

STEUBEN LAKES REGIONAL WASTE DISTRICT (SLRWD)

DEVELOPMENT STANDARDS, DETAILS AND SPECIFICATION MANUAL

SECTION I – REQUIREMENTS FOR INDIVIDUAL SEWER TAP

SECTION II – REQUIREMENTS FOR SEWER SYSTEM
EXTENSIONS & ADDITIONS

SECTION III – PLAN AND SPECIFICATION REQUIREMENTS
FOR SEWER SYSTEM EXTENSIONS &
ADDITIONS

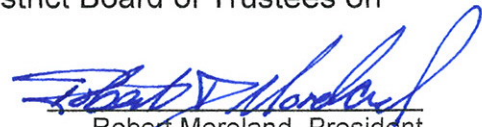
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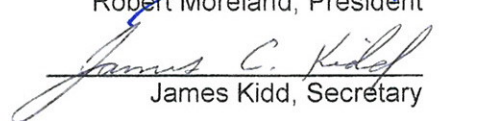
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Adopted by the Steuben Lakes Regional Waste District Board of Trustees on
this 13TH day of April, 2017.


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Development Standards, Details, And Specification Manual

Amendments

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SECTION I

CONSTRUCTION/PROPERTY IMPROVEMENT PERMIT

A Construction/Property Improvement Permit is required for all new construction, sewer tap relocation or reconnection, or when any utility will be relocated from those shown on existing approved sewer taps. This Permit is also required when any improvements, including landscaping, is to be installed within the SLRWD easement. Individual Sewer Taps are subject to the requirements of Section III.

1.0 Design Criteria.

The design criteria for any project to be connected to the SLRWD sewer system shall in all instances be in accordance with the Indiana Administrative Code 327, Article 3 except as modified or made more stringent herein.

1.1 General

- a. An application for a Construction/Property Improvement Permit is required for any of the following construction activities:
 - i. New Pressure Sewer Tap to a pressure sewer main
 - ii. Installing new or re-locating a grinder tank
 - iii. Installing new or re-locating a sewer service connection from a new or proposed structure to a grinder tank
 - iv. Installing new or re-locating a sewer service connection from a new or proposed structure to a gravity sewer main
 - v. Installing a new or re-locating a pressure sewer line from grinder tank to a pressure sewer main.
 - vi. Any modification, construction, or installation of structures or utilities within an SLRWD easement.
 - vii. Installation of any improvements, including Landscaping, within the SLRWD easement.

1.2 Application Procedure

- a. Application: The owner of the property, or the Owner's Steuben County Registered Contractor acting as agent, may prepare and submit the *Construction/Property Improvement Permit Application Form (Form 1A)* and pay the appropriate tap, connection, and permit fees as set out in the Sewer Rate Ordinance.
- b. Attachments: The applicant shall attach the following supplemental information to the application:
 - Copy of Deed.
 - Detailed Plot Plan showing location of new or existing sewer tap, pressure sewer lines, gravity sewer lines, building sewer lines and connections, grinder pump station, structures, well, water service line, and all other utilities
 - The Detailed Plot Plan shall also show any proposed modification to existing structures or utilities.
 - Location of existing and/or proposed easements.
- c. Easement:
 - If a recorded sanitary easement already exists for the property requiring a permit under this Section I, the applicant will be required to adhere to the restrictions as recorded in the easement document.
 - If a recorded easement does not exist for the property requiring a permit under this Section I, then the applicant will be required to complete and submit a properly executed easement document in a form as approved by the SLRWD legal council. (See attached form of easement). SLRWD will record said document.

- d. Pressure Sewer Tap Requirements: The applicant shall comply with the Pressure Sewer Tap Specifications (Section 5.6) and applicable details.
- e. Gravity Sewer Tap Requirements: The applicant shall comply with the Gravity Sewer Tap Specifications (Section 5.6) and applicable details.
- f. Grinder Pumps: The applicant shall comply with the Grinder Pump Specifications (Section 5.8 or Section 5.9) and Details.
- g. Location of Other Utilities: Other utilities, i.e. telephone, gas, electric, shall not be located within the easement for sanitary sewer. If it is impossible to maintain the separation distance, then prior approval must be obtained from all utilities involved. In no case shall other utilities be located within 2 feet of sanitary sewer utility.

SECTION II

REQUIREMENTS FOR SEWER SYSTEM EXTENSIONS & ADDITIONS

This Section outlines the submittal requirements and procedures for the extension of the Steuben Lakes Regional Waste District (SLRWD) sewer system. Individual Sewer Taps are not subject to the requirements and procedures of this Section II. This section does include submittal requirements and procedures for sewer systems that are to be turned over to the SLRWD for maintenance ("Extensions") or that are to be connected to the SLRWD sewers, but privately owned and maintained ("Additions").

2.0 Application Procedure

a. Conceptual Plan Approval

- i. Application. The Owner/Developer shall submit a completed "Sewer Tap Permit Application Form" (Form 1A), "Conceptual Plan Application for Extensions or Additions" ("Application") (Form 2A), and the top portion of "Conceptual Plan Review Checklist" ("Checklist") (Form 2B). A copy of the forms is located in Section VI.
- ii. Conceptual Plan Submittal. Along with the "Application" and "Checklist", submit two (2) copies of a general Sketch Plan of the proposed project and surrounding area. The Sketch Plan should generally include the following:
 1. Boundaries of the proposed development.
 2. Anticipated point of connection to the existing public sewer system.
 3. Proposed easements shown and labeled for sewer utilities.
 4. Intended use.
 5. Site Layout.
 6. Proposed sewer and other utility routes.
 7. The estimated flow to be generated based upon 327 IAC 3-6-11.
 8. No fee is required for the "Conceptual Plan Submittal."
- iii. Conceptual Plan Review. The SLRWD Superintendent or his authorized representative shall review the Conceptual Plan Submittal to address capacity requirements and complete the "Conceptual Plan Review Checklist" (Form 2B).
 1. If the submittal is incomplete, the owner/developer will be notified by letter what is required to complete the application.
 2. If the submittal is complete, the SLRWD Superintendent or his authorized representative shall determine estimated service costs, list concerns and submit to the SLRWD Board of Trustees for input and approval or denial of the proposed sewer extension.
- iv. Conceptual Plan Application Approval/Denial. Based upon the input from the Board of Trustees, the SLRWD Superintendent or his authorized representative will issue a Conceptual Plan Approval/Denial Letter (Form 2C) addressing the existing system's ability to handle the proposed flow. The letter will include the approval or denial of the proposed development and if denied the basis for such denial and, if applicable, a statement as to what can be done to make the proposed development plan adequate for conceptual plan approval.

The letter will contain any special requirements that may be imposed upon the development as a part of any approval. A copy of the form of letter for this notification can be found in Section VI.

b. Final Plan Approval

Upon receipt of "Conceptual Plan Approval," the Developer shall complete a set of development construction plans and specifications in accordance with Indiana State Code and this SLRWD Development Standards, Details and Specification Manual.

- i. Application. The Owner/Developer shall complete a "Final Plan Application for Extensions or Additions" ("Application") (Form 2D). A copy of the "Conceptual Plan Approval", completed IDEM Permit Application, and completed Waste Allocation Letter shall be attached to the "Application". A copy of this "Application" is located in Section VI.

The "Final Plan Review Checklist" ("Checklist") (Form 2E) found in Section VI shall serve as a guideline for the submittal of the development construction plans for approval and shall be completed by the Design Engineer.

ii. Final Plan Submittal. The final plan submittal shall include the following:

1. "Application" (Form 2D)
2. "Checklist" (Form 2E)
3. Three (3) sets of the plans and specifications.
4. "Plan Review Fee"
5. Payment for the appropriate tap and connection fees as set out in the Sewer Rate Ordinance

iii. Final Plan Review. The SLRWD Superintendent, his authorized representative, or the SLRWD's Engineer shall review the development construction plans and specifications for compliance with the SLRWD Development Standards, Details, and Specification Manual.

1. If changes or corrections are required, one (1) copy of the Construction Plan set with required changes/corrections marked or indicated and a letter containing statements or comments regarding additional information or corrections required to obtain approval will be returned to the Owner/Developer's Engineer.
2. The remaining copies will be retained by the SLRWD to be compared to any changes to plans that are re-submitted.
3. An additional fee will not be required for the first re-submittal of plans with changes or corrections required by the original comments from the SLRWD's Superintendent or his authorized representative.
4. If all issues on the plans and specifications have not been properly addressed with the first re-submittal, for each additional submittal review, the SLRWD's cost for each review will be charged to the Owner/Developer.

iv. Plan Review Fees. At the time the Owner/Developer files construction plans for approval, a plan review fee shall be paid in accordance with the following schedule:

Base Fee..... \$400.00 (includes up to 10 EDUs)

\$25.00 per each additional EDU in excess of 10 units.

v. Notification of Approval. Upon final approval of the plans and specifications, the SLRWD Superintendent or his authorized representative will issue a letter of approval, (Form 2F), along with a "Waste Allocation Letter" for the developer's use in submitting plans to IDEM/ISBOH.

c. **Construction Documents.**

Three (3) sets of the IDEM/ISBOH approved plans and specifications together with a copy of the IDEM/ISBOH permit/approval shall be provided to the SLRWD, prior to start of construction, for use by the SLRWD for inspection purposes on all projects during construction.

d. **As-Built Submittal.**

- i. As-Built drawings shall be submitted upon completion of construction and prior to acceptance of system extension or addition by SLRWD Board of Trustees.
- ii. Furnish three (3) sets of prints and one (1) electronic file in format compatible with SLRWD software in accordance with Section III of this manual. The Electronic file shall be furnished in State Plane Coordinates IN East and NAVD 1988 coordinate system. Basis for establishing the coordinates shall be noted.

e. **System Acceptance.**

- i. Upon satisfactory completion of construction and testing, furnishing completed "As-Built" documents, filing the warranty bond, and a deed of dedication, where required, the SLRWD Board of Trustees shall accept the sewer extension into its system for operation and maintenance, except when the condition of approval requires that the system remain privately owned and maintained.
- ii. No sewage shall be discharged into the SLRWD sewage system until the new system is accepted

SECTION III
PLAN AND SPECIFICATION REQUIREMENTS FOR SEWER SYSTEM
EXTENSIONS & ADDITIONS

3.0 Design Criteria.

The design criteria for any project to be connected to the SLRWD sewer system shall in all instances be in accordance with the Indiana Administrative Code 327, Article 3 except as modified or made more stringent herein.

a. Flow Calculations:

- i. All flows for pressure sewer systems for seasonal residential units shall be calculated based upon an equivalent residential dwelling unit (EDU) of 220 gpd per unit.
- ii. All flows for pressure sewer systems for new, full time residential units shall be calculated based upon an equivalent residential dwelling unit (EDU) of 310 gpd per dwelling or 1.4 EDUs per dwelling.
- iii. Gravity systems for residential dwellings shall use a flow of 310 gpd per dwelling or 1.4 EDUs per dwelling.
- iv. A peak flow of not less than 4 times Average Daily Flow (ADF) shall be used in the design of sewage pump stations and flow will be based on 310 gpd per dwelling.
- v. All other flow calculations shall be based upon Table 11-1 of 327 IAC 3-6-11 and converted to EDUs.

b. Pressure Sewer Design Velocity:

- i. At design peak flows, a velocity in pressure sewer mains should be 3.0 feet per second (fps). In no case should design velocities drop below 2.5 fps, nor exceed 7.0 fps unless approved as an exception.
- ii. All pressure sewer velocity calculations are to be based upon the actual inside diameter of the particular conduit to be used.

c. Pressure Sewer Friction Factor (C):

For pressure sewers, a "C" factor of 120 should be used.

d. Gravity Sewer Design Velocity:

Gravity sewer design shall be based upon a minimum velocity of 2.0 fps when flowing half (1/2) full. Where 8-inch main line gravity sewers are installed and less than 10 EDUs are to be connected, a minimum design velocity of 2.5 fps will be required.

e. Gravity Sewer Pipe Friction Factor (n):

All sewers: $n = 0.013$

f. Hydraulic Profile Data:

All pressure sewer systems shall, as a part of the submittal of construction plans to the SLRWD for approval, have a hydraulic profile based upon the peak design flow and the design pressure at the connection point.

g. Hydraulic Profile on Profile Sheet:

The hydraulic profile may be shown graphically by superimposing on the sewer profile sheet. The profile should be noted as "xx" feet above or below datum and show the elevation at all major connection points.

h. Hydraulic Profile in Tabular Form:

In lieu of superimposing the hydraulic profile on the profile sheet of the Plan Set, the Design Engineer may provide the elevation of the hydraulic profile in tabular form. The tabular version shall show the elevation at each major connection point and at each 100-foot station.

3.1 Easement Requirements:

On all Extensions or Additions as defined in Section II initiated after the adoption of these standards, the minimum width of easements shall be as follows:

- a. Service Lines from grinder pump to main line: 7.5 feet each side of centerline.
- b. Grinder pump station: 15 feet in diameter through grinder pump center point.
- c. Main line sewers: 20 feet with sewer centerline to be not closer than 5 feet to the edge of easement.
- d. No improvements to be allowed in easements.

3.2 Recording of Easements:

- a. All easements to contain sewers or service lines to be maintained by SLRWD shall be recorded in one of the following manners:
- b. A recorded Plat with proper dedication, in a form as approved by the SLRWD legal council, noted on the Plat with landowner's notarized signature.
- c. An easement description and easement Plat prepared by and certified by a Registered Land Surveyor (See Section VII, Appendix "A") and attached as an exhibit to a properly executed easement document in a form as approved by the SLRWD legal council.
- d. The recording of a Development Plan showing necessary easements is not an acceptable form of easement dedication.

3.3 Plan Sets.

The purpose of this Section is to outline and detail a standardization for the presentation of Construction Plans and Specifications to the SLRWD for review and approval that will minimize the review time by the SLRWD and therefore assure a faster turnaround time for the Owner or Developer.

- a. An Indiana Registered Professional Engineer or an Indiana Registered Professional Land Surveyor per State of Indiana requirements shall certify all sheets of any Construction Plan Set, except that any Plat included as a part of the Plan Set must be certified by an Indiana Registered Professional Land Surveyor. All sheets shall be either 24" x 36" sheets or 18" x 24" sheets. The sanitary sewer construction drawings and specifications shall be developed in such manner as to be a "stand alone" Plan Set without construction notes of other utilities, streets, etc.
- b. The Final Plan Submittal shall include all sheets of the Construction Plan Set.
- c. All plans must be prepared at a suitable scale to properly show all necessary detail.
- d. Plan units shall be in US survey feet.
- e. As a minimum, final plan submittal for the Sanitary Sewer Construction Plan Set should include the following elements:
 - i. All Sheets:
 - 1. Title Block with Project Name and Sheet Description
 - 2. Sheet Numbers – Referenced in Index
 - 3. Firm's Name, Address and Phone Number
 - 4. Name, Signature, and Seal of person certifying the drawings
 - 5. Drawing Date and Revision Date(s)

ii. Title Sheet:

1. Developer's Name, Address and Phone Number
2. Owner's Name, Address and Phone Number
3. Location Map (minimum 4 mile square)
4. Sheet Index
5. Utility Contact List
6. Benchmark(s) relative to NAVD 88
7. Separate Spec Note (if applicable)

f. Plan and Profile Sheets:

i. Plan Sheet(s):

1. Scale(s) - Vertical scale not less than 1" = 10'
2. Horizontal scale not less than 1" = 50'
3. North Arrow and Bar Scale
4. Proposed/Existing Utility Legend(s)
5. Elevation information relative to Project Benchmark
6. Plan Layout, Topography, and Contours
7. (Contours at not less than 1 foot for areas of less than 6% slope and 5 foot for areas of 6% or greater.)
8. Street/Road Names
9. Sewer Centerline Stationing
10. Stationing and Identification of Bends, Fittings, Branches, Valves and Structures
11. Sewer Centerline Stationing Tied to Physical Features
12. Match Lines with Stationing
13. Existing and/or proposed utilities
14. Reference Profile Sheets if not a Plan and Profile Sheet
15. Line Designations and Branch Line Designations
16. Sewer Flow Direction Arrows
17. Show any Applicable Flood Plain Data.

ii. Profile Sheet(s): Profiles may be on sheet with plan.

1. Scale(s) - Vertical Scale not less than 1" = 10'
2. Horizontal Scale not less than 1" = 50'
3. Stationing to Match Plan Stationing
4. Match Lines with Stationing
5. Elevation information relative to Project Benchmark
6. Existing Grade Above Sewer Centerline
7. Proposed Grade Above Sewer Centerline, if Different than Existing
8. Street/Road Crossing Centerline Stationing shown with Name
9. Existing/Proposed Utility Crossings shown with Stationing and Appropriate Separation

10. Stationing of Bends, Fittings, Valves, and Structures
11. Stationing and Line Reference of Branches
12. Sewer Lengths, Sizes, and Material Type (As Applicable)
13. 5 Foot Cover Maintained (Where Required). **NOTE: Pressure sewers to be installed with 5 foot of cover unless pre-approved by SLRWD.**
14. Proposed Elevation of Key Elements of the Profile
15. Existing/Proposed Utility Crossings with Stationing
16. Hydraulic Grade Line (If not Shown in Tabular Form on Detail Sheet)
17. Flood Plain or Flood Elevation, Where Applicable

g. Detail Sheet(s):

- i. Scale(s)
- ii. Project Specifications
- iii. Referencing SLRWD Standards and Specifications
- iv. Include Data Required by IDEM/ISBOH
- v. Special Conditions
- vi. Any Special Details Required.
- vii. Tabular Form of Hydraulic Profile at Key Stations and Branches (If not Shown on Profile Sheets)
- viii. Pump requirement data per Section 5.7 SUBMERSIBLE PUMP STATIONS.
- ix. Lift Station Specifications (If Applicable)

3.4 Project Specifications:

- a. Project specification may be set out in the Plan Sets or issued in a separate "Specification Document."
- b. When separate Specification Documents are provided, a note in ¼ inch high letters shall be added to the Title Sheet as follows:

"SPECIFICATIONS FOR THESE PLANS ARE CONTAINED WITHIN A SEPARATE DOCUMENT AND THESE PLANS ARE NOT COMPLETE WITHOUT THE SEPARATE SPECIFICATION DOCUMENT."
- c. When specifications are included in the Plan Set, they should be referenced to the SLRWD Development Standards, Details and Specification Manual and supplemented with any special conditions and such information as required for approval from IDEM/ISBOH.
- d. "Specification Standards" for SLRWD projects are included in Section V of this Manual.

3.5 As-Built Drawings.

As-Built drawings shall be submitted to SLRWD within sixty (60) days after construction is completed and prior to acceptance of system extension or addition by SLRWD Board of Trustees. No sewage shall be discharged into the SLRWD sewage system until "As-Built" drawings have been accepted/approved by the SLRWD.

- a. Certification: As-Built Documents shall be certified to be a true and correct "As-Built Plan" and that all parts of the sewer system, to be maintained by SLRWD, lie within dedicated sanitary sewer easements.

- b. Submittal: The hard copy and electronic file (dwg format) of the drawings shall include, but not be limited to the following:
 - i. Property Boundary/Lot Lines with Street Names, Address, Building Line, and Easements
OR
 - ii. Plat with Street Names, Lot Numbers, Addresses, Boundary, Lot Lines, Building Lines, and Easements (If Applicable)
 - iii. Elevation information shall be provided relative to Project Benchmark
 - iv. Horizontal and vertical accuracy shall be plus or minus 0.1 feet.
- c. Plan Sheets:
 - i. Location of Fittings, Branches, Valves, and Structures Tied to Physical Features
 - ii. Sewer Centerline Tied to Physical Features
 - iii. Line Designations and Branch Line Designations
 - iv. Sewer Flow Direction Arrows
 - v. Sewer Lengths, Sizes, and Material Type
 - vi. Indicate any Portions Installed by Directional Drilling Method
 - vii. Changes or modifications from original design, including changing in station.
 - viii. Location of utilities exposed during construction.
- d. Profile Sheets:
 - i. Finished Grade above Sewer Line
 - ii. Location of Branches, Sewer Taps, Valves, and Structures
 - iii. Sewer Lengths, Sizes, and Material Type
 - iv. Indicate any Portions Installed by Directional Drilling Method
 - v. Changes or modifications from original design, including changing in station.
 - vi. Location of utilities exposed during construction.
 - vii. Elevations of Key Elements of Profile, including but not limited to:
 - 1. Gravity Sewer
 - A. Invert(s) at Manhole(s)
 - B. Top of Casting(s)
 - 2. Low Pressure Sewer
 - A. Invert(s) at Air Release Valve(s)
 - B. Top of Casting(s)
 - C. Low Point(s) in Line
 - D. High Point(s) in Line
 - E. Intervals not more than 50 Feet
 - F. Information for Pipe Installed by Directional Drilling Method shall be Provided at Intervals of not more than 25 Feet
 - G. Grade of Gravity and/or Directional Drilled Pipe

3.6 Geographic Information System (GIS)

The contractor shall provide a shape file to be imported into the Steuben Lakes Regional Waste District GIS

Coordinate data shall be provided in State Plane 1301 Indiana East. The horizontal accuracy of the coordinates shall be plus or minus 0.03 feet and the vertical accuracy shall be 0.1 feet.

The following information shall be provided:

- a. Laterals
 - I. Address
 - II. Size
 - III. Date Installed (to be project completion date)
 - IV. Length
 - V. Type (Single, shared, or duplex)
 - VI. Material
 - VII. Method of Installation (Bore, open cut, both)
 - VIII. Notes (testing information)
 - IX. System Segment Number
- b. VALVES (flow control)
 - I. Type (stop, swing check, ball check, combination)
 - II. Size
 - III. Turns
 - IV. Manufacturer
 - V. Date Installed (to be project completion date)
 - VI. Notes (testing information)
- c. Grinder Station
 - I. Address
 - II. Type (shared, single, or duplex)
 - III. Tank Type (size, material) (24", 30", 36", 48")
 - IV. Tank Manufacturer
 - V. Date Installed (to be project completion date)
 - VI. Pump Manufacturer
 - VII. Pump Type (Low or High Pressure)
 - VIII. Tank Depth
 - IX. Riser Size
 - X. Notes (Information from start up and pump number(s))
- d. Grinder Station Control Panel
 - I. Address
 - II. Manufacturer
 - III. Residential Type (Single, Shared)
 - IV. Other Station Type (Lift station, duplex)
 - V. Notes (Information from start up)

- e. Sanitary Main
 - I. Size (include/specify IPS or DPS)
 - II. Type (Force Main, Gravity)
 - III. Material (HDPE, PVC)
 - IV. Length
 - V. Slope
 - VI. Date Installed (to be project completion date)
 - VII. System Segment Number
 - VIII. Method of Installation (Bore, trench, or both)
 - IX. Notes (Testing Information)
- f. Sanitary Manhole
 - I. Local ID
 - II. Type (ARV, Gravity, Valve Vault, Flowmeter, Wetwell, Bypass)
 - III. Rim Elevation
 - IV. Diameter
 - V. Depth
 - VI. Invert
 - VII. Invert
 - VIII. Invert
 - IX. Notes (Material, testing information, ARV or Flowmeter Manufacturer and Model Number)
- g. Cleanout
 - I. Type (Flushing, gravity)
 - II. Rim Elevation
 - III. Invert
 - IV. Invert
 - V. Invert
 - VI. Invert
 - VII. Invert
 - VIII. Notes (Testing information)
 - IX. System ID

SECTION IV
STANDARD DETAILS

SLRWD—000 Series: Service Lines and Connections

SLRWD---100 Series: Pressure Sewer Main Construction Details

SLRWD---200 Series: Gravity Sewer Construction Details

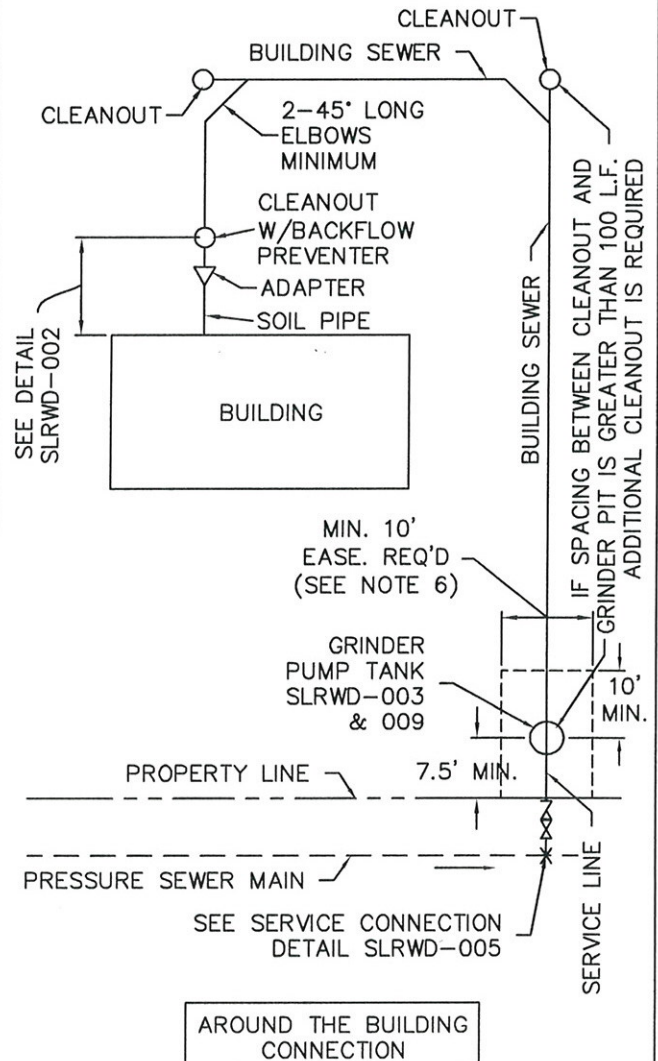
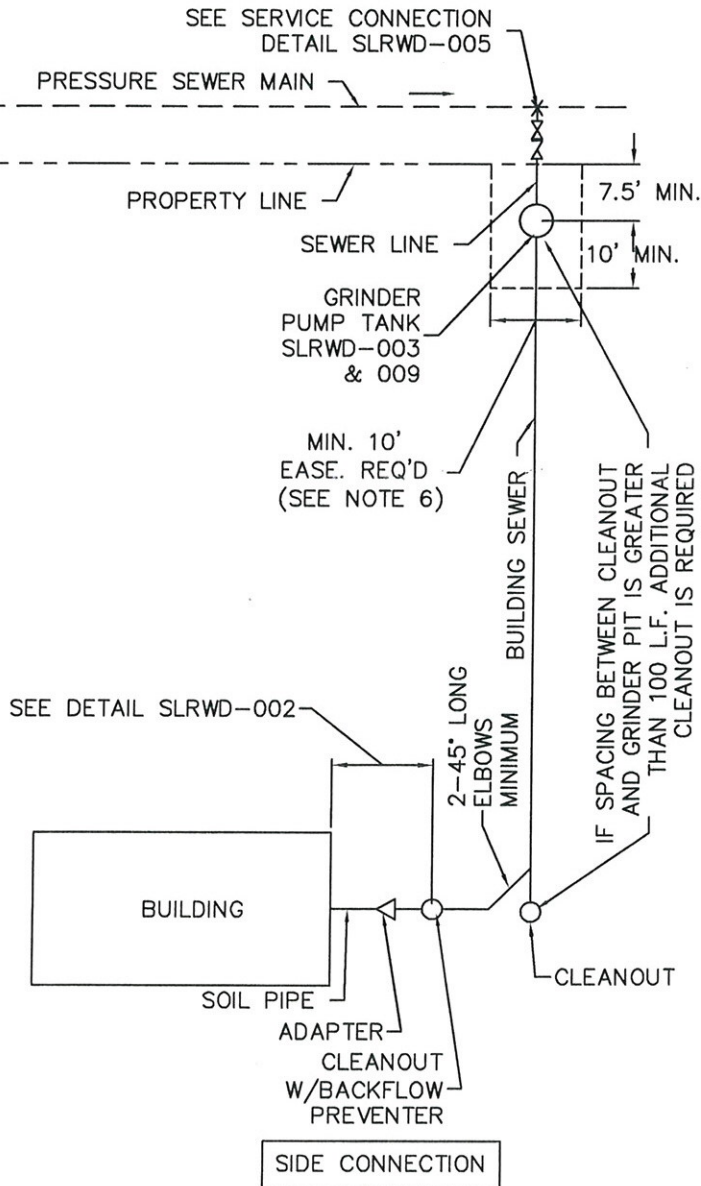
SLRWD---300 Series: Miscellaneous Details

SLRWD---400 Series: Corrosion Control Facility Details

SLRWD – 000 Series: Service Lines and Connections

- SLRWD – 001: Pressure Sewer Connection Detail
- SLRWD – 002: Building Adapter and Cleanout Detail
- SLRWD – 003: Typical Grinder Pump Station Installation Detail
- SLRWD – 004: Pressure Sewer Pipe Bedding Detail (Flexible Conduit)
- SLRWD – 005: Pressure Sewer Service Connection Detail
- SLRWD – 005A: Alternate Pressure Sewer Service Connection Detail
- SLRWD – 006: (Reserved)
- SLRWD – 007: Curb Box Detail for Valves Smaller than 3-Inches
- SLRWD – 008: Type 1 Pressure Sewer Cleanout Detail
- SLRWD – 009: Simplex Grinder Pump Station Detail
- SLRWD – 009A: Duplex Grinder Pump Station Detail
- SLRWD – 010: Simplex Grinder Pump Station Wiring Schematic
- SLRWD – 010A: Simplex Grinder Pump Station Control Panel Elementary Wiring Schematic Two Residence
(Shared)
- SLRWD – 010B: Duplex Grinder Pump Station Wiring Schematic
- SLRWD – 011: Gravity Sewer Connection Detail

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

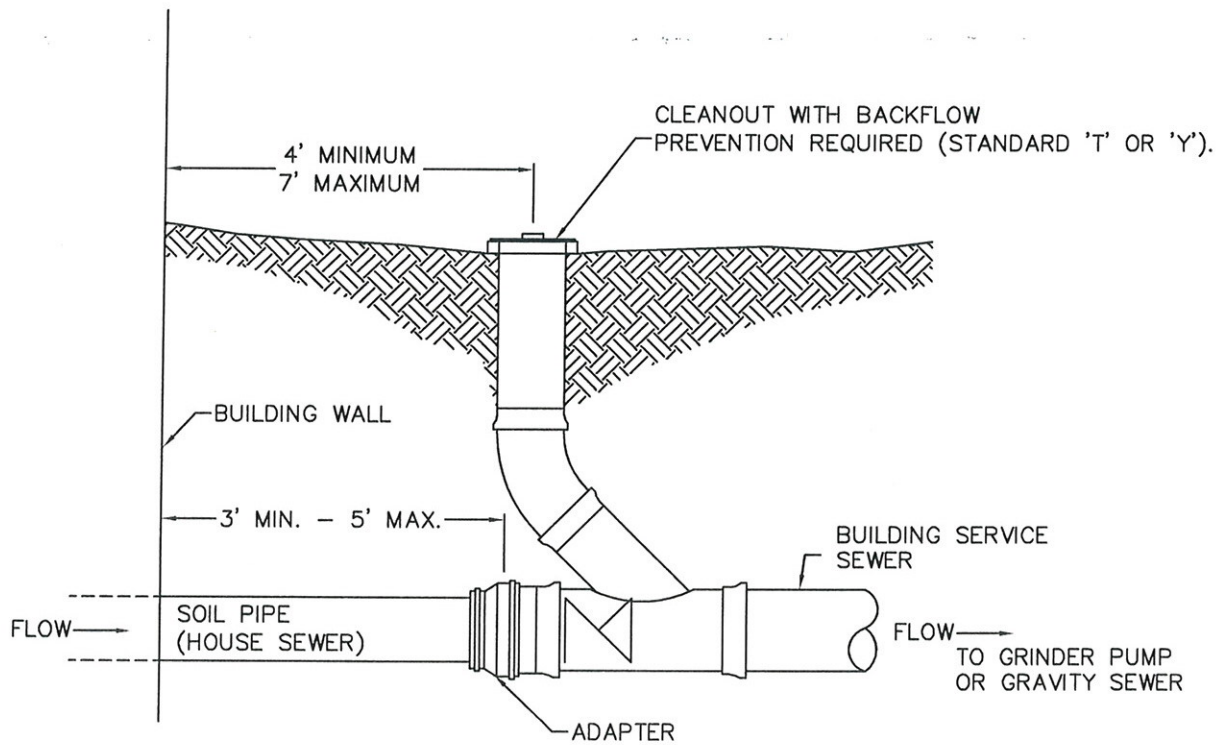


NOTES:

1. MAXIMUM DISTANCE BETWEEN THE EXTERIOR WALL AND THE CLEANOUT WYE SHALL BE 7'.
2. NO 90° ELBOW OR TURN IS PERMITTED IN GRAVITY BUILDING SEWER.
3. MINIMUM SLOPE OF GRAVITY BUILDING SEWER SHALL BE 0.62% FOR 6" OR 2.00% FOR 4".
4. BUILDING SEWER LINE SHALL BE INSPECTED AND APPROVED BEFORE EXCAVATION IS BACKFILLED.
5. BACKFLOW PREVENTION SHALL BE INSTALLED IN GRAVITY SEWER PIPE BETWEEN GRINDER PUMP AND BUILDING WITHIN FIVE FEET (5') OF THE BUILDING.
6. 15 FOOT EASEMENT REQUIRED IN NEW PLATS & TRACTS AND 15 FEET IN DIAMETER FROM GRINDER PUMP CENTER POINT.
7. GRINDER PUMP TANK TO BE LOCATED WITHIN 7.5 FT OF PROPERTY/RIGHT-OF-WAY LINE UNLESS OTHERWISE APPROVED BY SLRWD.
8. GRINDER PUMP TANK TO BE PLACED AS TO NOT CONFLICT WITH OTHER UTILITIES OR EXISTING FEATURES.
9. WHERE GRAVITY SEWER CAN NOT BE CONNECTED BETWEEN BUILDING AND GRINDER PUMP TANK, A PUMP AND LOW PRESSURE SEWER LINE CAN BE INSTALLED TO CONNECT TO THE GRINDER PUMP TANK

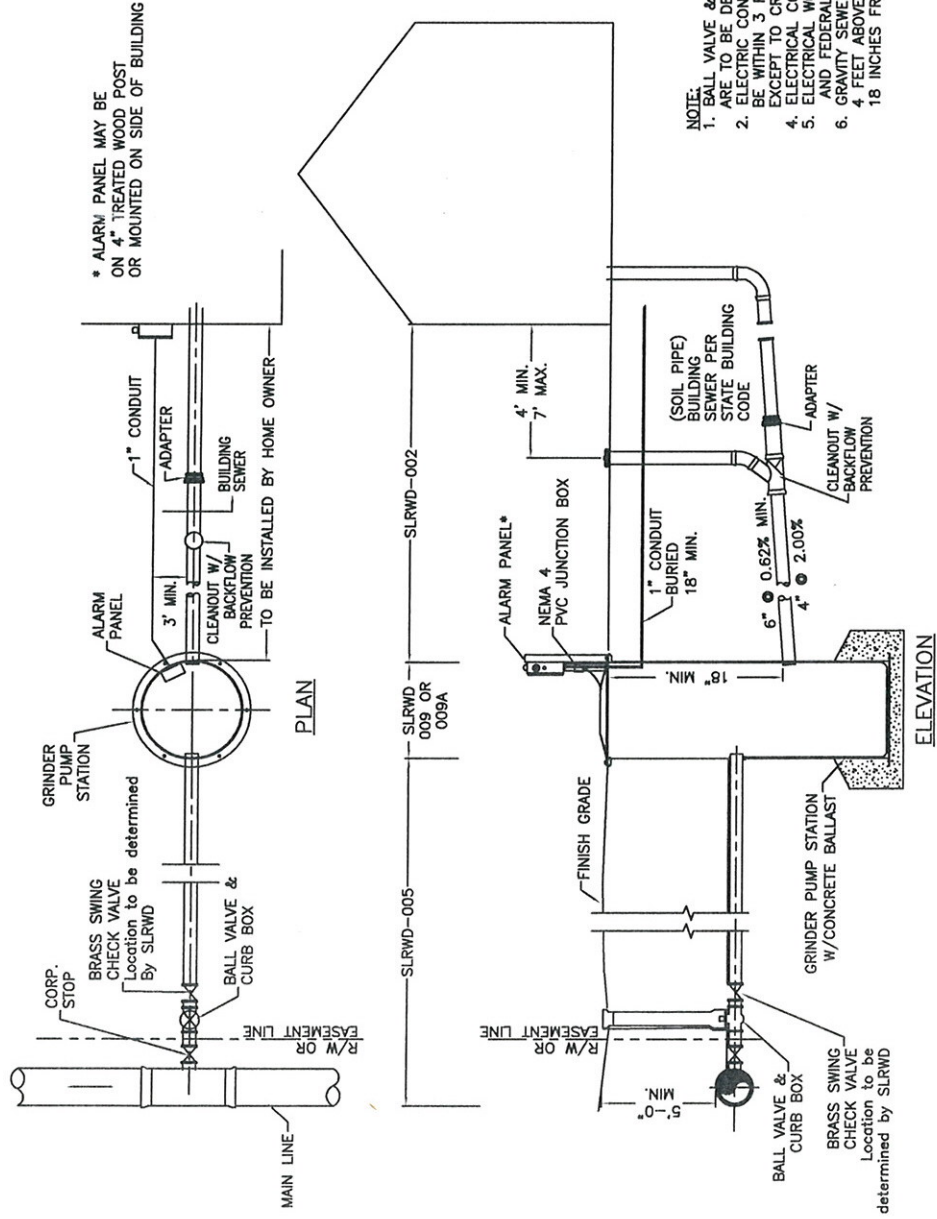
REV. DATE:		PRESSURE SEWER CONNECTION DETAIL	"adopted date" Dec. 4, 2008
4/13/17			
File:			SLRWD-001

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



REV. DATE:		BUILDING ADAPTOR AND CLEANOUT DETAIL	"adopted date" Dec. 4, 2008
4/13/17			
			SLRWD-002
File:			

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



- NOTE:**
1. BALL VALVE & SWING CHECK VALVE LOCATIONS ARE TO BE DETERMINED BY SLRWD.
 2. ELECTRIC CONDUIT SHOULD NOT BE WITHIN 3' FOOT OF SEWER LINE EXCEPT TO CROSS.
 4. ELECTRICAL CONDUIT TO ENTER BOTTOM OF PANEL.
 5. ELECTRICAL WORK SHALL MEET LOCAL, STATE, AND FEDERAL CODES.
 6. GRAVITY SEWER INVERT TO BE MINIMUM 4' FEET ABOVE BOTTOM OF TANK AND NOT LESS THAN 18 INCHES FROM TOP OF TANK

TYPICAL GRINDER PUMP STATION INSTALLATION DETAIL

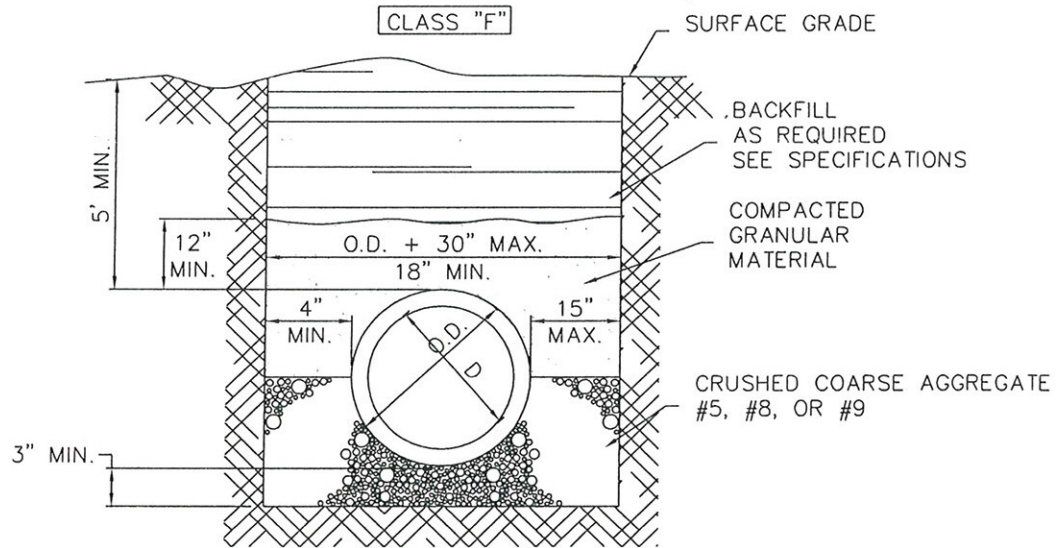
REV. DATE:
4/13/17

"adopted date"
Dec. 4, 2008

File

SLRWD-003

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



Note: For Rock Or Other Non-Compressible Materials: The Trench Should Be Over-Excavated A Minimum Of 4" & Refilled With Compacted Granular Materials.

LEGEND:

O.D. = Outside Diameter
D. = Inside Diameter

-Flexible Conduits Are Considered The Following Pipes: Solid Wall PVC and HDPE

Size Of Coarse Aggregates (Crushed Stone) As Per Indiana Department Of Highway Standards And Specifications - Latest Edition

Sieve Sizes	Coarse Aggregates Sizes (Percents Passing Sieve)		
	#5	#8	#9
1 1/2'	100	100	100
1"	85-98	100	100
3/4"	60-85	75-95	100
1/2"	30-60	40-70	60-85
3/8"	15-45	20-50	30-60
NO. 4	0-15	0-15	0-15
NO. 8	0-10	0-10	0-10

Note: Stone Chips Are Permitted In Lieu Of Crushed Aggregate Provided That No More Than 20% Of Stone Chips Pass The No. 4 Sieve.

