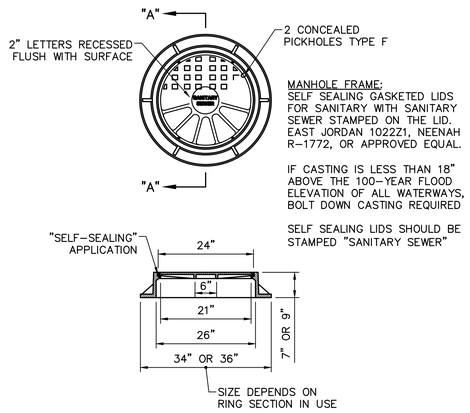
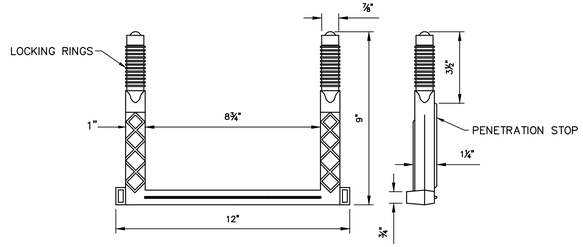


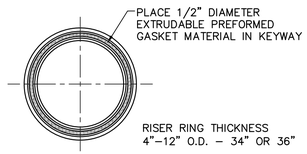
SANITARY SEWER MANHOLE FRAME AND COVER
NOT TO SCALE



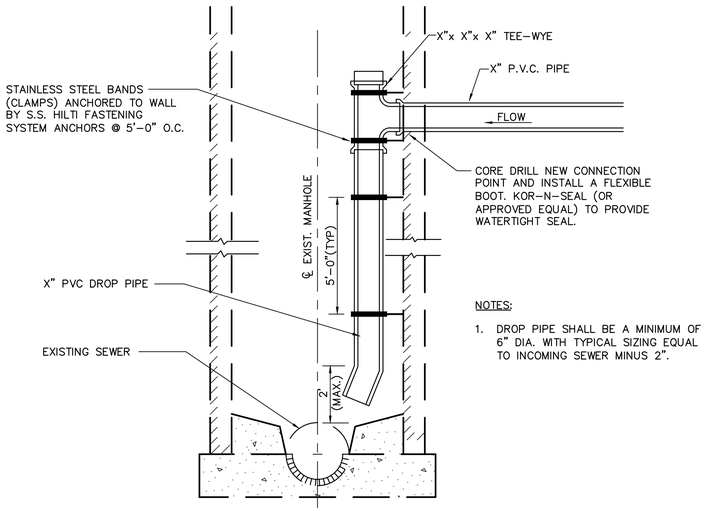
NOTES:

1. TO BE INSTALLED WITH NON-SHRINK MORTAR OR EPOXY GROUT.
2. STEPS SHALL NOT BE SITUATED DIRECTLY ABOVE INLET OR OUTLET PIPES.

FIBERGLASS REINFORCED POLYPROPYLENE MANHOLE STEPS
NOT TO SCALE



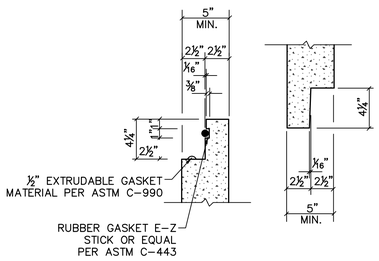
ADJUSTING RING
NOT TO SCALE



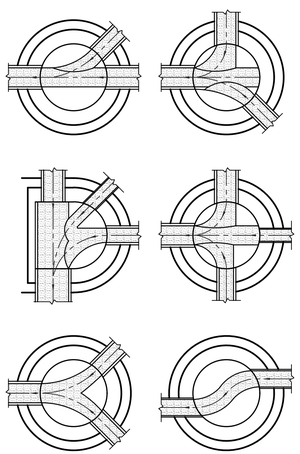
NOTES:

1. DROP PIPE SHALL BE A MINIMUM OF 6" DIA. WITH TYPICAL SIZING EQUAL TO INCOMING SEWER MINUS 2".

INTERIOR DROP CONNECTION AT EXISTING MANHOLE
NOT TO SCALE

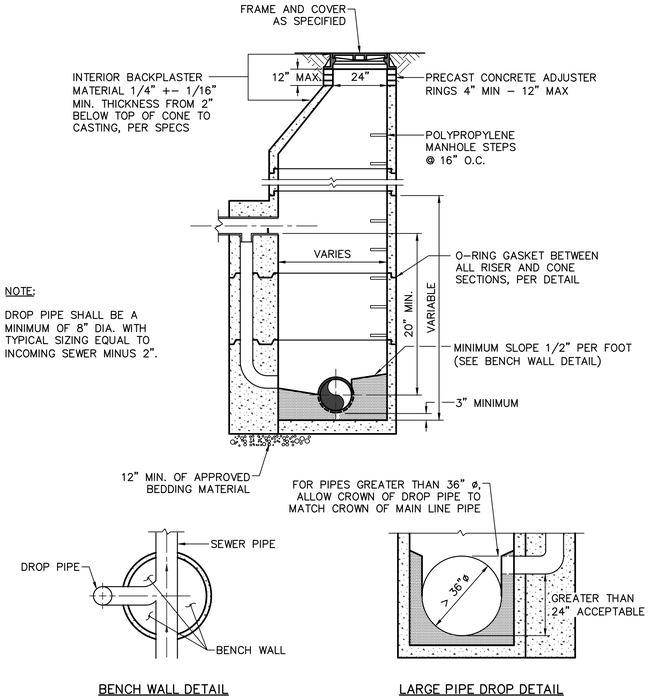


O-RING JOINT
NOT TO SCALE



SANITARY SEWER
BENCH SLOPE = 1/2" PER FOOT
TROUGH WIDTH = PIPE DIAMETER x 1.3

STANDARD MANHOLE BENCHES
NOT TO SCALE



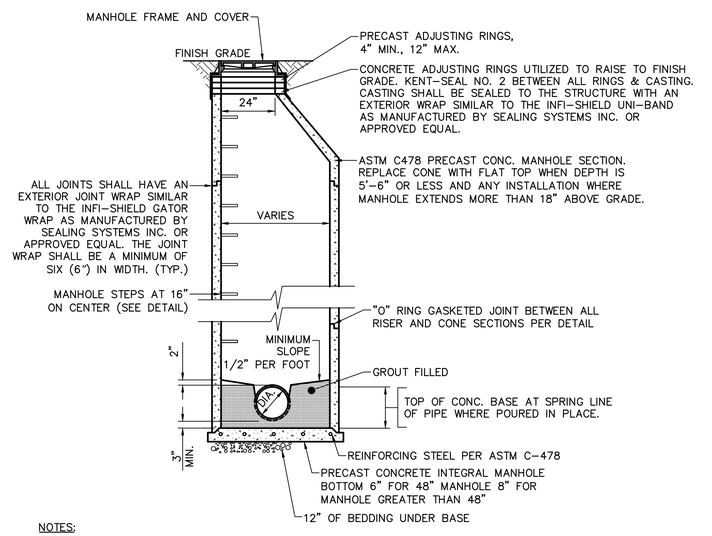
NOTE:

DROP PIPE SHALL BE A MINIMUM OF 8" DIA. WITH TYPICAL SIZING EQUAL TO INCOMING SEWER MINUS 2".

BENCH WALL DETAIL

LARGE PIPE DROP DETAIL

PRECAST OUTSIDE DROP CONNECTION
NOT TO SCALE



NOTES:

1. MANHOLE SHALL CONFORM TO ASTM C-478.
2. JOINTS SHALL CONFORM TO ASTM C-433.
3. 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.
4. PIPE OPENINGS IN BASE AND RISER SECTIONS SHALL BE FORMED OR CORE-DRILLED.

STANDARD PRECAST CONCRETE MANHOLE
(FOR PIPE SIZES 8" TO 24")
NOT TO SCALE

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

STANDARD DETAILS

CYNTHIA L. FOX REGISTERED No. PE60860328 STATE OF INDIANA PROFESSIONAL ENGINEER

Cynthia L Fox
CERTIFIED BY

ISSUANCE INDEX
DATE:
06/14/2016

REVISION SCHEDULE		
NO.	DESCRIPTION	DATE

Project Number 2000.00103

STANDARD DETAILS

01

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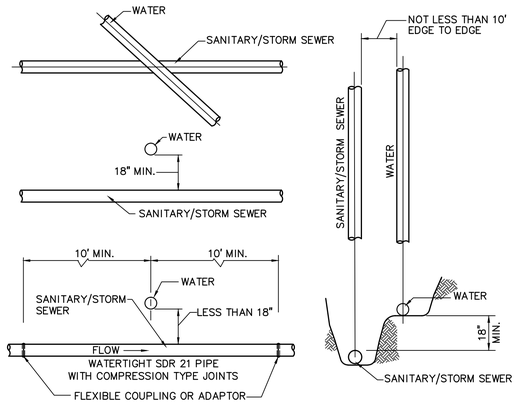
EDIT DATE: 7/13/2016
EDITED BY: KSAAVEDRA
DRAWING FILE: P:\IN2000\0101D Drawings\Standards 2016\HCRSD Standards (Updated)2016 (HCRSD Sewer Details M-R).dwg

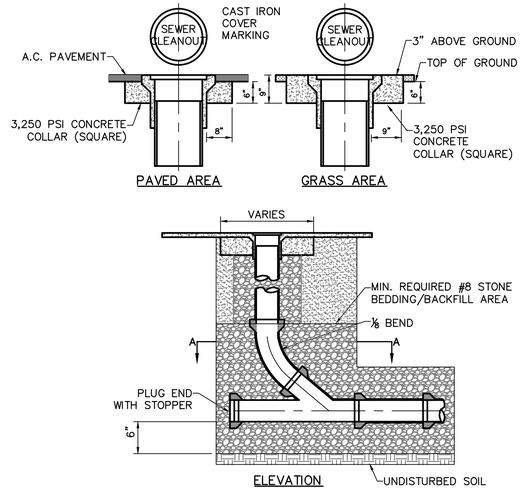


NOTES:

1. WHEN LATERAL SEPARATION IS 10' OR GREATER NO VERTICAL CLEARANCE IS NEEDED
2. ALL CROSSINGS AND SEPARATIONS TO BE 327 IAC, ARTICLES 3 & 8
3. WHEN HORIZONTAL SEPARATION IS LESS THAN 10' OR VERTICAL SEPARATION IS LESS THAN 18", SANITARY PIPE MUST BE WATERTIGHT SDR 21 WITH COMPRESSION TYPE JOINTS.
4. CONTRACTOR SHALL VERIFY THAT MORE STRINGENT SEPARATION REQUIREMENTS DO NOT EXIST WITH THE JURISDICTIONAL WATER UTILITY. IF THEY DO EXIST, CONTRACTOR SHALL FOLLOW THE MORE STRINGENT REQUIREMENTS.

MIN. CROSSOVER & SEPARATION REQUIREMENTS FOR WATER & SANITARY/STORM SEWERS

NOT TO SCALE

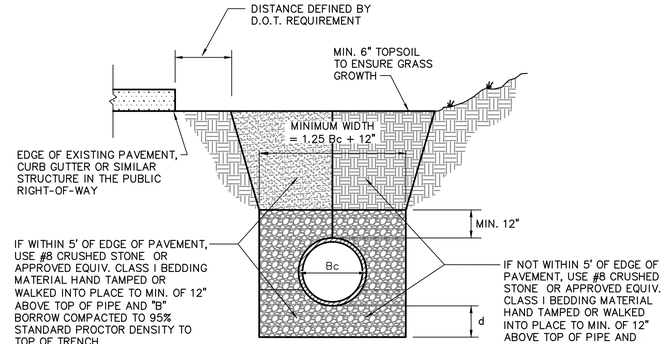


NOTES:

1. CLEANOUT PIPE TO BE SAME SIZE AND KIND OF MATERIAL AS MAIN
2. INSTALL SEWUR VALVE BY KODIAK CONTROLS, INC., OR APPROVED EQUAL

SEWER CLEANOUT

NOT TO SCALE



LEGEND

Bc= OUTSIDE DIAMETER
D= INSIDE DIAMETER
d= DEPTH OF BEDDING MATERIAL BELOW PIPE

NOTE:

ALL INITIAL BACKFILL SHALL BE INSTALLED IN 6" TO 12" BALANCED LIFTS.

A MINIMUM 9" OF CLEARANCE SHALL BE PROVIDED ON EACH SIDE OF THE INSTALLED PIPE.

DEPTH OF BEDDING MATERIAL BELOW PIPE

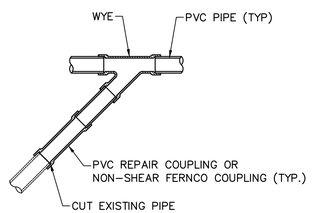
D	d (MIN)
27" & SMALLER	4
30" TO 60"	4
66" & LARGER	4

PLASTIC PIPE (PVC & HDPE) BEDDING DETAIL

NOT TO SCALE

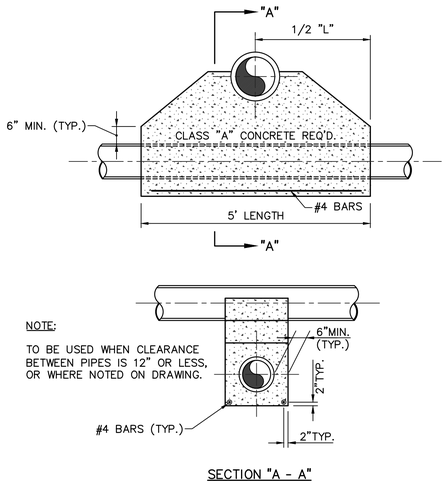
HENDRICKS COUNTY REGIONAL SEWER DISTRICT

STANDARD DETAILS



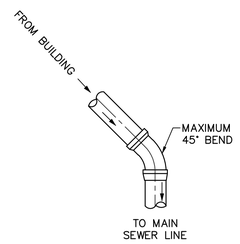
EXISTING LATERAL RECONNECTION DETAIL

NOT TO SCALE



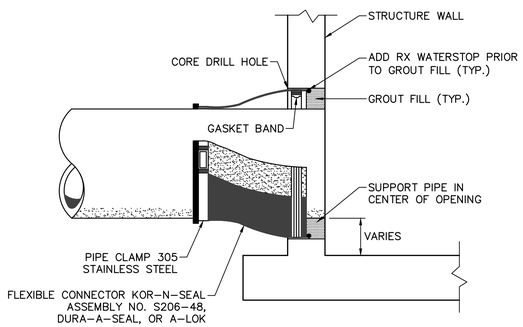
CONCRETE SADDLE DETAIL

NOT TO SCALE



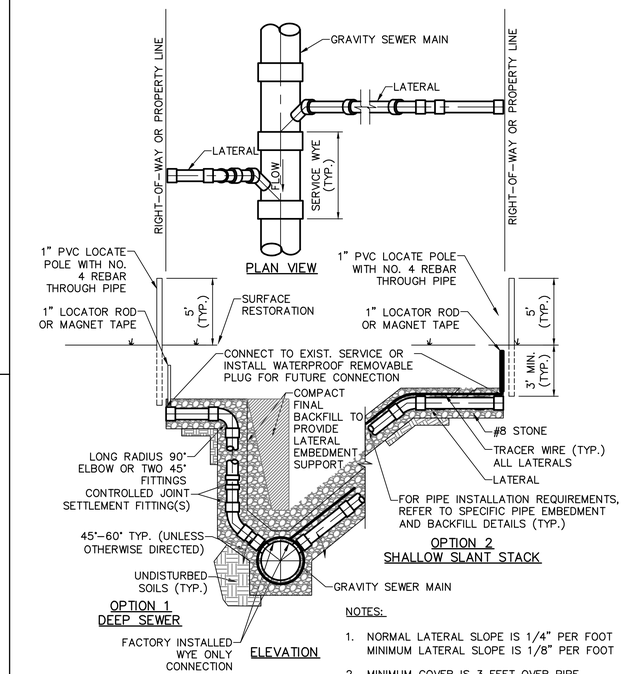
TYPICAL HORIZONTAL BEND IN LATERAL DETAIL

NOT TO SCALE



NEW CONNECTION TO EXISTING MANHOLE

NOT TO SCALE



CONTRACTOR SHALL PROVIDE "AS–BUILT" SERVICE CONNECTION TIES TO THE OWNER, ENGINEER, AND PROPERTY OWNER (TYP.)

