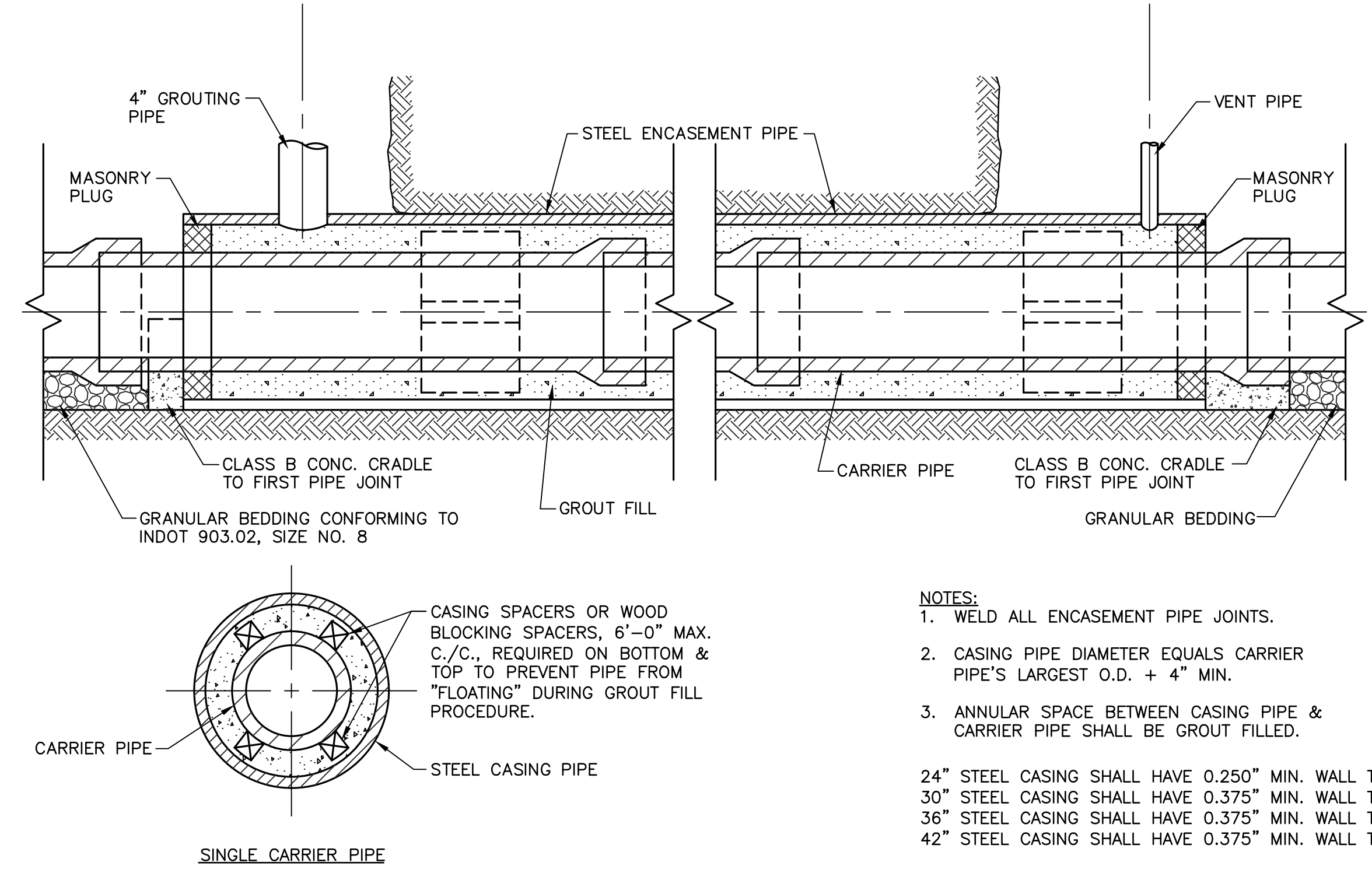
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SANITARY SEWER
STANDARD DETAILS

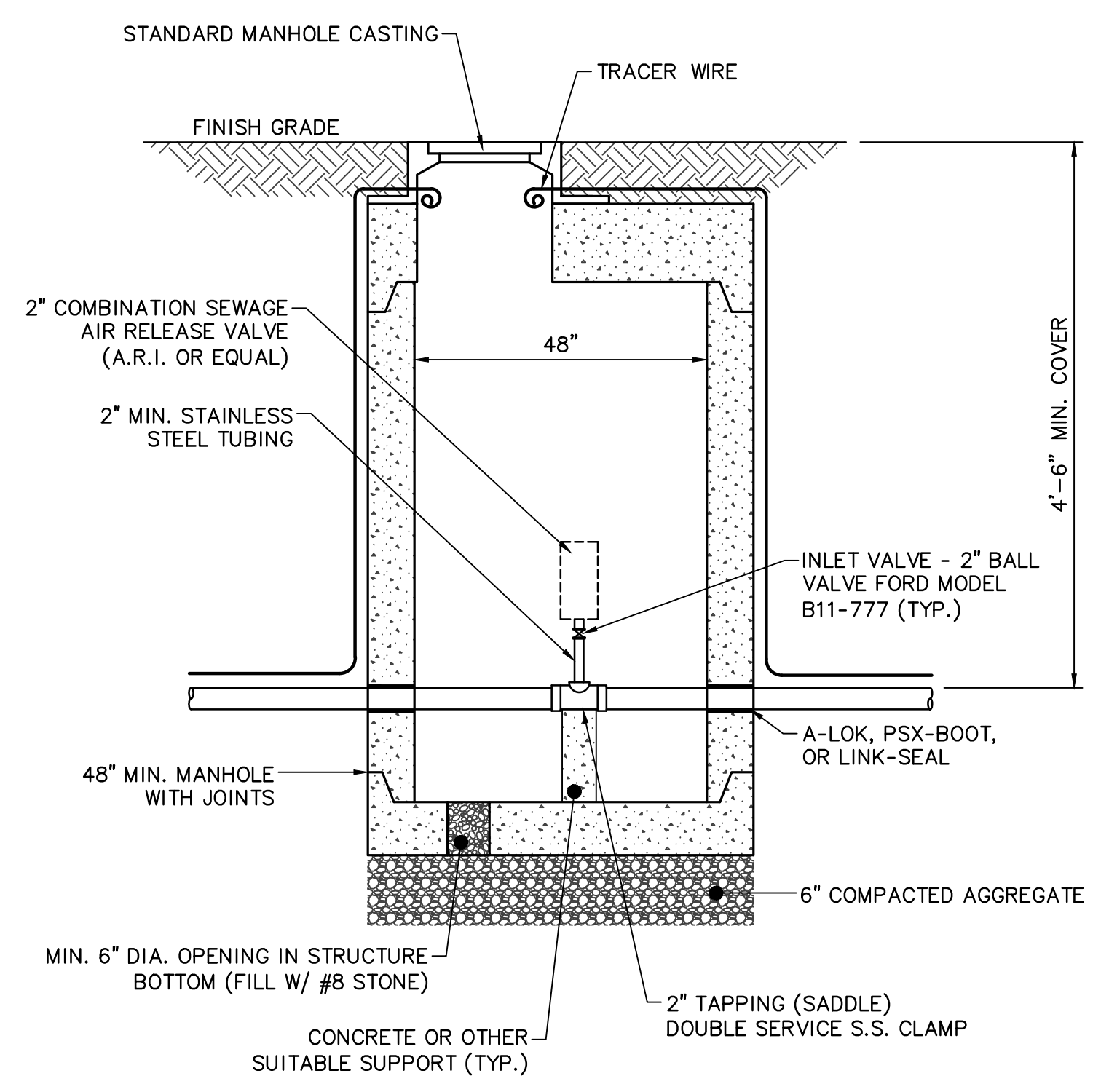


TYPICAL STREAM CROSSING RESTORATION FOR OPEN CUT PIPE INSTALLATION
SCALE: NONE

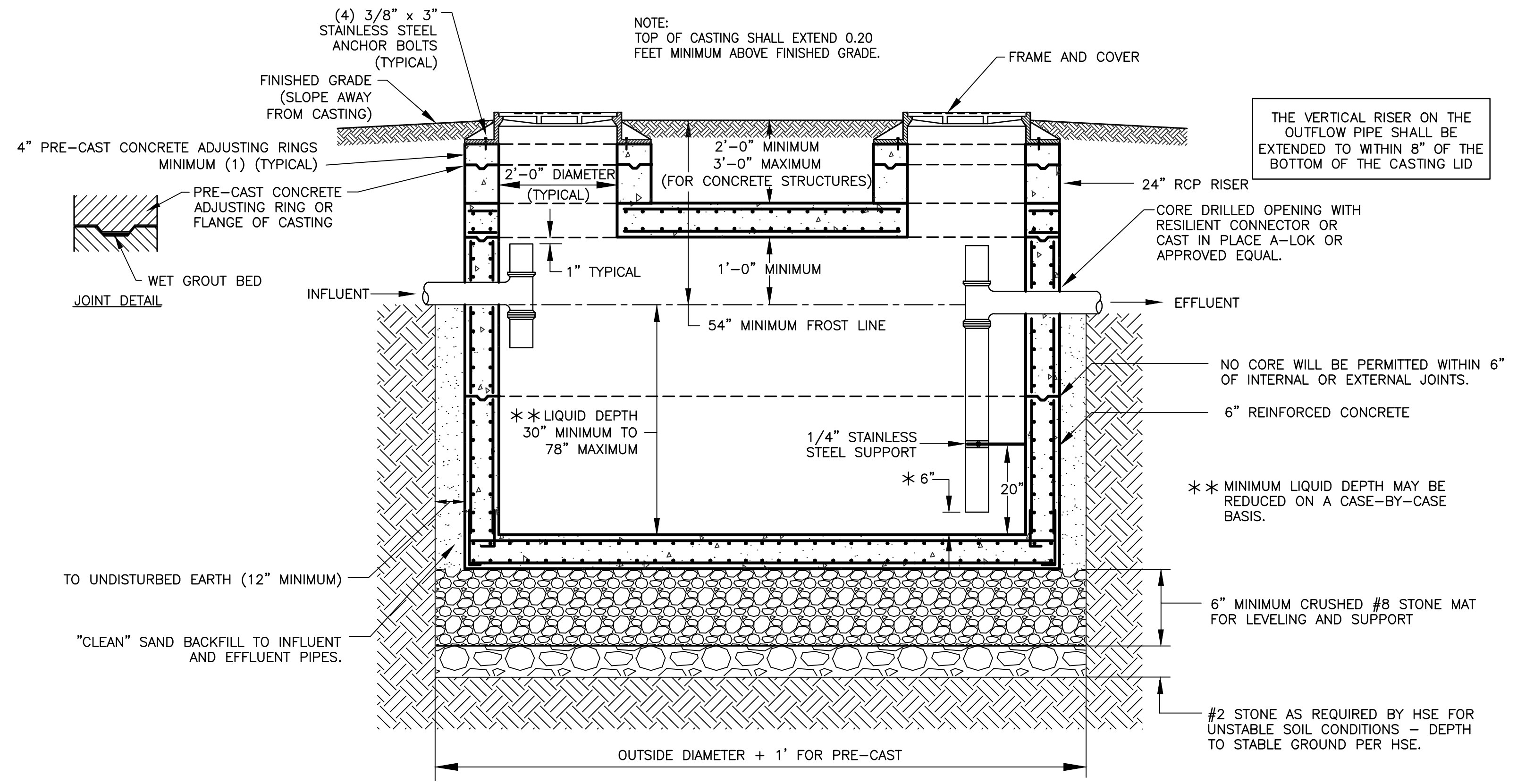
- NOTES:
- RIPRAP SHALL EXTEND FROM TOP OF BANK TO TOE OF SLOPE.
 - WIDTH OF RIPRAP SHALL EXTEND TO THOSE AREA ALONG THE BANK THAT HAVE BEEN DISTURBED DURING TRENCHING A MAXIMUM OF 10" WIDE.
 - CROSSING OF STREAMS SHALL BE DONE DURING PERIODS OF LOW FLOW.
 - RESTORATION OF STREAM BEDS AND BANKS SHALL IMMEDIATELY FOLLOW TRENCHING ACTIVITIES/PIPE INSTALLATION ACROSS THE STREAM BED.
 - TOP ELEVATION OF RIPRAP SHALL BE FLUSH WITH THE EXISTING BOTTOM ELEVATION OF THE CHANNEL AND SURROUNDING STREAM BANK.



HORIZONTAL BORING DETAIL
NOT TO SCALE



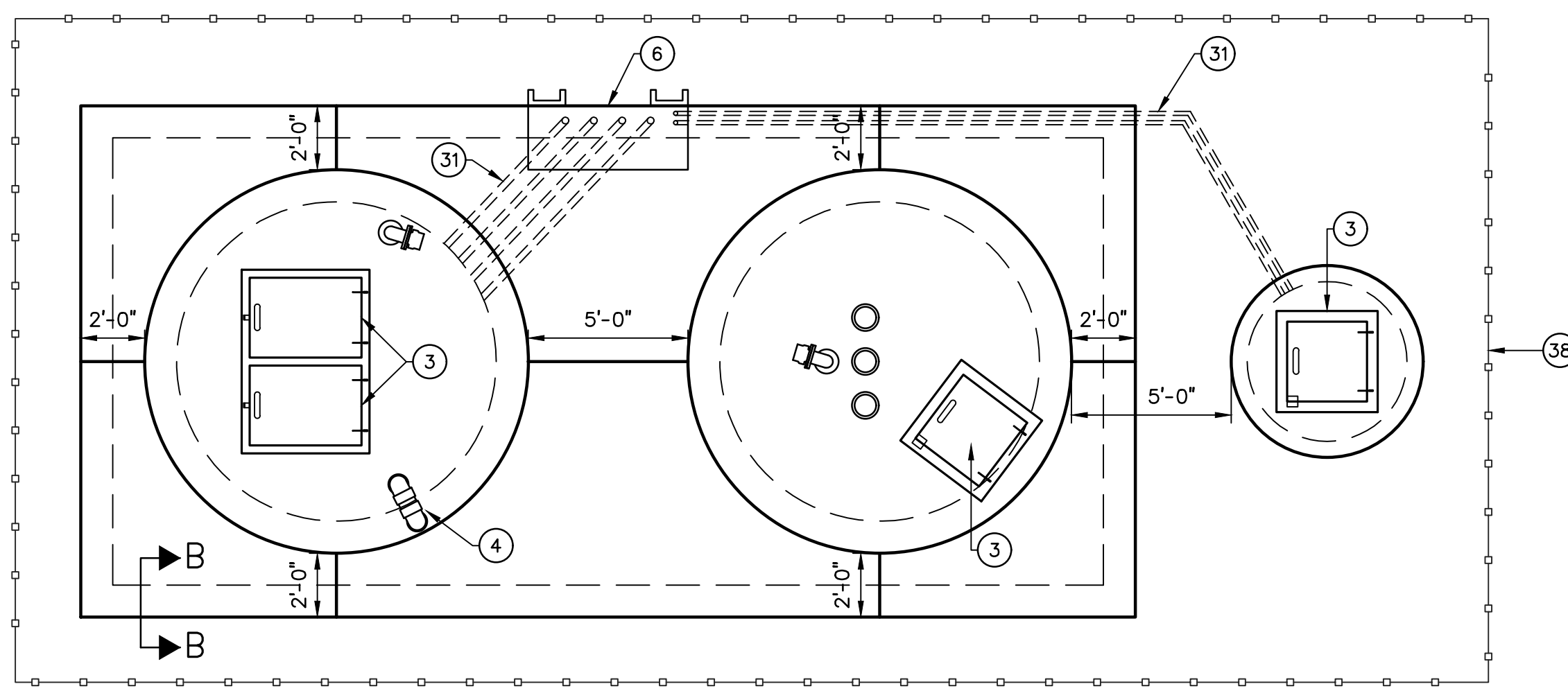
COMBINATION AIR RELEASE VALVE
NOT TO SCALE



- NOTE:
- GREASE TRAPS MUST BE A MINIMUM OF 1000 GALLONS AND SIZED ACCORDING TO 410 IAC 6-10.1-66.
 - GREASE TRAP SHALL CONFORM TO ASTM C 478 UTILIZING 4,000 PSI CONCRETE. CONTRACTOR MAY SUPPLY GREASE TRAP AS MANUFACTURED BY ZURN SERIES Z-1170 OR JAY R. SMITH MANUFACTURING COMPANY SERIES 8000 OR EQUAL.
 - EXTERIOR INSTALLATION MUST BE CONCRETE OR CAST IRON.

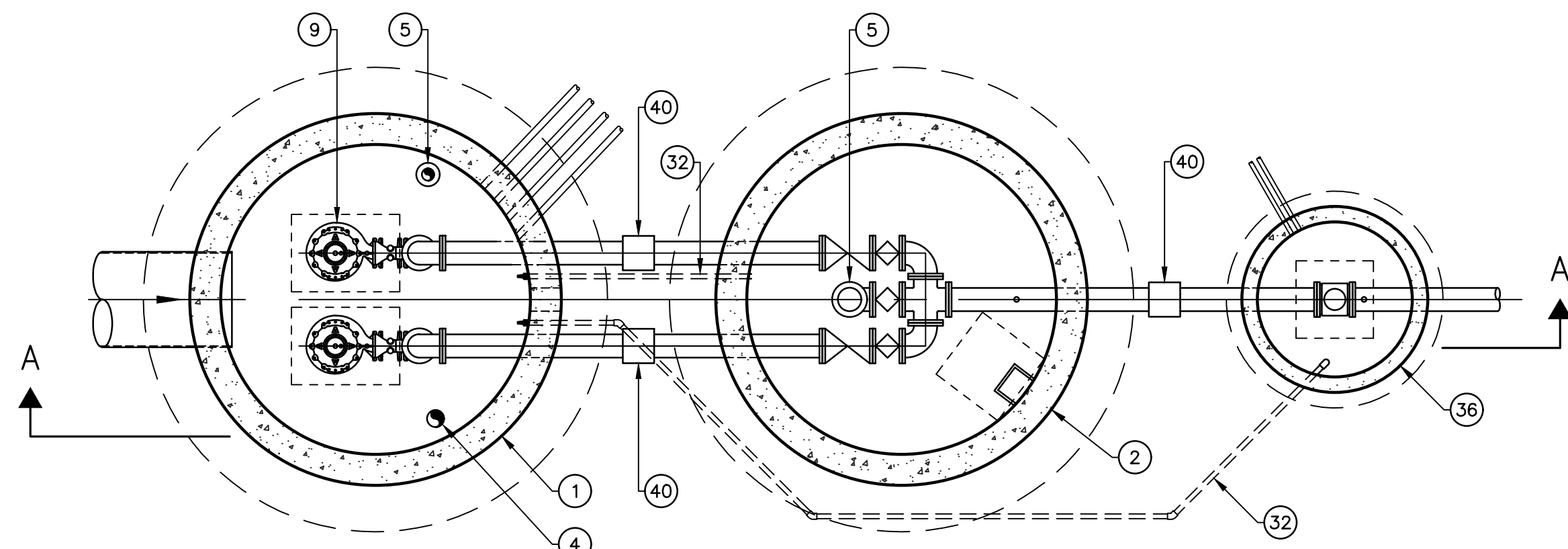
EXTERIOR GREASE TRAP DETAIL
NOT TO SCALE

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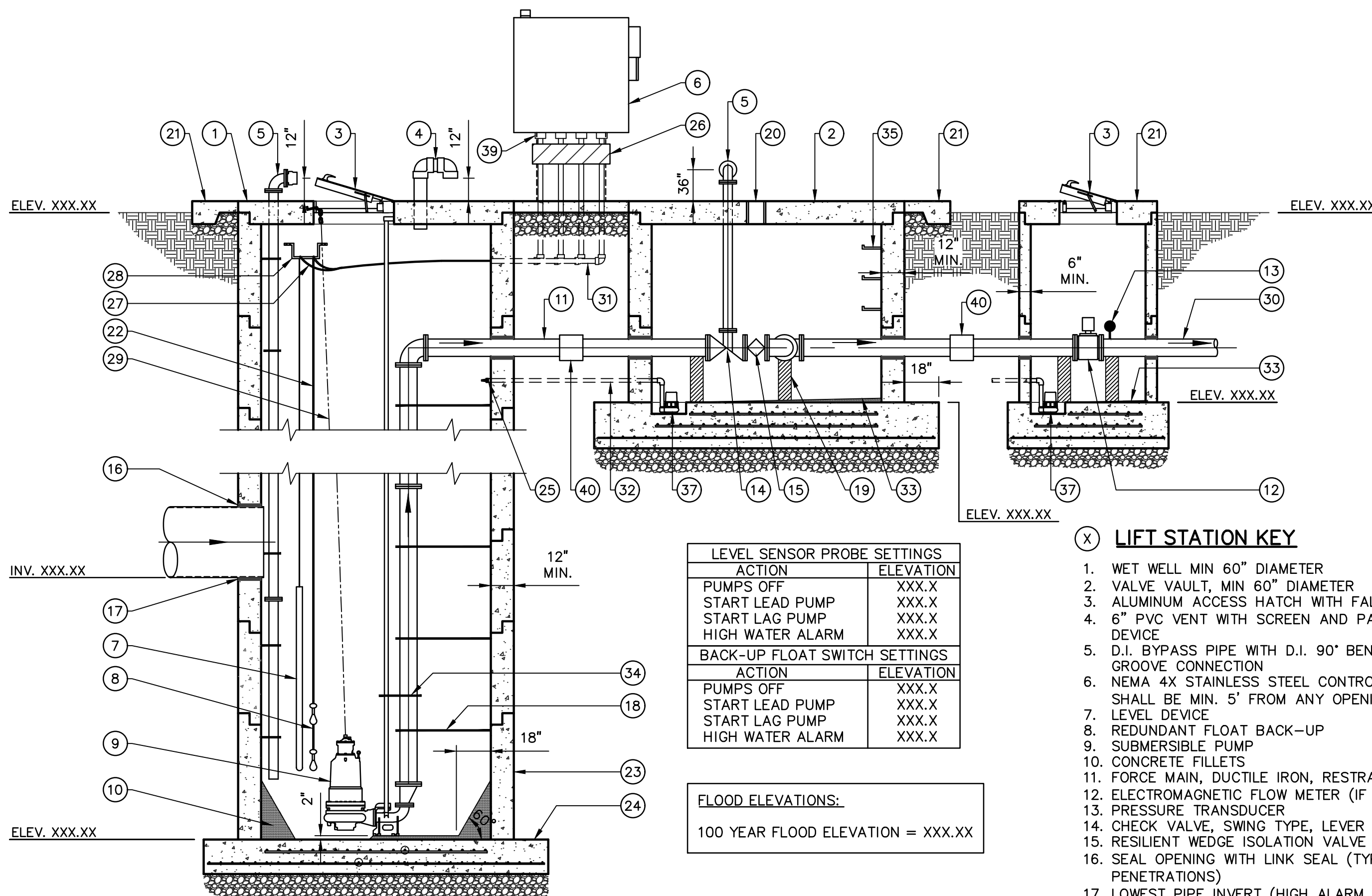


PLAN VIEW AT GRADE
NOT TO SCALE

NOTE:
APPLY PREFORMED JOINT MATERIAL BETWEEN ALL PRECAST STRUCTURES AND CAST IN PLACE CONCRETE. SEAL EXPANSION JOINTS WITH TREMFLEX SL JOINT SEALANT OR APPROVED EQUIVALENT CONFORMING TO ASTM C-920 (TYP.)



LIFT STATION PLAN VIEW BELOW TOP SLAB
NOT TO SCALE



LIFT STATION SECTION A-A
NOT TO SCALE

| LEVEL SENSOR PROBE SETTINGS | |
|-------------------------------|-----------|
| ACTION | ELEVATION |
| PUMPS OFF | XXX.X |
| START LEAD PUMP | XXX.X |
| START LAG PUMP | XXX.X |
| HIGH WATER ALARM | XXX.X |
| BACK-UP FLOAT SWITCH SETTINGS | |
| ACTION | ELEVATION |
| PUMPS OFF | XXX.X |
| START LEAD PUMP | XXX.X |
| START LAG PUMP | XXX.X |
| HIGH WATER ALARM | XXX.X |

FLOOD ELEVATIONS:
100 YEAR FLOOD ELEVATION = XXX.XX

(X) LIFT STATION KEY

1. WET WELL MIN 60" DIAMETER
2. VALVE VAULT, MIN 60" DIAMETER
3. ALUMINUM ACCESS HATCH WITH FALL PROTECTION
4. 6" PVC VENT WITH SCREEN AND PASSIVE ODOR CONTROL DEVICE
5. D.I. BYPASS PIPE WITH D.I. 90° BEND & CAM AND GROOVE CONNECTION
6. NEMA 4X STAINLESS STEEL CONTROL PANEL. PANEL SHALL BE MIN. 5' FROM ANY OPENING OR OBSTRUCTION
7. LEVEL DEVICE
8. REDUNDANT FLOAT BACK-UP
9. SUBMERSIBLE PUMP
10. CONCRETE FILLETS
11. FORCE MAIN, DUCTILE IRON, RESTRAINED JOINTS
12. ELECTROMAGNETIC FLOW METER (IF REQUESTED)
13. PRESSURE TRANSDUCER
14. CHECK VALVE, SWING TYPE, LEVER WEIGHT OPERATED
15. RESILIENT WEDGE ISOLATION VALVE
16. SEAL OPENING WITH LINK SEAL (TYP. ALL PIPE PENETRATIONS)
17. LOWEST PIPE INVERT (HIGH ALARM ON)
18. PIPE SUPPORT, PER DETAIL (TYP 3 PER PIPE SECTION)
19. PIPE SUPPORT, SEE DETAIL
20. STAINLESS STEEL STEM WITH OPERATOR NUT 1/2" BELOW CONCRETE SLAB AND STAINLESS STEEL COVERS AND FASTENERS.
21. TOP OF STRUCTURE, MIN. 6", MAX. 12" ABOVE FINISH GRADE
22. STAINLESS STEEL GUIDE RAIL
23. MONOLITHIC BASE
24. ANTI-FLOTATION EXTENSIONS (AS REQUIRED)
25. BACKFLOW PREVENTER/ DUCKBILL
26. VENTED JUNCTION BOX
27. SEPARATE CONDUITS FOR EACH PUMP
28. CABLE HANGER
29. STAINLESS STEEL LIFTING CABLE SIZED TO THE WEIGHT OF THE PUMP
30. FORCE MAIN TRANSITION FITTING FROM DUCTILE IRON TO ALTERNATE MATERIAL
31. CONDUIT PUMP TO JUNCTION BOX - PVC COATED RGS
32. PVC DRAIN PIPE, MAINTAIN 1/4" PER FOOT INTO WET WELL
33. SLOPE FLOOR TO DRAIN 1/4" PER FOOT
34. INTERMEDIATE GUIDE RAIL SUPPORT
35. FIBERGLASS REINFORCED POLYPROPYLENE MANHOLE STEPS AT 16" ON CENTER
36. METER VAULT, MIN. 60" DIAMETER
37. SUMP PUMP
38. 6" HIGH CHAIN LINK FENCE WITH BARBED WIRE
39. EPOXY CONDUIT SEALS
40. FLEXIBLE COUPLING (TYP.)

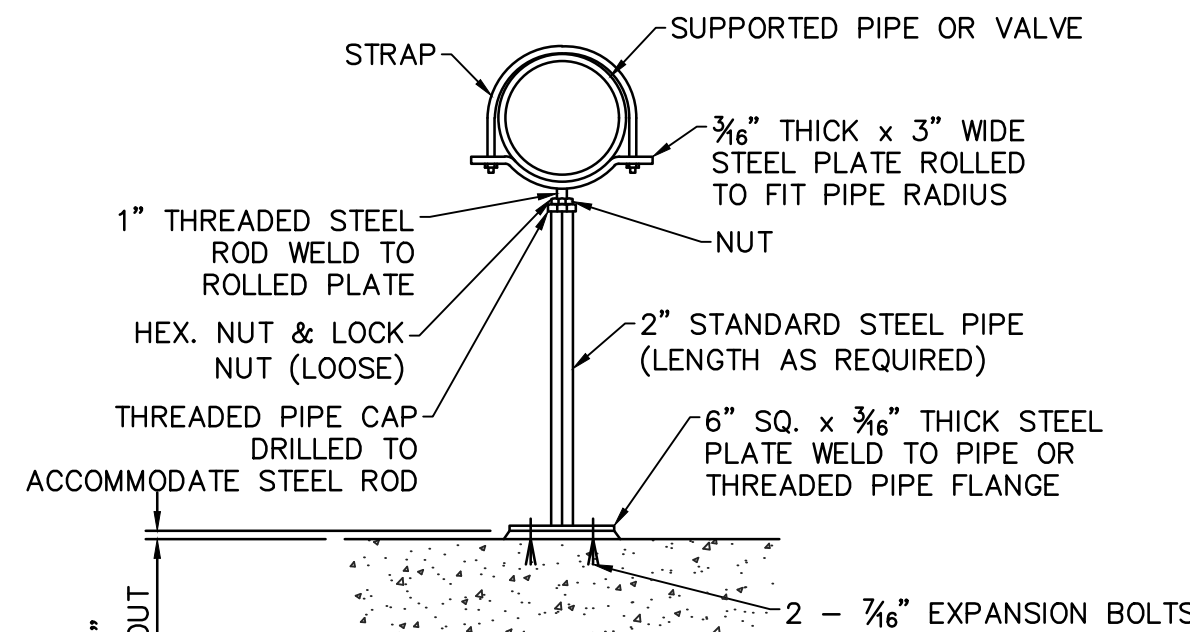
INFORMATION

COUNTY: _____ TOWNSHIP: _____
SECTION: _____ TWP: _____ RANGE: _____
PROJECT: _____
LOCATION: _____

STATION PIPE SIZE, INCHES: _____ FORCE MAIN TYPE: _____
FORCE MAIN SIZE, INCHES: _____ LIFT STATION I.D.: _____
FORCE MAIN LENGTH, FEET: _____

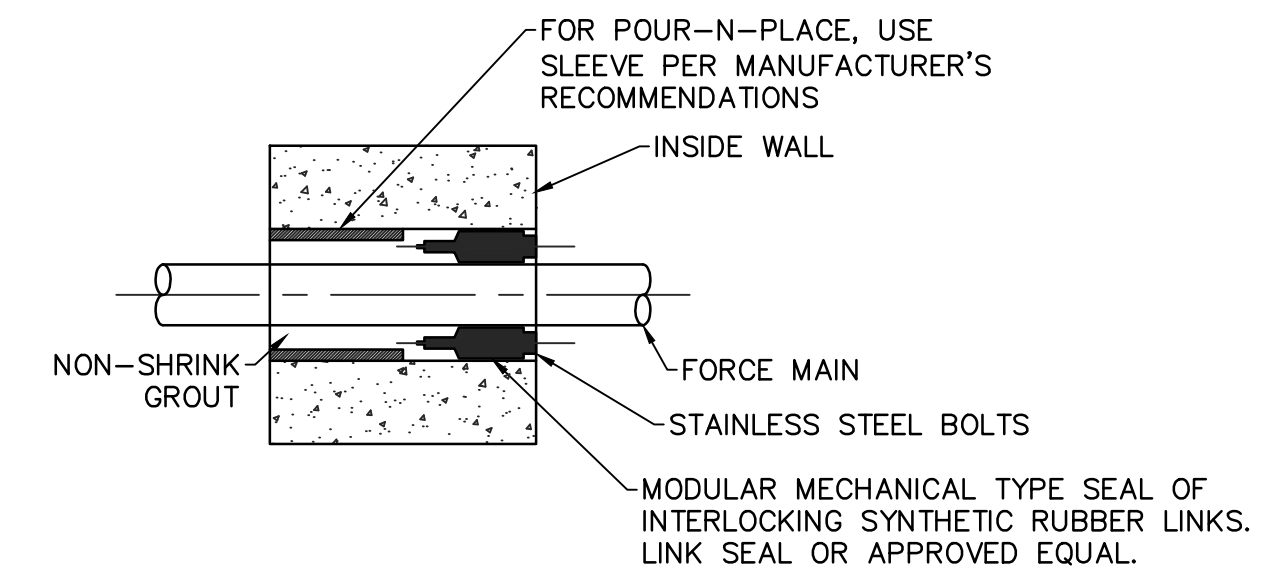
PUMP DATA

| | KSB | MYERS |
|-----------------|-------|-------|
| DISCHARGE SIZE: | _____ | _____ |
| GPM: | _____ | _____ |
| TDH: | _____ | _____ |
| HP: | _____ | _____ |
| RPM: | _____ | _____ |
| VOLTAGE: | _____ | _____ |
| PHASE: | _____ | _____ |
| MODEL: | _____ | _____ |
| IMPELLER SIZE: | _____ | _____ |



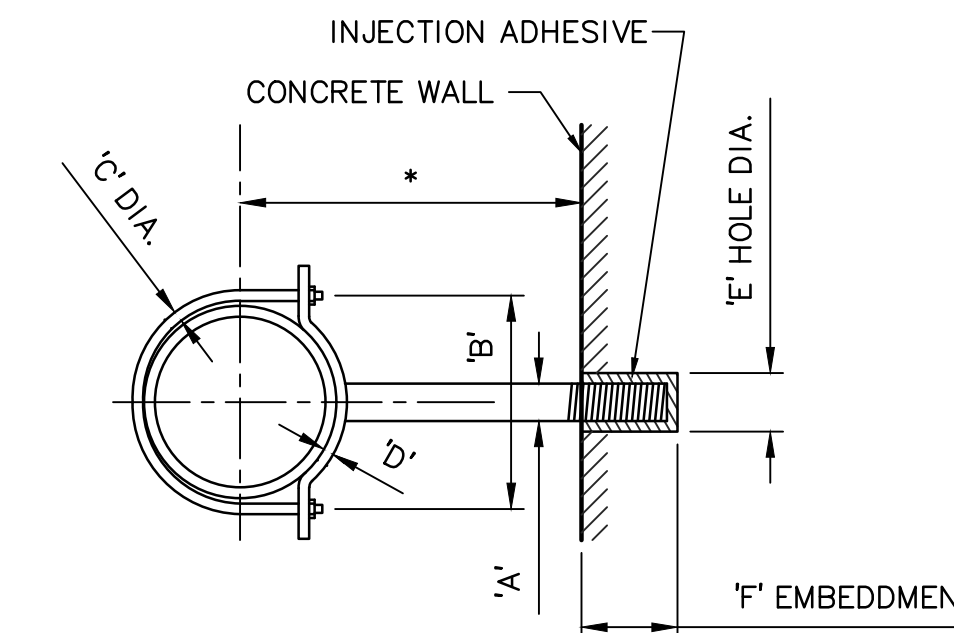
- NOTES:
1. PIPE SUPPORTS SHALL BE SPACED NOT MORE THAN 12'-0" ON CENTER.
2. PIPE TO BE SUPPORTED EACH SIDE OF VALVES, FLOW METERS, AND COUPLINGS.