REV. DATE:

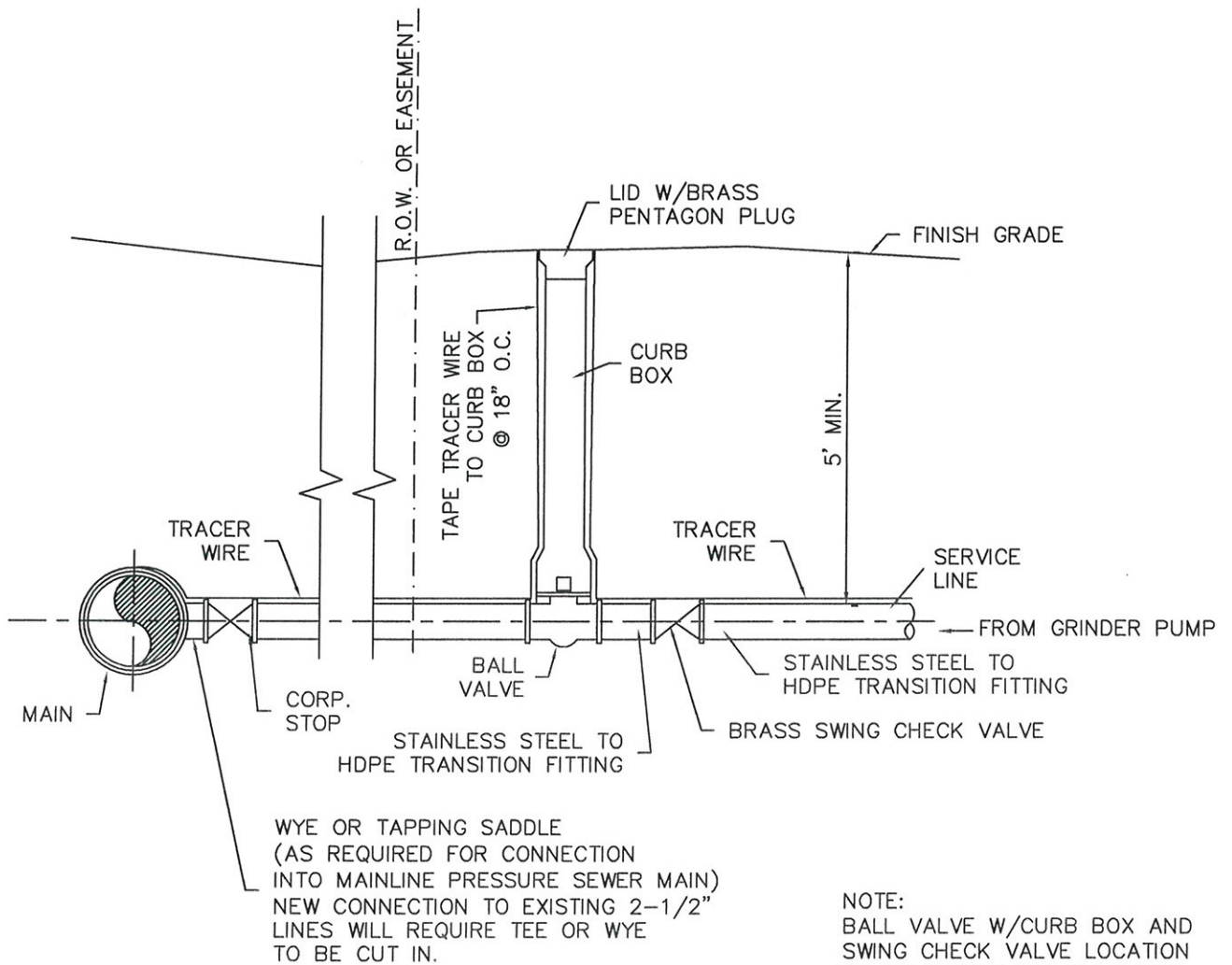
**PRESSURE SEWER PIPE BEDDING DETAIL
(FLEXIBLE CONDUIT)**

"adopted date"
Dec. 4, 2008

SLRWD-004

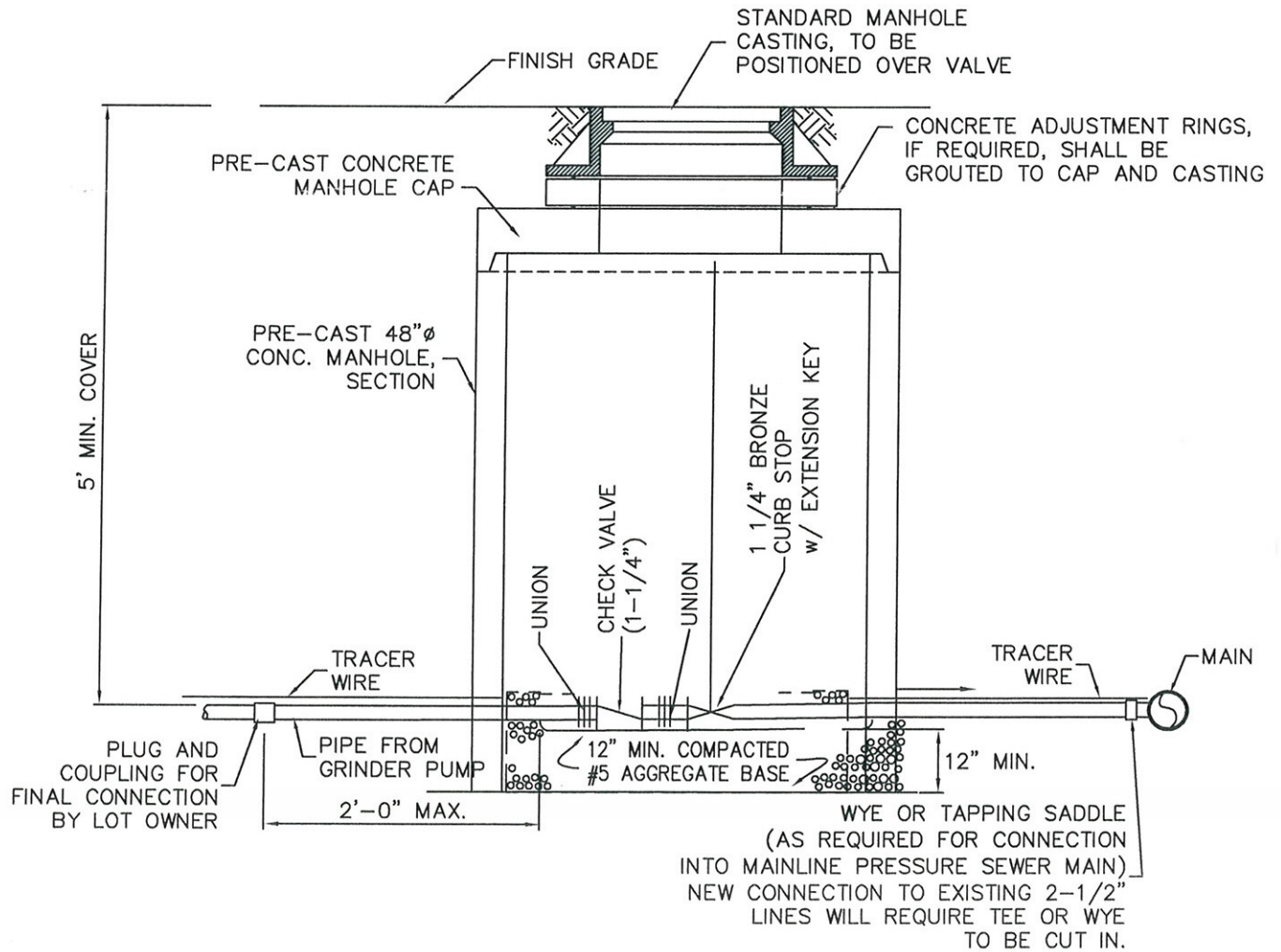
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STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



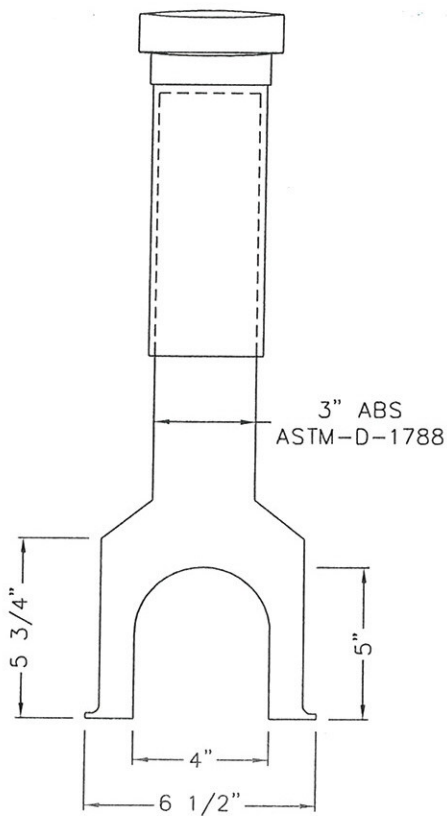
REV. DATE:		PRESSURE SEWER SERVICE CONNECTION DETAIL	"adopted date" Dec. 4, 2008
4/13/17			
File:			SLRWD-005

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

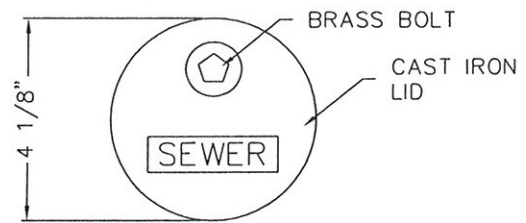


REV. DATE: 4/13/17 File:		ALTERNATE PRESSURE SEWER SERVICE CONNECTION DETAIL		"adopted date" Dec. 4, 2008 SLRWD-005A	
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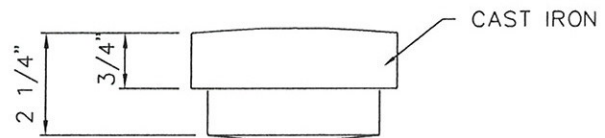
STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



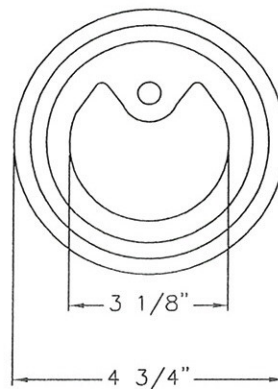
ELEVATION
(5' MIN. COVER)



LID TOP VIEW



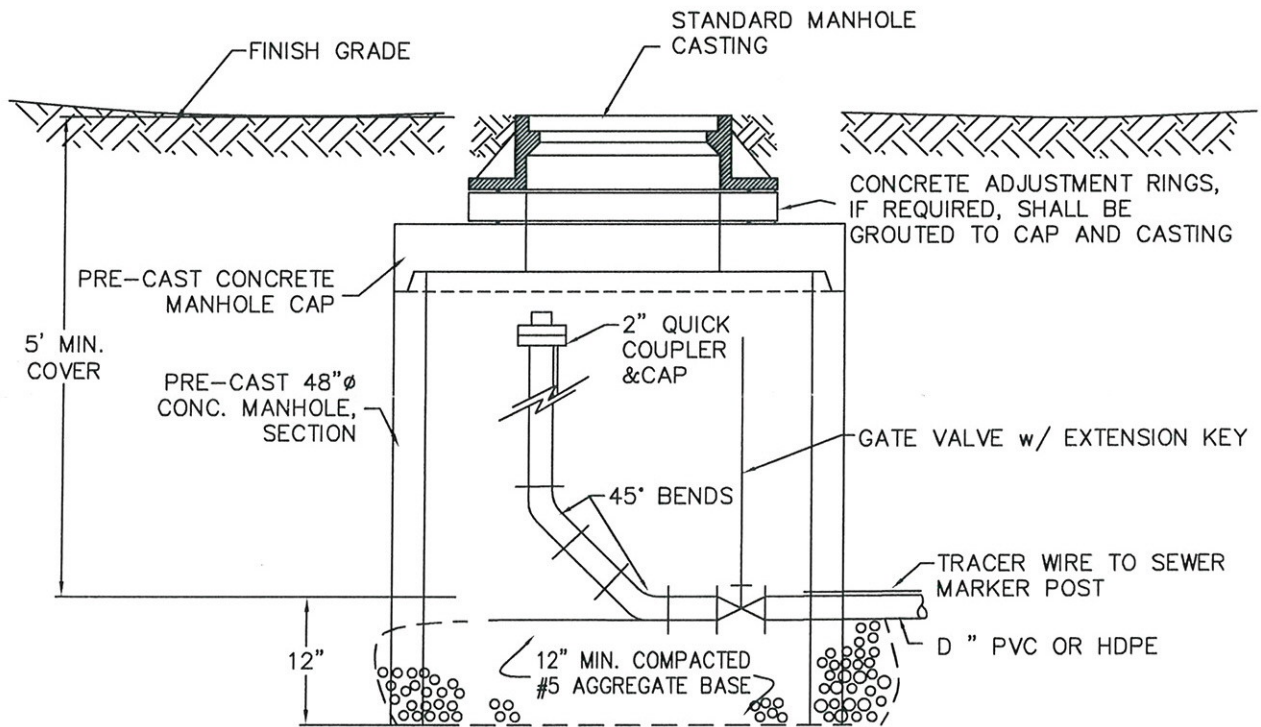
COLLAR SIDE VIEW



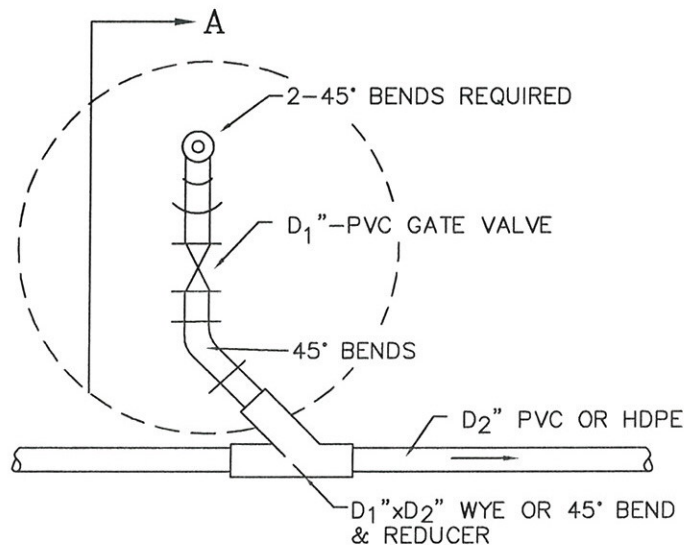
COLLAR TOP VIEW

REV. DATE:		CURB BOX DETAIL FOR VALVES SMALLER THAN 3 INCHES	"adopted date" Dec. 4, 2008
—			
			SLRWD-007
File:			

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



SECTION "A"

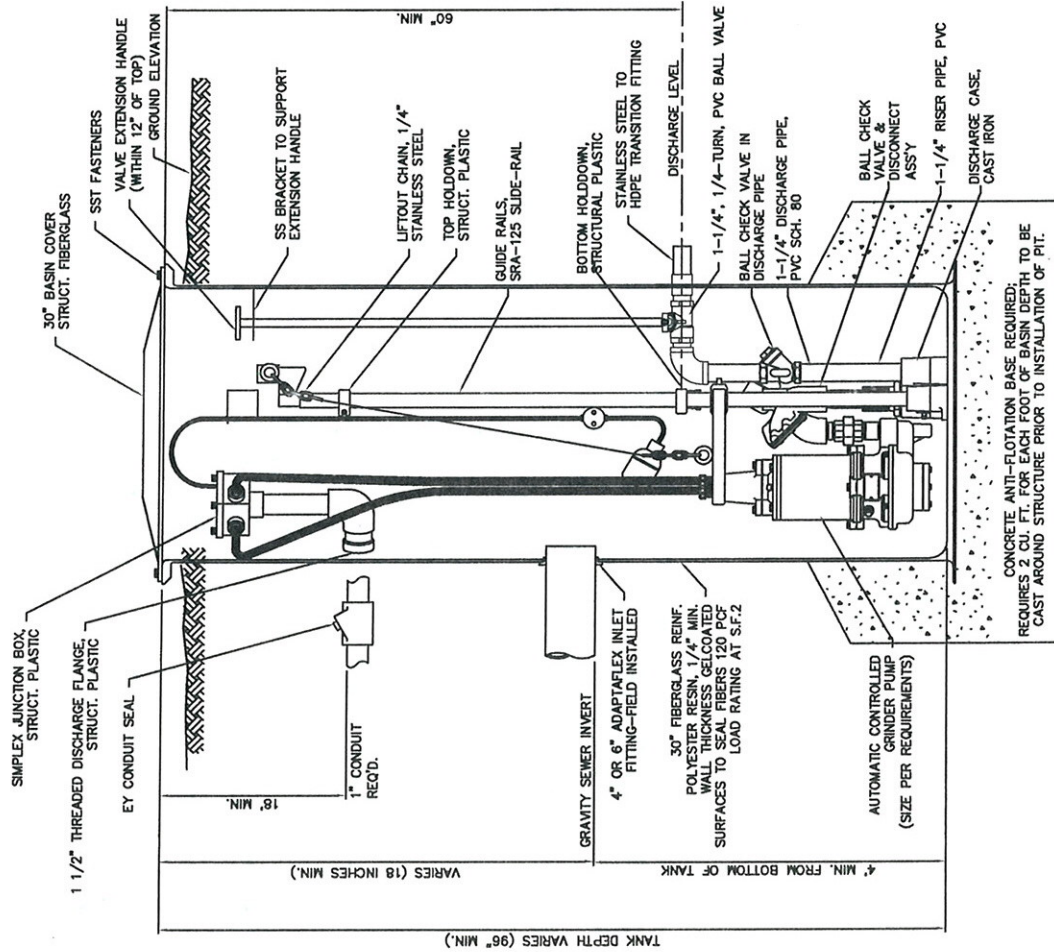


D_x = PIPE DIAMETER

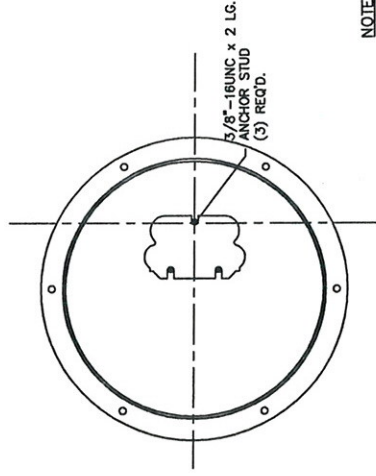
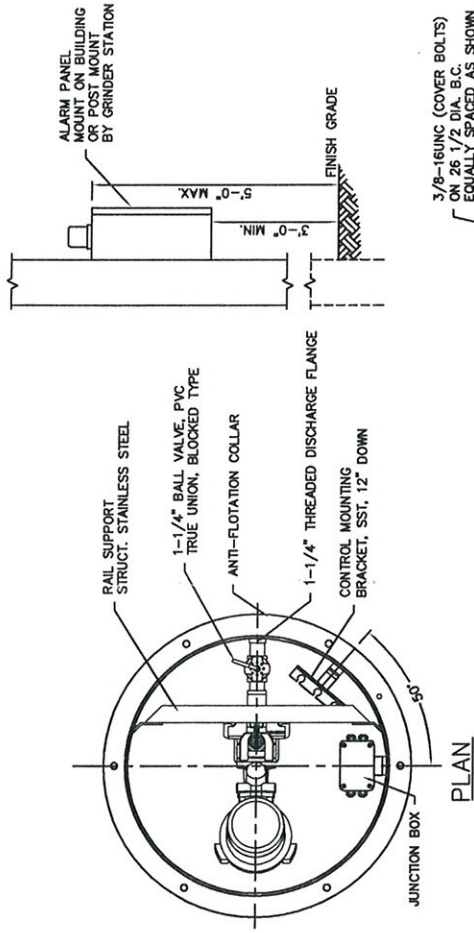
PLAN VIEW

<p>REV. DATE:</p> <p>4/13/17</p> <p></p> <p>File:</p>	<p>TYPE I PRESSURE SEWER CLEANOUT DETAIL</p>	<p>"adopted date" Dec. 4, 2008</p> <p>SLRWD-008</p>
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STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



FLOAT SETTING:
 ALARM - 4" BELOW INFLOW INVERT
 ON - 6" BELOW INFLOW INVERT
 OFF - 20" ABOVE BOTTOM OF TANK



**BOTTOM PLATE
(ENCAPSULATED STEEL)**

- NOTES:**
- 1) TOP OF TANK TO BE MIN. 2" ABOVE 100 YEAR FLOOD ELEVATION
 - 2) ELECTRICAL CONDUIT TO HAVE MIN. 18" COVER
 - 3) DISCHARGE PIPE TO HAVE A MIN. 5' COVER
 - 4) POWER FROM CUSTOMER TO BE IN CONDUIT SEPARATE FROM ALL OTHER WIRING
 - 5) ELECTRICAL CONDUIT TO ENTER BOTTOM OF BOX/PANEL
 - 6) ALL ELECTRICAL WORK TO MEET LOCAL, STATE, AND FEDERAL CODE.

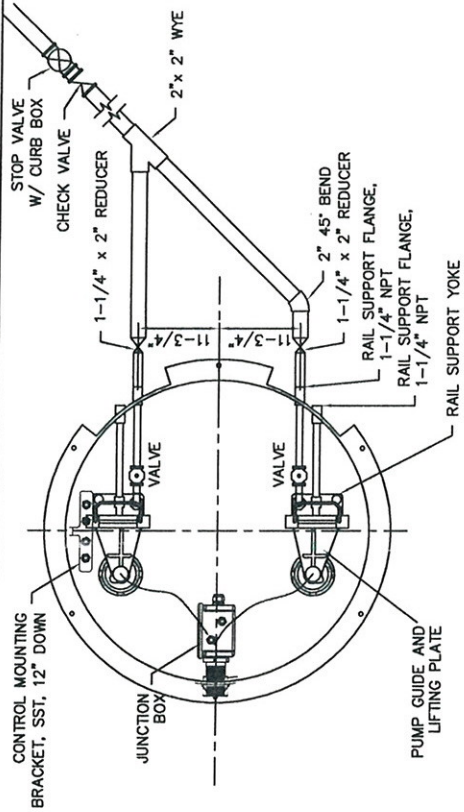
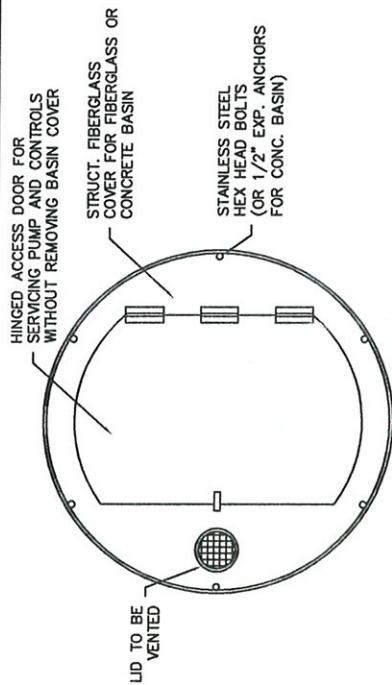
SIMPLEX GRINDER PUMP STATION DETAIL

REV. DATE:
 4/13/17

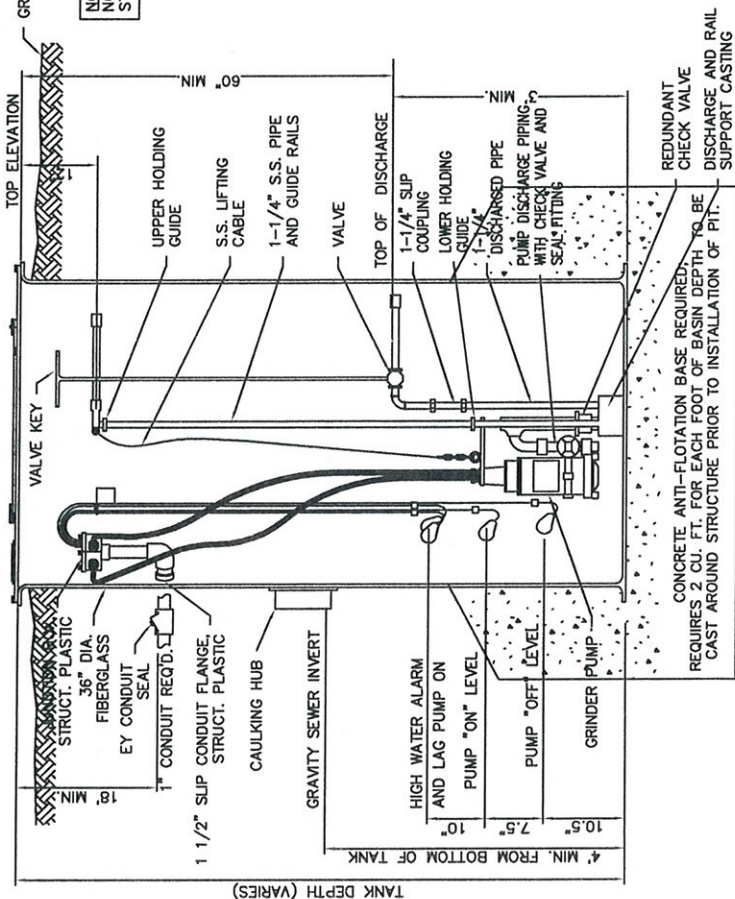
"adopted date"
 Dec. 4, 2008

SLRWD-009

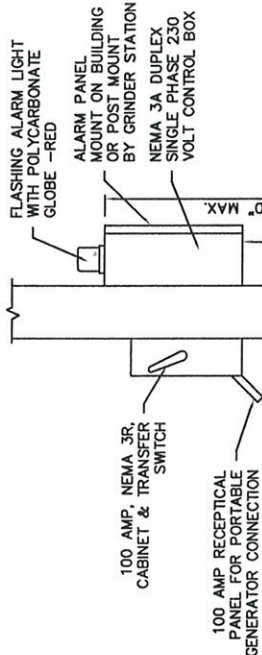
STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



SUPPORT BRACKET AND CONNECTORS FOR FLOW CONTROLS



NOTE:
NO GALVANIZED, PAINTED, OR EXPOSED STEEL ALLOWED INSIDE OF STATION



- NOTES:
- 1) TOP OF TANK TO MIN. 2" ABOVE 100 YEAR FLOOD ELEVATION
 - 2) ELECTRICAL CONDUIT TO HAVE MIN. 18" COVER
 - 3) DISCHARGE PIPE TO HAVE A MIN. 5" COVER
 - 4) POWER FROM CUSTOMER TO BE IN CONDUIT SEPARATE FROM ALL OTHER WIRING
 - 5) ELECTRICAL CONDUIT TO ENTER BOTTOM OF BOX/PANEL
 - 6) ALL ELECTRICAL WORK TO MEET LOCAL, STATE, AND FEDERAL CODE.

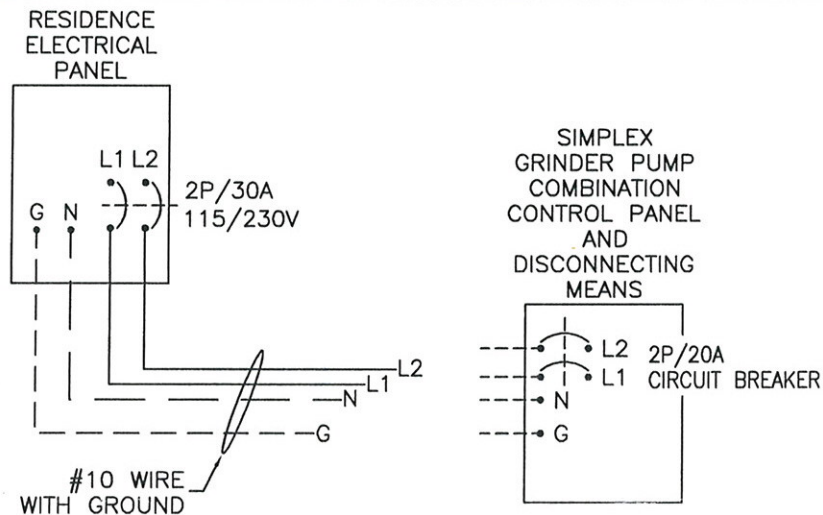
DUPLIX GRINDER PUMP STATION DETAIL

"adopted date"
Dec. 4, 2008

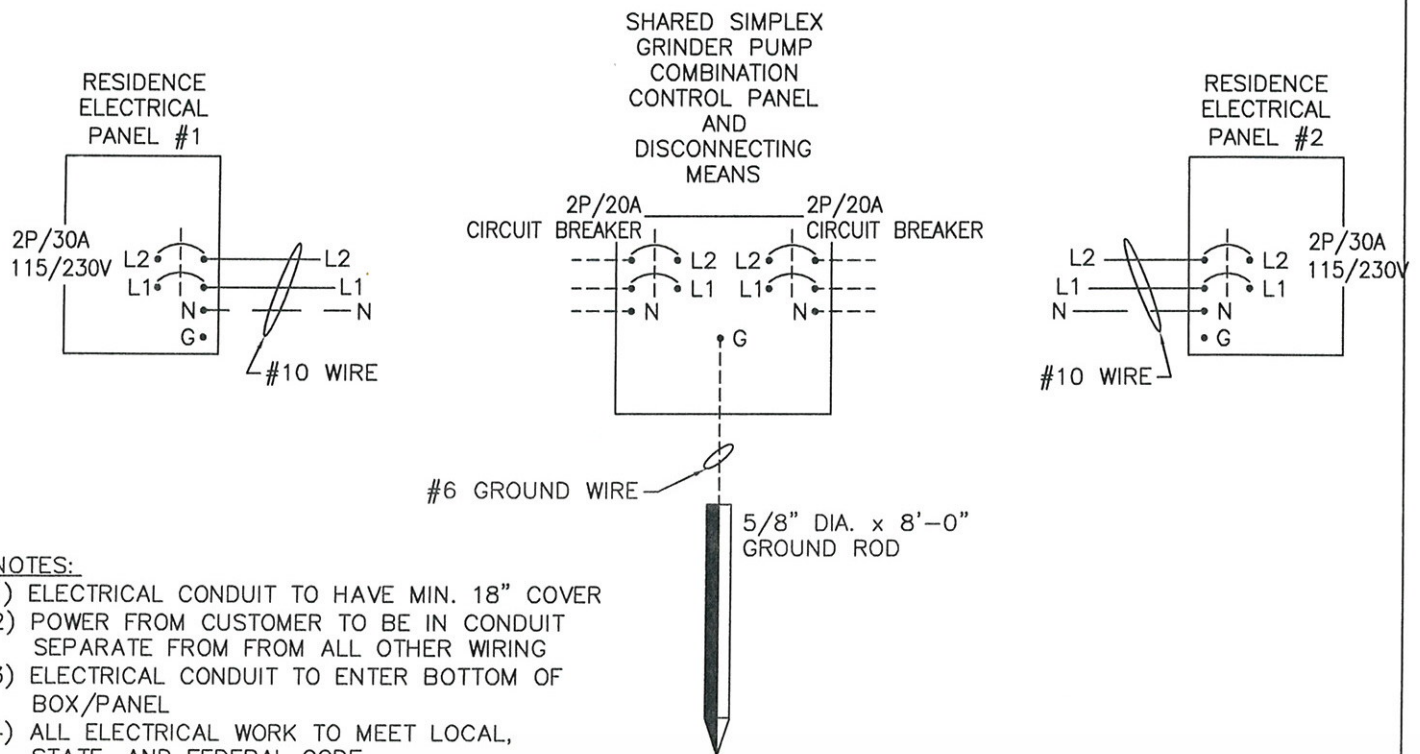
SLRWD-009A

File

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



SIMPLEX GRINDER PUMP STATION SCHEMATIC SINGLE RESIDENCE



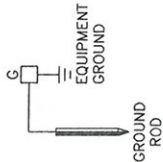
NOTES:

- 1) ELECTRICAL CONDUIT TO HAVE MIN. 18" COVER
- 2) POWER FROM CUSTOMER TO BE IN CONDUIT SEPARATE FROM FROM ALL OTHER WIRING
- 3) ELECTRICAL CONDUIT TO ENTER BOTTOM OF BOX/PANEL
- 4) ALL ELECTRICAL WORK TO MEET LOCAL, STATE, AND FEDERAL CODE.

SIMPLEX GRINDER PUMP STATION SCHEMATIC TWO RESIDENCE (SHARED)

REV. DATE:	SIMPLEX GRINDER PUMP STATION WIRING SCHEMATIC	"adopted date" Dec. 4, 2008
4/13/17		
File:		SLRWD-010

STANDARD DETAILS



COMPONENTS SHALL BE HEAVY DUTY, INDUSTRIAL TYPE RATED FOR CONTINUOUS DUTY AND THE ENVIRONMENTAL CONDITIONS.

MAIN PANEL DISCONNECT MUST BE PROVIDED BY INSTALLER.

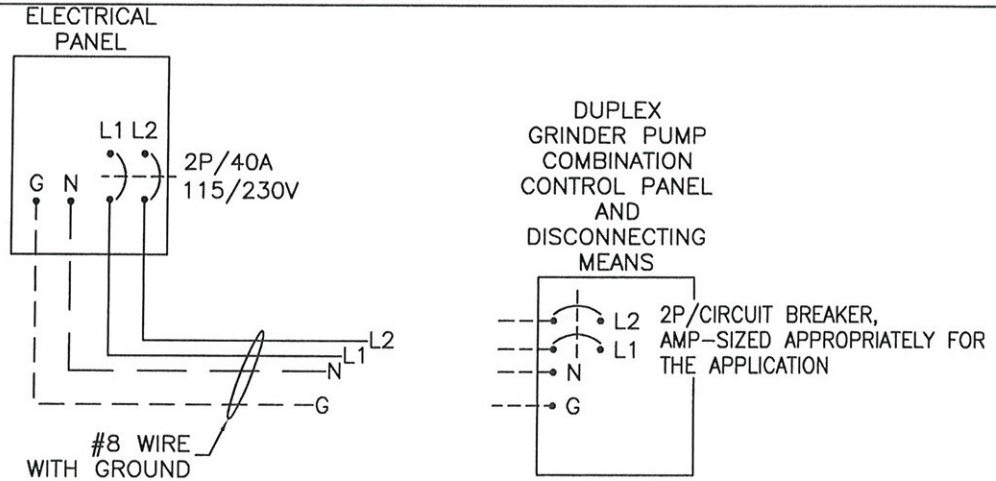
REQUIRED TORQUE FOR TERMINAL BLOCK SCREWS IS 16 in.-lbs.

POWER FROM CUSTOMER TO BE IN CONDUIT SEPARATE FROM FROM
ALL OTHER WIRING

SIMPLEX GRINDER PUMP STATION
CONTROL PANEL ELEMENTARY WIRING
SCHEMATIC TWO RESIDENCE (SHARED)

SLRWD-010A

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

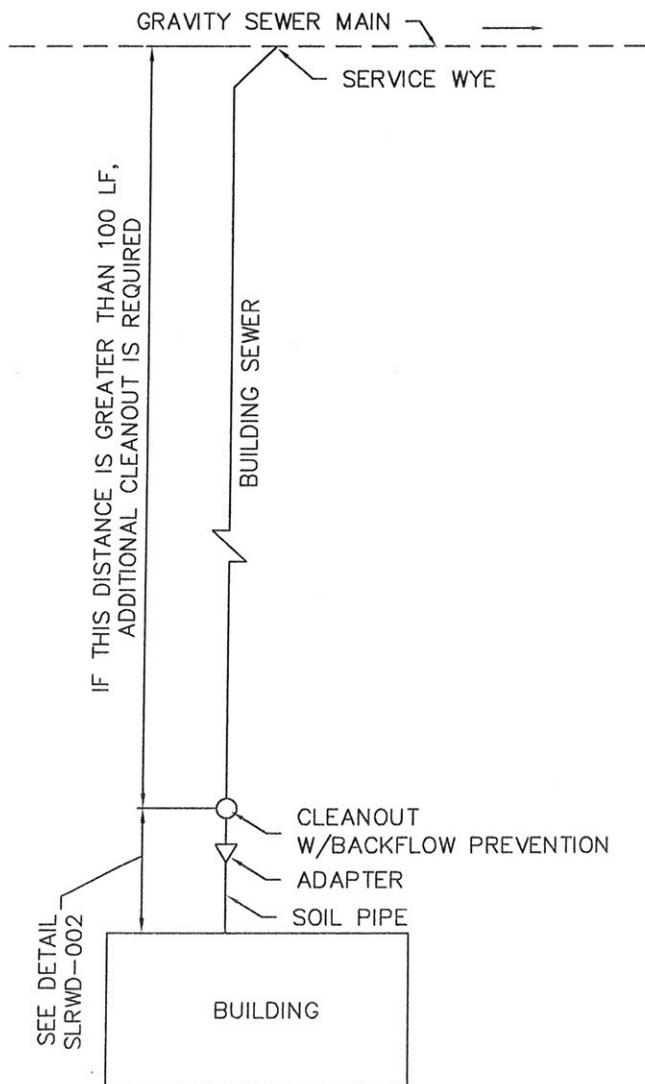


GENERAL NOTES:

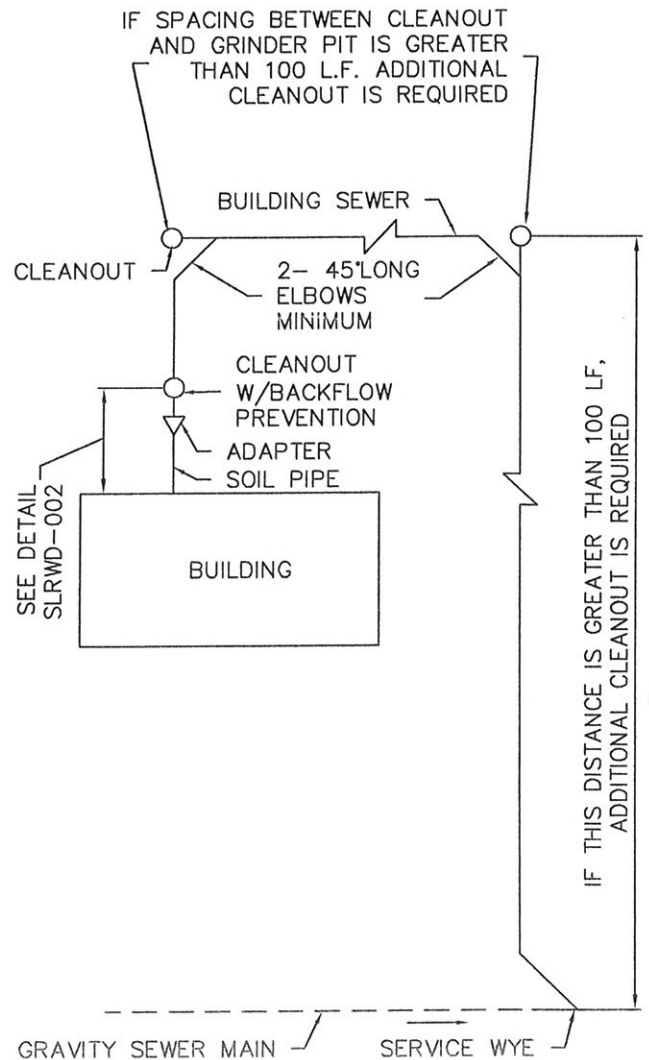
1. DUPLEX GRINDER PUMP STATIONS WILL CONTAIN TWO 2 HP, 240V, 1-PHASE GRINDER PUMPS.
2. ALL GRINDER PUMP STATION CONTROL PANELS SHALL HAVE LOCKABLE LATCHES FOR UTILITY SEALS AND/OR LOCKS.
3. GRINDER PUMP STATIONS TO BE SERVED FROM SLRWD CUSTOMER ELECTRICAL PANEL.
4. CONTRACTOR TO PROVIDE PUMP FIELD WIRING AND "OFF", "ON" AND "ALARM" FIELD CONTROL WIRING, ROUGH-IN AND INSTALL IN STRICT COMPLIANCE WITH THE MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS.
5. THE RESIDENTIAL (OR COMMERCIAL) OWNER WILL BE RESPONSIBLE TO PROVIDE:
 - a. A 2P-40A CIRCUIT BREAKER IN THE ELECTRICAL PANEL
 - b. #8 WIRING IN CONDUIT INSTALLED COMPLETELY FROM THE PANEL BOARD CIRCUIT BREAKER TO THE GRINDER PUMP CONTROL PANEL INCLUDING TRENCHING AND BACKFILL.
 - c. CONDUIT SHALL HAVE A MINIMUM OF 18-INCHES OF COVER
6. POWER FROM CUSTOMER TO BE IN CONDUIT SEPARATE FROM FROM ALL OTHER WIRING
7. ELECTRICAL CONDUIT TO ENTER BOTTOM OF BOX/PANEL
8. ALL ELECTRICAL WORK TO MEET LOCAL, STATE, AND FEDERAL CODE.
9. THE STEUBEN LAKES REGIONAL WASTE DISTRICT WILL COORDINATE THE ELECTRICAL SERVICE CONNECTION FROM THE RESIDENCE TO THE GRINDER PUMP STATION CONTROL PANEL DIRECTLY WITH THE RESIDENTIAL OWNER. THIS WORK IS OUTSIDE THE RESPONSIBILITIES OF THE CONTRACTOR. THIS WORK MUST BE PROVIDED BY A QUALIFIED ELECTRICIAN AND COMPLY WITH ALL LOCAL CODES, STATE ELECTRICAL CODES, AND THE NATIONAL ELECTRIC CODES. CHANGES TO THE RESIDENTIAL ELECTRICAL SUPPLY TO ACCOMMODATE THIS CONNECTION SHALL BE THE RESPONSIBILITY OF THE OWNER OF THE RESIDENCE.