NOTES:

1. NORMAL LATERAL SLOPE IS 1/4" PER FOOT MINIMUM LATERAL SLOPE IS 1/8" PER FOOT
2. MINIMUM COVER IS 3 FEET OVER PIPE
3. ADDITIONAL CLEANOUT REQUIRED AT RIGHT–OF–WAY WHERE LATERAL CROSSES ROADWAY.
4. MINIMUM LATERAL SIZE IS 6".
5. WITH SEWER UTILITY APPROVAL, DEEP SEWER SLANT STACK MAY BE INSTALLED.

TYPICAL SERVICE CONNECTION

NOT TO SCALE

CYNTHIA L FORT
REGISTERED
No. PE60860328
STATE OF INDIANA
PROFESSIONAL ENGINEER

Cynthia L Fort
CERTIFIED BY

ISSUANCE INDEX
DATE:
06/14/2016

REVISION SCHEDULE		
NO.	DESCRIPTION	DATE

Project Number 2000.00103

STANDARD DETAILS

02

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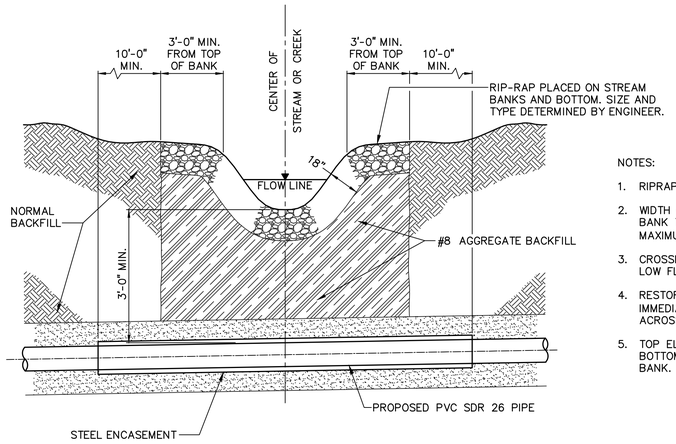
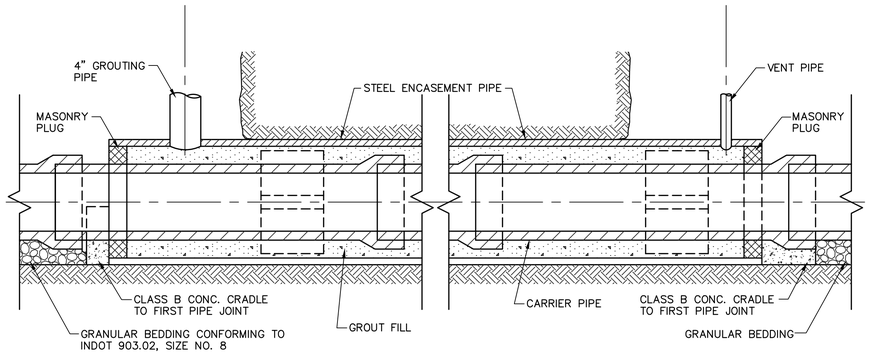


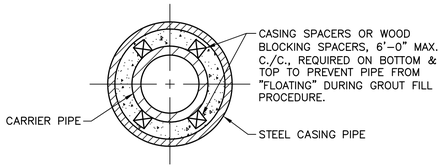
NOTES:

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

TYPICAL STREAM CROSSING RESTORATION FOR OPEN CUT PIPE INSTALLATION

SCALE: NONE





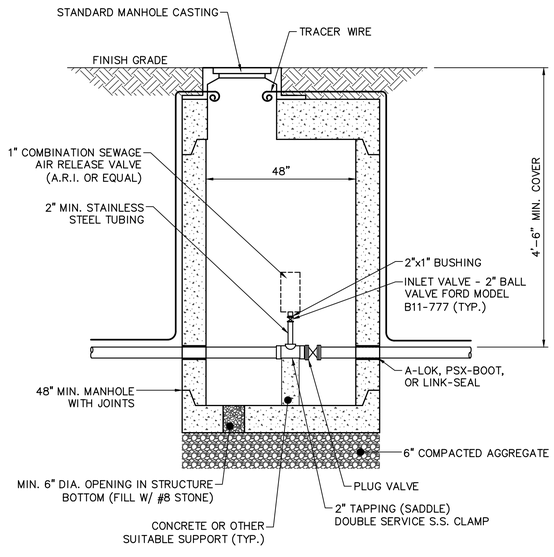
SINGLE CARRIER PIPE

NOTES:
1. WELD ALL ENCASEMENT PIPE JOINTS.
2. CASING PIPE DIAMETER EQUALS CARRIER PIPE'S LARGEST O.D. + 4" MIN.
3. ANNULAR SPACE BETWEEN CASING PIPE & CARRIER PIPE SHALL BE GROUT FILLED.

24" STEEL CASING SHALL HAVE 0.250" MIN. WALL THICKNESS
30" STEEL CASING SHALL HAVE 0.375" MIN. WALL THICKNESS
36" STEEL CASING SHALL HAVE 0.375" MIN. WALL THICKNESS
42" STEEL CASING SHALL HAVE 0.375" MIN. WALL THICKNESS

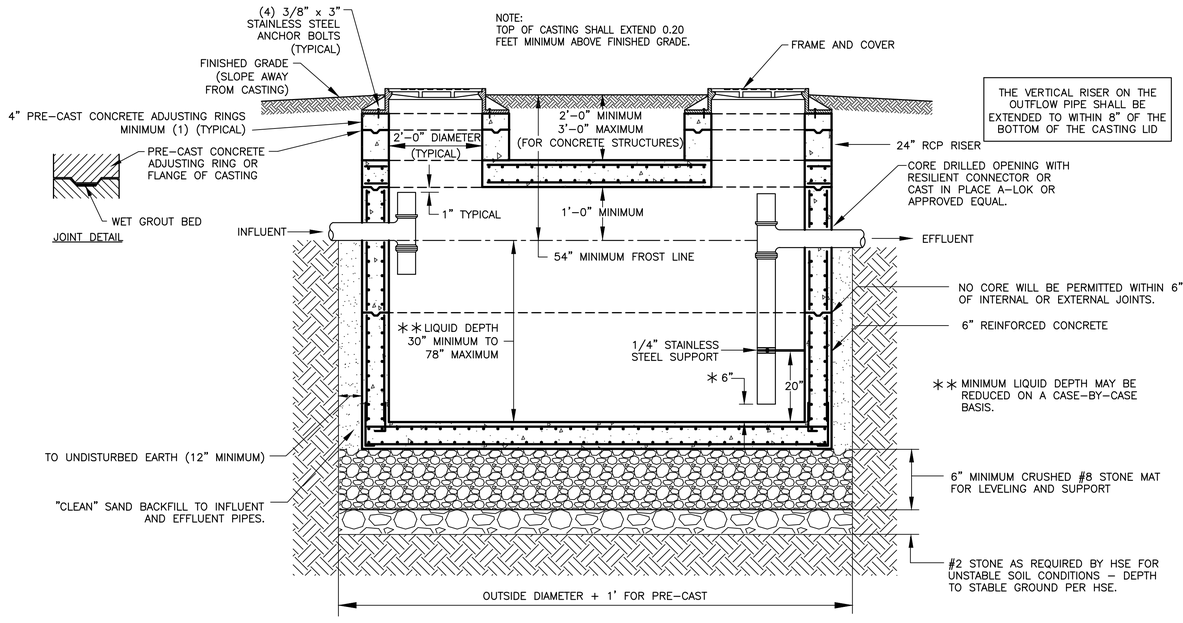
HORIZONTAL BORING DETAIL

NOT TO SCALE



COMBINATION AIR RELEASE VALVE

NOT TO SCALE



NOTE:

1. GREASE TRAPS MUST BE A MINIMUM OF 1000 GALLONS AND SIZED ACCORDING TO 410 IAC 6-10.1-66.
2. 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.
3. EXTERIOR INSTALLATION MUST BE CONCRETE OR CAST IRON.

EXTERIOR GREASE TRAP DETAIL

NOT TO SCALE

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

STANDARD DETAILS

CYNTHIA L. FORD
REGISTERED
No. PE60860328
STATE OF INDIANA
PROFESSIONAL ENGINEER

Cynthia L Ford
CERTIFIED BY

ISSUANCE INDEX
DATE:
06/14/2016

REVISION SCHEDULE		
NO.	DESCRIPTION	DATE

Project Number 2000.00103

STANDARD DETAILS

03

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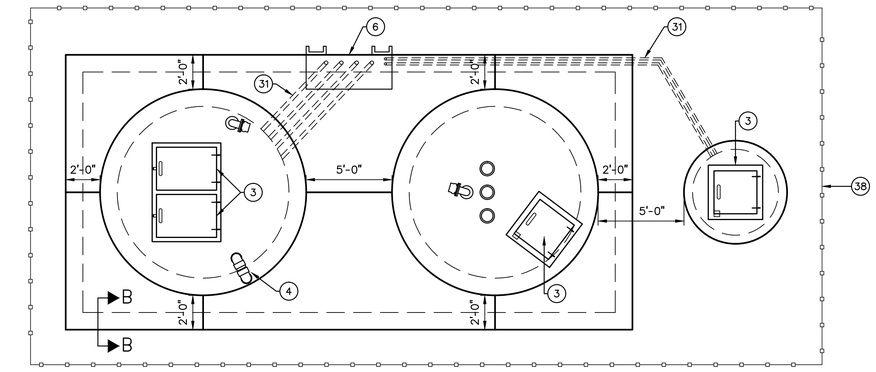
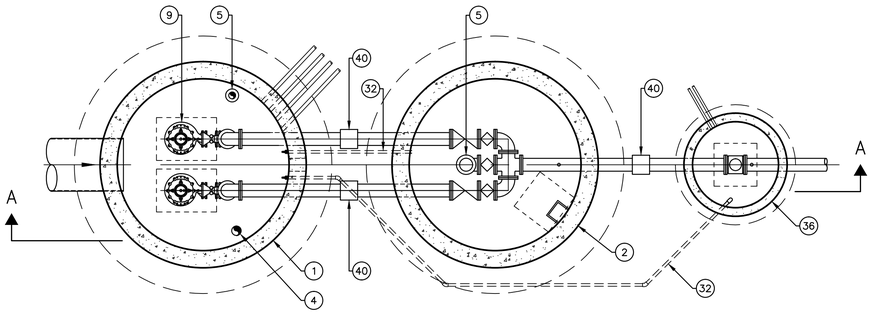
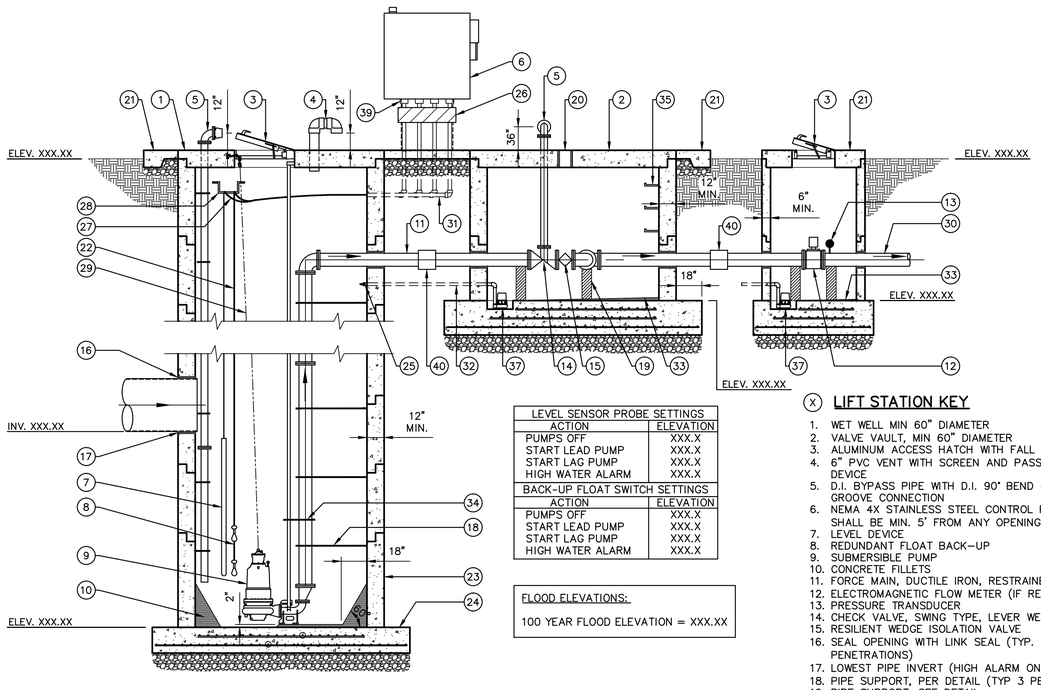


PLAN VIEW AT GRADE
NOT TO SCALE

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: _____

_____

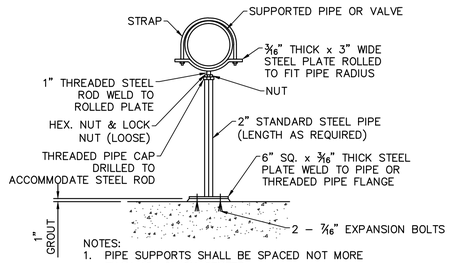
STATION PIPE SIZE, INCHES: _____ FORCE MAIN TYPE: _____

FORCE MAIN SIZE, INCHES: _____ LIFT STATION I.D.: _____

FORCE MAIN LENGTH, FEET: _____

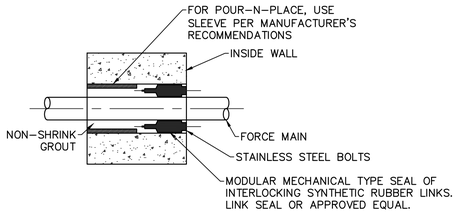
PUMP DATA

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



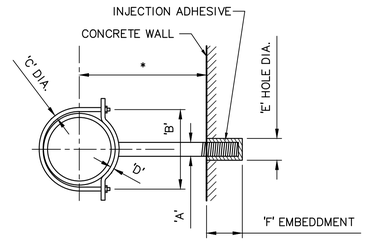
NOTES:
1. PIPE SUPPORTS SHALL BE SPACED NOT MORE THAN 12'-0" ON CENTER.
2. PIPE TO BE SUPPORTED EACH SIDE OF VALVES, FLOW METERS, AND COUPLINGS.

ADJUSTABLE PIPE SUPPORT DETAIL
NOT TO SCALE



NOTE:
WALLS SHALL BE CORE DRILLED

PIPE SLEEVE DETAIL FOR ALL WALL PENETRATIONS
NOT TO SCALE

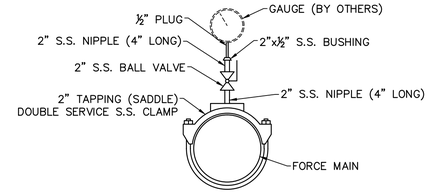


PIPE SUPPORT DIMENSIONS						
PIPE SIZE	A	B	C	D	E	F
4"	7/8"	5 1/4"	5/8"	1/4" X 1 1/4"	1 1/16"	6"
8"	1"	9 3/8"	5/8"	3/8" x 1 1/2"	1 1/16"	6"
12"	1 1/4"	13 1/2"	5/8"	5/8" x 2"	1 1/16"	6"

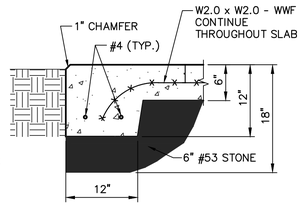
PIPE SUPPORT NOTES:

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



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

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.