ADJUSTABLE PIPE SUPPORT DETAIL
NOT TO SCALE



NOTE:
WALLS SHALL BE CORE DRILLED

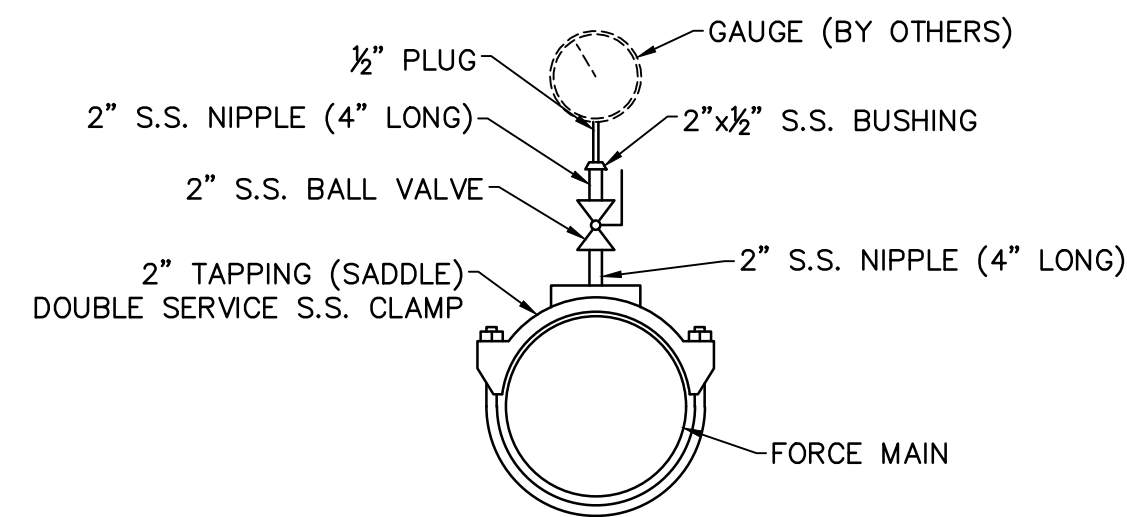
PIPE SLEEVE DETAIL FOR ALL WALL PENETRATIONS
NOT TO SCALE



| PIPE SIZE | PIPE SUPPORT DIMENSIONS | | | | | |
|-----------|-------------------------|--------|------|---------------|--------|----|
| | A | B | C | D | E | F |
| 4" | 7/8" | 5/4" | 3/8" | 1/4" x 1 1/4" | 1 1/2" | 6" |
| 8" | 1" | 9/8" | 3/8" | 3/8" x 1 1/2" | 1 1/2" | 6" |
| 12" | 1 1/4" | 1 3/4" | 3/8" | 3/8" x 2" | 1 1/2" | 6" |

- PIPE SUPPORT NOTES:
1. CONTRACTOR SHALL DETERMINE DIMENSION * PER PUMP MANUFACTURER'S INSTALLATION INSTRUCTIONS.
2. PIPE SUPPORTS SHALL BE CARBON STEEL, COATED WITH 14 MIL COAL TAR EPOXY.
3. INJECTION ADHESIVE SHALL BE HIT HY 150 BY HILTI OR APPROVED EQUAL. INSTALL PER HILTI INSTALLATION INSTRUCTIONS FOR ROD INSTALLATION.
4. PIPE SUPPORT SHALL BE GRINNEL FIGURE 191 OR APPROVED EQUAL.

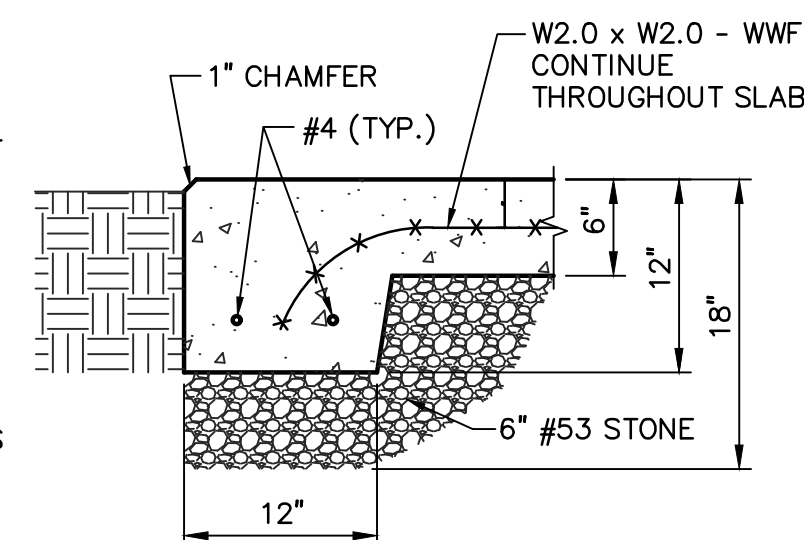
PIPE SUPPORT
NOT TO SCALE



PRESSURE GAUGE TAP DETAIL (TYP.)
NOT TO SCALE

GENERAL NOTES:

1. PUMP CONTROL PANEL SHALL BE PROVIDED BY PUMP SUPPLIER AND SHALL BE COMPATIBLE WITH PUMP SYSTEM. THE PANEL SHALL CONTROL A DUPLEX SYSTEM.
2. ALL PIPING IN AND BETWEEN WET WELL, VALVE VAULT, AND METER VAULT, SHALL BE DUCTILE IRON.
3. DUCTILE IRON PIPE: A. SHALL CONFORM TO ANSI SPEC. A-21.51 B. SHALL CONFORM TO AWWA C-151, CURRENT REV. C. DUCTILE IRON PIPE SHALL BE PRESSURE CLASS 350 (MIN.)
4. WET WELL HATCH SHALL BE COMPATIBLE WITH THE GUIDE RAIL SYSTEM AND SHALL BE LOCATED AS SHOWN SUCH THAT PUMPS CAN BE EASILY REMOVED FROM THE WET WELL. SAFETY GRATE SHALL ALLOW OBSERVATION OF WET WELL WHILE PREVENTING FALLS INTO WET WELL.
5. MAINTAIN 24 INCHES BETWEEN ALL STRUCTURES, SLAB, AND FENCING.
6. 8" RESILIENT WEDGE VALVES SHALL BE OPERABLE FROM THE TOP SLAB. CONTRACTOR SHALL PROVIDE ONE (1) 'TEE' HANDLED VALVE KEY TO MATCH RESILIENT WEDGE VALVE OPERATING NUTS.
7. ALL PIPING, STRUCTURE EXCAVATION AND TRENCHES SHALL BE BACKFILLED WITH AN APPROVED STRUCTURAL BACKFILL.



SECTION B-B
NOT TO SCALE
(TYP. FOR ALL WET WELL SLABS)



HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

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Kevin C. Saalbach
REGISTERED PROFESSIONAL ENGINEER
CERTIFIED BY

ISSUANCE INDEX

DATE:
04/30/2021

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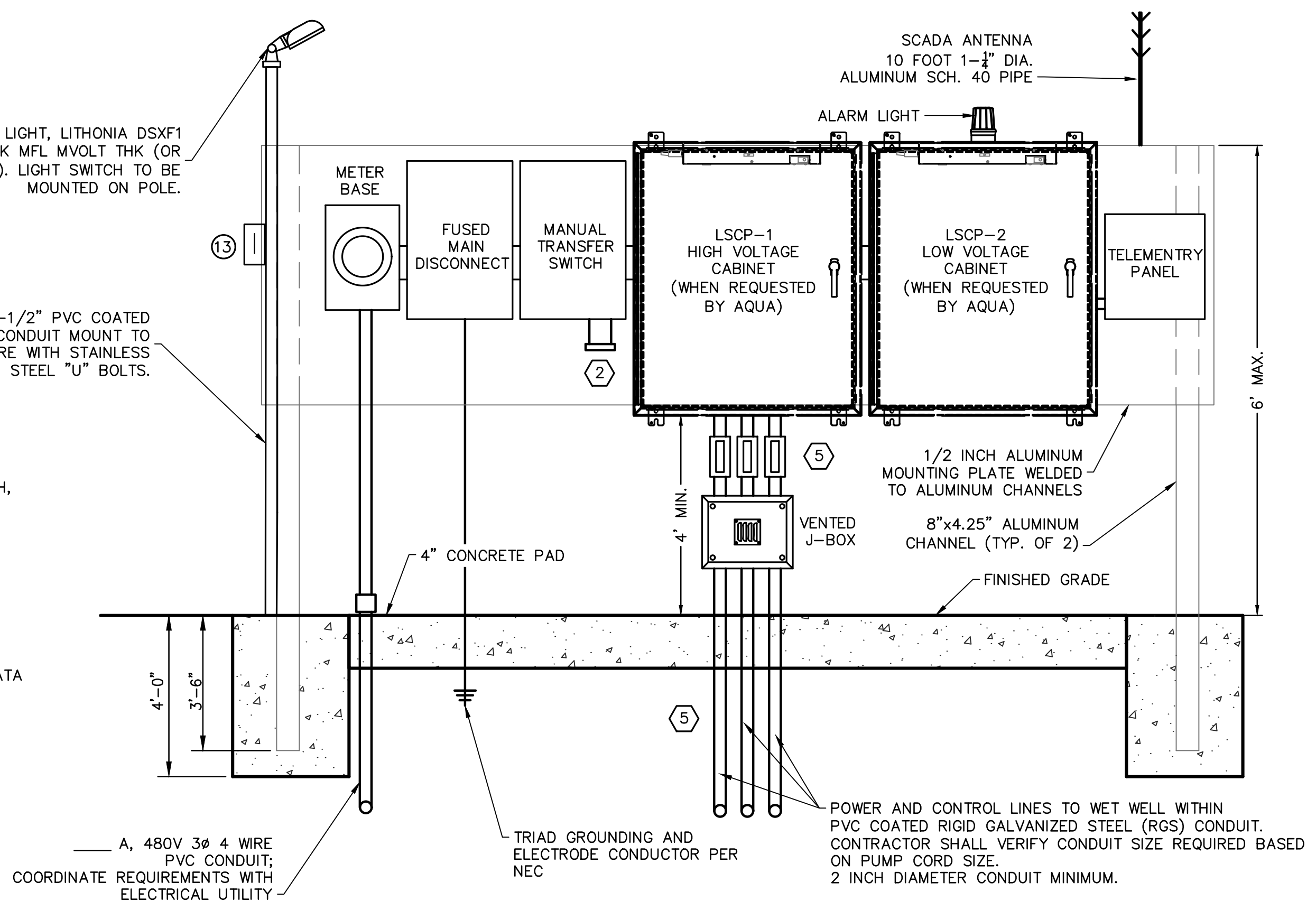
SANITARY SEWER
STANDARD DETAILS

NEMA 4X CONTROL PANEL DEVICE LEGEND

| ITEM# | DESCRIPTION |
|-------|---|
| ① | ILSCO (OR EQUAL) POWER DISTRIBUTION BLOCK. |
| ② | PILOT DEVICES (TYPICAL FOR EACH PUMP): RUNNING LIGHT, FAIL LIGHT, SEAL FAIL LIGHT, HIGH MOTOR TEMP LIGHT, HOA SWITCH, AND ELAPSED TIME METER. PILOT DEVICES TO BE MOUNTED ON PANEL DEAD FRONT. |
| ③ | ALARM ACKNOWLEDGE PUSHBUTTON LOCATED ON SIDE OF PANEL. |
| ④ | NEMA 4 ALARM LIGHT. |
| ⑤ | ALTERNATING RELAYS AND CONTROL RELAYS AS REQUIRED. |
| ⑥ | SQUARE D (OR EQUAL) IEC STARTER SIZED PER PUMP FLA. |
| ⑦ | ISOLATION CIRCUIT BREAKERS WITH LOCKOUT/TAGOUT CAPABILITY. BREAKER ACCESSIBLE THROUGH DEAD FRONT. |
| ⑧ | MISCELLANEOUS COMPONENTS INCLUDING BUT NOT LIMITED TO PILOT RELAYS, TERMINAL BLOCKS, CIRCUIT BREAKERS, CONTROL TRANSFORMER, POWER SUPPLIES, ETHERNET SWITCH, PHASE LOSS RELAYS, ETC. TO PROVIDE FOR A COMPLETE AND FUNCTIONING CONTROL PANEL. |
| ⑨ | PROVIDE INTRINSICALLY SAFE BARRIERS FOR NEW FLOATS. |
| ⑩ | HEATER WITH INTEGRAL THERMOSTAT. |
| ⑪ | PUMP CONTROL MFR. TO COORDINATE WITH OWNER AND PROVIDE MONITORING POINTS AS REQUIRED FOR SCADATA. |
| ⑫ | PROVIDE CURRENT TRANSDUCER (CT) WIRE TO DEAD FRONT PANEL METER AND TO SCADATA SYSTEM. CURRENT DISPLAYS MOUNTED ON DEAD FRONT PANEL SHALL BE SCALABLE WITH INPUT SIGNAL TO MATCH CT. 4-20mA SIGNAL ONLY. |
| ⑬ | MOUNT LIGHT SWITCH FOR FLOOD LIGHT TO LIGHT POST. |
| ⑭ | PROVIDE AND MOUNT TO PANEL DEAD FRONT A 20A RATED CONVENIENCE OUTLET. |

SITE FLOOD LIGHT, LITHONIA DSXF1 LED P1 40K MFL MVOLT THK (OR EQUAL). LIGHT SWITCH TO BE MOUNTED ON POLE.

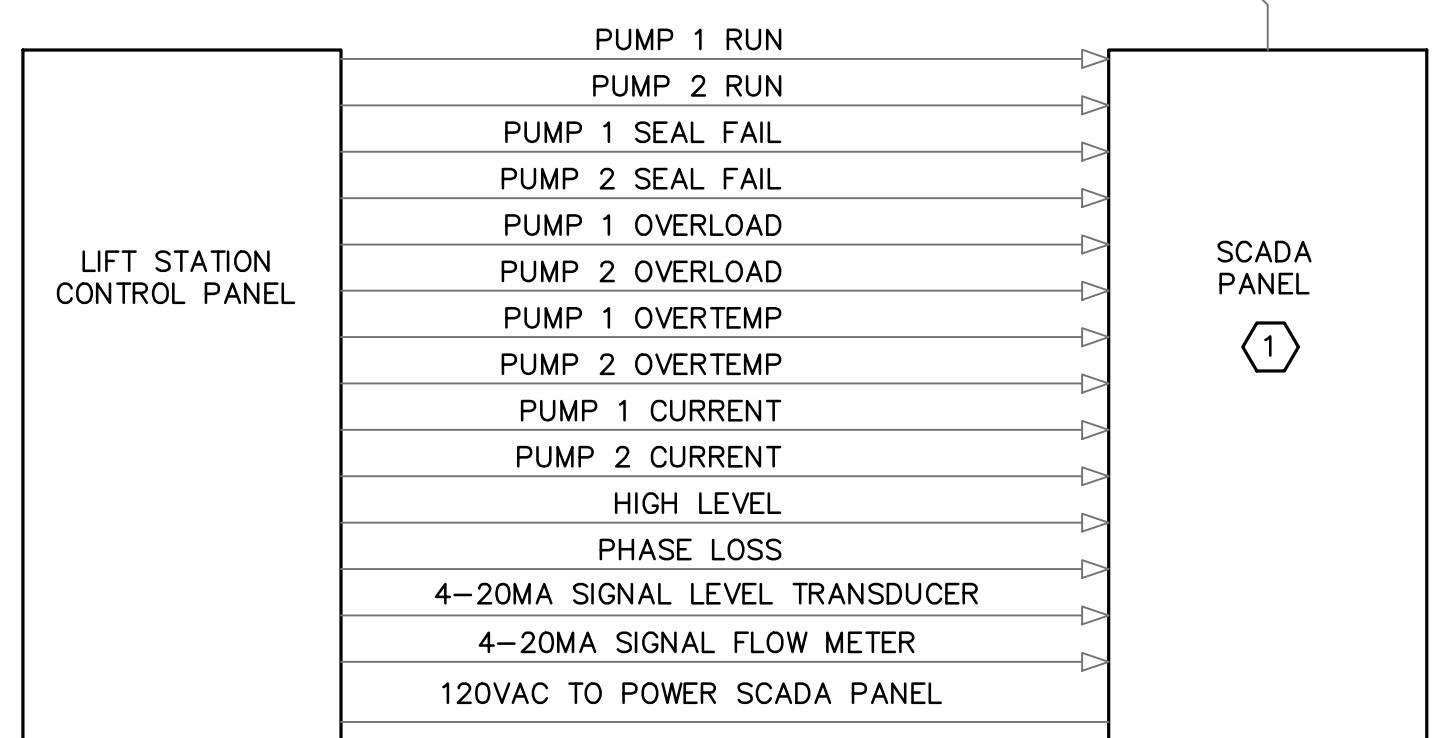
10 FOOT 1-1/2" PVC COATED RIGID CONDUIT MOUNT TO STRUCTURE WITH STAINLESS STEEL "U" BOLTS.



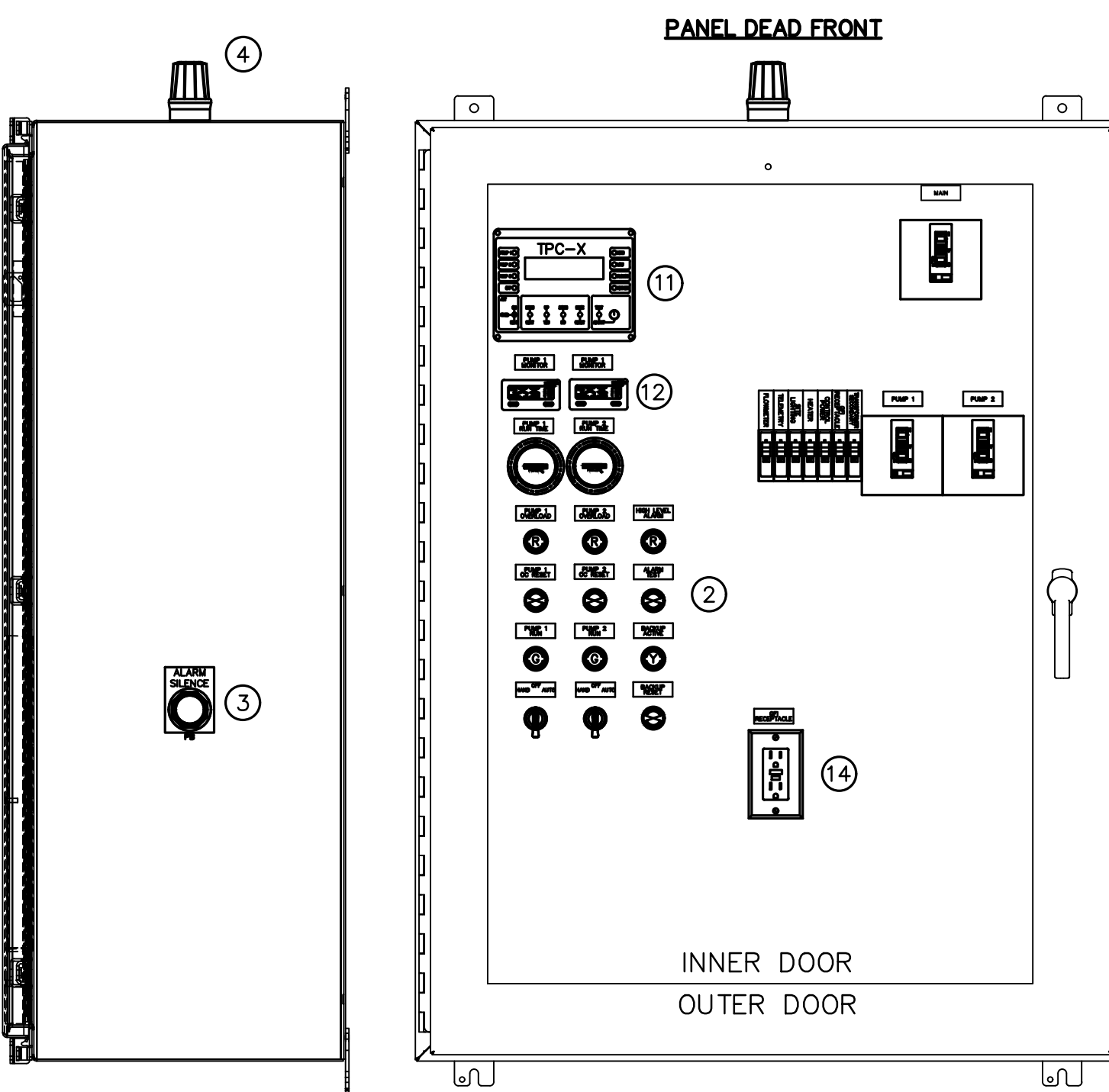
ELECTRICAL AND PUMP CONTROL MOUNTING DETAIL
NOT TO SCALE

NOTES:

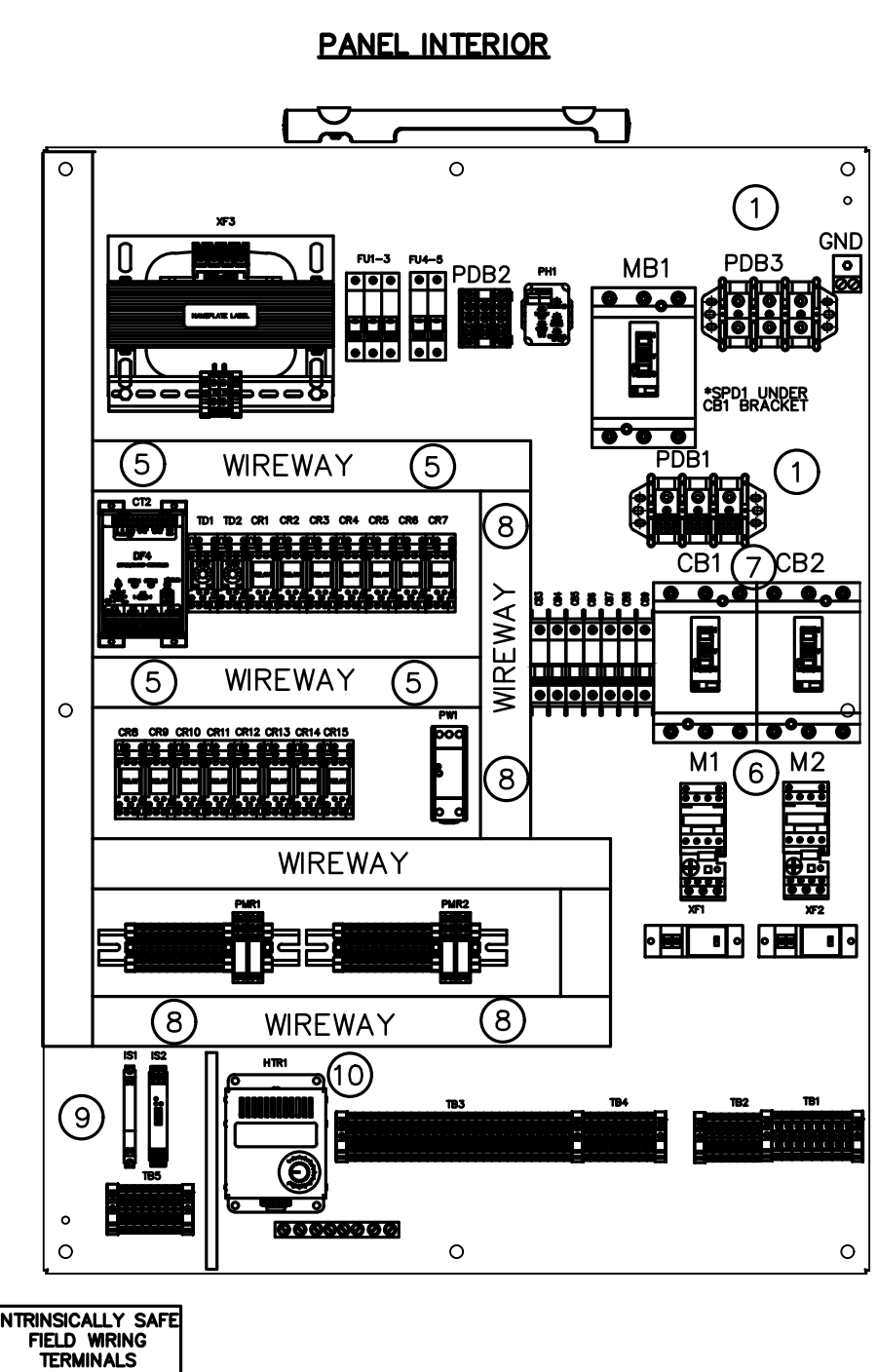
1. SIZE NEMA 4X CONTROL PANEL AS REQUIRED.
2. CONTROL PANEL SHALL BE CONSTRUCTED TO UL STANDARDS IN A UL PANEL SHOP. CONTROL PANEL SHALL BE UL LISTED.
3. CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE ELECTRIC UTILITY TO PROVIDE POWER SERVICE TO THE NEW LIFT STATION. PROVIDE CONDUIT, WIRE, METER BASE, ETC. TO PROVIDE POWER COMPLETE TO THE LIFT STATION.
4. CONTRACTOR TO PROVIDE METER BASE PER ELECTRIC UTILITY METER BASE REQUIREMENTS.
5. ALL COSTS ASSOCIATED WITH PROVIDING POWER TO THE LIFT STATION SHALL BE INCLUDED IN THE CONTRACTOR'S BID PRICE; EXCEPT ANY CHARGES BY THE UTILITY COMPANY FOR THEIR WORK.
6. PROVIDE FLOAT CONTROL (4 FLOATS).
7. CONTROL PANEL SHALL BE CONSTRUCTED AND PROGRAMMED TO PROVIDE AUTOMATIC LEVEL CONTROL. PUMP SHALL CYCLE TO MAINTAIN LEVEL SETPOINT. PROVIDE AUTOMATIC ALTERNATION BETWEEN PRIMARY AND BACKUP TO ALTERNATE EACH TIME THEY RUN. HIGH LEVEL FLOAT SHALL BE HARDWIRED TO START BOTH PUMPS. LOW LEVEL CUTOFF FLOAT SHALL STOP BOTH PUMPS AFTER A HIGH LEVEL FLOAT HARDWIRED START VIA A LATCHING RELAY.
8. AN ARC FLASH STUDY SHALL BE COMPLETED AS PART OF THIS PROJECT AND ARC FLASH DECALS SHALL BE PLACED ON ALL ELECTRICAL CABINETS AS REQUIRED BY STUDY.



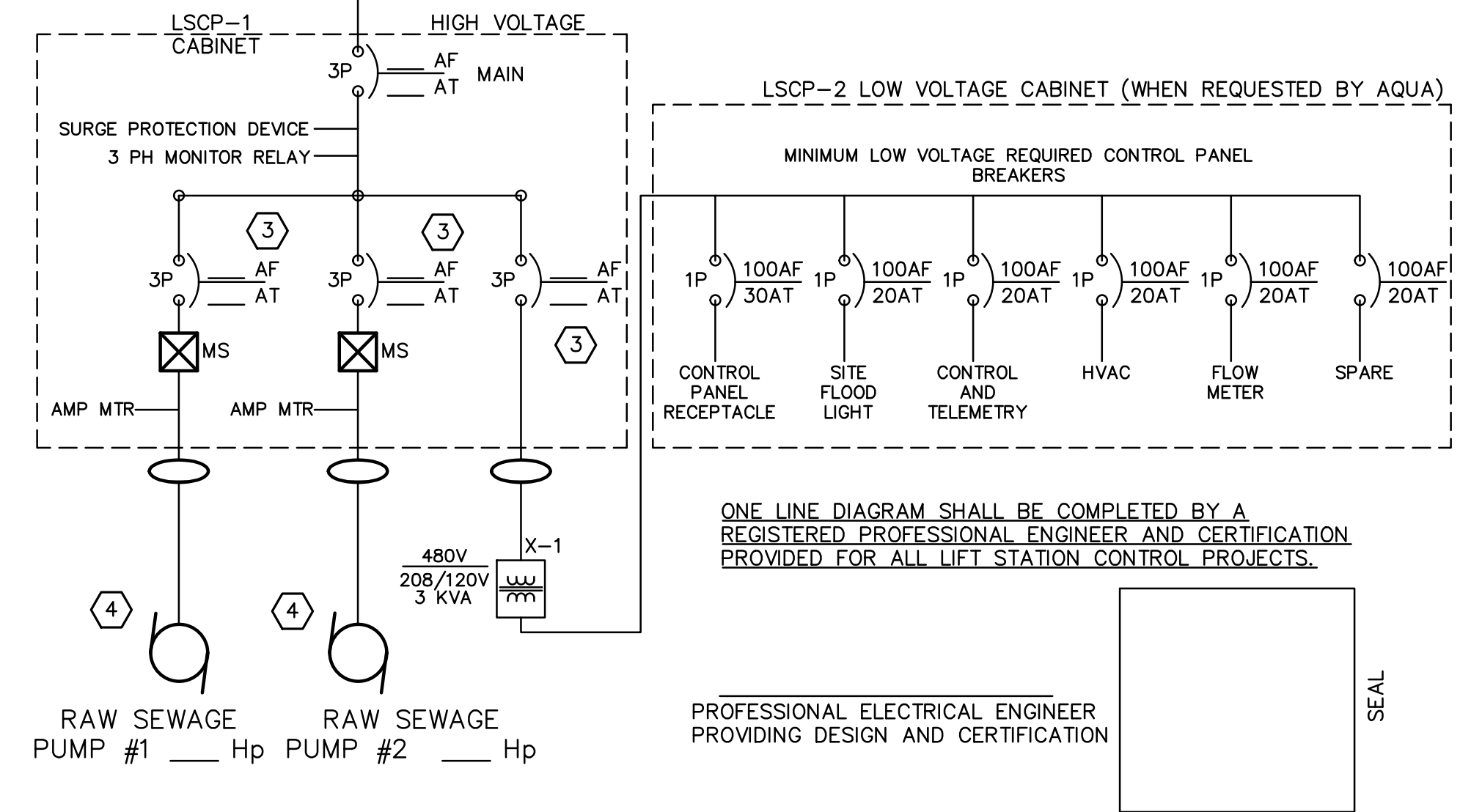
SCADA DETAIL
NOT TO SCALE



LIFT STATION CONTROL PANEL DETAIL
NOT TO SCALE



J-BOX DETAIL
NOT TO SCALE



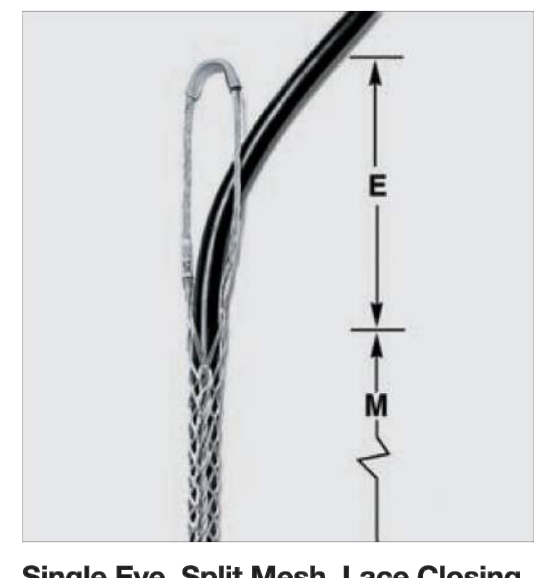
ONE LINE REFERENCE DIAGRAM
NOT TO SCALE

Load Wiring Schedule

| Type # | Quantity and Wire Size | Conduit |
|--------|------------------------|---------|
| 20 | 3 #12's & #12 Ground | 3/4" |
| 30 | 3 #10's & #10 Ground | 3/4" |
| 50 | 3 #8's & #10 Ground | 3/4" |
| 60 | 3 #6's & #8 Ground | 3/4" |
| 80 | 3 #4's & #8 Ground | 1" |
| 100 | 3 #2's & #6 Ground | 1.5" |
| 125 | 3 #1's & #6 Ground | 1.5" |
| 150 | 3 - 2/0 & #6 Ground | 2" |
| 200 | 3 - 4/0 & #4 Ground | 2.5" |
| 250 | 3 - 300's & #4 Ground | 3" |

NOTES:

- ① COORDINATE WITH OWNER REGARDING THE WIRING REQUIREMENTS FOR THE SCADA SYSTEM.
- ② THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE OWNER REGARDING THE CORRECT PART NUMBERS TO PROVIDE THE OWNER'S STANDARD FOR THE GENERATOR PLUG.
- ③ COORDINATE WITH THE CONTRACTOR AND EQUIPMENT SUPPLIERS WHEN SELECTING THE CIRCUIT BREAKER SIZES TO ENSURE NEW CIRCUIT BREAKERS ARE PROPERLY SIZED.
- ④ WIRE PUMP SAFETIES AND LEVEL CONTROLS AS REQUIRED. REFERENCE DS SPECIFICATIONS AND COORDINATE WITH CONTRACTOR DURING BIDDING AND CONSTRUCTION. INTEGRATE PUMP SAFETY RELAYS INTO CONTROL PANEL AS REQUIRED BY PUMP MANUFACTURER.
- ⑤ ALL CONDUIT CONNECTED TO WET WELL SHALL BE PVC COATED RIGID GALVANIZED STEEL. ALL OTHER CONDUIT SHALL BE ALUMINUM OR OWNER APPROVED MATERIAL.



Single Eye, Split Mesh, Lace Closing*

For permanent support when cable end is not available to be installed through grip.

| Cable Diameter Range Inches (cm) | Approx. Breaking Strength Lbs. (N) | E Inches (cm) | M Inches (cm) | Catalog Number |
|----------------------------------|------------------------------------|---------------|---------------|----------------|
| .75"- .99" (1.90-2.51) | 2,820 (12,543) | 10" (25.40) | 25" (63.50) | 02207010 |
| 1.00"-1.24" (2.54-3.15) | 4,280 (19,037) | 12" (30.48) | 28" (71.12) | 02207011 |
| 1.25"-1.49" (3.17-3.78) | 4,280 (19,037) | 12" (30.48) | 30" (76.20) | 02207012 |
| 1.50"-1.99" (3.81-5.05) | 4,280 (19,037) | 12" (30.48) | 34" (86.36) | 02207013 |

Note: E=Eye length.
M=Mesh length at nominal diameter.
* Change catalog number from 022 to 024 for stainless steel. Consult factory for availability.