REV. DATE:	DUPLEX GRINDER PUMP STATION SCHEMATIC	"adopted date" Dec. 4, 2008
4/13/17		
File:		SLRWD-010B

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



STRAIGHT CONNECTION



AROUND THE BUILDING
CONNECTION

NOTES:

1. MAXIMUM DISTANCE BETWEEN THE EXTERIOR WALL AND THE CLEANOUT WYE WITH BACKFLOW PREVENTION SHALL BE 5'.
2. NO 90° ELBOW OR TURN IS PERMITTED IN BUILDING SEWER.
3. MINIMUM SLOPE OF BUILDING SEWER SHALL BE 0.62% FOR 6" OR 2.00% FOR 4".
4. PROVIDE CLEANOUTS ON BUILDING SEWER AT 100' MAXIMUM.
5. BUILDING SEWER LINE SHALL BE INSPECTED AND APPROVED BEFORE EXCAVATION IS BACKFILLED.

REV. DATE:

GRAVITY SEWER CONNECTION DETAIL

"adopted date"
Dec. 4, 2008

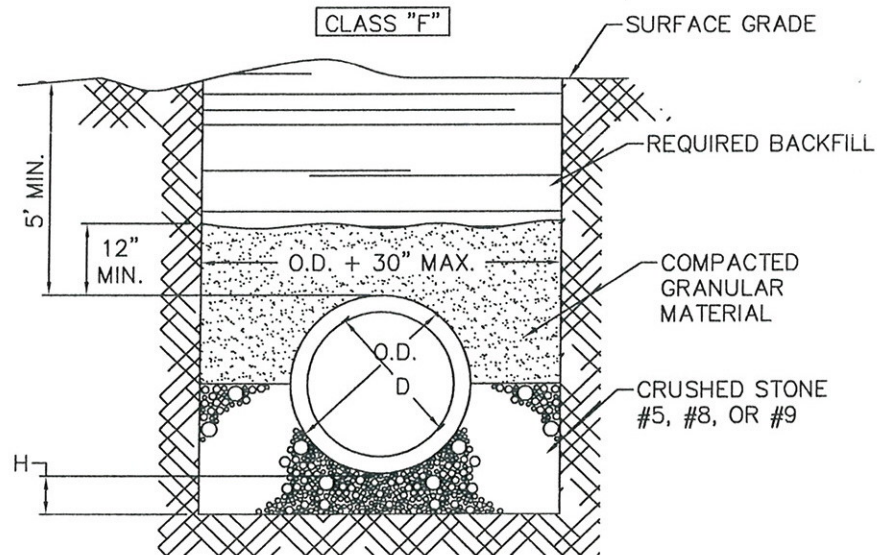
SLRWD-011

File:

SLRWD – 100 Series: Pressure Sewer Main Construction Details

- SLRWD – 101: Pipe Bedding Detail (Flexible Pipe)
- SLRWD – 102: Pipe Bedding Detail (Rigid Pipe)
- SLRWD – 103: Valve Box (Roadway Box) for Valves 3 Inches or Larger
- SLRWD – 104A: Air Release Manhole Type "A" (ARM/A)
- SLRWD – 104B: Air Release Manhole Type "B" (Offset From Low Pressure Sewer)
- SLRWD – 105: Type I Pressure Sewer Cleanout Detail
- SLRWD – 106: Cleanout & Flush Valve Structure Type "A" (CO-A)
- SLRWD – 107: Meter Pit Structure Detail
- SLRWD – 108: Ditch Crossing Detail
- SLRWD – 109: Typical Submersible Pump Station Detail
- SLRWD – 110: Standard Casting Type "B"
- SLRWD – 111: Pump Station Power Connection

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



Note: For Rock Or Other Non-Compressible Materials: The Trench Should Be Over-Excavated A Minimum Of 6" & Refilled With Granular Materials.

—Flexible Conduits Are Considered The Following Pipes: PVC Solid Wall, And HDPE.

LEGEND:

O.D. = Outside Diameter
D. = Inside Diameter
6" = Backfill Cover Above Top Of Pipe
H = $\frac{O.D.}{8}$ Min.

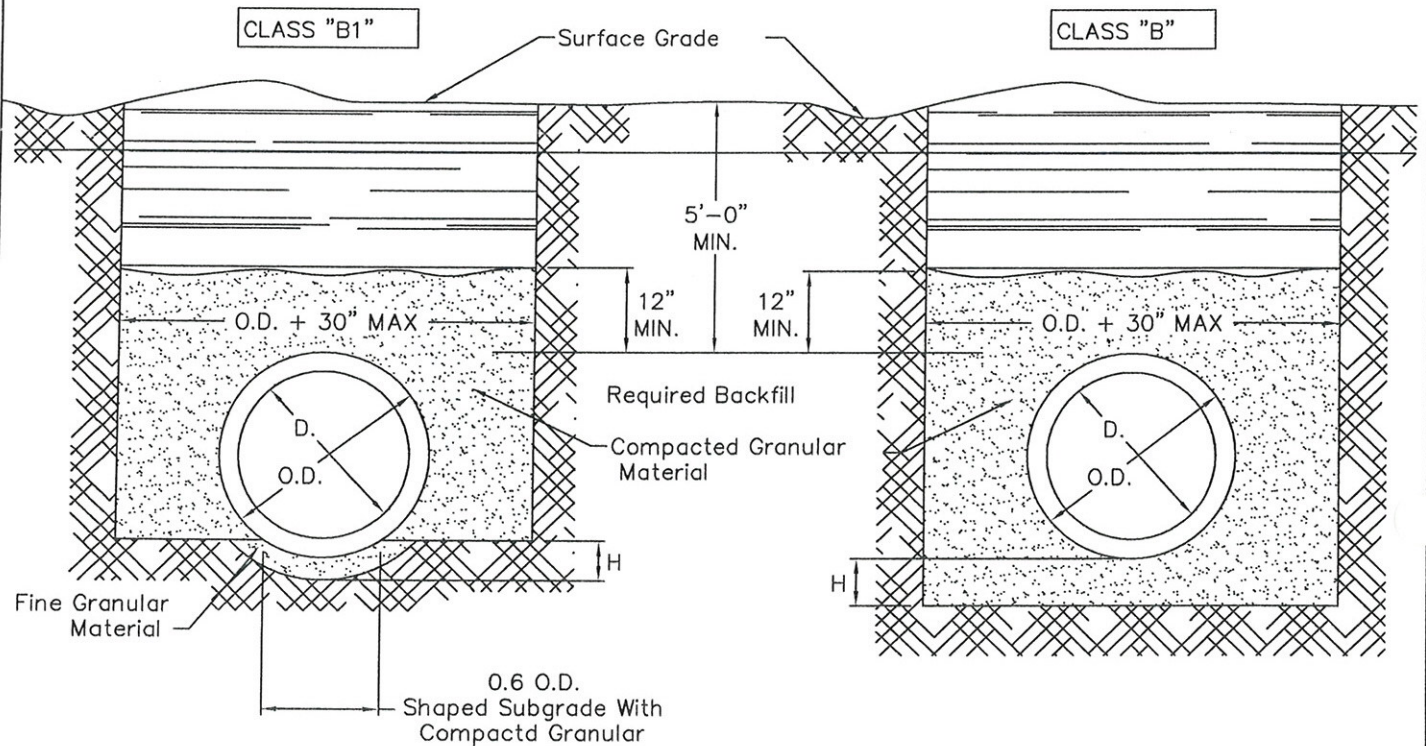
Size Of Coarse Aggregates (Crushed Stone) As Per Indiana Department Of Highway Standards And Specifications — 1985 Edition

Sieve Sizes	Coarse Aggregates Sizes (Percents Passing Sieve)		
	#5	#8	#9
1 1/2"	100	100	100
1"	85-98	100	100
3/4"	60-85	75-95	100
1/2"	30-60	40-70	60-85
3/8"	15-45	20-50	30-60
NO. 4	0-15	0-15	0-15
NO. 8	0-10	0-10	0-10

Note: Stone Chips Are Permitted In Lieu Of Crushed Stone Provided That No More Than 20% Of Stone Chips Pass The No. 4 Sieve.

REV. DATE:	PIPE BEDDING DETAIL (FLEXIBLE PIPE)	"adopted date" Dec. 4, 2008
—		
File:		SLRWD-101

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



Note:
For Rock Or Other Non-Compressible Materials: The Trench Should Be Over-Excavated A Minimum Of 6" & Refilled With Granular Materials.

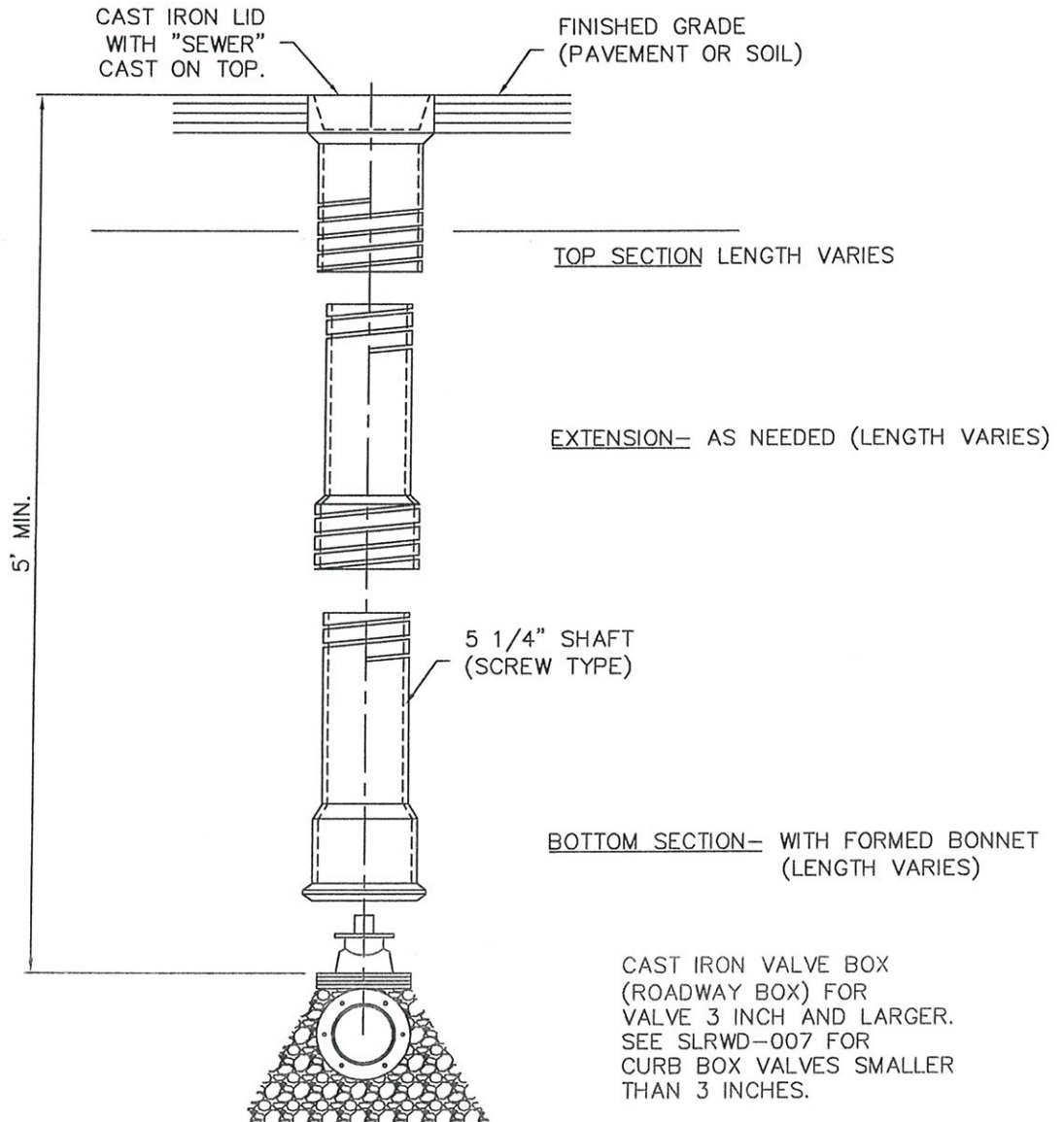
LEGEND

O.D. = Outside Diameter
D. = Inside Diameter
6" = Backfill Cover Above Top Of Pipe

$$H = \frac{O.D.}{8} \text{ Min.}$$

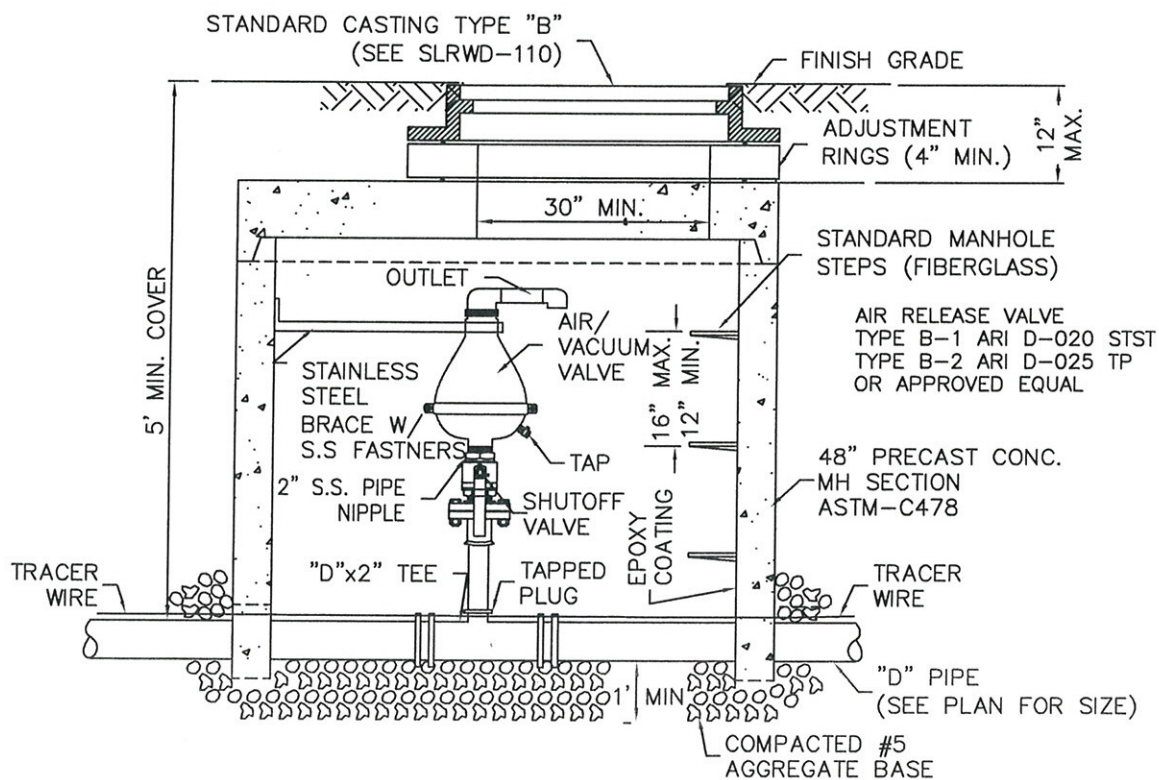
REV. DATE:	PIPE BEDDING DETAIL (RIGID PIPE)	"adopted date" Dec. 4, 2008
-		
		SLRWD-102
File:		

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



REV. DATE:		VALVE BOX (ROADWAY BOX) FOR VALVES 3 INCHES OR LARGER	"adopted date" Dec. 4, 2008
—			SLRWD-103
File:			

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

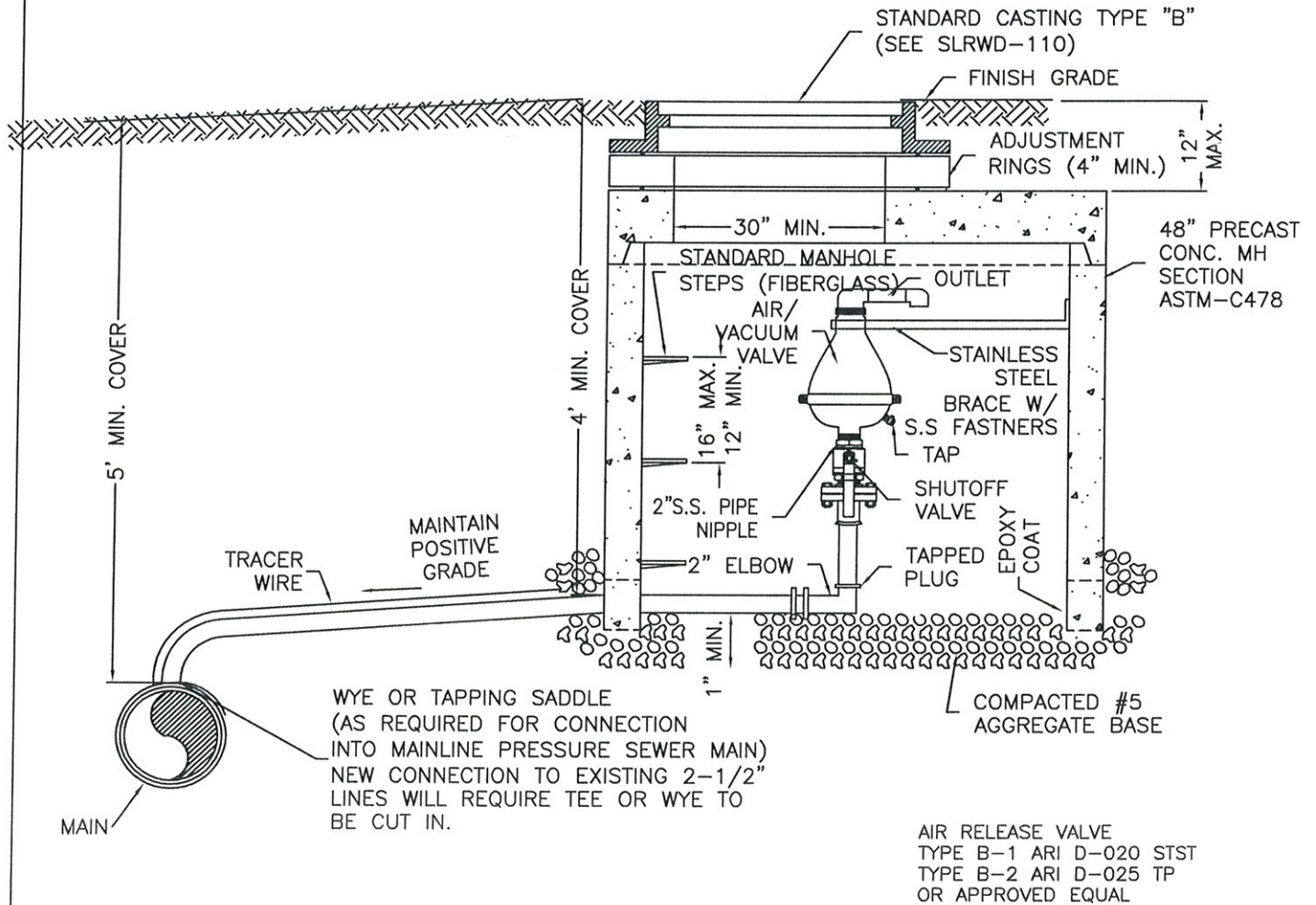


NOTE:

- 1) THE AIR/VACUUM RELEASE VALVES SHALL MEET THE REQUIREMENTS AS DESCRIBED IN 327 IAC 3-6-13 (5).

REV. DATE:		AIR RELEASE MANHOLE TYPE "A" (ARM/A)	"adopted date" Dec. 4, 2008
4/13/17			
File:			SLRWD-104A

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

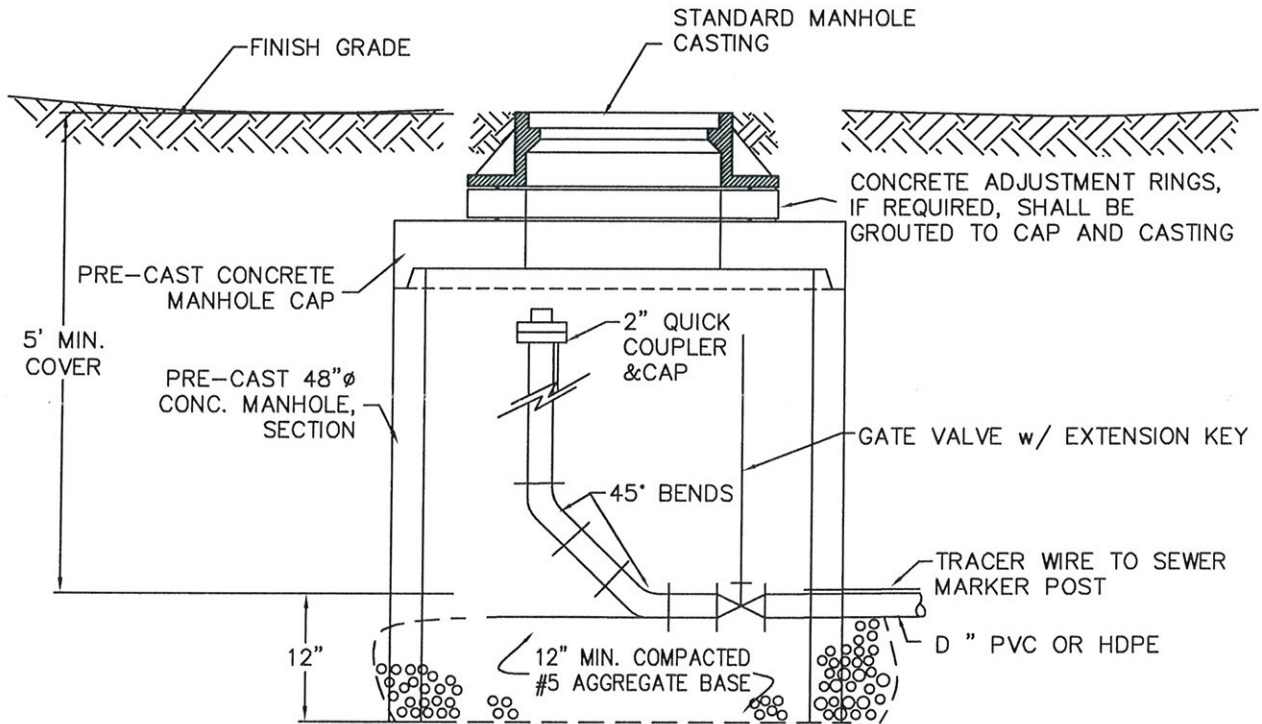


NOTES:

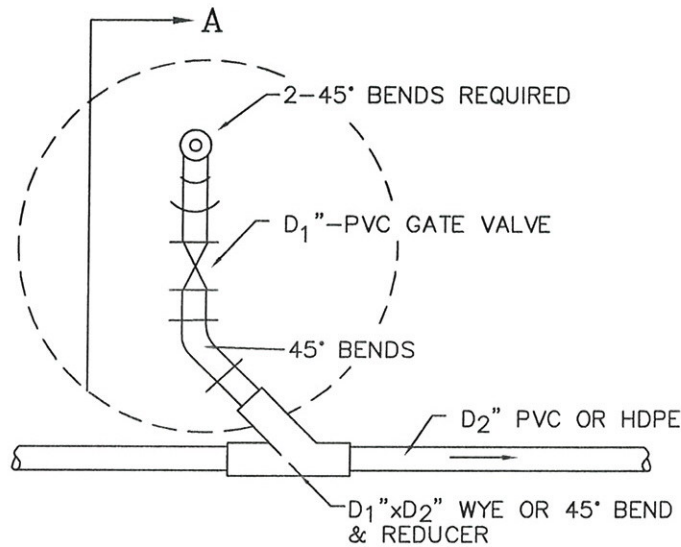
- 1) THE AIR/VACUUM RELEASE VALVES SHALL MEET THE REQUIREMENTS AS DESCRIBED IN 327 IAC 3-6-13 (5).

REV. DATE:		AIR RELEASE MANHOLE TYPE "B" (OFFSET FROM LOW PRESSURE SEWER)	"adopted date" Dec. 4, 2008
4/13/17			
File:			SLRWD-104B

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



SECTION "A"

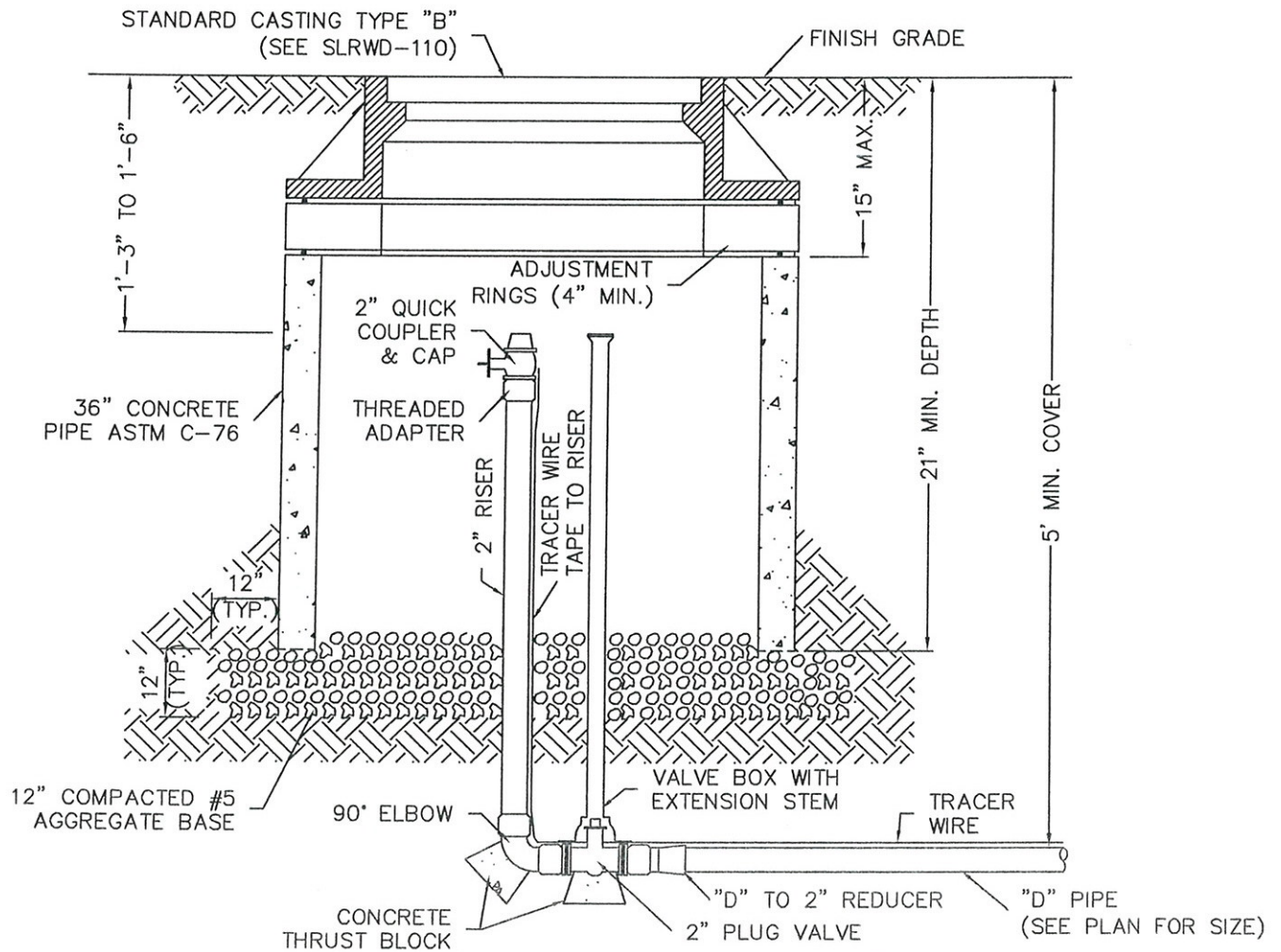


D_x = PIPE DIAMETER

PLAN VIEW

REV. DATE:		TYPE I PRESSURE SEWER CLEANOUT DETAIL	"adopted date" Dec. 4, 2008
4/13/17			
File:		SLRWD-105	

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



REV. DATE:

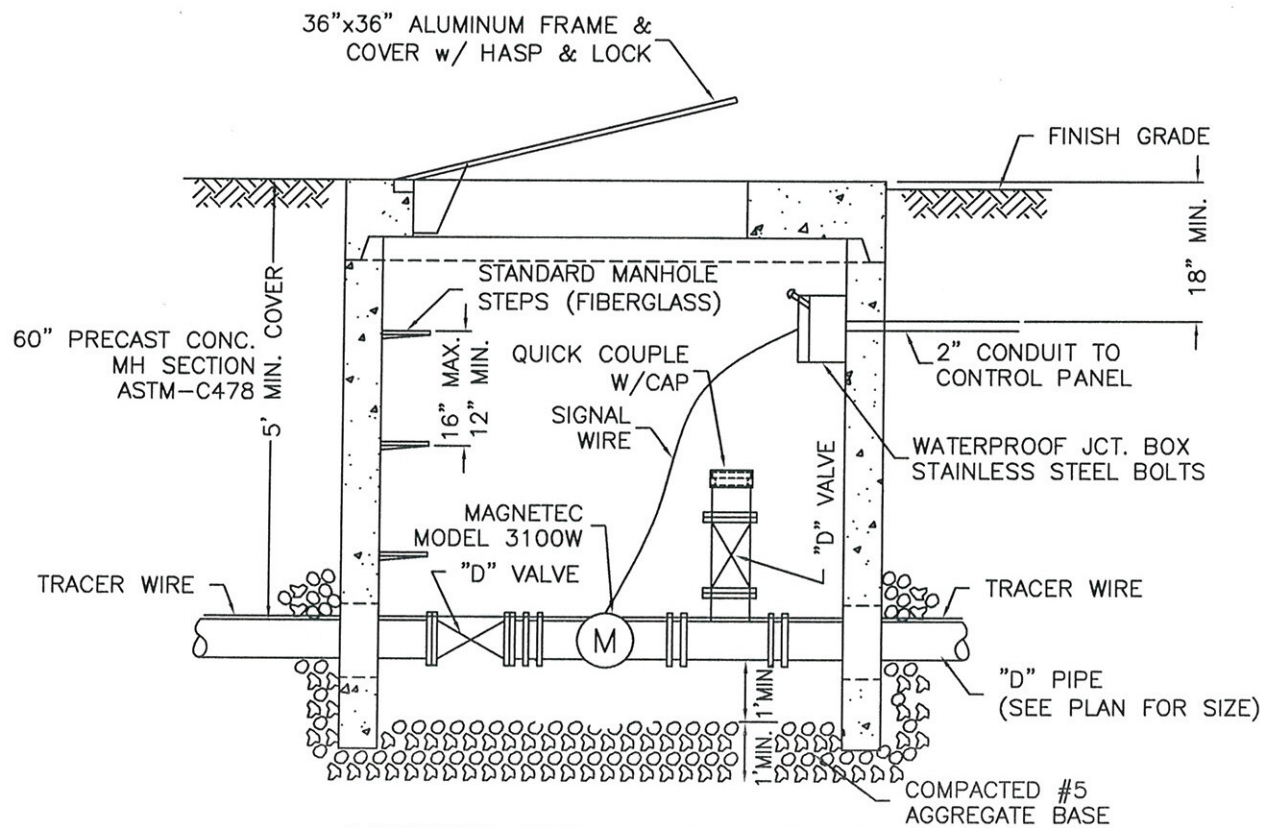
CLEANOUT & FLUSH VALVE STRUCTURE
TYPE "A" (CO-A)

"adopted date"
Dec. 4, 2008

SLRWD-106

File:

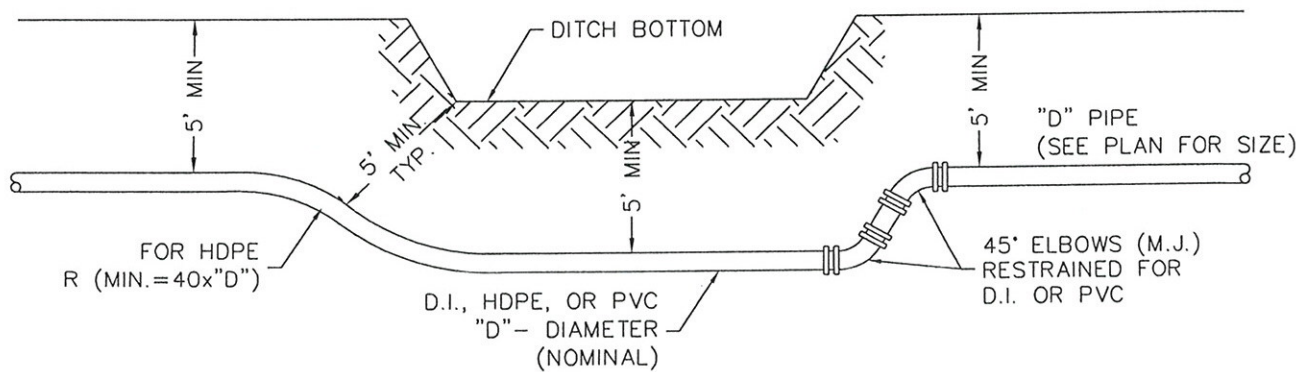
STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



METER PIT STRUCTURE

REV. DATE:		METER PIT STRUCTURE DETAIL	"adopted date" Dec. 4, 2008
4/13/17			
File:			SLRWD-107

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



REV. DATE:

DITCH CROSSING DETAIL

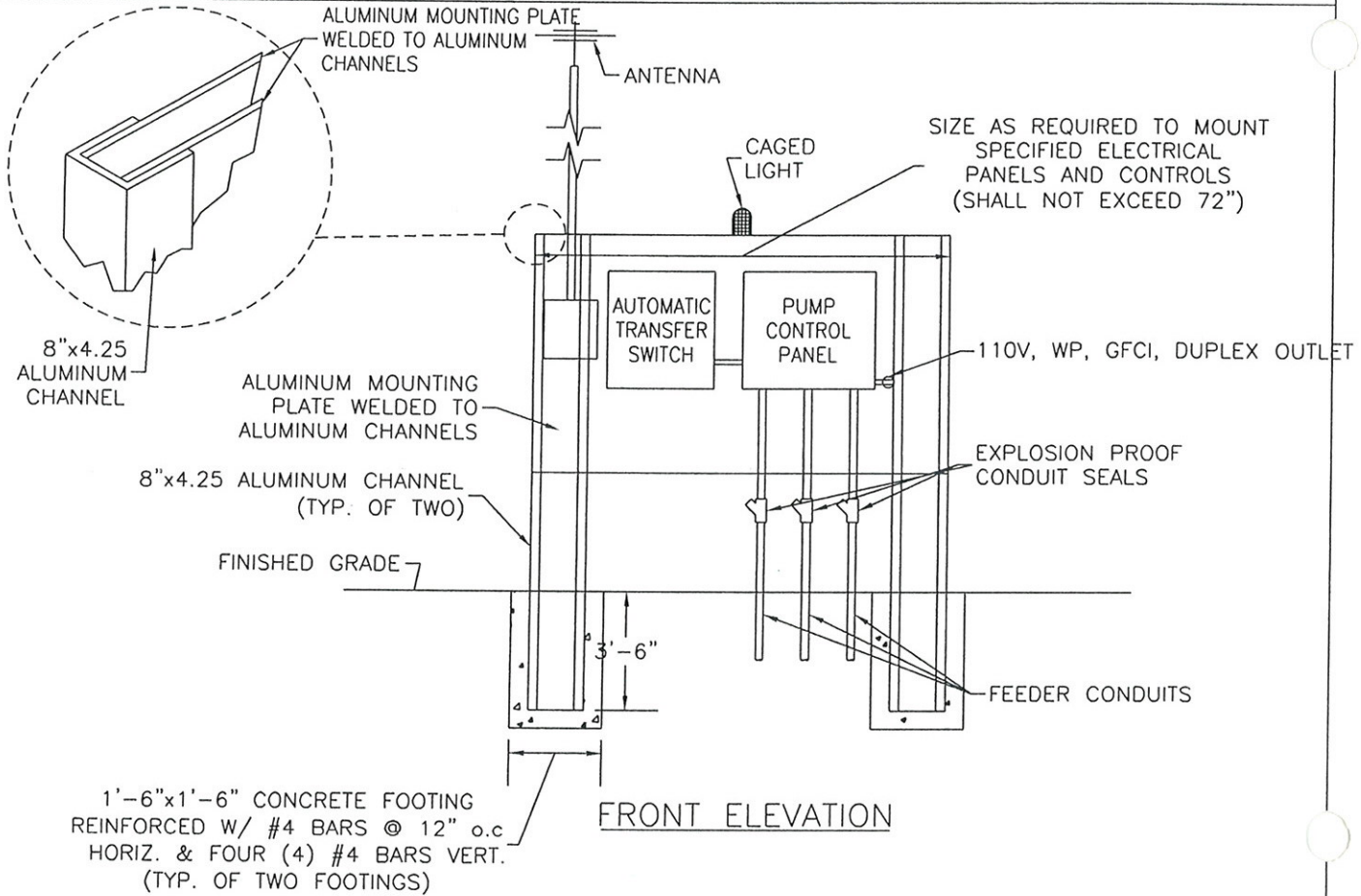
"adopted date"

Dec. 4, 2008

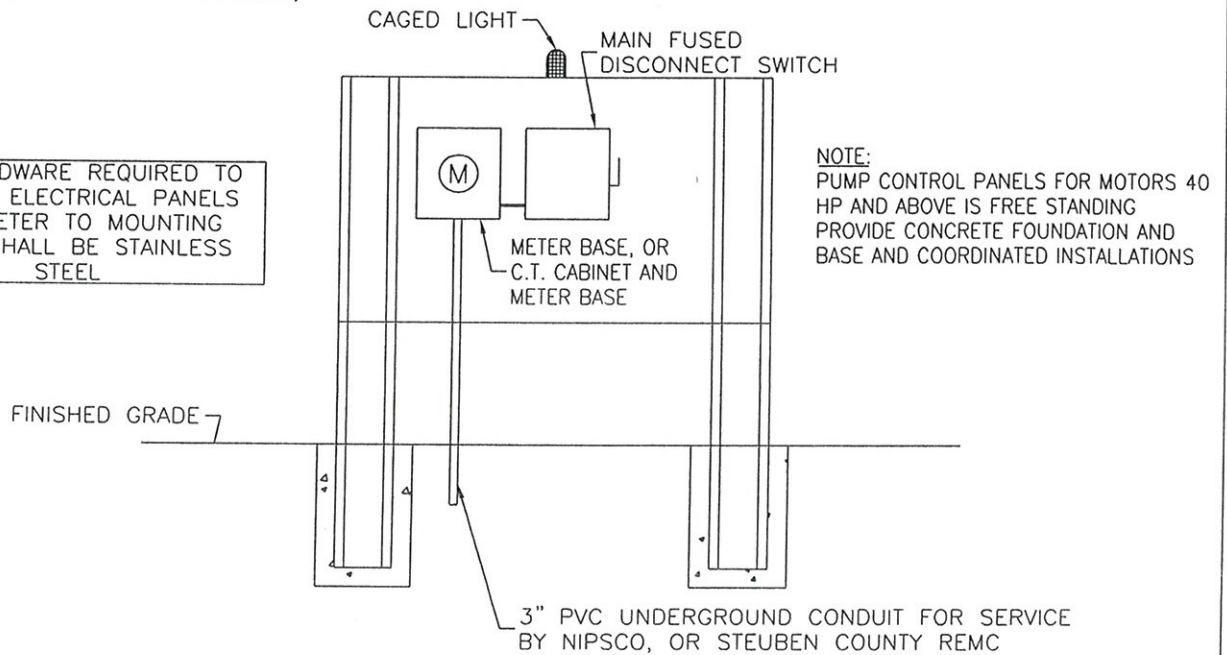
SLRWD-108

File:

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



ALL HARDWARE REQUIRED TO ANCHOR ELECTRICAL PANELS AND METER TO MOUNTING PLATE SHALL BE STAINLESS STEEL



REV. DATE:

PUMP STATION POWER CONNECTION
DETAIL

"adopted date"
Dec. 4, 2008

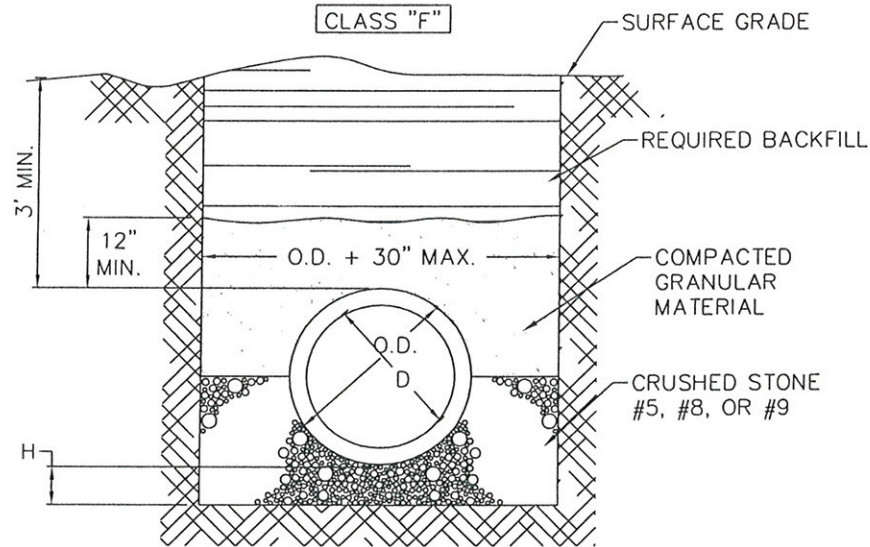
SLRWD-111

File:

SLRWD – 200 Series: Gravity Sewer Construction Details

- SLRWD – 201: Pipe Bedding Detail (Flexible Pipe)
- SLRWD – 202: Pipe Bedding Detail (Rigid Pipe)
- SLRWD – 203: Standard Type “A” Manhole
- SLRWD – 204: Standard Type “B” Drop Manhole
- SLRWD – 205: Drop Pipe Connection (Existing Manholes)
- SLRWD – 206: Precast Concrete Riser Rings
- SLRWD – 207: Standard Manhole Step
- SLRWD – 208: Manhole Connection Details
- SLRWD – 208A: Force Main to Manhole Connection Details
- SLRWD – 209: Standard Manhole Casting Type “A”
- SLRWD – 210: Standard Service Connection Detail
- SLRWD – 211: Deep Service Connection Detail
- SLRWD – 212: Typical Cut-in Wye– Methods I & II

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



Note: For Rock Or Other Non-Compressible Materials: The Trench Should Be Over-Excavated A Minimum Of 6" & Refilled With Granular Materials.