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

STANDARD DETAILS

FINAL FOR REGISTERED No. PE60860328 STATE OF INDIANA PROFESSIONAL ENGINEER

Cynthia L Frat
CERTIFIED BY

ISSUANCE INDEX
DATE:
06/14/2016

REVISION SCHEDULE		
NO.	DESCRIPTION	DATE

Project Number 2000.00103

STANDARD DETAILS

04

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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.

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 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.

B. 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 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

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.
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. LATERALS SHALL BE 6–INCH PVC SDR 35 LAID AT A MINIMUM OF 1.00% SLOPE FROM THE SEWER MAIN TO THE RIGHT OF WAY LINE (OR EASEMENT LINE).
      1) EACH PROPERTY HAVING A SEPARATE PROPERTY OWNER SHALL HAVE ITS OWN LATERAL FROM THE BUILDING TO THE MAINLINE SEWER.
   e. 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.
   f. 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 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 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. 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.
   d. 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:
   a. EXCAVATION
   b. EMBEDMENT AND BACKFILL
4. FLOW FROM PRESSURE PIPES SHALL BE DIRECTED TOWARDS THE OUTLET PIPE WITHIN THE DISCHARGE MANHOLE. MODIFICATIONS TO THE BENCH MAY BE NECESSARY.

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) POLYURETHANE 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 MANUFACTURER 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 ONTO 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.
   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 D1599.
   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 L.F.
   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 3408 POLYETHYLENE RESIN MEETING THE REQUIREMENTS OF ASTM D 3350 WITH A CELL CLASSIFICATION OF PE345434C FOR MATERIALS IN ACCORDANCE WITH ASTM F 714, DR11 OR PE334434C FOR MATERIALS IN ACCORDANCE WITH AWWA C906, DR14. 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 HPDE 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 L.F.
   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 RUSHING 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 D4184/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 COATING.

2.5 CASING AND JACKING PIPE

H. DESCRIPTION

1. ALL CASING AND JACKING PIPE AND HORIZONTAL BORES SHALL BE APPROVED BY HCRSD.

I. 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:
   a. 24" STEEL CASING SHALL HAVE 0.250" MINIMUM WALL THICKNESS
   b. 30" STEEL CASING SHALL HAVE 0.375" MINIMUM WALL THICKNESS
   c. 36" STEEL CASING SHALL HAVE 0.375" MINIMUM WALL THICKNESS
   d. 42" STEEL CASING SHALL HAVE 0.375" MINIMUM WALL THICKNESS
2. ALL ENCASEMENT PIPE JOINTS SHALL BE WELDED.
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.

J. 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.

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

SPECIFICATIONS

CYNTHIA L. FORT
REGISTERED
No. PE60860328
STATE OF INDIANA
PROFESSIONAL ENGINEER

Cynthia L Fort
CERTIFIED BY

ISSUANCE INDEX
DATE:
06/14/2016

REVISION SCHEDULE		
NO.	DESCRIPTION	DATE

Project Number 2000.00103

STANDARD SANITARY SEWER SPECIFICATIONS

01

2.5 MANHOLES (CONT.)

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 0.39 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 WIDTH.
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 MAY 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 FOR ADJUSTMENT OF THE MANHOLE FRAME AND COVER TO REQUIRED ELEVATION. GRADE RING JOINTS SHALL HAVE A 1 ¼" 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 SPECTRASHIELD, CEMENTITIOUS LINERS WITH CALCIUM ALUMINATE MORTARS SUCH AS STRONGSEAL, SAUEREISEN, MADEWELL, CONCO SPRAYROQ 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 DURA–SEAL GASKET OR "A–LOK" 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 1022ZI 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 WIDTH.
4. NO GROUTING OF THE INTERIOR OR EXTERIOR OF THE JOINT WILL BE REQUIRED.

2.6 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, CONSTRUCTION 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 AREA 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 WIDTH OF 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 SLOPES AS DIRECTED ON THE PLANS TO MAINTAIN A SAFE WORKING ENVIRONMENT.
3. TRENCH SHEETING AND BRACING OR A TRENCH SHIELD OR BOX SHALL BE USED AS REQUIRED BY THE RULES AND REGULATIONS OF OSHA. THE BOTTOM OF THE TRENCH SHALL CONFORM TO THE DETAILS SHOWN ON THE APPROVED PLANS.

J. EARTH EXCAVATION

1. EARTH MATERIALS 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 BARREL OF THE PIPE. SHOULD THE BASE STILL NOT BE SUITABLE FOR ADEQUATE SUPPORT OF THE PIPE (I.E. A BOILING OR QUICKSAND 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.

3.3 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 LEVELED 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 MOUNDED TO ACCOMMODATE SETTLEMENT DURING THE PROJECT DEVELOPMENT. EXCAVATED TRENCH MATERIAL FOR USAGE AS FINAL BACKFILL SHALL BE 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.

B. STRUCTURES EMBEDMENT AND COMPACTION

1. FOR PURPOSES OF THIS SPECIFICATION, STRUCTURES SHALL INCLUDE BUT NOT BE LIMITED TO VAULTS AND MANHOLES, ITEMS SPECIFICALLY EXCLUDED FROM THIS DEFINITION OF "STRUCTURES" ARE PIPE, CONDUITS AND THEIR APPURTENANCES EXCEPT THOSE LISTED HEREIN.
2. STRUCTURE BACKFILLING AND COMPACTION SHALL COMPLY WITH THE REQUIREMENTS AS SPECIFIED FOR THE ADJACENT SANITARY SEWER.
3. ALL EXCAVATIONS SHALL BE BACKFILLED TO THE ORIGINAL SURFACE OF THE GROUND OR SUCH OTHER GRADE AS SHOWN ON THE PLANS. THE BACKFILLING SHALL BE PERFORMED AS SOON AS POSSIBLE AFTER CONCRETE, MORTAR AND PIPE JOINTS HAVE SUFFICIENT STRENGTH TO RESIST THE IMPOSED LOAD WITHOUT DAMAGE. ALL APPURTENANCES AND ATTACHMENTS TO STRUCTURE WALLS SHALL BE MADE AND ANY WALL COATINGS SHALL BE IN PLACE AND CURED PRIOR TO BACKFILLING AT THAT ELEVATION.
4. PRIOR TO BACKFILLING, ALL FORMWORK AND CONSTRUCTION DEBRIS WILL BE REMOVED. ANY FROZEN OR WET SUBSOIL WILL BE THAWED OR DRIED AND COMPACTED OR REMOVED PRIOR TO RECEIVING BACKFILL. DURING COLD SEASONS, GRADES RECEIVING BACKFILL WILL BE PROTECTED FROM FROST DURING THE WORK PROGRESS.
5. RAINFALL AND/OR GROUNDWATER TRAPPED IN THE EXCAVATION DURING BACKFILL OPERATIONS SHALL BE PUMPED OUT BY THE CONTRACTOR. EXCESSIVELY WET SOIL OR SOIL WHICH HAS ERODED INTO THE EXCAVATION SHALL BE REMOVED OR EXCAVATED AND RE–COMPACTED PRIOR TO PLACING ADDITIONAL BACKFILL MATERIAL.
6. OPENINGS IN STRUCTURES TO RECEIVE PIPE SHALL BE TEMPORARILY PLUGGED OR BULKHEADED DURING BACKFILL OPERATIONS. BACKFILL SHALL PROCEED TO AN ELEVATION LEVEL WITH THE INVERT OF THE PIPE. THE PIPE SHALL THEN BE BEDDED AND BACKFILLED IN ACCORDANCE WITH THE APPLICABLE DRAWING DETAILS AND SPECIFICATIONS.

C. TEMPORARY SURFACES SUBJECT TO TRAFFIC

1. THE CONTRACTOR SHALL OPEN STREETS TO TRAFFIC IMMEDIATELY AFTER COMPLETING THE BACKFILL OPERATION. THE CONTRACTOR SHALL ACCOMPLISH THIS BY INSTALLING THE COMPACTED AGGREGATE BASE IMMEDIATELY AFTER GRANULAR BACKFILL. WHEN TEMPORARY ASPHALT PAVEMENT IS REQUIRED THIS SHALL ALSO BE INSTALLED IMMEDIATELY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF THE TEMPORARY SURFACE TO PROMOTE SAFETY OF THE TRAVELLING PUBLIC.

D. MAINTAINING TRENCH SURFACES

1. ALL SURFACE SETTLEMENT OF THE BACKFILL ALONG TRENCHES LOCATED BENEATH STREETS, ROADS, ALLEYS, DRIVEWAYS AND PARKING LOTS WHICH ARE SUBJECT TO TRAFFIC SHALL BE KEPT FILLED LEVEL WITH OR SLIGHTLY ABOVE THE ORIGINAL PAVED SURFACE AT ALL TIMES WITH COMPACTED AGGREGATE BASE MATERIAL UNTIL THE PERMANENT PAVEMENT IS SATISFACTORILY RESTORED. WHEN TEMPORARY ASPHALT PAVEMENT IS USED, DEPRESSIONS AND "POT HOLES" SHALL BE PROMPTLY FILLED WITH THE TEMPORARY ASPHALT MATERIAL. ATTENTION SHALL BE GIVEN BY THE CONTRACTOR TO THE TIMELY AND PROPER MAINTENANCE, LEVELING AND GRADING OF THE SURFACE OF ALL BACKFILLED TRENCHES, ESPECIALLY THOSE SUBJECT TO TRAFFIC AND ESPECIALLY FOLLOWING RAINS. THE SURFACE OF STREETS, ROADS AND ALLEYS SHALL BE MAINTAINED SMOOTH AND FREE OF RUTS AND WATER TRAPPING DEPRESSIONS BY PERIODIC BLADING, SCARIFYING; AND/OR FILLING SETTLED AREAS, RUTS, POCKETS, OR HOLES WITH COMPACTED AGGREGATE BASE MATERIAL OR TEMPORARY ASPHALT WHERE USED.
2. IN EXISTING RESIDENTIAL AREAS WHERE STONE AGGREGATE HAS BEEN TEMPORARILY USED TO RESTORE THE ROADWAY SURFACE, DUST PREVENTION MAY BE REQUIRED TO REDUCE THE EFFECT OF DUST UPON LOCAL RESIDENTS.
3. IN AREAS OUTSIDE OF THE INFLUENCE OF TRAFFIC, UNLESS OTHERWISE SPECIFIED, THE BACKFILL SHALL BE NEATLY ROUNDED OVER THE TRENCH TO A SUFFICIENT HEIGHT TO ALLOW FOR SETTLEMENT TO GRADE AFTER CONSOLIDATION. PRIOR TO THE ACCEPTANCE OF THE WORK, ANY SURFACE SETTLEMENT BELOW ORIGINAL GROUND SURFACE SHALL BE REFILLED AND RESTORED.

3.4 GRAVITY SANITARY SEWER PIPE INSTALLATION

A. DESCRIPTION

1. THIS SECTION ON THE LAYING OF SEWERS ADDRESSES NON–RIGID PIPE. POLYVINYL CHLORIDE (PVC), HDPE, EITHER AWWA C900/C905 OR SDR 35, 26 OR 21, PIPE SHALL BE CONSIDERED NON–RIGID OR FLEXIBLE CONDUITS.
2. ALL PIPES SHALL BE HANDLED, STORED AND INSTALLED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
3. THE MINIMUM COVER FOR SANITARY SEWER SHALL BE FIVE (5) FEET. THE MAXIMUM ALLOWABLE DEPTH SHALL BE PER MANUFACTURER'S RECOMMENDATIONS AND SHALL BE BASED UPON THE BEDDING AND BACKFILL USED FOR THE INSTALLATION.
4. SANITARY SEWERS SHALL BE CONSTRUCTED WITH A TEN (10) FOOT MINIMUM SEPARATION FROM AN EXISTING OR PROPOSED WATER MAIN, MEASURED HORIZONTALLY FROM THE OUTSIDE EDGE OF THE SANITARY SEWER TO THE OUTSIDE EDGE OF THE WATER MAIN. A VERTICAL SEPARATION OF A MINIMUM OF EIGHTEEN (18") INCHES, MEASURED VERTICALLY FROM THE OUTSIDE EDGE OF THE SANITARY SEWER TO THE OUTSIDE EDGE OF THE WATER MAIN, MUST ALSO BE MAINTAINED. WHEN A SANITARY SEWER MAIN CROSSES A WATER MAIN, IT SHALL CROSS AT AS NEARLY TO NINETY (90) DEGREES AS POSSIBLE BUT NOT LESS THAN FORTY–FIVE (45) DEGREES, MEASURED FROM THE CENTERLINES OF THE SANITARY SEWER AND WATER MAIN. NO SANITARY MANHOLE SHALL BE LOCATED WITHIN EIGHT (8') FEET OF A WATER MAIN, MEASURED FROM THE OUTSIDE EDGE OF THE SANITARY SEWER MANHOLE TO THE CLOSEST OUTSIDE EDGE OF THE WATER MAIN.
5. WHERE REQUIRED HORIZONTAL AND/OR VERTICAL SEPARATION FROM WATER LINES CAN'T BE MET, THE SEWER MATERIAL SHALL BE CONSTRUCTED OF PVC SDR 21 OR PVC AWWA C900/C905 PIPE FOR A DISTANCE OF TEN (10') FEET ON EITHER SIDE OF THE CROSSING POINT AND SHALL MEET THE REQUIREMENTS OF 327 IAC.

B. ALIGNMENT AND GRADE

1. ALL PIPE SHALL BE CONSTRUCTED BEGINNING FROM THE LOWEST POINT AND SHALL BEGIN AT EITHER A NEW STRUCTURE OR CONNECTION TO AN EXISTING STRUCTURE. CONSTRUCTION SHALL PROCEED TO THE LINES AND GRADES SHOWN ON THE APPROVED DRAWINGS. LINE AND GRADE BETWEEN MANHOLES SHALL BE MAINTAINED BY USE OF LASER.
2. THE HCRSD WILL NOT ACCEPT GRAVITY SEWER DESIGNED OR INSTALLED BELOW MINIMUM SLOPE AS SPECIFIED IN 327 IAC ARTICLE 3.
3. THE MINIMUM SLOPE OF END RUN GRAVITY SEWERS SHALL BE 1.00%. END RUN LENGTH SHALL BE MAXIMIZED TO REDUCE THE NUMBER OF MANHOLES. AN END RUN SEWER IS DEFINED AS FOLLOWS:
    a. THE UPSTREAM MANHOLE HAS NO INFLUENT FLOWS FROM SEWERS, AND
    b. A SEWER IS NOT PLANNED TO BE EXTENDED FROM THE UPSTREAM MANHOLE IN THE FUTURE.
4. THE CONTRACTOR SHALL VERIFY THE INITIAL STARTING ELEVATION FROM AT LEAST TWO (2) ESTABLISHED BENCHMARKS.

C. TRENCHING

1. GENERAL
    a. EXCAVATION AND BACKFILLING SHALL BE PERFORMED ACCORDING TO THE EMBEDMENT AND BACKFILLING SECTION, SECTION 3.3 OF THESE SPECIFICATIONS.