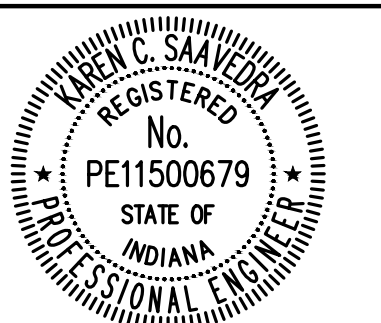
STAINLESS STEEL CABLE SUPPORT DETAIL
NOT TO SCALE



HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

STANDARD DETAILS



Kevin C. Saalbach
REGISTERED PROFESSIONAL ENGINEER
STATE OF INDIANA
CERTIFIED BY

ISSUANCE INDEX

| NO. | DESCRIPTION | DATE |
|-----|--|------------|
| 1 | SHEET ADDED | 12/10/2018 |
| 2 | REVISIONS TO AIR RELEASE VALVE | |
| 3 | LATERAL CONNECTION TO EXISTING SEWER | 01/03/2019 |
| 4 | DETAIL AND LIFT STATION SPECIFICATIONS UPDATES | 01/21/2021 |

REVISION SCHEDULE

| NO. | DESCRIPTION | DATE |
|-----|---------------------------------------|------------|
| 1 | UPDATED TESTING REQ PER IDEM COMMENTS | 01/20/2017 |
| 2 | UPDATED TESTING REQ PER IDEM COMMENTS | 12/10/2018 |
| 3 | GENERAL REVISIONS | 01/03/2019 |
| 4 | ASTM REFERENCE | 08/05/2019 |

Project Number 2000.00103

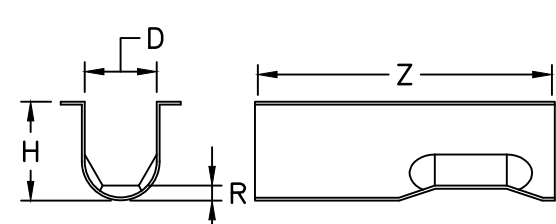
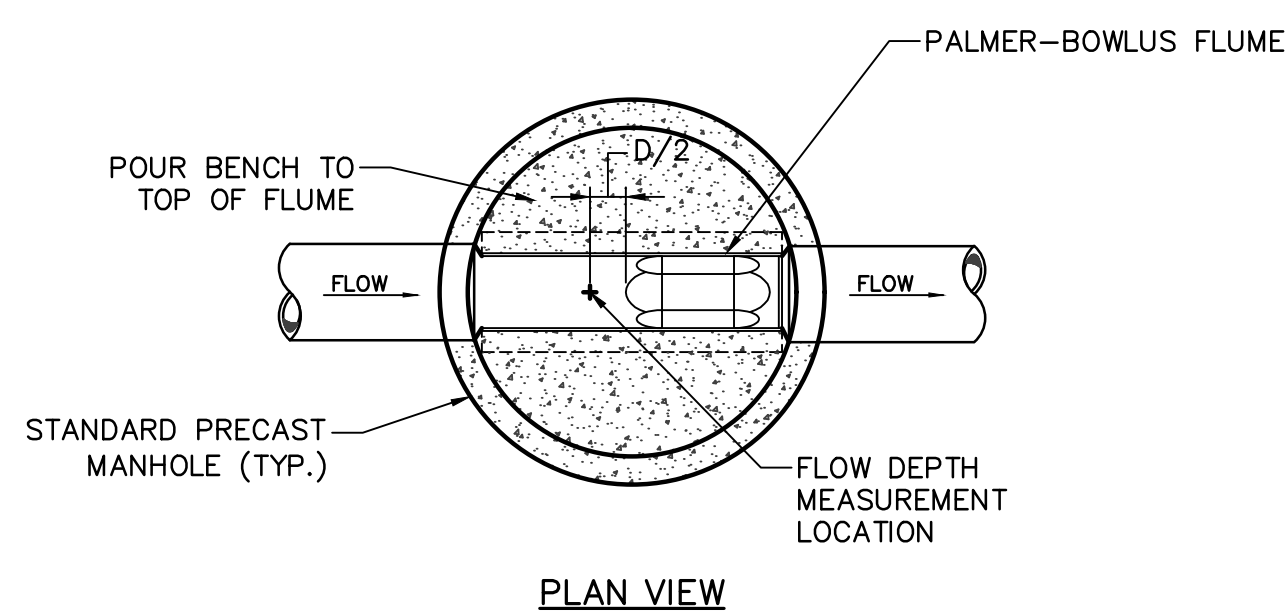
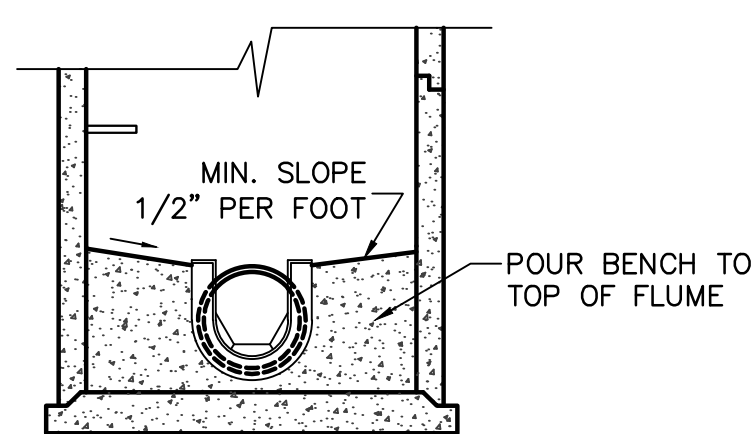
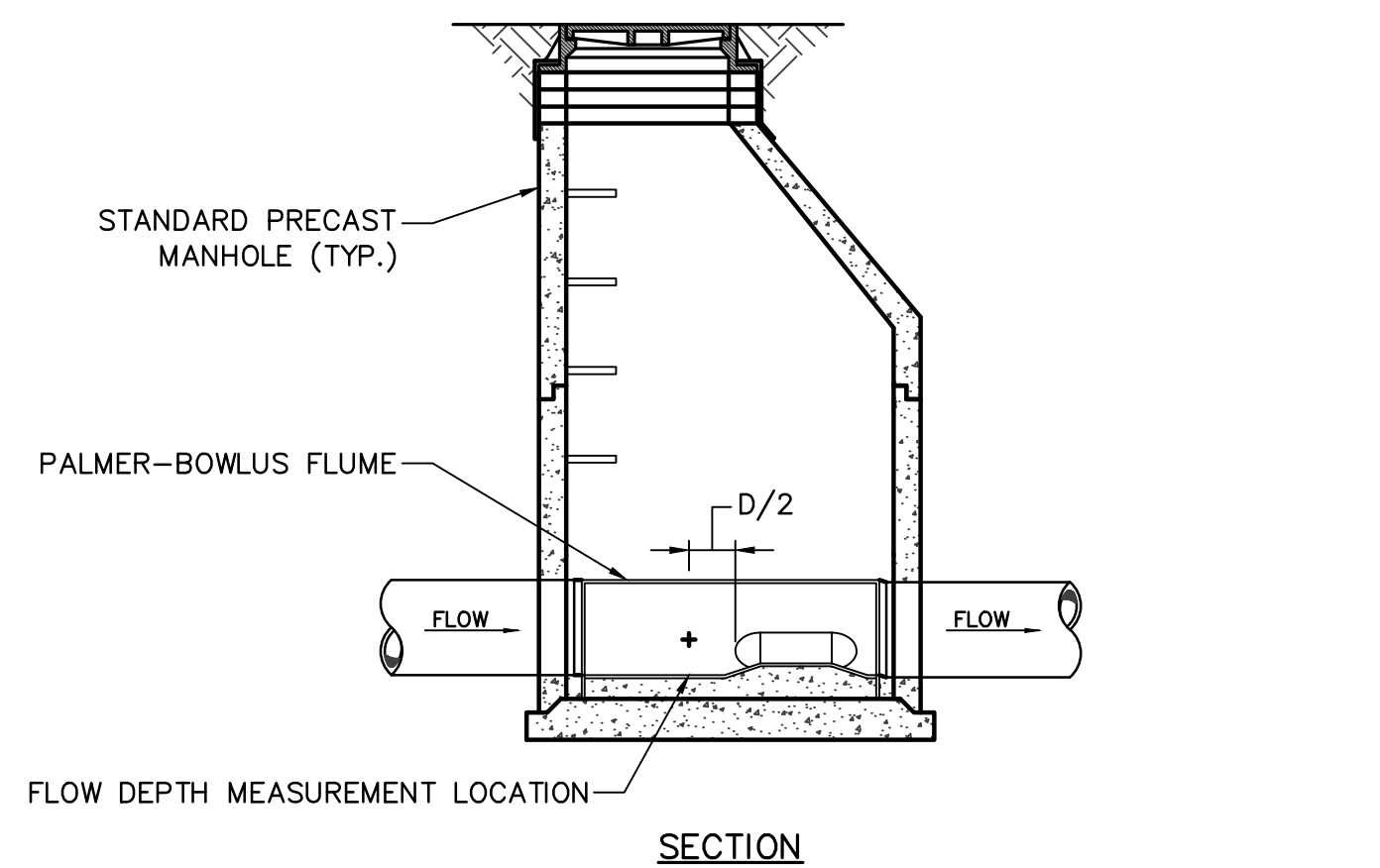
SANITARY SEWER
STANDARD DETAILS

04-A

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 PLOT DATE: 5/9/2021 12:32 PM
 PLOT SCALE: 1:1
 EDIT DATE: 3/22/2021
 EDITED BY: PTRAWNSKI

| FLUME | | | | | | | | | | MANHOLE SIZE | SLOPE UPSTREAM (%) |
|-------------------|-------|-------|--------|--------|---------------------|-----|------|----|----|--------------|--------------------|
| MAXIMUM DISCHARGE | | | HEAD | MODEL | DIMENSIONS (INCHES) | | | | | | |
| GPM | MGD | CFS | INCHES | | D | D/2 | R | H | Z | MIN. | MAX. |
| 165 | 0.238 | 0.388 | 4.70 | PBF-6 | 6 | 2 | 1.00 | 8 | 25 | 6' DIA. | 2.2 |
| 343 | 0.494 | 0.764 | 6.30 | PBF-8 | 8 | 3 | 1.33 | 10 | 33 | 6' DIA. | 2.0 |
| 603 | 0.868 | 1.344 | 7.90 | PBF-10 | 10 | 4 | 1.67 | 12 | 41 | 6' DIA. | 1.8 |

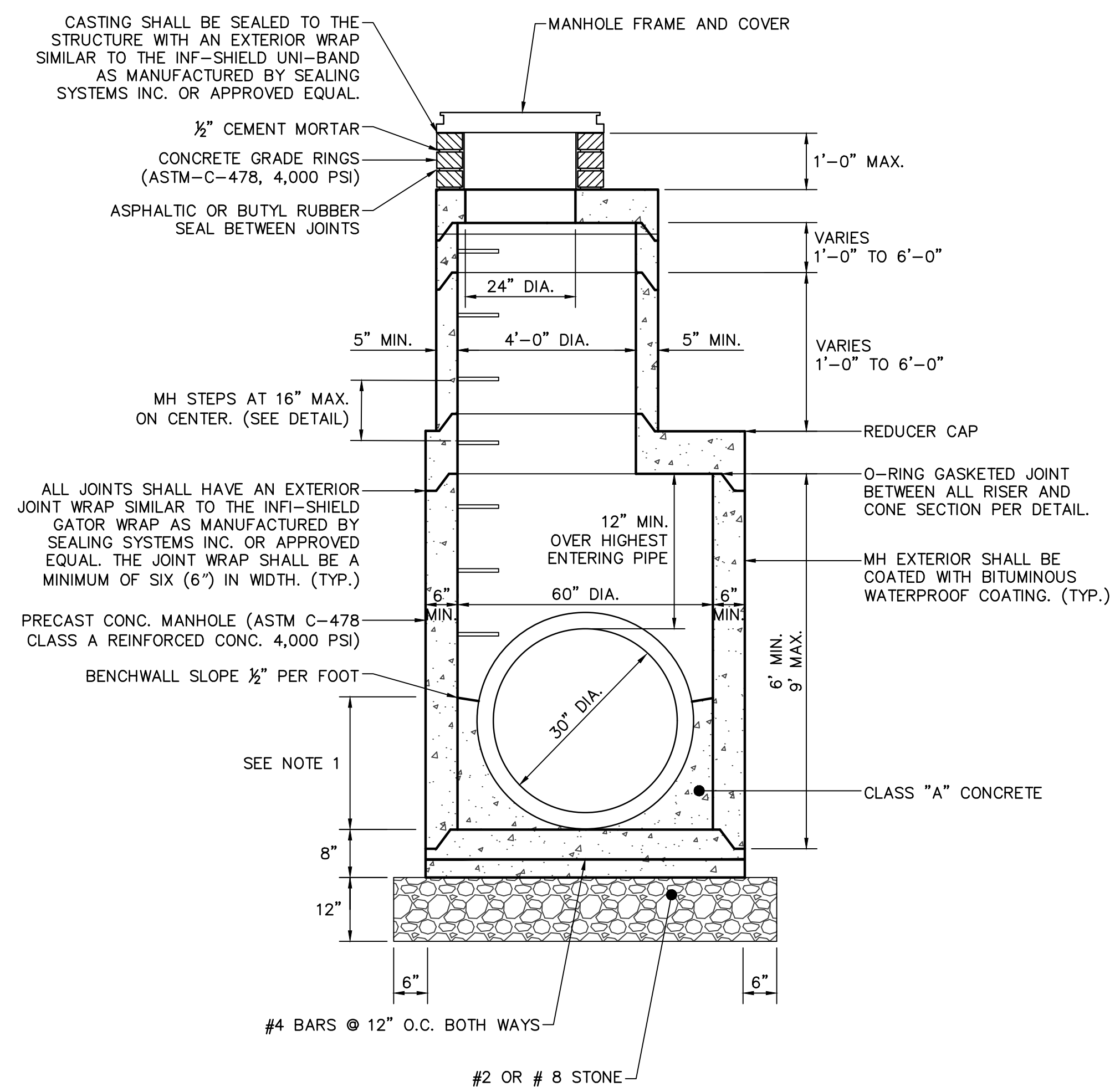


PALMER-BOWLUS FLUME

NOTES:

1. FLUME SHALL BE A PALMER-BOWLUS FLUME.
2. FIELD POUR CONCRETE BENCH WITH FLUME INSTALLED IN MANHOLE AT LINE SLOPE.
3. FLUME SELECTION SHALL BE BASED UPON THE FLOW TO BE MEASURED AND NOT UPON THE PIPE SIZE.

SAMPLING AND METERING CONTROL MANHOLE DETAIL
NOT TO SCALE



NOTES:

1. BENCH WALLS SHALL FORM A DEFINED CHANNEL TO A MINIMUM HEIGHT OF 80% OF THE INSIDE DIAMETER OF THE INLET AND OUTLET PIPES.
2. MANHOLE SHALL CONFORM TO ASTM C-478.
3. JOINTS SHALL CONFORM TO ASTM C-433.
4. PIPE CONNECTIONS TO MANHOLES SHALL BE MADE WITH WATERTIGHT FLEXIBLE RUBBER BOOTS WITH STAINLESS STEEL BANDS OR FLEXIBLE WATERTIGHT GASKETS. ACCEPTABLE PRODUCTS ARE: KOR-N-SEAL AS MANUFACTURED BY CORE AND SEAL COMPANY, DURA-SEAL III AS MANUFACTURED BY DURA TECH, INC., PSX AS MANUFACTURED BY THE PRESS SEAL GASKET CORPORATION, OR APPROVED EQUAL. PIPE SEAL SHALL MEET ASTM C-443.
5. PIPE OPENINGS IN BASE AND RISER SECTIONS SHALL BE FORMED OR CORE-DRILLED.

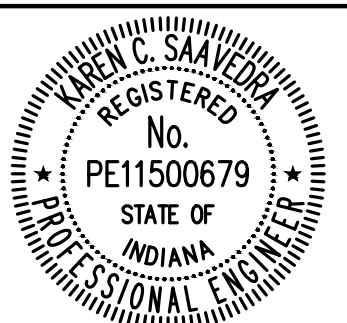
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HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

STANDARD DETAILS



Kevin C. Saalbach
CERTIFIED BY

ISSUANCE INDEX

| | |
|-------|------------|
| DATE: | 04/30/2021 |
| | |
| | |

REVISION SCHEDULE

| NO. | DESCRIPTION | DATE |
|-----------------------|---|------------|
| 1 | SHEET ADDED | 12/10/2018 |
| 3 | REVISIONS TO AIR RELEASE VALVE LATERAL CONNECTION TO EXISTING SEWER | 01/03/2019 |
| 4 | DETAIL AND LIFT STATION SPECIFICATIONS UPDATES | 01/21/2021 |
| SPECIFICATIONS | | |
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| 4 | ASTM REFERENCE | 08/05/2019 |

Project Number 2000.00103

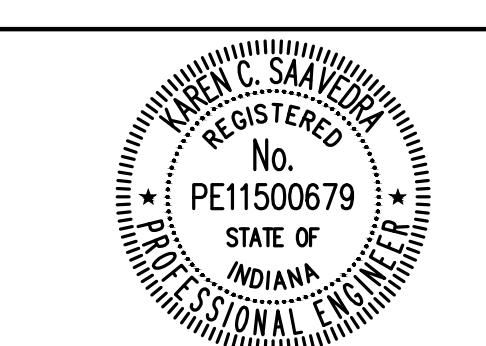
SANITARY SEWER
STANDARD DETAILS



HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

STANDARD DETAILS



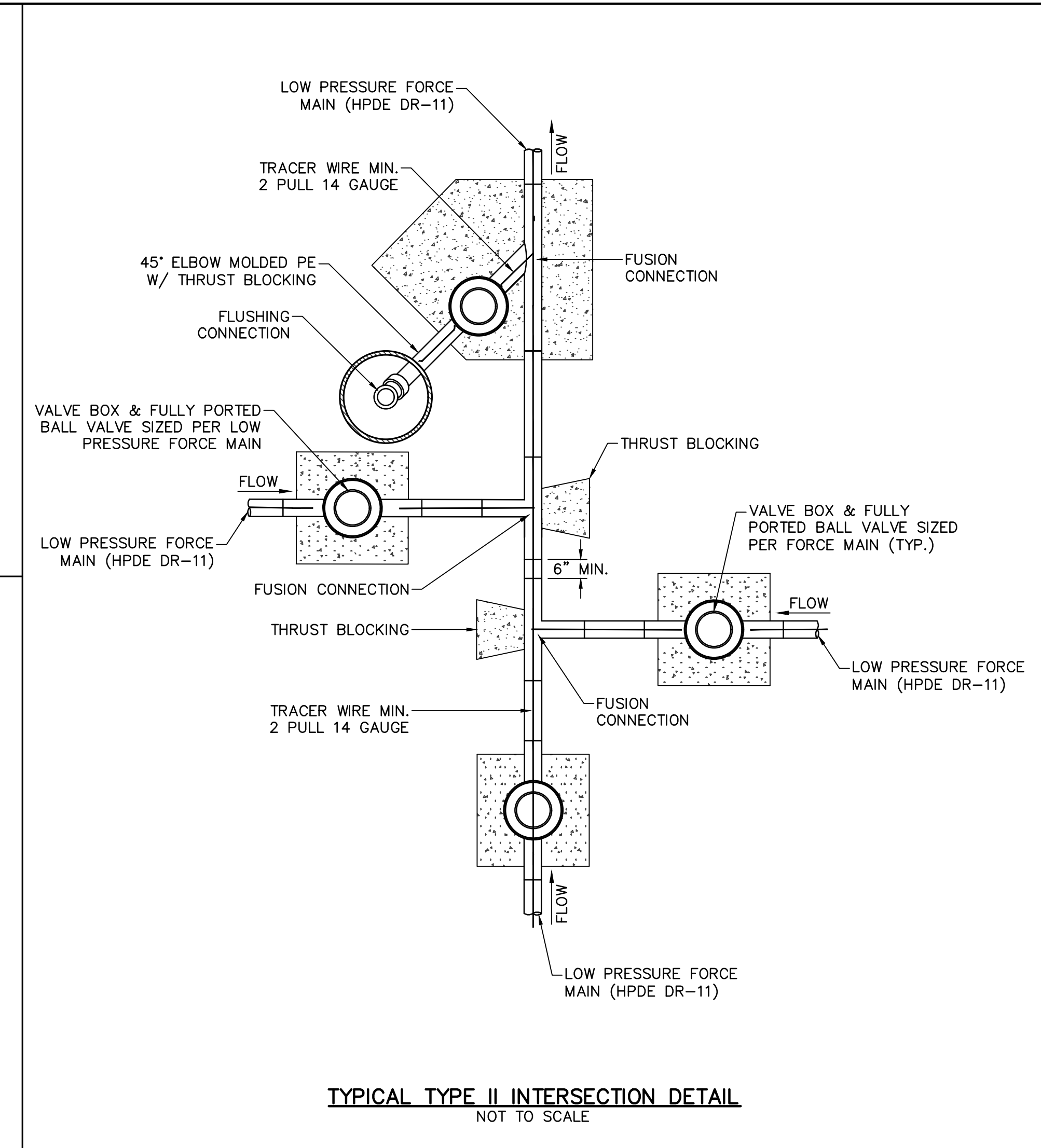
Kevin C. Saalbach
REGISTERED PROFESSIONAL ENGINEER
CERTIFIED BY

| ISSUANCE INDEX | |
|----------------|------------|
| DATE: | 04/30/2021 |

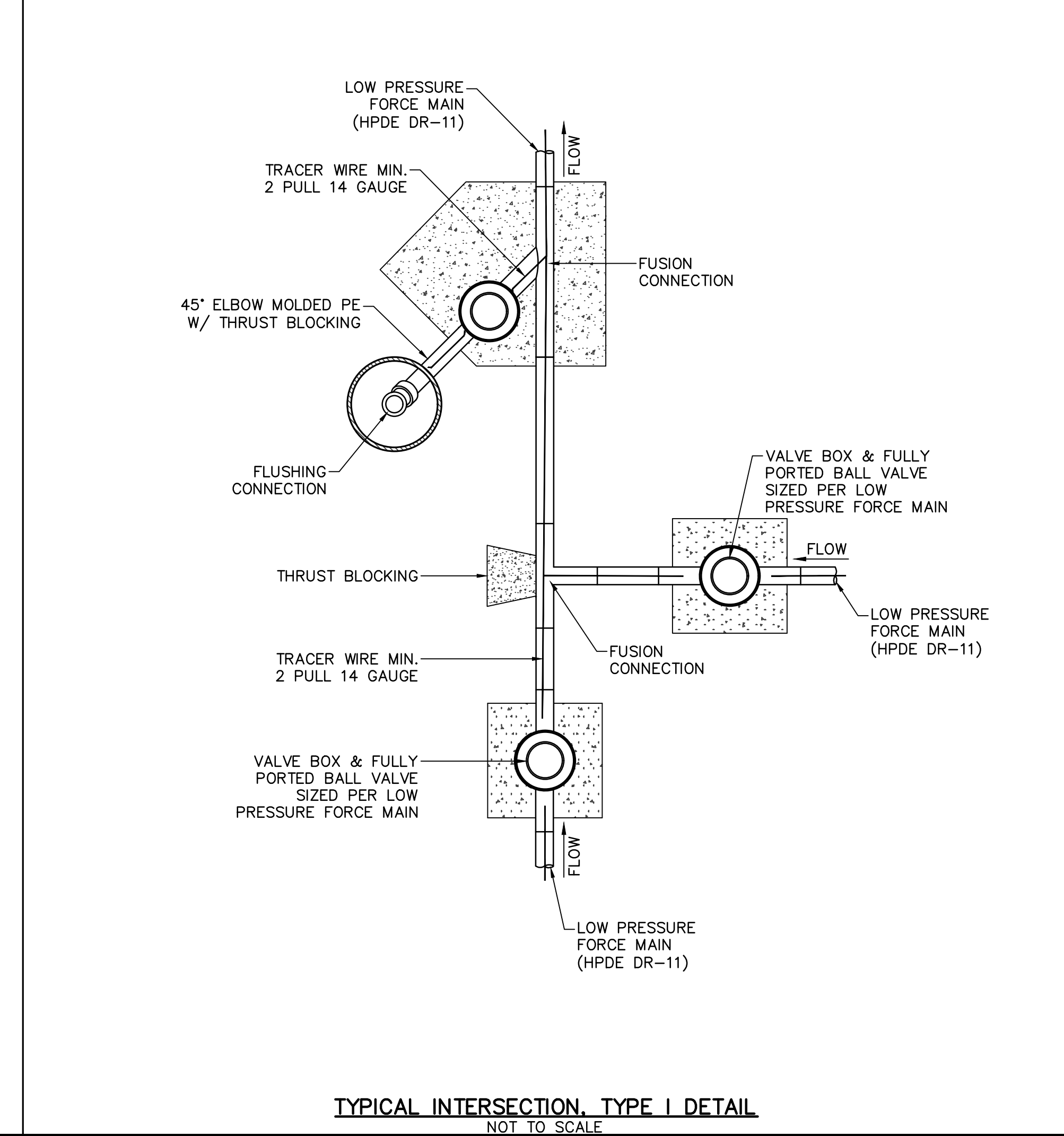
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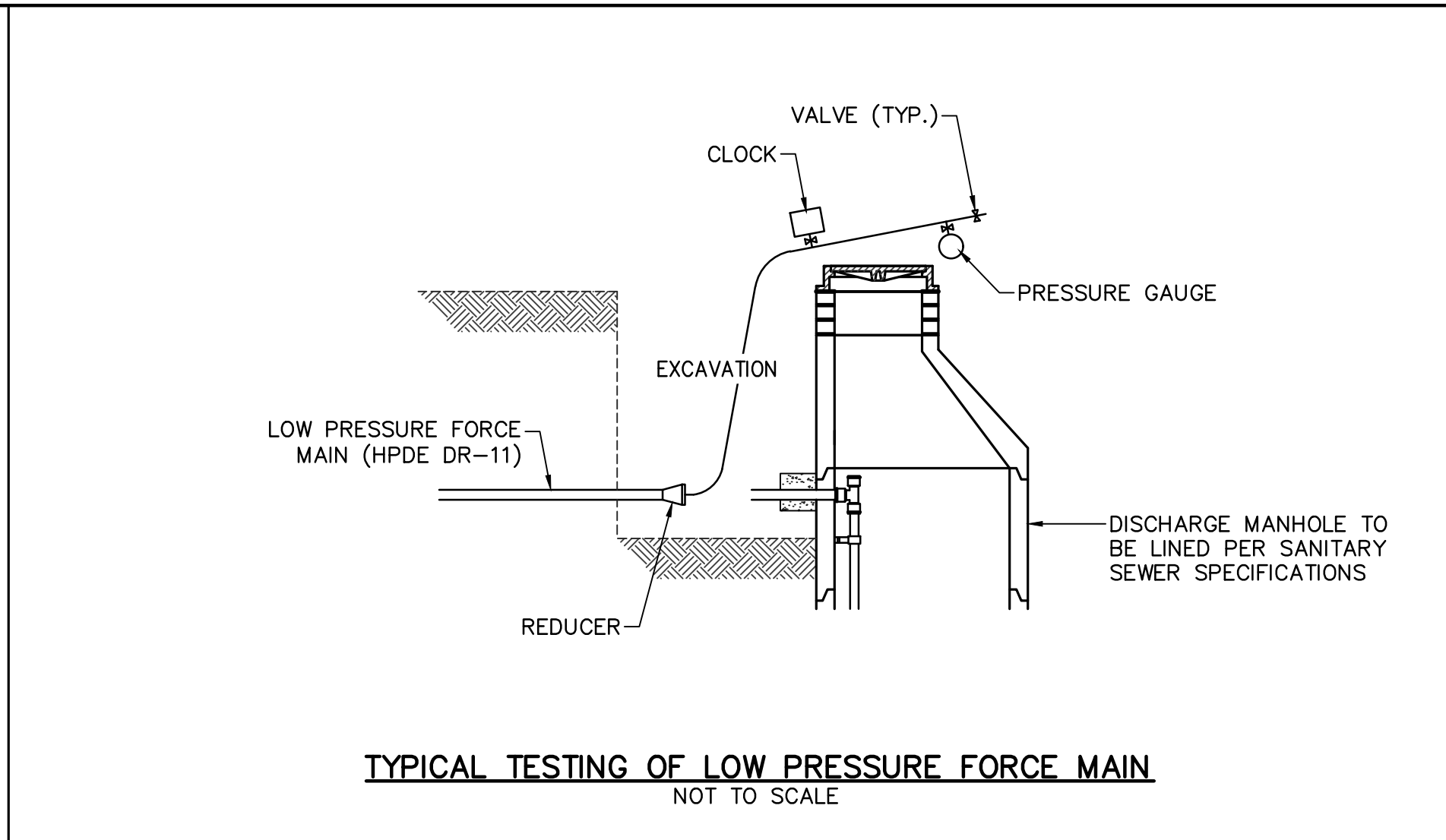
LOW PRESSURE SEWER STANDARD DETAILS



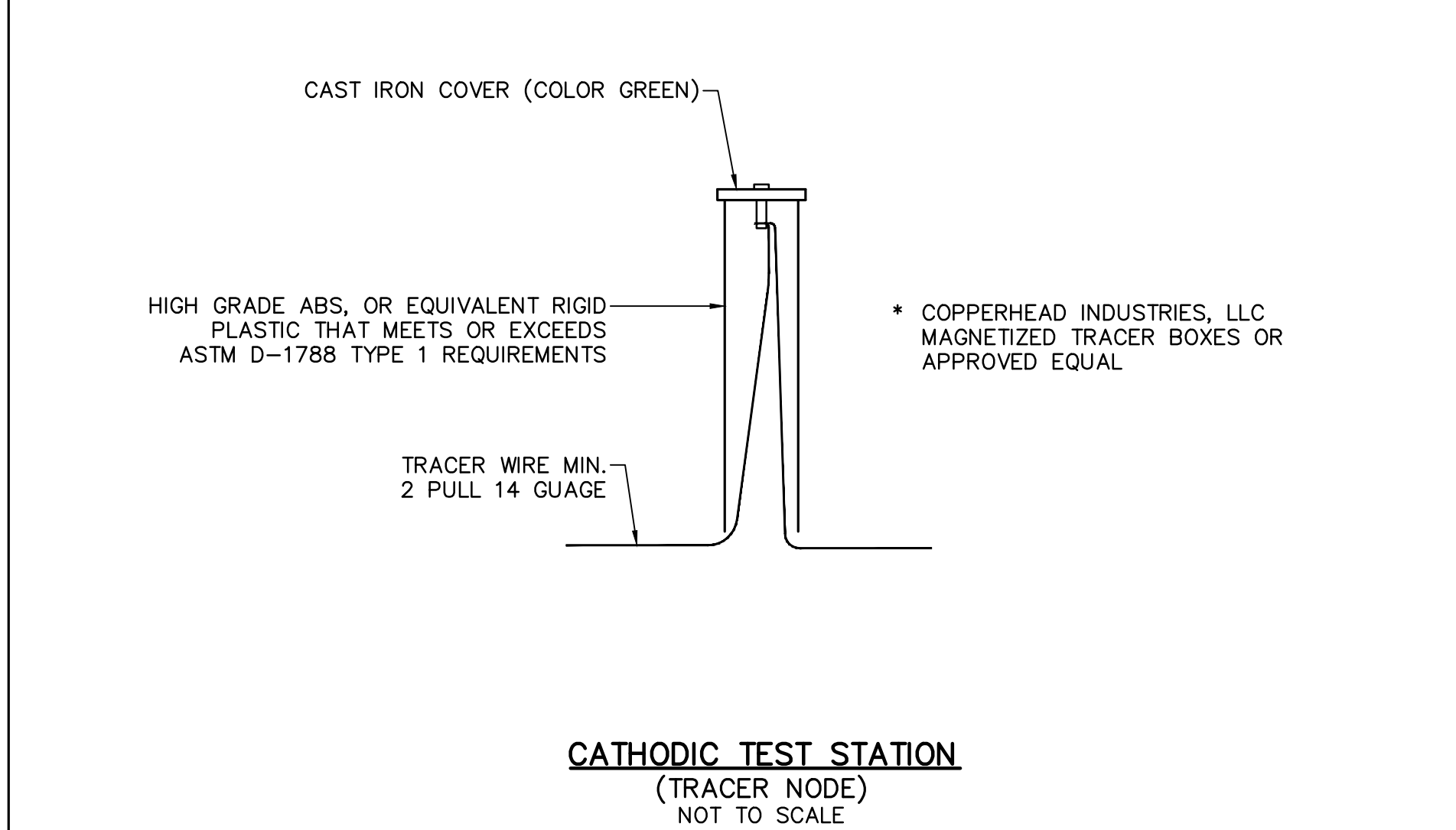
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NOT TO SCALE