—Flexible Conduits Are Considered The Following Pipes: PVC Solid Wall, And HDPE.

LEGEND:

O.D. = Outside Diameter
D = Inside Diameter
6" = Backfill Cover Above Top Of Pipe
 $H = \frac{O.D.}{8}$ Min.

Size Of Coarse Aggregates (Crushed Stone) As Per Indiana Department Of Highway Standards And Specifications - 1985 Edition

Sieve Sizes	Coarse Aggregates Sizes (Percents Passing Sieve)		
	#5	#8	#9
1 1/2"	100	100	100
1"	85-98	100	100
3/4"	60-85	75-95	100
1/2"	30-60	40-70	60-85
3/8"	15-45	20-50	30-60
NO. 4	0-15	0-15	0-15
NO. 8	0-10	0-10	0-10

Note: Stone Chips Are Permitted In Lieu Of Crushed Stone Provided That No More Than 20% Of Stone Chips Pass The No. 4 Sieve.

REV. DATE:

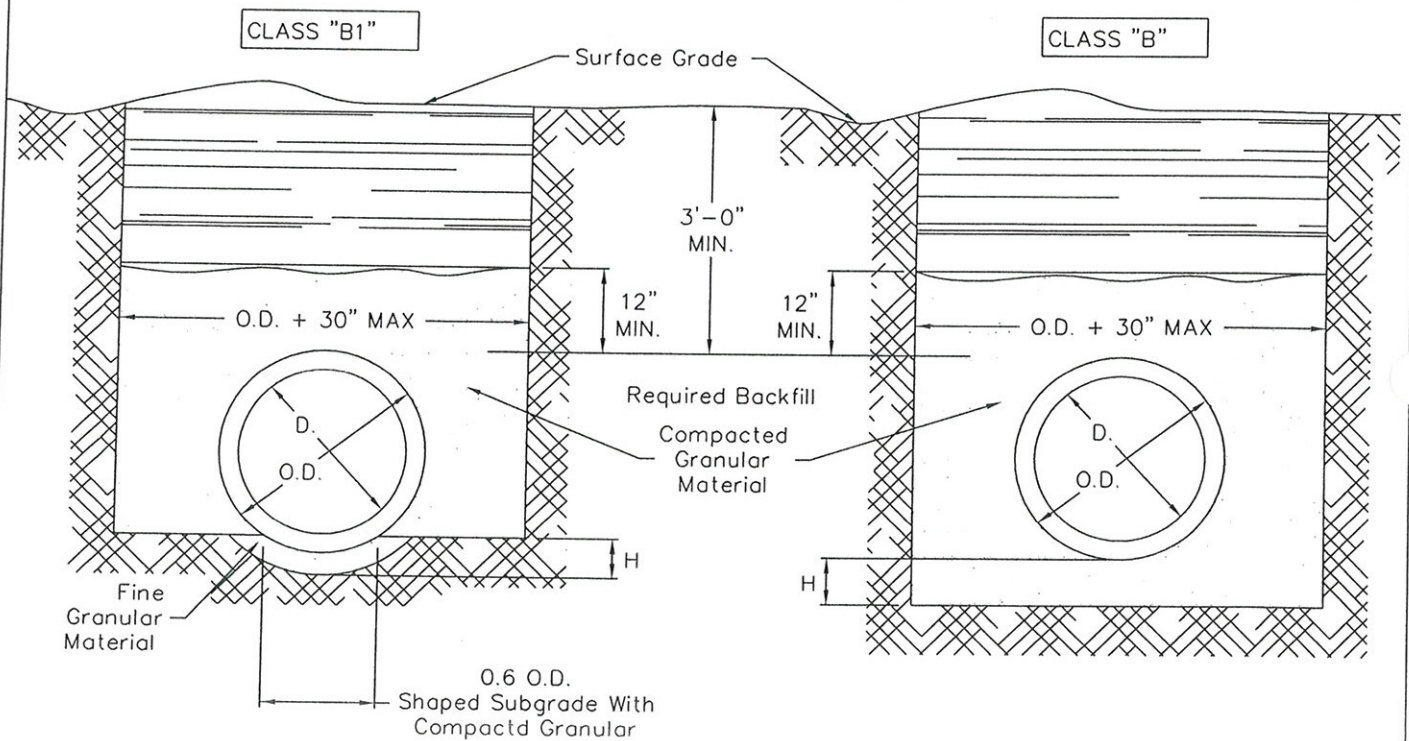
**PIPE BEDDING DETAIL
(FLEXIBLE PIPE)**

"adopted date"
Dec. 4, 2008

SLRWD-201

File:

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



Note:
For Rock Or Other Non-Compressible Materials: The Trench Should Be Over-Excavated A Minimum Of 6" & Refilled With Granular Materials.

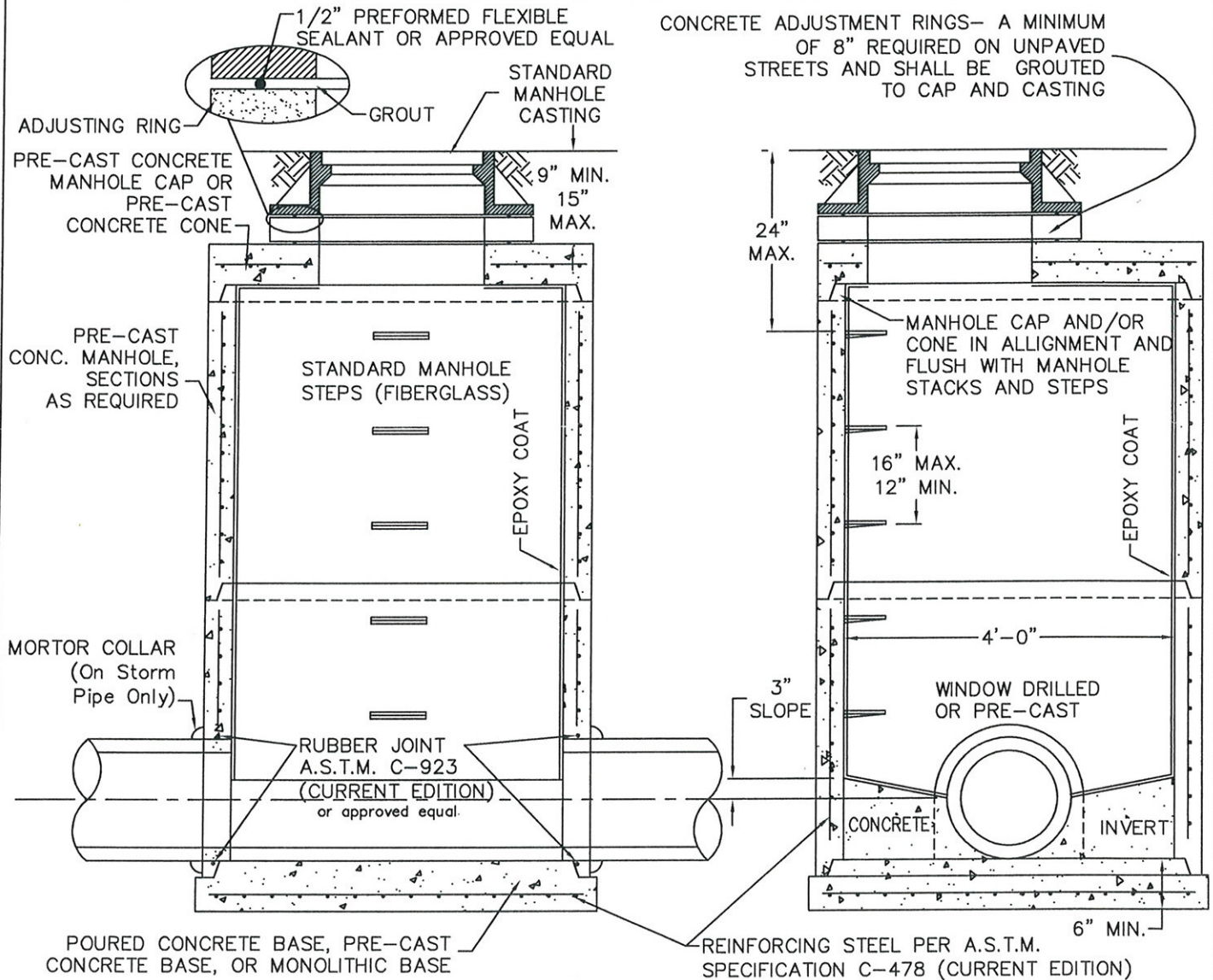
LEGEND

O.D. = Outside Diameter
D. = Inside Diameter
6" = Backfill Cover Above Top Of Pipe

$$H = \frac{O.D.}{8} \text{ Min.}$$

<table> <tr> <td>REV. DATE:</td> <td>PIPE BEDDING DETAIL (RIGID PIPE)</td> <td data-bbox="1299 1816 1549 2005" rowspan="2"> "adopted date" Dec. 4, 2008 SLRWD-202 </td> </tr> <tr> <td>-</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>File:</td> <td></td> <td></td> </tr> </table>	REV. DATE:	PIPE BEDDING DETAIL (RIGID PIPE)	"adopted date" Dec. 4, 2008 SLRWD-202	-					File:				
REV. DATE:	PIPE BEDDING DETAIL (RIGID PIPE)	"adopted date" Dec. 4, 2008 SLRWD-202											
-													
File:													

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



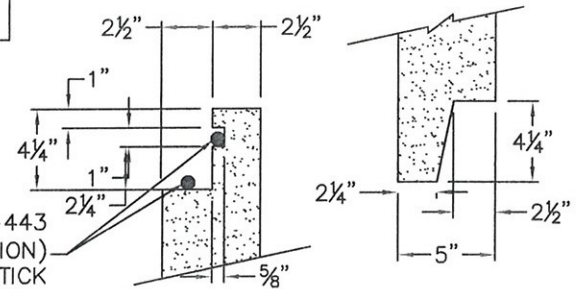
NOTE:
MANHOLE SECTIONS IN ACCORDANCE WITH A.S.T.M. C-478 (CURRENT EDITION)

MANHOLE JOINTS
NOT TO SCALE

GENERAL CONSTRUCTION REQUIREMENTS
ALL PIPES SHALL HAVE A SMOOTH FINISH ALL CONCRETE SHALL BE 4,000 PSI THE BASE SHALL BE PLACED ON COMPACTED GRAVEL OR STONE (4" MINIMUM) THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MINIMUM OF 12"

O-RING A.S.T.M. C-443 (CURRENT EDITION)
E-Z STICK OR APPROVED EQUAL

MANHOLE SHALL BE TESTED FOR LEAKAGE BY CONDUCTING A VACUUM TEST IN ACCORDANCE WITH ASTM C-1244-93



REV. DATE:

4/13/17

STANDARD TYPE "A" MANHOLE

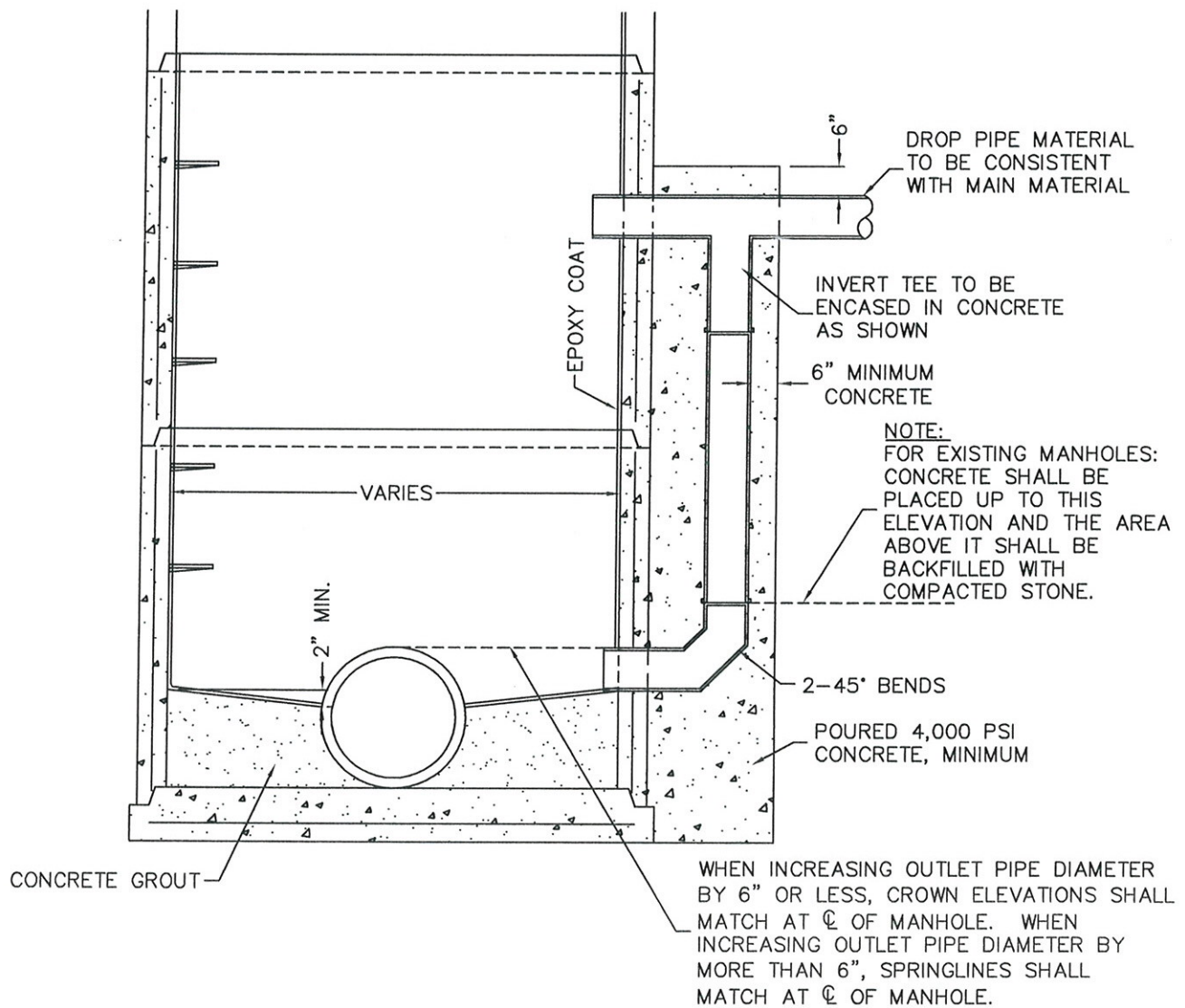
"adopted date"

Dec. 4, 2008

SLRWD-203

File:

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



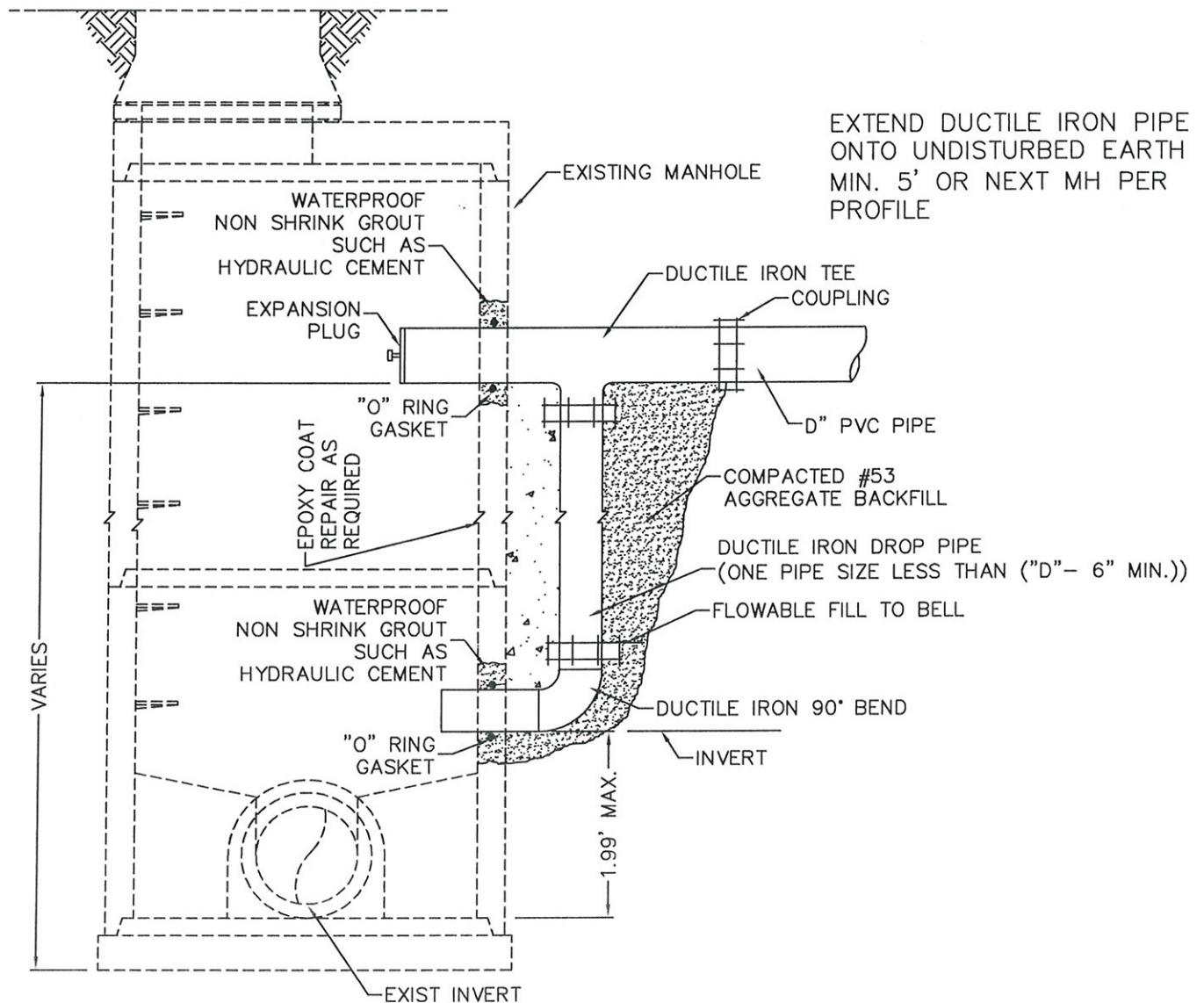
MANHOLE JOINTS: PER STANDARD MANHOLE TYPE I

NOTES: DROP PIPE MAY BE ONE SIZE SMALLER THAN MAIN LINE SEWER, BUT NOT LESS THAN 6" NOR LARGER THAN 12". MAINLINE PIPE AND 12" DROP PIPE FOR ALL LARGER MAINLINE PIPES UNLESS OTHERWISE SPECIFIED.

GENERAL CONSTRUCTION REQUIREMENTS SAME AS STANDARD 48" MANHOLE.

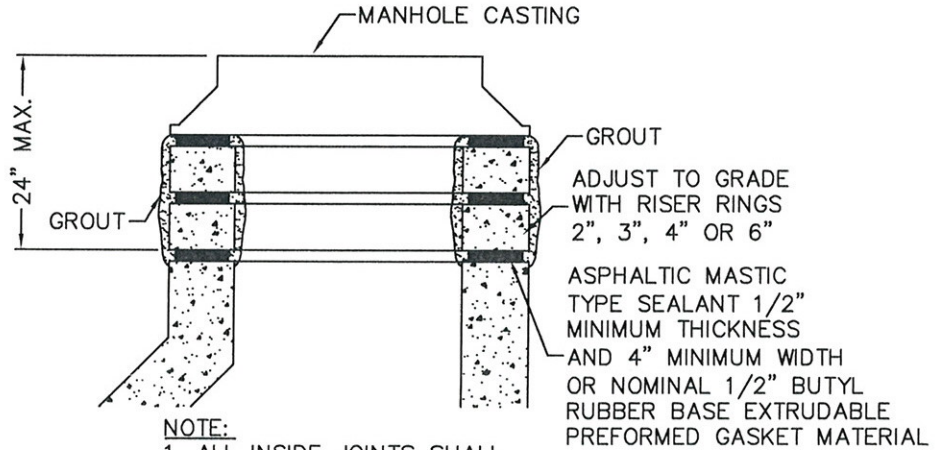
REV. DATE:		STANDARD TYPE "B" DROP MANHOLE	"adopted date" Dec. 4, 2008
4/13/17			
File:			SLRWD-204

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



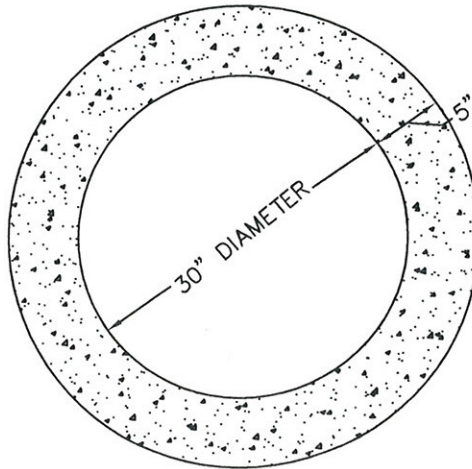
REV. DATE: 4/13/17	DROP PIPE CONNECTION (EXISTING MANHOLES)	"adopted date" Dec. 4, 2008
File:		SLRWD-205

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

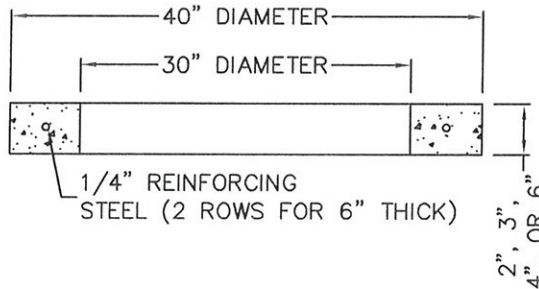


NOTE:

1. ALL INSIDE JOINTS SHALL
BE SMOOTHED WITH MORTAR
2. INTERIOR OF RINGS TO HAVE
EPOXY COATING



MINIMUM 4500 PSI CONCRETE



REV. DATE:

4/13/17

PRECAST CONCRETE RISER RINGS

"adopted date"

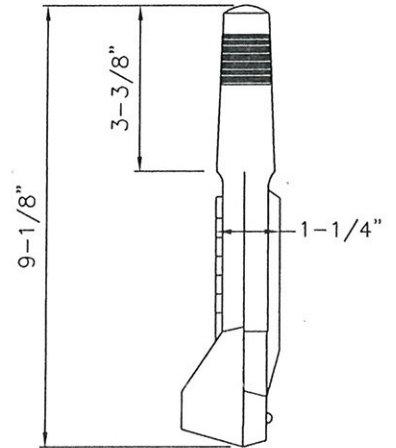
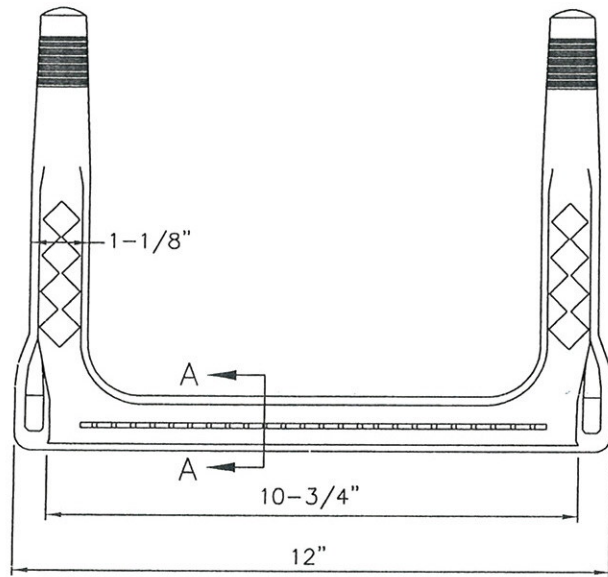
Dec. 4, 2008

File:

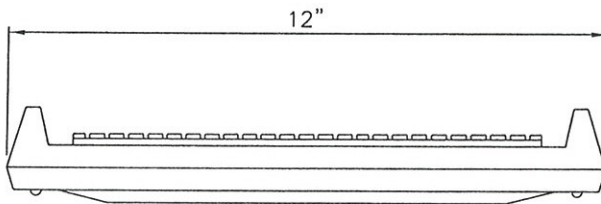
SLRWD-206

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

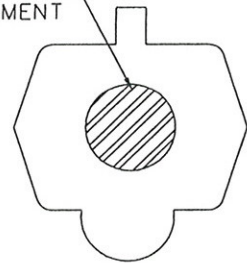
REINFORCED PLASTIC



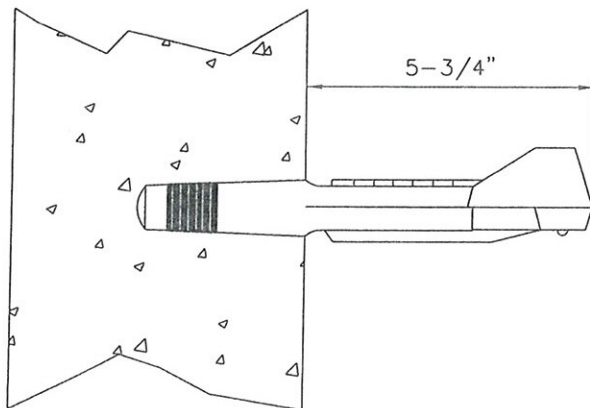
STEPS SHALL BE IN ACCORDANCE WITH
ASTM C-478 LATEST VERSION



1/2" GRADE 60 STEEL
REINFORCEMENT



SECTION A-A



REV. DATE:

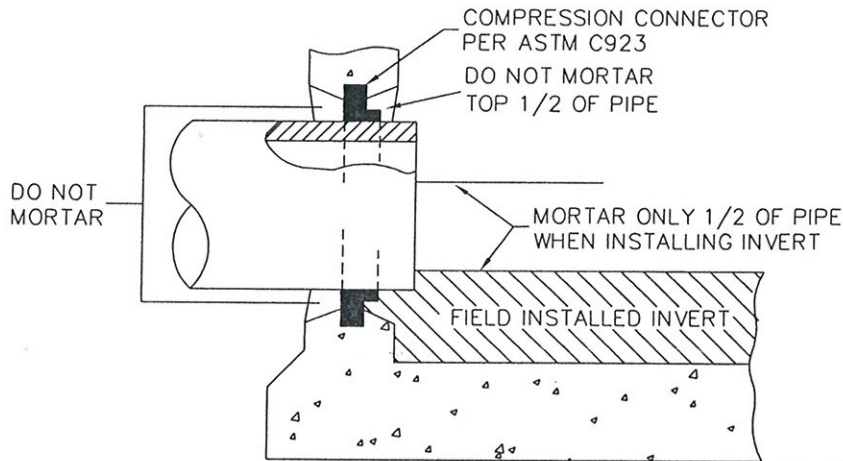
STANDARD MANHOLE STEP

"adopted date"
Dec. 4, 2008

SLRWD-207

File:

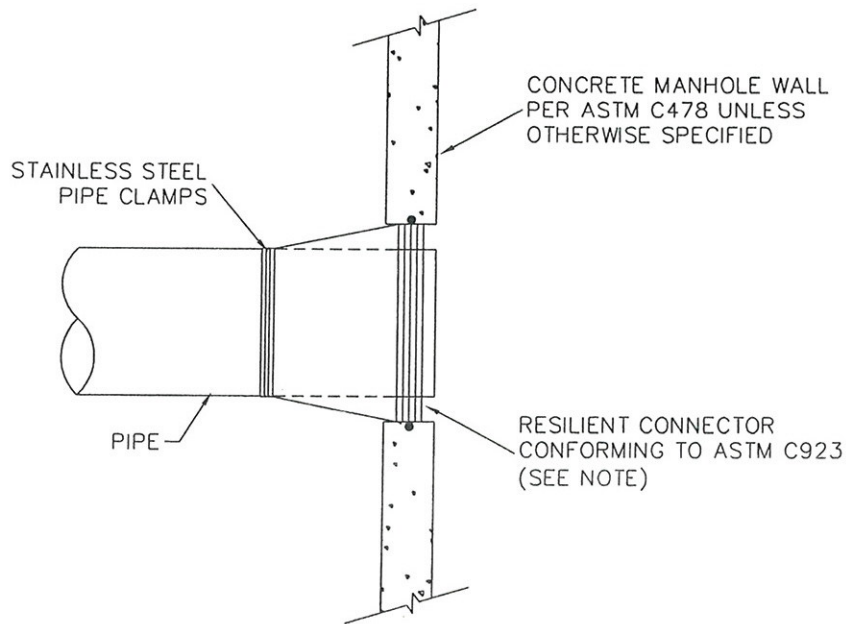
STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



COMPRESSION TYPE

NOT TO SCALE

CAUTION
WHEN INSTALLING PIPE STUBS FOR FUTURE PIPELINE, INSTALLATION OF ALL STUBS SHOULD BE PROPERLY RESTRAINED TO PREVENT ANY MOVEMENT.



BOOT TYPE

NOT TO SCALE

REV. DATE:

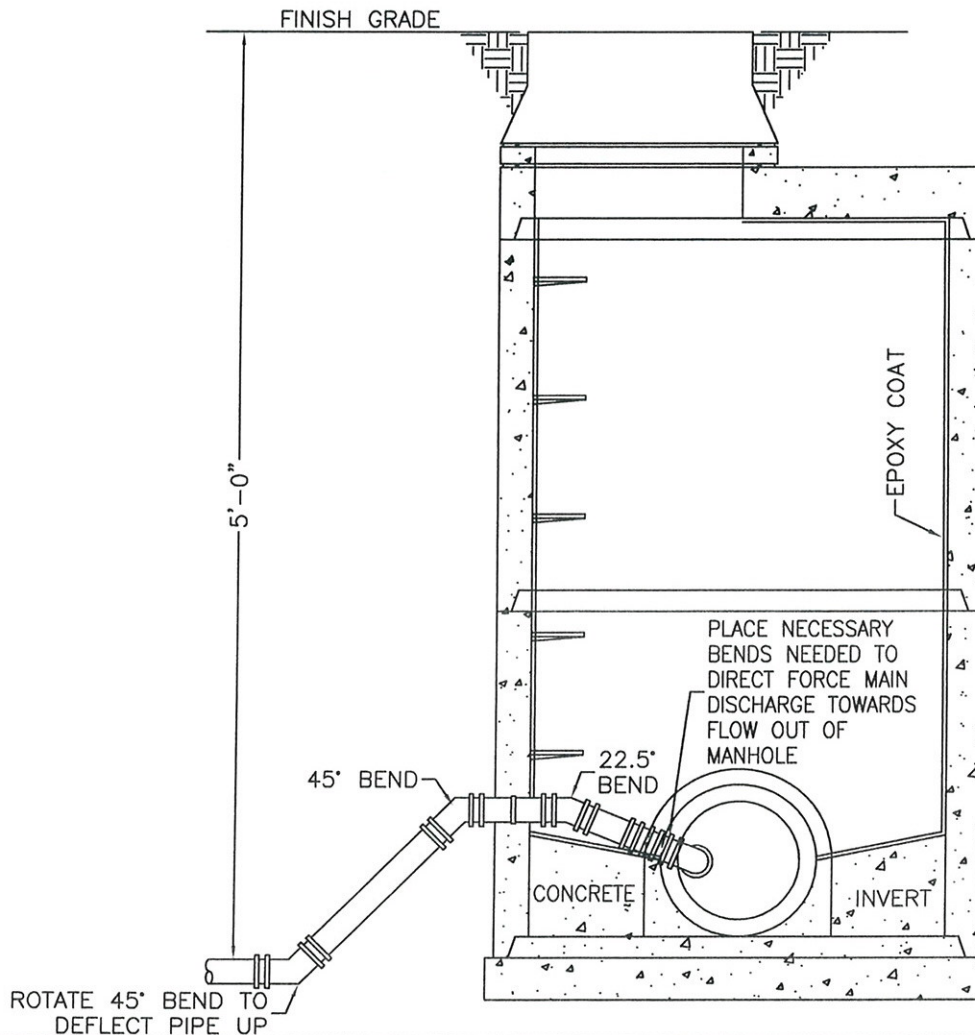
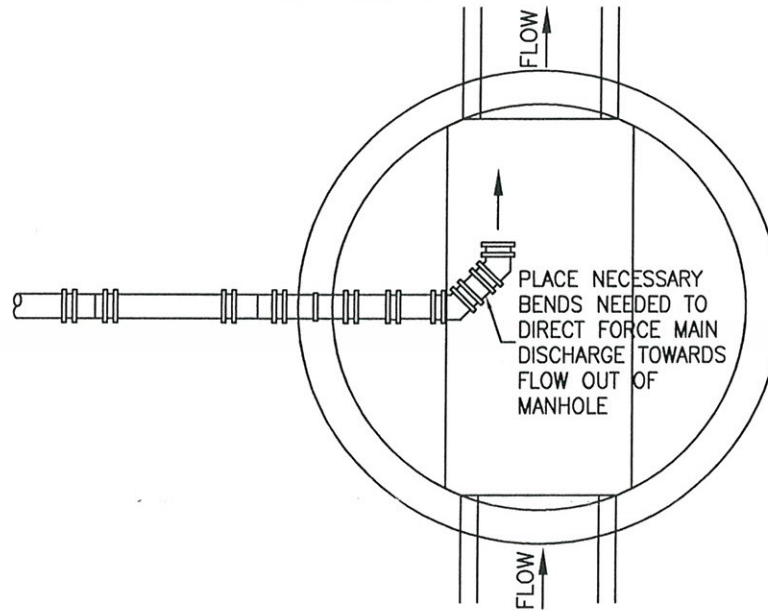
MANHOLE CONNECTION DETAILS

"adopted date"
Dec. 4, 2008

SLRWD-208

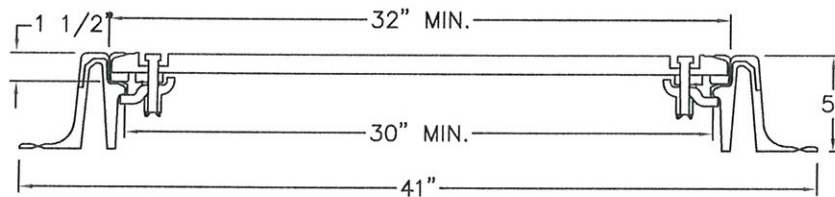
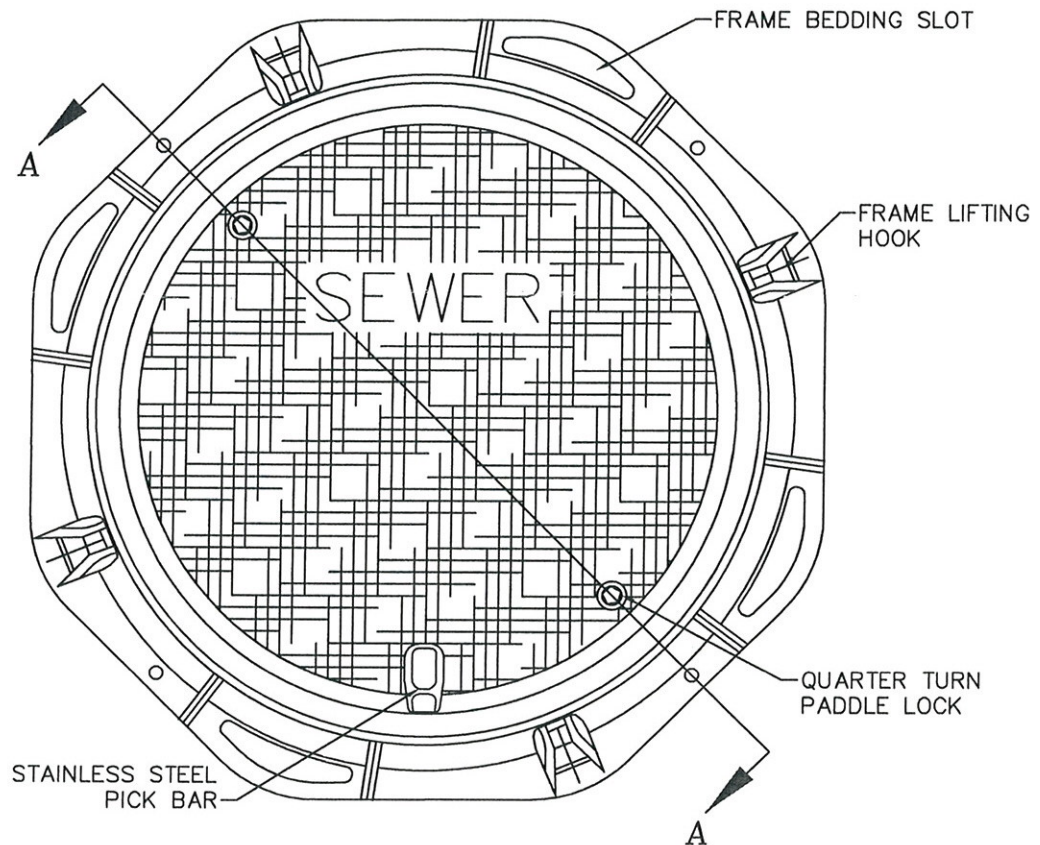
File:

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



REV. DATE:		FORCE MAIN TO MANHOLE CONNECTION DETAIL	"adopted date" Dec. 4, 2008
4/13/17			
File:			SLRWD-208A

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

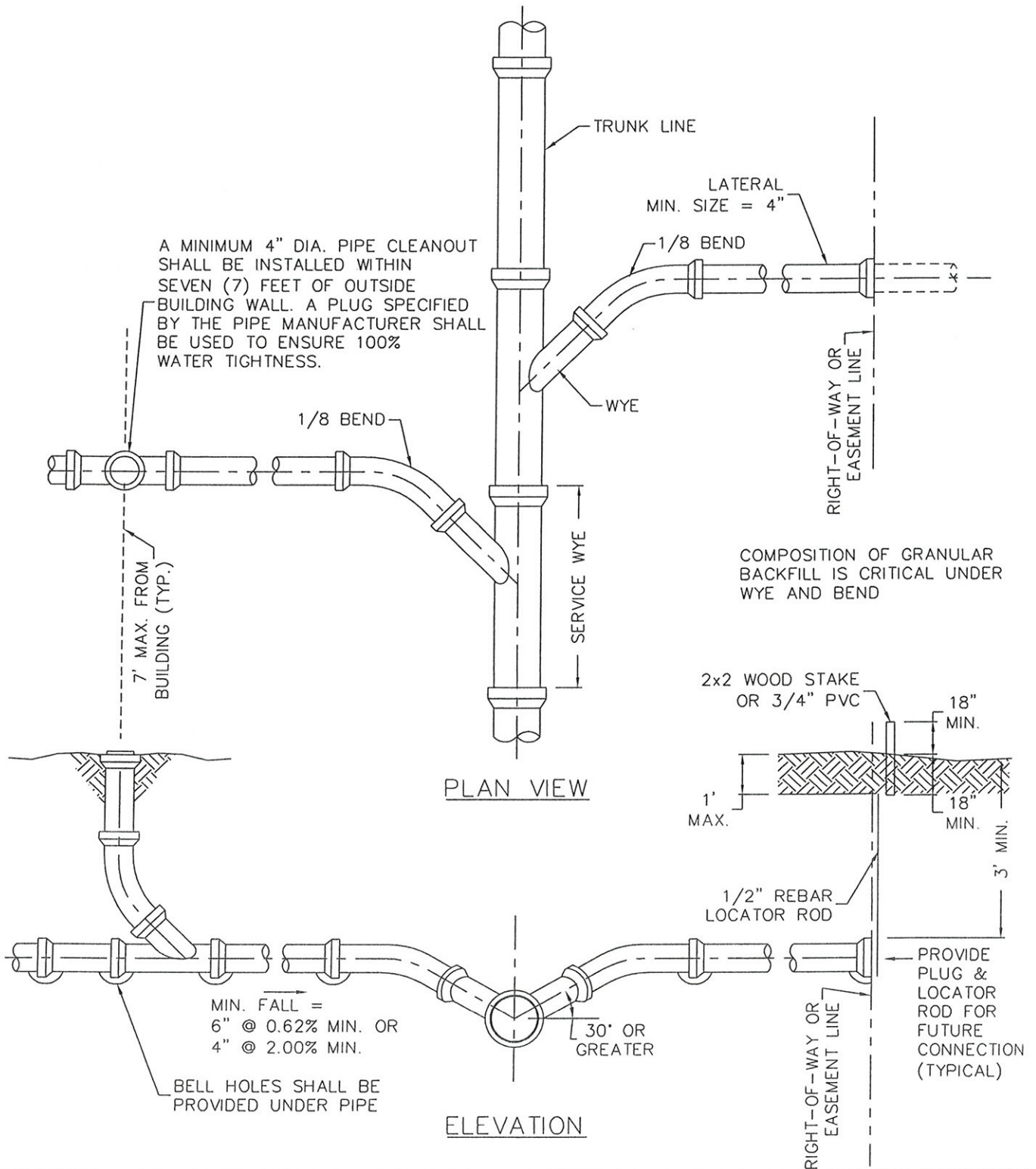


SECTION A-A

FRAME & SOLID LID
GMI COMPOSITES INC.
3200 FRAME & COVER
OR APPROVED EQUAL

REV. DATE:		STANDARD MANHOLE CASTING TYPE "A"	"adopted date" Dec. 4, 2008
4/13/17			
File:			SLRWD-209