D. PIPE LAYING

1. ALL PIPE, FITTINGS AND VALVES SHALL BE LOWERED CAREFULLY INTO THE TRENCH IN SUCH A MANNER AS TO PREVENT DAMAGE TO MATERIALS AND PROTECTIVE COATINGS AND LININGS. UNDER NO CIRCUMSTANCES SHALL GRAVITY SEWER MAIN MATERIALS BE DROPPED OR DUMPED INTO THE TRENCH. THE TRENCH SHALL BE DEWATERED PRIOR TO INSTALLATION OF THE PIPE.
2. EXAMINATION OF MATERIAL
    a. ALL PIPE, FITTINGS AND VALVES AND OTHER APPURTENANCES SHALL BE EXAMINED CAREFULLY FOR DAMAGE AND OTHER DEFECTS IMMEDIATELY BEFORE INSTALLATION.
3. PIPE ENDS
    a. ALL LUMPS, BLISTERS, AND EXCESS COATING SHALL BE REMOVED FROM THE SOCKET AND PLAIN ENDS OF EACH PIPE, AND THE OUTSIDE OF THE PLAIN END AND THE INSIDE OF THE BELL SHALL BE WIPED CLEAN AND DRY AND BE FREE FROM DIRT, SAND, GRIT OR ANY FOREIGN MATERIALS BEFORE THE PIPE IS LAID.
4. PIPE CLEANLINESS
    a. FOREIGN MATERIAL SHALL BE PREVENTED FROM ENTERING THE PIPE WHILE IT IS BEING PLACED IN THE TRENCH.
5. PIPE PLACEMENT
    a. AS EACH LENGTH OF PIPE IS PLACED IN THE TRENCH, THE JOINT SHALL BE ASSEMBLED AND THE PIPE BROUGHT TO CORRECT LINE AND GRADE. THE PIPE SHALL BE SECURED IN PLACE WITH SPECIFIED BACKFILL MATERIAL.
6. PIPE PLUGS
    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.
    b. PRIOR TO REMOVAL OF THE PLUG FOR EXTENDING THE LINE OR FOR ANY OTHER REASON, AIR AND/OR WATER PRESSURE IN THE LINE SHALL BE RELEASED.

E. JOINT ASSEMBLY

1. JOINTS SHALL BE ASSEMBLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
2. ASSEMBLY
    a. AFTER PLACING A LENGTH OF PIPE IN THE TRENCH, THE MANUFACTURER'S LUBRICANT SHALL BE PROPERLY APPLIED. SPIGOT END SHALL THEN BE CENTERED IN THE BELL AND THE PIPE PUSHED HOME AND BROUGHT TO CORRECT LINE AND GRADE. PIPE AND FITTINGS WHICH DO NOT ALLOW A SUFFICIENT AND UNIFORM SPACE FOR JOINTS SHALL BE REMOVED AND REPLACED WITH PIPE OF PROPER DIMENSIONS TO INSURE SUCH UNIFORM SPACE. PRECAUTIONS SHALL BE TAKEN TO PREVENT DIRT FROM ENTERING THE JOINT SPACE.
3. PIPE CUTTING
    a. CUTTING PIPE FOR INSERTION OF VALVES, FITTINGS, OR CLOSURE PIECES SHALL BE DONE IN CONFORMANCE RECOMMENDATIONS OF THE MANUFACTURER OF THE CUTTING EQUIPMENT. CUTTING SHALL BE DONE IN A SAFE, WORKMANLIKE MANNER WITHOUT CREATING DAMAGE TO THE PIPE LINING. AN OXYACETYLENE TORCH SHALL NOT BE USED.
    b. CUT ENDS AND ROUGH EDGES SHALL BE GROUND SMOOTH, AND FOR PUSH–ON JOINT CONNECTIONS THE CUT END SHALL BE BEVELED BY METHODS RECOMMENDED BY THE MANUFACTURER.

3.5 PRESSURE PIPE INSTALLATION

A. DESCRIPTION

1. PRESSURE SEWER MAINS SHALL BE INSTALLED IN ACCORDANCE WITH AWWA/ASTM D–2774 STANDARDS AND MANUFACTURER'S RECOMMENDATIONS. IF ANY CONFLICT BETWEEN THESE STANDARDS AND MANUFACTURER'S RECOMMENDATIONS, THE MANUFACTURER'S RECOMMENDATIONS SHALL TAKE PRECEDENCE.

B. ALIGNMENT AND GRADE

1. THE PRESSURE SEWER MAINS SHALL BE LAID AND MAINTAINED TO LINES AND GRADES ESTABLISHED BY THE DRAWINGS, WITH FITTINGS AND VALVES AT THE REQUIRED LOCATIONS. VALVE OPERATING STEMS SHALL BE ORIENTED IN A MANNER TO ALLOW PROPER OPERATION.
2. CLEARANCE
    a. WHEN CROSSING EXISTING PIPELINES OR OTHER STRUCTURES, ALIGNMENT AND GRADE MAY BE ADJUSTED AS NECESSARY, TO PROVIDE CLEARANCE AS REQUIRED BY FEDERAL, STATE, AND LOCAL REGULATIONS AND TO PREVENT FUTURE DAMAGE OR CONTAMINATION OF EITHER THE PIPELINES OR STRUCTURES.
3. DEPTH
    a. THE MINIMUM COVER FOR SANITARY FORCE MAIN SHALL BE FOUR (4) FEET. THE MAXIMUM ALLOWABLE DEPTH SHALL BE PER MANUFACTURER'S RECOMMENDATIONS AND SHALL BE BASED UPON THE BEDDING AND BACKFILL USED FOR THE INSTALLATION.
4. SLOPE
    a. FORCE MAINS MUST BE DESIGNED AT A CONSTANT POSITIVE SLOPE FROM LOW POINTS AND CLEAN–OUTS TO AIR/VACUUM RELIEF VALVES.

C. TRENCHING

1. GENERAL
    a. EXCAVATION AND BACKFILLING SHALL BE PERFORMED ACCORDING TO THE EMBEDMENT AND BACKFILLING SECTION, SECTION 3.3 OF THESE SPECIFICATIONS.

D. PIPE LAYING

1. ALL PIPE, FITTINGS AND VALVES SHALL BE LOWERED CAREFULLY INTO THE TRENCH IN SUCH A MANNER AS TO PREVENT DAMAGE TO MATERIALS AND PROTECTIVE COATINGS AND LININGS. UNDER NO CIRCUMSTANCES SHALL PRESSURE SEWER MAIN MATERIALS BE DROPPED OR DUMPED INTO THE TRENCH. THE TRENCH SHALL BE DEWATERED PRIOR TO INSTALLATION OF THE PIPE.
2. EXAMINATION OF MATERIAL
    a. ALL PIPE, FITTINGS AND VALVES AND OTHER APPURTENANCES SHALL BE EXAMINED CAREFULLY FOR DAMAGE AND OTHER DEFECTS IMMEDIATELY BEFORE INSTALLATION.
3. PIPE ENDS
    a. ALL LUMPS, BLISTERS, AND EXCESS COATING SHALL BE REMOVED FROM THE SOCKET AND PLAIN ENDS OF EACH PIPE, AND THE OUTSIDE OF THE PLAIN END AND THE INSIDE OF THE BELL SHALL BE WIPED CLEAN AND DRY AND BE FREE FROM DIRT, SAND, GRIT OR ANY FOREIGN MATERIALS BEFORE THE PIPE IS LAID.
4. PIPE CLEANLINESS
    a. FOREIGN MATERIAL SHALL BE PREVENTED FROM ENTERING THE PIPE WHILE IT IS BEING PLACED IN THE TRENCH.
5. PIPE PLACEMENT
    a. AS EACH LENGTH OF PIPE IS PLACED IN THE TRENCH, THE JOINT SHALL BE ASSEMBLED AND THE PIPE BROUGHT TO CORRECT LINE AND GRADE. THE PIPE SHALL BE SECURED IN PLACE WITH SPECIFIED BACKFILL MATERIAL.
6. PIPE PLUGS
    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.
    b. PRIOR TO REMOVAL OF THE PLUG FOR EXTENDING THE LINE OR FOR ANY OTHER REASON, AIR AND/OR WATER PRESSURE IN THE LINE SHALL BE RELEASED.

E. JOINT ASSEMBLY

1. JOINTS SHALL BE ASSEMBLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
2. ASSEMBLY
    a. AFTER PLACING A LENGTH OF PIPE IN THE TRENCH, THE MANUFACTURER'S LUBRICANT SHALL BE PROPERLY APPLIED. SPIGOT END SHALL THEN BE CENTERED IN THE BELL AND THE PIPE PUSHED HOME AND BROUGHT TO CORRECT LINE AND GRADE. PIPE AND FITTINGS WHICH DO NOT ALLOW A SUFFICIENT AND UNIFORM SPACE FOR JOINTS SHALL BE REMOVED AND REPLACED WITH PIPE OF PROPER DIMENSIONS TO INSURE SUCH UNIFORM SPACE. PRECAUTIONS SHALL BE TAKEN TO PREVENT DIRT FROM ENTERING THE JOINT SPACE.
3. PIPE CUTTING
    a. CUTTING PIPE FOR INSERTION OF VALVES, FITTINGS, OR CLOSURE PIECES SHALL BE DONE IN CONFORMANCE RECOMMENDATIONS OF THE MANUFACTURER OF THE CUTTING EQUIPMENT. CUTTING SHALL BE DONE IN A SAFE, WORKMANLIKE MANNER WITHOUT CREATING DAMAGE TO THE PIPE LINING. AN OXYACETYLENE TORCH SHALL NOT BE USED.
    b. CUT ENDS AND ROUGH EDGES SHALL BE GROUND SMOOTH, AND FOR PUSH–ON JOINT CONNECTIONS THE CUT END SHALL BE BEVELED BY METHODS RECOMMENDED BY THE MANUFACTURER.

F. INSTALLATION BY HORIZONTAL DIRECTIONAL DRILLING (HDD)

1. EQUIPMENT
    a. THE DIRECTIONAL DRILLING SYSTEM SHALL BE REMOTELY STEERABLE AND PERMIT ELECTRONIC MONITORING OF TUNNEL DEPTH AND LOCATION. THE SYSTEM SHALL BE ABLE TO CONTROL THE DEPTH AND DIRECTION OF THE PIPE AND MUST BE ACCURATE TO +/– 2 INCHES.
    b. THE SYSTEM SHALL UTILIZE A FLUID–CUTTING PROCESS, USING A LIQUID CLAY SUCH AS BENTONITE. THIS CLAY SHALL BE TOTALLY INERT AND CONTAIN NO RISK TO THE ENVIRONMENT.
    c. THE LIQUID CLAY SHALL REMAIN IN THE BORE HOLE TO INCREASE THE STABILITY OF THE BORE HOLE AND TO PROVIDE A LUBRICANT TO REDUCE FRICTIONAL DRAG WHEN THE PIPE IS INSTALLED.
    d. THE SPOILS SHALL BE RECOVERED BY USE OF A VACUUM SYSTEM MOUNTED ON A VEHICLE FOR REMOVAL OF THE SPOILS. SPOILS SHALL NOT BE DISCHARGED INTO SEWERS OR STORM DRAINS. THE CONTRACTOR IS RESPONSIBLE FOR DISPOSAL OF ALL SPOIL MATERIAL.
2. DRILLING PROCEDURE
    a. CONTRACTOR SHALL CALIBRATE THE DIRECTIONAL DRILLING HEAD LOCATOR AT THE START OF THE DAY AND AT EACH NEW DIRECTIONAL DRILLING OPERATION.
    b. THE MAXIMUM DRILL ANGLE SHALL BE FIFTEEN DEGREES MEASURE PERPENDICULAR TO GRADE TO THE DESIGN DEPTH ELEVATION.
    c. A PILOT HOLE SHALL BE DRILLED ON THE DRILL PATH WITH NO DEVIATIONS GREATER THAN 5% OF DEPTH OVER A LENGTH OF 100 FEET.
    d. UPON SUCCESSFUL COMPLETION OF THE PILOT HOLE, CONTRACTOR WILL REAM THE DRILL HOLE TO A MINIMUM OF 25% GREATER THAN THE OUTSIDE DIAMETER OF THE INSTALLED PIPE USING THE APPROPRIATE TOOLS.
    e. THREE STRANDS OF TRACER WIRE SHALL BE PULLED BACK WITH THE PIPE. THE WIRES SHALL BE INSTALLED ALONG THE PIPE, FASTENED SECURELY TO THE PIPE AT FIVE (5) FOOT INTERVALS, AND TERMINATING ABOVE GROUND WITH THE LEAD TAPED AROUND EACH STRUCTURE.
    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.

G. THRUST RESTRAINT

1. FITTINGS
    a. ALL PLUGS, CAPS, TEES, REDUCERS AND BENDS, UNLESS OTHERWISE SPECIFIED, SHALL BE PROVIDED WITH SUITABLY RESTRAINED JOINTS, AS SHOWN ON PLANS. VALVES ARE CONSIDERED DEAD ENDS AND SHALL BE RESTRAINED AS SUCH.
2. DESIGN
    a. THE DESIGN PRESSURE IS THE MAXIMUM PRESSURE TO WHICH THE PIPELINE WILL BE SUBJECTED, WITH CONSIDERATION GIVEN TO THE VULNERABILITY OF THE PIPE SOIL SYSTEM WHEN THE PRESSURE IS EXPECTED TO BE APPLIED. IN MOST CASES, THIS WILL BE THE TEST PRESSURE OF THE PIPE, APPLIED SHORTLY AFTER INSTALLATION, WHEN THE PIPE–SOIL SYSTEM IS NORMALLY MOST VULNERABLE.
    b. FOR BURIED PIPELINES, THRUST RESTRAINT IS ACHIEVED BY TRANSFERRING THE THRUST FORCE TO THE SOIL STRUCTURE OUTSIDE THE PIPE. THE OBJECTIVE OF THE DESIGN IS TO DISTRIBUTE THE THRUST FORCES TO THE SOIL STRUCTURE IN SUCH A MANNER THAT JOINT SEPARATION WILL NOT OCCUR IN UNRESTRAINED JOINTS.
3. RESTRAINING MECHANISMS FOR PUSH–ON OR MECHANICAL JOINTS: TIE RODS, CLAMPS, OR OTHER COMPONENTS OF DISSIMILAR METAL SHALL BE PROTECTED AGAINST CORROSION BY HAND APPLICATION OF A SUITABLE COATING OR BY ENCASEMENT OF THE ENTIRE ASSEMBLY WITH 8–MIL LOOSE POLYETHYLENE FILM IN ACCORDANCE WITH ANSI/AWWA C105/A21.5.
    a. GLANDS SHALL BE MANUFACTURED OF DUCTILE IRON CONFORMING TO ASTM A536– 80, GRADE 60–42–10. SET SCREWS SHALL BE HARDENED DUCTILE IRON. THESE DEVICES SHALL HAVE PRESSURE RATING WITH A SAFETY FACTOR OF 281. GLANDS SHALL BE LISTED WITH UL AND FACTORY MANUAL.

G. AIR RELIEF

1. AIR RELIEF VALVES SHALL BE INSTALLED AT EVERY INTERMEDIATE APEX POINT WHERE AIR MAY ACCUMULATE IN THE FORCE MAIN.
2. EACH AIR RELIEF VALVE THAT EXHAUSTS ABOVE GROUND MUST BE EQUIPPED WITH AN EXHAUST PIPE EXTENDING TO A DOWNWARD FACING ELBOW COVERED WITH A CORROSION–RESISTANT, TWENTY–FOUR (24) MESH SCREENED OPENING AT AN ELEVATION OF EIGHTEEN (18") INCHES ABOVE GROUND.
3. AUTOMATIC AIR RELIEF VALVES SHALL NOT BE USED IN AREAS WITHIN THE ONE HUNDRED (100) YEAR FLOOD ELEVATION OR IN AREAS WHERE FLOODING MAY OCCUR UNLESS THEY ARE EQUIPPED WITH A DOWNWARD FACING EXHAUST PIPE COVERED WITH A CORROSION–RESISTANT, TWENTY–FOUR (24) MESH SCREENED OPENING AT AN ELEVATION OF EIGHTEEN (18) INCHES ABOVE THE GROUND SURFACE AND ABOVE THE ONE HUNDRED (100) YEAR FLOOD ELEVATION.
4. MANUALLY OPERATED AIR RELIEF VALVES SHALL BE USED IN AREAS WITHIN THE ONE HUNDRED (100) YEAR FLOOD PLAIN AND WHERE FLOODING MAY OCCUR.