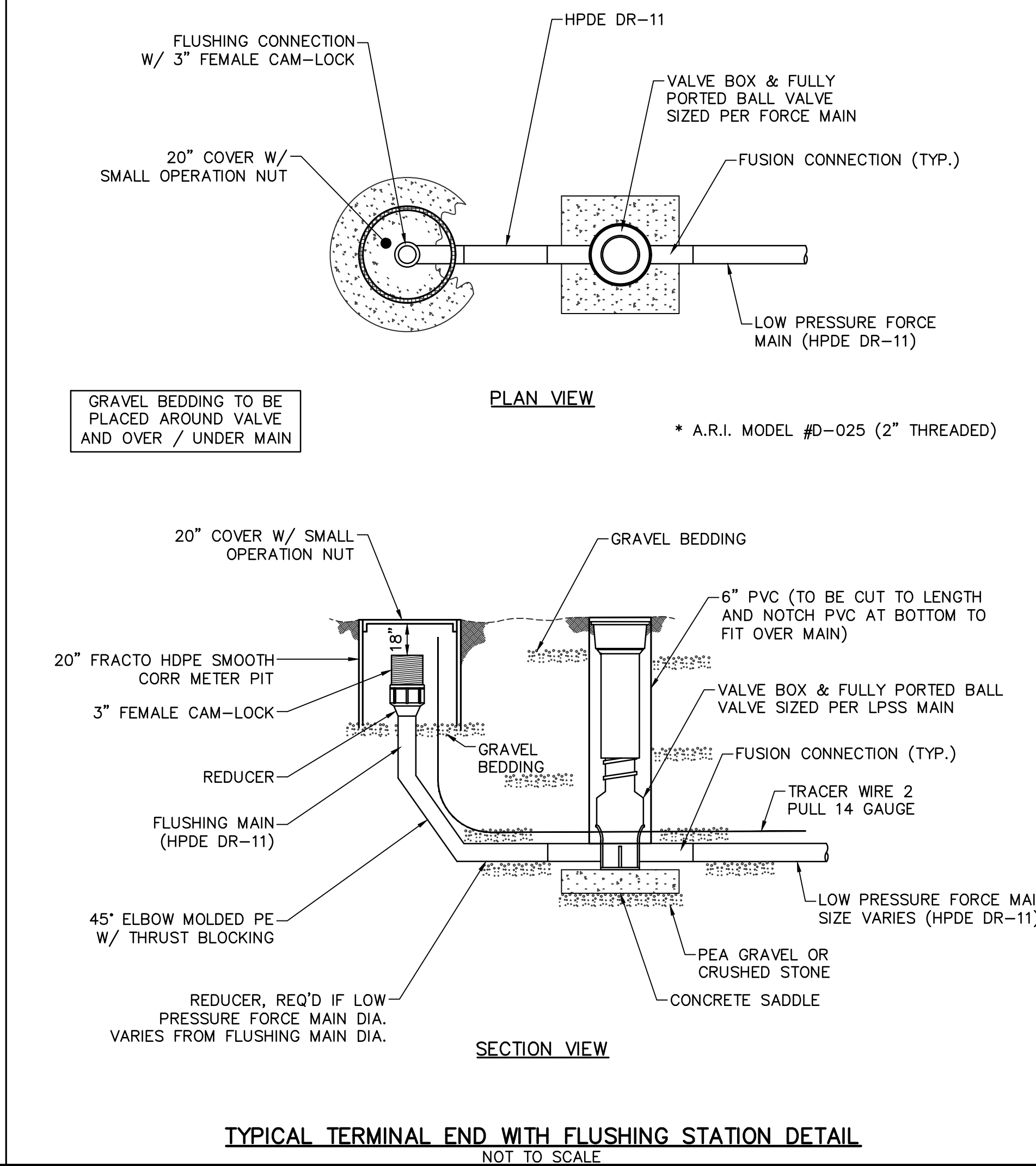
TYPICAL INTERSECTION, TYPE I DETAIL
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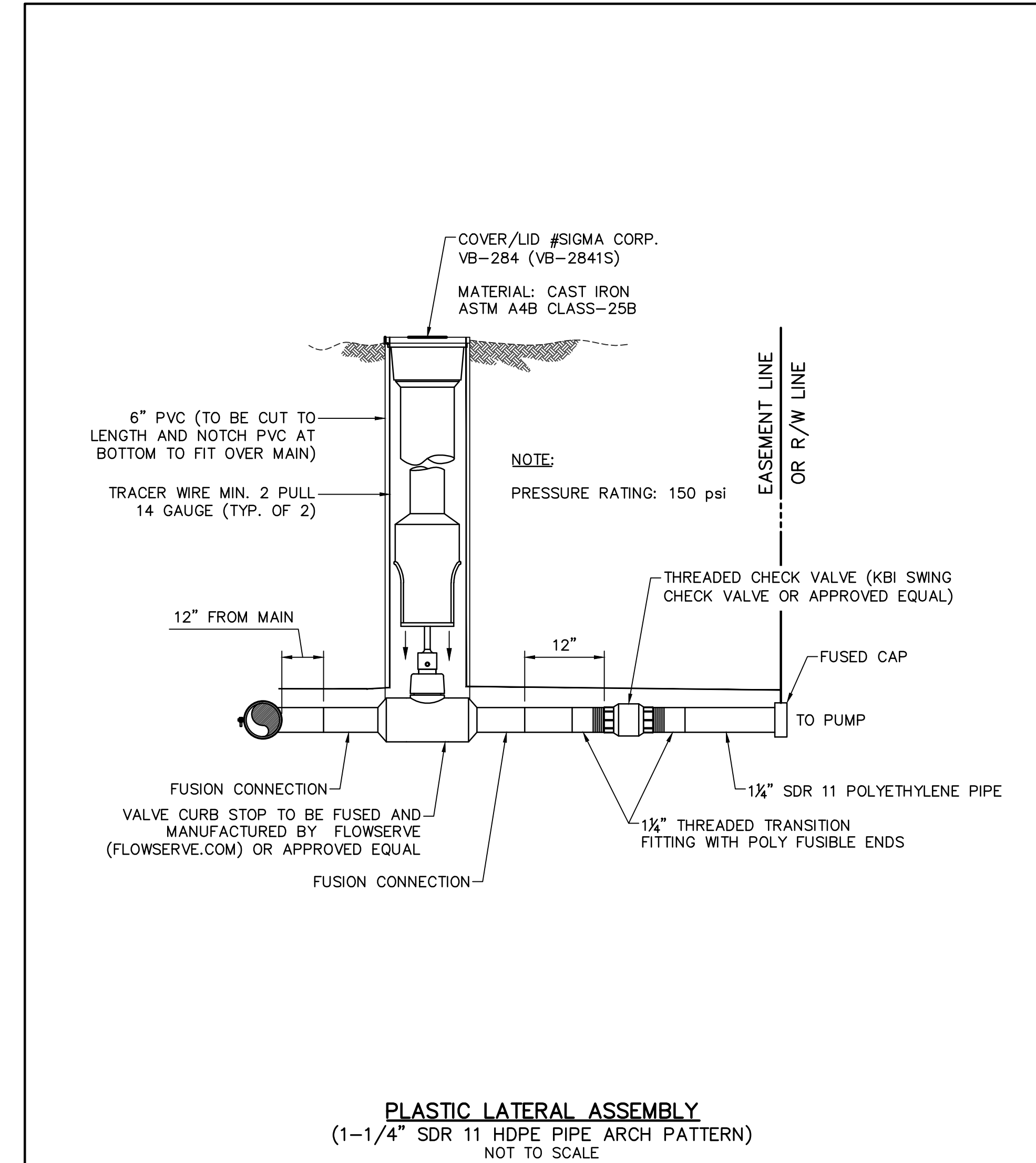
TYPICAL TESTING OF LOW PRESSURE FORCE MAIN
NOT TO SCALE



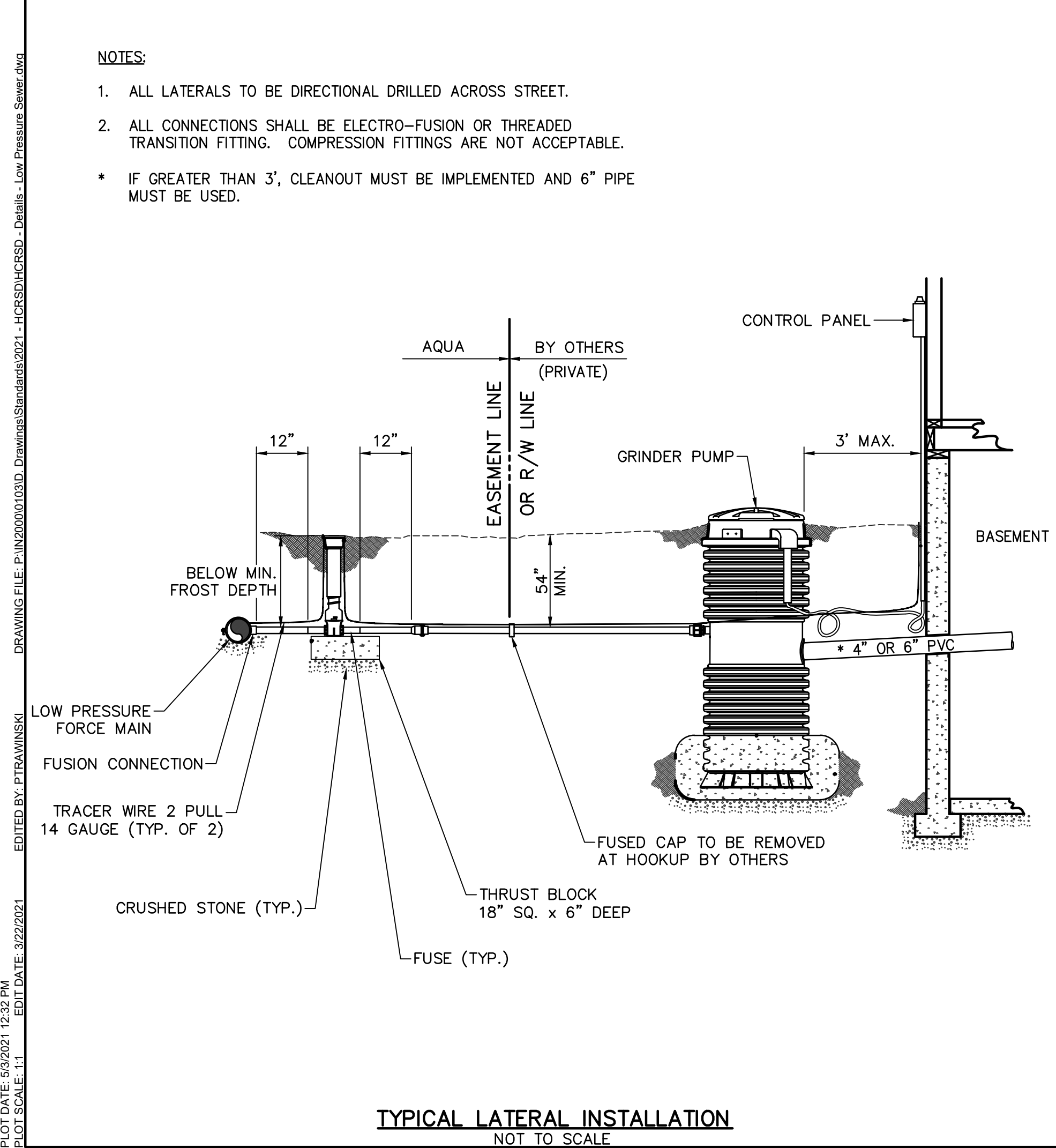
CATHODIC TEST STATION (TRACER NODE)
NOT TO SCALE



TYPICAL TERMINAL END WITH FLUSHING STATION DETAIL
NOT TO SCALE



PLASTIC LATERAL ASSEMBLY
(1-1/4" SDR 11 HDPE PIPE ARCH PATTERN)
NOT TO SCALE



TYPICAL LATERAL INSTALLATION
NOT TO SCALE

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FOREWORD

THE "STANDARD SANITARY SEWER SPECIFICATIONS" FOR HENDRICKS COUNTY REGIONAL SEWER DISTRICT (HCRSD) HAVE BEEN PREPARED TO SET FORTH THE DISTRICT'S MINIMUM CRITERIA FOR CONSTRUCTION WITHIN HCRSD'S LIMITS.

ALL CONSTRUCTION PROJECTS WHICH ARE CONNECTED TO THE HCRSD SYSTEM SHALL CONFORM TO THESE STANDARDS. CONSTRUCTION DRAWINGS AND SPECIFICATIONS MUST BE APPROVED BY THE HCRSD AND A WRITTEN PERMIT OBTAINED FOR SEWER EXTENSIONS IN ACCORDANCE WITH EXISTING ORDINANCES BEFORE CONSTRUCTION BEGINS. IN ADDITION, SANITARY SEWER PROJECTS MUST BE SUBMITTED TO THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (IDEM) FOR APPROVAL AND ISSUANCE OF A CONSTRUCTION PERMIT. DEVELOPERS MAY NOT SUBMIT PROJECTS TO IDEM UNTIL HCRSD ISSUES A WASTELOAD ALLOCATION AND APPROVAL OF PLANS.

CONSTRUCTION OBSERVATION WILL BE PERFORMED BY HCRSD. A MINIMUM OF 48 HOURS' NOTICE SHALL BE GIVEN PRIOR TO STARTING CONSTRUCTION.

THESE STANDARDS WERE PREPARED WITH THE INTENT OF OBTAINING THE HIGHEST QUALITY OF CONSTRUCTION POSSIBLE, CONSISTENT WITH ACCEPTED INDUSTRY PRACTICES AND SPECIFICATIONS. AS NEW MATERIALS BECOME AVAILABLE AND ACCEPTABLE, THE STANDARDS MAY BE REVISED AND UPDATED.

PART 1 - GENERAL

1.1 SCOPE OF WORK

THE WORK UNDER THIS SECTION INCLUDES PIPE MATERIALS, MANHOLES, AND APPURTENANCES, INCLUDING EXCAVATING AND BACKFILLING, NORMALLY ENCOUNTERED WITH SANITARY SEWER EXTENSIONS AND SANITARY BUILDING PIPING (LATERAL) FROM 3 FEET OUTSIDE BUILDING TO CONNECTION WITH MUNICIPAL SEWERS OR OTHER DISCHARGE SYSTEM OR METHOD. THE ENDS OF SEWERS SHALL BE TIGHTLY PLUGGED OR CAPPED AT THE TERMINAL POINTS, ADJACENT TO BUILDINGS, PENDING THE CONNECTING OF ALL SUCH LINES TO THE BUILDING DRAIN AS SPECIFIED IN THE PLUMBING SPECIFICATIONS AND ARCHITECTURAL DRAWINGS. ONE SET OF APPROVED PLANS SHALL BE ON THE JOB SITE AT ALL TIMES.

THIS SECTION INCLUDES, BUT IS NOT LIMITED TO:

- 1. EXCAVATION
2. EMBEDMENT AND BACKFILL
3. GRAVITY SANITARY SEWER PIPE
4. GRAVITY LATERAL PIPES
5. PRESSURE PIPE
6. MANHOLES
7. APPURTENANCES
8. DETAILS

1.2 DEFINITIONS

BEDDING: FILL PLACED UNDER, BESIDE, AND DIRECTLY OVER PIPE, PRIOR TO SUBSEQUENT BACKFILL OPERATIONS.

CONTRACTOR: COMPANY OR INDIVIDUAL AUTHORIZED BY HCRSD TO PERFORM WORK AS CALLED FOR BY ISSUANCE OF A SEWER CONSTRUCTION PERMIT.

DEVELOPER: ANY PUBLIC AGENCY, PRIVATE COMPANY, OR INDIVIDUAL WHO PROPOSES THE DEVELOPMENT OF PROPERTY WHICH REQUIRES CONSTRUCTION OF SANITARY SEWERS OR LATERALS.

DISTRICT: THE HENDRICKS COUNTY REGIONAL SEWER DISTRICT AND ITS REPRESENTATIVES: AQUA INDIANA, HENDRICKS COUNTY REGIONAL SEWER DISTRICT OPERATOR; AND AMERICAN STRUCTUREPOINT, INC., HENDRICKS COUNTY REGIONAL SEWER DISTRICT ENGINEER

EMBEDMENT: EARTH OR OTHER SPECIAL MATERIAL USED TO REPLACE MATERIAL REMOVED FROM TRENCHES DURING CONSTRUCTION FROM THE SEWER SUBGRADE.

MAIN SEWER: REFERS TO ANY EXISTING OR PROPOSED SEWER DEDICATED TO PUBLIC USE WITHIN THE PUBLIC RIGHT-OF-WAY OR EASEMENT.

LATERAL: REFERS TO ANY EXISTING OR PROPOSED PIPE WHICH CONNECTS FROM THE BUILDING PLUMBING TO THE MAIN SEWER.

1.3 ABBREVIATIONS

- DI: DUCTILE IRON PIPE
HCRSD: HENDRICKS COUNTY REGIONAL SEWER DISTRICT
IDEM: INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
PVC: POLYVINYL CHLORIDE PLASTIC
SDR: STANDARD DIMENSION RATIO
HDPE: HIGH DENSITY POLYETHYLENE
CCTV: CLOSED CIRCUIT TELEVISION
IAC: INDIANA ADMINISTRATIVE CODE

1.4 DELIVERY, STORAGE, AND HANDLING

STORE PLASTIC PIPING PROTECTED FROM DIRECT SUNLIGHT AND SUPPORT TO PREVENT SAGGING AND BENDING. PROTECT STORED PIPING FROM MOISTURE AND DIRT BY ELEVATING ABOVE GRADE. PROTECT FLANGES, FITTINGS, AND SPECIALTIES FROM MOISTURE AND DIRT.

HANDLE MANHOLES ACCORDING TO MANUFACTURER'S WRITTEN RIGGING INSTRUCTIONS.

1.5 REFERENCE STANDARDS

THE PUBLICATIONS LISTED BELOW FORM A PART OF THIS SPECIFICATION TO THE EXTENT REFERENCED. THE PUBLICATIONS ARE REFERENCED IN THE TEXT BY THE BASIC DESIGNATION ONLY. MOST RECENT STANDARDS APPLY.

- A. ASTM INTERNATIONAL:
1. ASTM C443 - STANDARD SPECIFICATION FOR JOINTS FOR CONCRETE PIPE AND MANHOLES, USING RUBBER GASKETS
2. ASTM D1785 - STANDARD SPECIFICATION FOR POLY(VINYL CHLORIDE) (PVC) PLASTIC PIPE, SCHEDULES 40, 80, AND 120.
3. ASTM D2564 - STANDARD SPECIFICATION FOR SOLVENT CEMENTS FOR POLY(VINYL CHLORIDE) (PVC) PLASTIC PIPING SYSTEMS.
4. ASTM D2729 - STANDARD SPECIFICATION FOR POLY(VINYL CHLORIDE) (PVC) SEWER PIPE AND FITTINGS.
5. ASTM D2855 - STANDARD PRACTICE FOR MAKING SOLVENT-CEMENTED JOINTS WITH POLY(VINYL CHLORIDE) (PVC) PIPE AND FITTINGS.
6. ASTM D3034 - STANDARD SPECIFICATION FOR TYPE PSM POLY(VINYL CHLORIDE) (PVC) SEWER PIPE AND FITTINGS.
7. ASTM D6938 - STANDARD TEST METHOD FOR IN-PLACE DENSITY AND WATER CONTENT OF SOIL AND SOIL-AGGREGATE BY NUCLEAR METHODS (SHALLOW DEPTH).
B. ASTM F477 - STANDARD SPECIFICATION FOR ELASTOMERIC SEALS (GASKETS) FOR JOINING PLASTIC PIPE.
C. AMERICAN WATER WORKS ASSOCIATION (AWWA):
1. AWWA C111 - RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS.
2. AWWA C150 - THICKNESS DESIGN OF DUCTILE-IRON PIPE.
3. AWWA C151 - DUCTILE-IRON PIPE, CENTRIFUGALLY CAST.

1.6 COORDINATION

1. COORDINATE CONNECTION TO SANITARY SEWER MAIN WITH HCRSD. A HCRSD REPRESENTATIVE MUST BE NOTIFIED A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION STARTUP.

1.7 EASEMENTS

A. MINIMUM EASEMENT WIDTH IS 20 FEET WITH THE SEWER CENTERED IN THE EASEMENT. THE EASEMENT SHALL BE DEDICATED TO THE UTILITY.

Table with 3 columns: DEPTH OF SEWER, EASEMENT (FEET), WIDTH. Rows include UP TO 15 FEET, 15 - 20 FEET, 20 - 25 FEET, 25 - 35 FEET, OVER 35 FEET.

- B. A MINIMUM OF TWENTY (20) FEET OF HORIZONTAL SEPARATION (AS MEASURED HORIZONTALLY FROM THE SEWER SPRING LINE) MUST BE MAINTAINED BETWEEN GRAVITY SEWERS AND THE TOP OF BANK OF ALL WATER WAYS, BODIES OF WATER AND DRY DETENTION AREAS.
C. WHEN CROSSING WATERWAY, THE SANITARY SEWER FACILITIES SHOULD BE DESIGNED TO CROSS AS CLOSE TO NINETY (90) DEGREES AS POSSIBLE. THE UTILITY WILL NOT PERMIT THE CROSSING OF BODIES OF WATER INCLUDING LAKES AND RETENTION DETENTION PONDS OR DRY DETENTION AREAS.

1.8 CLOSEOUT SUBMITTALS

- 1. PROJECT RECORD DOCUMENTS: SUBMITTALS OF PROJECT RECORD DOCUMENTS SHALL CONFORM TO THE HENDRICKS COUNTY REGIONAL SEWER DISTRICT DIGITAL SUBMISSION STANDARDS, LATEST VERSION.
2. COMPLETE TRANSFER OF ASSETS DOCUMENTATION (FOR SEWER MAIN EXTENSIONS ONLY).
3. PROVIDE HCRSD WITH COPY OF ANY EASEMENTS, PLATTED OR RECORDED.
4. DELIVER TO HCRSD THE CCTV RECORDINGS OF THE COMPLETED SEWER (FOR SEWER MAIN EXTENSIONS ONLY).
5. PROVIDE HCRSD WITH THE SEWER MANHOLE AND PIPE TEST RESULTS.
6. COMPLETE FINAL INSPECTION WITH A HCRSD REPRESENTATIVE.

PART 2 - PRODUCTS

2.1 EXCAVATION

A. DESCRIPTION

- 1. THE CONTRACTOR SHALL CONSTRUCT ALL EARTH EXCAVATIONS TO THE WIDTHS AND DEPTHS DETAILED IN THE DRAWINGS. EXCAVATION SHALL INCLUDE ALL KINDS OF MATERIALS, WET AND/OR DRY, EXCAVATED, OR WHICH ARE TO BE EXCAVATED, INCLUDING ROCK, SHALE, HARDPAN, MUCK, ETC.
2. EXCAVATION INCLUDES ALL EXCAVATION SURFACE REMOVAL, CLEARING, DISPOSAL OF SURPLUS MATERIAL, DEWATERING, BORING AND JACKING, AND ALL OTHER WORK INCIDENTAL TO THE CONSTRUCTION OF TRENCHES OR TRENCHLESS MEANS FOR PIPE INSTALLATION. EXCAVATION ALSO INCLUDES THE SAME ACTIVITIES RELATED TO THE INSTALLATION OF MANHOLES OR OTHER REQUIRED STRUCTURES.
3. THE DEVELOPER AND HIS OR HER CONTRACTOR SHALL BE RESPONSIBLE FOR ASSURING THE PROTECTION OF ALL EXISTING IMPROVEMENTS, BOTH PUBLIC AND PRIVATE. THE HCRSD SHALL BE HELD HARMLESS FROM ANY AND ALL DAMAGES TO SAID EXISTING IMPROVEMENTS DURING THE CONSTRUCTION OF THE IMPROVEMENTS.
4. COMPLIANCE WITH THESE SPECIFICATIONS DOES NOT ELIMINATE THE NEED TO COMPLY WITH OTHER APPLICABLE CITY, COUNTY, STATE AND FEDERAL ORDINANCES, REGULATIONS, AND CONSTRUCTION REQUIREMENTS. THIS INCLUDES, BUT IS NOT LIMITED TO CODES AND STANDARDS ISSUED BY IDEM, INDOT, OR OTHER GOVERNMENTAL AGENCIES.
5. THE PROVISIONS OF THIS DOCUMENT SHALL BE DEEMED AS ADDITIONAL REQUIREMENTS TO MINIMUM STANDARDS REQUIRED BY OTHER APPLICABLE ORDINANCES AND STANDARDS. IN THE CASE OF CONFLICTING REQUIREMENTS, THE MOST RESTRICTIVE SHALL APPLY.

2.2 EMBEDMENT AND BACKFILL

A. DESCRIPTION

- 1. ALL TRENCHES OR EXCAVATIONS SHALL BE BACKFILLED TO THE ORIGINAL SURFACE OF THE GROUND OR SUCH OTHER GRADES AS SHOWN ON THE DRAWINGS. IN GENERAL, BACKFILLING OPERATIONS SHALL BE CARRIED ALONG AS SPEEDILY AS POSSIBLE AND AS SOON AS THE PIPE HAS BEEN LAID AND BEDDING HAS BEEN PLACED.
2. DEFINITIONS AND GENERAL CONSIDERATIONS
1. PIPE BEDDING SHALL BE CONSIDERED THE AREA USED FOR SUPPORT DIRECTLY UNDER THE PIPE FOR THE FULL WIDTH OF THE TRENCH. THE HAUNCH IS THE AREA FROM THE TOP OF THE BEDDING TO THE SPRINGLINE (HORIZONTAL CENTERLINE OF THE PIPE) FOR THE FULL WIDTH OF THE TRENCH. INITIAL BACKFILL IS THE AREA FROM THE SPRINGLINE TO TWELVE (12) INCHES ABOVE THE CROWN (TOP) OF THE PIPE. PIPE EMBEDMENT IS THE TOTAL AREA THAT INCLUDES THE BEDDING, HAUNCH AND INITIAL BACKFILL. THE FINAL BACKFILL IS ALL OF THE AREA ABOVE THE TOP OF THE INITIAL BACKFILL ELEVATION.
2. SPECIAL FOUNDATION MATERIAL MAY BE REQUIRED UNDER THE PIPE BEDDING FOR AREAS OF UNSTABLE SOIL MATERIAL. IN CIRCUMSTANCES WHERE UNSTABLE SOIL MATERIAL IS ENCOUNTERED, THE AREA SHALL BE EXCAVATED AND REPLACED WITH SUITABLE CRUSHED STONE TO FORM A SOUND FOUNDATION. THE PIPE BEDDING CAN THEN BE PLACED UPON THE FOUNDATION MATERIAL.
3. THE CONTRACTOR SHALL NOT PLACE PIPE EMBEDMENT MATERIALS BY METHODS THAT WILL DAMAGE OR DISTURB THE PIPE OR OTHER UTILITIES. CARE SHALL BE TAKEN THAT COMPACTION EQUIPMENT DOES NOT COME INTO CONTACT WITH THE PIPE. PRIOR TO PERFORMING COMPACTION OPERATION OVER THE PIPE, THE CONTRACTOR MUST ENSURE THAT SUFFICIENT BACKFILL IS INSTALLED OVER THE PIPE TO PREVENT DAMAGE OR EXCESSIVE DEFLECTION.
C. BEDDING AND BACKFILL OF TRENCH EXCAVATIONS FOR PIPES AND CONDUITS
1. BEDDING AND BACKFILL MATERIALS FOR PIPE INSTALLATION AND TRENCH BACKFILL SHALL CONFORM TO THE TYPES DETAILED IN PART 3 OF THIS SPECIFICATION FOR THE SPECIFIC PIPE TYPE INSTALLED.
D. STRUCTURAL BACKFILL
1. BACKFILL MATERIALS FOR BACKFILL OF STRUCTURES OTHER THAN PIPES AND CONDUITS SHALL BE ACCORDING TO THE STANDARD DETAILS.

2.3 GRAVITY SANITARY SEWER PIPE

A. DESCRIPTION

- 1. THE CONTRACTOR SHALL FURNISH AND LAY SEWER PIPE, AND ALL ACCESSORIES, TO THE LINES AND GRADES SHOWN ON THE DRAWINGS. SEWER PIPE SHALL BE CONSTRUCTED OF THE PIPE MATERIALS AS SPECIFIED HEREIN AND AS SHOWN ON THE DRAWINGS.
2. RELATED WORK DESCRIBED ELSEWHERE:
A. EXCAVATION
B. EMBEDMENT AND BACKFILL

QUALITY ASSURANCE

- 1. CODES AND STANDARDS
A. EACH LENGTH OF PIPE SHALL BE MARKED PER THE REQUIREMENTS OF THE RESPECTIVE ASTM STANDARD.
B. ALL CODES AND STANDARDS SHALL BE SET FORTH IN THE LATEST ASTM STANDARD.
2. UPON REQUEST BY THE HCRSD, THE CONTRACTOR SHALL FURNISH COPIES OF ALL MATERIAL TESTS REQUIRED BY THE APPLICABLE ASTM STANDARD.
3. MAXIMUM ALLOWED INFILTRATION IN NEW GRAVITY SANITARY SEWERS SHALL BE 100 GALLONS PER 24 HOUR PERIOD PER INCH-DIAMETER-MILE.
C. POLYVINYL CHLORIDE (PVC) PIPE, SDR-35, SDR-26, OR SDR-21
1. MATERIAL
A. POLYVINYL CHLORIDE (PVC) FOR GRAVITY SANITARY SEWER PIPE SHALL BE THE INTEGRAL WALL BELL AND SPIGOT TYPE WITH ELASTOMERIC SEAL JOINTS AND SMOOTH INNER WALLS MEETING OR EXCEEDING ALL OF THE REQUIREMENTS SET FORTH IN ASTM D-3034 FOR PIPE DIAMETERS 15-INCHES OR LESS.
B. FOR DIAMETERS 15-INCHES OR LESS, THE PIPE SHALL HAVE A MINIMUM CELL CLASSIFICATION OF 12454 OR 12364; WITH ALL PIPE HAVING A MINIMUM TENSILE STRENGTH OF 34.50 MPA AS DEFINED IN ASTM D-1784.
C. PVC SANITARY SEWER PIPE SHALL HAVE A MINIMUM PIPE STIFFNESS OF 46 PSI FOR SDR 35 AND 115 PSI FOR SDR 26 FOR EACH DIAMETER, WHEN MEASURED AT 5% VERTICAL RING DEFLECTION AND TESTED IN ACCORDANCE WITH ASTM D-2412.
D. SDR-35 MAY BE USED FOR PIPE DEPTHS LESS THAN 15-FEET AND SDR-26 SHALL BE USED FOR PIPE DEPTHS GREATER THAN 15-FEET.
E. FOR PIPE INSTALLATION WHERE THE SEWER IS CLOSER THAN 51 FEET TO A RESIDENTIAL WATER WELL, THE SEWER SHALL BE CONSTRUCTED FROM SDR-21 IN ACCORDANCE WITH ASTM D-2241, WITH A MINIMUM CELL CLASS OF 12454.
2. JOINTS
A. FLEXIBLE GASKET JOINTS SHALL BE COMPRESSION TYPE SO THAT WHEN ASSEMBLED, THE GASKET INSIDE THE BELL WILL BE COMPRESSED RADIALLY ON THE PIPE SPIGOT TO FORM A WATERTIGHT SEAL. THE ASSEMBLY OF JOINTS SHALL BE IN ACCORDANCE WITH THE PIPE MANUFACTURER'S RECOMMENDATIONS AND ASTM D-3212 FOR PIPE CONFORMING TO ASTM D-3034 OR JOINTS SHALL MEET THE REQUIREMENTS OF ASTM D-3139 FOR PIPE CONFORMING TO ASTM D-2241. THE GASKET'S SEALING THE JOINT SHALL BE MADE OF RUBBER OF SPECIAL COMPOSITION HAVING A TEXTURE TO ASSURE A

WATERTIGHT AND PERMANENT SEAL AND SHALL BE THE PRODUCT OF A MANUFACTURER HAVING AT LEAST FIVE (5) YEARS OF EXPERIENCE IN THE MANUFACTURE OF RUBBER GASKETS FOR PIPE JOINTS. THE GASKET SHALL BE A CONTINUOUS RING OF FLEXIBLE JOINT RUBBER OF A COMPOSITION AND TEXTURE WHICH IS RESISTANT TO COMMON INGREDIENTS OF SEWAGE, INDUSTRIAL WASTES AND GROUNDWATER AND WHICH WILL ENDURE PERMANENTLY UNDER THE CONDITIONS IMPOSED BY THIS SERVICE. THE GASKET SHALL CONFORM TO THE REQUIREMENTS OF ASTM F-477.

- B. NO SOLVENT CEMENT JOINTS SHALL BE ALLOWED.
C. ALL FIELD-CUTTING OF PIPE SHALL BE DONE IN A NEAT MANNER AS PER MANUFACTURER'S RECOMMENDATIONS AND THE CUT END SHALL BE BEVELED USING A FILE OR WHEEL TO PRODUCE A SMOOTH BEVEL OF APPROXIMATELY 15° AND BE A MINIMUM DEPTH OF ONE-THIRD THE PIPE WALL THICKNESS. FIELD CUT PIPE WILL ONLY BE ALLOWED TO BE INSTALLED AT MANHOLES, AT PREFABRICATED TEES AND WYES, AND AT THE CONNECTION OF NEW SANITARY SEWER TO EXISTING SANITARY SEWER.

3. FITTINGS

- A. ALL PIPE FITTINGS SHALL BE MANUFACTURED IN ACCORDANCE WITH THE LATEST ASTM D-3034 AND ASTM F-679 STANDARDS AND SHALL HAVE A MINIMUM PIPE STIFFNESS OF 46 PSI FOR SDR 35 AND 115 PSI FOR SDR 26 IN ALL DIRECTIONS. THE MINIMUM CELL CLASSIFICATION SHALL BE 12454 OR 12364 PER THE LATEST ASTM D-1784 STANDARD. ALL FITTINGS SHALL BE "HEAVY WALL" AND PROVIDED GASKETS MEETING OR EXCEEDING THE STANDARDS FOR THE PIPE.
B. ALL SEWER MAIN LATERAL CONNECTIONS SHALL BE PRE-FABRICATED WYE FITTINGS. ALL PIPE FITTINGS SHALL BE INJECTION MOLDED UNLESS PRIOR AUTHORIZATION IS GRANTED BY THE HCRSD.
C. SADDLE CONNECTIONS SHALL NOT BE ALLOWED FOR NEW CONSTRUCTION. FOR INSTALLATION OF A NEW LATERAL ON EXISTING SEWERS, CONNECTION WITH A SADDLE MAY BE CONSIDERED ON PIPE 10-INCHES IN DIAMETER AND LARGER.

4. DESIGN

- A. THE MINIMUM WALL THICKNESS FOR PVC SEWER PIPE AND LATERAL SEWER PIPE 15-INCHES OR LESS IN DIAMETER SHALL CONFORM TO SDR-35, SDR-26, OR SDR-21 AS SPECIFIED IN ASTM D-3034 OR ASTM D-2241.

5. MARKINGS

- A. THE DATE OF MANUFACTURE, SHIFT CODE, CLASS OF PIPE, ASTM SPECIFICATION DESIGNATION (E.G. "PVC-SDR-26"), SIZE OF PIPE, NAME OR TRADEMARK OF MANUFACTURER, AND IDENTIFICATION OF PLANT/LOCATION SHALL BE LEGIBLY MARKED ON THE OUTSIDE OF EACH PIPE SECTION AND FITTING IN ACCORDANCE WITH THE ASTM D-3034.

6. CERTIFICATION

- A. THE CONTRACTOR SHALL FURNISH, UPON REQUEST, CERTIFIED REPORTS STATING THAT INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THAT THE RESULTS THEREOF COMPLY WITH THE APPLICABLE STANDARDS.