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



REV. DATE:

STANDARD GRAVITY SERVICE CONNECTION DETAIL

"adopted date"
Dec. 4, 2008

SLRWD-210

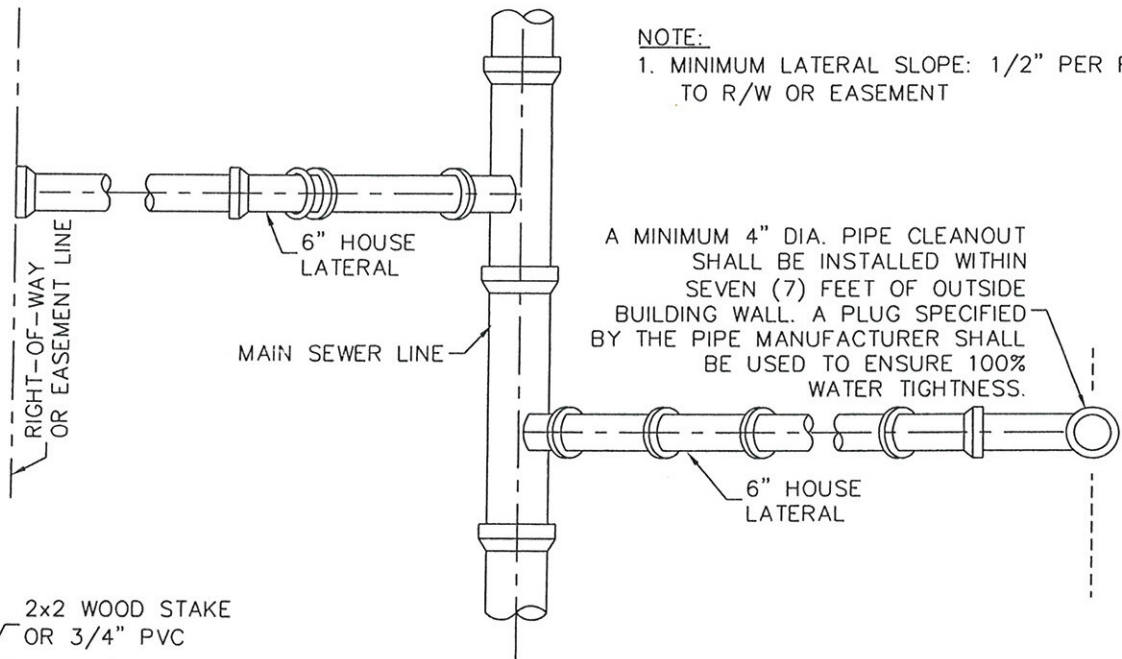
STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

15' DEEP AND DEEPER

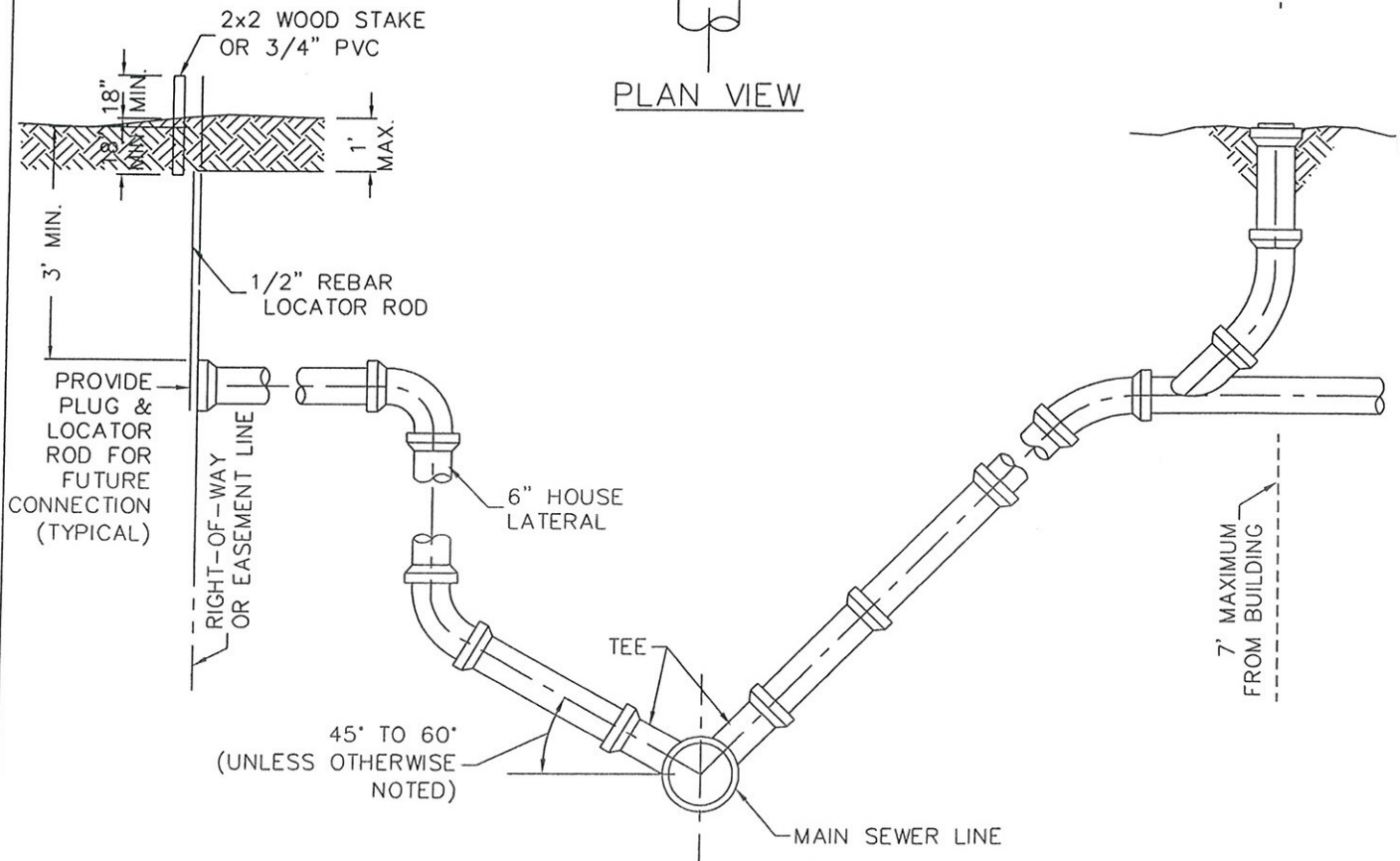
NOTE:

1. MINIMUM LATERAL SLOPE: 1/2" PER FOOT TO R/W OR EASEMENT

A MINIMUM 4" DIA. PIPE CLEANOUT SHALL BE INSTALLED WITHIN SEVEN (7) FEET OF OUTSIDE BUILDING WALL. A PLUG SPECIFIED BY THE PIPE MANUFACTURER SHALL BE USED TO ENSURE 100% WATER TIGHTNESS.



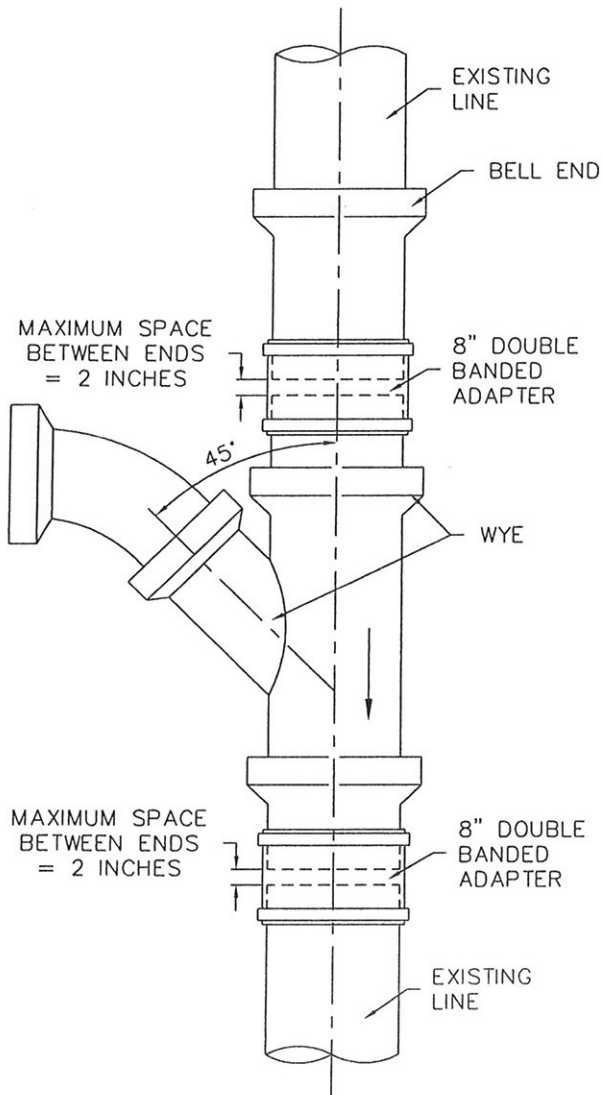
PLAN VIEW



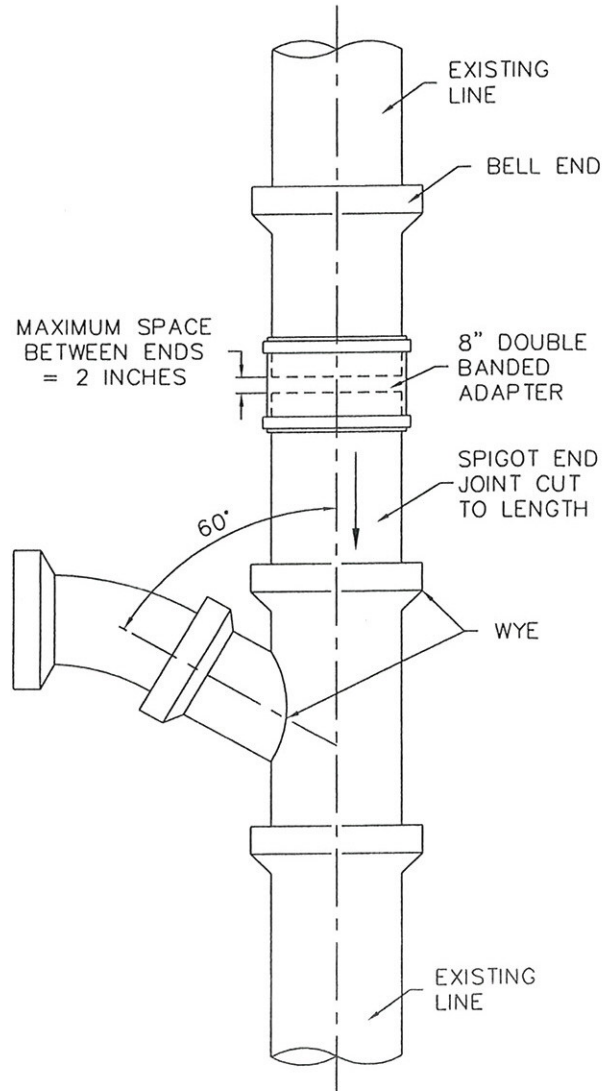
ELEVATION

REV.		DATE:	DEEP GRAVITY SERVICE CONNECTION DETAIL	"adopted date" Dec. 4, 2008
—				
			SLRWD-211	

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



METHOD I



METHOD II

REV.	DATE:	TYPICAL CUT-IN GRAVITY WYE METHODS I & II	"adopted date" Dec. 4, 2008
-			
			SLRWD-212

SLRWD – 300 Series: Miscellaneous Details

SLRWD – 301: Control & Inspection Type "C" Manhole

SLRWD – 302: Grease Trap Detail (Typical), 1,000 Gal. Minimum or as Required

SLRWD – 303: Casing Pipe (Jacked or Bored)

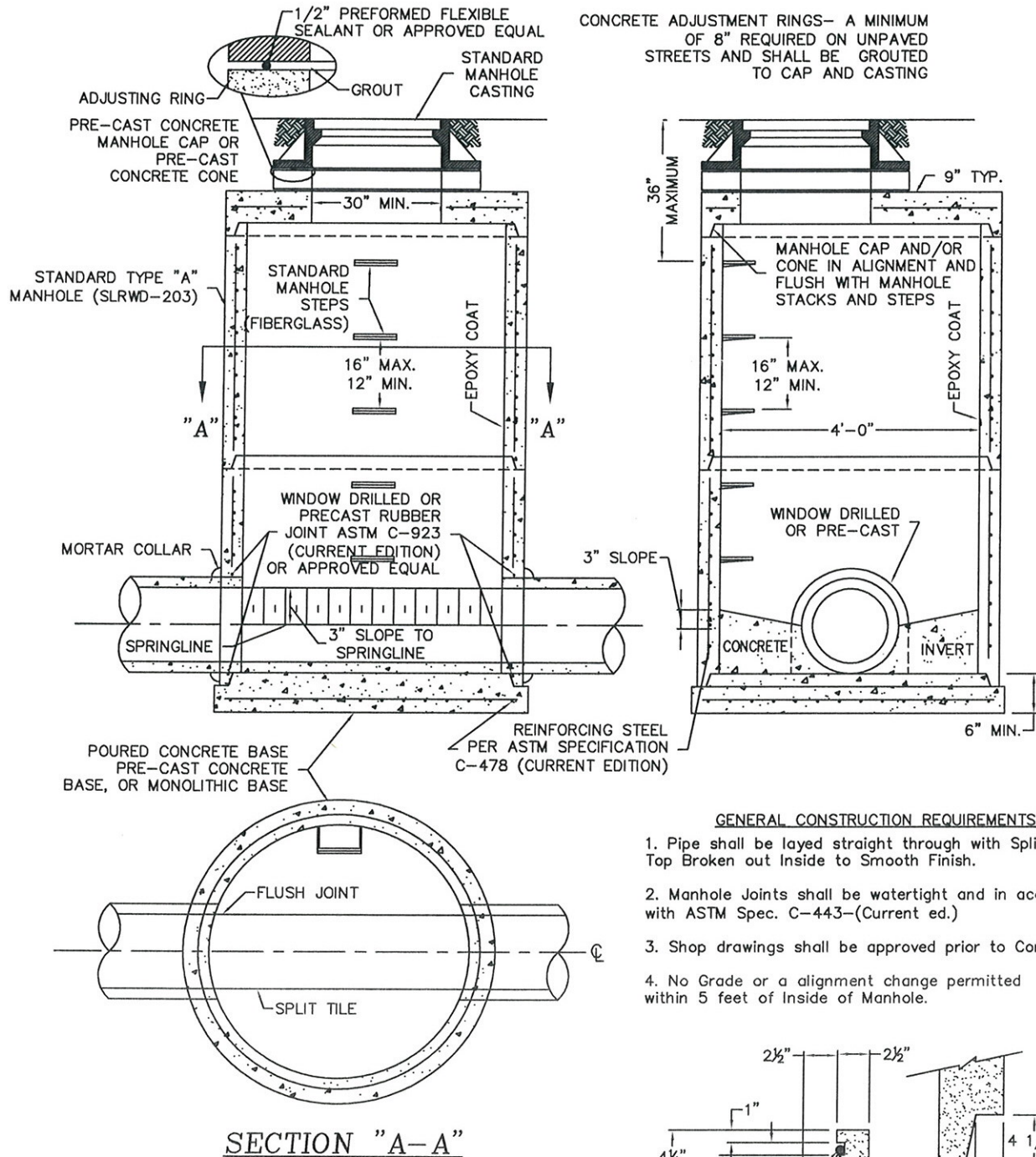
SLRWD – 304: Casing Spacers (Typical)

SLRWD – 305: Casing End Seals

SLRWD – 306: Sign Detail

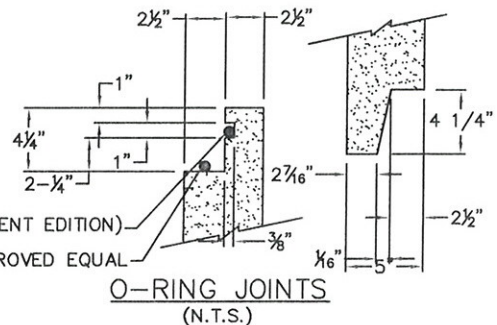
SLRWD – 307: Force Main/ Pressure Sewer Marker

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



GENERAL CONSTRUCTION REQUIREMENTS

1. Pipe shall be layed straight through with Split tile or Top Broken out Inside to Smooth Finish.
2. Manhole Joints shall be watertight and in accordance with ASTM Spec. C-443-(Current ed.)
3. Shop drawings shall be approved prior to Construction.
4. No Grade or a alignment change permitted within 5 feet of Inside of Manhole.



NOTE:

MANHOLE SECTIONS IN ACCORDANCE WITH A.S.T.M. C-478 (CURRENT EDITION)

REV. DATE:
4/13/17

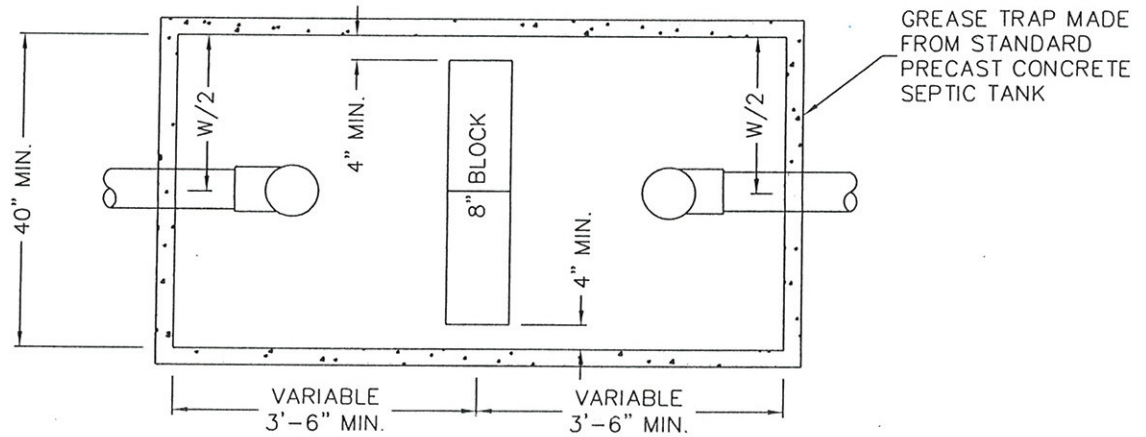
CONTROL & INSPECTION
TYPE "C" MANHOLE

"adopted date"
Dec. 4, 2008

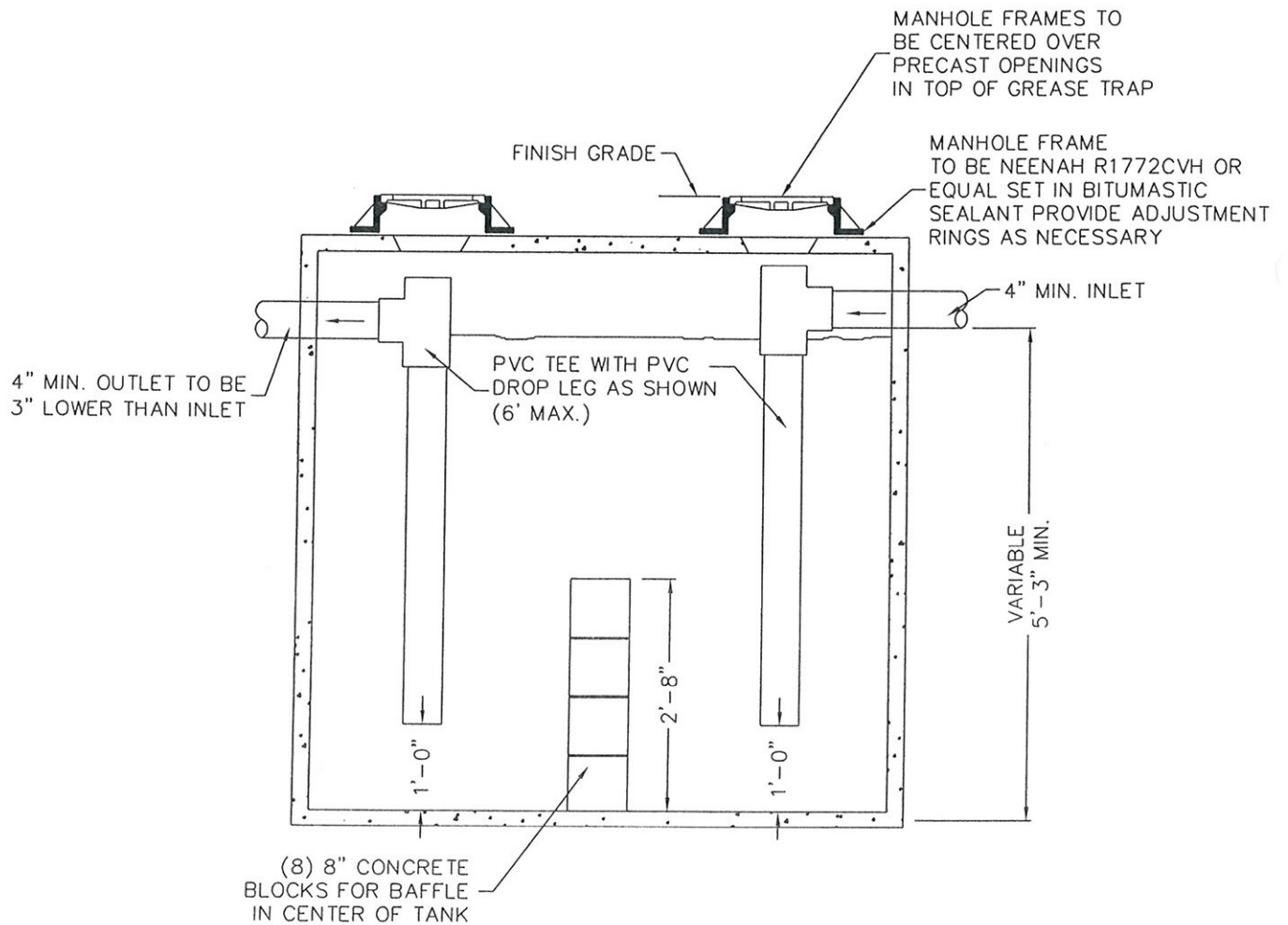
SLRWD-301

File:

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



GREASE TRAP MADE FROM STANDARD PRECAST CONCRETE SEPTIC TANK



REV. DATE:

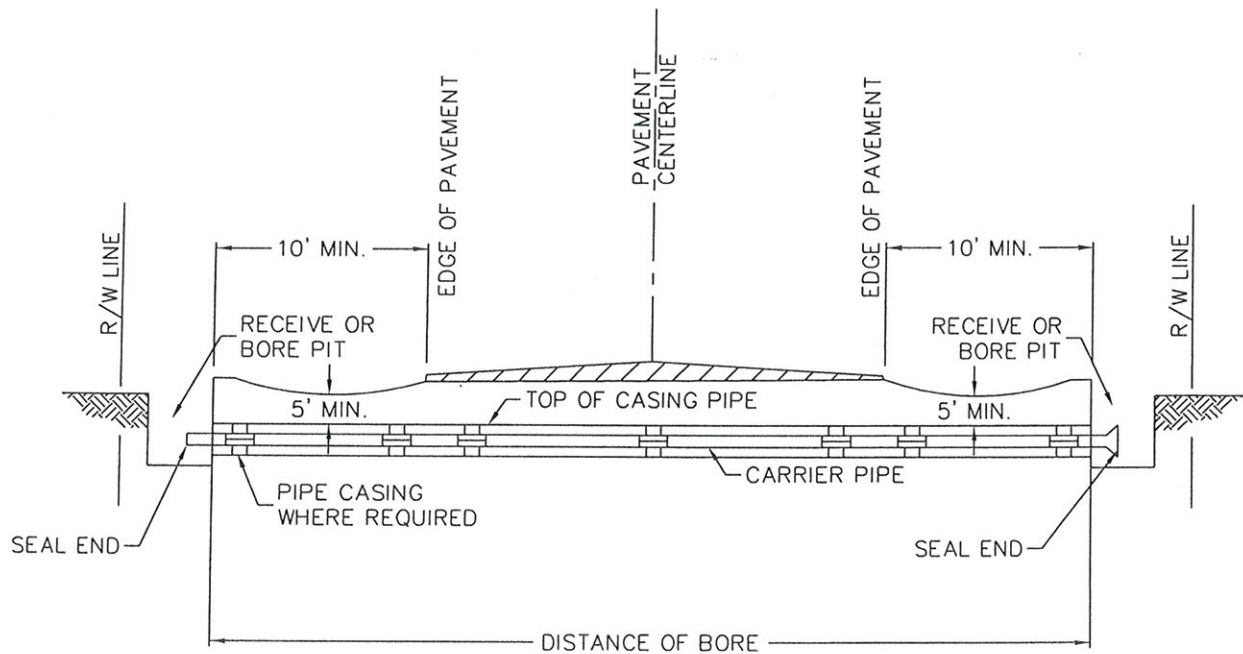
GREASE TRAP DETAIL (TYPICAL)
1,000 GAL MINIMUM OR AS REQUIRED

"adopted date"
Dec. 4, 2008

SLRWD-302

File:

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

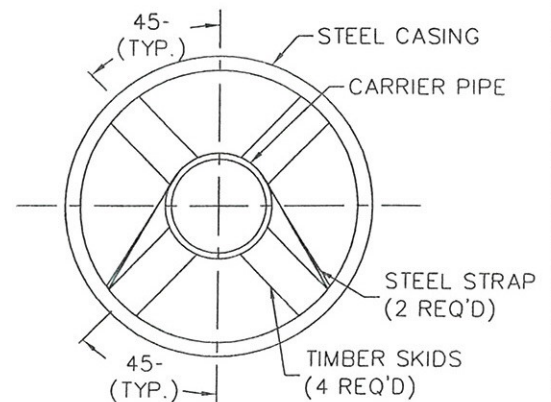
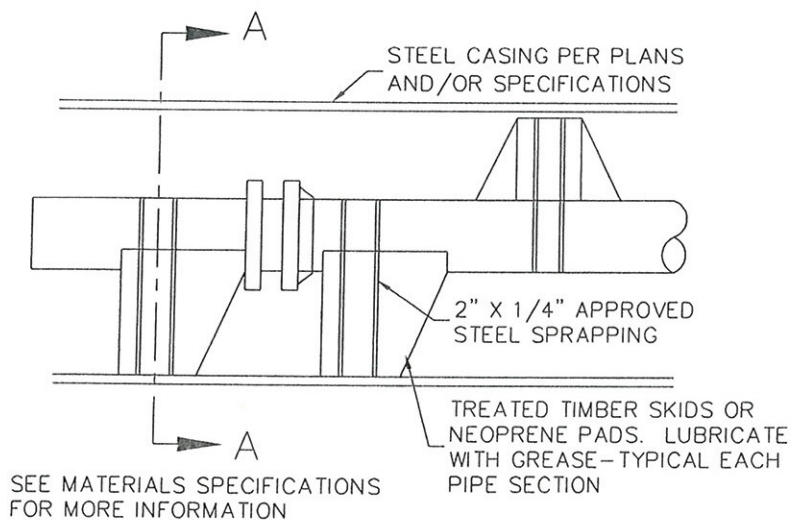
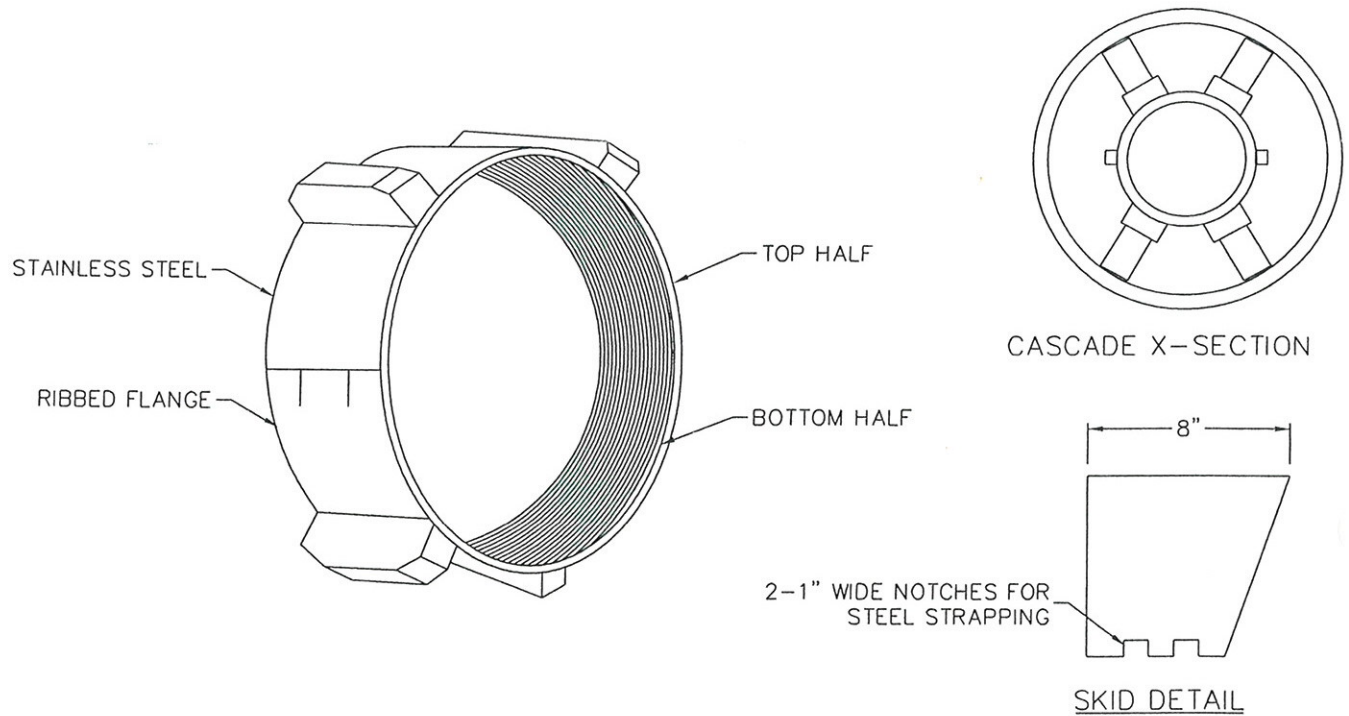
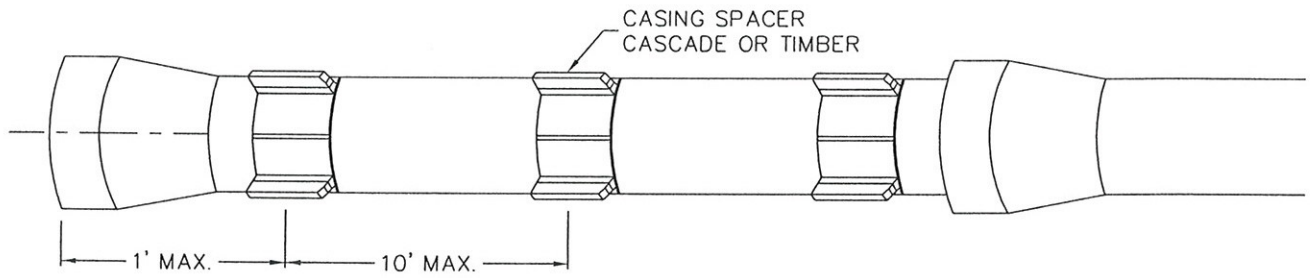


NOTE:

1. STEEL CASING SECTIONS SHALL BE CONNECTED BY WELDING. WELD SHALL CONFORM TO AWWA C206.
2. HDPE CASING PIPE SUBJECT TO HIGHWAY DEPARTMENT APPROVAL.
3. WHERE HDPE CARRIER PIPE O.D. IS LESS THAN 2" OF CASING I.D., NO SPACERS WILL BE REQUIRED.
4. FOR GRAVITY SEWERS, SLOPE OF CASING TO MATCH OR EXCEED CARRIER PIPE. MAKE ALLOWANCES TO ASSURE PROPER MINIMUM GRADE OF CARRIER PIPE MANHOLE TO MANHOLE.

REV. DATE:	CASING PIPE (JACKED OR BORED)		"adopted date" Dec. 4, 2008
-			
			SLRWD-303
File:			

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



SECTION A

REV. DATE:

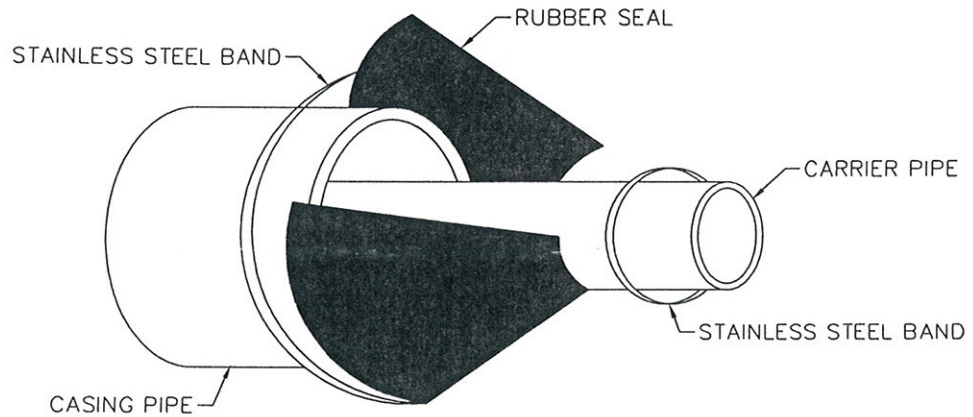
CASING SPACERS (TYPICAL)

"adopted date"
Dec. 4, 2008

SLRWD-304

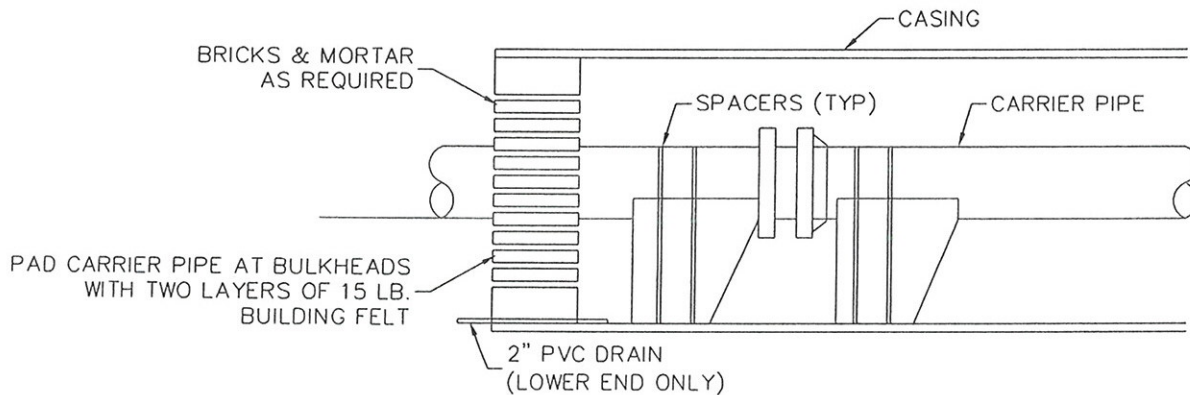
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STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



TYPE I

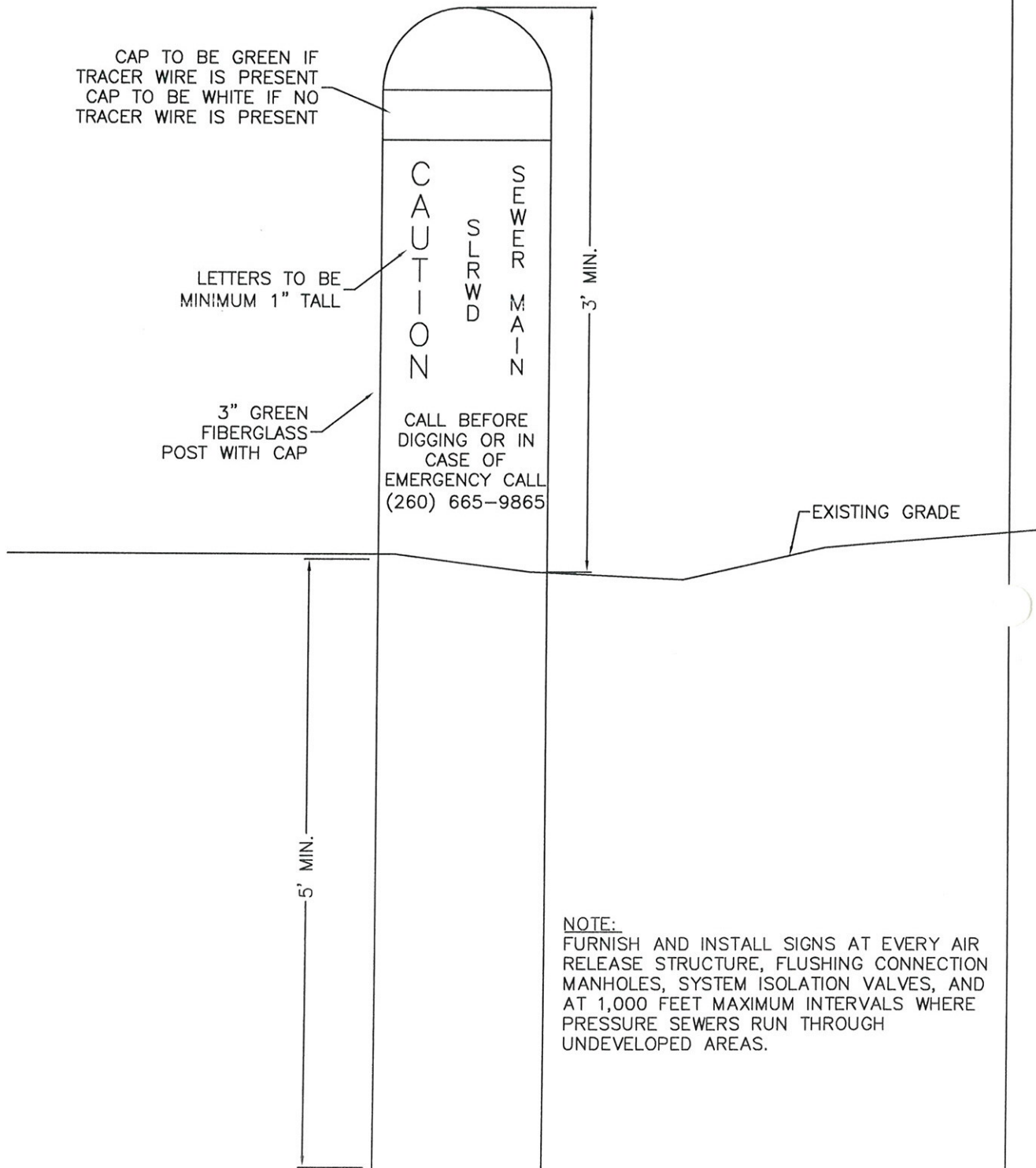
NOTE: THIS STANDARD APPLICABLE FOR
4" DIA. & LARGER PIPE



TYPE II

REV. DATE:	CASING END SEALS		"adopted date" Dec. 4, 2008
-			
			SLRWD-305
File:			

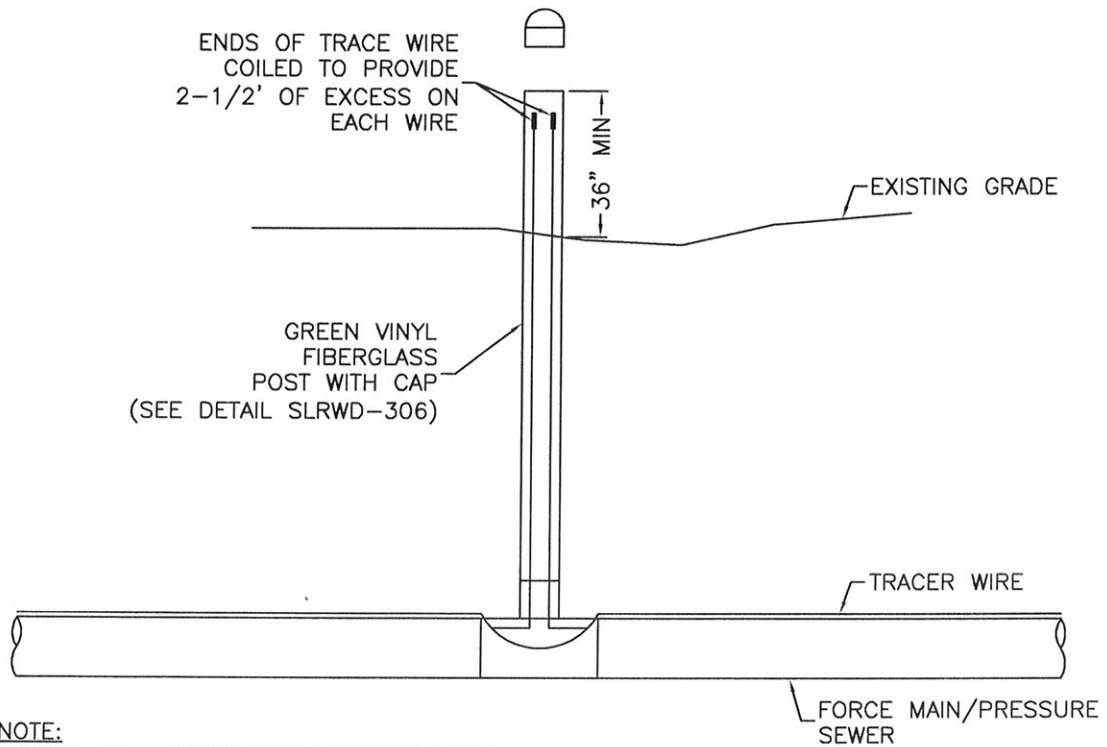
STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



NOTE:
FURNISH AND INSTALL SIGNS AT EVERY AIR RELEASE STRUCTURE, FLUSHING CONNECTION MANHOLES, SYSTEM ISOLATION VALVES, AND AT 1,000 FEET MAXIMUM INTERVALS WHERE PRESSURE SEWERS RUN THROUGH UNDEVELOPED AREAS.