3.6 HORIZONTAL BORING INSTALLATION

A. PITS OR APPROACH TRENCHES

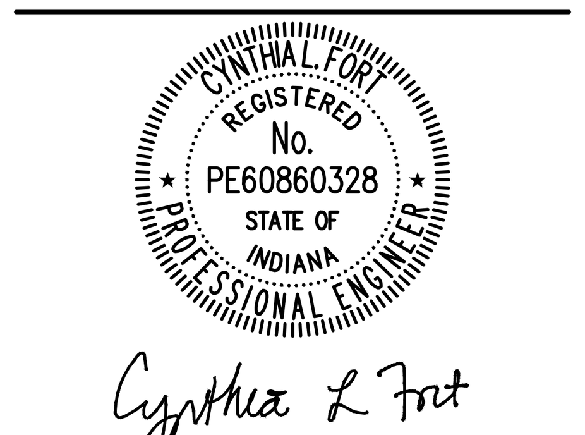
1. EXCAVATE APPROACH TRENCHES OR PITS AS SITE CONDITIONS REQUIRE.
2. ENSURE CASING ENTRANCE FACES AS NEAR PERPENDICULAR TO ALIGNMENT AS CONDITIONS PERMIT.
3. ESTABLISH VERTICAL ENTRANCE FACE AT LEAST 1 FOOT ABOVE TOP OF CASING.
4. INSTALL DEWATERING MEASURES AND EXCAVATION SUPPORTS.

B. CASING PIPE

1. BORING:
    a. PUSH PIPE INTO GROUND WITH BORING AUGER, ROTATING WITHIN PIPE TO REMOVE SOIL.
    b. DO NOT ADVANCE CUTTING HEAD AHEAD OF CASING PIPE, EXCEPT FOR DISTANCE NECESSARY TO PERMIT CUTTING TEETH TO CUT CLEARANCE FOR PIPE.
    c. ARRANGE MACHINE BORE AND CUTTING HEAD TO BE REMOVABLE FROM WITHIN PIPE.
    d. ARRANGE FACE OF CUTTING HEAD TO PROVIDE BARRIER TO FREE FLOW OF SOFT MATERIAL.
    e. IF UNSTABLE SOIL IS ENCOUNTERED DURING BORING, RETRACT CUTTING HEAD INTO CASING TO PERMIT BALANCE BETWEEN PUSHING PRESSURE AND RATIO OF PIPE ADVANCEMENT TO QUANTITY OF SOIL.
    f. GROUT TO FILL VOIDS IF VOIDS DEVELOP GREATER THAN OUTSIDE DIAMETER OF PIPE BY APPROXIMATELY 1 INCH.
    g. IF BORING IS OBSTRUCTED, RELOCATE, JACK, OR TUNNEL AS DIRECTED BY HCRSD REPRESENTATIVE.
2. JACKING:
    a. CONSTRUCT ADEQUATE THRUST WALL NORMAL TO PROPOSED LINE OF THRUST.
    b. IMPART THRUST LOAD TO PIPE THROUGH SUITABLE THRUST RING SUFFICIENTLY RIGID TO ENSURE UNIFORM DISTRIBUTION OF THRUST LOAD ON FULL PIPE CIRCUMFERENCE.
3. CARRIER PIPE:
    a. CLEAN AND INSPECT PIPE.
    b. PLACE CARRIER PIPE PER DETAIL. EXERCISE CARE TO PREVENT DAMAGE TO PIPE JOINTS WHEN CARRIER PIPE IS PLACED IN CASING.
    c. SUPPORT PIPELINE WITHIN CASING SO NO EXTERNAL LOADS ARE TRANSMITTED TO CARRIER PIPE.
    d. ATTACH SUPPORTS TO BARREL OF CARRIER PIPE; DO NOT REST CARRIER PIPE ON BELLS.
    e. THE ANNULAR SPACE BETWEEN THE CASING PIPE AND THE CARRIER PIPE SHALL BE GROUT FILLED.

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

SPECIFICATIONS



CERTIFIED BY

ISSUANCE INDEX
DATE:
06/14/2016

REVISION SCHEDULE		
NO.	DESCRIPTION	DATE

Project Number 2000.00103

SANITARY SEWER SPECIFICATIONS

02

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3.7 MANHOLES

A. INSTALLATION

1. ALL MANHOLES SHALL BE INSTALLED SO THAT THE TOP OF THE MANHOLE CASTING AND FRAME:
   a. IN AREAS NOT SUBJECT TO TRAFFIC, THE LID SHALL BE SET AT THREE (3') INCHES ABOVE THE SURROUNDING SURFACE AFTER EARTH SETTLEMENT.
   b. IN AREAS SUBJECT TO TRAFFIC, THE LID SHALL BE FLUSH WITH THE FINAL GROUND ELEVATION.
2. ALL STRUCTURES SHALL BE BEDDED ON A MINIMUM OF TWELVE (12') INCHES OF COMPACTED AGGREGATE MEETING THE GRADATION OF #8 CRUSHED STONE PER INDOT STANDARD SPECIFICATIONS. NO STRUCTURE SHALL BE SET ON SOFT OR YIELDING SOILS. IF YIELDING SOILS ARE ENCOUNTERED, THE AREA SHALL BE EXCAVATED AND FILLED WITH COMPACTED CRUSHED STONE.
3. ALL LIFT HOLES IN PRECAST SECTIONS SHALL BE WETTED AND COMPLETELY FILLED WITH NON-SHRINK GROUT, SMOOTHED AND COATED WITH BITUMINOUS WATERPROOFING MATERIAL TO ENSURE WATER TIGHTNESS.
4. INSTALL EXTERIOR CHIMNEY AND JOINT WRAPS PER MANUFACTURER'S INSTRUCTIONS.

B. REGRADING

1. RAISE OR LOWER EXISTING MANHOLES AND STRUCTURES FRAMES AND COVERS, CLEANOUT FRAMES AND COVERS AND VALVE BOXES IN REGRADED AREAS TO FINISH GRADE. CAREFULLY REMOVE, CLEAN AND SALVAGE CAST IRON FRAMES AND COVERS. ADJUST THE ELEVATION OF THE TOP OF THE MANHOLE OR STRUCTURE AS DETAILED ON THE DRAWINGS. ADJUST THE ELEVATION OF THE CLEANOUT PIPE RISER, AND REINSTALL THE CAP OR PLUG. RESET CAST IRON FRAME AND COVER, GROUTING BELOW AND AROUND THE FRAME. INSTALL CHIMNEY SEAL AROUND RESET FRAME AND COVER AS SPECIFIED FOR NEW CONSTRUCTION.
2. DURING PERIODS WHEN WORK IS PROGRESSING ON ADJUSTING MANHOLES OR STRUCTURES COVER ELEVATIONS, THE CONTRACTOR SHALL INSTALL A TEMPORARY COVER ABOVE THE BENCH OF THE STRUCTURE OR MANHOLE. THE TEMPORARY COVER SHALL BE INSTALLED ABOVE THE HIGH FLOW ELEVATION WITHIN THE STRUCTURE, AND SHALL PREVENT DEBRIS FROM ENTERING THE WASTEWATER STREAM.

3.8 APPURTENANCES

A. OIL AND GREASE INTERCEPTOR AND GREASE REMOVAL PIT INSTALLATION

1. PIPE AND FITTINGS SHALL BE PVC, PIPING SHALL BE USED INSIDE OF TRAP, BETWEEN TRAP AND BUILDINGS, AND BETWEEN TRAP AND MANHOLE.
2. MANWAYS AND ACCESS MANHOLES SHALL BE SET TO FINISH GRADE PROVIDING ADEQUATE ACCESS TO THE UNIT. SLOPE PAVEMENT AROUND THE ACCESS-WAY TO PREVENT STORMWATER FROM ENTERING THE UNIT.

B. CLEANOUT INSTALLATION

1. INSTALL CLEANOUTS AND RISER EXTENSIONS FROM SEWER PIPES TO CLEANOUTS AT GRADE. INSTALL CLEANOUT SHUT-OFF VALVE (SEWUR VALVE BY KODIAK CONTROLS, INC. OR APPROVED EQUAL). CLEANOUTS SHALL MATCH DETAIL. INSTALL PIPING SO CLEANOUTS OPEN IN DIRECTION OF FLOW IN SEWER PIPE.
2. SET CLEANOUT FRAMES AND COVERS IN EARTH IN CAST-IN-PLACE-CONCRETE, 18 BY 12 INCHES 1 INCH ABOVE SURROUNDING GRADE.
3. SET CLEANOUT FRAMES AND COVERS IN CONCRETE PAVEMENT AND ROADS WITH TOPS FLUSH WITH PAVEMENT SURFACE.
4. THE TOP OF THE CLEANOUT ASSEMBLY SHALL BE 2 INCHES BELOW THE BOTTOM OF THE COVER TO PREVENT LOADS BEING TRANSFERRED FROM THE FRAME AND COVER TO THE PIPING.

C. BUILDING SERVICE LINES

1. INSTALL SANITARY SEWER SERVICE LINES TO POINT OF CONNECTION WITHIN 3 FEET OUTSIDE OF BUILDING(S) WHERE SERVICE IS REQUIRED AND MAKE CONNECTIONS.

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

1.1 FIELD QUALITY CONTROL

A. ALL SYSTEMS SHALL BE INSPECTED AND TESTED. A HCRSD REPRESENTATIVE MUST BE PRESENT FOR ALL TESTING. AQUA INDIANA SHALL BE CONTACTED 48 HOURS PRIOR TO ANY TESTING. PRIOR TO FINAL ACCEPTANCE, PROVIDE A VIDEO RECORD OF ALL PIPING FOR SANITARY SEWER MAIN EXTENSIONS TO SHOW THE LINES ARE FREE FROM OBSTRUCTIONS, PROPERLY SLOPED AND JOINED.

B. GRAVITY SANITARY SEWERS

1. ONCE CONSTRUCTED, ALL SANITARY SEWERS AND MANHOLES SHALL BE WATERTIGHT AND FREE FROM LEAKAGE. THE CONTRACTOR SHALL BE REQUIRED TO REPAIR ALL VISIBLE LEAKS. THE RATE OF INFILTRATION INTO THE SANITARY SEWER SYSTEM BETWEEN ANY TWO ADJACENT MANHOLES SHALL NOT BE IN EXCESS OF 100 GALLONS PER INCH OF PIPE DIAMETER PER MILE PER DAY.
2. ALL GRAVITY SANITARY SEWERS CONSTRUCTED OF FLEXIBLE PIPE SHALL BE DEFLECTION TESTED NO SOONER THAN THIRTY (30) DAYS AFTER INSTALLATION AND COMPLETE BACKFILL. THE DIAMETER OF THE RIGID BALL OR MANDREL USED FOR A DEFLECTION TEST SHALL BE NO LESS THAN NINETY-FIVE PERCENT (95%) OF THE BASE INSIDE DIAMETER OF THE PIPE TO BE TESTED DEPENDENT ON WHAT IS SPECIFIED IN THE CORRESPONDING ASTM STANDARD. THE TEST SHALL NOT BE PERFORMED WITH THE AID OF A MECHANICAL PULLING DEVICE.
3. ALL SEWERS TWENTY-FOUR (24) INCHES AND LESS SHALL BE TESTED BY MEANS OF A LOW-PRESSURE AIR TEST TO DETECT DAMAGED PIPING AND/OR IMPROPER JOINTING. TESTING SHALL BE DONE PER ASTM F-1417 FOR FLEXIBLE AND SEMI-RIGID PIPE.
4. ALL SEWERS GREATER THAN TWENTY-FOUR (24) INCHES SHALL BE JOINT TESTED USING AIR OR WATER UNDER LOW PRESSURE. ALL JOINTS SHALL BE TESTED. TESTING PROCEDURES SHALL BE PER ASTM C-1103.
5. THE CONTRACTOR SHALL SUPPLY ALL EQUIPMENT NECESSARY TO PERFORM THE TESTS REQUIRED.
6. ALL TESTS SHALL BE CONDUCTED UNDER THE OBSERVATION OF A REPRESENTATIVE OF THE HCRSD. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO SCHEDULE TESTING.
7. ANY LEAKAGE FOUND DURING THE INFILTRATION TEST SHALL BE CORRECTED PRIOR TO ACCEPTANCE. GROUTING OF THE JOINT OR CRACK TO REPAIR THE LEAKAGE SHALL NOT BE PERMITTED FOR FLEXIBLE PIPE. IF THE DEFECTIVE PORTION OF THE SANITARY SEWER CANNOT BE LOCATED, THE CONTRACTOR SHALL REMOVE AND RECONSTRUCT AS MUCH OF THE WORK AS IS NECESSARY TO OBTAIN A SYSTEM THAT PASSES INFILTRATION REQUIREMENTS.
8. ALL SEWER MAIN EXTENSIONS SHALL BE TELEVISED PRIOR TO ACCEPTANCE OF SEWER BY THE DISTRICT.

C. PRESSURE PIPE

1. AFTER THE PIPE HAS BEEN LAID AND BACKFILLED, ALL NEWLY LAID PRESSURE PIPE OR ANY VALVED SECTIONS OF IT SHALL, UNLESS OTHERWISE EXPRESSLY SPECIFIED, BE SUBJECTED TO A HYDROSTATIC PRESSURE TESTS. THE DURATION OF EACH PRESSURE TEST SHALL BE FOR A PERIOD OF NOT LESS THAN TWO HOURS AND NOT MORE THAN SIX HOURS. THE BASIC PROVISIONS OF AWWA C 600 (DI PIPE), C 605 (PVC PIPE), SHALL BE FOLLOWED FOR ALL PRESSURE TESTING.
2. THE TEST PRESSURE SHALL NOT EXCEED PIPE AND/OR THRUST RESISTANT DESIGN PRESSURES. THE TEST PRESSURE SHALL NOT VARY BY MORE THAN PLUS OR MINUS 5 PSI FOR THE DURATION OF THE TEST.
3. ALL NEWLY LAID PIPE OR ANY VALVED SECTION THEREOF SHALL BE SUBJECTED TO A HYDROSTATIC PRESSURE OF AT LEAST 1.5 TIMES THE MAXIMUM WORKING PRESSURE AT THE LOWEST ELEVATION IN THE LINE OR 1.25 TIMES THE MAXIMUM WORKING PRESSURE AT THE HIGHEST ELEVATION IN THE LINE. IN NO CASE SHALL THE TEST PRESSURE BE LESS THAN 50 PSI.
4. PRESSURIZATION
   a. EACH VALVED SECTION OF PIPE SHALL BE SLOWLY FILLED WITH WATER AND THE SPECIFIED TEST PRESSURE, BASED ON THE ELEVATION OF THE LOWEST POINT OF THE LINE OR SECTION UNDER TEST AND CORRECTED TO THE ELEVATION OF THE TEST GAUGE SHALL BE APPLIED BY MEANS OF A PUMP CONNECTED TO THE PIPE. THE PUMP PIPE CONNECTION AND ALL NECESSARY APPARATUS, INCLUDING GAUGES AND METERS SHALL BE FURNISHED BY THE CONTRACTOR. BEFORE APPLYING THE SPECIFIED TEST PRESSURE, AIR SHALL BE EXPELLED COMPLETELY FROM THE TEST SECTION. IF PERMANENT AIR RELEASE VALVES ARE NOT LOCATED AT ALL HIGH POINTS, THE CONTRACTOR SHALL INSTALL CORPORATION COCKS AT ALL POINTS SO THAT THE AIR CAN BE EXPELLED AS THE SECTION IS FILLED WITH WATER. AFTER ALL THE AIR HAS BEEN EXPELLED, THE CORPORATION COCKS SHALL BE CLOSED AND THE TEST PRESSURE APPLIED. AT THE CONCLUSION OF THE PRESSURE TEST THE CORPORATION COCKS SHALL BE REMOVED AND PLUGGED.
   b. ANY EXPOSED PIPE, FITTINGS, VALVES, AND JOINTS SHALL BE EXAMINED CAREFULLY DURING THE TEST. ANY DAMAGED OR DEFECTIVE PIPE, FITTINGS, VALVES, OR JOINTS THAT ARE DISCOVERED FOLLOWING THE PRESSURE TEST SHALL BE REPAIRED OR REPLACED WITH SOUND MATERIAL AND THE TEST SHALL BE REPEATED UNTIL IT PASSES.
   c. PRESSURE TEST SHALL BE MAINTAINED FOR A MINIMUM OF 2 HOURS.
5. LEAKAGE TEST
   a. AFTER THE COMPLETION OF THE PRESSURE TEST, A LEAKAGE TEST SHALL BE CONDUCTED TO DETERMINE THE QUANTITY OF WATER LOST BY LEAKAGE UNDER THE SPECIFIED TEST PRESSURE. LEAKAGE SHALL BE DEFINED AS THE QUANTITY OF WATER THAT MUST BE SUPPLIED INTO THE NEWLY LAID PIPE OR ANY VALVED SECTION THEREOF TO MAINTAIN PRESSURE WITHIN 5 PSI OF THE SPECIFIED TEST PRESSURE AFTER THE PIPE HAS BEEN FILLED WITH WATER AND THE AIR HAS BEEN EXPELLED.
   b. LEAKAGE SHALL NOT BE MEASURED BY A DROP IN PRESSURE IN A TEST SECTION OVER A PERIOD OF TIME.
6. TEST ALL TRACER WIRES TO CONFIRM CONTINUITY.