D. POLYVINYL CHLORIDE (PVC) PIPE, C-900/C-905

- 1. PIPE
A. PVC GRAVITY SEWER MAIN PIPE SHALL CONFORM TO ASTM SPECIFICATION D-2241, STANDARD SPECIFICATION FOR POLYVINYL CHLORIDE (PVC) PLASTIC PIPE (SDR PR). THE MATERIAL USED SHALL CONFORM TO ASTM SPECIFICATION D-1784, STANDARD SPECIFICATION OF RIGID POLYVINYL CHLORIDE AND CHLORINATED POLYVINYL CHLORIDE COMPOUNDS, CLASS 12454. THE MINIMUM PRESSURE CLASS FOR A STREAM CROSSING SHALL BE CLASS 200.
B. THE PIPE FITTINGS SHALL BE PRESSURE RATED IN ACCORDANCE WITH RECOMMENDATIONS OF THE PLASTIC PIPE INSTITUTE.
C. PVC GRAVITY SEWER MAIN SHALL BE IN COMPLIANCE WITH AWWA C-900 FOR 4" THROUGH 12" AND AWWA C-905 FOR 14" AND GREATER. THE MINIMUM DIMENSION RATIO SHALL BE DR18 WITH A PRESSURE RATING OF 235 PSI.
D. ALL PLASTIC PIPE AND COUPLINGS SHALL BEAR IDENTIFICATION MARKINGS IN ACCORDANCE WITH SECTION 2.5.2 AND 2.5.3 OF AWWA C-900, WHICH SHALL INCLUDE THE NATIONAL SANITATION FOUNDATION (NSF) SEAL OF APPROVAL. IN ADDITION, THE PLAIN END OF EACH PIPE LENGTH SHALL HAVE TWO (2) RINGS, ONE INCH (1") APART, PAINTED AROUND THE PIPE AT THE PROPER LOCATION TO ALLOW FIELD CHECKING OF THE CORRECT SETTING DEPTH OF THE PIPE IN THE BELL OR COUPLING.
2. JOINTS
A. JOINTS SHALL BE BELL END OR COUPLING PUSH-ON TYPE.
B. THE PUSH-ON JOINT AND JOINT COMPOUNDS SHALL MEET THE REQUIREMENTS FOR ASTM SPECIFICATION D-3139, JOINT FOR THE PLASTIC PIPE, USING FLEXIBLE ELASTOMERIC SEALS. THE JOINT SHALL BE DESIGNED SO AS TO PROVIDE FOR THE THERMAL EXPANSION AND CONTRACTION EXPERIENCED WITH A TOTAL TEMPERATURE CHANGE OF SEVENTY-FIVE (75) DEGREES F IN EACH JOINT OF PIPE. DETAILS OF THE JOINT DESIGN AND ASSEMBLY SHALL BE IN ACCORDANCE WITH JOINT MANUFACTURER'S STANDARD PRACTICE.
C. THE LUBRICANT SHALL HAVE NO DETERIORATING EFFECTS ON THE GASKET OR THE PIPE. THE LUBRICANT CONTAINERS SHALL BE LABELED WITH MANUFACTURER'S NAME.
D. THE GASKETS SEALING THE JOINT SHALL BE MADE OF RUBBER OF SPECIAL COMPOSITION HAVING A TEXTURE TO ASSURE A WATERTIGHT AND PERMANENT SEAL AND SHALL BE THE PRODUCT OF A MANUFACTURER HAVING AT LEAST FIVE (5) YEARS OF EXPERIENCE IN THE MANUFACTURE OF RUBBER GASKETS FOR PIPE JOINTS. THE GASKET SHALL BE A CONTINUOUS RING OF FLEXIBLE JOINT RUBBER OF A COMPOSITION AND TEXTURE WHICH IS RESISTANT TO COMMON INGREDIENTS OF SEWAGE, INDUSTRIAL WASTES AND GROUNDWATER AND WHICH WILL ENDURE PERMANENTLY UNDER THE CONDITIONS IMPOSED BY THIS SERVICE. THE GASKET SHALL CONFORM TO ASTM F-477. GASKETS SHALL MEET ALL APPLICABLE REQUIREMENTS OF ANSI STANDARD A- 21-11.

3. FITTINGS

- A. FITTINGS SHALL BE MANUFACTURED IN ONE PIECE OF INJECTION MOLDED PVC COMPOUND MEETING THE REQUIREMENTS OF ASTM D1784. FITTINGS SHALL BE DESIGNED TO WITHSTAND A MINIMUM OF 755 PSI QUICK BURST PRESSURE @ 73 DEGREES F IN ACCORDANCE WITH ASTM D1599.
B. ALL SEWER MAIN LATERAL CONNECTIONS SHALL BE PRE-FABRICATED WYE FITTINGS TO FIT C900 PIPE. ALL PIPE FITTINGS SHALL BE INJECTION MOLDED UNLESS PRIOR AUTHORIZATION IS GRANTED BY THE HCRSD.
4. MARKINGS
A. THE DATE OF MANUFACTURE, SHIFT CODE, CLASS OF PIPE, ASTM SPECIFICATION DESIGNATION (E.G. "PVC-C900"), SIZE OF PIPE, NAME OR TRADEMARK OF MANUFACTURER, AND IDENTIFICATION OF PLANT/LOCATION SHALL BE LEGIBLY MARKED ON THE OUTSIDE OF EACH PIPE SECTION AND FITTING IN ACCORDANCE WITH THE ASTM D-3034.
5. CERTIFICATION
A. THE CONTRACTOR SHALL FURNISH, UPON REQUEST, CERTIFIED REPORTS STATING THAT INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THAT THE RESULTS THEREOF COMPLY WITH THE APPLICABLE STANDARDS.

E. NON-PRESSURE TYPE TRANSITION COUPLINGS:

- 1. COMPLY WITH ASTM C1173, ELASTOMERIC, SLEEVE TYPE, REDUCING OR TRANSITION COUPLING, FOR JOINING UNDERGROUND NONPRESSURE PIPING. INCLUDE ENDS TO MATCH SAME SIZES OF MAIN LINE PIPING AND INSTALL CORROSION-RESISTANT METAL TENSION BANDS AND TIGHTENING MECHANISM ON EACH END.
2. SLEEVE MATERIALS:
A. FOR PLASTIC PIPES: ASTM F477, ELASTOMERIC SEAL.
B. FOR DISSIMILAR PIPES: PVC OR OTHER MATERIAL COMPATIBLE WITH PIPE MATERIALS BEING JOINED.
3. NON-SHEAR, FLEXIBLE COUPLINGS.
A. COUPLINGS SHALL BE ELASTOMERIC SLEEVE WITH STAINLESS STEEL SHEAR RING AND CORROSION-RESISTANT-METAL TENSION BAND AND TIGHTENING MECHANISM ON EACH END.
F. LATERALS
1. LATERALS AND TEE-WYES SHALL BE 6-INCH PVC SDR 26 LAID AT A MINIMUM OF 1.00% SLOPE FROM THE SEWER MAIN TO THE RIGHT OF WAY LINE (OR EASEMENT LINE).
2. EACH PROPERTY HAVING A SEPARATE PROPERTY OWNER SHALL HAVE ITS OWN LATERAL FROM THE BUILDING TO THE MAINLINE SEWER.
3. LATERAL CONNECTIONS SHALL ONLY OCCUR AT TEE-WYES.
4. EXCEPT AS PROVIDED IN A WRITTEN APPROVAL ISSUED BY THE DISTRICT OR ITS REPRESENTATIVES, NO PERSON SHALL CONNECT A LATERAL TO A SANITARY SEWER WHEN THE LATERAL HAS ANY OF THE FOLLOWING SOURCES OF CLEAR WATER:
A. FOUNDATION FOOTING DRAINS;
B. SUMP PUMPS WITH OR WITHOUT FOUNDATION DRAINS CONNECTED;
C. ROOF DRAINS;
D. HEAT PUMP DISCHARGE;
E. COOLING WATER; OR
F. ANY OTHER SOURCES OF CLEAR WATER, SUCH AS, BUT NOT LIMITED TO, YARD AND / OR DRIVEWAY DRAIN.

5. BASEMENTS

- A. HCRSD DOES NOT ALLOW ANY DIRECT BASEMENT CONNECTIONS TO A GRAVITY LATERAL.

B. ALL BUILDINGS CONSTRUCTED WITH A BASEMENT (BELOW GROUND LEVEL) SHALL USE A SUMP PIT AND SEWAGE EJECTOR PUMP ARRANGEMENT TO LIFT THE SEWAGE ABOVE THE OUTSIDE GRADE RELATIVE TO THE DIRECTION AND LOCATION OF THE SANITARY SEWER MAIN (OVERHEAD SEWER). ALL PIPING SHALL BE ARRANGED AS TO PRECLUDE THE PUMP FROM PUMPING SEWAGE TO AN UPPER LEVEL WHEN THE PUMP IS PUMPING AGAINST A HEAD (BLOCKED SEWER MAIN OR LATERAL).

C. A CHECK VALVE SUITABLE FOR THE PIPE MATERIAL BEING USED SHALL BE INSTALLED HORIZONTALLY IN THE DOWNSTREAM PIPING OF THE EJECTOR PUMP PRIOR TO DISCHARGE INTO THE HOUSE GRAVITY LATERAL. THE CHECK VALVE SHALL BE ABLE TO WITHSTAND NORMAL PUMPING PRESSURE AND WATER HAMMER. THE CHECK VALVE SHALL BE ACCESSIBLE FOR NORMAL MAINTENANCE. A BALL-TYPE SHUT-OFF VALVE SHALL BE INSTALLED ON BOTH DOWNSTREAM AND UPSTREAM SIDE OF THE CHECK VALVE FOR EASE OF MAINTENANCE.

6. GENERALLY, HCRSD DOES NOT ALLOW LATERAL CONNECTIONS TO A SEWER BEYOND THOSE INSTALLED DURING ORIGINAL CONSTRUCTION. LATERALS MUST CONNECT TO THE SANITARY SEWER ONLY AT MANUFACTURED FITTINGS (EXCEPT AS OTHERWISE PERMITTED BY THESE DESIGN SPECIFICATIONS). A "SADDLE" CONNECTION TO THE SANITARY SEWER WILL BE ALLOWED IF APPROVED BY THE DISTRICT IN WRITING.
A. THE SEWER PIPE SADDLE SHALL BE ROMAC INDUSTRIES, INC. STYLE "CB" SEWER SADDLE OR APPROVED EQUAL.

- 7. LATERALS CANNOT CONNECT DIRECTLY INTO A MANHOLE, EXCEPT AS FOLLOWS:
A. APPROVED BY HCRSD IN WRITING.
B. ON DEEP LINES (GREATER THAN TWELVE (12) FEET) OR INTERCEPTORS GREATER THAN TEN (10) INCHES IN DIAMETER.
C. ON BUILDINGS IN WHICH HCRSD MAY WISH TO FLOW MONITOR OR SAMPLE FLOW CHARACTERISTICS.
D. ON BUILDINGS IN WHICH ADDITIONAL ACCESS TO THE LATERAL WOULD BE HELPFUL. FOR EXAMPLE, SURVEILLANCE.

8. DURING CONSTRUCTION OF THE MAIN LINE SEWER, LATERALS MUST TERMINATE WITHIN A SANITARY SEWER OR UTILITY EASEMENT AND BE SEALED WITH A MANUFACTURED CAP/PLUG MADE SPECIFICALLY FOR THE PURPOSED OF SEALING/CAPPING THE END OF THE SANITARY SEWER TO ENSURE 100% WATER TIGHTNESS. THE TERMINATION POINT MUST BE A MINIMUM OF FIVE (5) FEET FROM THE BUILDING LINE.

9. ALL PIPE FITTINGS MUST BE ASTM D-3034 SDR-26 HEAVY WALL MINIMUM. BELL TO SPIGOT FITTINGS MAY BE APPROVED BY THE DISTRICT.

G. CLEANOUTS

- 1. PVC CLEANOUTS:
A. PVC BODY WITH PVC THREADED PLUG. CLEANOUT SHALL BE AS PER ASTM D3034. PVC SEWER PIPE FITTING AND RISER TO CLEANOUT.
B. CLEANOUT SHALL BE INSTALLED AT A MINIMUM OF 3 FEET FROM THE OUTSIDE OF BUILDING WALL AND EVERY 100 FEET OF LATERAL UNTIL CONNECTION AT THE MAINLINE SEWER.
C. CLEANOUT RISER: SEWER PIPE FITTING ON MAIN LINE SEWER AND RISER SHALL MATCH MAIN LINE PIPING. CLEANOUT SHUT-OFF VALVE: A CLEANOUT VALVE SHALL BE PROVIDED, SEWUR VALVE OR APPROVED EQUAL.
2.4 PRESSURE PIPE
A. DESCRIPTION
1. THE CONTRACTOR SHALL FURNISH AND LAY, AS REQUIRED, SANITARY PRESSURE PIPE, TOGETHER WITH ALL FITTINGS, THRUST BLOCKING OR OTHER INCIDENTALS AS SHOWN ON THE APPROVED PLANS OR SPECIFIED AND, NECESSARY, TO COMPLETE THE WORK. SANITARY PRESSURE PIPE SHALL BE CONSTRUCTED OF THE PIPE MATERIALS AS SPECIFIED HEREIN.

- 2. ALL SANITARY PRESSURE PIPES TO BE FURNISHED UNDER THIS CONTRACT SHALL CONFORM TO SPECIFICATIONS OF THIS SECTION.
3. PRESSURE PIPE MAY BE INSTALLED BY THE HORIZONTAL DIRECTIONAL DRILLING (HDD) METHOD.
4. RELATED WORK DESCRIBED ELSEWHERE:
B. EMBEDMENT AND BACKFILL
5. FLOW FROM PRESSURE PIPES SHALL BE DIRECTED TOWARDS THE OUTLET PIPE WITHIN THE DISCHARGE MANHOLE. MODIFICATIONS TO THE BENCH MAY BE NECESSARY.
6. NO PUBLIC FORCE MAIN WILL BE LESS THAN FOUR (4) INCHES IN DIAMETER, EXCEPT IN A LOW PRESSURE TYPE GRINDER PUMP COLLECTION SYSTEM APPROVED BY THE UTILITY.
7. VELOCITIES IN FORCE MAINS OF LESS THAN TWO (2) FEET PER SECOND WILL NOT BE ACCEPTED.
8. FORCE MAINS MUST BE DESIGNED AT A CONSTANT POSITIVE SLOPE FROM LOW POINTS AND CLEAN-OUTS TO AIR/VACUUM RELIEF VALVES.

B. QUALITY ASSURANCE

- 1. CODES AND STANDARDS
A. EACH LENGTH OF PIPE SHALL BE MARKED PER THE REQUIREMENTS OF THE RESPECTIVE ASTM STANDARD.
B. ALL CODES AND STANDARDS SHALL BE SET FORTH IN THE LATEST ASTM STANDARD.
C. UPON REQUEST BY THE ENGINEER, THE CONTRACTOR SHALL FURNISH COPIES OF ALL MATERIAL TESTS REQUIRED BY THE APPLICABLE ASTM STANDARD.
C. DUCTILE IRON PIPE
1. MATERIAL
A. DUCTILE IRON PIPE SHALL BE CENTRIFUGALLY CAST AND SHALL CONFORM TO ANSI SPECIFICATIONS A-21 AND AWWA C-151, LATEST REVISION. DUCTILE IRON PIPE SHALL BE PRESSURE CLASS 350, 300 OR 250.
2. COATINGS AND LININGS
A. PIPE SHALL BE SULFATE RESISTING CEMENT LINED IN ACCORDANCE WITH AWWA C-104. THE PIPE OUTSIDE SHALL BE SEAL COATED WITH AN APPROVED BITUMINOUS SEAL COAT IN ACCORDANCE WITH AWWA SPECIFICATION C-151 (ANSI A21).
B. THE PIPE SHALL ALSO HAVE EITHER OF THE FOLLOWING INTERIOR COATINGS:
1) POLYETHYLENE IN ACCORDANCE WITH ASTM D16 TYPE V (1000 MICRONS MINIMUM THICKNESS)
2) EPOXY (40 MILS MINIMUM THICKNESS)
3) POLYETHYLENE (1500 MICRONS MINIMUM THICKNESS)
3. FITTINGS
A. FITTINGS SHALL BE STANDARDIZED FOR THE TYPE OF PIPE AND JOINT SPECIFIED AND SHALL COMPLY WITH AWWA C-110 (ANSI A-21) OR AWWA C-153 (ANSI A-21).

4. JOINTS

- A. MECHANICAL JOINTS OR SLIP JOINTS SHALL BE PROVIDED
B. MECHANICAL JOINTS AND ACCESSORIES SHALL CONFORM TO AWWA STANDARD C-111, ANSI A-21. THE BOLTS AND NUTS SHALL BE CORROSION RESISTANT HIGH STRENGTH ALLOY STEEL.
C. THE O-RING GASKETS SEALING THE SLIP JOINT SHALL BE MADE OF RUBBER OF SPECIAL COMPOSITION HAVING A TEXTURE TO ASSURE A WATERTIGHT AND PERMANENT SEAL AND SHALL BE THE PRODUCT OF A MANUFACTURER HAVING AT LEAST FIVE (5) YEARS OF EXPERIENCE IN THE MANUFACTURE OF RUBBER GASKETS FOR PIPE JOINTS. THE GASKET SHALL BE A CONTINUOUS RING OF FLEXIBLE JOINT RUBBER OF A COMPOSITION AND TEXTURE WHICH IS RESISTANT TO COMMON INGREDIENTS OF SEWAGE, INDUSTRIAL WASTES AND GROUNDWATER; AND WHICH WILL ENDURE PERMANENTLY UNDER THE CONDITIONS LIKELY TO BE IMPOSED BY THIS SERVICE. THE GASKET SHALL CONFORM TO THE REQUIREMENTS OF AWWA C-111 (ANSI A-21-11).
D. WHERE INDICATED ON PLANS, RESTRAINED JOINT PIPE SHALL BE PROVIDED. RESTRAINED JOINTS SHALL BE DESIGNED IN ACCORDANCE WITH AWWA C-111 AND SHALL PERMIT HORIZONTAL AND/OR VERTICAL DEFLECTION AFTER ASSEMBLY, YET ADEQUATELY RESTRAIN THE JOINT AT THE FULL DESIGN PRESSURE.
5. DUCTILE IRON ENCASEMENT
A. POLYETHYLENE ENCASEMENT SHALL BE REQUIRED FOR ALL DUCTILE IRON PIPE AND SHALL BE INSTALLED IN ACCORDANCE WITH ANSI/AWWA C105/A21.5.
6. MARKINGS
A. THE CLASS DESIGNATIONS FOR THE VARIOUS CLASSES OF PIPE AND FITTINGS, MANUFACTURER'S NAME AND THE YEAR OF MANUFACTURE SHALL BE CAST ON FITTINGS IN RAISED NUMERALS, AND CAST OR STAMPED ON THE OUTSIDE OF EACH JOINT OF PIPE.
7. LOCATING TRACING WIRE
A. ALL DUCTILE IRON PIPE FOR PRESSURE SANITARY SEWER SHALL BE INSTALLED WITH TRACING WIRE. TRACING WIRE SHALL BE 10 AWG SOLID COPPER HIGH STRENGTH TRACER WIRE, CCS REINFORCED BY COPPERHEAD OR APPROVED EQUAL.
B. LOCATING TRACER WIRE SHALL BE BROUGHT TO SURFACE NO LESS THAN EVERY 500 L.F.
C. LOCATE WIRE SHALL BE TESTED FOR CONTINUITY PRIOR TO ACCEPTANCE.

8. CERTIFICATION

- A. THE CONTRACTOR SHALL FURNISH, UPON REQUEST, CERTIFIED REPORTS STATING THAT INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THAT THE RESULTS THEREOF COMPLY WITH THE APPLICABLE STANDARDS.
D. POLYVINYL CHLORIDE PIPE (PVC)
1. PIPE
A. PVC FORCE MAIN SHALL CONFORM TO ASTM D2241, AWWA C900 OR AWWA C905.



HENDRICKS COUNTY REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

SPECIFICATIONS



CERTIFIED BY K. S. Sankar

ISSUANCE INDEX table with columns: DATE, 04/30/2021

REVISION SCHEDULE table with columns: NO., DESCRIPTION, DATE. Includes revisions for sheet added, air release valve, lateral connection, and testing requirements.

Project Number 2000.00103

STANDARD SANITARY SEWER SPECIFICATIONS

Vertical text on the left margin: DRAWING FILE: P:\INDOT\001030_H\Drawings\Standards\2021 - HCRSD\HCRSD - Specs - San Sewer.dwg, EDIT DATE: 3/22/2021, PLOT DATE: 6/6/2024 12:32 PM, PLOT SCALE: 1:1, EDITED BY: P.TRAWINSKI

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- B. PVC FORCE MAIN PIPE MATERIAL SHALL CONFORM TO ASTM SPECIFICATION D-1784, STANDARD SPECIFICATION OF RIGID POLYVINYL CHLORIDE AND CHLORINATED POLYVINYL CHLORIDE COMPOUNDS, CELL CLASS 12454 (PVC 1120).
- C. FOR ASTM D2241, THE MATERIAL SHALL CONFORM TO ASTM D1784, CELL CLASS 12454 AND HYDROSTATIC DESIGN STRESS OF 2000 PSI. THE MINIMUM PRESSURE CLASS/SDR RATING SHALL BE CLASS 200/SDR 21.
- D. FOR AWWA C900, THE MATERIAL SHALL HAVE A DESIGN BASIS OF 4000 PSI AND THE MINIMUM PRESSURE CLASS/DR RATING SHALL BE CLASS 200/DR 14.
- E. FOR AWWA C905, THE MATERIAL SHALL HAVE A HYDROSTATIC DESIGN BASIS OF 4000 PSI AND THE MINIMUM PRESSURE CLASS/DR RATING ACCEPTABLE SHALL BE CLASS 200/DR 21.
- F. PVC FORCE MAIN SHALL BE IN COMPLIANCE WITH AWWA C-900 FOR 4" THROUGH 12" AND AWWA C-905 FOR 14" AND GREATER.
- G. ALL PLASTIC PIPE AND COUPLINGS SHALL BEAR IDENTIFICATION MARKINGS IN ACCORDANCE WITH SECTION 2.5.2 AND 2.5.3 OF AWWA C-900, WHICH SHALL INCLUDE THE NATIONAL SANITATION FOUNDATION (NSF) SEAL OF APPROVAL. IN ADDITION, THE PLAIN END OF EACH PIPE LENGTH SHALL HAVE TWO (2) RINGS, ONE INCH (1") APART, PAINTED AROUND THE PIPE AT THE PROPER LOCATION TO ALLOW FIELD CHECKING OF THE CORRECT SETTING DEPTH OF THE PIPE IN THE BELL OR COUPLING.
2. JOINTS
- A. JOINTS SHALL BE BELL END OR COUPLING PUSH-ON TYPE WITH JOINT RESTRAINTS AS NEEDED. JOINT RESTRAINTS SHALL BE MEGALUG STYLE MECHANICAL JOINTS FOR PVC PIPE AS MANUFACTURED BY EBAA IRON OR APPROVED EQUAL.
- B. THE PUSH-ON JOINT AND JOINT COMPOUNDS SHALL MEET THE REQUIREMENTS FOR ASTM SPECIFICATION D-3139, JOINT FOR THE PLASTIC PIPE, USING FLEXIBLE ELASTOMERIC SEALS. THE JOINT SHALL BE DESIGNED SO AS TO PROVIDE FOR THE THERMAL EXPANSION AND CONTRACTION EXPERIENCED WITH A TOTAL TEMPERATURE CHANGE OF SEVENTY-FIVE (75) DEGREES F IN EACH JOINT OF PIPE. DETAILS OF THE JOINT DESIGN AND ASSEMBLY SHALL BE IN ACCORDANCE WITH JOINT MANUFACTURER'S STANDARD PRACTICE.
- C. THE LUBRICANT SHALL HAVE NO DETERIORATING EFFECTS ON THE GASKET OR THE PIPE. THE LUBRICANT CONTAINERS SHALL BE LABELED WITH MANUFACTURER'S NAME.
- D. THE GASKETS SEALING THE JOINT SHALL BE MADE OF RUBBER OF SPECIAL COMPOSITION HAVING A TEXTURE TO ASSURE A WATERTIGHT AND PERMANENT SEAL AND SHALL BE THE PRODUCT OF A MANUFACTURER HAVING AT LEAST FIVE (5) YEARS OF EXPERIENCE IN THE MANUFACTURE OF RUBBER GASKETS FOR PIPE JOINTS. THE GASKET SHALL BE A CONTINUOUS RING OF FLEXIBLE JOINT RUBBER OF A COMPOSITION AND TEXTURE WHICH IS RESISTANT TO COMMON INGREDIENTS OF SEWAGE, INDUSTRIAL WASTES AND GROUNDWATER AND WHICH WILL ENDURE PERMANENTLY UNDER THE CONDITIONS IMPOSED BY THIS SERVICE. THE GASKET SHALL CONFORM TO ASTM F-477. GASKETS SHALL MEET ALL APPLICABLE REQUIREMENTS OF ANSI STANDARD A-21-11.
3. FITTINGS
- A. FITTINGS SHALL BE MANUFACTURED IN ONE PIECE OF INJECTION MOLDED PVC COMPOUND MEETING THE REQUIREMENTS OF ASTM D1784. FITTINGS SHALL BE DESIGNED TO WITHSTAND A MINIMUM OF 755 PSI QUICK BURST PRESSURE @ 73 DEGREES F IN ACCORDANCE WITH ASTM D1699.
- B. FOR RESTRAINED JOINTS, FITTINGS SHALL BE RESTRAINED JOINT DUCTILE IRON FITTINGS CONFORMING TO AWWA C110 AND AWWA C111.
4. LOCATING TRACING WIRE
- A. ALL PVC PIPE FOR PRESSURE SANITARY SEWER SHALL BE INSTALLED WITH TRACING WIRE. TRACING WIRE SHALL BE 10 AWG SOLID COPPER HIGH STRENGTH TRACER WIRE, CCS REINFORCED BY COPPERHEAD OR APPROVED EQUAL.
- B. LOCATING TRACER WIRE SHALL BE BROUGHT TO SURFACE NO LESS THAN EVERY 500 LF.
- C. LOCATE WIRE SHALL BE TESTED FOR CONTINUITY PRIOR TO ACCEPTANCE.
5. MARKINGS
- A. THE DATE OF MANUFACTURE, SHIFT CODE, CLASS OF PIPE, ASTM SPECIFICATION DESIGNATION ("PVC-C900"), SIZE OF PIPE, NAME OR TRADEMARK OF MANUFACTURER, AND IDENTIFICATION OF PLANT/LOCATION SHALL BE LEGIBLY MARKED ON THE OUTSIDE OF EACH PIPE SECTION IN ACCORDANCE WITH THE ASTM D-3034.
- B. WHERE C900/905 IS USED FOR SEWER FORCE MAIN, IT SHALL BE GREEN IN COLOR TO DESIGNATE IT IS SEWER. ALTERNATELY, A PLASTIC TAPE "SEWER" COMPLYING WITH 327 IAC MAY BE INSTALLED.
6. CERTIFICATION
- A. THE CONTRACTOR SHALL FURNISH, UPON REQUEST, CERTIFIED REPORTS STATING THAT INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THAT THE RESULTS THEREOF COMPLY WITH THE APPLICABLE STANDARDS.
- E. HIGH DENSITY POLYETHYLENE PIPE (HDPE)
1. PIPE
- A. HDPE FORCE MAIN SHALL BE EXTRA HIGH MOLECULAR WEIGHT, HIGH DENSITY ETHYLENE/HEXANE COPOLYMER PE 4710 POLYETHYLENE RESIN MEETING THE REQUIREMENTS OF ASTM D 3350 WITH A CELL CLASSIFICATION OF PE445474C FOR MATERIALS IN ACCORDANCE WITH ASTM F 714 OR ASTM D3035, DR11; OR PE334434C FOR MATERIALS IN ACCORDANCE WITH AWWA C906, DR14. PIPE SIZES 3" AND LARGER SHALL HAVE A MANUFACTURER'S STANDARD OF ASTM F 714, WHILE PIPE SMALLER THAN 3" SHALL BE MANUFACTURED TO THE DIMENSIONAL REQUIREMENTS LISTED IN ASTM D 3035. PIPE SHALL BE SIZED IN ACCORDANCE WITH DIPS. ALL MATERIAL SHALL HAVE A HYDROSTATIC DESIGN BASIS OF 1600 PSI. THE PIPE SHALL CONTAIN NO RECYCLED COMPOUND EXCEPT THAT GENERATED IN THE MANUFACTURER'S OWN PLANT FROM RESIN OF THE SAME SPECIFICATION FROM THE SAME RAW MATERIAL. ALL MATERIAL SHALL BE LISTED BY THE PLASTIC PIPE INDUSTRY IN THE NAME OF THE PIPE MANUFACTURER AND SHALL BE BASED ON ASTM D 2837 AND PPI TR-3 TESTING AND VALIDATION FOR SAMPLES OF THE PIPE MANUFACTURER'S PRODUCTION PIPE.
- B. IN ADDITION TO THE HOLDING, STORAGE, AND COLOR REQUIREMENTS IN THESE SPECIFICATIONS, WHEN MOVING FUSED SECTIONS OF PIPE, CHAINS OR CABLE TYPE CHOKERS SHALL BE AVOIDED, NYLON SLINGS ARE PREFERRED. CARE MUST BE EXERCISED TO AVOID CUTTING OR GOUGING THE PIPE.
- C. PIPE POSSESSING THE FOLLOWING DEFECTS MAY BE REJECTED FOR INSTALLATION: VARIATION FROM STRAIGHT CENTERLINE; ELLIPTICAL SHAPE; ILLEGIBLE MARKINGS AS REQUIRED HEREIN; DEEP OR EXCESSIVE GOUGES OR SCRATCHES OF THE PIPE WALL; FRACTURES, PUNCTURES, OR CRACKS PASSING THROUGH THE PIPE WALL; DAMAGED ENDS WHERE SUCH DAMAGE WOULD PREVENT MAKING A SATISFACTORY JOINT.
2. JOINTS
- A. HDPE PIPE SHALL BE JOINED INTO CONTINUOUS LENGTHS ON THE JOB SITE ABOVE GROUND. THE JOINING METHOD SHALL BE THE BUTT FUSION METHOD AND SHALL BE PERFORMED IN STRICT ACCORDANCE WITH THE PIPE MANUFACTURER'S RECOMMENDATIONS. ELECTROFUSION SHALL NOT BE USED EXCEPT AS NEEDED TO CONNECT ADJACENT DIRECTIONALLY DRILLED SECTIONS WHICH ARE TO BE CONNECTED IN THE TRENCH BOTTOM. MECHANICAL JOINT ADAPTERS ARE REQUIRED TO MECHANICALLY CONNECT THE HDPE PIPE TO THE MAIN LINE. JOINT RESTRAINT TO PREVENT AXIAL SEPARATION SHALL BE INCORPORATED INTO THE DESIGN OF THE SLEEVE OR COUPLING USED TO CONNECT HDPE PIPE PLAIN ENDS. INTERNAL PIPE WALL STIFFENERS MUST BE USED WHEN RESTRAINING HDPE. THE RESTRAINED COUPLING SYSTEM SHALL BE SERIES 4800 MANUFACTURED BY EBAA IRON, INC. OR AN APPROVED EQUAL.
3. FITTINGS
- A. FITTINGS SHALL BE EITHER HDPE OR DUCTILE IRON. HDPE FITTINGS SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM D 3261 BY INJECTION MOLDING, A COMBINATION OF EXTRUSION AND MACHINING, OR FABRICATED FROM HDPE PIPE CONFORMING TO THIS SPECIFICATION. FITTINGS SHALL BE FULLY PRESSURE RATED AND PROVIDE A WORKING PRESSURE EQUAL TO THE ADJACENT PIPE WITH SAFETY FACTOR OF 2. DUCTILE IRON FITTINGS SHALL BE RESTRAINED JOINT DUCTILE IRON FITTINGS CONFORMING TO ANSI A21.10/AWWA C110 AND ANSI A21.11/AWWA C111 WITH MJ ADAPTERS.
4. MARKINGS
- A. DURING THE EXTRUSION PRODUCTION, THE HDPE PIPE SHALL BE CONTINUOUSLY MARKED PER ASTM AND AWWA WITH DURABLE PRINTING WITH, AT A MINIMUM, THE FOLLOWING: NOMINAL PIPE SIZE, DIMENSION RATIO, PRESSURE RATING, TRADE NAME, MATERIAL CLASSIFICATION, CERTIFICATION BASES, AND DATE.
5. LOCATING TRACING WIRE
- A. ALL HDPE PIPE FOR PRESSURE SANITARY SEWER SHALL BE INSTALLED WITH TRACING WIRE. TRACING WIRE SHALL BE 10 AWG SOLID COPPER HIGH STRENGTH TRACER WIRE, CCS REINFORCED BY COPPERHEAD OR APPROVED EQUAL.
- B. LOCATING TRACER WIRE SHALL BE BROUGHT TO SURFACE NO LESS THAN EVERY 500 LF.
- C. LOCATE WIRE SHALL BE TESTED FOR CONTINUITY PRIOR TO ACCEPTANCE.
6. CERTIFICATION
- A. THE CONTRACTOR SHALL FURNISH, UPON REQUEST, CERTIFIED REPORTS STATING THAT INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THAT THE RESULTS THEREOF COMPLY WITH THE APPLICABLE STANDARDS.
- F. AIR RELEASE VALVES
1. AIR RELEASE VALVES SHALL BE COMBINATION AIR RELEASE VALVES AS MANUFACTURED BY A.R.I. OR OWNER APPROVED EQUAL. THE VALVE SHALL ALLOW AIR TO ESCAPE OUT OF THE LARGE ORIFICE WHEN AIR IS PRESENT AND CLOSE WHEN LIQUID ENTERS THE VALVE. WHEN THE VALVE IS CLOSED AND