REV. DATE:	SIGN DETAIL		"adopted date"
4/13/17			Dec. 4, 2008
File:			SLRWD-306

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

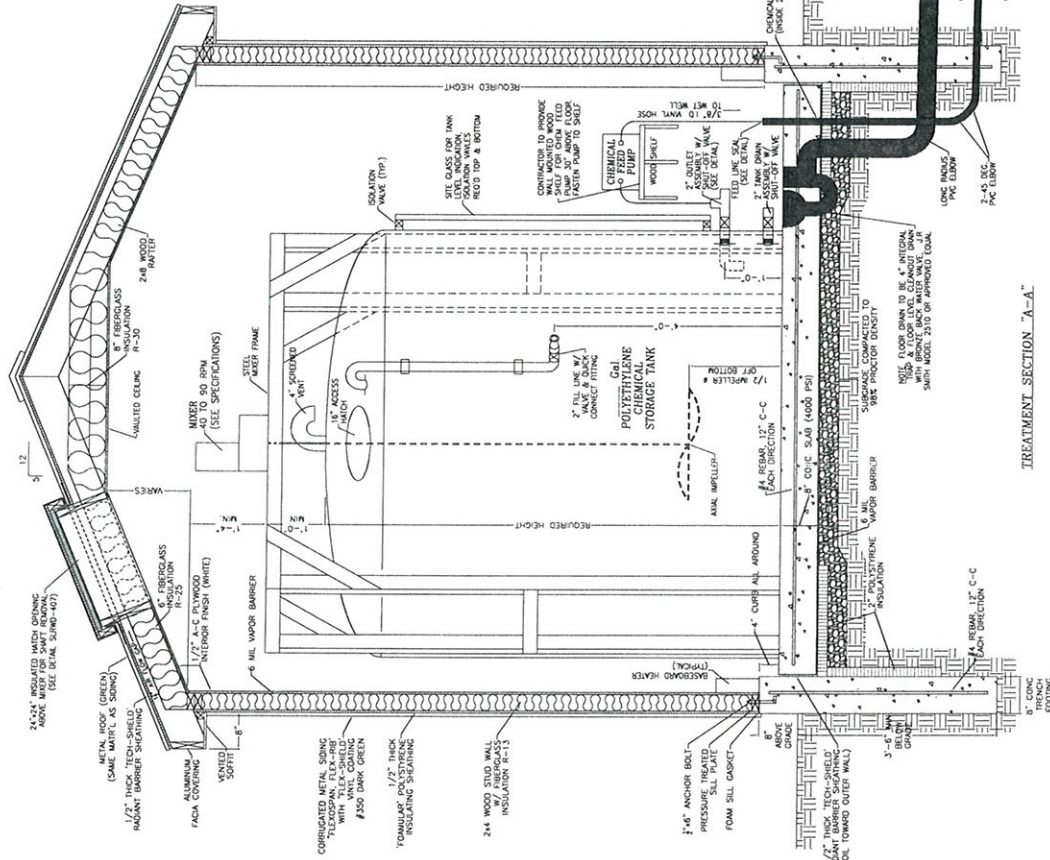


REV. DATE:	FORCE MAIN/PRESSURE SEWER MARKER	"adopted date" Dec. 4, 2008
4/13/17		
		SLRWD-307
File:		

SLRWD – 400 Series: Corrosion Control Facility Details

- SLRWD – 401: Corrosion Control Facilities Typical Building Section and Feed Line Hanger Detail
- SLRWD – 402: Corrosion Control Facilities Typical Building Plan Detail
- SLRWD – 403: Corrosion Control Facilities Entrance Elevation Detail
- SLRWD – 404: Corrosion Control Facilities Removable Wall Elevation Detail
- SLRWD – 405: Corrosion Control Facilities Removable Wall Section Detail
- SLRWD – 406: Corrosion Control Facilities Roof Framing Plan
- SLRWD – 407: Corrosion Control Facilities Roof & Truss Detail and Roof Hatch Opening Detail
- SLRWD – 408: Corrosion Control Facilities Example Electrical Schematic
- SLRWD – 409: Corrosion Control Facilities Electrical Plan
- SLRWD – 410: Corrosion Control Facilities Miscellaneous Details

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



NOTE: DESIGN ENGINEER TO PROVIDE SIZE OF TANK AND BUILDING DIMENSIONS WHERE REQUIRED.

REV. DATE:
4/13/17

CORROSION CONTROL FACILITIES TYPICAL BUILDING SECTION AND FEED LINE HANGER DETAIL

"adopted date"
Dec. 4, 2008

File

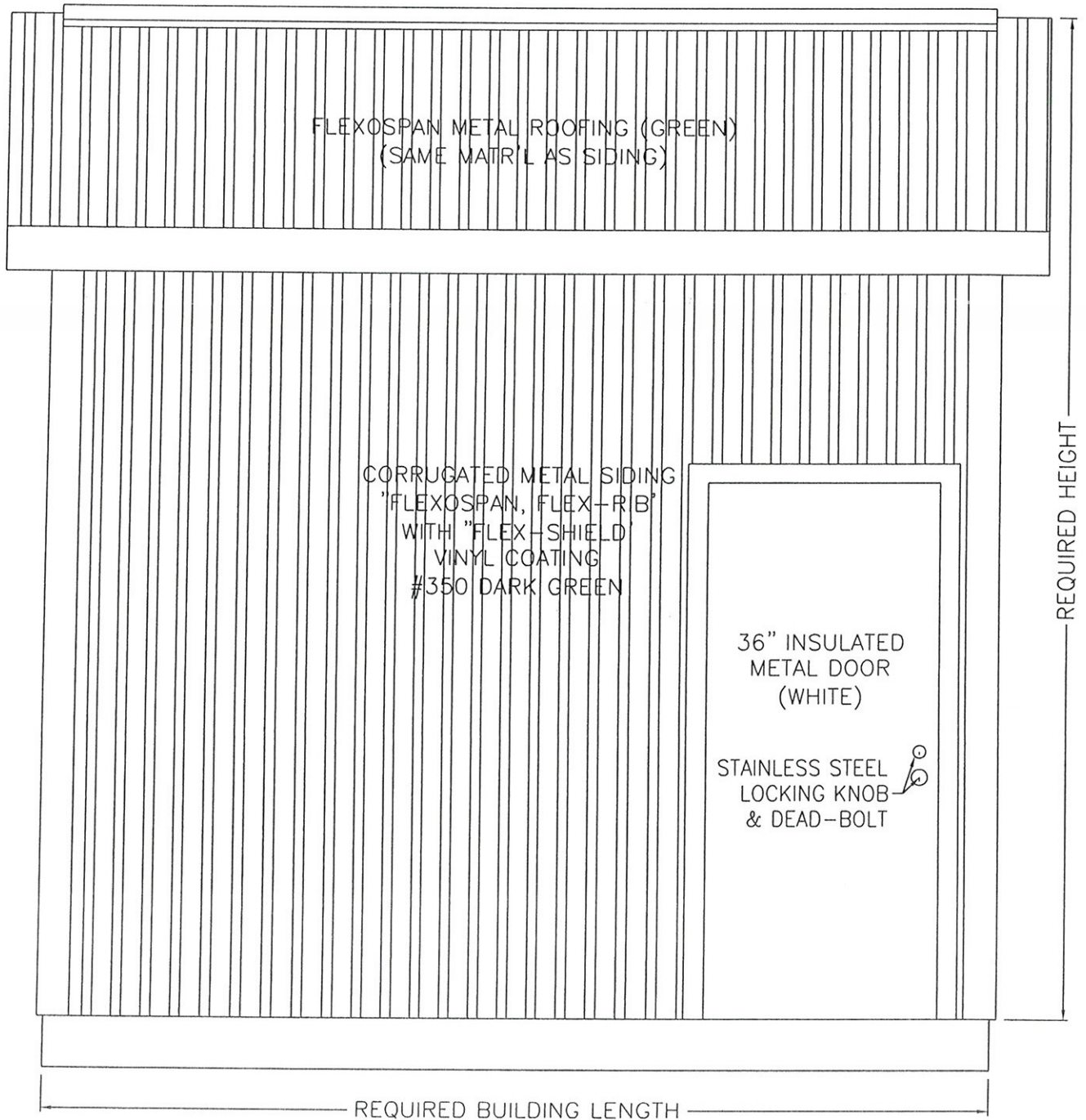
SLRWD-401

REV. DATE:	
-	

"adopted date"
Dec. 4, 2008

SLRWD-402

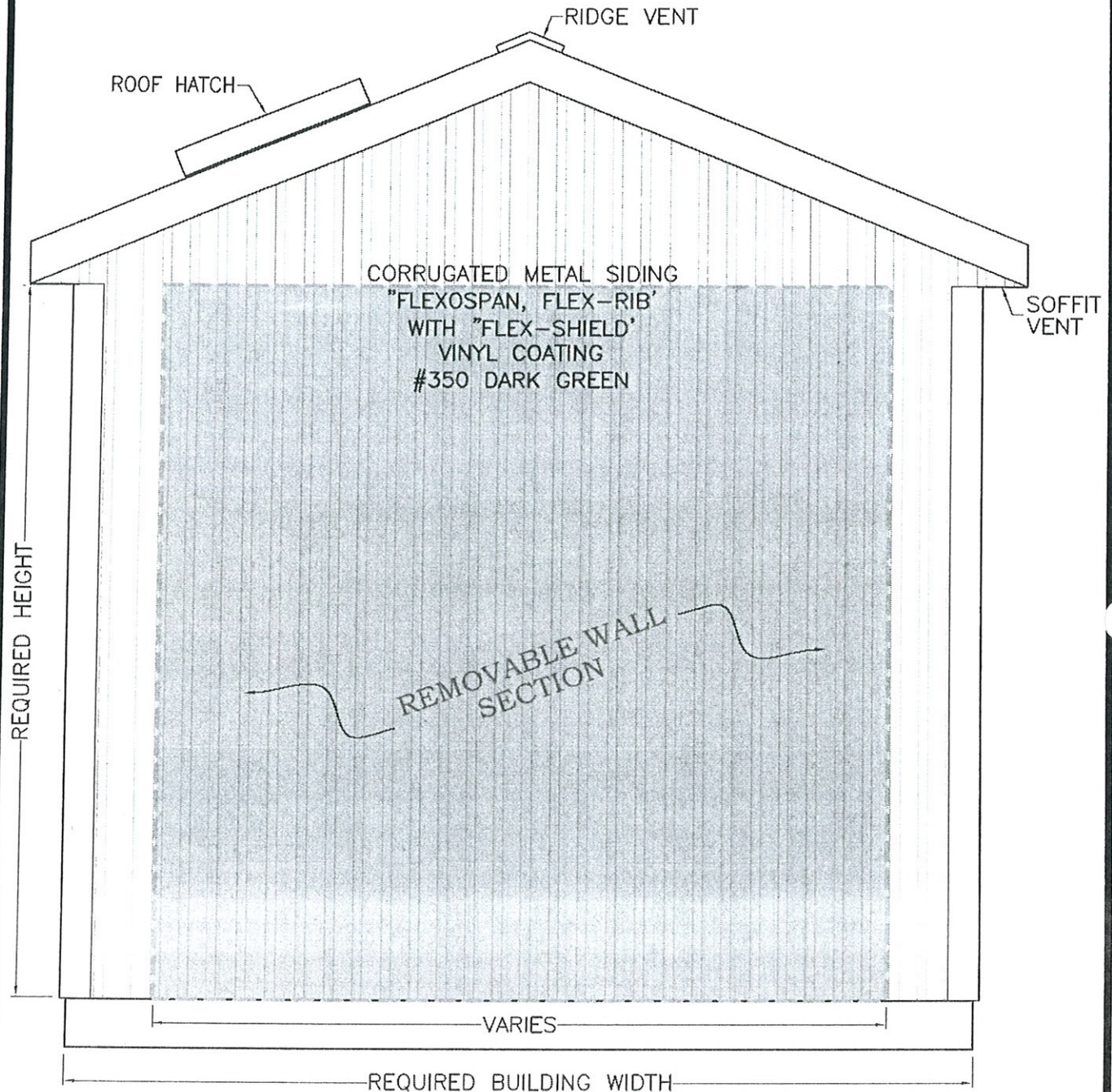
STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



NOTE: DESIGN ENGINEER TO PROVIDE SIZE OF TANK AND BUILDING DIMENSIONS WHERE REQUIRED.

REV. DATE:		CORROSION CONTROL FACILITIES ENTRANCE ELEVATION DETAIL	"adopted date" Dec. 4, 2008
-			
File:			SLRWD-403

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



NOTES:

1. Design Engineer to Provide Size of Tank and Building Dimensions Where Required.
2. Roof Hatch Shall be Centered Above the Mixer to Allow for Removal of Mixer and Assembly.
Roof Hatch Opening Shall be Clear of Obstructions.

REV. DATE:		CORROSION CONTROL FACILITIES REMOVABLE WALL ELEVATION DETAIL	"adopted date" Dec. 4, 2008
-			
			SLRWD-404
File: P:\ACTIVE-PROJECTS\080510_SLRWD-Gen\080510-4_Design-Manual\Dwg\SLRWD-404.dwg			

Technical drawing of a removable wall section, showing various components and dimensions:

- REMOVABLE WALL SECTION** (Central label)
- 4" WIDE FOAM SILL SEAL TO COVER GAP ALL AROUND REMOVABLE WALL SECTION** (Top and bottom seals)
- 4" WIDE FOAM SILL SEAL BETWEEN BOTTOM OF REMOVABLE WALL SECTION & CONCRETE FOUNDATION** (Bottom seal)
- 16" C-C (TYP)** (Center-to-center spacing of wall panels)
- REMOVABLE CONCRETE COMPRESSION ANCHOR W/ NUT & WASHER (TYPICAL) (LUBRICATE THREADS)** (Bottom anchors)
- 1/4"x3" FRAMING LAG BOLT (TYP., AS REQUIRED)** (Side anchors)
- CONCRETE FOUNDATION** (Base)
- ANCHOR BOLT W/ NUT & WASHER (TYPICAL) (LUBRICATE THREADS)** (Top anchors)
- 1" SPACE (TYP.)** (Top and bottom gaps)
- 1'-3"** (Side dimensions)
- VARIES** (Bottom dimension)
- REQUIRED BUILDING WIDTH** (Bottom dimension)
- REQUIRED HEIGHT** (Right side dimension)
- NON-REMOVABLE WALL FRAMING** (Right side)
- GABLE END TRUSS WITH HEADER** (Top right)
- 1" SHEATH (TYP.)** (Bottom right)
- 3" SHEATHING (TYP.)** (Bottom left)

1. FRAME BUILDING WITH REQUIRED OPENING AT GABLE END.
2. CONSTRUCT REQUIRED WIDTH BY THE REQUIRED HEIGHT FRAMED PANEL WITH PLYWOOD INTERIOR SKIN. FRAMING TO BE 16" C-C.
3. SCREW PLYWOOD TO FRAMING.
4. LAG SCREW REMOVABLE WALL SECTION INTO THE OPENING.
5. INSULATE REMOVABLE WALL SECTION.
6. INSTALL 4" WIDE "SILL SEAL" BETWEEN BOTTOM OF REMOVABLE WALL SECTION AND CONCRETE FOUNDATION.
7. STAPLE 4" WIDE "SILL SEAL" OVER TOP & SIDE GAPS ALL AROUND REMOVABLE WALL SECTION.
8. INSTALL EXTERIOR METAL SIDING OVER REMOVABLE WALL SECTION SIDE OF BUILDING USING REMOVABLE SCREWS AND OVERLAPPING JOINTS.

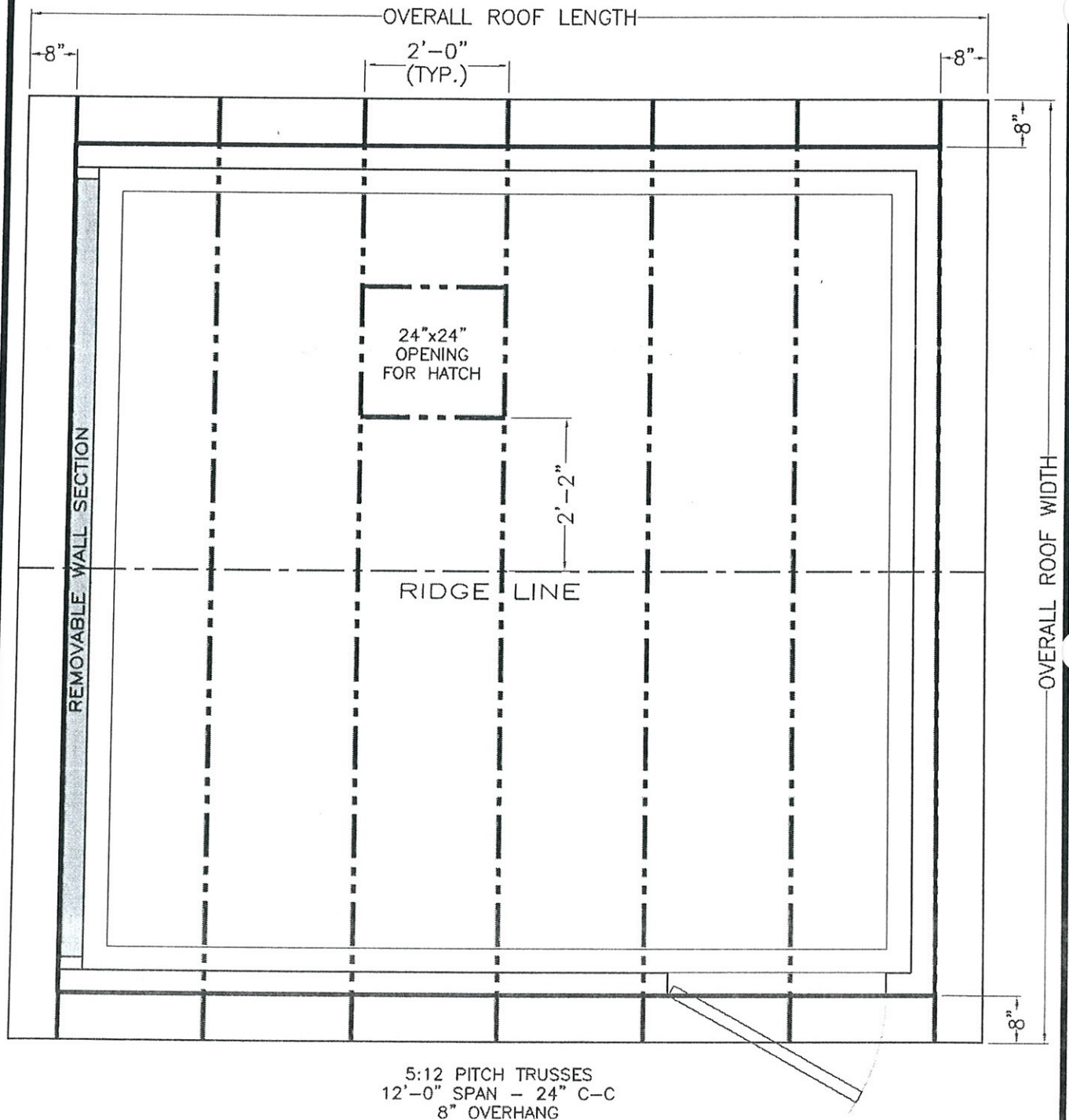
REV. DATE:

CORROSION CONTROL FACILITIES
REMOVABLE WALL SECTION DETAIL

"adopted date"
Dec. 4, 2008

SLRWD-405

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



NOTES:

1. Design Engineer to Provide Size of Tank and Building Dimensions Where Required.
2. Roof Hatch Shall be Centered Above the Mixer to Allow for Removal of Mixer and Assembly.
Roof Hatch Opening Shall be Clear of Obstructions.

REV. DATE:

CORROSION CONTROL FACILITIES
ROOF FRAMING PLAN

"adopted date"
Dec. 4, 2008

[illegible]

WRAP W/ ALUMINUM (GREEN)

MIN. 1" FOAM INSULATED BOARD
(GLUED TO COVER)

5/8" PLYWOOD

1/4"x3" LAG BOLTS
W/ WASHERS (TYP)
8--REQ'D

MATCH EXTENSION
(2x4 2400 GAL.)
(2x6 250 GAL.)

2x4
(TYP)

METAL ROOF (GREEN)
(SAME MATR'L AS SIDING)

FLASHING
(TYP)

2x12
(TYP)

ROOF JOIST
(2x6 2400 GAL.)
(2x6 250 GAL.)

ROOF HATCH OPENING DETAIL

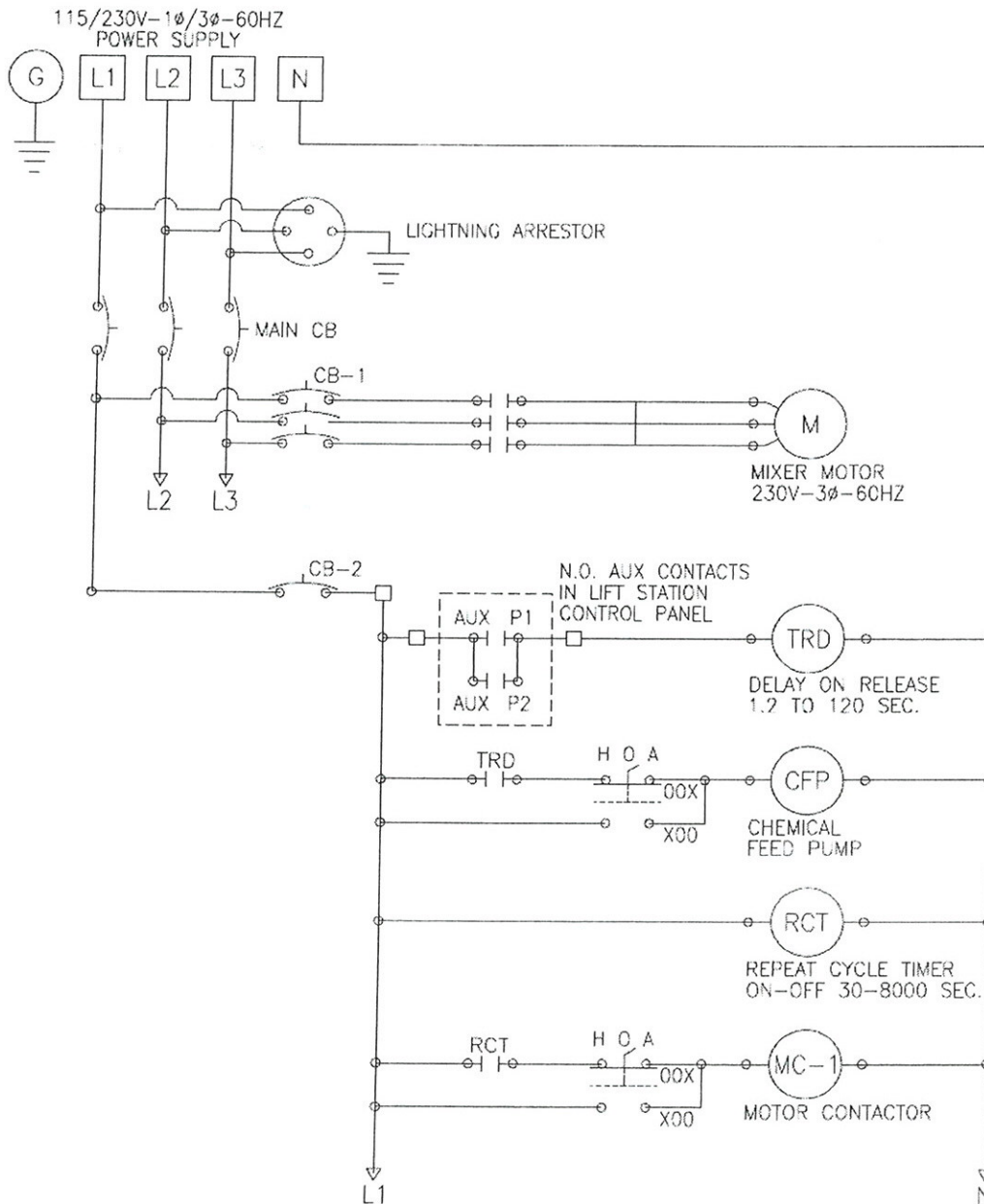
1. Design Engineer to Provide Size of Tank and Building Dimensions Where Required.
2. Roof Hatch Shall be Centered Above the Mixer to Allow for Removal of Mixer and Assembly. Roof Hatch Opening Shall be Clear of Obstructions.

REV. DATE:		CORROSION CONTROL FACILITIES ROOF & TRUSS DETAIL & ROOF HATCH OPENING DETAIL	"adopted date" Dec. 4, 2008
-			
File: P:\ACTIVE-PROJECTS\080510_SLRWD-Gen\080510-4_Design-Manual\Dwg\SLRWD-407.dwg			SLRWD-407

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

ELECTRICAL NOTE:

POWER SUPPLY FOR CHEMICAL FEED BUILDING IS TO
CONNECT TO PUMP STATION ELECTRICAL SERVICE.



REV. DATE:

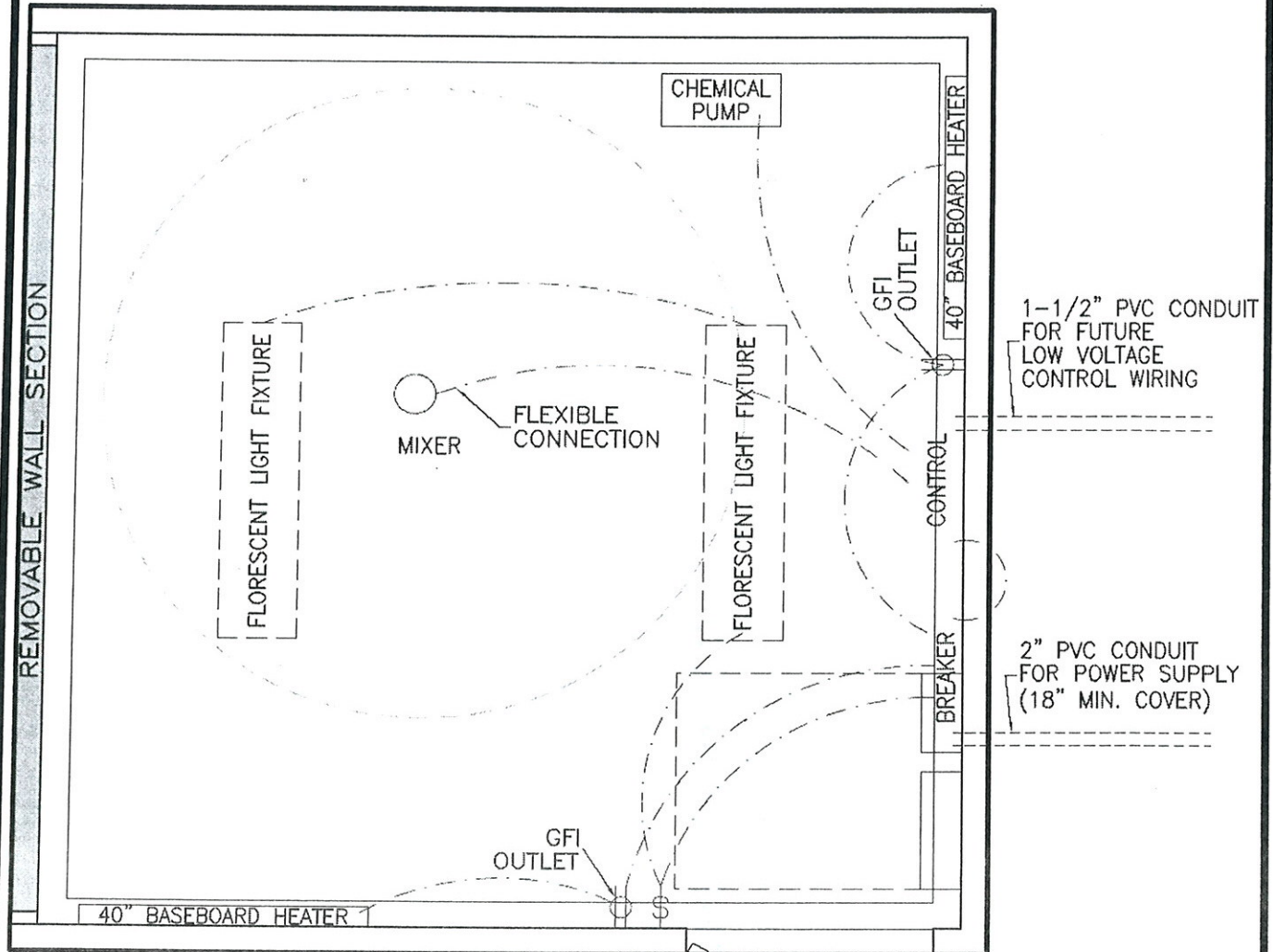
CORROSION CONTROL FACILITIES
EXAMPLE ELECTRICAL SCHEMATIC

"adopted date"
Dec. 4, 2008

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS

ELECTRICAL NOTE:

POWER SUPPLY FOR CHEMICAL FEED BUILDING IS TO
CONNECT TO PUMP STATION ELECTRICAL SERVICE.



NOTE: ALL WIRING TO BE IN CONDUIT
& ATTACHED TO CEILING OR WALL

REV. DATE:

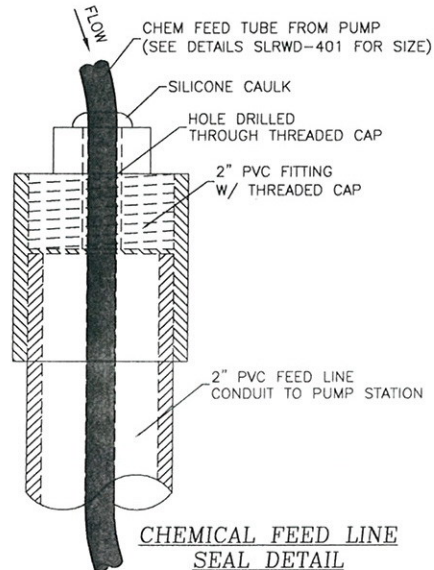
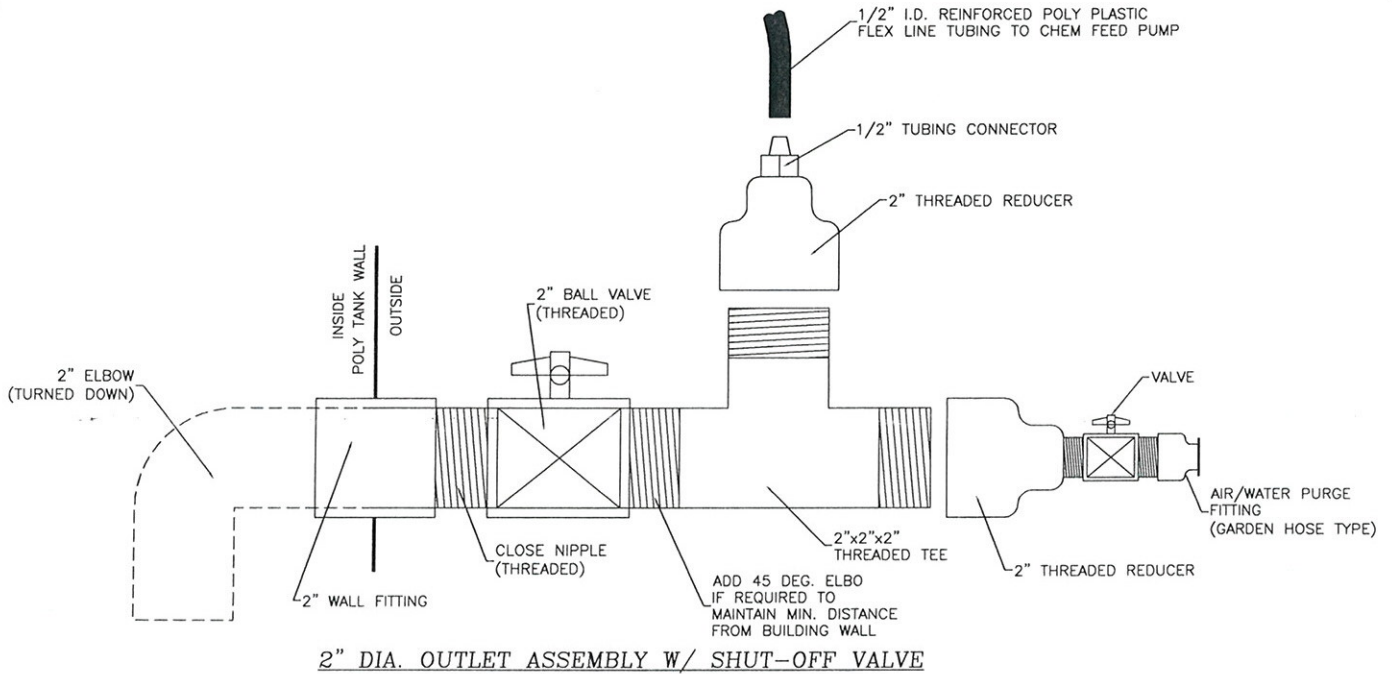
CORROSION CONTROL FACILITIES
ELECTRICAL PLAN

"adopted date"
Dec. 4, 2008

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SLRWD-409

STEUBEN LAKES REGIONAL WASTE DISTRICT STANDARD DETAILS



REV. DATE:	CORROSION CONTROL FACILITIES MISCELLANEOUS DETAILS	"adopted date" Dec. 4, 2008
4/13/17		
File:		SLRWD-410

SECTION V
SPECIFICATION STANDARDS

INDEX

- 5.0 General
- 5.1 Excavation and Backfill
- 5.2 Site Restoration
- 5.3 Pipe
- 5.4 Appurtenances
- 5.5 Installation
- 5.6 Sewer Tap Construction Requirements
- 5.7 Protective Coating
- 5.8 Simplex Grinder Pump Station
- 5.9 Duplex Grinder Pump Station
- 5.10 Submersible Pump Stations
- 5.11 Standby Electrical Power System
- 5.12 SCADA System
- 5.13 Corrosion Control Chemical Feed Building
- 5.14 Testing
- 5.15 Warranty

5.0 GENERAL

- 5.0.1 General: Contractor shall furnish all workmanship and materials for the construction and installation of the sanitary sewer extension project in accordance with the approved development plans and these specifications.
- 5.0.2 Water and Power for Construction Purposes: The Contractor shall furnish all water and power for construction purposes. Any expenses related to temporary water or power connections shall be paid by the Contractor. Connections shall be made in accordance to Local, State, and Federal Codes.
- 5.0.3 Changes caused by Equipment Purchased by the Contractor: The Contractor shall make any and all necessary changes in construction, electrical wiring and piping to install equipment items approved for installation.
- 5.0.4 Testing: All equipment, pipe and appurtenances shall be installed and tested for defects in the manner specified and as approved by the SLRWD. Contractor shall submit testing methods and procedures for approval prior to testing.
- 5.0.5 Material Furnished by the Contractor: The Contractor shall be responsible for all material furnished by him and shall replace at his own expense all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. Installed material discovered to be defective shall be removed and replaced with acceptable material at the Contractor's expense.
- The Contractor shall be responsible for the safe storage of material furnished by him or to him, and accepted by him, and intended for the work, until it has been incorporated in the completed project. The interior of all equipment, piping and accessories shall be kept free from dirt or foreign matter at all times.
- 5.0.6 Material Furnished by the SLRWD: The Contractor's responsibility for any material furnished by the SLRWD shall begin at the point of pick up by the Contractor.
- The Contractor shall examine all material furnished by the SLRWD at the time and place of pick up and shall reject all defective material. Material furnished by the SLRWD that becomes damaged after acceptance by the Contractor shall be replaced by the Contractor and at the Contractor's expense.
- 5.0.7 Disposition of Defective Material: All material found during the progress of the work to have cracks, flaws or other defects will be rejected by the SLRWD's authorized inspector. The Contractor shall promptly remove all defective materials from the site of the work.
- 5.0.8 Disposal of Waste and Water: During and after the progress of the work, the Contractor shall dispose of all soil, water and debris in a manner to meet Federal, State, and Local Codes.
- 5.0.9 Permits: All permits for construction shall be secured and paid for by the Owner/Developer.
- 5.0.10 Construction: It is the expressed intent of these specifications, that the project be complete with minimum interference to the operation of the existing sewage system.
- 5.0.11 Watermain Crossing: Where sanitary sewer and water main cross, one full 20 foot length of water main should be centered over the sanitary sewer, and the vertical distance to be a minimum of 18 inches. Where water lines and sewers cross and the minimum clearance cannot be maintained, the sewer must be constructed of water main grade ductile iron pipe with mechanical joints or ASTM D2241-96b, Standard Specifications for Polyvinylchloride (PVC) Pressure Rated Pipe and having a SDR ratio of 21 with compression joints within ten feet of the water line.
- 5.0.12 Field Inspection: Notify the SLRWD at least forty-eight (48) hours prior to start of construction. Notification shall be made to an individual in SLRWD's main office during normal business hours. The contractor shall also review the materials list with the SLRWD Superintendent or his authorized representative prior to beginning work. Copies of the contractor's construction documents shall be made available to the SLRWD Superintendent or his authorized representative.
- Contractor shall notify an individual in SLRWD's main office during normal business hours at least twenty-four(24) hours prior to delivery of material on-site. Contractor shall provide a list of material to be delivered and where material is to be installed.

The SLRWD shall inspect materials delivered to the construction site within twenty-four (24) hours of delivery. No material shall be installed until the SLRWD has approved the material and approved its use.

Pipe and appurtenances and bedding installed by open cut method shall be inspected by SLRWD prior to backfilling of the trench.

- 5.0.13 Inspection Fees: The Owner/Developer will be responsible to compensate SLRWD for inspection provided by SLRWD. Additional compensation will be required for any inspection considered "overtime". "Overtime" includes but is not limited to, working before or after SLRWD's normal operation hours, holidays, or weekends.

- 5.0.14 Notification to Utilities by Contractor Prior to Construction: Contractor shall give 48 hour notice to all utility companies whose utilities may be affected by the work.

- 5.0.15 Shop Drawings: Provide the SLRWD with six (6) copies of the shop drawings for all components of the proposed system prior to construction, as set out in these specifications. Shop drawings shall be approved by the Design Engineer prior to submitting to the SLRWD.

The contents of the shop drawings shall be submitted in an organized fashion and shall include a statement explaining the use for the material(s).

Should the contractor fail to provide shop drawings prior to construction, the system will not be accepted by the SLRWD and no sewage from the system will be accepted.

- 5.0.16 Equipment Manuals: The Contractor shall furnish three (3) sets of equipment manufacturer's operation and maintenance materials and manuals for the use in preparation of the Operation and Maintenance Manual. The O & M Manual must include the manufacturer's manuals and sources of service and parts in compliance with Environmental Protection Agency requirements.

The material furnished under this sub-section shall not necessarily be considered a part of the Shop Drawing requirements.

A printed operation and maintenance manual shall be provided for every mechanical and electrical equipment item and shall be legible and bound in a soft cover. The manuals shall be furnished to the Engineer prior to the time at which construction is 50% complete.

- 5.0.17 Manufacturer's Service Representative:

The Contractor shall provide the services of qualified and technically trained representative(s) of the manufacturer(s) of the principal items of equipment, as necessary to supervise the installation of the equipment, supervise the start-up, and instruct the SLRWD operation personnel in the operation and maintenance of the equipment. These services shall be provided as part of the work under the applicable contract items and no extra payment will be made by the Owner for any such services in connection with the installation, start-up, operation, and maintenance instructions relating to the equipment.

- 5.0.18 Adjustment and Operation of Systems:

Prior to time of final inspection, the Contractor shall carefully adjust and place in operation all parts of the equipment, systems and electrical facilities, installed by him when any work included in this contract is completed. The Contractor shall also assist in the adjustment of equipment and systems furnished by the Owner and installed by the Contractor. All automatic controls and safety devices shall be adjusted, all air and water flow shall be balanced and adjusted, all valves shall be properly set. The Contractor shall perform all other necessary operations to make the equipment, systems and electrical facilities fully operable. Where required, all equipment shall be oiled and greased and all oilers and grease cups shall be left filled.

Upon completion of this work, the Contractor shall notify the Engineer that all equipment, systems and electrical facilities are ready for final tests and inspection and shall cooperate with the Owner's representative in charge in conducting the tests and inspection.

At the time of final inspection, the Contractor shall be represented by a person of authority. Major subcontractors also shall be represented. Each shall demonstrate that his work fully complies with the

purpose and intent of the plans and specifications. All labor, all services, and all instruments or tools necessary for such demonstration and tests shall be provided by the Contractor.