D. MANHOLES

1. ALL MANHOLE VACUUM TESTS SHALL BE CONDUCTED IN THE PRESENCE OF A REPRESENTATIVE OF THE HCRSD AND IN ACCORDANCE WITH ASTM C1244, STANDARD TEST METHOD FOR CONCRETE SEWER MANHOLES BY NEGATIVE AIR PRESSURE (VACUUM) TEST.
2. 100% OF ALL MANHOLES SHALL BE TESTED.
3. THE VACUUM TEST EQUIPMENT SHALL CONSIST OF: INFLATABLE PLUGS FOR ALL INCOMING AND OUTGOING SEWER LINES; AN INFLATABLE TEST COLLAR TO SEAL THE MANHOLE AT THE MANHOLE FRAME; AND A VACUUM PUMP. A VACUUM LIQUID FILLED GAUGE SHALL BE LOCATED IN-LINE BETWEEN THE TEST COLLAR AND THE PUMP TO ACCURATELY INDICATE THE VACUUM IN INCHES OF MERCURY WITHIN THE MANHOLE. THE VACUUM GAUGE SHALL HAVE A MINIMUM OF 3.5 INCH DIAMETER FACE AND A RANGE TO NO MORE THAN THIRTY (30) INCHES OF MERCURY, WITH SCALE MARKINGS OF NO GREATER THAN ONE-HALF (1/2) INCH OF MERCURY VACUUM AND AN ACCURACY TO WITHIN ± TWO PERCENT (2%) OF TRUE VACUUM.
4. PREPARATION
   a. MANHOLES SHALL BE TESTED AFTER INSTALLATION WITH ALL CONNECTIONS IN PLACE.
   b. LIFT HOLES SHALL BE FILLED WITH NON-SHRINK GROUT, SEALED AND CURED.
   c. MANHOLE VACUUM TESTING SHALL BE PERFORMED AFTER ALL ADJACENT UNDERGROUND UTILITIES HAVE BEEN INSTALLED AND ALL MANHOLES HAVE BEEN COMPLETELY BACKFILLED AND FINISHED TO GRADE. VACUUM TESTING PRIOR TO INSTALLATION OF ALL UTILITIES MAY BE CONSIDERED UPON REQUEST TO THE HCRSD PRIOR TO INSTALLATION OF ALL UTILITIES IF THE MANHOLES ARE COMPLETELY BACKFILLED AND SEWER LEAKAGE AND DEFLECTION TESTING IS COMPLETE. IF VACUUM TESTING IS PERFORMED PRIOR TO ALL UTILITIES BEING INSTALLED AND ANY MANHOLES ARE FOUND TO HAVE BEEN DISTURBED OR DAMAGED DURING INSPECTION DURING THE WARRANTY PERIOD, THE MANHOLES SHALL BE REPAIRED AND VACUUM TESTED AGAIN TO ENSURE THAT THERE IS NO LEAKAGE.
   d. IF A COATING OR LINING IS TO BE APPLIED TO THE INTERIOR OF THE MANHOLE, THE TEST MUST NOT BE PERFORMED UNTIL THE COATING IS CURED PER MANUFACTURER'S RECOMMENDATION.
5. CONTRACTOR SHALL SUBMIT TO THE HCRSD THE RESULTS OF EACH MANHOLE VACUUM TEST. SUCH REPORTS SHALL INCLUDE A DESCRIPTION OF THE LOCATION OF THE MANHOLE, THE TIME, DATE AND WEATHER OF THE TEST, A LIST OF ALL PERSONS PRESENT, THE DIAMETER AND DEPTH OF THE MANHOLE AND THE ALLOWABLE TEST RESULTS, AND THE ACTUAL TEST RESULTS.
6. ALL MANHOLES SHALL BE REPAIRED BY CONTRACTOR AND RETESTED AS DESCRIBED ABOVE UNTIL A SUCCESSFUL TEST IS MADE. AFTER EACH TEST, THE TEMPORARY PLUGS SHALL BE REMOVED.

E. LATERALS

1. ALL LATERALS SHALL BE VISUALLY INSPECTED BY A HCRSD REPRESENTATIVE.

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HENDRICKS COUNTY REGIONAL SEWER DISTRICT

SPECIFICATIONS

CYNTHIA L. FORT
REGISTERED
No.
PE60860328
STATE OF
INDIANA
PROFESSIONAL ENGINEER

Cynthia L Fort
CERTIFIED BY

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1	Updated testing req. per IDEM comments	01/20/17

Project Number 2000.00103

SANITARY SEWER SPECIFICATIONS

03

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" (NEB)
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.)

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.

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 WELL LEVEL DEVICE (FOGROD OR SIMILAR) WITH CABLE AND WET WELL STANDBY FLOAT CONTROL SWITCHES WITH CABLES, VALVE VAULT WITH MAGNETIC FLOW METER/FLOW TUBE, SECONDARY ELECTRICAL SERVICE CONDUCTORS AND CONDUITS, ELECTRICAL SERVICE METER AND SUMP PUMP, MAIN FUSED DISCONNECT, PETERSON BOX CAPABLE OF ACCEPTING PORTABLE GENERATOR WIRES, LIFT STATION CONTROLS AND ENCLOSURE WITH OMNI–SITE EQUIPMENT AND ELECTRONIC FLOW RECORDER (ONLY IF SHOWN ON DRAWINGS), 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, CONDUCTORS 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. EACH 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 6–FT TALL (MINIMUM HEIGHT) CHAIN LINK FENCE TOPPED WITH THREE STRANDS OF BARBED WIRE. THE FENCE SHALL BE HEAVY GAUGE GREEN COATED, AND THE POLES SHALL BE HEAVY GAUGE GREEN. THE FENCE SHALL ALSO HAVE GREEN VINYL SLATS. 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 MOTION DETECTOR AND MANUAL OVERRIDE ACTIVATION SWITCHES, IMPACT RESISTANT GLASS AND A 500 WATT LED LAMP. LIGHT SHALL BE EQUIPPED WITH A MANUALLY OPERATED TOGGLE SWITCH TO OVERRIDE THE MOTION DETECTOR. LAMP SHALL BE INSTALLED IN A METAL CAGE TO PROTECT IT FROM IMPACT.

C. EACH LIFT STATION SHALL BE ACCESSED BY A PAVED DRIVEWAY AND BE PROVIDED WITH A PAVED PARKING AREA. DRIVEWAY TO BE BITUMINOUS, MINIMUM 10–FOOT WIDE PROVIDING ACCESS DIRECTLY ADJACENT TO THE WET WELL, VALVE VAULT, AND METER VAULT. PROVIDE ENOUGH TURNAROUND AND PARKING AREA FOR ONE VEHICLE.

D. CONTRACTOR SHALL PROVIDE A PERMANENT BYPASS PUMP IF REQUESTED BY OWNER.

E. MINIMUM PUMP SUCTION AND DISCHARGE DIAMETER SHALL BE 4–IN. NO GRINDER PUMPS ARE ALLOWED UNLESS OTHERWISE APPROVED BY THE OWNER.

F. MINIMUM FORCE MAIN DIAMETER SHALL BE 4–IN.

G. CONTRACTOR SHALL PROVIDE A MAGNETIC FLOW METER WITH DATA LOGGING WITH ELECTRONIC FLOW RECORDER IF REQUESTED BY OWNER.

H. EACH LIFT STATION SHALL HAVE, AS A MINIMUM, TWO PUMPS. STATION SHALL BE DESIGNED TO PROVIDE THE DESIGN PEAK HOUR FLOW WITH THE LARGEST PUMP OUT OF SERVICE (FIRM CAPACITY).

I. 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
5. 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.
6. THE JUNCTION BOXES SHALL HAVE EPOXY CONDUIT SEALS FROM THE JUNCTION BOX UP TO THE PANEL.
7. THE CONDUITS BETWEEN THE POWER PANEL AND THE JUNCTION BOX FOR THE PUMPS SHALL BE A MINIMUM OF 4–INCH.
8. 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.
9. 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.
10. THE LIFT STATION MAIN FUSED DISCONNECT SWITCH ENCLOSURE SHALL BE MOUNTED A MINIMUM OF EIGHTEEN INCHES ABOVE THE WET WELL VENT OUTLET.

J. 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), HORSE POWER, 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

K. AFTER PLAN APPROVAL, AND PRIOR TO CONSTRUCTION, APPLICANT TO 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, AUTOMATIC TRANSFER SWITCH, STANDBY GENERATOR AND ENCLOSURE, LIFT STATION CONTROLS ENCLOSURE AND COMPONENTS TO INCLUDE OMNI–SITE 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, RIGID GALVANIZED STEEL AND PVC CONDUITS, WATERPROOF ELECTRICAL CONNECTIONS, EQUIPMENT STRUCTURAL SUPPORTS, SITE LIGHTING TO INCLUDE FIXTURE, POLE, LAMP, MOTION DETECTOR, AND POLE FOUNDATION AND GROUNDING DETAILS, SITE FENCING AND FENCE GROUNDING DETAILS, HYDRANT.
4. LIFT STATION CONTROLS ELECTRICAL POWER AND CONTROL DIAGRAMS INDICATING ALL CONTROL COMPONENTS, COMPONENT SIZES, RATINGS, AND FUNCTIONS.

L. OPERATION AND MAINTENANCE MANUALS: CONTRACTOR SHALL SUBMIT FOUR (4) OPERATION AND MAINTENANCE MANUALS TO OWNER. MANUALS SHALL INCLUDE, AT A MINIMUM, THE FOLLOWING:

1. WARRANTY STATEMENT, IN ACCORDANCE WITH ARTICLE 3.4 OF THIS SECTION;
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.

M. FACTORY TESTS

1. EACH PUMP TO BE DELIVERED UNDER THIS SECTION SHALL BE TESTED FOR PERFORMANCE AT THE PUMP MANUFACTURER'S FACTORY TO DETERMINE HEAD VERSUS CAPACITY, EFFICIENCIES, 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.
8. AFTER THE OPERATIONAL TEST (DESCRIBED IN LINE F) HAS BEEN CONDUCTED, THE INSULATION TEST (DESCRIBED IN LINE D ABOVE) SHALL BE PERFORMED AGAIN.
9. AFTER TESTING, THE PUMP SHALL BE INSPECTED TO INSURE THAT THE PUMP MAINTAINS FULL WATERTIGHT INTEGRITY.
10. 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. "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 VERIFY ALL FIELD DIMENSIONS.

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 KSB, MYERS, OR HCRSD 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.
2. 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.
3. 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.
4. 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 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.
5. 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.
8. 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 SEALING 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, 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. ALL ACCESS COVERS SHALL BE SUPPLIED WITH RIGID FALL THROUGH PROTECTIVE GRATING.

B. THE DOORS SHALL BE MINIMUM 1/4" ALUMINUM TREAD PLATE REINFORCED AS REQUIRED 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. WET WELL ACCESS SHALL BE MULTI– LEAF TO PROVIDE ADEQUATE ACCESS FOR PUMPS.

C. ALL WET WELL HATCHES SHALL BE PROVIDED WITH A SAFETY GRATE 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 GRATE 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 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 II 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 SEATING PRECAST SECTIONS SHALL BE PREFORMED GASKETS JOINT STRAPS CONFORMING TO FEDERAL SPECIFICATIONS SS–S00210, 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.
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.

B. CONSTRUCT VALVE VAULTS OF PRECAST REINFORCED CONCRETE.

1. BASES SHALL BE ONE PIECE PRECAST BASE SECTIONS CONSISTING OF INTEGRALLY CAST SLAB AND BOTTOM RING SECTION, CONSTRUCTED TO THE DIMENSIONS INDICATED ON THE DRAWINGS AND PER ASTM STANDARDS.
2. RESILIENT GASKET PIPE–TO–MANHOLE CONNECTORS, MANUFACTURED IN ACCORDANCE WITH ASTM C–923 SHALL BE PROVIDED.
3. RISER SHALL BE THE SAME DIMENSIONS AS THE BASE. RISERS SHALL BE PRECAST REINFORCED CONCRETE RISER SECTIONS IN ACCORDANCE WITH ASTM C478.
4. AT EACH JOINT BETWEEN PRECAST SECTIONS PROVIDE A PERMANENT, FLEXIBLE, WATERTIGHT, FULL PERIMETER EXTERNAL JOINT WRAP IN ACCORDANCE WITH ASTM C–877, TYPE II AND PASSING ASTM C–1244 VACUUM TEST. WRAP SHALL BE AS MANUFACTURED BY MAR MAC CONSTRUCTION PRODUCTS, INC. OR OWNER APPROVED EQUAL.
5. GASKETS FOR SEATING PRECAST SECTIONS SHALL BE PERFORMED GASKET JOIN STRIPS CONFORMING TO FEDERAL SPECIFICATION SS–S–00210, TYPE I, ROPE FORM, OR KENT SEAL MASTIC.
6. RISERS SHALL NOT HAVE THROUGH WALL LIFT HOLES.
7. TOP SLABS SHALL BE ONE PIECE PRECAST CONCRETE, CONSTRUCTED TO THE DIMENSIONS SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH ASTM STANDARDS.
8. TOP SLAB STEEL REINFORCEMENT SHALL BE DESIGNED FOR THE DESIGNATED SURFACE LOAD OF THE STRUCTURE PER ASTM STANDARDS.
9. 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.
10. 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.

2.6 VALVES

A. CHECK VALVES SHALL BE VAL–MATIC SWING CHECK, WITH AN OUTSIDE LEVER WEIGHT.

B. ISOLATION VALVES SHALL BE RESILIENT SEAT WEDGE TYPE WITH A SQUARE ACTUATOR NUT FOR OPERATION. THE OPERATING STEM FOR THE VALVE SHALL EXTEND CLOSE TO THE TOP OF THE VALVE VAULT. THE VAULT SHALL HAVE A MONUMENT BOX INSTALLED AND CENTERED OVER THE VALVE NUT, SO THAT THE VALVE MAY BE OPERATED FROM THE SURFACE.

1. MANUFACTURERS: MUELLER, CLOW, OR 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 4 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 AND CIRCULAR CHART RECORDER

A. THE FOLLOWING DETAILS APPLY TO THE FLOW METER, IF REQUESTED.

B. 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.

C. 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.

D. 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.

E. 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.

F. THE FLOW TUBE SHALL BE INSTALLED IN A METER VAULT AS SHOWN ON THE PLANS. THE TRANSMITTER AND DIGITAL RECORDER SHALL BE INSTALLED IN THE ELECTRIC CONTROL PANEL SPECIFIED IN SECTION 2.11 OF THESE SPECIFICATIONS.

G. 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

H. THE VALVE VAULT SHALL CONTAIN A 6–INCH BYPASS DUCTILE IRON RISER THAT EXTENDS ABOVE THE PAD ON THE VALVE VAULT WITH A CAM LOK FITTING.