- PRESSURIZED, THE SMALL AIR RELEASE ORIFICE WILL OPEN TO ALLOW SMALL POCKETS OF AIR TO ESCAPE AUTOMATICALLY AND INDEPENDENTLY OF THE LARGE ORIFICE. THE LARGE ORIFICE SHALL ALSO ALLOW AIR TO ENTER TO BREAK VACUUM. THE BODY INLET SHALL BE BAFFLED TO PROTECT THE FLOAT FROM DIRECT FORCES OF PUSHING AIR AND WATER TO PREVENT PREMATURE VALVE SHUT-OFF.
2. MATERIALS SHALL CONFORM TO THE FOLLOWING:
- A. BODY AND COVER: DUCTILE IRON (ASTM A536 GR 65-45-12)
- B. FLOAT: STAINLESS STEEL (ASTM A240)
- C. NEEDLE & SEAT: BUNA-N
- D. PLUG: STAINLESS STEEL (ASTM A276)
- E. LEVERAGE FRAME: DELRIN/CAST IRON (ASTM D1484/ASTM A126 GR. B)
3. VALVES SHALL BE COMBINATION AIR RELEASE AND VACUUM VALVE WITH A SINGLE BODY. THE VALVES SHALL BE RATED FOR 150 PSI WORKING PRESSURE, AND CONFORM TO AWWA C512. VALVE SHALL BE PROVIDED WITH THREADED CONNECTIONS, AND BE MOUNTED ON A FULL OPENING STAINLESS STEEL BALL VALVE TO ISOLATE THE AIR RELEASE VALVE FROM THE SYSTEM.
- G. PRESSURE TYPE PIPE COUPLINGS:
1. TUBULAR-SLEEVE COUPLINGS:
2. COUPLINGS SHALL MEET AWWA C219, WITH CENTER SLEEVE, GASKETS, END RINGS, AND BOLT FASTENERS.
3. METAL, BOLTED, SLEEVE-TYPE, REDUCING OR TRANSITION COUPLINGS FOR JOINING UNDERGROUND PRESSURE PIPING.
4. COUPLINGS SHALL MEET A 200-PSI MINIMUM PRESSURE RATING AND ENDS OF SAME SIZES OF THE MAIN LINE PIPING.
5. CENTER-SLEEVE MATERIAL:
6. SLEEVE SHALL BE STAINLESS STEEL.
7. GASKET MATERIAL: GASKETS SHALL BE NATURAL OR SYNTHETIC RUBBER RESISTANT TO SEWAGE.
8. METAL COMPONENT FINISH: FINISH SHALL BE A CORROSION-RESISTANT MATERIAL OR COATINGS.
- 2.5 CASING AND JACKING PIPE
- A. DESCRIPTION
1. ALL CASING AND JACKING PIPE AND HORIZONTAL BORES SHALL BE APPROVED BY HCRSD.
- B. STEEL CASING PIPE
1. STEEL CASING PIPE SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM A53 WITH 35,000 PSI MINIMUM YIELD STRENGTH, AND HAVE THE FOLLOWING MINIMUM WALL THICKNESSES:
- | |
|---|
| 24" STEEL CASING SHALL HAVE 0.250" MINIMUM WALL THICKNESS |
| 30" STEEL CASING SHALL HAVE 0.375" MINIMUM WALL THICKNESS |
| 36" STEEL CASING SHALL HAVE 0.375" MINIMUM WALL THICKNESS |
| 42" STEEL CASING SHALL HAVE 0.375" MINIMUM WALL THICKNESS |
2. ALL ENCASINGMENT OF NATURAL RESOURCES 100-YEAR BASE FLOOD ELEVATION OF NEARBY WATERWAYS
3. THE CASING PIPE DIAMETER EQUALS THE CARRIER PIPE'S LARGEST OUTSIDE DIAMETER PLUS 4-INCHES MINIMUM.
4. CARRIER PIPE: PER SECTION 2.3 OR 2.4 OF THESE SPECIFICATIONS.
- C. CASING SPACERS
1. MANUFACTURED CASING SPACERS OR WOOD BLOCKING SPACERS ARE REQUIRED ON THE BOTTOM AND TOP TO PREVENT PIPE FROM "FLOATING" DURING GROUT FILLING PROCEDURE.
2. CASING SPACERS SHOULD BE AT 6-FOOT MAXIMUM, CENTER-TO-CENTER, PER DETAIL.
- 2.6 MANHOLES
- A. DESCRIPTION
1. STANDARD MANHOLES SHALL BE CONSTRUCTED COMPLETE, READY FOR USE, INCLUDING EXCAVATION, BACKFILL, CONCRETE WORK, CAST IRON FRAMES AND COVERS, AND PERTINENT WORK AS SHOWN ON THE DRAWINGS. ALL MANHOLES SHALL BE MADE WATERTIGHT, AND THE CONTRACTOR SHALL FURNISH ALL MATERIALS AND PERFORM ALL WORK NECESSARY FOR WATERTIGHT CONSTRUCTION.
2. ALL PROPOSED CASTINGS SET IN PAVED AREAS SHALL BE FLUSH WITH THE FINAL PAVEMENT ELEVATIONS. ALL PROPOSED CASTINGS TO BE SET IN NON-PAVED AREAS SHALL STAND APPROXIMATELY THREE (3) INCHES ABOVE FLUSH WITH THE FINAL GROUND.
3. MAXIMUM MANHOLE SPACING SHALL BE FOUR HUNDRED (400) FEET, UNLESS APPROVAL IS GIVEN BY THE DISTRICT.
4. MANHOLE ELEVATIONS MUST BE SET EIGHTEEN (18) INCHES ABOVE THE CURRENT PUBLISHED INDIANA DEPARTMENT OF NATURAL RESOURCES 100-YEAR BASE FLOOD ELEVATION OF NEARBY WATERWAYS (INCLUDING, BUT NOT LIMITED TO, LAKES, PONDS, STREAMS, AND EMERGENCY SPILLWAYS OR STORM WATER ROUTING). IF THIS REQUIREMENT CANNOT BE MET, THEN WATER TIGHT BOLTED AND GASKETED CASTINGS MUST BE INSTALLED.
5. MANHOLES SHALL BE INSTALLED AT A 6-FOOT MINIMUM DEPTH (7-FOOT PREFERRED), AS MEASURED FROM THE TOP OF CASTING TO THE INVERT.
6. MANHOLES EXTERIOR SHALL BE COATED WITH MATERIAL TO ENSURE WATER TIGHTNESS, E.G. BITUMINOUS WATERPROOF COATING.
- B. REINFORCED CONCRETE MANHOLES AND ACCESSORIES
1. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE ASTM C478, STANDARD SPECIFICATIONS FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS. MANHOLES SHALL BE A MINIMUM DIAMETER OF 48 INCHES WITH A MINIMUM ACCESS DIAMETER OF 24 INCHES. THE MINIMUM WALL THICKNESS SHALL BE FIVE (5) INCHES FOR MANHOLES FOUR (4) FEET IN DIAMETER.
2. THE PRECAST TOPS SHALL BE OF THE ECCENTRIC CONE TYPE. PRECAST FLAT COVERS SHALL BE NOT LESS THAN EIGHT (8) INCHES THICK AND REINFORCED WITH TWO LAYERS OF STEEL WITH A MINIMUM AREA OF 0.38 SQUARE INCHES PER LINEAR FOOT IN BOTH DIRECTIONS IN EACH LAYER. PRECAST FLAT BOTTOMS OF MANHOLES SHALL ALSO BE REINFORCED THE SAME AS SPECIFIED HEREIN FOR PRECAST FLAT TOP HOISTING LUGS OR HOOKS SHALL BE CAST IN PLACE FOR HANDLING AND SETTING OF THE RINGS. NO THROUGH HOLES SHALL BE PERMITTED. OPENINGS OF PROPER SIZES AND SUITABLE DESIGN SHALL BE CAST IN PLACE FOR RECEIVING THE SEWER AND/OR DROP PIPES AND CONNECTIONS. ADJUSTING RISER RINGS SHALL BE PROVIDED, WITH NO MORE THAN 12-INCHES OF RISER RINGS ALLOWED.
3. ALL MANHOLE JOINTS SHALL BE TONGUE AND GROOVE AND THEY SHALL BE SEALED WITH 1-1/4" BUTYL MASTIC JOINT SEALANT MEETING ASTM C-990. CRACKED OR DAMAGED BARREL JOINTS SHALL NOT BE ALLOWED. ALL JOINTS SHALL ALSO HAVE AN EXTERIOR JOINT WRAP SIMILAR TO THE INFI-SHIELD GATOR WRAP AS MANUFACTURED BY SEALING SYSTEMS INC. OR APPROVED EQUAL. THE JOINT WRAP SHALL BE A MINIMUM OF SIX (6) IN WITH.
4. MANHOLE STEPS SHALL BE INSTALLED IN ALL SANITARY SEWER MANHOLES. MANHOLE STEPS SHALL BE POLYPROPYLENE. MANHOLE STEPS SHALL BE INSTALLED IN A VERTICAL ROW ON 16-INCH CENTERS.
5. MANHOLE BASES SHALL BE OF CAST-IN-PLACE MONOLITHIC CONCRETE OR PRECAST CONCRETE. WHERE SEWER LINES PASS THROUGH OR ENTER MANHOLES, THE INVERT CHANNELS SHALL BE SMOOTH AND SEMI-CIRCULAR IN CROSS SECTION WITH THE WALL EXTENDING TO FULL DEPTH ELEVATION OF THE PIPE. THE INVERT CHANNELS SHALL BE FORMED DIRECTLY IN THE CONCRETE OF THE MANHOLE BASE. CHANGES OF DIRECTION OF FLOW WITHIN THE MANHOLES SHALL BE MADE WITH A SMOOTH CURVE WITH AS LONG AS A RADIUS AS POSSIBLE. THE WALLS OF THE CHANNELS WILL BE FLARED OUT TO ALLOW TESTING EQUIPMENT TO BE INSERTED AND REMOVED. THE FLOOR OF THE MANHOLE OUTSIDE THE CHANNELS SHALL BE SMOOTH AND SLOPE TOWARD THE CHANNEL, NOT LESS THAN ONE (1) INCH PER FOOT.
6. FOR CAST IN PLACE BASES, NO MORTAR OR CONCRETE SHALL BE PLACED IN WATER, AND NO WATER SHALL BE ALLOWED TO FLOW OVER OR AGAINST THE CONCRETE BEFORE IT HAS HAD ADEQUATE TIME TO SET IN ORDER TO PREVENT DAMAGE TO THE STRUCTURE.
7. THE STANDARD MANHOLE IS FORTY-EIGHT (48") IN DIAMETER. LARGER DIAMETER MANHOLES MAY BE REQUIRED IN INSTANCES WITH LARGE PIPE DIAMETERS OR WITH CERTAIN INTERNAL DROPS, IF APPROVED. MANHOLE BARREL SECTIONS SHALL BE IN ONE, TWO, THREE, OR FOUR FOOT SECTIONS. THE CONE SECTION SHALL BE OF THE ECCENTRIC CONE TYPE, TWO OR THREE FEET IN LENGTH.
8. ADJUSTING RINGS, WHERE ONE (1) SOLID RISER OR BARREL SECTION CANNOT BE USED, FINAL ADJUSTMENTS IN ELEVATION OF THE FRAME AND COVER SHALL ONLY BE ACCOMPLISHED BY THE USE OF PRECAST CONCRETE ADJUSTING RINGS CONFORMING TO ASTM C 478. RINGS SHALL BE OF A NOMINAL THICKNESSES OF FOUR (4") OR SIX (6) INCHES, NOT MORE THAN TWO (2) RINGS AND NOT MORE THAN TWELVE (12) INCHES TOTAL OF ADJUSTING RINGS SHALL BE ALLOWED. THE ADJUSTMENT OF THE MANHOLE FRAME AND COVER TO REQUIRED ELEVATION, GRADE RING JOINTS SHALL HAVE A 1/4" THICK PREFORMED BUTYL RUBBER FLEXIBLE SEALANT CONFORMING TO ASTM C990.
9. ALL PRECAST CONCRETE FOR NEW MANHOLES THAT WILL BE RECEIVING A FORCE MAIN OR ARE WITHIN FIVE HUNDRED (500) FEET UPSTREAM OR DOWNSTREAM OF THE RECEIVING MANHOLE SHALL HAVE THE INTERIOR OF THE MANHOLE LINED WITH CEMENTITIOUS LINERS WITH CALCIUM ALUMINATE MORTARS SUCH AS STRONGSOL SAUERISEN, MADWELL, CONCO SPRAYOQ OR APPROVED EQUAL. APPLY COATING PER MANUFACTURER'S RECOMMENDATION.
10. MINIMUM MANHOLE DIAMETERS
- A. THE FOLLOWING ARE MINIMUM MANHOLE DIAMETERS FOR SANITARY SEWERS ENTERING/EXITING A MANHOLE AT THE FOLLOWING RANGE OF ANGLES:

| PIPE SIZE | PIPES ENTERING / LEAVING AT 0° - 45° BEND | PIPES ENTERING / LEAVING AT 45° - 90° BEND |
|-----------|---|--|
| 8" - 21" | 48" | 48" |
| 24" | 48" | 60" |
| 27" - 30" | 60" | 60" |
| 33" - 36" | 60" | 72" |

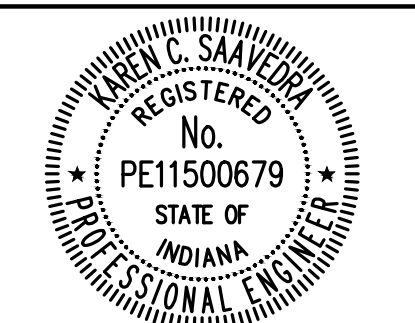
- * NOTE 72" IF THE "A"-LOCK CONNECTOR IS USED.
- B. THE MINIMUM MANHOLE DIAMETER TO ACCOMMODATE AN INSIDE DROP IS 60".
- C. MANHOLE BASE CHANNELS:
1. MANHOLE CHANNELS SHALL BE MAIN LINE PIPE MATERIAL. LAY MAIN PIPE THROUGH MANHOLE AND CUT TOP OF PIPE OUT TO BE THREE-FOURTHS OF PIPE DIAMETER. FOR ALL MANHOLES WITH EQUAL DIAMETER INFLUENT AND EFFLUENT PIPES, A MINIMUM 0.10 FOOT DROP BETWEEN THE INVERTS AND EFFLUENT PIPES SHALL BE MAINTAINED. FOR CHANGES IN DIRECTION 45 TO 90 DEGREES, A MINIMUM 0.20 FOOT DROP SHALL BE MAINTAINED.
- D. SEWER PIPE TO MANHOLE CONNECTIONS
1. TO CONNECT A SANITARY SEWER TO A MANHOLE, A RESILIENT PIPE TO MANHOLE CONNECTOR SHALL BE USED MEETING THE REQUIREMENTS OF ASTM C-923. EITHER A FLEXIBLE BOOT KOR-N-SEAL 1 OR 2, CAST-IN-PLACE DUR-A-SEAL GASKET OR "A-L-OK" GASKET OR AN APPROVED EQUAL SHALL BE USED. CONNECTIONS TO AN EXISTING MANHOLE SHALL BE A FLEXIBLE BOOT SEAL.
2. IF THE FLEXIBLE BOOT CONNECTION IS USED, IT SHALL BE PLACED IN THE REINFORCED CONCRETE MANHOLE BASE AND SECURED TO THE PIPE BY A STAINLESS STEEL CLAMP. FLEXIBLE CONNECTORS SHALL CONFORM TO ASTM C 923.
3. ALL CONNECTIONS SHALL PROVIDE FOR A WATERTIGHT SEAL BETWEEN THE PIPE AND MANHOLE. THE CONNECTOR SHALL BE THE SOLE ELEMENT RELIED UPON TO ASSURE A FLEXIBLE WATERTIGHT SEAL OF THE PIPE TO THE MANHOLE.
4. THE INVERT OF THE CONNECTION SHALL BE GROUTED WITH NON-SHRINK GROUT. THE REMAINDER OF THE RESILIENT CONNECTION SHALL BE FREE OF GROUT TO PROMOTE FLEXIBILITY OF THE CONNECTION.
5. THE RUBBER FOR THE CONNECTOR SHALL CONFORM TO ASTM C 923 AND SHALL BE RESISTANT TO OZONE, WEATHER ELEMENTS, CHEMICALS, INCLUDING ACIDS AND ALKALIS, ANIMAL AND VEGETABLE FATS, OILS AND PETROLEUM PRODUCTS.
6. THE STAINLESS STEEL ELEMENTS OF THE CONNECTOR SHALL BE TOTALLY NON-MAGNETIC SERIES 305 STAINLESS STEEL. THE STAINLESS STEEL CLAMP SHALL BE CAPABLE OF SUSTAINING APPLIED TORQUE IN EXCESS OF EIGHTY (80) INCH-POUNDS.
7. NEW CONNECTIONS MADE TO ANY EXISTING STRUCTURE SHALL BE DRILLED IN THE DIRECTION OF FLOW. THE INTERNAL BASE MATERIAL SHALL BE REMOVED AND RE-POURED WITH THE CHANNELS MEETING THE REQUIREMENTS OF THE MANHOLE BASE SECTION. IF THE STRUCTURAL INTEGRITY OF THE CONCRETE BASE SECTION IS COMPROMISED DURING THE REMOVAL OF THE INTERIOR BASE, THE ENTIRE BASE SECTION SHALL BE REPLACED. THE CONNECTOR BOOT SHALL BE APPROPRIATELY SIZED TO FIT THE OPENING AND SHALL BE KOR-N-SEAL® BY NPC, INC., A-LOK PRODUCTS, INC., OR APPROVED EQUAL.
- E. DROP MANHOLES
1. WHERE A SANITARY SEWER OR SANITARY LATERAL ENTERS A MANHOLE TWENTY-FOUR (24) INCHES OR MORE ABOVE THE INVERT OF THE OUTGOING SEWER, THE INCOMING SEWER SHALL BE CONNECTED TO THE MANHOLE BY MEANS OF A DROP CONNECTION.
2. OUTSIDE DROP CONNECTIONS MAY BE EITHER PRECAST OR FIELD FABRICATED. DROP CONNECTIONS ON THE INSIDE OF MANHOLES SHALL BE SECURED TO THE INTERIOR WALL OF THE MANHOLE AND PROVIDE ACCESS FOR CLEANING, AND DROP PIPE CONNECTIONS ON THE OUTSIDE OF MANHOLES SHALL BE ENCASED IN CONCRETE.
- F. SAMPLE MANHOLE REQUIREMENTS
1. ALL WAREHOUSE AND INDUSTRIAL SITES SHALL INSTALL A SAMPLING MANHOLE PRIOR TO CONNECTION TO HCRSD SEWER.
2. THE SAMPLING MANHOLE SHALL BE A STANDARD 48-INCH PRECAST CONCRETE MANHOLE.
3. THE SAMPLING MANHOLE SHALL HAVE A THREE (3) FOOT STRAIGHT LATERAL RUN ON BOTH SIDES OF THE MANHOLE.
- G. CASTINGS
1. STANDARD MANHOLES SHALL HAVE A SELF-SEALING, HEAVY-DUTY FRAME AND COVER, NEENAH R-1772 OR APPROVED EQUAL. MATERIAL SHALL BE IN COMPLIANCE WITH ASTM A-48, CL 35. EACH LID SHALL HAVE "SANITARY SEWER" MOLDED INTO THE EXTERIOR SURFACE IN LETTERS TWO (2) INCHES IN HEIGHT RECESSED, AND FLUSH WITH SURFACE.
2. WHERE WATERTIGHT CASTINGS ARE REQUIRED, THE MANHOLES SHALL HAVE A BOLT DOWN NEENAH 1772 OR 1022Z CASTING BY EAST JORDAN IRON WORKS, OR APPROVED EQUAL. THE FRAME SHALL BE ANCHORED THROUGH THE RISER RINGS (IF PROVIDED) TO THE CONE SECTION WITH FOUR (4) GALVANIZED RODS.
3. NO OPEN PICK HOLES SHALL BE ALLOWED.
- H. FRAME, CHIMNEY AND JOINT SEAL
1. ALL MANHOLES SHALL HAVE AN EXTERNAL CHIMNEY SEAL AND JOINT SEALS.
2. THE SECTION OF THE MANHOLE FROM THE ECCENTRIC CONE TO THE CASTING FRAME SHALL BE WRAPPED ON THE EXTERIOR WITH JOINT WRAP MEETING THE REQUIREMENTS OF THE UNI-BAND SEALING SYSTEM AS MANUFACTURED BY SEALING SYSTEMS, INC. OR APPROVED EQUAL.
3. ALL MANHOLE JOINTS SHALL BE WRAPPED ON THE EXTERIOR WITH JOINT WRAP MEETING THE REQUIREMENTS OF THE INFI-SHIELD GATOR WRAP AS MANUFACTURED BY SEALING SYSTEMS INC. OR APPROVED EQUAL. THE JOINT WRAP SHALL BE A MINIMUM OF SIX (6) IN WITH.
4. NO GROUTING OF THE INTERIOR OR EXTERIOR OF THE JOINT WILL BE REQUIRED.
- 2.7 APPURTENANCES
- A. OIL AND GREASE INTERCEPTOR AND GREASE REMOVAL PIT
1. PIT SHALL BE CONSTRUCTED OF REINFORCED PRECAST CONCRETE OR CAST-IN-PLACE CONCRETE OF THE SHAPE AND CONFIGURATION INDICATED ON THE PLANS. PRECAST VAULTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C857 AND BE RATED FOR AASHTO HS20-44 LOADING. THE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS, AND REINFORCEMENT SHALL COMPLY WITH ASTM A615, GRADE 60. ACCESS TO THE PIT SHALL BE THROUGH 24 INCHES DIAMETER MANHOLE FRAME AND COVER OR THROUGH HINGED ALUMINUM ACCESS MANWAYS.
2. BAFFLES SHALL BE CONSTRUCTED OF 1/4 INCH MILD CARBON STEEL WITH 1/4 INCH THERMOPLASTIC COATING.
3. THE PIT SHALL HOLD A VOLUME OF NO LESS THAN 1000 GALLONS.
- PART 3 - EXECUTION
- 3.1 PREPARATION
- A. REMOVE LARGE STONES OR OTHER HARD MATERIALS THAT COULD DAMAGE PIPE OR IMPEDE CONSISTENT BACKFILLING OR COMPACTION.
- B. PROTECT AND SUPPORT EXISTING SEWER LINES, UTILITIES, AND APPURTENANCES.
- 3.2 EXCAVATION
- A. CLEARING
1. PRIOR TO EXCAVATION, AREAS WITHIN THE PROJECT LIMITS SHALL BE FIRST CLEARED OF OBSTRUCTIONS, DEBRIS, AND EXISTING FACILITIES WITH THE EXCEPTION OF FACILITIES THAT MUST TEMPORARILY OR PERMANENTLY REMAIN. THE CONTRACTOR SHALL REMOVE AND KEEP SEPARATE THE TOPSOIL, AND SHALL CAREFULLY REPLACE IT AFTER THE BACKFILLING IS COMPLETED.
- B. PROTECTION OF EXISTING IMPROVEMENTS REQUIRED TO REMAIN IN PLACE
1. BEFORE ANY EXCAVATION IS STARTED, ADEQUATE PROTECTION SHALL BE PROVIDED FOR ALL LAWNS, TREES, SHRUBS, LANDSCAPE WORK, FENCES, SIDEWALKS, HYDRANTS, UTILITY POLES, STREET, ALLEY AND DRIVEWAY PAVING, CURBS, STORM SEWERS, DITCHES, HEADWALLS, CATCH BASINS, SURFACE INLETS AND ALL OTHER IMPROVEMENTS THAT ARE DESIGNATED TO REMAIN IN PLACE. SUCH PROTECTION SHALL BE PROVIDED AS LONG AS NECESSARY TO PREVENT DAMAGE FROM THE CONTRACTOR'S OPERATIONS.
2. THE CONTRACTOR SHALL EXERCISE EVERY PRECAUTION TO PREVENT DAMAGE TO PROPERTY WITHIN AND OUTSIDE THE IMMEDIATE VICINITY OF THE WORK. THE CONTRACTOR SHALL RESTORE THE GROUND SURFACES, REPLACE OR REPAIR DRIVEWAYS, BUILDINGS, FENCES, RETAINING WALLS, CULVERTS, DRAINS, PAVING, SIDEWALKS, ETC., WHICH ARE REMOVED OR DAMAGED DURING CONSTRUCTION AND WHICH ARE DESIGNATED ON THE PLANS TO REMAIN IN PLACE.
- C. PAVEMENT REMOVAL
1. ALL PAVEMENT CUTTING AND REMOVAL SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE REGULATORY AGENCY RESPONSIBLE FOR THE MAINTENANCE OF THE ROADWAY.
- D. MAINTENANCE OF ROADWAY ACCESS
1. ALL MAINTENANCE OF TRAFFIC SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE REGULATORY AGENCY OR AUTHORITY IN CHARGE OF MAINTAINING THE SUBJECT ROADWAY.

2. THE CONTRACTOR SHALL NOT CLOSE OR OBSTRUCT ANY PORTION OF A PUBLIC STREET WITHOUT FIRST NOTIFYING IN WRITING THE APPROPRIATE REGULATORY ROADWAY AUTHORITY. THE CONTRACTOR SHOULD BE AWARE THAT THERE IS SUFFICIENT TIME ALLOWED FOR THE AUTHORITY TO REVIEW AND ACT ON THE CLOSURE REQUEST.
3. UNLESS CLOSURE IS APPROVED, STREETS, ROADS, PRIVATE WAYS AND WALKS SHALL BE MAINTAINED PASSABLE BY THE DEVELOPER'S CONTRACTOR AT ALL TIMES, AND THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ADEQUACY AND SAFETY OF PROVISIONS MADE.
4. TO PROTECT PERSONS FROM INJURY AND TO AVOID PROPERTY DAMAGE, ADEQUATE BARRICADES, PROTECTION SIGNS, WARNING LIGHTS, AND GUARDS AS REQUIRED SHALL BE PLACED AND MAINTAINED DURING THE PROGRESS OF THE CONSTRUCTION WORK AND UNTIL IT IS SAFE TO USE THE CONSTRUCTION AREA FOR ITS NORMAL PURPOSES.
- E. UTILITY PROTECTION
1. PRIOR TO PROCEEDING WITH EXCAVATION, THE CONTRACTOR SHALL INITIATE THE LOCATION OF ALL UTILITIES IN THE AREA TO AID IN LOCATING THEIR UNDERGROUND SERVICES. UPON LOCATION OF UTILITIES, THE CONTRACTOR SHALL USE CARE IN EXCAVATING NEAR EXISTING UTILITIES IN ORDER TO PROTECT THEM FROM DAMAGE.
- F. DEVIATIONS FROM LINE AND GRADE DUE TO UNFORESEEN UNDERGROUND ISSUES
1. WHEREVER OBSTRUCTIONS ARE ENCOUNTERED DURING THE PROGRESS OF THE WORK AND INTERFERE TO SUCH AN EXTENT THAT AN ALTERATION IN THE PLAN IS REQUIRED, THE ENGINEER MAY REVISE THE PLANS AND REQUEST A DEVIATION FROM THE LINE AND GRADE OR ARRANGE WITH THE OWNERS OF THE STRUCTURES FOR THE REMOVAL, RELOCATION OR RECONSTRUCTION OF THE OBSTRUCTIONS. WHERE SEWER, GAS, WATER, TELEPHONE, ELECTRICAL OR OTHER EXISTING UTILITIES ARE AN IMPEDIMENT TO THE VERTICAL OR HORIZONTAL ALIGNMENT OF THE PROPOSED PIPE LINE, THE CONTRACTOR MUST ARRANGE WITH THE CONFLICTING UTILITY TO RELOCATE OR HAVE THE ENGINEER REVISE THE DRAWINGS TO AVOID THE CONFLICT. ALL CHANGES IN THE LINES OR GRADES ON THE PLANS MUST BE APPROVED BY THE HCRSD PRIOR TO CONTINUING CONSTRUCTION.
- G. CONSTRUCTION IN EASEMENTS
1. IN EASEMENTS ACROSS PRIVATE PROPERTY, THE CONTRACTOR SHALL CONFINE ALL OPERATIONS TO THE EASEMENT AREA. IN GENERAL, THE EASEMENT AREA IS INTENDED TO PROVIDE REASONABLE ACCESS AND WORKING SPACE FOR EFFICIENT OPERATION BY THE CONTRACTOR. WHERE ADEQUATE EASEMENT SPACE FOR EFFICIENT OPERATION IS NOT PROVIDED, THE CONTRACTOR SHALL ADJUST CONSTRUCTION METHODS TO COMPLETE THE WORK WITHIN THE EASEMENT OR WORK WITH THE HCRSD TO GRANT OR ACQUIRE ADDITIONAL EASEMENT.
- H. MAINTENANCE OF EXISTING DRAINAGE FLOW
1. THE CONTRACTOR SHALL MAKE PROVISIONS FOR HANDLING AND MAINTAINING ALL FLOWS IN EXISTING CREEKS, DITCHES, SEWERS AND TRENCHES BY PIPES, FLUMES OR OTHER APPROVED METHODS AT ALL TIMES WHEN HIS OPERATIONS WOULD, IN ANY WAY, INTERFERE WITH THE NATURAL FUNCTIONING OF SAID CREEKS, DITCHES, SEWERS AND DRAINS.
2. NO STORM WATER SHALL BE PERMITTED IN THE SANITARY SEWER.
- I. TRENCH DIMENSIONS
1. THE ALL TRENCHES IN EARTH FOR SEWER PIPE, LATERALS, AND OTHER STRUCTURES SHALL PROVIDE A TRENCH WIDTH OF APPROXIMATELY 1.25 TIMES THE OUTSIDE DIAMETER OF THE PIPE PLUS TWELVE (12) INCHES.
2. SIDEWALLS OF PIPE TRENCHES SHALL BE VERTICAL FROM THE BOTTOM OF THE TRENCH TO A POINT NOT LESS THAN TWELVE (12) INCHES ABOVE THE TOP OF THE PIPE. ABOVE THAT POINT, SIDEWALLS MAY BE BATTERED TO SUCH AN EFFICIENT OPERATION BY THE CONTRACTOR. WHERE ADEQUATE EASEMENT SPACE FOR EFFICIENT OPERATION IS NOT PROVIDED, THE CONTRACTOR SHALL ADJUST CONSTRUCTION METHODS TO COMPLETE THE WORK WITHIN THE EASEMENT OR WORK WITH THE HCRSD TO GRANT OR ACQUIRE ADDITIONAL EASEMENT.
- J. EARTH EXCAVATION
1. STANDARD MANHOLES SHALL BE EXCAVATED SO THAT THE OPEN CUTS CONFORM TO THE LINES, GRADES AND DIMENSIONS SHOWN ON THE DRAWINGS.
2. AFTER THE TRENCH IS EXCAVATED TO GRADE, THE ENGINEER SHALL EXAMINE THE BASE AND DETERMINE WHETHER OR NOT IT IS SATISFACTORY FOR PIPE LAYING. IF THE BASE IS NOT SATISFACTORY, IT SHALL BE REMOVED AND REPLACED WITH CRUSHED STONE AS ORDERED BY THE ENGINEER. THE CRUSHED STONE SHALL BE #8 GRADATION AS SPECIFIED IN INDOT STANDARD SPECIFICATION, AND EXTEND A MINIMUM DEPTH OF SIX INCHES (6") BELOW THE BARRER OF THE PIPE. SHOULD THE BASE STILL NOT BE SUITABLE FOR ADEQUATE SUPPORT OF THE PIPE (I.E. A BOLING OR QUIKSAND CONDITION, MUCK, ETC.), THE CONTRACTOR SHALL PROPOSE ALTERNATE METHODS OF SUITABLE CONSTRUCTION PRACTICES TO THE HCRSD FOR APPROVAL. THE HCRSD SHALL APPROVE ALTERNATE BASE STABILIZATION METHODS PRIOR TO COMMENCING LAYING OF PIPE IN THE TRENCH.
3. EXCAVATED EARTH MATERIALS THAT ARE SUITABLE FOR BACKFILLING MAY BE USED FOR BACKFILL WHEN ALLOWED BY THE APPROVED PLANS AND SPECIFICATIONS. THIS EXCAVATED MATERIAL MAY ONLY BE USED AS FINAL BACKFILL IN AREAS NOT SUBJECT TO TRAFFIC LOADING OR PAVEMENT, AND AS SHOWN ON THE PROJECT DRAWINGS AND DETAILS.
- K. BORING AND JACKING
1. IF CALLED FOR ON THE DRAWINGS, BORING AND JACKING OF PIPE MAY BE REQUIRED. THE SAME STANDARDS FOR LINE AND GRADE IN OPEN CUT INSTALLATIONS APPLY TO BORING OR JACKING OF PIPE.
- L. REMOVAL OF WATER
1. THE CONTRACTOR SHALL AT ALL TIMES DURING CONSTRUCTION PROVIDE AND MAINTAIN AMPLE MEANS AND DEVICES WITH WHICH TO REMOVE AND PROPERLY DISPOSE OF ALL WATER ENTERING THE EXCAVATIONS OR OTHER PARTS OF THE WORK AND SHALL KEEP THE EXCAVATIONS DRY UNTIL THE STRUCTURES TO BE BUILT THEREIN ARE COMPLETED OR CONNECTIONS TO EXISTING STRUCTURES ARE COMPLETED.
2. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE ALL EQUIPMENT AND LABOR TO MAINTAIN BYPASS PUMPING DURING CONNECTIONS TO EXISTING STRUCTURES. THE CONTRACTOR SHALL MAINTAIN ADEQUATE PUMPING CAPACITY AT ALL TIMES TO PREVENT ANY SPILLS, OVERFLOWS, OR DISCHARGES FROM THE EXISTING SANITARY SYSTEM.
3. EMBEDMENT AND BACKFILL
- A. PIPE EMBEDMENT AND COMPACTION
1. FOR THE PURPOSE OF THIS SPECIFICATION, PIPE SHALL INCLUDE THOSE MADE OF PVC, HDPE, DUCTILE IRON, AND OTHER MATERIALS APPROVED BY THE HCRSD.
2. ALL NON-RIGID PIPE SHALL BE BEDDED, HAUNCHED, AND INITIALLY BACKFILLED WITH #8 CRUSHED STONE OR #8 FRACTURED FACE AGGREGATE. THE PIPE BEDDING SHALL BE PLACED ON A PREPARED FLAT TRENCH BOTTOM. THE PIPE BEDDING SHALL EXTEND A MINIMUM OF SIX (6") INCHES OR ONE HALF (1/2) THE OUTSIDE PIPE DIAMETER TO A MAXIMUM OF EIGHT (8") BELOW THE PIPE. AFTER THE PIPE HAS BEEN PLACED TO GRADE AND LINE, THERE REMAINS A 4-INCH MINIMUM DEPTH OF MATERIAL BELOW THE PIPE BARREL AND A MINIMUM OF 3-INCHES BELOW THE BELL.
3. THIS SAME GRANULAR MATERIAL SHALL BE USED TO HAUNCH (AREA FROM THE TOP OF THE BEDDING TO THE SPRINGLINE OF THE PIPE) AND FOR INITIAL BACKFILL (AREA FROM THE HAUNCH TO TWELVE (12) INCHES ABOVE THE PIPE) ON BOTH SIDES OF THE PIPE FOR THE FULL TRENCH WIDTH.
4. ALL MATERIALS SHALL BE PLACED IN THE TRENCH IN NO MORE THAN SIX (6) INCH LAYERS. EACH LAYER SHALL BE LEVELLED AND EVENLY DISTRIBUTED ON BOTH SIDES OF THE PIPE SO AS NOT TO DISTURB, DISPLACE OR DAMAGE THE PIPE AND SHALL BE THOROUGHLY COMPACTED. COMPACTION OF THE CRUSHED STONE SHALL BE ACCOMPLISHED BY HAND TAMPING OR WALKING IN THE MATERIAL. MATERIAL FOR HAUNCHING CAN BE COMPACTED BY MANUAL COMPACTION METHODS OR BY SHOVEL SLICING.
5. FINAL BACKFILL IS CONSIDERED TO BE ALL MATERIAL ABOVE AN ELEVATION THAT IS TWELVE (12) INCHES ABOVE THE TOP OF THE PIPE TO THE BOTTOM OF THE SURFACE RESTORATION (TOP SOIL, PAVEMENTS, SIDEWALKS, ETC.) FOR THE FULL WIDTH OF THE TRENCH. ALL SANITARY SEWER PIPE SHALL BE BACKFILLED THE SAME DAY THAT IT IS INSTALLED. PRIOR TO USING HEAVY COMPACTION OR CONSTRUCTION EQUIPMENT DIRECTLY OVER THE PIPE, ENSURE THAT SUFFICIENT BACKFILL MATERIAL IS INSTALLED OVER THE PIPE TO PREVENT DAMAGE OR EXCESSIVE DEFLECTION. GRANULAR BACKFILL SHALL BE REQUIRED FOR ALL PIPE UNDER WALKS OR PAVEMENT.
6. COMPACTION OF FINAL BACKFILL IN AREAS SUBJECT TO TRAFFIC INFLUENCE OR PAVEMENT, WHICH ARE DEFINED AS BEING AREA SUBJECT TO ROUTINE VEHICLE USAGE SUCH AS ROADWAYS, ALLEYS, DRIVEWAYS, SIDEWALKS, ETC. SHALL BE PERFORMED ACCORDING TO THE LATEST REVISION OF THE ROADWAY REGULATORY AUTHORITY STANDARDS (STATE, COUNTY OR CITY). THE AREA OF TRAFFIC INFLUENCE IS NORMALLY CONSIDERED THE AREA WITHIN FIVE (5) FEET OF THE EDGE OF PAVEMENT, INCLUDING SHOULDERS AS MEASURED FROM THE OUTERMOST EDGE OF THE PIPE TRENCH CLOSEST TO THE EDGE OF THE TRAFFIC AREA. IT ALSO INCLUDES AREAS WITHIN A 1:1 SLOPE FROM THE EDGE OF THE TRAFFIC AREA, BASED UPON DEPTH AND DISTANCE, TAKEN FROM THE OUTER EDGE OF THE PIPE CLOSEST TO THE TRAFFIC. PLACEMENT AND COMPACTION OF THE FINAL BACKFILL SHALL BE IN ACCORDANCE WITH THE STANDARDS OF THE REGULATORY AGENCY HAVING JURISDICTION OVER THE ROADWAY.
7. PIPES INSTALLED IN AREAS NOT SUBJECT TO TRAFFIC INFLUENCE MAY BE BACKFILLED WITH SUITABLE EXCAVATED TRENCH SOIL MATERIALS. EXCAVATED TRENCH SOIL MATERIALS SHALL BE PLACED IN UNIFORM LAYERS, COMPACTED AS SPECIFIED, AND MOUND TO ACCOMMODATE SETTLEMENT DURING THE PROJECT DEVELOPMENT. EXCAVATED TRENCH MATERIAL FOR USAGE AS FINAL BACKFILL SHALL BE



HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT SPECIFICATIONS



Kevin C. Saalbach
CERTIFIED BY

| ISSUANCE INDEX | |
|----------------|------------|
| DATE: | 04/30/2021 |

| REVISION SCHEDULE | | |
|-------------------|--|------------|
| NO. | DESCRIPTION | DATE |
| 1 | SHEET ADDED | 12/10/2018 |
| 3 | REVISIONS TO AIR RELEASE VALVE LATERAL CONNECTION TO EXISTING SEWER | 01/03/2019 |
| 4 | DETAIL AND LEFT STATION SPECIFICATIONS UPDATES | 01/21/2021 |
| SPECIFICATIONS | | |
| 1 | UPDATED TESTING REQ PER IDEM COMMENTS | 01/20/2017 |
| 2 | UPDATED TESTING REQ PER IDEM COMMENTS | 12/10/2018 |
| 3 | GENERAL REVISIONS | 01/03/2019 |
| 4 | ASTM REFERENCE | 08/05/2019 |

Project Number 2000.00103

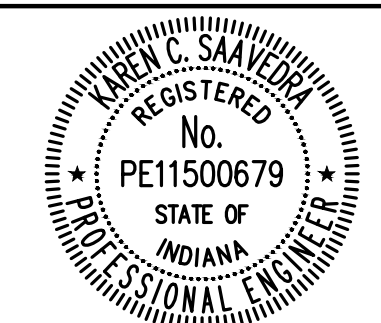
STANDARD SANITARY SEWER SPECIFICATIONS

02



HENDRICKS COUNTY REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT SPECIFICATIONS



K. S. Sankar CERTIFIED BY

ISSUANCE INDEX table with columns for DATE and description of changes.

REVISION SCHEDULE table with columns for NO., DESCRIPTION, and DATE.

Project Number 2000.00103

STANDARD SANITARY SEWER SPECIFICATIONS

FREE FROM ROCKS (TWO INCHES IN DIAMETER OR GREATER), CONCRETE, ROOTS, STUMPS, LARGE AMOUNTS OF SOD OR ORGANIC MATTER, RUBBISH, FROZEN MATERIALS AND OTHER SIMILAR MATERIALS THAT MAY CAUSE EXCESSIVE SETTLEMENT. TO ALLOW FOR SETTLEMENT, THE SURFACE OF THE TRENCH SHALL GENERALLY BE LEFT IN A SLIGHTLY ROUNDED CONDITION.

6. PIPE LUGS
A. AT TIMES WHEN PIPE-LAYING IS NOT IN PROGRESS, THE OPEN ENDS OF PIPE SHALL BE CLOSED BY A WATERTIGHT PLUG. THE PLUG SHALL BE FITTED WITH A MEANS FOR VENTING. WHEN PRACTICAL, THE PLUG SHALL REMAIN IN PLACE UNTIL THE TRENCH IS PUMPED COMPLETELY DRY. CARE MUST BE TAKEN TO PREVENT PIPE FLOTATION, SHOULD THE TRENCH FILL WITH WATER.

F. TEST/PRESSURE RELIEF HOLES (POTHOLES) DUG EVERY 25 FEET SHALL BE REQUIRED ALONG THE BORE ROUTE TO CONFIRM ALIGNMENT AND GRADE, AND TO RELIEVE SUBSURFACE PRESSURE.
G. AFTER THE PIPE HAS BEEN INSTALLED, ALLOW PIPE MANUFACTURER'S RECOMMENDED AMOUNT OF TIME, BUT NOT LESS THAN FOUR (4) HOURS, FOR COOLING AND RELAXATION DUE TO TENSILE STRESSING PRIOR TO HYDROSTATIC TESTING.

D. SAMPLING MANHOLE
1. INSTALL SAMPLING MANHOLE PRIOR TO CONNECTION TO HCRSD SEWER IN A LOCATION ACCESSIBLE TO HCRSD AND AQUA INDIANA PERSONNEL.
2. THE SAMPLING MANHOLE SHALL HAVE A THREE (3) FOOT STRAIGHT LATERAL RUN ON BOTH SIDES OF THE MANHOLE. PART 4 -- TESTING

VERTICAL TEXT: DRAWING FILE: P:\INDIANA\03\03\Drawings\Standard\2000 - HCRSD\03\03\SS-03.swg; EDITED BY: P.TRAWINSKI; PLOT DATE: 6/30/2021 12:32 PM; PLOT SCALE: 1:1

PART 1 - GENERAL

1.1 Scope of Work

A. The purpose of these specifications is to provide the main framework for the construction of sanitary sewage lift stations for Hendricks County Regional Sewer District (HCRSD-Owner), and to outline the requirements for the design and construction of sanitary sewage lift stations by a person or entity (Applicant) seeking to construct a lift station for inclusion in, or connection to, the HCRSD sanitary sewer system. The content of this document is therefore by necessity of a general nature which applies to all projects.

- 1. The term "Owner", where used in these specifications, refers to HCRSD or the authorized representative of HCRSD.
2. The term "Applicant", where used in these specifications, refers to a person or entity seeking permission to connect, construct, alter or disturb, or cause to be connected, constructed, altered or disturbed, any sanitary sewage lift station directly or indirectly tributary to the Owner's sewer system.
3. The term "Contractor", where used in these specifications, refers to a person or entity engaged by HCRSD or Applicant to construct a sanitary sewage lift station.

1.2 Work and Materials to be Provided by the Contractor

- A. Unless otherwise indicated, all work, equipment and materials described in these specifications shall be provided by the Contractor.
B. The Contractor shall warrant work and materials for a period of one year from the date of putting the facilities in service. Contractor shall be responsible for full cost of repairs made under warranty.
C. The Contractor shall provide all materials and equipment necessary to clean and test the lift station prior to placing it into service.
D. The Owner is exempt from sales tax for the materials used for lift station construction. However, if lift station is constructed by and for Applicant, Applicant and Contractor shall pay all required sales tax.
E. When tie-ins to the existing system are made, the Contractor shall advise the Owner at least one week in advance of when the connection will be needed. The Contractor shall assert no claims due to delays allegedly caused by the Owner.
F. The Contractor shall obtain and pay for all temporary office facilities, utilities, and material or equipment storage areas which the Contractor desires and that are not shown on the drawings as "to be provided by the Owner".

1.3 Reference Standards and Specifications

- A. These Specifications make reference and incorporate other standard specifications. The referenced specifications include the latest version of:
1. Indiana Administrative Code, Section 327-3
2. "National Electrical Safety Code" (NESC)
3. "American National Standards Institute Standards" (ANSI)
4. "Institute of Electrical and Electronic Engineers Standards" (IEEE)
5. "Insulated Power Cable Engineers Association Standards" (IPCEA)
6. "National Bureau of Standards" (NBS)
7. "National Electrical Manufacturers Association Standards" (NEMA)
8. "National Electrical Contractors Association Standard of Installation" (NECA)
9. "National Fire Protection Association Standards" (NFPA)
10. "Underwriters Laboratories Publications" (U.L.C.)
B. All Contractors are advised to obtain a copy of each specification for their review during bidding and construction.
C. In case of a conflict between these specifications and the reference specifications, HCRSD specifications shall rule. Contractor shall notify Owner of discrepancies between specifications.
D. When reference is made to a reference specification, that specification shall be followed as if it were an integral part of the HCRSD specifications.

1.4 Safety

- A. The Contractor is responsible for the protection of persons from injury and prevention of property damage at the project site.
1. All OSHA regulations regarding proper working practices shall be used.
2. All INDOT safety requirements on the marking and performance of construction in roadways shall apply whether the construction is along INDOT roadways or not.
3. The Contractor shall take whatever steps necessary to protect the public from open trenches, material piles, and all other site obstructions.
4. Contractor shall adhere to all requirements listed in 29 CFR 1910 - Occupational Safety and Health Standards.
5. The electrical contractor or control panel manufacturer shall perform an arc flash study for the project if requested by Owner.

1.5 Coordination of Work

- A. The Contractor shall coordinate all subcontractors, affected utilities, and governmental agencies that have an involvement in the construction of the project.
1. Roadways shall remain open to the degree satisfactory with the affected governmental agency.
2. Utility service shall remain in near continuous operation to the satisfaction of the utility. During bidding, and prior to construction, the Contractor shall determine if nighttime or other off-time work will be necessary to maintain the desired level of service.
3. All subcontractors shall coordinate their work and arrangements directly through the Contractor.

1.6 Scope of Work

- A. Furnish and install sanitary sewage lift station as shown on the plans, including submersible pumping equipment with power and sensor cable, wet well with wet level device with cable and wet well standby float control switches with cables, valve vault with magnetic flow meter/flow tube (if requested), secondary electrical service conductors and conduits, electrical service meter and sump pump, main fused disconnect, Peterson power/generator connection capable of accepting portable generator wires, lift station controls and enclosure with Omni-site equipment or SCADA monitoring and electronic flow recorder (only if requested by Owner), power and control junction boxes located prior to the control panel, conduit cable seals, explosion proof conduit seal-off fittings, concrete equipment pads, electrical service grounding triangle, all conduits, conduits and electrical connections, equipment structural supports, and appurtenances as a fully operable system compatible with the current HCRSD specifications, as indicated on the approved plans.

1.7 Additional Requirements

- A. Lift station shall be located within a fenced area with manually operated gates having a total minimum opening width of 16-ft. The gates shall be capable of being padlocked. The fence shall be 7 ft tall (minimum height) chain link fence. The fence shall be heavy gauge PVC coated, and the poles shall be heavy gauge PVC coated. The fence shall also have vinyl slats that are green or black matching fence and post. The completed fence assembly shall be grounded in accordance with the National Electrical Safety Code.
B. A single exterior site light shall be mounted 12 ft above ground on an aluminum pole set in a concrete base. Floodlight shall be a heavy-duty aluminum fixture with manual activation switch, impact resistant glass and a 500 watt LED lamp. Light shall be equipped with a manually operated toggle switch. Lamp shall be installed in a metal cage to protect it from impact. Exterior site light shall be Lithonia DSXF1 LED P1 40K WFL MVOLT THK DDBXD, or Owner approved equal.
C. Each lift station shall be accessed by a paved driveway and be provided with a paved parking area. Driveway shall be heavy duty rated bituminous or concrete surface, minimum 16-foot wide providing access directly adjacent to the wet well, valve vault, and meter vault. Provide enough turnaround and parking area for one vehicle requested.
D. Contractor shall provide a permanent bypass pump if requested by Owner.
E. Minimum pump suction and discharge diameter shall be 4-in.
F. No grinder pumps are allowed unless otherwise approved by the Owner.
G. Minimum force main diameter shall be 4-in.
H. Contractor shall provide a magnetic flow meter with data logging with electronic flow recorder if requested by Owner.
I. Each lift station shall have, as a minimum, two pumps. Station shall be designed to provide the design peak flow with the largest pump out of service (firm capacity).
J. Electrical requirements:
1. The service entrances and all equipment shall be properly grounded in accordance with Article 250 of the National Electrical Code utilizing a ground triangle.
2. The Contractor shall install the electrical meter (provided by the power company) on a pedestal base approved by the electrical utility company.
3. Electrical service to the lift station shall be three phase configuration. If only single phase power is available, Contractor shall utilize a VFD for each pump to make three phase configuration from single phase power. In this case, the VFD will not be used for pump speed variation.
4. Electrical service voltages may be:
a. 120/240 vac, single phase, three wire
b. 240 vac, three phase, three wire
c. 240/120 vac, three phase, four wire
d. 208Y/120 vac, three phase, four wire

- e. 480 vac, three phase, three wire (preferred)
f. 408Y/277 vac, three phase, four wire, four-wire, four-wire, four-wire

- 4. All conductors shall be routed in conduit. In applications where there is anticipated population growth and the potential for increases in pump horsepower, one spare power and control conduit shall be provided from the wet well to the pumps power and wet well control junction boxes, and from the electrical service source (transformer) to the main fused disconnect.
5. The junction boxes shall have epoxy conduit seals between the junction box and control panel.
6. The conduits between the wet well and the junction box for the pumps shall be a minimum of 4-inch.
7. The lift station controls enclosure shall be mounted a minimum of eighteen inches above the wet well vent outlet and five feet horizontally from all openings.
8. The lift station pumps power, wet well level device, and float switches control junction boxes shall be mounted a minimum of eighteen inches above the wet well vent outlet.
9. The lift station main fused disconnect switch enclosure shall be mounted a minimum of eighteen inches above the wet well vent outlet.

K. Applicant shall provide the following:

- 1. Buoyancy calculations demonstrating that the wet well and valve vault will remain submerged given saturated soil conditions and using a safety factor of 1.5.
2. Pump sizing calculations, including design average and peak flow rates, total dynamic head, pump cycle times, and wet well detention time. Calculations shall indicate the service area tributary to the lift station, including the number and nature of existing, planned and future units to be served by the lift station.
3. Pump selection documentation to include pump efficiency, impeller diameter, design peak flow rate (in gallons per minute), horsepower, and design rpm's. Provide pump and system curves.
4. For developments that are planned to be constructed in phases, the calculations and documentation shall address the ultimate demands on the station as well as the demands for each phase of the development.
5. Design drawings and structural calculations for concrete slabs used to support the standby generator and other exterior equipment.
6. Electrical sizing calculations to include electrical service size load calculations, and standby generator sizing calculations.

L. After plan approval, and prior to construction, applicant shall provide shop drawings to Aqua Indiana and Owner's Engineer for the following:

- 1. Wet well top slab, bottom slab and risers, including reinforcing steel.
2. Valve and Meter Vaults.
3. Selected lift station equipment including pumps, pumps power and sensor cables, wet well level device and cable, wet well standby float control switches and cables, float switches suspension method, valve vault sump pump, magnetic flow meter / flow tube, electrical service meter pedestal, main fused disconnect, manual transfer switch, lift station controls enclosure and components to include SCADA equipment and electronic flow recorder, pumps power and wet well controls junction boxes, conduit cable seals, explosion proof conduit seal-off fittings, electric service grounding triangle, ground rods, wire and cable, EMT and PVC conduits, waterproof electrical connections, equipment structural supports, site lighting to include fixtures, pole, lamp, and pole foundation and grounding details, site fencing and fence grounding details.
4. Lift station controls electrical power and control diagrams indicating all control components, component sizes, ratings, and functions.

M. Operation and Maintenance Manuals: Contractor shall submit two (2) Operation and Maintenance Manuals to Owner. Manuals shall include, at a minimum, the following:

- 1. Warranty Statement;
2. Pump down test procedures and results from the start-up tests;
3. Operation Instructions;
4. Maintenance Instructions;
5. Recommended spare parts list;
6. Lubrication schedules;
7. Structural diagrams;
8. As-built wiring diagrams;
9. Piping and Instrumentation Drawings (P&ID); and
10. Bill of materials.

N. FACTORY TESTS

- 1. Each pump to be delivered under this Section shall be tested for performance at the pump manufacturer's factory to determine design head versus capacity, efficiency, and kilowatt draw required for the operating points that are specified. All tests shall be run in accordance with the latest edition of the American Hydraulic Institute Standards and Submersible Wastewater Pump Association and at the appropriate voltage and frequency. Testing shall also include, but not be limited to, the following:
2. Head vs. flow with five (5) equally spaced points including shutoff and maximum flow shall be certified.
3. The input KW, speed, power factor, no load current, and torque characteristics shall be certified.
4. Impeller, motor rating, and electrical connections shall first be checked for compliance to the specifications.
5. Insulation Test: A motor and cable insulation test for moisture content or insulation defects shall be made.
6. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
7. Operational Test: The pump shall be run for 30 minutes submerged, under a minimum of six feet of water. After the operational test has been conducted, the insulation test shall be performed again.
8. After testing, the pump shall be inspected to ensure that the pump maintains full watertight integrity.
9. A written report stating the tests have successfully been completed and providing the results of the test shall be provided for each pump. The pump manufacturer shall also certify that similar tests have been conducted on pumps of a similar size for a period of not less than five (5) years.

PART 2 - PRODUCTS

2.1 Manufacturing Requirements

- A. For most products, Owner has limited the number of manufacturers approved for use in its systems. Contractor shall provide the listed manufacturer(s) unless written approval is given by Owner prior to bidding. "Owner approved equal" means that for a specific project, Owner has given written approval that a different manufacturer or model may be used.
B. Electrical system and components in the raw sewage wet well must comply with NEC requirements for Class I, Group D, Division 1 locations.

2.2 Sizes of Material and Additional Material Requirements

- A. Where specific sizes of materials are not listed in paragraphs below, sizes will be shown on the Drawings.
B. Contractor shall identify all field materials.
C. Refer to HCRSD Standard Details for additional dimension and material requirements.

2.3 Sewage Pumps

- A. Furnish and install submersible non-clog sewage pumps capable of passing a 3 in. diameter spherical solid. Pump suction and discharge openings shall be 4 in. or greater in diameter. Pumps shall be Myers, Hydromatic, Flygt, Grundfos, or Owner approved equal.
B. Pump Construction:
1. Submersible pumps and motors shall be designed specifically for raw sewage use, including totally submerged operation during a portion of each pumping cycle and shall meet the requirements of the National Electrical Code (NEC) for such units. If pump and motor are not fully submerged at shut off level, explosion proof motors shall be provided. The pump body, seal plates, impeller, and motor housing shall be constructed of high quality ASTM Class 30 cast iron or better. A coat of air dry enamel shall be applied before and after assembly. All exposed hardware shall be 300 series stainless steel. The impeller shall be of the two-vane, non-clog design with pressure vanes on the back side and of the key drive design. The impeller shall be dynamically balanced and shall be capable of handling solids, fibrous materials, and other matter found in normal sewage applications. A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller.
2. Each pump shall be provided with a tandem mechanical shaft seal consisting of two independent seal assemblies operating in an oil-filled seal cavity. The materials of construction shall be carbon and ceramic lapped and polished to a tolerance of one light

- 5. band, stainless steel hardware, and with all rubber parts of Buna-N. A moisture sensor detection system shall be included within the oil-filled seal chamber.

- The motor shall be a premium efficiency motor that is the standard product of an established American motor manufacturer. The motor shall be designed to be non-overloading over the entire pump curve. The rotor and stator assembly shall be of the standard frame design. The motor housing shall be of submersible construction and shall be filled with high dielectric oil. The motor windings shall be of Class F insulation rated at 155 degrees C. The combined service factor shall be a minimum of 1.15. The motor shall be able to operate dry without damage while pumping under load. The motor shall meet the standard for enclosure, type of mounting and basic electric design for NEMA Design B. The motor shaft shall be of 416 stainless steel, or carbon steel with a replaceable type 420 stainless steel shaft sleeve. The thrust bearing shall be of the double row ball type with the upper radial bearing of the single row ball type.
6. Thermal sensors shall be used to monitor stator temperatures. The stator shall be equipped with a thermal switch embedded in the end coil of the stator winding. This shall be used in conjunction with and supplemental to external motor overload protection and wired to the control panel.
7. The pump shall be equipped with adequate power cord and sensor cord to connect the pumps to the control panel. Pump motor cords shall be designed for flexibility and serviceability under conditions of extra hard usage and shall meet the requirements of the NEC for flexible cords and cables in sewage pumping stations. Each flexible cable, or cord, shall be provided with a watertight seal and separate strain relief at the motor. The cable entry design shall be such that it insures a watertight and submersible seal. All incoming lead wires shall be spliced in the motor terminal housing. After splicing, the terminal housing shall be filled with epoxy to seal the outer cable jacket and the individual strands to prevent water from entering the motor housing. In lieu of the epoxy seal, a terminal board shall separate the junction chamber and motor. A secondary rubber pressure grommet shall be provided as an additional sealing point and strain relief at the point of cable entry.

C. Pump Lift-Out Assembly: For each pump, the discharge connection elbow shall be permanently installed in the wet well along with the discharge piping. The pump(s) shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection and service. There shall be no need for personnel to enter the wet well. A simple linear downward motion of the pump shall accomplish seating of the pumping unit to the discharge connection. A stainless-steel sliding guide bracket shall be an integral part of the pump unit. Two stainless steel guide rails shall guide the entire weight of the pumping unit. Provide stainless steel lifting chain of appropriate diameter for pump size, length as required for the installation (minimum of 50 feet), for each pump. Provide a stainless-steel hook underneath the access cover for attaching the cables.

2.4 Access Covers

- A. Access covers shall be aluminum, designed and constructed to withstand water intrusion.
B. The doors shall be minimum 14" aluminum tread plate reinforced and attached to the frame with stainless steel hinges. A lock tab for pad locking shall be provided for securing the door closed. A positive guided open-door latch shall engage automatically when door is fully opened to 90 degrees. The open-door latch must be released for closing. A retractable handle shall be provided on the outside of the door to assist opening and closing. Access hatches are to be Halliday Model W1S single leaf or W2S multi-leaf or Owner approved equal. Wet well access shall be multi-leaf to provide adequate access for pumps. All wet well hatches shall be provided with safety grates which allows visual inspection of the wet well with the grate in place. The grate shall have a separate hold open door latch that engages when fully opened to 90 degrees. The door latch shall have a release mechanism. Safety grates and latches shall be made from stainless steel or aluminum and be resistant to sewage, sewer gasses and moisture.
D. Access dimensions shall be adequate for maintenance of equipment, accommodating removal of equipment when necessary.

2.5 Wet Wells, Valve Vaults and Meter Vaults

- A. Construct wet wells of precast reinforced concrete sections. Wet wells constructed of steel are not allowed.
1. Bases shall be one-piece precast base or cast-in-place concrete base section constructed to the dimensions shown on the Drawings and in accordance with ASTM standards. Steel reinforcement shall be as delineated on the Drawings and in accordance with ASTM Standards.
2. Risers shall be precast reinforced concrete riser sections in accordance with ASTM C478, constructed to the dimensions shown on the Drawings and in accordance with ASTM Standards. Riser shall be the same dimensions as the base. Riser steel reinforcement shall be designed for the designated depth of the structure per ASTM standards. At each joint between precast manhole sections, provide a permanent, flexible, watertight, full perimeter external joint wrap in accordance with ASTM C-877, Type I and passing ASTM C-1244 vacuum test. Wrap shall be as manufactured by Mar Mac Construction Products, Inc. or Owner approved equal.
3. Gaskets for sealing precast sections shall be preformed gaskets conforming to Federal Specifications SS-500210, Type I Rope Form, or Kent Seal Mastic.
4. Resilient gasket pipe-to-manhole connectors, manufactured in accordance with ASTM C-923, shall be provided.
5. Risers shall not have through-wall lift holes. All lift holes in precast sections shall be wetted and completely filled with non-shrink grout, smoothed.
6. Top slabs shall be one-piece precast concrete, constructed to the dimensions shown on the Drawings and in accordance with ASTM standards. Top slab steel reinforcement shall be designed for the designated surface load of the structure per ASTM Standards. Manholes exterior shall be coated with bituminous waterproofing material to ensure plastic tightness.
7. Furnish and install manhole steps at 16 inches on center in the valve vault. Provide plastic steps with steel bar reinforcement, as manufactured by M.A. Industries, or equal.
8. Provide a 2-inch minimum PVC drain from the valve vault to the wet well. Equip the drain with a check valve in the wet well to prevent backflow into the valve vault. Slope the floor of the valve vault to drain.
9. Wet Well concrete shall have an antimicrobial admixture.
a. Antimicrobial Admixture: 1 gallon per cubic yard of concrete of ConmicShield® by Conshield Technologies Inc or Owner approved equal. Additive shall be included in the concrete mix design as part of the total water content. The additive shall be added to the concrete mix water to ensure even distribution throughout the concrete mixture.

2.6 Valves

- A. Check valves shall be Swing-Flex Check Valve or Owner approved equal. Valve shall be equipped with a manual backflow actuator for manual backflow operation.
B. Isolation valves shall be resilient seat wedge type with a square actuator nut for operation. Valve shall be designed for wastewater operations. The operating stem for the valve shall extend close to the top of the valve vault. The vault shall be equipped with a manual backflow actuator and centered over the valve nut, so that the valve may be operated from the surface.
1. Manufacturers: Val-Matic, Mueller, Clow, or Owner approved equal.

2.7 Pressure Gauges

- A. Provide a 2-inch saddle tap downstream of where the pump force mains join. Install a 2-inch stainless steel ball valve and a 2-inch x 1-inch stainless steel bushing with a 1-inch stainless steel pipe nipple and a 1/2 in. diameter, 0 to 60 psi, Bourdon tube type pressure gauge with shut-off cocks, as shown on the plans.

2.8 Electromagnetic Flow Meter

- A. The following details apply to the flow meter, if requested.
B. Approved Manufacturers:
1. ABB - Magmaster MFE Series Model
2. Krohne - AquaFlux Model
3. Owner approved equal
C. Furnish and install a pulsed DC electromagnetic flow meter for flow measurement. The flow meter shall consist of a flow tube and a converter, which shall indicate, totalize and transmit flow to a digital recorder. The flow tube shall use a spool piece configuration with field-interchangeable sensors containing coils and electrodes. The flow tube shall not require removal from service in order to repair/replace liners or repair/replace coils. Magnetic flow meters requiring liners will not be acceptable.
D. Provide and install flange adapter in the main line and provide spool piece (left in the meter vault) the length and diameter of the magnetic flow meter.
E. The magnetic flow transmitter shall be furnished with a digital LCD display for flow rate, a six digit totalizer, alarm relays and 4 to 20 mA analog output. The meter shall include digital data logging for a minimum of 60 days.
F. The flow tube shall be EMCO UniMag M carbon steel flanged Flow Tube, furnished with two UniMag sensors for 0.5% accuracy. The flow tube construction shall be suitable for submersible operation with a remote transmitter installation. Each flow sensor shall contain a coil, a pair of sensing electrodes, and an integral grounding electrode. The sensors shall use pulsed DC excitation.
G. The flow tube shall be installed in a meter vault as shown on the plans. The transmitter and digital recorder

- H. shall be installed in the electric control panel specified in these specifications. Provide a minimum 1/3 horsepower, 115 vac sump pump in the meter vault if it cannot be drained by gravity. Provide a water in vault alarm.

2.9 Portable Pump Connections

- A. The valve vault shall contain a 6-inch bypass ductile iron riser that extends above the pad on the valve vault with a cam-loc fitting. Isolation valves for bypass pumping should be accessible from on top of the pad.
B. A 6-inch ductile iron suction pipe shall be installed in the wet well for use in emergency pumping situations. The suction pipe shall be supported off the wall of the lift station and terminate above the pad with a cam-loc fitting.

2.10 Permanent Mounted Bypass Pump (If Required by Owner)

- A. Permanent pump required if lift station has a capacity of 250 gpm or greater.
1. Manufacturer to be Godwin, Thompson or Owner approved equal.
B. Pump shall start automatically via the redundant float backup.

2.11 Control Panel

- A. The control panel(s) shall be constructed in compliance with Underwriter's Laboratories Categories 698A and 913 standards - "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions"
B. While the use of U.L. listed components is encouraged, their use alone and/or the alternate use of a U.L. 508A - "Enclosed Industrial Control Panel" serialized label will not be considered an acceptable or satisfactory alternate to the "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions" serialized label specified above.
C. Upon request from the Owner, the Contractor shall supply documentation from the control panel manufacturer to the Owner demonstrating that the manufacturer is a U.L. recognized manufacturing facility for the type of equipment required. Only the labeled products of U.L. 698A and 913 "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions" recognized panel manufacturer shall be considered acceptable.
D. Provide a NEMA 4X, 14 gauge, stainless steel enclosure with dead front door. Enclosure shall be of appropriate dimensions for the equipment provided. All hardware and hinges shall be stainless steel. Chassis plates shall be 12" grade 6061-T6 aluminum. Each door shall have a drip shield, continuous hinge door with 3-point latching mechanism. The latching mechanism shall be a lever type locking device (lockable exterior door), no screw down clamps shall be allowed to secure door. The enclosure shall have a separate section for controls as described below. Reserve 12 inches below each enclosure for conduit entrance. The panel shall be supplied by pump manufacturer, or Owner approved equal.

E. Provide the following equipment in the power section of the enclosure:

- 1. Main circuit breaker or disconnect.
2. Branch circuit breakers for each pump motor.
3. NEMA Size motor starters with Type 10 overload relays for each pump motor.
4. Low voltage relay for single phase electrical service applications or phase failure relay for three phase electrical service applications, each with integral surge protection, to provide motor and control equipment protection in the event of low voltage, voltage unbalance, phase loss, or phase reversal.
5. Phase/Voltage monitor.
6. Lightning Arrestor.
7. Incoming power terminal block.
8. Ground fault interruption protection shall be provided to de-energize the circuit in the event of any failure in the electrical integrity of the cable to each motor.
9. LED Panel Light
10. Site lighting circuit breaker
11. Control Power Transformer with Primary Fuses.
12. Control Power Circuit Breaker and Fuse.
13. Motor heat sensor circuits.
14. Individual pump Ammeter.

F. Provide the following equipment in the control section of the enclosure:

- 1. Telemetry Circuit, 15A, single pole circuit breaker 120V GFI
2. Spare Circuit 20A, single pole circuit breaker and 20A, 120V GFI duplex receptacle.
3. Control Circuit, 15A, single pole circuit breaker for controls.
4. Circuit breakers as required for all other power needs.
5. Level controller with isolation transformer.
6. Hand-Off-Automatic (H-O-A) switches for each pump.
7. Run lights (green) push-to-test for each pump.
8. Run failure lights (red) push-to-test for each pump.
9. Seal failure lights (amber) push-to-test for each pump.
10. Elapsed time meters (9999.9 hours) for each pump.
11. Primary transducer, intrinsically safe, 4-20 Ma output
12. Back-up float control relay intrinsically safe, to automatically operate the pumps in the event of level controller failure. This relay shall also activate the high water alarm and alarm light.
13. Panel heater with thermostat.
14. Omni-site Crystal Ball Micro RTU, Wireless Alarm Monitor, with 12V DC power supply and battery backup, if requested by Owner.
15. A digital data logger shall be installed in the control cabinet, if requested by Owner.
16. Magnetic flow meter transmitter for use with remotely mounted Magnetic flow tube, if requested by Owner. Provide 120 vac, 1 pole, 15 amp circuit breakers for the flow transmitter, if requested by Owner.
17. Red alarm light, test push button (NO HORN).
18. 22 mm LED Indicating Lights, NEMA Type 4x4x13 IP66 suitable for wash down environments.
19. 22mm oil light lenses.
20. ETM's (Elapsed time meters)
G. Solderless, marked terminals shall be used for control wiring. Mount control devices on the inner door within the enclosure. The seal failure sensor shall be wired to relays to activate seal failure lights. The heat sensing thermostat in the motor windings shall be wired in series to the motor starters.
On the outside of the enclosure mount the following:
1. High Water Alarm LED Light, red in color.