5.0.19 Traffic Control: Traffic Control shall be in accordance with the Indiana State Department of Transportation Specifications (latest edition), Section 800 and OSHA, or State of Michigan regulations.

a. Full Lane Closures

- i. No full lane closures will be allowed on State Roads.
- ii. The Contractor may close County Roads or roads in towns for minimum periods of time with proper notice to the town or County Highway Department as applicable, local occupants of all premises, police and fire protection authorities, and other public authorities as applicable. The Contractor shall schedule this work so that this time is at a minimum and shall, whenever possible, make suitable provisions for access by local residents, businesses, school buses, police and fire emergency vehicles and mail delivery vehicles. The Contractor shall keep fire hydrants and other public utility valves accessible at all times.
- iii. The Contractor shall submit traffic control plans to the town or the County Highway Department if required.
- iv. The Contractor shall furnish, erect, and maintain barricades, suitable and sufficient red lights and other lights or reflecting material as may be required for the protection of any local traffic permitted on the roadway.
- v. The Contractor shall furnish, erect, and maintain advanced warning signs to direct traffic away from closed sections and detour marking signs on temporary routes, except where same may be furnished by the State or County Highway Departments.
- vi. All road crossings where the Contractor is permitted to open cut the trench, the crossing shall be completed, cleaned up, temporary pavement in place, and open to traffic within twenty-four (24) hours from the time the road is closed to through traffic, unless specific approval is received from the authority having jurisdiction, for a longer period.

b. Single Lane Closures

- i. No single lane closures will be allowed on State Roads.
- ii. The Contractor may close a single lane on County Roads or roads in towns. The Contractor shall submit traffic control plans to the towns or the County Highway Department if required.
- iii. The Contractor shall furnish, erect, and maintain lights, signs, barricades, temporary guardrails and other traffic control devices, watchmen and flagmen as may be necessary to maintain safe traffic conditions.
- iv. Whenever it is necessary to divert traffic from its normal channel into another channel, such diversion shall be clearly marked by cones, drums, barricades or temporary guardrail. If markers are left in place at night, pot flares or other suitable lights shall be maintained.

5.1 EXCAVATIONS AND BACKFILL

5.1.1 Excavation:

- a. All earth excavation for gravity sewers shall be open cut from the surface, except where otherwise shown on the drawings. Excavation shall be interpreted to mean: clearing the site; pavement removal where required; excavation of the material encountered to the proposed grade of the pipe bedding; furnishing and placing all sheeting, trenching, trimming and bracing; supporting of structures above and below ground; removal and disposal of water; repairing damage to structures, conduits, and utilities encountered; backfilling, tamping or jetting; temporary surfacing of roadways; disposal of surplus materials; providing barricades and lighting; and restoration of the site. During the progress of excavation, care shall be exercised to reserve sufficient material for backfilling above the embedment material.
- b. Where the directional boring method of construction is to be used, all bore pits, connection pits and service line connection pits shall be excavated and backfilled in the same manner as open cut excavation.
- c. The Contractor shall remove, salvage, and keep separate all topsoil, and carefully replace topsoil after backfilling is complete.

5.1.2 Excavation to Grade:

- a. In areas of existing utilities and drains the Contractor shall proceed with caution in the open-cut excavation and preparation of the trench so that the exact location of underground structures and utilities, both known and unknown, may be determined, and Contractor shall be held responsible for the repair of such when broken or otherwise damaged. The trench shall be excavated to a point four inches (4") below the bottom of the pipe and backfilled with compacted sand, #53 or #73 aggregate or #12 gravel (pea gravel) so as to provide a uniform and continuous bearing on the lower 90 degrees of the pipe between bell holes.
- b. Any part of the bottom of the trench excavation below the specified grade shall be backfilled and compacted to design grade with compacted sand or #53 or #73 aggregate or #12 gravel (pea gravel) material. Bell holes shall be provided at each joint to permit joints to be made properly.
- c. Open trenches shall be properly protected and guarded by the Contractor in such a manner as to prevent accidents, casualties, or damage of any nature whatsoever to persons, vehicles and abutting property. Open trenches left overnight or periods of time longer than 6 hours shall be protected by properly supported "Safety Fence".
- d. The trench shall be excavated so that the pipe can be laid to the alignment and grade required. The trench shall be so braced and drained that the workmen may work therein safely and efficiently. Discharge from any trench dewatering pumps shall not be into a new or existing sanitary sewer system. Discharge from trench dewatering pumps shall be in a manner to meet Federal, State, or Local Codes.
- e. When installing pressure sewers by directional boring, all bore pits and pits for connecting pipe shall be treated in the same manner as open trench excavation.
- f. The Contractor shall thoroughly familiarize himself with OSHA rules and regulations relating to the Construction Industry, with specific attention being given to the section devoted to open trench construction.

5.1.3 Exploratory Excavation:

- a. The Contractor will be required to excavate and locate existing underground improvements in advance of proceeding with both open-cut excavation and directional boring for the conduit or, in the case of open-cut, carry the excavation sufficiently in advance of pipe laying operations that changes in line and grade may be accommodated in order to avoid such existing underground improvements.
- b. Various underground conduits and other structures may be shown on the drawings, as taken from the records of the respective utilities, but other structures and field tile not shown on the drawings

may be encountered. The Contractor shall be held responsible for the repair of all improvements broken or otherwise damaged, including reconnection of field tile.

- c. On the basis of the information obtained from the exploratory excavation, the Owner's Engineer may order certain changes in line or grade of the conduit. In any case, changes in the new conduit, or in existing improvements, shall be made only with the concurrence from the SLRWD.
- d. The Contractor may be responsible for costs associated with changes to new construction or existing improvements if he has not performed sufficient exploratory excavation in advance.

5.1.4 Pipe Clearance in Rock:

- a. Ledge rock, boulders and large stones shall be removed to provide a clearance of at least six inches (6") below and on each side of all pipe and appurtenances.
- b. The specified minimum clearances are the minimum clearance distances which will be permitted between any part of the pipe and appurtenances being laid, and any part, projection or point of such rock, boulder or stone.

5.1.5 Unstable Soil:

- a. In areas where unstable soil is encountered below the bottom of the pipe, the Contractor shall stabilize the soil. If stabilization is accomplished by removing the unstable soil, removal shall be to a maximum of 1-foot unless otherwise approved by the SLRWD's authorized representative or Design Engineer.
- b. Where unstable soil has been removed, the excavation shall be backfilled with #2 crushed aggregate to the bottom of the pipe bedding or structure.

5.1.6 Pipe Bedding: All pipe used in the construction of the new sanitary sewer conduits shall be bedded in accordance with SLRWD Standard SLRWD-102 or 202 for rigid pipe and SLRWD Standard SLRWD-101 or 201 for flexible pipe. Provide ample clearance for making the joints without disturbing the uniform bearing for the pipe. In addition, all conduits shall have embedment material compacted to a minimum of 12-inches above the conduit prior to placing of backfill materials.

5.1.7 Sheeting, Bracing and Shoring: Sheeting, bracing and shoring shall be provided where required to properly protect the construction work, adjacent property, work or workmen. If the Owner's Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports, but neither the placing of such additional supports by the order of the Owner's Engineer nor the failure of the Owner's Engineer to order such additional supports placed, shall release the Contractor from his responsibility for the sufficiency of such supports for protection of the work and adjacent property work or workmen until the excavation has been backfilled and compacted.

5.1.8 Sheeting Left in Place: Sheeting, bracing and shoring shall not be left in place after completion of the work except as required by written order of the Owner's Engineer. Where required to protect the work, adjacent structures or property, sheeting, bracing and shoring shall be left in place, but shall be cut off and left not less than two feet (2') below the established finished grade.

5.1.9 Removal of Water: The Contractor shall provide and maintain during construction, adequate equipment to properly remove and dispose of all water entering the trench or other part of the work where conduits are being placed. In water bearing strata, well points or underdrain material may be required to affect a dry trench or pit. No pipe shall be laid in water or when, in the opinion of the Owner's Engineer or the SLRWD's authorized inspector, trench conditions are unsuitable.

5.1.10 Disposal of Excavated Materials: All suitable excavated material shall be used in backfilling over and around the pipe and appurtenances or distributed otherwise by the Contractor. All excavated material in excess of the quantity required for backfilling and subsequent settlement shall be disposed of in a timely and appropriate manner. The Contractor shall be responsible for securing disposal site(s), grading, seeding and erosion control, etc.

5.1.11 Backfilling:

- a. All open-cut trenches and excavations shall be backfilled from the top of the embedment material to at least the original surface of the ground or pavement subgrade with allowances made for subsequent settlement. Backfill material shall be deposited in the trench for its full width simultaneously.
- b. For non-pavement areas the backfill shall be placed in 8-inch loose layers and each layer shall be lightly compacted, to the original grade level. For pavement areas, the backfill shall be placed in 8-inch loose/6-inch compacted layers and compacted as per specifications. In placing the backfill, the Contractor shall exercise care so as to avoid moving or damaging the new pipe, appurtenances or existing utilities.
- c. Backfilling shall not be completed in freezing weather except by permission of the SLRWD's authorized inspector. No backfilling shall be made with frozen material, nor shall backfilling be made when the material in the trench is already frozen.
- d. The Contractor shall remove, salvage, and keep separate all topsoil, and carefully replace topsoil after backfilling is complete.

5.1.12 Embedment Material: All embedment material for conduit shall be as recommended by the pipe manufacturer. As a minimum, this material shall be INDOT Class II or III, sand, #53 or #73 aggregate. Embedment material shall be placed and compacted to the spring line of the pipe, with subsequent placement and compaction to a minimum of 12-inches above the pipe.

5.1.13 Backfill Material:

- a. Backfill material for non-pavement areas shall be the material removed from the trench, if suitable, except in State Highway Rights of Way. Backfill material for pavement areas or under drives shall be granular. Reuse of material removed from the trench for pavement areas shall be permitted only with prior approval. Backfill material for flexible pipe shall be Class I, II, or III as described in ASTM D2321. All material shall be placed in 8-inch loose layers and lightly compacted as set forth in Section 5.1.11 and compacted where required in accordance with Section 5.1.14. Backfill materials shall not contain rocks, stones or other objects greater than 6 inch in diameter.
- b. Excavated material reserved for backfill material shall be placed in a manner that will not disturb the pipe. The reserved excavated material shall not consist of debris, organic material, frozen material, unstable materials, or boulders or stones unable to pass through an opening of two inches (2") that are placed within two feet (2') of the pipe as measured radially from the outside edge of the pipe.

5.1.14 Compaction:

- a. 95% compaction will be required of all embedment material or in accordance with the manufacturer's written recommendations. The Contractor shall maintain on the job site with each crew, a copy of the manufacturer's recommendations with respect to pipe embedment material and compaction. With respect to Special Backfill material or Special Compaction above the embedment material, the Contractor shall place such material in 8-inch lifts and utilize a mechanical compactor to compact each lift to 95% of its maximum density at optimum moisture content in accordance with ASTM D-1557.
- b. The Contractor will be permitted to submit, to the SLRWD, in writing an alternate detailed plan for achieving adequate compaction prior to commencing construction.
- c. When compaction testing is required, the contractor shall provide an outside consulting firm to provide the testing. Testing shall be in accordance with INDOT specifications for testing. The consulting firm providing the testing shall provide a copy of the results to the SLRWD for verification of the compaction.

5.1.15 Construction in Highway Rights of Way: All construction within the road rights of way is to be carried out in complete accordance with the requirements of the respective City, Town, County or State highway authority.

- 5.1.16 Special Construction: It is anticipated that special construction procedures may be required or acceptable at certain locations when shown on the drawings or otherwise approved. Where required or approved, special construction procedures shall consist of jacking, boring, or tunneling a casing pipe for installation of the carrier pipe, pipe bursting or directional boring of either casing pipe or the carrier pipe. When required casing pipe lengths, sizes, thickness and location will be shown on the drawings.
- 5.1.17 Directional Boring: When the directional bore method of construction is required, specified or allowed for the installation of HDPE pipe or other, the directional bore shall be made using equipment of adequate size and capacity and as approved by the pipe manufacturer. All excavation for boring or connecting pits shall be backfilled in accordance with the specifications for open cut.
- 5.1.18 Site Clearing:
- a. Prior to performing open cut from the surface, the area shall be cleared of trees, timber, stumps, brush, fences, rubbish, and other obstructions, except such items as may be indicated or directed to remain. Trees to remain shall be protected by creating some type of barrier, fencing them off, or wrapping individual trees with snow fencing and prune low-hanging limbs that could otherwise be broken off by equipment. Only those trees, brush, fences, lawns, sidewalks, pavement, and driveways that fall within the earth excavation shall be removed.
 - b. Clearing of trees shall be performed in a manner as to protect trees to remain, existing structures, proposed structures, and employees and others.
 - c. The Contractor shall remove, salvage, and keep separate all topsoil, and carefully replace topsoil after backfilling is complete.
- 5.1.19 Disposal: The Contractor shall dispose of all trees, timber, stumps, brush, fences, rubbish, and other obstructions resulting from clearing and grubbing. All items disposed shall be in accordance with State, Local, and Federal rules and regulations. All liability resulting in the disposal of items due to clearing and grubbing shall become the responsibility of the Contractor.
- 5.1.20 Grubbing: Grubbing shall consist of the removal and disposal of stumps, roots larger than 1/2 inches in diameter, and matted roots. This material, together with logs and other organic and metallic debris not suitable for foundation or subgrade purposes, shall be excavated and removed to a depth of not less than 18 inches in depth below the original ground level in embankment areas and not less than 2 feet below the finished ground level in excavated areas. Depressions made by grubbing shall be filled with suitable material and compacted as set forth in these specifications.
- 5.1.21 Protection of Trees & Shrubs:
- a. The Contractor shall NOT damage or destroy any existing trees or shrubs located in street Rights-of-Way and easements. Trees to remain shall be protected by creating some type of barrier, fencing them off, or wrapping individual trees with snow fencing and prune low-hanging limbs that could otherwise be broken off by equipment.
 - b. Where limbs or branches of trees or shrubs conflict with construction operations, the Contractor shall protect trees by tying limbs or branches back whenever possible. Limbs and branches may be pruned when tying limbs or branches cannot be accomplished. The trees shall be pruned according to Natural Target Pruning standards by a certified arborist. Dead branches of 1-1/2 inches in diameter may be trimmed. If construction operations require that trees or bushes be removed, the Contractor shall be wholly responsible for satisfying all claims for restoration or restitution resulting from the damage or removal of trees or bushes.
 - c. Small trees and shrubs that may be relocated or pruned to permit more working space during construction operations, shall be done in accordance with Home and Garden Bulletin No. 83, U.S. Department of Agriculture, "Pruning Shade Trees and Repairing Their Injuries." The Contractor shall obtain written permission from property owners to move or prune existing trees or shrubs on their property.
 - d. Trees and shrubs damaged by the Contractor shall be repaired in accordance with said Bulletin No. 83.

- 5.1.22 Remove and Replace Fence: Where existing fences are to be removed the existing fence shall be removed neatly and stored carefully. The existing fence materials shall be reused, provided the materials were not damaged during removal. Any damaged materials shall be replaced with new material of equal quality and match in appearance to the existing material. Reinstallation of the fence shall match the line and height of the existing fence, except as directed by the Engineer, when fences are to be replaced. Fences that are required for security of private, commercial, or public property shall be reinstalled before the end of the workday in which they were removed.
- 5.1.23 Remove and Replace Mail Boxes: Where existing mailboxes are removed, they shall be removed neatly and stored carefully or installed in a temporary location as directed by the Engineer. Reinstallation of mailboxes shall match their previous location and height. The existing materials shall be reused, provided the materials were not damaged during removal. Any damaged materials shall be replaced with new material of equal quality and match in appearance to the existing material.
- 5.1.24 Remove and Replace Ground Covers: Ground covers that are to be retained shall be preserved and protected. Items that must be disturbed or relocated shall be carefully removed so as to prevent damage to the root systems, stored, and replanted as soon as possible after construction in the area is completed. Heeling in, mulching and regular watering are minimum preservation treatments.
- 5.1.25 Remove and Replace Signs: State and local road signs shall be removed and replaced as directed by the State or local authority. Where existing signs, other than State or local road signs, are removed, they shall be removed neatly and stored carefully or installed in a temporary location as directed by the Engineer. Reinstallation of signs shall match their previous location and height. The existing materials shall be reused, provided the materials were not damaged during removal. Any damaged materials shall be replaced with new material of equal quality and match in appearance to the existing material.

2.0. SITE RESTORATION

- 5.2.1 Temporary Surfacing: The contractor shall provide all temporary roadway surfacing and maintenance of the temporary surfacing until the backfill has properly settled, to permit pavement replacement. Temporary roadway surfacing shall consist of not less than a six-inch (6") depth of #53 aggregate over the entire area of surface where pavement has been removed.
- 5.2.2 Site Restoration: For offsite construction the Contractor shall restore all fences, poles, topsoil, grass, or other property to a condition equal to that before the work began. A registered professional surveyor shall replace property stakes when removed or disturbed.
- 5.2.3 Roadway Pavement:
- All materials for pavement replacement shall conform to the applicable requirements of the Indiana Department of Transportation (INDOT) Standards and Specifications, latest revision thereto unless otherwise specified.
 - No permanent roadway pavement shall be replaced until the condition of the backfill is such as to properly support the pavement. Types of pavement indicated on the drawings refer to the wearing surface only except as may be otherwise indicated.
 - The edges of the existing pavement shall be sawed, cut with a wheel or other approved manner in a neat and straight line along the edges of the backfilled trench before placement of any permanent pavement replacement.
 - In the preparation of the subgrade for pavement replacement, the temporary surfacing shall be removed to the subgrade of the pavement replacement and any loose or cracked pavement adjacent shall be cut and removed. The subgrade shall be accurately graded and compacted. Where the subgrade under the undisturbed pavement has fallen away, the Contractor shall provide properly compacted material or flowable fill under the pavement or remove such pavement as may be necessary to provide a firm supporting pavement subgrade foundation.

5.2.4 Asphalt Pavement Replacement:

Replacement of existing pavement using an asphalt cross section shall be in accordance with permit requirement but shall consist of no less than the following.

- City/Town Streets & County Roads:
Nine-inch (9") depth #53 aggregate compacted in two layers of equal depth.
Five inch (5") depth of #8 or a #9 Hot Asphaltic binder in two layers of equal depth.
One inch (1") depth of type "11" Hot Asphaltic surface.
- State Roads:
Six inch (6") depth #53 aggregate.
Twelve inch (12") depth of HMA Bituminous Base, Type "C" in three layers of equal depth.
One-and a half inch (1.5") depth of HMA Bituminous Surface, Type "C"

Where the existing cross section of any road is greater, the greater section shall be used.

5.2.5 Concrete Replacement:

Concrete utilized to replace driveways, sidewalks, curbs, curb and gutters and street pavements shall be "Ready Mixed" to ASTM Standard Specification C-94. The cement shall conform to ASTM Standard Specification C-175 for air-entrained cement with the entrained air within the limits of 4% to 7%. All aggregate shall conform to ASTM Standard Specification C-33.

- Preparation: All subgrade shall be compacted to 95% density.
- Forms: Shall be of metal or wood, straight and free of warps and of sufficient strength to resist springing. These forms shall be to the full depth, securely staked, braced and held firmly to the required line and grade with all walks a minimum of 4-inches in depth.
- Expansion Joints: Shall be placed at intervals of approximately fifty feet (50') and be of a preformed asphaltic impregnated expansion joint material composed of a durable elastic compound of mineral or vegetable matter of not less than 1/2-inch and shall be placed the entire width and depth of the walk or curb. Expansion joints of 1/2-inch thickness shall also be placed where any sidewalk joins with any curb or curb and gutter, around all valves, poles, etc., which may fall within the concrete.

- d. **Placing Concrete:** The subgrade shall be wetted before the concrete is placed thereon. The concrete shall be deposited within the forms upon the wetted subgrade to such a depth that after being compacted, it shall be to the full thickness required. Concrete shall be leveled off and tamped sufficiently to bring mortar to the surface after which it shall be finished smooth and even by means of a wood float or trowel. Transverse joints shall be cut at intervals not greater than fifteen feet (15') on all curbs. When completed, the sidewalk and/or curb shall be covered and kept wet or sprayed with an approved curing agent. Concrete shall not be allowed to freeze.
- e. **Concrete Proportioning:** Concrete shall be of standard weight concrete and shall meet the following requirements:

Maximum Water-Cement Ratio:	6-1/2 gals. / sack
Minimum Cement Content	6 sacks / cu. yd.
Maximum Slump	3 inches
Water Reducing Admixture	1/4 lb. / sack
Air Content (exposed concrete)	4% - 7%
Minimum Strength at 28 days	4000 psi

- f. **Finish:** All pavement, curbs, and sidewalks shall have a broom finish at right angles to the direction of traffic.
- g. **Existing Walks or Curbs:** When disturbed or damaged by construction walks or curbs shall be replaced to their original condition with the construction as per new sidewalks or curbs. All sidewalk removal shall be to the nearest joint.
- h. **Curing:** Before actual concrete placement begins, the Contractor shall have all equipment needed for adequate curing of the concrete on hand and ready to install.

All concrete shall be adequately protected from injurious action by the sun. Fresh concrete shall be protected from heavy rains, flowing water and mechanical injury. All concrete shall be kept wet for a period of not less than fourteen (14) days by covering with water, or with an approved water saturated covering, or by a system of perforated pipes or mechanical sprinklers, or any other approved method which will keep surfaces continuously (not periodically) wet. Where wood forms are left in place for curing, they shall be kept wet at all times to prevent opening at the joints and drying out the concrete. Water for curing shall be generally clean and entirely free from any elements that might cause staining or discoloration of the concrete.

Concrete, when placed during cold weather, shall be kept moist and provided with adequate protection for a period of not less than fourteen (14) days, so that the air in contact with the concrete will be maintained at temperatures between 50 degrees F. and 70 degrees F. for at least the first seven (7) days of curing period. Salt or other chemicals shall not be admitted into the mixing.

5.2.6 **Driveways:** Existing driveways where disturbed or damaged by construction shall be replaced to the line, grade and cross section of the original drive. The various types of drive shall meet the following specifications.

a. **Concrete:**

i. City/County Roads:

All concrete driveways shall consist of not less than 6 inches of Portland cement concrete.

ii. State Roads:

1. *Private Approach:* All concrete driveways shall consist of not less than 6 inches of Portland cement concrete.
2. *Commercial Approach:* All concrete driveways shall consist of not less than 9 inches of Portland cement concrete.

All concrete driveways shall be constructed upon a compacted sub-base all as set forth in Section 5.2.5 of these minimum specifications, unless otherwise set out in the Special Conditions and made part of the SLRWD approval.

b. Asphalt:

i. City/Town Streets & County Roads:

All asphalt drives shall consist of not less than a 8 inch thickness of #53 aggregate base constructed upon a compacted sub-base. The binder shall consist of not less than 2-inch thickness of HMA Bituminous Base, Type "C" with a surface course consisting of a minimum of 1.5 inch of #HMA Bituminous Surface, Type "C".

ii. State Roads:

1. *Private Approach:* All asphalt drives shall consist of:

Three-and a half inch (3.5") depth of HMA Bituminous Base, Type "C" constructed upon a compacted sub-base.

One-and a half inch (1.5") depth of type HMA Bituminous Surface, Type "C".

2. *Commercial Approach:* All asphalt drives shall consist of:

Six inch (6") depth #53 aggregate, adequately drained, constructed upon a compacted sub-base.

Twelve inch (12") depth of HMA Bituminous Base, Type "C" in three layers of equal depth.

One-and a half inch (1.5") depth of HMA Bituminous Surface, Type "C"

c. Gravel: All gravel drives shall consist of not less than 6 inches of compacted #73 aggregate upon a compacted sub-base.

d. Stone: All stone drives shall consist of not less than 4 inches of compacted #53 limestone upon a compacted sub-base and topped with 2 inches of # 73 limestone.

5.2.7 Grading and Seeding:

a. All areas disturbed by construction shall, within ten (10) days of completing the pipe installation, be graded to a uniform and level grade and seeded.

b. All grading and seeding shall be in accordance with the project's approved "Erosion Control Plan" which is supplemental to and a part of these specifications.

5.3. PIPE

5.3.1 General: All pipe materials shall conform to 327 IAC 3-6

5.3.2 Private Wells: All sanitary sewer lines shall be no closer than 10 feet from private wells. When sanitary sewer lines are within 50 feet of a private well then the pipe shall be watermain grade pressure rated pipe.

5.3.3 Transient or Non-Transient/Non-Community Wells:

A sanitary sewer line shall be no closer than 50 feet to transient or non-transient/non-community well. When sanitary sewer lines are within 100 feet of a transient or non-transient/non-community well then the pipe shall be watermain grade pressure rated pipe.

A transient well is considered to be a well which serves a church, campground, restaurant, or has more than 15 connection for more than 60 days or serves 25 or more people for more than 60 days. A non-transient/non-community well is considered to be a well which serves a factory, daycare, school or has 15 or more connections for 6 months or serves 25 or more people for 6 months.

5.3.4 Community Well:

All sanitary sewer lines shall be no closer than 50 feet from community wells. When sanitary sewer lines are within 200 feet of a community well then the pipe shall be watermain grade pressure rated pipe.

A community well is considered to be a well that serves 15 or more connections year-round.

5.3.5 PVC Gravity Pipe for Sewer Mains:

- a. Solid wall polyvinyl chloride (PVC) gravity sewer pipe and fittings shall be type PSM solid wall conforming to ASTM D-3034 with minimum wall thickness SDR-35 for sizes 4-inch through 15-inch and conforming to ASTM F-679 with a minimum wall thickness SDR-35 for sizes 18-inch and 21-inch. Smooth wall PVC gravity pipe is classified as a "flexible conduit."
- b. Corrugated polyvinyl chloride (CPVC) shall be PVC corrugated pipe with a smooth interior and shall conform to the requirements of ASTM Designation F949 (latest revision). Pipe and fittings shall be homogeneous throughout and free from visible cracks, holes, foreign intrusions or other injurious defects. Pipe shall be manufactured to 46-psi stiffness when tested in accordance with ASTM Test Method D2412. There shall be no evidence of splitting, cracking or breaking when the pipe is tested per ASTM Test Method D2412 at 60 percent flattening. The pipe shall be made of PVC compound having a minimum cell classification of 12454B as defined in ASTM Specification D1784.

All fittings for PVC corrugated sewer pipe with a smooth interior shall conform to ASTM F949, Section 5.2.3. To insure compatibility, the pipe manufacturer shall provide all fittings.

All joints shall be made with integrally-formed bell and spigot gasketed connections. The manufacturer shall provide documentation showing no leakage when gasketed pipe joints are tested in accordance with ASTM Test Method D3212. Elastometric seals (gaskets) shall meet the requirements of ASTM Designation F477.

5.3.6 Pressure Pipe for Pressure Sewers:

- a. PVC pipe for pressure sewer of the size shown on the drawings shall be Class 200 pressure pipe (minimum SDR-21) in accordance with ASTM D-2241, "Poly Vinyl Chloride (PVC) plastic pipe".
All PVC pressure pipe, and fittings shall be rubber ring joints in accordance with ASTM D-1869. Joints for PVC pressure pipe shall be flexible elastomeric seals in accordance with ASTM D3139.
All PVC pipe diameter shall be in Iron Pipe Size (I.P.S.)
- b. Ductile Iron Pipe (DI): When ductile iron pipe is allowed or specified it shall be 200 psi rated cement lined and in accordance with ANSI specifications 21.50 and 21.51 of not less than class 350 or as otherwise approved.
- c. Pipe Fittings: All pressure sewer pipe fittings for PVC or ductile, unless shown or noted otherwise, shall be coated ductile iron class 150, of either "slip joint" or "mechanical joint" type. The Contractor

shall submit details to the SLRWD of the type of fittings he proposes to use based on the type of pipe used. All bolts and nuts for mechanical joints shall be cadmium plated.

5.3.7 High Density Polyethylene Pipe (H.D.P.E.) for pressure sewers:

When allowed or required all H.D.P.E. pipe and fittings, 3.5 inches and larger, shall be made from PE 3408 plastic material with minimum 160 psi pressure rating and furnished by the same manufacturer and shall be not less than DR 11 for directional boring. The pipe and fitting manufacturer shall certify that samples of his production pipe and fittings conform to AWWA C906 and have undergone stress ASTM D-2837 and PPI TR-3. The minimum hydrostatic design basis shall be certified by the pipe and fitting manufacturer to be 1600 psi at 73.4 degrees F. and 800 psi at 140 degrees F. Where directional boring is used for installation of HDPE pipe, the pipe wall thickness may need to be increased. Any increase in pipe wall thickness shall not result in reducing the inside diameter of the pipe by more than 0.26 inches.

HDPE Pipe diameter designation for pipe 3-inches or smaller shall be in Iron Pipe Size (I.P.S.).

HDPE Pipe diameter designation for pipe 4-inches and larger shall be in Ductile Iron Pipe Size (D.I.P.S.).

Material shall be listed in the name of the pipe and fitting manufacturer by the Plastics Pipe Institute (PPI) in PPI TR-4 with the following standard grade ratings:

	73.4 deg. F.	140 deg. F.
Hydrostatic Design Basis (HDB)	1600 psi	800 psi
Hydrostatic Design Stress (HDS)	800 psi	400 psi

PPI material listing in the name of the resin supplier is not acceptable in meeting this requirement.

Pressure sewers less than 3.5 inches shall conform to ANSI/AWWA C901.

a. Pipe and Fittings:

- i. Pipe and fittings shall be produced from identical materials meeting the requirements of this specification.
- ii. Molded fittings shall meet the requirements of ASTM D-3261 and this specification. At the point of fusion, the outside diameter and minimum wall thickness of fitting butt fusion outlets shall meet the diameter and wall thickness specifications of the mating system pipe. Fitting markings shall include a production code from which the location and date of manufacture can be identified.
- iii. Outside diameter controlled pipe shall be manufactured in accordance with ASTM D-3035. Inside diameter controlled pipe shall be manufactured to the specifications provided by the manufacturer. Printline markings shall include a production code from which the location and date of manufacture can be identified.

b. Manufacturer's Quality Assurance:

The pipe and fitting manufacturer shall have an established quality assurance program responsible for assuring the long term performance of materials and products. Representative samples of polyethylene materials shall be tested against the physical property requirements of this specification. Each extrusion line and molding machine shall be qualified to produce pressure rated products by taking representative production samples and performing sustained pressure tests in accordance with ASTM D-1598.

Quality assurance tests for representative pipe and fitting samples shall include:

TEST (fo>1000h)	STANDARD	PIPE	FITTINGS
Ring ESCR	ASTM F-1248	Yes	Not Applicable
Sustained Pressure at 176 deg. F. / 725 psi			

hoop stress	ASTM D-1598	Yes	Yes
Sustained Pressure at 73 deg. F. / 1600 psi hoop stress	ASTM D-1598	Yes (fo>1000h)	Yes (fo>1000h)

- c. Quality Control and Quality Assurance Report: The pipe and fitting manufacturer shall maintain permanent QA records.
- d. Joining and Fusion Training: Except where flange connections or other mechanical connections are specified, pipe and fittings shall be butt fusion joined in accordance with ASTM D3261 and the manufacturer's recommended procedure.
- e. Handling, Construction and Installation: The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier. Pipe and fittings shall be handled, installed and tested in accordance with manufacturer's recommendations, and the requirements of this specification.

5.3.8 Service Laterals:

All gravity sewer laterals from the main gravity sanitary sewer line to the approximate right of way, property line, easement line of the user or existing service line shall be not less than six inch (6") diameter pipe, the sewer lateral from the property or easement line to the house sewer may be 4 inch or 6 inch.

Where the main line gravity sewer is PVC pipe, the service laterals shall be PVC.

The end of each gravity sewer lateral shall be marked with a #4 rebar extending from the end of the lateral to a point 1.5 foot below grade and a wood stake (2" x 2" x 3') or 1-inch PVC pipe extending to a point 1.5 foot above grade, except when connecting existing service laterals.

Pressure sewer service lateral shall be 1 ¼-inch minimum HDPE in accordance with AWWA Standard C-901.

The end of each pressure sewer lateral shall terminate at the property line or easement line with a curb stop and box, check valve, and watertight plug. The location of the plug shall be marked with a wood stake (2" x 2" x 3') or 1 inch PVC pipe extending to a point 1.5 foot above grade, except when connecting existing service laterals.

- 5.3.9 Relocation of Existing Sewer Mainline: Sewer mainline to be relocated shall be replaced with the same type and size material as existing. A separate Maintenance Bond will be required for the portion of relocated sewer mainline. The Bond shall be in a form and in the amount approved by the SLRWD and shall be with an approved Bond provider.

- 5.3.10 Replacement of Existing Pipes and Appurtenances: Unless shown or noted otherwise on the drawings, all existing sewer lines, water lines, drainage tile, culverts, or other pipes or appurtenances that are disturbed by construction shall be repaired or replaced with the same type and size material as encountered. Existing sanitary sewers noted to be abandoned shall be permanently plugged with concrete.

5.4 APPURTENANCES

- 5.4.1 Isolation Valves: Isolation valves shall be placed where a sewer branch connects to the sewer mainline and at air release valves. Valves shall be equipped with a square operating nut and provided with a two piece screw type, 5 1/4-inch cast iron roadway box. Valves eight inches (8") or larger shall be equipped with gear operator and installed in a concrete manhole section with manhole casting lid appropriately sized to accommodate the valve and operator.
- 5.4.2 Plug Valves for underground service shall be ANSI Class 125 flanged cast iron body, resilient seated eccentric plug valves with 316 stainless steel bearings, stainless steel plug with acrylonitrile-butadiene coated facing and square top nut for valve wrench operation. DeZurik Fig. 118 or equal.
- 5.4.3 Gate Valves for underground isolation of the pressure sewers 3 inch and larger shall conform to ANSI/AWWA C509 latest revision with resilient wedge facings, valves shall be of the wedge type RHO with mechanical joint ends conforming to ANSI/AWWA C111/A21.11 with PVC transition gaskets.
- Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber except for guide and wedge nut areas. Wedge rubber shall be molded in place and bonded to the ductile iron portion, and shall not be mechanically attached with screws, rivets, or similar fasteners. Wedge shall seat against surfaces arranged symmetrically about the centerline of the operating stem, so that seating is equally effective regardless of direction of pressure unbalanced across the wedge.
 - All seating surfaces in body shall be inclined to the vertical at a minimum angle of 32 deg. (when stem is in a vertical position) to eliminate abrasive wear of rubber sealing surfaces. Stem shall be sealed by at least two (2) O-Rings; all stem seals shall be replaceable with valve wide open and while subjected to full rated pressure.
 - Waterway shall be smooth and shall have no depressions or cavities in seat area where foreign material can lodge and prevent closure or sealing. Valve body and bonnet shall be coated inside and out, with fusion-bonded epoxy. Coating shall conform to AWWA C550-81, Standard for Protective Interior Coating for Valves.
- 5.4.4 Curb Stop Valves: Thermoplastic curb stop valves for pressure sewer lines 2 inches and smaller shall be manufactured from glass reinforced nylon material (Noryl GTX) and ISO 9002 certified. All valves shall be rated for 200 psi service. Each valve shall have an operating nut for service key operation that disengages and ratchets in either direction when operating torque exceeds 20 ft. lbs. Curb valves to be CEPEX, Philmac or approved equal.
- 5.4.5 Swing Checks: Swing check valves for pressure sewer lines 2 inch and smaller shall be manufactured from Brass. All valves shall be rated for 125 psi working pressure. Valves shall have end connections to accommodate the specified service pipe or tubing.
- 5.4.6 Service Saddles: Where required or allowed Service Saddles shall be manufactured with Type 304 Stainless Steel and all welds must be fully passivated. Gasket shall be manufactured from SBR rubber or Buna-in-Rubber per ASTM D 2000 and be seated in a preformed cavity in the shell for retention of the gasket. Saddles shall have a working pressure of 200 psi and have been fully tested for use on HDPE and PVC main line pipe up through 12-inch diameter.
- 5.4.7 Concrete: All concrete except precast concrete units shall be as specified under Section 3.5. Precast units shall conform to the appropriate ASTM specification noted on the detail or elsewhere in these specifications.
- 5.4.8 Manhole Castings and Covers: All manhole frames and covers shall consist of a fiber reinforced polymer (FRP) matrix and shall conform to ASTM C1028-83. Unless otherwise approved and shown on the plans, frames and covers shall be as follows:
- Standard Casting Type "A" (SLRWD-209) shall be:
 - GMI Composites, Inc. 3200 series or approved equal
 - Minimum opening width shall be 30 inches.

- b. Standard Casting Type "B" (SLRWD-110) shall be:
 - i. GMI Composites, Inc. 3200 series or approved equal.
 - ii. Minimum opening width shall be 30 inches.

Frames shall be set on the concrete manhole structure on a bed of mastic and grouted into place to provide a watertight seal.

- 5.4.9 Precast Manhole Units (SLRWD-203): Shall be circular with circular reinforcement and shall conform to the requirements of the current specifications for precast reinforced concrete manholes, ASTM Designation C-478.

Openings for pipe inlets and outlets shall be provided in the precast units as the locations shown on the plans, at the place and time of manufacture. Openings shall be made true to form and shall have a manhole waterstop gasket provided to firmly clamp around the O.D. of the pipe on the exterior of the manhole.

If it becomes necessary to cut an opening in the manhole on the job site, it shall be accomplished utilizing a saw. No changes in the opening in a manhole utilizing a hammer will be permitted. Sealing of a field cut opening shall be accomplished using a waterstop gasket around the pipe exterior and sealing of the space around the pipe with non-shrink grout forming a smooth appearance on the interior and exterior of the manhole.

The unit for the top of the structure shall be constructed to provide for the use of standard covers as called for on the drawings, but shall provide for not less than a 30 inch diameter clear opening.

Manholes shall have joints sealed with rubber gaskets conforming to ASTM C-443.

Each manhole shall be provided with steps spaced at 15-inch center to center with the first step a maximum of 24 inches below the top of the manhole casting. These manhole steps shall be constructed of steel reinforced fiberglass conforming to ASTM C478 with minimum design live load of 300 ft. lbs. Where drop pipes are shown or required, they may be precast on the outside of the precast manhole bottom section or site built per detail. (SLRWD-204)

Lift holes are acceptable but must be repaired using a conical shaped precast concrete plug properly sealed into place using mastic or non-shrink cement or epoxy grout. The repair shall be clean and neat.

- 5.4.10 Adjusting Rings (SLRWD-206): Final adjustments in elevation of the casting frame and grate for precast manholes shall be accomplished by use of precast concrete adjusting rings.

The rings shall be a minimal nominal thickness of two inches (2") and shall conform to ASTM C478. One-half inch (½") of performed flexible sealant or approved equal shall be placed in the center of the concrete rings along with any necessary grout. The sealant shall also be placed at the cone/slab interface and below the manhole casting.

- 5.4.11 Sewage Air Release Valves: Each sewage air valve shall be designed for its specific location: the following minimum specification shall apply. All air valves shall be installed within a concrete structure with Standard Type "B" manhole casting for access. Air release valves shall be as manufactured by A.R.I. or pre-approved equal.

- 5.4.12 Sewage Air Release Valve (SLRWD-104A) shall be of the type that automatically releases air, gas or vapor under pressure during system operation. The valve shall have not less than a 2-inch N.P.T. inlet with not less than a 1-inch N.P.T. outlet and a 7/16-inch venting orifice for a maximum working pressure of 150 psi.

"Back Wash Accessories" shall be furnished and assembled to the valve, consisting of an inlet shutoff valve, blow-off valve, clean water inlet valve, rubber supply hose and quick disconnect couplings.

- 5.4.13 Sewage Air and Vacuum Valve (SLRWD-104B) shall be of the type that automatically exhausts large quantities of air during the filling of a system and allows air to re-enter during draining or when a vacuum occurs. The valve shall have an inlet size of not less than 2-inch N.P.T. and a discharge size of not less than 1-inch N.P.T.

"Back Wash Accessories" shall be furnished and assembled to the valve, consisting of an inlet shutoff valve, blow-off valve, clean water inlet valve, rubber supply hose and quick disconnect couplings.

Air Release Valves shall be Type B-1 ARI D-020 STST, Type B-2 ARI D0-025 TP, or approved equal

The valve shall be designed to operate with wastewater with solids in a manner that will not allow discharge to the environment.

The valve shall have a conical shaped, made of corrosion resistant stainless steel or reinforced nylon body.

A cam lock back-flushing connection shall be integral to the working mechanism. A ball valve shall be provided to drain the valve.

The valve shall have a spring loaded stainless steel float.

The operating mechanism shall be non-metallic and corrosion resistant. All metal parts shall be made of corrosion resistant stainless steel.

The working pressures shall be from 3 to 250 psi, tested to 360 psi.

The valve shall be of type that release large amounts of air, gases, and vapor during filling of the system and admits large amounts air when system drains.

The valve shall be capable of releasing accumulated air from the system while system is under pressure, while maintaining an air pocket separation between the liquid and the working mechanism.

The valve shall maintain an air pocket separation between the liquid and the working mechanism

The area of the air release orifice shall be 0.0186 square inches and be an integral extension of the air and vacuum orifice, which shall be rectangular in shape.

The valve shall allow sewage to drain into the system when not under pressure, allowing the internals of the valve to remain clean and unobstructed.

The valve shall be coated with a fusion bonded coating.

5.4.14 Valve Boxes:

Valve boxes for valves 3-inch and larger shall be two-piece screw type, 5 1/4-inch cast iron roadway box with cast iron lid marked "SEWER. "

Valve or curb boxes for valves under 3-inch shall be two-piece slide type, 3-inch ABS (ASTM D1788) curb box with cast iron top collar and lid marked "SEWER" (SLRWD-007).

5.4.15 Pipe Tracer:

The Contractor shall furnish and install on each PVC or HDPE pressure sewer two (2) UL listed (for direct burial), 10 gauge solid copper tracer wire with high molecular weight polyethylene insulating cover. Each tracer wire shall be of a different color.

For pipe installed by trenching method, the tracer wire shall be installed 6-inches to 12-inches above the pipe.

For pipe installed by the directional drilling method, the tracer wire shall be located on opposite sides of the pipe and shall not cross each other.