I. 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–LOK FITTING. ISOLATION VALVES FOR BYPASS PUMPING SHOULD BE ACCESSIBLE FROM ON TOP OF THE PAD.

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 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 FREE STANDING, PAD MOUNTED, 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 .125" GRADE 6061–T6 ALUMINUM. EACH DOOR SHALL HAVE A DRIP SHIELD, AND PADLOCK ABLE 3 POINT LATCHING MECHANISM. THE LATCHING MECHANISM SHALL BE A LEVER TYPE LOCKING DEVICE, 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 MANUFACTURED 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. 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.
6. 20A, SINGLE POLE CIRCUIT BREAKER AND 20A, 120V GFI DUPLEX RECEPTACLE. F.

F. PROVIDE THE FOLLOWING EQUIPMENT IN THE CONTROL SECTION OF THE ENCLOSURE:

1. 15A, SINGLE POLE CIRCUIT BREAKER FOR CONTROLS.
2. LEVEL CONTROLLER WITH ISOLATION TRANSFORMER.
3. HAND–OFF–AUTOMATIC (H–O–A) SWITCHES FOR EACH PUMP.
4. RUN LIGHTS (GREEN) PUSH–TO–TEST FOR EACH PUMP.
5. SEAL FAILURE LIGHTS (RED) PUSH–TO–TEST FOR EACH PUMP.
6. ELAPSED TIME METERS (99999.9 HOURS) FOR EACH PUMP.
7. BACK–UP FLOAT CONTROL RELAY, INTRINSICALLY SAFE, WITH TIMER TO AUTOMATICALLY OPERATE THE PUMPS IN THE EVENT OF LEVEL CONTROLLER FAILURE. THIS RELAY SHALL ALSO ACTIVATE THE HIGH WATER ALARM AND LIGHT BELOW.
8. CHANNEL HEATER WITH THERMOSTAT.
9. OMNI–SITE CRYSTAL BALL MICRO RTU, WIRELESS ALARM MONITOR, WITH 12V DC POWER SUPPLY AND BATTERY BACKUP.
10. A DIGITAL DATA LOGGER SHALL BE INSTALLED IN THE CONTROL CABINET.
11. 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.

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.

H. ON THE OUTSIDE OF THE ENCLOSURE MOUNT THE FOLLOWING:

1. HIGH WATER ALARM LIGHT TO INCLUDE 120V, 75W LAMP AND LAMP HOLDER WITH RED GLOBE AND GUARD.

2.12 PUMP STATION CONTROLLER

A. FURNISH A NEW PUMP CONTROLLER FOR MONITORING AND AUTOMATICALLY CONTROLLING THE DUAL PUMPS IN A PUMP DOWN MODE OF OPERATION IN RESPONSE TO LEVEL PROCESS VARIABLES AS BASED ON PRECONFIGURED SET POINTS. UNIT SHALL COMMUNICATE STATION STATUS AND ALARMS VIA CELLULAR BASED COMMUNICATIONS TO THE HOST WEBSITE ACCESSIBLE TO THE SYSTEM OPERATIONS AND MAINTENANCE PERSONNEL.

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 3 PUMPS. "ONE OF A KIND" SYSTEMS USING CUSTOM SOFTWARE WITH A GENERIC PROGRAMMABLE CONTROLLER WILL NOT BE ACCEPTABLE.

C. THE OPERATING PROGRAM SHALL BE RESIDENT IN NON–VOLATILE FLASH MEMORY AND INCLUDE FULL– SCALE RANGING AND PUMP–UP/DOWN DETERMINATION. THE CONTROLLER SHALL BE ARRANGED TO OPERATE UP TO THREE (3) PUMPS PLUS HIGH AND LOW (ANALOG) ALARMS. THE ON AND OFF ADJUSTMENTS OF EACH PUMP AND ALARM SET POINT SHALL BE FULL–RANGE ADJUSTABLE THROUGH USE OF AN AUTHORIZED OPERATOR ACCESS CODE AND A KEYPAD. THE CONTROLLER DISPLAY SHALL SHOW THE OPERATION OF EACH CONTROL STAGE.

D. THE CONTROLLER SHALL INCLUDE KEYPAD ADJUSTABLE ON–DELAY TIMING LOGIC TO PROVIDE STAGGERED PUMP STARTING FOLLOWING A POWER FAILURE CONDITION. KEYPAD ADJUSTABLE OFF DELAY TIMING FOR EACH PUMP CONTROL STAGE SHALL PROVIDE SMOOTH TRANSITION BETWEEN CONTROL STAGES.

E. 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 ANNUNCIATION 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. BACK 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.

F. THE PUMP CONTROLLER SHALL BE FURNISHED WITH A USER FRIENDLY "VIEW–AT–A–GLANCE™" 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, & 3 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 MEASURED PROCESS. RANGE CAN ALSO BE OFFSET ALLOWING DISPLAY OF A PRESSURE OR LEVEL RANGE THAT DOES NOT START AT ZERO. THE DISPLAY RANGES SHALL 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:
   i. PROCESS DISPLAY TO XX.X OF THE FULL SCALE PROCESS RANGE.
   ii. TIME AND DATE STAMPED ALARMS & EVENTS
   iii. PUMP STATISTICS (INCLUDING RUN TIME, NUMBER OF STARTS, DAILY AVERAGE NUMBER OF STARTS)
   iv. SYSTEM DIAGNOSTICS
   v. CONTROLLER SECURITY
   vi. UNAUTHORIZED STATION ENTRY DETECTION

G. 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.

H. 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:

1. PUMP 1, 2, 3 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.
2. PUMP 1, 2, 3 IN AUTO – THIS SIGNAL SHALL BE USED BY THE CONTROLLER TO DETERMINE PUMP AVAILABILITY. A PUMP IN THIS MODE CANNOT BE CALLED INTO OPERATION.
3. PUMP 1, 2, 3 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.
4. 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.
5. PUMP INHIBIT – THIS SIGNAL SHALL BE USED BY THE CONTROLLER TO INHIBIT PUMPS FROM OPERATING.
6. 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.
7. 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.

I. THE PUMP CONTROLLER LCD SHALL OPERATE IN A MANUAL SCROLLING MENU MODE WITH THE VARIOUS 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.

J. THE PUMP CONTROLLER SHALL BE PROTECTED FROM UNAUTHORIZED CHANGES VIA BUILT–IN SYSTEM SECURITY. THE UNIT SHALL SUPPORT 3 LEVELS OF SECURITY IN A HIERARCHICAL STRUCTURE ALLOWING DIFFERENT LEVELS OF ACCESS TO THE PUMP CONTROLLER FOR DIFFERENTIATION OF DESIRED ASSESS LEVELS TO INCLUDE OPERATOR, MAINTENANCE, & SUPERVISORY ACCESS LEVELS.

K. THE PUMP CONTROLLER SHALL PROVIDE OUTPUTS FOR INTERFACE TO LOCAL PUMPS AND ALARM ANNUNCIATION EQUIPMENT. RELAY ISOLATED CONTACT OUTPUTS FOR ACTIVATION OF PUMP 1, PUMP 2, PUMP 3, COMMON ALARM AND ALARM HORN 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.

L. THE PUMP CONTROLLER SHALL PROVIDE 4–20 MA OUTPUT SIGNAL FOR INTERFACE TO EXTERNAL EQUIPMENT INCLUDING VFDS, CHART RECORDERS 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.

M. 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.

N. THE PUMP CONTROLLER SHALL HAVE BUILT–IN STANDARD OPERATOR ADJUSTABLE ALTERNATION FUNCTIONS ALLOWING FOR SEQUENCING AND EQUALIZING WEAR OF THE PUMPS. THE FOLLOWING ALTERNATION SEQUENCES SHALL BE SUPPORTED.

1. FIXED
2. ROTARY
3. FIRST ON FIRST OFF (FOFO)
4. UTILIZE ONE FAVOR OTHERS (UOFO)
5. EMERGENCY MODE

O. 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.

P. THE CONTROLLER SHALL INCLUDE BUILT IN SITE INTRUSION DETECTION LOGIC THAT WILL MONITOR AN EXTERNAL SENSOR (MOTION SENSOR, DOOR SWITCH, ETC.) AND ALLOW AUTHORIZED ACCESS TO THE STATION VIA CONTROLLER KEYPAD ENTRY OF PROPER SECURITY CODE OR ACCESS LEVEL. THE INTRUSION SYSTEM UPON DETECTION OF ENTRY, WILL ALLOW A PRESET AMOUNT OF TIME FOR THE OPERATOR TO GO THE CONTROLLER KEYPAD AND ENTER THE PROPER CODE. WHEN THE OPERATOR LOGS OUT AND LEAVES THE FACILITY, THE CONTROLLER SHALL ALLOW A PRESET AMOUNT OF TIME FOR THE OPERATOR TO GET OUT BEFORE RE–ARMING.

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

SPECIFICATIONS

CYNTHIA L. FORT
REGISTERED
No. PE60860328
STATE OF INDIANA
PROFESSIONAL ENGINEER

Cynthia L Fort

CERTIFIED BY

ISSUANCE INDEX
DATE:
06/14/2016

REVISION SCHEDULE		
NO.	DESCRIPTION	DATE

Project Number 2000.00103

STANDARD LIFT STATION SPECIFICATIONS

01

PLOT DATE: 6/14/2016 6:54 AM
PLOT SCALE: 1:1
EDIT DATE: 6/10/2016
EDITED BY: MBAKER
DRAWING FILE: P:\IN2000\0103\D_Drawings\Standards 2015\HCRSD Standards (Updated)\2016 HCRSD Lift Station Specs.dwg

2.12 PUMP STATION CONTROLLER (CONT.)

Q. IN ADDITION TO THE PUMP AND ALARM CONTROL CAPABILITY, THE CONTROLLER SHALL PROVIDE ALARM ANNUNCIATION. THE CONTROLLER SHALL, UPON THE OCCURRENCE OF AN ALARM, SOUND AN AUDIBLE DEVICE AND FLASH THE ALPHA–NUMERIC DISPLAY. THE DISPLAY WILL INDICATE THE ALARM DESCRIPTION, COMPLETE WITH THE TIME AND DATE OF THE ALARM OCCURRENCE. AN ACKNOWLEDGE PUSHBUTTON SHALL BE PROVIDED TO ALLOW SILENCING OF THE AUDIBLE DEVICE WHILE THE DIGITAL DISPLAY WILL CONTINUE TO SHOW THE ALARM FUNCTION, COMPLETE WITH TIME AND DATE INFORMATION, UNTIL THE CONDITION HAS CLEARED. A BUILT–IN ALARM AND STATUS HISTORIAN SHALL RETAIN THE LAST 100 TIME AND DATE STAMPED EVENTS PROVIDING A HISTORICAL RECORD OF RECENT ACTIVITY.

R. THE PUMP CONTROLLER SHALL INCLUDE A VOLUMETRIC LIFT STATION FLOW AND PUMP PERFORMANCE MONITORING CAPABILITY ALLOWING STATION FLOW MEASUREMENT WITHOUT THE USE OF AN IN LINE FLOW METER. IN ADDITION TO FLOW MEASUREMENT, THE PUMP CONTROLLER SHALL PROVIDE PUMP PERFORMANCE RELATED INFORMATION. PUMP STATION FLOW AND PUMP 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:

1. AVERAGE STATION INFLUENT FLOW RATE
2. MAXIMUM STATION INFLUENT RATE (K GAL) W/DATE & TIME
3. CURRENT DAY TOTAL EFFLUENT FLOW (K GAL)
4. PREVIOUS DAYS TOTAL EFFLUENT FLOW (K GAL)
5. AVERAGE DAILY EFFLUENT FLOW (K GAL)
6. MAXIMUM DAILY EFFLUENT FLOW (K GAL) W/DATE & TIME
7. TOTAL STATION EFFLUENT FLOW (K GAL)
8. AVERAGE FLOW RATE PUMP 1, 2, 3 OVER ALL CYCLES (GPM) – EACH PUMP
9. AVERAGE FLOW RATE PUMP 1, 2, 3 OVER LAST THREE CYCLES (GPM) – EACH PUMP
10. TOTAL FLOW PUMP 1, 2, 3 (K GAL) – EACH PUMP
11. FLOW RATE PUMPS 1, 2 (K GAL)
12. FLOW RATE PUMPS 1, 3 (K GAL)
13. FLOW RATE PUMPS 2, 3 (K GAL)
14. FLOW RATE PUMPS 1, 2, 3 (K GAL)
15. PUMP 1, 2, 3 LOW FLOW RATE ALARM (SET POINT) – EACH PUMP
16. PUMP 1, 2, 3 RUN TIME – EACH PUMP
17. PUMP 1, 2, 3 NUMBER OF STARTS – EACH PUMP
18. PUMP 1, 2, 3 AVERAGE NUMBER OF STARTS – EACH PUMP

S. THE PUMP CONTROLLER SHALL HAVE ONE (1) RS–232C SERIAL COMMUNICATIONS PORT THAT SHALL BE AVAILABLE FOR TELEMETRY COMMUNICATIONS. THE RS–232 SERIAL PORT SHALL SUPPORT OPEN COMMUNICATION STANDARDS INCLUDING AS A MINIMUM, MODBUS RTU OR ASCII. UNIT SHALL SUPPORT COMMUNICATION DATA RATES OF 1,200 TO 38,800 BAUD RATES. ON BOARD COMMUNICATION DIAGNOSTIC LEDS SHALL BE AVAILABLE TO PROVIDE INDICATION OF COMMUNICATIONS ACTIVITY FOR VERIFICATION AND TROUBLESHOOTING.

T. UNIT SHALL BE CONSTRUCTED FOR INDUSTRIAL APPLICATIONS FOR USE IN HARSH ENVIRONMENTS. UNIT SHALL HAVE A TEMPERATURE OPERATING RANGE OF –40 TO + 85 DEG C, AND BE ABLE TO OPERATE IN ENVIRONMENTS WITH 10–90% NON–CONDENSING HUMIDITY. UNIT SHALL BE UL LISTED AND IN COMPLIANCE WITH FCC PART 15 CLASS A EMISSIONS AND CE IEC61000 SURGE WITHSTAND CERTIFICATIONS.

U. 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.

V. IT IS THE INTENTION OF THIS SPECIFICATION THAT A STANDARD CONTROLLER/TRANSCEIVER BE PROVIDED, WITH ALL OF THE CONTROL AND COMMUNICATIONS FEATURES DESCRIBED AS A FULLY– INTEGRATED ASSEMBLY. THE CONTROLLER SHALL BE EVOQUA LC150 OR AS REQUIRED BY HCRSD FOR COMPATIBILITY WITHIN THE SPECIFIC SYSTEM.

2.13 LEVEL DEVICE SYSTEM

A. THE LIQUID LEVEL OF THE WET WELL SHALL BE SENSED BY A SUBMERSIBLE LEVEL DEVICE. THE LEVEL DEVICE SHALL BE FOGROD AS MANUFACTURED BY WASTEWATER LEVEL, LLC OR APPROVED EQUAL.

B. THE LEVEL DEVICE SHALL BE CONSTRUCTED OF CPVC AND HAVE METAL CONTACTS MADE OF AL6XN, WITH A RATING OF NEMA 6P.

C. THE LEVEL DEVICE SHALL BE SUPPLIED WITH A MOUNTING BRACKET AND CLEANING PAD.

D. THE LEVEL DEVICE ASSEMBLY SHALL BE INSTALLED WHERE DIRECTED BY THE ENGINEER AND CONNECTED WITH OTHER SYSTEM ELEMENTS AND PLACED IN SUCCESSFUL OPERATION.

E. 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 1, 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 REDUNDANT 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 BACKUP CONTROL SYSTEM, EVOQUA CB1T SHALL ALSO PROVIDE A WET WELL LOW LEVEL/SUCTION FUNCTION THAT DISABLES THE LIFT PUMPS UPON DETECTION THAT WET WELL LEVEL HAS REACHED A LEVEL THAT COULD CAUSE DAMAGE TO THE PUMPS. THE PUMPS SHALL BE LOCKED OUT OF OPERATION UNTIL WET WELL LEVEL HAS REACHED AN ELEVATION ABOVE THE PUMP OFF SENSOR.