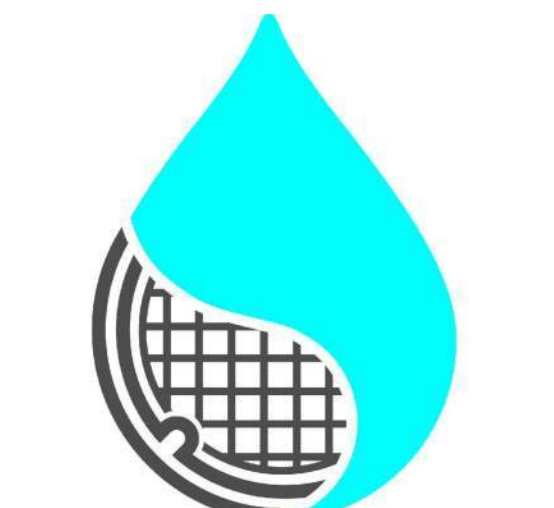
2.12 Pump Station Controller

- A. Furnish a NE250 (VFD pump controller) or NE152 (non-VFD pump controller) general-purpose pump controller designed to control up to 2 pumps in pump down applications. The controller shall have an integral programmable logic controller (PLC) and human machine interface (HMI) unit in one. It sequences pumps on and off in response to changes in level, pressure, or flow. The primary sensor input is a 4 to 20 mA current loop, which can be connected to any sensor which has a 4 to 20 mA output connected to a pressure transducer. The controller also allows for a float backup system.

It is the intention of this specification that a standard controller be provided, with all the control and communications features described as a fully integrated assembly. The controller shall be manufactured by N.E. Controls LLC (315) 299-5161 <https://www.neccontrols.com/> (7048 Interstate Island Rd Syracuse, NY 13209) or Owner approved equal.

- B. The pump controller shall be a standard, catalogued product of a water and wastewater pumping automation equipment manufacturer regularly engaged in the design and manufacture of such equipment. The PUMP CONTROLLER shall be specifically designed for wastewater pumping automation utilizing built-in preconfigured control and telemetry strategies allowing pump up or down mode pump control of 1 to 2 pumps. "One of a kind" systems using custom software with a generic programmable controller will not be acceptable.
C. The pump controller shall be able to operate on either 120 AC or 10-30 VDC power sources. The unit shall be battery backed to provide continued system monitoring and alarm announcement in the event of primary power failure. Unit shall have built in battery charging circuitry to maintain and charge battery. Battery shall be sized to provide a minimum of 4 hours of backup power. Backup up battery power will extend to necessary process sensors, local alarm lights, horns and telemetry equipment. A power on LED shall be built on board providing local indication that power is available to the unit.
D. The pump controller shall be furnished with a user-friendly touchscreen operator interface allowing adjustment and viewing of all system parameters and status. The operator interface shall be NEMA 4X rated suitable for front door mounting including locations requiring wash-down and moisture protection.

- 1. The process variable signal, pump 1, 2 on/off and high & low set points, shall be displayed simultaneously via front panel mounted long lasting Ultra Bright LED bar graphs. These bar graphs shall be vertically mounted in parallel fashion to provide relational viewing of all set points vs. the measured process. Each display column shall have a minimum of 40 segments of resolution. Each set point column shall have a status LED mounted on top of the associated set point providing indication of set point activation status. Units that require operator action to view the above parameters are not acceptable.
2. To assure the highest resolution and accuracy, the process display shall be configured to display the full range of the actual measure process. Range can also be offset allowing display of a pressure or level range that does not start at zero. The display ranges shall



HENDRICKS COUNTY REGIONAL SEWER DISTRICT

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SPECIFICATIONS



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ISSUANCE INDEX table with columns: DATE, 04/30/2021

REVISION SCHEDULE table with columns: NO., DESCRIPTION, DATE. Includes revisions for sheet added, air release valve, and updated testing requirements.

Project Number 2000.00103

STANDARD LIFT STATION SPECIFICATIONS

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HENDRICKS COUNTY REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

SPECIFICATIONS



K. S. Sankar
CERTIFIED BY

| ISSUANCE INDEX | |
|----------------|------------|
| DATE: | 04/30/2021 |

| REVISION SCHEDULE | | |
|-------------------|---|------------|
| NO. | DESCRIPTION | DATE |
| 1 | SHEET ADDED | 12/10/2018 |
| 3 | REVISIONS TO AIR RELEASE VALVE LATERAL CONNECTION TO EXISTING SEWER | 01/03/2019 |
| 4 | DETAIL AND LIFT STATION SPECIFICATIONS UPDATE | 01/21/2021 |
| SPECIFICATIONS | | |
| 1 | UPDATED TESTING REQ PER IDEM COMMENTS | 01/20/2017 |
| 2 | UPDATED TESTING REQ PER IDEM COMMENTS | 12/10/2018 |
| 3 | GENERAL REVISIONS | 01/03/2019 |
| 4 | ASTM REFERENCE | 08/05/2019 |

Project Number 2000.00103

STANDARD LIFT STATION SPECIFICATIONS

02

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be field configurable.

3. System Pump On/Off and Alarm set point parameters shall be easily adjustable via individual up and down pushbutton arrows located next to the associated set point display column(s).

4. The unit shall have a built-in process simulation capability allowing the operator to verify system operation by forcing the process variable up or down via pushbutton arrows located next to the process display. To prevent accidentally leaving the unit in simulation mode, the PUMP CONTROLLER shall be configured to automatically restore monitored process display within 2 minutes after last keypad usage or immediately upon operator initiated restore.

5. The display unit shall incorporate a high contrast LCD panel allowing for viewing of higher level functions including the following:

- Process display to XX.X of the full scale process range.
- Time and Date Stamped Alarms & Events
- Pump Statistics (Including Run Time, Number Of Starts, Daily Average Number Of Starts)
- System diagnostics
- Controller Security
- Unauthorized Station Entry Detection

E. The pump controller shall provide on board 24 VDC loop power output for external loop powered sensor. A built-in Analog Supply Voltage Status LED shall indicate availability of loop power. Unit shall be able to monitor a user selectable - 4.20 mA or 0-10 Volt analog input representing the process to be controlled. The analog digital conversion shall not be less than 16 bit to allow accurate measurement of the process variable. The analog input circuitry shall provide optical isolation from the main board to the field device. A minimum of 1000 volts electrical isolation shall be required. The analog process signal shall be displayed locally via 40 segment vertical LED display and the LCD digital display as specified above. This signal shall also be available for telemetry transmission.

F. The pump controller shall have the ability to monitor up to 16 digital inputs to be used to provide monitoring of local station status. Each discrete input shall provide optical isolation from the main board to the field device. A minimum of 1500 volts electrical isolation shall be required. An on board LED shall be provided indicating that digital input isolation is not compromised. All discrete inputs shall be available for telemetry transmission. The following inputs shall be monitored:

- Pump 1, 2 Run - This signal shall be used to provide local display of pump run status, pump total run time, and pump average daily starts for each pump.
- Pump 1, 2 In Auto - This signal shall be used by the controller to determine pump availability. A pump in this mode cannot be called into operation.
- Pump 1, 2 High Temperature/Seal Failure - This signal shall be used by the controller to disable the pump required when a High Temperature is the cause of the failure, and provide local alarm display. Controller shall be able to differentiate alarm. A seal failure shall not disable pump operation.
- High & Low Float/Pressure - This signal shall be used by the controller to provide back up control of the pumps in the event of primary (analog) sensor failure.
- Pump Inhibit - This signal shall be used by the controller to inhibit pumps from operating.
- Power Quality - This signal shall be used by the controller to disable pumps in the event incoming station power is unsuitable for use as determined by an optional external power monitoring device.
- Alarm Silence - This signal shall be used by the controller to monitor an optional external silence push button and will temporarily disable the alarm horn output.

G. The pump controller LCD shall operate in a manual scrolling menu mode with the manual displays shown in sequence as selected by the keypad's up/down arrow keys. The display shall indicate the specific function entered on the keypad to confirm that selection of a particular output or other function from the keypad during adjustment or review routines.

H. The pump controller shall provide outputs for interface to local pumps and alarm annunciation equipment. Relay isolated contact outputs for activation of Pump 1 and Pump 2, Common Alarm shall be provided. Each contact shall be rated for a minimum of 10 amps at 120 VAC or 5 Amps at 240 VAC. Open collector outputs for Low and High Level Alarm shall be provided for interface to off board monitoring equipment. Open collector outputs shall have a minimum operating range of 5-30 VDC @ 100 mA.

I. The pump controller shall provide 4-20 mA output signal for interface to external equipment including VFDs, flow meter or other monitoring devices. Analog output can be configured to provide output representing process variable for retransmission or as a process control output for interface to VFDs, valves, or other process-controlled device.

J. The pump controller shall support contact closure inputs from float or pressure switches representing high and low (Level/Pressure). The pump controller shall annunciate these inputs as alarms and use them to provide back up control in the event the primary (analog) sensor fails. Unit will provide local alarm indication and utilize the inputs to cycle pumps on and off to maintain system operation.

K. The pump controller shall include built-in pump failure detection logic. In the event the pump has been called into operation and the pump run signal is not received within a pre-adjustable time period. A motor failure shall be produced. The failed motor shall be disabled, an alarm shall be displayed and the next available pump based on the selected alternation sequence shall be requested to start.

L. PUMP CONTROLLER shall provide pump performance related information. Pump station performance data shall be viewable locally through built in LCD or available for telemetry transmission to master station. The following information is to be provided:

- Pump 1, 2 Low Flow Rate Alarm (Set point) - each pump
- Pump 1, 2 Run Time - each pump
- Pump 1, 2 Number Of Starts - each pump
- Pump 1, 2 Average Number Of Starts - each pump

M. All connections shall be made via plug-in terminal blocks with a minimal rating of 10 amps, 300 volts and capable of accepting 30-12 AWG wire.

2.13 Level Device System

A. The liquid level of the wet well shall be sensed by a submersible level pressure transducer device. The level device shall be Dwyer Instruments, Inc. PBLTX-5-50-PU or Owner approved equal.

B. The level device shall be provided with a 50 foot cord.

C. The level device assembly shall be installed where directed by the Engineer and connected with other system elements and placed in successful operation.

D. The control panel shall include a UL Listed intrinsic safety barrier that has been UL tested with the specific submersible level device furnished for this application to render the level device suitable for use in Class I, Division 1 or 2, Groups A, B, C and D; Class II, Division 1 or 2, Groups E, F and G; and Class III, hazardous locations (which includes a sewage wet well).

2.14 Redundant Float Back-up

A. An independent high level alarm and redundant pump control capability with features as hereinafter listed shall be provided in addition to the specified primary control system. It shall be powered by a 120 VAC circuit breaker.

B. The high level alarm shall be a float system that activates when the float rises 45-degrees.

C. The independent alarm/control panel equipment shall be designed to UL Industrial Control Panel standards and shall incorporate 120 VAC input power transient protection, a fused primary and a DC power supply with limited 12 VDC to power the intrinsic safety barrier level sensing float circuit(s). The front face of the controller accessible through the operator's door and shall incorporate four red LED indicators; a "control hold" LED, a redundant control "turn on" LED, a high level alarm/monitor LED, a "control contacts" energized LED and a pump "off delay" time control adjustment with a 0-5 minute range.

D. The controller shall operate in conjunction with necessary direct-acting float switches (as specified elsewhere) to provide back up control of lift pumps, detection of high level and to protect the pumps from damage that may result from low wet well levels. The system shall monitor the float switch inputs and provide local indication of system operation via LEDs. Built in relay contacts shall be interfaced to alarm circuitry and pump motor starter pilot circuitry. The backup system shall not interfere with primary controller operation when wet well levels are within normal operating range. The backup system will only become active, and bypass the primary control and sensor system and assume full control, in the event wet well levels go outside of normal operating range. Back up sensors shall be mounted and configured to operate outside primary controller set point settings.

E. Upon detection of abnormally high wet well level the backup system shall provide independent dedicated high level alarm indication and contact closure output for activation of common alarm system. The backup system shall also provide independent dedicated control output active indication and dual isolated outputs suitable for direct interface to motor starter pilot circuits to activate both lift pumps. The high level alarm signal shall be deactivated upon lowering of wet well level below the high alarm sensor. The pumps will remain on until wet well level drops below a separate pump off sensor. Pump off sensor shall be mounted at a level that is below the normal operating range of the primary controller set point setting.

F. The contractor shall furnish, install, and wire the float switches as shown on the drawings. Each float shall have molded polyethylene body, internal redundant polyurethane foam flotation, potted switch and cable connections and fine-stranded AWG #18 cable with heavy-duty synthetic rubber jacket in lengths as required to run unspliced to the control panel. The floats shall include internal weight allowing suspended operation without the use of special pipe or suspension mounting systems.

G. Float switches shall be provided by the control panel supplier. They are to be a catalogued item of the

control panel manufacturer. The float bracket shall be made of stainless steel.

2.15 Alarm/Data Monitoring

A. A microprocessor-based monitor unit shall be provided for monitoring and control of the lift station based on alarm contact closures, universal voltage input signals, 4-20mA signals and relay outputs.

B. The microprocessor-based monitor shall be a standard, catalogued product of a water and wastewater equipment manufacturer regularly engaged in the design and manufacture of such equipment. The pump/alarm monitor shall be specifically designed for wastewater pumping automation utilizing standard hardware and software. "One of a kind" systems using custom software with a generic programmable controller or pieces from many manufacturers that are "integrated" together will not be acceptable. The controller shall be Crystal Ball™ as mfg. by Omni-site, Inc. or Owner approved equal.

C. The controller shall accept (14) universal DI configurable to monitor dry contacts or any voltage range between 12VDC/VAC to 120 VAC/VDC or to act as pulse counters; (4) 4-20 mA isolated analog inputs, (4) 20 amp relay outputs, (1) rain gauge input, and (1) crew on-site intelligent key reader input in its base form, and the ability to monitor up to two IP enabled infrared cameras. It shall have Phoenix type removable terminal blocks. One additional expansion I/O module can be added providing an additional (10) universal DI voltage inputs, and (4) 4-20mA inputs.

D. Gel Cell Battery: On-board 12VDC, 800mAh gel cell battery provides backup for up to 24 hours in the event of power loss. Battery is automatically recharged using temperature compensated floating battery charging circuit.

E. The controller shall monitor and transmit the following points:

- Power Fail
- High Wet well Level
- Bypass Pump Run
- Bypass pump Fail
- Pump 1 Seal Fail
- Pump 2 Seal Fail
- Pump 1 Run
- Pump 2 Run
- Pump 1 Thermal Fault
- Pump 2 Thermal Fault
- Pump 1 Elapsed Time
- Pump 2 Elapsed Time
- Float Backup Mode
- Pump 1 Amp Draw
- Pump 2 Amp Draw Level
- Pump Station Flow
- Level Device Fail
- One (1) year cellular service thru Omni-site/Verizon shall be included with each unit.

2.16 Additional Electrical Materials

A. Grounding for chain link fence shall consist of 3/4 inch diameter by 10 feet long copper clad steel ground rods connected to each corner post with minimum No.6 copper bonding jumpers, also used to tie each mesh fence section to its adjacent post and horizontal bottom and top support pole section. Each of the gates mesh fence sections shall be tied to its respective horizontal and vertical support poles. The hinged side vertical support pole of each gate section shall be tied to its adjacent fence post with a flexible No.6 copper bonding jumper. The fence grounding system shall be bonded to the electrical service ground triangle.

B. The ground triangle for service entrances and all equipment shall be constructed of three 3/4 inch diameter x 10 feet long copper clad steel ground rods bonded together with a minimum No.6 bare copper conductor, (typical for 100 amp service, larger services require larger grounding/bonding conductors) attached to each ground rod with utility company approved ground clamps or exothermic weld. Resistance to ground shall be 10 ohms or less.

C. Electrical conductors shall be solid or stranded copper, rated for 600 vac, with type THHN-THWN or XHHW insulation.

D. Instrumentation cable shall be two conductor No. 16 awg twisted pair, stranded copper conductors with PVC insulation, aluminum polyester or aluminum mylar tape shield, or braided copper shield, tinned copper drain wire, black PVC overall jacket, 300 v working class.

E. The lift station pumps-metal and wet well level device and float switches control junction boxes shall be aluminum or non-metallic, NEMA 4X, single door enclosures, capable of being padlocked. The pumps power junction box shall have an aluminum isolation divider providing a section of the junction box for control and low voltage sensor control wiring.

2.17 Site Requirements

A. Concrete Pad: Contractor shall install a concrete pad around the wet well and valve vault as shown in the most recent HCRSD standard detail.

B. Fence: Contractor shall install a chain-link fence around the lift station site with a vehicle-access gate as manufactured by Merchants Metals, www.merchantsmetals.com or Owner approved equal.

- Steel chain link fabric: 6-foot high, Class 2b fused and adhered, 2" or tighter, 9 gauge core, green, knuckle/twist selvage.
- Round steel pipe fence framework: Round steel pipe and rail: Cold-rolled electric-resistance welded pipe in accordance with ASTM F1043 Materials Design Group IC (LG-40), minimum steel yield strength 50,000 psi. Type B external coating, hot dip galvanized zinc 0.9 oz./ft² with a clear polymeric overcoat, Type D interior 90% zinc-rich coating having a minimum thickness of 0.30 mils.
 - Line post: 1.900" min. - 2.375" max. LG-40
 - End, Corner, Pull post: 2.875" min. LG-40
 - Top, brace, bottom and intermediate rails, 1.660 in. OD: LG-20 or heavier.
- Tension Wire: COLORBOND® Polymer Coated Steel Tension Wire: 7 gauge core (0.177 in.) wire complying with ASTM F1664. Match color to that of the chain link fabric. Class 2b, fused and adhered.

d. Fittings

- Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (0.105 in.), minimum width of 3/4 in. and minimum zinc coating of 1.20 oz/ft². Secure bands with 5/16 in. galvanized steel carriage bolts.
- Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft².
- Tension Bars: In compliance with ASTM F626. Galvanized steel one-piece length 2 in. less than the fabric height. Minimum zinc coating 1.2 oz./ft². Bars for 2 in. and 1 3/4 in. mesh shall have a minimum cross section of 3/16 in. by 3/4 in.

e. Tie Wire and Hog Ring: Polymer coated COLORBOND®, match the coating, class and color to that of the chain link fabric.

f. Swing Gates: Galvanized steel pipe welded fabrication in compliance with ASTM F900. Gate frame members 1 1/2 in. OD LG-20 or heavier. Frame members spaced no greater than 8 ft. apart vertically and horizontally. Welded joints protected by applying zinc-rich paint in accordance with ASTM Practice A780. DAC Strong Arm gate latch, pressed steel galvanized after fabrication. Galvanized malleable iron or heavy gauge pressed steel post and frame hinges. Gate fabric is to match that of the described fence system. Gate Post, both hinge and latch, are to be no less than 2.375 in. in diameter for gate widths up to and not exceeding 48" in width. Hinge post for single gates wider than 4' and not exceeding 5' in width are to be no less than 4 in. in diameter. All post weights is to be no less than LG-40. COLORBOND® Polymer coated gate frames and gateposts; match the coating type and color to that specified for the fence framework.

g. Concrete: Concrete for post footings shall be wet mixed and poured. No less than a 4,500 psi mix is to be used on all posts.

PART 3 - EXECUTION OF THE WORK

3.1 General

A. Refer to HCRSD Standard Specifications for Sanitary Sewer for applicable requirements regarding site preparation, sewer and water separation requirements, trench excavation and maintenance, bedding and backfill, pipe laying and site cleanup and restoration.

B. Install lift station, alarms and controls in accordance with manufacturer's instructions and applicable standards. Equipment and wiring shall be installed in a neat, workman-like manner by skilled workers. Conduits shall be rigidly supported.

C. All wires shall be labeled.

3.2 Electrical Work

A. Perform all electrical work as required for the installation of all electrical and process equipment as indicated in these specifications.

B. All electrical work shall be performed in a neat and workman like manner in accordance with the provisions of The National Electrical Code (NEC), the guidelines of The National Electrical Safety Code (NESC), and the installation standards of The National Electrical Contractors Association (NECA), and applicable local codes.

C. All conduit above ground shall be Aluminum Electric Metallic Tubing (EMT) conduit. All conduit below

ground shall be heavy wall PVC. Minimum conduit diameter shall be 1/2 inch.

Junction Boxes

1. Separate junction boxes shall be provided for pumps power/sensor cables and for wet well level device and float switch control cables.

2. The lift station control enclosure shall be protected by explosion proof epoxy conduit seal off fittings located in the conduits from the pumps power/sensor junction box and from the controls junction box to the lift station control panel enclosure, to prevent the atmosphere of the wet well from gaining access to the lift station control panel. This allows for the disconnection and removal of any of the pumps, the wet well level device or any of the float switches without disturbing the seal. The conduits from the pumps power/sensor cable junction box and from the wet well level device and float switches junction box to the wet well shall be sealed with OZ-Gedney type CSBG conduit seal fittings.

3. Pump power/sensor cable in conduit shall be installed from the wet well to the pumps power/sensor cables junction box for each pump. Pump power conductors shall be installed in conduit from the power/sensor cables junction box to the lift station control enclosure for each pump. Pump sensor conductors shall be installed in conduit from the power/sensor cables junction box to the lift station control enclosure for each pump. Conduits shall be a minimum of 4-inch for power lines to the pumps. All conductor to cable terminations in the pumps power/sensor junction box shall be made with waterproof connections.

4. Wet well level device cable in conduit shall be installed from the wet well to the controls junction box. Wet well level device conductors shall be installed in conduit with epoxy conduit seals from the controls junction box to the lift station control enclosure. Float switch cables (4) shall be installed in conduit from the wet well to the controls junction box. Float switch conductors shall be installed in conduit with epoxy conduit seals from the controls junction box to the lift station control enclosure. All conductor to cable terminations in the controls junction box shall be made with waterproof connections. Additional float switch cables from the wet well to the controls junction box may be installed in the same conduit as the wet well level device cable.

5. Individual conduit with sump pump power conductors and an individual conduit with manufacturer's flow transmitter interconnecting cable shall be installed from the lift station control enclosure to the valve and flow meter vault as needed. These conduits shall be equipped with explosion proof conduit seal-off fittings prior to entering the lift station control enclosure.

6. All explosion proof conduit seal-off fittings shall be properly sealed to exclude the wet well atmosphere from the interior of the lift station control enclosure.

E. Manual Transfer Switch

1. The conduit between the manual transfer switch and the lift station control enclosure shall be Aluminum Electric Metallic Tubing (EMT) conduit.

F. Main Disconnect Switch

1. The lift station main fused disconnect shall be a heavy duty fused switch in a NEMA 4X enclosure.

G. Install the lift station control enclosure on a control panel rack per detail.

3.3 Pumps

A. Set pump discharge elbows level and plumb for proper pump operation. Install guide rails plumb to prevent binding of pump upon removal.

B. Install piping plumb and level. Support valves and piping in wet well and valve vault as indicated in the standard details.

3.4 Fence

A. Install fence per manufacturer's instructions.

3.5 Lift Station Testing

A. The force main and all gravity sanitary sewers constructed as part of the project shall have passed all required tests prior to the startup and final acceptance of the lift station.

B. Wet Well Leakage Testing: All wet wells shall be watertight and free from leakage. The wet well shall be visually inspected for leakage by the Owner after assembly and backfilling. All dewatering activities shall be ceased a minimum of eight (8) hours prior to the leak testing. If the wet well shows signs of leakage, it shall be repaired to the satisfaction of the Owner and re-inspected.

C. All equipment testing shall be observed by the Owner during the lift station's final inspection. Partial testing will not be accepted. The testing must be done on the complete lift station. It is not the Owner's responsibility to engage in ANY activity or supply ANY equipment to test and/or accept the lift station. The Contractor shall provide the clean water to run the pumps and perform all tests. The startup and final inspection shall be as follows:

- The waiting period shall be after BOTH of the following:
 - AFTER the force main, gravity sewers and manholes constructed as part of the project have passed all required tests
 - AFTER ALL equipment has been installed, been determined to be in working order by the Contractor and manufacturer and been previously tested by the manufacturer.
- Equipment: The Contractor or manufacturer shall provide all necessary equipment to safely complete all the tasks necessary to test and accept the lift station.
- Testing Procedures: A lift station checklist provided by the Owner shall be completed during the start-up and final inspection. The test shall verify all equipment performs in accordance with the design and the requirements of this Specification. Procedures for each component shall be determined by the Owner at the time of startup. At a minimum, the following shall be tested:
 - Pumping rate for all pumps in gpm;
 - Communications equipment;
 - Controller;
 - All electronic equipment;
 - All mechanical equipment;
 - All instrumentation and control equipment;
 - Incoming power;
 - The overall operating condition of the lift station; and
 - Any other test the Owner deems necessary.
- Calibration: All measuring equipment supplied for the lift station shall be calibrated prior to acceptance. Calibration test results shall be made available upon request. The measuring equipment shall include at a minimum the following:
 - Level Devices;
 - Flow Meters;
 - Gauges; and
 - Other equipment as deemed necessary by the Owner.
- Determination of Lift Station Acceptance: If the station performs to the satisfaction of the Owner, as designed, and per the requirements of this Specification, the lift station shall have passed the test.
- Determination of Lift Station Failure: If the station does not perform to the satisfaction of the Owner, as designed, and per the requirements of this Specification, the lift station shall have failed the test. The Contractor shall be required to correct all deficiencies and retest.

3.6 Pump Warranty

A. Pump warranty shall be provided by the pump manufacturer and shall warrant the units against defects in workmanship and materials for a period of five (5) years under normal use, operation and service. The warranty shall be in printed form and apply to all similar units. A copy of the warranty statement shall be submitted with the approved shop drawings.

3.7 Lift Station Warranty

A. Warranties for lift station and all equipment, except for the pumps, shall be three (3) years from the date of acceptance.

3.8 Post Construction

A. Refer to HCRSD Standard Specifications for Sanitary Sewer Construction Part 3 Paragraph 3.11 for post construction requirements, in addition to the following:

B. Record drawings to include field location and elevation of all above ground improvements, including but not limited to wet well, valve vault and meter vault rims, driveway and parking area, concrete slabs, buildings and enclosures, fencing and other above ground improvements.

C. Record drawings to include actual float switch elevations.

D. Record drawings to include wet well, valve and meter vault inside diameters and bottom elevations.

E. Testing to include testing pumps, controls and alarms in accordance with manufacturer instructions, to include one full pump cycle of each pump and each alarm as a minimum.

F. Spare parts as recommended by manufacturer(s).

Critical Design Criteria for Low Pressure Grinder Pump System Construction:

1. The Design Engineer shall submit a low pressure system service area map.
2. HCRSD will make the determination as to the need for improvements to downstream sanitary sewer facilities. Early coordination is recommended to eliminate delays during design.
3. Low pressure grinder pump systems (LPGPS) will only be considered in areas where sanitary sewers currently serve the surrounding areas and where conventional sanitary sewer facilities cannot be constructed.
4. Design Engineer shall submit LPGPS calculations per the manufacturer's recommendations including: calculation worksheet, individual pump curves, and make and model number of pumps.
5. Force main shall be designed per HCRSD Standards for Sanitary Sewer Construction.
6. The Utility shall be responsible for the operation and maintenance of the common force main and the portion of the lateral from the common force main to, and including, the shutoff valve.
7. The Customer/Homeowner shall be responsible for all piping, pumping equipment, and appurtenances between the building and the shutoff valve.
 - a. Customer/Grinder Pump Owner is responsible for all future maintenance and replacement of grinder pump.
8. Manuals and warranty shall be provided to the Grinder Pump Owner (Customer).

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The contractor shall furnish and install a complete factory-built and tested Grinder Pumps Stations, each consisting of a grinder pump suitably mounted in a basin constructed of high density polyethylene (HDPE), electrical quick disconnect, pump removal system, shut-off valve, anti-siphon valve, and check valve assembled within the basins, electrical alarm/disconnect panel, and all necessary internal wiring and controls. All equipment specified herein and, and shown on the Drawings shall also be provided.

1.2 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 1. The equipment specified shall be a product of a company experience in the design and manufacture of grinder pumps for specific use in low pressure sewage systems. The company shall submit detailed installation and user instructions for this product; submit evidence of an established service program including complete parts and service manuals, and be responsible for maintaining a continuing inventory of grinder pump replacement parts.

2. The manufacturer shall provide a reference and contact list from three of its largest contiguous grinder pump installations.

1.3 SUBMITTALS

- A. Submit shop drawings for review by the Engineer showing the following:
 1. Complete description in sufficient detail to permit an itemized comparison with the specifications.
 2. Dimensions and installation requirements.
 3. Descriptive information including manufacturers' catalog cuts and specifications for all components.
 4. Electrical schematics and layouts.
 5. Hydraulic calculations demonstrating compliance with the specified hydraulic characteristics.

PART 2 - PRODUCTS

2.1 MANUFACTURER

Grinder pump station shall be Model DH071/DR071 as manufactured by Environment One Corporation, Niskayuna, New York; Zoller 810 PG pump as manufactured by Zoller Pump Company, or approved equal.

2.2 GENERAL REQUIREMENTS

A. PUMP: The pump shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet and 9 GPM against a rated total dynamic head of 138 feet. The pump must also be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping of valving be allowed to create a false apparent head. The material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance.

B. GRINDER: The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder will be of the rotating type with a stationary hardened and ground stainless steel shredding ring spaced in close annular alignment with the driven impeller assembly, which shall carry two hardened type 400 series stainless steel cutter bars.

- a. This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks

which would impair the operation of the pump.

- b. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.
- c. ELECTRIC MOTOR: As a maximum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with a low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application.

D. MECHANICAL SEAL: The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

E. TANK AND INTEGRAL ACCESSWAY: The tank shall be made of fiberglass or high density polyethylene, with a melt index of 2.0 grams/10 minutes or lower to assure high environmental stress cracking resistance.

- a. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. Corrugations of the outside wall are to be of a minimum amplitude of 1 1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be a minimum .250 inch thick. All seams created during tank construction are to be thermally welded and factory tested for leak tightness. Tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.
- b. The grinder pump station tank shall have an optimum capacity of 70 gallons.

- c. The accessway shall be an integral extension of the wet well assembly and include a lockable cover assembly mounting and watertight capability. Accessway design and construction shall enable field adjustment of station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

d. The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations shall be acceptable.

e. All discharge piping shall be constructed of 304 Series Stainless Steel and terminate outside the accessway bulkhead with a stainless steel, 1 1/4 inch female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 200 psi WOG; PVC ball valves will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

f. The accessway shall include a single NEMA 6P electrical quick disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. The accessway shall also include a 2 inch PVC vent to prevent sewage gases from accumulating in the tank.

F. CHECK VALVE: The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure. The valve body shall be an injection molded part made of glass filled PVC. Ball type check valves are unacceptable due to their limited sealing capacity in slurry applications.

- a. Each grinder pump installation shall also include one separate check valve of the type manufactured by Environment One



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SPECIFICATIONS



Kevin C. Sauer
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| 1 | SHEET ADDED | 12/10/2018 |
| 3 | REVISIONS TO AIR RELEASE VALVE LATERAL CONNECTION TO EXISTING SEWER | 01/03/2019 |
| 4 | DETAIL AND LIFT STATION SPECIFICATIONS UPDATES | 01/21/2021 |
| SPECIFICATIONS | | |
| 1 | UPDATED TESTING REQ PER IDEM COMMENTS | 01/20/2017 |
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Corporation or Approved Equal for installation in the 1 1/4" service lateral between the grinder pump station and the sewer main, preferably next to the curb stop.

G. ANTI-SIPHON VALVE: The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of 300 series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from a glass-filled thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices, due to their tendency to clog from the solids in the slurry being pumped.

H. CONTROLS: All necessary controls, including motor and level controls, shall be located in the top housing of the core unit. The top housing will be attached with stainless steel fasteners.

a. Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The level detection device shall have no moving parts in direct contact with the wastewater. High-level sensing will be accomplished in the manner detailed above by a separate air-bell sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and High-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices.

b. To assure reliable operation of the pressure switches, each core shall be equipped with a breather assembly, complete with a suitable means to prevent accidental entry of water into the motor compartment.

J. ALARM PANEL: Each grinder pump station shall include a NEMA 4X, UL listed ALARM PANEL suitable for wall mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic to assure corrosion resistance. The enclosure shall include a hinged, lockable cover, padlock, and secured dead front.

1. The Alarm Panel shall include the following features: audio & visual alarm, push-to-run switch, and high

level (redundant) pump starting control. The alarm sequence is to be as follows:

2. When liquid level in the sewage wet-well rises above the alarm level, visual and audio alarms will be activated. The contacts on the alarm pressure switch will close. The redundant pump starting system will be energized.
3. The audio alarm may be silenced by means of the externally mounted, push-to-silence button.
4. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.
5. The entire Alarm Panel as manufactured, shall be listed by Underwriters Laboratories, Inc.

K. SERVICEABILITY: The grinder pump core unit shall have two lifting hooks complete with nylon lift-out harness connected to its top housing to facilitate easy core removal when necessary. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. A push-to-run feature will be provided for field trouble shooting. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

L. OSHA CONFINED SPACE: All maintenance tasks for the grinder pump station must be possible without entry into the grinder pump station (as per OSHA 1910.146, permit-required confined spaces). "Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space."

M. SAFETY: The Grinder Pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired Grinder Pump Station shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use. UL listing of components of the station, or third-party testing to UL standard will not be acceptable.

a. The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to

perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the seal of NSF International. Third-party testing to NSF standard will not be acceptable.

- C. The services of a trained factory-authorized technician shall be provided for two days.
- D. Upon completion of the start-up and testing, the CONTRACTOR shall submit to the ENGINEER the start-up authorization form describing the results of the tests performed for each Grinder Pump Station. Final acceptance of the system will not occur until authorization forms have been received for each pump station installed and any installation deficiencies corrected.

PART 3 – EXECUTION

3.1 FACTORY TEST

1. Each grinder pump shall be submerged and operated for 5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge assembly and each unit's dedicated level controls and motor controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field, shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps will not be acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two (2) different points on its curve, with the maximum pressure no less than 60 psi. The ENGINEER reserves the right to inspect such testing procedures with representatives of the OWNER, at the GRINDER PUMP MANUFACTURER'S facility.

2. All completed stations shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets etc.).

3.2 INSTALLATION

A. CONTRACTOR shall install grinder pump units in accordance with the MANUFACTURER'S Drawings, shop drawings and instructions.

3.3 START-UP AND FIELD TESTING

A. The MANUFACTURER shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests, and instruct the OWNER'S (Customer) personnel in the operation and maintenance of the equipment before the stations are accepted by the OWNER (Customer).

B. All equipment and materials necessary to perform testing shall be the responsibility of the INSTALLING CONTRACTOR. This will include, as a minimum, a portable generator (if temporary power is required) and water in each basin.



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