G. THE REDUNDANT CONTROL/ALARM CAPABILITY SHALL BE COMPLETELY INTEGRATED IN THE SPECIFIED CONTROL PANEL AND SYSTEM AS DESCRIBED AND IN ACCORDANCE WITH ALL APPLICABLE CODES AND JOB REQUIREMENTS.

H. 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.

I. THE REDUNDANT HIGH LEVEL ALARM/PUMP CONTROL MODULE SHALL CONNECT TO THE FLOAT SWITCH LEVEL SENSORS THROUGH A CONTROL PANEL MOUNTED UL LISTED INTRINSIC SAFETY BARRIER. THE MODULE SHALL PROVIDE AN INTRINSICALLY SAFE INTERFACE FOR UP TO SIX SENSORS LOCATED IN A HAZARDOUS AREA (THE WET WELL) RATED CLASS I, DIVISION 1 OR 2, GROUPS A, B, C AND D, AND CLASS II, DIVISION 1 OR 2, GROUPS E, F, AND G. THE MODULE SHALL CONTAIN AN LED INDICATOR FOR EACH OF THE SIX SENSOR INPUTS PROVIDING VISIBLE INDICATION OF SENSOR ACTUATION AS WELL AS AN LED TO INDICATE BARRIER "POWER ON" STATUS.

J. FLOAT SWITCHES SHALL BE PROVIDED BY THE CONTROL PANEL SUPPLIER. THEY ARE TO BE A CATALOGUED ITEM OF THE CONTROL PANEL MANUFACTURER.

2.15 ALARM/DATA MONITORING

A. A MICROPROCESSOR–BASED CONTROLLER UNIT SHALL BE PROVIDED FOR MONITORING AND CONTROL OF THE LIFT STATION BASED ON ALARM CONTACT CLOSURES, UNIVERSAL VOLTAGE INPUT SIGNALS, 4–20MA SIGNALS, ETHERNET BASED CAMERAS, 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.

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. FOUR 20 AMP CONTROL RELAYS: HEAVY DUTY 20 AMP CONTROL RELAYS ARE USED TO CONTROL UP TO 4 PUMPS BASED UPON WET WELL LEVEL AND INCLUDES AUTOMATIC PUMP ALTERNATION. PUMP CONTROL RELAYS SHALL HAVE ADJUSTABLE CONTROL DIRECTION, SET POINTS, AND DEAD BANDS. A DEDICATED "LEVEL SIMULATION BUTTON" IS USED TO MANUALLY ACTIVATE RELAYS AND DETERMINE PROPER OPERATION.

F. INTER–START TIME DELAYS SHALL BE UTILIZED TO PREVENT "SLAMMING–ON" ALL PUMPS TOGETHER AFTER A POWER FAILURE. A DEDICATED "OVERRIDE" KEY ON THE USER KEYPAD SHALL ALLOW SIMPLE REMOVAL OF A PUMP FROM AUTOMATIC CONTROL WHEN "OUT OF SERVICE". A THIRD DEDICATED "LEVEL SET POINT" KEY ALLOWS SIMPLE ADJUSTMENT OF ON/OFF SET POINTS WITHOUT THE NEED FOR LAPTOP COMPUTERS OR COMPLEX RE–PROGRAMMING.

G. VFD DISPLAY: (20 CHARACTER X 4 LINE) VACUUM FLUORESCENT DISPLAY IS VIEWABLE IN VERY BRIGHT SUNLIGHT, TOTAL DARKNESS OR VERY HIGH OR LOW TEMPERATURES UNLIKE LOW COST LCD DISPLAYS. THIS HIGH VISIBILITY OPERATOR DISPLAY IS USED TO CONFIGURE AND MONITOR VARIABLES AND ELIMINATES THE NEED FOR PROGRAMMING DEVICES SUCH AS LAPTOP COMPUTERS. INCLUDES BUILT–IN SCREEN SAVER THAT CONTINUOUSLY SCROLLS VALUES OF ALL INPUTS AND CALCULATIONS FOR EASY VIEWING AND SET POINT ADJUSTMENT

H. ETHERNET PORT: STANDARD 10/100MB ETHERNET JACK AVAILABLE FOR COMMUNICATION TO IP ENABLED DEVICES SUCH AS PLCS, CONTROLLERS, PCS, CHART RECORDERS, MMIS, REMOTE I/O AND PLUG–AND–PLAY OMNI–SITE CLEARVIEW™ CAMERAS.

I. EXPANSION I/O PORT: STANDARD RS232 PORT TO COMMUNICATE TO OMNI–SITE EXPANSION I/O MODULES. ALLOWS MONITORING AND CONTROL OF VARIOUS MFG. DEVICES WHEN STANDARD I/O COUNT IS EXHAUSTED. SETUP USING LOCAL DISPLAY AND KEYPAD ELIMINATES NEED FOR LAPTOP. ALLOWS EXPANSION OF RTU I/O TO (24) UNIVERSAL DI, (8) AI, (2) PULSE COUNTERS, (1) RAIN GAUGE INPUT, (4) RELAY OUTPUTS

J. RS485 PORT: THE VFD DISPLAY/KEYPAD ASSEMBLY ON THE FACE OF THE RTU CAN BE REMOTELY MOUNTED. A SINGLE CABLE DELIVERS POWER AND CONTROL TO NETWORK UP TO 4 REMOTE DISPLAY/KEYPAD ASSEMBLIES TO A SINGLE RTU. ALLOWS VIEWING INPUT, CALCULATION, AND ALARM INFORMATION OUTSIDE OF HAZARDOUS OR RESTRICTED AREAS. THE REMOTELY MOUNTED DISPLAY SHALL BE NEMA 4X RATED, AND SHALL INCLUDE A RECEPTACLE TO READ THE INTELLIGENT PERSONNEL TRACKING KEY.

K. SD MEMORY CARD SLOT: PHOTOGRAPHIC IMAGES SHALL BE CAPTURED FROM IP ENABLED CAMERAS AND STORED ON THE ON–BOARD SD MEMORY STICK. TREND LOG DATA FROM CONNECTED VARIABLES SHALL ALSO BE STORED ON THE MEMORY STICK FOR LATER RETRIEVAL. MEMORY SHALL HAVE THE ABILITY TO BE USED FOR UPDATES TO THE RTU OPERATING SYSTEM ELIMINATING THE NEED FOR FIELD LAPTOP COMPUTERS TO REPAIR OPERATING PROGRAM ERRORS. MEMORY STICKS AVAILABLE FROM 32MB TO 1GB. ONE 500 MB STICK INCLUDED WITH EACH RTU ON THIS PROJECT.

L. CAMERA PORT: ONE ETHERNET JACK IS AVAILABLE TO CONNECT UP TO (2) IP ENABLED SECURITY CAMERAS FOR TAKING PHOTOGRAPHIC STILL IMAGES AT A MAXIMUM RATE OF ONE PHOTO/ 3– SECONDS. PHOTOGRAPH STORAGE DETERMINED BY SIZE OF SD MEMORY STICK. IF MEMORY STICK BECOMES FULL, USER CAN SELECT TO AUTOMATICALLY OVERWRITE OLDEST IMAGES, OR STOP TAKING PICTURES. PHOTOS ARE AVAILABLE TO BE DOWNLOADED OVER THE WIRELESS CONNECTION TO CLIENT'S WEBSITE OR CAN BE RETRIEVED FROM MEMORY STICK. MEMORY STICK STORES IMAGES IN CASE WIRELESS CONNECTION TO WEBSITE IS LOST FOR ANY REASON. ALL IMAGES STORED IN JPEG FORMAT FOR EASY VIEWING ON PCS.

M. INTELLIGENT KEY READER: INTELLIGENT KEY READER IDENTIFIES OPERATOR ON SITE AND LOGS WHO VISITED SITE, TOOK EQUIPMENT OUT OF SERVICE, ETC. KEYS CAN BE REPROGRAMMED BY THE RTU KEY READER ON SITE, ELIMINATING THE NEED TO CONTACT THE FACTORY FOR KEY RE–PROGRAMMING. ONE RTU KEY INCLUDED WITH EACH RTU.

N. USER DEFINED LOGIC STATEMENTS: EACH CRYSTAL BALL RTU SHALL INCLUDE THE POWERFUL SCRIPTING LOGIC STATEMENTS THAT ALLOW A NOVICE TO QUICKLY AND EASILY CREATE CUSTOM, INTERLOCKED LOGIC AND CONTROL STATEMENTS USING SIMPLE DROPDOWN SELECTIONS AND <, >, =, IF, THEN, OR STATEMENTS FROM THE FRONT OF EACH RTU. NO LAPTOP COMPUTER OR CUSTOM PLC PROGRAMMING IS REQUIRED TO CREATE THESE STATEMENTS. SYSTEMS THAT RELY ON "ONE OF A KIND" SPECIALIZED PLC–STYLE LOGIC PROGRAMS OR SPECIALIZED TECHNICAL KNOWLEDGE SHALL NOT BE CONSIDERED.

O. UL 508 PENDING INDUSTRIAL APPLIANCE

P. THE CONTROLLER SHALL MONITOR AND TRANSMIT THE FOLLOWING POINTS:

1. POWER FAIL
2. HIGH WET WELL LEVEL
3. BYPASS PUMP RUN
4. BYPASS PUMP FAIL
5. PUMP 1 SEAL FAIL
6. PUMP 2 SEAL FAIL
7. PUMP 1 RUN
8. PUMP 2 RUN
9. PUMP 1 THERMAL FAULT
10. PUMP 2 THERMAL FAULT
11. PUMP 1 ELAPSED TIME
12. PUMP 2 ELAPSED TIME
13. FLOAT BACKUP MODE
14. PUMP 1 AMP DRAW
15. PUMP 2 AMP DRAW LEVEL
16. PUMP STATION FLOW
17. LEVEL DEVICE FAIL
18. 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, AND TIE EACH BARBED WIRE RUN TO A MESH FENCE SECTION ON AT LEAST THE THREE CONTINUOUS SIDES OF THE FENCE. 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. ALL CONDUIT ABOVE GROUND SHALL BE RIGID GALVANIZED STEEL. ALL CONDUIT BELOW GROUND SHALL BE HEAVY WALL PVC. MINIMUM CONDUIT DIAMETER SHALL BE 1/2 INCH.

F. THE LIFT STATION PUMPS POWER 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.

G. THE LIFT STATION MAIN FUSED DISCONNECT SHALL BE A HEAVY DUTY FUSED SWITCH IN A NEMA 4X ENCLOSURE.

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 APPROVED EQUAL.

a. STEEL CHAIN LINK FABRIC: 6–FEET HIGH. CLASS 2B FUSED AND ADHERED, 2" OR TIGHTER, 9 GAUGE CORE, GREEN, KNUCKLE/TWIST SELVAGE.

b. 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/ FT^2 WITH A CLEAR POLYMERIC OVERCOAT, TYPE D INTERIOR 90% ZINC–RICH COATING HAVING A MINIMUM THICKNESS OF 0.30 MILS).

1. LINE POST: 1.900" MIN. – 2.375" MAX. LG–40
2. END, CORNER, PULL POST: 2.875" MIN., LG–40
3. TOP, BRACE, BOTTOM AND INTERMEDIATE RAILS, 1.660 IN. OD: LG–20 OR HEAVIER.

c. 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. BARBED WIRE: COLORBOND® POLYMER COATED BARBED WIRE: COMPLY WITH ASTM F1665, 14 GAUGE (0.80 IN) DOUBLE TWISTED GALVANIZED STEEL STRAND CORE WIRE; ZINC COATED STEEL OR ALUMINUM ALLOY FOUR POINT, 14 GAUGE (0.080 IN.) BARBS SPACED 5 INCHES ON CENTER. CLASS 2B FUSED AND ADHERED. BARBS ARE NOT POLYMER COATED. MATCH COLOR TO THAT OF THE CHAIN LINK FABRIC.

e. FITTINGS

1. 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/FT^2 . SECURE BANDS WITH 5/16 IN. GALVANIZED STEEL CARRIAGE BOLTS.
2. 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/FT^2.
3. 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. /FT . BARS FOR 2 IN. AND 1 ¾ IN. MESH SHALL HAVE A MINIMUM CROSS SECTION OF 3/16 IN. BY 3/4 IN.
4. BARBED WIRE ARMS: IN COMPLIANCE WITH ASTM F626, PRESSED STEEL GALVANIZED AFTER FABRICATION, MINIMUM ZINC COATING OF 1.20 OZ. $/FT^2$, CAPABLE OF SUPPORTING A VERTICAL 250 LB LOAD. TYPE I – THREE STRAND 45 DEGREE ARM.

f. TIE WIRE AND HOG RING: POLYMER COATED COLORBOND®, MATCH THE COATING, CLASS AND COLOR TO THAT OF THE CHAIN LINK FABRIC.

g. SWING GATES: GALVANIZED STEEL PIPE WELDED FABRICATION IN COMPLIANCE WITH ASTM F900. GATE FRAME MEMBERS 1.900 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 4.000 IN. IN DIAMETER. ALL POST WEIGHT 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.

h. CONCRETE: CONCRETE FOR POST FOOTINGS SHALL BE WET MIXED AND POURED. NO LESS THAN A 5000 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 AND AS REQUIRED BY PART 2 OF 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. 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.

D. TRANSFER SWITCH

1. THE CONDUIT BETWEEN THE TRANSFER SWITCH AND THE LIFT STATION CONTROL ENCLOSURE SHALL BE ALUMINUM ELECTRIC METALLIC TUBING (EMT) CONDUIT.

E. INSTALL THE LIFT STATION CONTROL ENCLOSURE ON A CONCRETE PAD 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 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:

1. THE WAITING PERIOD SHALL BE AFTER BOTH OF THE FOLLOWING:
   i. AFTER THE FORCE MAIN, GRAVITY SEWERS AND MANHOLES CONSTRUCTED AS PART OF THE PROJECT HAVE PASSED ALL REQUIRED TESTS CONTAINED IN SECTIONS 602, 603, AND/OR 604.
   ii. 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.
2. EQUIPMENT: THE CONTRACTOR OR MANUFACTURER SHALL PROVIDE ALL NECESSARY EQUIPMENT TO SAFELY COMPLETE ALL THE TASKS NECESSARY TO TEST AND ACCEPT THE LIFT STATION.
3. 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:
   i. PUMPING RATE FOR ALL PUMPS IN GPM;
   ii. COMMUNICATIONS EQUIPMENT;
   iii. PROGRAMMABLE LOGIC CONTROLLER;
   iv. ALL ELECTRONIC EQUIPMENT;
   v. ALL MECHANICAL EQUIPMENT;
   vi. ALL INSTRUMENTATION AND CONTROL EQUIPMENT;
   vii. ALL PROGRAMMING;
   viii. INCOMING POWER;
   ix. THE OVERALL OPERATING CONDITION OF THE LIFT STATION; AND
   x. ANY OTHER TEST THE OWNER DEEMS NECESSARY.
4. 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:
   i. LEVEL DEVICES;
   ii. FLOW METERS;
   iii. GAUGES; AND
   iv. OTHER EQUIPMENT AS DEEMED NECESSARY BY THE OWNER.
5. 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.
6. 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).

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

SPECIFICATIONS

CYNTHIA L. FORT
REGISTERED
No. PE60860328
STATE OF INDIANA
PROFESSIONAL ENGINEER

Cynthia L Fort

CERTIFIED BY

ISSUANCE INDEX
DATE:
06/14/2016

REVISION SCHEDULE		
NO.	DESCRIPTION	DATE

Project Number 2000.00103

STANDARD LIFT STATION SPECIFICATIONS

02

PLOT DATE: 6/14/2016 6:55 AM
PLOT SCALE: 1:1
EDIT DATE: 6/10/2016
EDITED BY: MBAKER
DRAWING FILE: P:\IN2000\0103\D_Drawings\Standards 2015\HCRSD Standards (Updated)\2016 HCRSD Lift Station Specs.dwg