The tracer wire shall be bolted to each valve, air release valve and other access points that will allow for a surface connection for tracing of the pipe location. Each tracer wire shall be connected separately to each access point. Maximum distance between access points shall be 1000 feet. Where there is more than 1000 feet between access points, a tracer tower/access point shall be installed with required signage.

Where splices are required, they shall be made with direct bury splice kits similar to "Scotchlock."

Metallic pipe (Ductile Iron) and fittings may be equipped with approved conductive gaskets or wedge connection at all joints to provide a continuous contact to allow for tracing of the pipe, or shall be installed with a tracer wire.

5.5 INSTALLATION

5.5.1 General:

All Pressure sewer pipe shall be installed at a depth with minimum cover of 5 feet unless pre-approved by the SLRWD.

Sanitary setbacks shall meet all Local, State, and Federal regulations.

5.5.2 Handling Sewer Main Material into Trench:

Pipe and fittings shall be installed in a workmanship like manner. Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient progression of the work. All pipe and fittings shall be carefully put into the trench using suitable tools or equipment, in such a manner as to prevent damage to sewer main materials and to protective coatings and linings. Under no circumstances shall sewer main materials be dropped or dumped into the trench.

When installing HDPE pipe that has been thermally welded into long sections, care must be used to prevent scuffing of the pipe surface during handling and installation.

5.5.3 Field Inspection of Materials: Before lowering into the trench, all pipe and fittings shall be inspected for defects.

5.5.4 Cleaning Pipe and Fittings: All lumps, blisters, and excess coatings shall be removed from the bell and spigot end of each pipe, and the outside of the spigot and the inside of the bell shall be wiped clean and dry and free from oil, grease and dirt before the pipe is laid.

5.5.5 Laying Pipe:

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the SLRWD's authorized inspector may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing or other material shall be placed in the pipe.

After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced 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 and fittings of proper dimensions to insure such uniform space. Precautions shall be taken to prevent dirt from entering the joint space.

At times when pipe laying is not in progress, the open ends of the installed pipe shall be closed by a watertight plug or other means approved by the SLRWD. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

5.5.6 Cutting Pipe:

The cutting of pipe for inserting fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe, coating or lining, and so as to leave a smooth end at right angles to the axis of the pipe.

All cutting of pipe shall be performed utilizing a saw or approved pipe cutter.

5.5.7 Jointing Pipe: All pipe joints shall be made up in strict accordance with the pipe manufacturer's recommendations. Bolted joints not tight shall be disassembled, thoroughly cleaned, and remade. Under no conditions shall bolted joints be made tight by overstressing the bolts, or tightening the bolts beyond the manufacturer's recommended range of torque. The Contractor shall provide and have available on the job at all times, properly calibrated indicating torque wrenches to fit all joint bolts being used. Joints found to have bolts tightened above the manufacturer's recommended maximum torque shall be disassembled, cleaned and properly remade as directed by the SLRWD's authorized inspector.

5.5.8 Unsuitable Conditions for Laying Pipe:

No pipe shall be laid in water, or when trench conditions are unsuitable.

The Contractor shall take all precautions necessary to prevent flotation of the pipe due to water coming into the trench. Any damage from flotation or water entering the trench shall be corrected by removing that section which becomes damaged and repairing or replacing any damaged pipe or fittings.

- 5.5.9 Records: The Contractor shall keep accurate and complete records of the actual location of house service lateral wye, lateral end and other appurtenances, and turn said records over to the SLRWD at the completion of the project and before final acceptance by the SLRWD. The "AS BUILT" service connection locations shall be shown on the set of "AS BUILT" drawings as provided for in Section III of these standards and also typewritten on a separate sheet with property location. Each tap shall be referenced to the nearest down stream manhole, or property corner.

- 5.5.10 Special Installation Instruction: In recognition of the fact that there are currently many different pipe materials available from many different manufacturers, the Contractor will be required to obtain the pipe manufacturer's published recommendations for installation of pipe; and nothing in these specifications shall preclude compliance by the Contractor with the manufacturers recommendations. Any pipe material and installation method not called for in these specifications and/or included in the IDEM construction permit, will need to be submitted and approved prior to construction.

5.5.11 Joint Restraint:

Approved restraints shall be provided at all fittings of 22.5 degrees or greater on PVC or ductile iron pressure sewers. Provide ductile iron retainer glands to restrain ductile iron or PVC pipe. Where required restraint length requires restraint of PVC pipe over more than one pipe length, provide necessary adapter flanges.

Restraint devices for bell and spigot joints of PVC pipe shall consist of split restraint rings, one installed on the spigot, connected to one installed on the pipe barrel behind the bell. The restraint devices shall incorporate a series of machined serrations (not "as cast") on the inside diameter to provide positive restraint, exact fit, 360° contact and support of the pipe wall. Restraint devices shall be of ductile iron, ASTM A536, Grade 65-45-12 and connecting rods shall be of high strength, low alloy material in accordance with ANSI/AWWA C111/A21.11. Restraint devices for bell and spigot joints of PVC pipe shall be Uni-Flange Block Buster 1390 or approved equal.

Restraint devices for PVC pipe shall incorporate a series of machined serrations (not "as cast") on the inside diameter to provide positive restraint, exact fit, 360° contact and support of the pipe wall. Restraint devices shall be manufactured of high strength ductile iron, ASTM A536, Grade 65-45-12 in 2" through 24." Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11.

All restraint devices for PVC pipe shall have a water working pressure rating equivalent to the full rated pressure of the PVC pipe on which they are installed, with a minimum of 2:1 safety factor in any nominal pipe size.

Restraint devices for mechanical joint or push-on fittings shall be Uni-Flange Block Buster 1300 or approved equal

A thermal weld joint for HDPE pipe does not require additional restraint. Thrust blocks will be required for change in direction.

High Density Polyethylene Pipe (HDPE) jointing shall be performed by personnel trained in the use of butt-fusion equipment and recommended methods for new pipe connections. Personnel directly involved with installing the new pipe shall be trained in the proper methods for handling and installing the HDPE pipe.

5.5.12 Grade and Alignment:

- a. All gravity conduit pipes shall be installed to grade in an acceptable manner.
- b. Contractor shall verify pipe grade and elevation at each manhole in recorded form in a manner acceptable to the SLRWD.
- c. Installation by Directional Drilling Method:
 - i. Grade for directional boring of pressure sewer shall be monitored and recorded from the "head" of the boring equipment. Care must be maintained to assure that high points do not occur that do not provide for a properly designed "air release valve."
 - ii. HDPE pipe installed by the directional drilling method shall be performed by a qualified Contractor with a minimum of 3 years experience. All Contractors' personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. Each employee must have at least two years directional drilling experience. Contractor shall provide documentation of qualification.
 - iii. HDPE pipe installed by the directional drilling method shall be at a grade of no less than 1 percent. Grade shall be maintained at plus or minus 0.04 foot. An electric walkover tracking system or a Magnetic Guidance System (MGS) probe, or proven gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate and calibrated to manufacturer's specifications of the vertical depth of the borehole at sensing position at depths up to fifty feet and accurate to 2-feet horizontally, in any soil condition, including hard rock.
 - iv. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on the drawings. The vertical elevation shall be relative to the project benchmark. If the Contractor is using a MGS, drill path will be surveyed for any surface geo-magnetic variations or anomalies. The Contractor shall keep daily records in a manner acceptable to the SLRWD of the actual location horizontally and vertically of the pipe installation, and all utility facilities found during the installation. The vertical elevation information for the pipe shall be recorded relative to the project benchmark. The information shall be recorded at a maximum of 25 foot intervals and be kept available to the SLRWD at all times. Before final acceptance by the SLRWD of the system, this profile information must be filed with the SLRWD.
 - v. The reamer type shall be at the Contractor's discretion with the final hole opening being a maximum of 1.5 times larger than the outside diameter of the pipe.
 - vi. Where pipe is to be installed by directional drilling method, a minimum of two soil borings is required. The maximum distance between soil borings is 500 feet. Soil borings shall be provided by the Directional Drilling Contractor within the scope of the project.

5.6 SEWER TAP CONSTRUCTION REQUIREMENTS

5.6.1 General:

- a. Sanitary setbacks shall meet all Local, State, and Federal regulations.
- b. Private Wells: All sanitary service lines shall be no closer than 10 feet from private wells as measured from well casing. When sanitary service lines are within 50 feet of a private well then the pipe shall be watermain grade pressure rated pipe.
- c. Transient or Non-Transient/Non-Community Wells: A sanitary sewer line shall be no closer than 50 feet to transient or non-transient/non-community well. When sanitary sewer lines are within 100 feet of a transient or non-transient/non-community well then the pipe shall be watermain grade pressure rated pipe.
- d. A transient well is considered to be a well which serves a church, campground, restaurant, or has more than 15 connection for more than 60 days or serves 25 or more people for more than 60 days. A non-transient/non-community well is considered to be a well which serves a factory, daycare, school or has 15 or more connections for 6 months or serves 25 or more people for 6 months.
- e. Community Well: All sanitary sewer lines shall be no closer than 50 feet from community wells. When sanitary sewer lines are within 200 feet of a community well then the pipe shall be watermain grade pressure rated pipe.
- f. A community well is considered to be a well that serves 15 or more connections year-round.
- g. Sanitary lines shall be no closer than 10 feet from surface water bodies, as measured from outside of pipe and outside of grinder pump stations.
- h. A minimum 10 feet horizontal and 18 inches vertical separation between proposed sewer and water mains shall be maintained.
- i. Where the minimum clearance cannot be maintained or the location of the water line or well is unknown, the sewer must be constructed of waterworks grade ductile iron pipe with mechanical joints or PVC pressure pipe with a SDR rating of 26 or less with mechanical or compression fittings and pressure tested per the minimum separation requirements as set out in 410 IAC 6-8.1-36.

5.6.2 PIPE:

- a. Pipe for service connections shall be per 410 IAC 6-8-8.1-42.
- b. Gravity sewers for service shall be meet the following standard as a minimum; ASTM-D 2665-89a for 4-inch and 6-inch only; ASTM-D 3034-89, SDR 35 for 4-inch through 15-inch; ASTM-D 3034, SDR 26 with compression fittings.

5.6.3 Pressure Sewer Tap Specifications – Steuben Lakes Regional Waste District (SLRWD)

- a. Notify the SLRWD at least forty-eight (48) hours prior to installing tap. Notification shall be made to an individual in SLRWD's main office during normal business hours. The contractor shall also review the materials list with the SLRWD Superintendent or his authorized representative prior to beginning work. Copies of the contractor's construction drawings shall be made available to the SLRWD Superintendent or his authorized representative.
- b. The SLRWD can provide the sewer tapping saddle at a cost. (EXCEPTION: A saddle cannot be supplied for 2-inch pressure mains)
- c. The sewer trench MUST be left open until inspected and approved by the SLRWD Superintendent or his authorized inspector. A time shall be agreed upon between the Contractor and the SLRWD to inspect the sewer trench. If the SLRWD fails to show at the agreed time, the Contractor may backfill in the trench at the end of the normal work day. Contractor to take photos of open trench and pipe and connections prior to backfilling and record measurement ties of location of pipe and connections to physical features. If the Contractor is not prepared to have the sewer trench inspected at the agreed upon time, the Contractor will incur additional inspection fees to have SLRWD return to the site to perform the inspection.
- d. Some commercial installations may require an inspection (monitoring) manhole as determined by the SLRWD Superintendent or his authorized representative.
- e. A road cut permit from the appropriate authority is required whenever work enters a road and/or the road right-of-way. To include, but not be limited to, INDOT and the Steuben County Highway Department.
- f. The distance between the top of the grinder tank and the top of gravity pipe from the home/structure shall not be less than one (1) ft. The invert of the gravity pipe shall be a minimum of four (4) feet from the bottom of the grinder tank.
- g. A minimum four inch (4") diameter clean out shall be required on any gravity line leaving a structure. If outside, the clean out shall be located a minimum four feet (4') to a maximum seven feet (7') outside the foundation wall.
- h. Backflow prevention shall be installed in gravity sewer pipe between grinder pump station and building within five feet (5') of the building where practical or as approved by SLRWD Representative.
- i. The contractor shall install a simplex or duplex grinder pump station to meet the applicable requirements and standards of the SLRWD as set out in the approved permit application. The SLRWD can provide the grinder pump station at a cost. The lid of tank to be two inches (2") above final grade, or two inches (2") above the 100-Year Flood Grade, whichever is higher.
- j. In existing developments or tracts, where a curb-stop is not already installed, or when a curb stop is to be relocated, a curb-stop valve and box shall be located on the right-of-way line or road easement line, unless otherwise approved.
- k. In new developments the curb stop valve and box shall be located on the right-of-way line or road easement line, unless otherwise approved.
- l. Curb Stop Valves shall be per Section 5.4.4.
- m. The curb-stop valve shall be turned on only by order of the SLRWD Superintendent or his authorized representative and only after the inspection has been passed.
- n. Valve Boxes shall be per Section 5.4.14.
- o. A swing check valve can be provided to the contractor by the SLRWD at a cost, and shall be located between the grinder pump and the curb-stop, as close to the curb stop as possible. Only if a secondary ball check valve was not installed in the grinder tank.
- p. Swing check valves for pressure sewer lines 2 inch and smaller shall be manufactured from Brass. All valves shall be rated for 125 psi working pressure. Valves shall have end connections to

accommodate the specified service pipe or tubing. (Check valve to be "Flo Control", or approved equal)

- q. Pipe from grinder pump station to the main line shall be not less than 1¼-inch pipe for simplex station and not less than 2-inch pipe for duplex station. HDPE pipe shall conform to AWWA Standard C901; DR11 and PVC pipe shall be Class 200 pressure pipe (minimum SDR-21) in accordance with ASTM D-2241. Minimum pipe cover shall be 5 feet.
- r. A UL listed (for direct burial), 10 gauge solid copper tracer wire with high molecular weight polyethylene insulating cover shall be installed on each service line between the grinder station and the main line.
- s. Tracer Wire
 - i. The tracer wire shall be connected to the main line tracer wire at the point of the tap and to the inside of the curb box lid. The tracer wire shall also be attached to the inside of the grinder pump lid if the distance between the valve and the grinder pump is greater than five (5) feet.
 - ii. Where the pipe is installed using the trenching method, the tracer wire shall be installed 6-inches to 12-inches above the pipe.
 - iii. Two (2) tracer wires of different colors shall be installed if the service line is installed by directional drilling method and shall be located on opposite sides of the pipe. The wire shall not cross each other.
 - iv. Where splices are required, they shall be made with direct bury splice kits similar to "Scotchlock". The wire(s) shall be tested for continuity.

5.6.4 **Gravity Sewer Tap Specifications – Steuben Lakes Regional Waste District (SLRWD)**

- a. Notify the SLRWD at least forty-eight (48) hours prior to connecting to an existing gravity sewer tap. Notification shall be made to an individual in SLRWD's main office during normal business hours. Copies of the contractor's construction documents shall be made available to the SLRWD Superintendent or his authorized representative.
- b. Where an existing tap is not available on the existing gravity sewer, a new wye may be cut into the existing main line gravity sewer in accordance with construction detail SLRWD-212.
- c. The sewer trench MUST be left open until inspected and approved by the SLRWD Superintendent or his authorized inspector. A time shall be agreed upon between the Contractor and the SLRWD Superintendent to inspect the sewer trench. If the SLRWD Superintendent fails to show at the agreed time, the Contractor may backfill in the trench at the end of the normal work day. Contractor to take photos of open trench and pipe and connections prior to backfilling and record measurement ties of location of pipe and connections to physical features. If the Contractor is not prepared to have the sewer trench inspected at the agreed upon time, the Contractor will incur additional inspection fees to have SLRWD return to the site to inspect the sewer trench.
- d. Commercial installations may require an inspection (monitoring) manhole as determined by the SLRWD Superintendent or his authorized representative.
- e. A road cut permit from the appropriate authority is required whenever work enters a road and/or the road right-of-way. To include, but not be limited to, INDOT and the Steuben County Highway Department.
- f. A minimum four inch (4") diameter clean out will be required on any gravity line leaving a building structure. If outside, the clean out shall be located a minimum of four feet (4') to a maximum of seven feet (7') outside the foundation wall.

5.7 PROTECTIVE COATING

5.7.1 General:

Protective coating shall be applied to the interior of all concrete structures including, but not limited to: manholes, air release manholes, wet wells, and valve vaults to protect the concrete structures from hydrogen sulfide and acid generated by microbiological sources present in the wastewater environment. The protective coating shall also eliminate infiltration, repair voids, and enhance the structural integrity of the structures.

Cementitious material will not be allowed for the protective coating, however, it will be allowed for patching operations

For valve pits, the protective coating shall be an acrylic polymer-base concrete coating and sealant.

For wet wells, sanitary manholes and other structure that will be in direct contact with raw sewage, the protective coating shall be a polymer based polyurethane or a high-build, solvent free epoxy coating. The material shall be light in color.

The coating limits shall include from the top of fillet, wet well walls, and roof. Coating system shall overlap 1" to 2" where hatches sit on the roof; but shall exclude the banked floor.

Applicator shall conform with all local, state, and federal regulations including those set forth by OSHA, RCRA, and the EPA and any other applicable authorities.

5.7.2 Submittals:

Provide reference documentation to confirm that the proposed coating system has a proven record of performance when used in the intended application, including at least five (5) successful installations that have been in service for a period of ten (10) years. The reference list shall include the name of the facility, the application date, a contact person, and a telephone number.

Manufacturer certification that Applicator has been trained and approved in the handling, mixing and application of the products to be used.

Certification that the equipment to be used for applying the products has been manufactured or approved by the concrete rehabilitation products manufacturer, protective coating manufacturer, and certified for proper use for this specific application.

Written documentation of four (4) recent references of Applicator (involving wet wells with surface area of approximately 3,000 square feet) indicating successful application of a polyurethane or a high-build solvent-free epoxy coating.

Applicator must provide written documentation of having installed a minimum of 40,000 square feet of protective coating to that specified within the last two (2) years.

5.7.3 Quality Assurance:

Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE, and SSPC standards and the protective coating manufacturer's recommendations.

Coating Manufacturer's authorized field representative shall be on site prior to the application of the coating system to verify that the substrate has been properly prepared, and during the application of the coating system to certify that the coating system has been properly applied. The authorized field representative will provide the Owner with an accurate and objective written report stating inspection observations on the preparation, application, and final inspection verifying adherence to coating manufacturer recommendations, industry standards, and the written specifications.

5.7.4 Examination:

Contractor shall provide a minimum 24 hours notice to SLRWD's representative for the following conditions:

- a. after final surface preparation is completed
- b. after each coating layer is applied

Installation of the protective coating shall not commence until the concrete substrate has properly cured in accordance with these specifications.

Temperature of the surface to be coated should be maintained between 60°F and 100°F during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, care should be taken to apply the coating when the temperature is fall versus rising (i.e., late afternoon into evening vs. morning into afternoon).

5.7.5 Surface Preparation:

Applicator shall inspect all surfaces specified to receive a protective coating prior to surface preparation. The existing piping, valves, and appurtenances shall be protected during structural rehabilitation and protective coating application.

The pipes and connectors are to be top coated with 30-50 mils DFT nominal. The pipes and connectors are to be primed by the fabricator with epoxy primer (not cold tar or asphaltic base) that is compatible with the protective coating. After installation, the pipes are to be pressure washed using a minimum 5,000 psi and 4 gpm washer and/or abrasive blast cleaned to an SSPC-SP7 'brush-off' specification as necessary for the window of overcoating of the primer.

All contaminants including: oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.

All concrete or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface or replaced.

Surfaces to receive protective coating shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide a strong bond between the protective coating and the substrate. At a minimum, this will be achieved with a low pressure water cleaning equipment using a 0 degree rotating nozzle at a minimum 3,500 psi and 4 gpm. Other methods such as high pressure water jetting (refer to NACE Standard No. 6 / SSPC-SP 13), abrasive blasting, shotblasting, grinding scarifying and/or acid etching may also be used. In addition, detergent water cleaning and hot water blasting may be necessary to remove oils, grease or other hydrocarbon residues from the concrete. The method(s) used shall be performed in a manner that provides a uniform, sound clean, neutralized surface that is not excessively damaged.

5.7.6 Application:

Application procedures shall conform to the recommendations of the protective coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.

The equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order.

The protective coating material must be applied by a Certified applicator of the protective coating manufacturer.

Application equipment approved by the coating manufacturer shall be used to apply each coat of the protective coating.

If necessary, subsequent topcoating or additional coats of the protective coating should occur as soon as the basecoat becomes tack free, ideally within 12 hours but no later than the recoat window for the specified products. Additional surface preparation procedures will be required if this recoat window is exceeded.

5.7.7 Testing and Inspection:

During application a wet film thickness gage meeting ASTM D4414 – Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to ensure a uniform thickness during application.

After the protective coating has set hard to the touch it shall be inspected with high-voltage holiday detection equipment meeting ASTM D4787 – Standard Practice for Continuity Verification of Liquid or Sheet Depth Applied to Concrete Substrates. The spark tester shall be initially set a 100 volts per 1 mil (25) microns) of film thickness applied. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch-up/repair procedures, for areas that do not meet the specified thickness, shall follow the protective coating manufacturer's recommendations.

The NACE Certified Coatings Inspector must be present and monitor the holiday testing (and repairs, if necessary). The final inspection report is to include the holiday testing results.

A final visual inspection shall be made by the Inspector and manufacturer's representative. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by Applicator.

5.8 SIMPLEX GRINDER PUMP STATION

5.8.1 General:

The contractor shall provide labor, material, equipment, and incidentals required to provide centrifugal grinder pumps as specified herein. The pump models covered in this specification are single phase grinder pumps.

Sanitary setbacks shall meet all Local, State, and Federal regulations.

The top of individual grinder pump stations shall be a minimum of 0.2 feet above the 100 year flood elevation, and shall not be placed in an area susceptible to standing water.

- a. Private Wells: All individual grinder pump stations shall be no closer than 50 feet from private wells. When the 50 foot separation cannot be met the maximum separation shall be the maximum distance that can be obtained on the property but in no case shall the separation distance be less than the distance from the private well to the existing septic system.

- b. Transient or Non-Transient/Non-Community Wells: All individual grinder pump stations shall be no closer than 100 feet to transient or non-transient/non-community well

A transient well is considered to be a well which serves a church, campground, restaurant, or has more than 15 connection for more than 60 days or serves 25 or more people for more than 60 days. A non-transient/non-community well is considered to be a well which serves a factory, daycare, school or has 15 or more connections for 6 months or serves 25 or more people for 6 months.

- c. Community Well: All individual grinder pump stations shall be no closer than 200 feet from community wells.

A community well is considered to be a well that serves 15 or more connections year-round.

- d. Grinder Pump Stations shall not be located closer than 10 feet from water lines or bodies of water.

5.8.2 Individual Grinder Pump Stations:

Individual grinder pump stations shall, whenever possible, provide service to two (2) single family dwellings or two (2) equivalent dwelling units provided they are residential/non-commercial. No more than two (2) single family dwellings shall be connected to a simplex grinder pump station.

Non-residential connections shall be to a duplex grinder pump station.

5.8.3 Operating Conditions:

Each submersible pump shall be rated at 2 hp, 240 volts, single phase, 60 Hz. 3450 RPM. The unit shall produce 25 G.P.M. minimum at 82 feet of total dynamic head.

The grinder pump shall be capable of handling residential sewage with 3" solids and grinding it to a fine slurry enabling it to be pumped over long distances in pipelines as small as 1.25" in diameter. The grinder pump shall have a shut-off head of 110 feet and a maximum flow of 50 GPM @ 10 feet of total dynamic head.

Alternately, the system shall be capable running a higher head submersible pump that has a shut-off head of 190 feet and a minimum flow of 10GPM @ 150 feet of total dynamic head.

The pump shall be controlled with:

- a. A NEMA 4X simplex control panel with three float switches and a high water alarm.
- b. Alternately, A shared panel may be used, whereby the panel has two incoming power supplies, and alternates power sources for each pumping cycle.

5.8.4 Construction:

Each centrifugal grinder pump shall be equal to the  certified Series LSG Grinder pumps as manufactured by Liberty Pumps, Bergen NY. Castings shall be constructed of class 25 cast iron. The

motor housing shall be oil filled to dissipate heat. Air filled motors shall not be considered equal since they do not properly dissipate heat from the motor. All mating parts shall be machined and sealed with a Buna-N o-ring. All fasteners exposed to the liquid shall be stainless steel. The motor shall be protected on the top side with sealed cord entry plate with molded pins to conduct electricity eliminating the ability of water to enter internally through the cord. The motor shall be protected on the lower side with a dual seal arrangement. The first seal is a double lip seal molded in FKM fluoroelastomer or Buna N.

The second / main seal shall be a unitized hard face silicon carbide seal with stainless steel housings and spring.

The upper and lower bearing shall be capable of handling all radial thrust loads. The lower bearing shall have the additional ability to handle the downward axial thrust produced by the impeller and cutters by design of angular contact roller races. The pump housing shall be of the concentric design thereby equalizing the pressure forces inside the housing which will extend the service life of the seals and bearings. Additionally there shall be no cutwater in the housing volute in order to discourage the entrapment of flowing debris. The pump shall be furnished with stainless steel handle having a nitrile grip.

5.8.5 Electrical Power Cord

The submersible pump shall be supplied with 25 feet of multiconductor power cord. It shall be cord type SJOOW (1-phase), capable of continued exposure to the pumped liquid. The power cord shall be sized for the rated full load amps of the pump in accordance with the National Electric Code. The power cable shall not enter the motor housing directly but will conduct electricity to the motor by means of a water tight compression fitting cord plate assembly, with molded pins to conduct electricity. This will eliminate the ability of water to enter internally through the cord, by means of a damaged or wicking cord.

5.8.6 Motors

Single phase motors shall be oil filled, capacitor start / capacitor run, class B insulated NEMA B design, rated for continuous duty. At maximum load the winding temperature shall not exceed 135 degrees C unsubsmerged. Since air filled motors are not capable of dissipating heat they shall not be considered equal. The pump motor shall have an integral thermal overload switch in the windings for protecting the motor. The capacitor circuit shall be mounted internally in the pump. Single phase motors shall have an integral solid state starting circuit switch for switching the start winding off.

5.8.7 Bearings And Shaft

An upper radial and lower thrust bearing shall be required. The upper bearing shall be a single ball / race type bearing. The lower bearing shall be an angular contact heavy duty ball / race type bearing, designed to handle axial grinder pump thrust loads. Both bearings shall be permanently lubricated by the oil, which fills the motor housing. The bearing system shall be designed to enable proper cutter alignment from shut off head to maximum load at 10' of TDH. The motor shaft shall be made of 300 or 400 series stainless steel and have a minimum diameter of 0.670".

5.8.8 Seals

The pump shall have a dual seal arrangement consisting of a lower and upper seal to protect the motor from the pumping liquid. The lower seal shall be a FKM fluoroelastomer OR Buna N molded double lip seal, designed to exclude foreign material away from the main upper seal. The upper seal shall be a unitized silicon carbide hard face seal with stainless steel housings and spring equal to Crane Type T-6a. The motor plate / housing interface shall be sealed with a Buna-N o-ring.

5.8.9 Impeller

The impeller shall be a investment cast stainless steel impeller, with pump out vanes on the back shroud to keep debris away from the seal area. It shall be keyed and bolted to the motor shaft.

5.8.10 Cutter Mechanism

The cutter and plate shall consist of 440 stainless steel with a Rockwell C hardness of 55-60. The Stationary cutter plate shall have specially designed orifices through it, which enable the slurry to flow through the pump housing at an equalized pressure and velocity. The Stationary cutter shall consist of V shapes to maximize cutting action and arc shape exclusion slots to outwardly eject debris from under the rotary cutter. The rotary cutter shall be designed with a recessed area behind the cutting edge to prevent the accumulation and binding of any material between rotary cutter and the stationary cutter. Cutter designs incorporate close tolerance and those that grind on the outside circumference of the rotary cutter shall not be considered equal.

5.8.11 Controls

a. Single Phase Simplex Control Panel

i. General

Contractor shall furnish all labor, materials, equipment and incidentals required to provide a simplex motor control panel as specified herein.

The motor control panel shall be assembled and tested by a controls system manufacturer meeting the Standards of UL 508A for industrial controls and be UL labeled and serialized accordingly. The motor control panel shall be assembled and tested by the manufacturer so as to insure suitability in matching controls to motors and to insure single source responsibility for the equipment.

The panel shall contain all components required by the pump manufacturer for starting and protecting the motor as well as features required by the pump manufacturer for warranty of the pumps. Items such as thermal overload detection or seal failure detection shall be included when required.

Incoming pump power shall be single-phase, 60 Hz, 240 volts AC.

Incoming control/alarm power shall be single-phase, 60 Hz, 120 volts AC.

The control panel shall incorporate three (3) normally open, mechanically-activated control switches with pipe clamps. Floats shall be labeled in the panel as stop, start, and alarm. Floats shall be non-mercury, contact activated type.

Controls shall provide a three-way selector switch for ON-OFF-AUTOMATIC mode. ON turns the pump on, regardless of the liquid level in the basin; OFF turns the pump off, regardless of the liquid level in the basin; and AUTOMATIC operates the pump in conjunction with the floats within the basin.

1. In Automatic Mode

- A. The pump Starts and Stops on rise or fall of water level.
- B. Activate the alarm light and sound horn in the event the water continues to rise.

2. The pump and alarm circuit shall be controlled by a direct acting three (3) float system.

- A. The bottom float energizes the Automatic Control circuit on its rise, and de-energizes the circuit turning off the pump on its fall.
- B. The second float starts the pump on its rise.
- C. The third float activates the Alarm Light & Horn.

b. Panel Construction

The controls for the pump shall be housed in a NEMA 4X enclosure with a hinged door and neoprene gasket. The enclosure shall have provisions for a padlock.

The panel shall be furnished with an secondary swing out inner door which allows access to only the breaker and on-off-auto switch when the outer door is opened. The secondary door must be opened to service all other control components.

A nameplate shall be permanently affixed to the panel. A ratings label shall include the model number, voltage, phase, frequency, ampere rating and horsepower rating and shall be affixed to the inside of the enclosure. A warning label against electric shock shall be permanently affixed to the outer door and shall include a note that the disconnect breakers are located under this (outer) door. The interior of the enclosure shall have a clear envelope with "as built" schematics located within.

All power shall be disconnected without requiring the inner door to be opened.

A removable back plate shall be provided for mounting all circuit breakers, motor starters, etc. All components mounted to the back plate shall be secured by type 25, self-tapping screws in extruded holes. Rivets shall not be acceptable for securing any component to the back plate.

A simplex pump controller shall be provided for control logic. There shall be no electronic boards for control circuitry. The simplex pump control shall be by mechanically controlled circuitry. A circuit breaker shall be used for the control circuit. The control circuit breaker shall extend through the inner door. A green run light and an "on-off-auto" switch shall be provided for the pump circuit. The run light and "on-off-auto" switch shall be mounted on the outside of the inner door. A blue LED light connected to the control power supply shall be mounted on the outside of the outer door of the panel. A permanent sign shall be mounted below the blue light with the words **"If light is NOT on, Call for Service, 260-665-9865"** in lettering a minimum of one-half inch (1/2") in height.

A circuit breaker shall be used as branch circuit protection for the pump. The circuit breaker shall be thermal magnetic and sized to meet NEC requirements for interrupt capacity and amp rating.

The magnetic motor starter shall be general purpose type rated for the pump horsepower and include a contactor with a minimum mechanical life of 500,000 operations and a minimum contact life of 100,000 operations. Pump overloads, if not included in the pump, shall provide overload protection for the pump circuit and shall be sized to meet NEC requirements for the pump full load ampere rating specified.

A high-level alarm condition shall activate the main alarm light (red, mounted on the top of the panel) and alarm horn. The alarm light shall remain illuminated until the problem is corrected. The alarm horn shall be rated 83-85 dB minimum. A Test-Normal-Silence toggle switch labeled and placed adjacent to the horn, shall be included.

Wire ties shall be used to maintain panel wiring in neat bundles for maintenance and to prevent interference with operating devices. All grounding conductors shall be securely connected to assure a proper ground.

Mount control box within an unobstructed view of the grinder pump station at least three feet (3') above grade (but not more than five feet (5') above grade). Mount on treated 4" x 4" post with a minimum of three (3) feet of post imbedded in ground and a minimum of three (3) feet of unobstructed space in front of the control panel.

All work must be in accordance with 327 IAC 3-6-24, the National Electric Code and all state and local codes and requirements.

c. Dual Power Control Panel Specifications - Single Phase

i. General

Contractor shall furnish all labor, materials, equipment and incidentals required to provide a dual power motor control panel as specified herein.

The motor control panel shall be assembled and tested by a controls system manufacturer (SPI – Septic Products Inc. or pre-approved equal) meeting the Standards of UL 508A for industrial controls and be UL labeled and serialized accordingly. The motor control panel shall be assembled and tested by the manufacturer so as to insure suitability in matching controls to motors and to insure single source responsibility for the equipment.

The panel shall contain all components required by the pump manufacturer for starting and protecting the motor as well as features required by the pump manufacturer for warranty of the pump.

Incoming pump powers shall be single-phase, 60 Hz, 240 volts AC with Neutral.

The control shall alternate power supply except when power is not detected from one source, then power shall be from available source.

The control panel shall incorporate three (3), normally open, mechanically activated control switches with weights. Floats shall be labeled in the panel as stop, start, and alarm. Floats shall be non-mercury, contact activated type.

1. In Automatic Mode

A. The pump Starts and Stops on rise or fall of water level.

B. Activate the alarm light and sound horn in the event the water continues to rise.

2. The pump and alarm circuit shall be controlled by a direct acting three (3) float system.

A. The bottom float energizes the Automatic Control circuit on its rise, and de-energizes the circuit turning off the pump on its fall.

B. The second float starts the pump on its rise.

C. The third float activates the Alarm Light & Horn.

ii. Panel Construction

The controls for the pump shall be housed in a NEMA 4X enclosure with a hinged door and neoprene gasket. The enclosure shall have provisions for a padlock.

The panel shall be furnished with an secondary swing out inner door which allows access to only the breaker and on-off-auto switch when the outer door is opened. The secondary door must be opened to service all other control components.

A nameplate shall be permanently affixed to the panel. A ratings label shall include the model number, voltage, phase, frequency, ampere rating and horsepower rating and shall be affixed to the inside of the enclosure. A warning label against electric shock shall be permanently affixed to the outer door and shall include a note that the disconnect breakers are located under this (outer) door. A warning label shall be affixed to the inner door stating "the panel is powered by two separate sources, shut off power from both sources before servicing". The interior of the enclosure shall have a clear envelope with "as built" schematics located within.

All power shall be disconnected without requiring the inner door to be opened.

A removable back plate shall be provided for mounting all circuit breakers, motor starters, etc. All components mounted to the back plate shall be secured by type 25, self-tapping screws in extruded holes. Rivets shall not be acceptable for securing any component to the back plate.

The dual power pump controller shall be composed of mechanically controlled circuitry. There shall be no electronic boards for control circuitry. A circuit breaker shall be used for

the control circuit. The control circuit breaker shall extend through the inner door. A green run light and an "on-off-auto" switch shall be provided for each pump circuit. The run light and "on-off-auto" switch shall be mounted on the outside of the inner door. A blue LED light connected to the control power supply shall be mounted on the outside of the outer door of the panel. A permanent sign shall be mounted below the blue light with the words **"If light is NOT on, Call for Service, 260-665-9865"** in lettering a minimum of one-half inch (1/2") in height.

Circuit breakers shall be used as branch circuit protection for the pump. Circuit breakers shall be thermal magnetic and sized to meet NEC requirements for interrupt capacity and amp rating.

The magnetic motor starters shall be IEC type rated for the pump horsepower and include a contactor with a minimum mechanical life of 500,000 operations and a minimum contact life of 100,000 operations.

A high-level alarm condition shall activate the main alarm light (red, mounted on the top of the panel) and alarm horn. The alarm light shall remain illuminated until the problem is corrected. The alarm horn shall be rated 83-85 dB minimum. A Test-Normal-Silence toggle switch labeled and placed adjacent to the horn, shall be included.

Wire ties shall be used to maintain panel wiring in neat bundles for maintenance and to prevent interference with operating devices. All grounding conductors shall be securely connected to assure a proper ground.

The alternator shall consist of an alternating circuit which alternately switches house power and neutrals upon the next pumping cycle. The alternation circuitry shall be integrated into the pump controller.

Green House power indicators shall be mounted on the side of enclosure.

Mount control box within an unobstructed view of the grinder pump station at least three feet (3') above grade (but not more than five feet (5') above grade). Mount on treated 4" x 4" post with a minimum of three (3) feet of post imbedded in ground and a minimum of three (3) feet of unobstructed space in front of the control panel.

All work must be in accordance with 327 IAC 3-6-24, the National Electric Code and all state and local codes and requirements.

5.8.12 Paint

The exterior of the pump casting shall be protected with Powder Coat paint.

5.8.13 Support

The pump shall have cast iron support legs, enabling it to be a free standing unit. The legs will be high enough to allow solids and long stringy debris to enter the cutter assembly.

5.8.14 Serviceability

Components required for the repair of the pump shall be shipped within a period of 24 hours.

5.8.15 Assembled Tank Systems With Guide Rail And Quick Disconnect Discharge

Mounted guide rail system with pump shall be suspended by means of stainless steel bolt on quick disconnect which is sealed by means of nitrile grommets. The disconnect system shall have an internal ball check. The Discharge piping shall be schedule 80 PVC and furnished with a PVC shut-off ball valve. The Tank shall be wound fiberglass. A rubber inlet hub shall be provided with the fiberglass systems.

The Tank System Shall Include the following:

- a. Stainless steel Guide Rail attached to a stainless steel T-Bar Hanger
- b. 30" diameter basin size

- c. 96", 120", or 144" height basin size
- d. 60" distance from top of tank to top of discharge pipe outlet
- e. Fiberglass cover
- f. Simplex Control Panel System with Outdoor panel and alarm
or Shared Control Panel System with Outdoor panel and alarm

5.8.16 Testing

The pump shall have a ground continuity check and the motor chamber shall be Hi-potted to test for electrical integrity, moisture content and insulation defects. The motor and volute housing shall be pressurized, and an air leak decay test is performed to ensure integrity of the motor housing. The pump shall be run, voltage current monitored, and the tester checks for noise or other malfunction.

A start up report for each pump shall be provided and include serial numbers and testing technician's name.

5.8.17 Quality Control

The pump shall be manufactured in an ISO 9001 certified Facility.

5.8.18 Warranty

The warranty shall be for all workmanship and materials for a period of two (2) years from the date of start up.

5.9 DUPLEX GRINDER PUMP STATION

5.9.1 General:

The contractor shall provide labor, material, equipment, and incidentals required to provide centrifugal grinder pumps as specified herein. The pump models covered in this specification are single phase grinder pumps.

Sanitary setbacks shall meet all Local, State, and Federal regulations.

The top of individual grinder pump stations shall be a minimum of 0.2 feet above the 100 year flood elevation, and shall not be placed in an area susceptible to standing water.

a. Private Wells: All individual grinder pump stations shall be no closer than 50 feet from private wells. When the 50 foot separation cannot be met the maximum separation shall be the maximum distance that can be obtained on the property but in no case shall the separation distance be less than the distance from the private well to the existing septic system.

b. Transient or Non-Transient/Non-Community Wells: All individual grinder pump stations shall be no closer than 100 feet to transient or non-transient/non-community well

A transient well is considered to be a well which serves a church, campground, restaurant, or has more than 15 connection for more than 60 days or serves 25 or more people for more than 60 days. A non-transient/non-community well is considered to be a well which serves a factory, daycare, school or has 15 or more connections for 6 months or serves 25 or more people for 6 months.

c. Community Well: All individual grinder pump stations shall be no closer than 200 feet from community wells.

A community well is considered to be a well that serves 15 or more connections year-round.

Grinder Pump Stations shall not be located closer than 10 feet from water lines or bodies of water.

5.9.2 Individual Grinder Pump Stations:

Individual grinder pump stations shall, whenever possible, provide service to two (2) single family dwellings or two (2) equivalent dwelling units provided they are residential/non-commercial. No more than two (2) single family dwellings shall be connected to a simplex grinder pump station.

Non-residential connections shall be to a duplex grinder pump station.

5.9.3 Operating Conditions:

Each submersible pump shall be rated at 2 hp, 240 volts, single phase, 60 Hz. 3450 RPM. The unit shall produce 25 G.P.M. minimum at 82 feet of total dynamic head.


The grinder pump shall be capable of handling residential sewage with 3" solids and grinding it to a fine slurry enabling it to be pumped over long distances in pipelines as small as 1.25" in diameter. The grinder pump shall have a shut-off head of 110 feet and a maximum flow of 50 GPM @ 10 feet of total dynamic head.

Alternately, the system shall be capable running a higher head submersible pump that has a shut-off head of 190 feet and a minimum flow of 10GPM @ 150 feet of total dynamic head.

The pump shall be controlled with:

A NEMA 4X outdoor duplex control panel with three float switches and a high water alarm.

5.9.4 Construction:

Each centrifugal grinder pump shall be equal to the  certified Series LSG Grinder pumps as manufactured by Liberty Pumps, Bergen NY. The castings shall be constructed of class 25 cast iron. The motor housing shall be oil filled to dissipate heat. Air filled motors shall not be considered equal since they do not properly dissipate heat from the motor. All mating parts shall be machined and

sealed with a Buna-N o-ring. All fasteners exposed to the liquid shall be stainless steel. The motor shall be protected on the top side with sealed cord entry plate with molded pins to conduct electricity eliminating the ability of water to enter internally through the cord. The motor shall be protected on the lower side with a dual seal arrangement. The first seal is a double lip seal molded in FKM fluoroelastomer or Buna N.

The second / main seal shall be a unitized hard face silicon carbide seal with stainless steel housings and spring.

The upper and lower bearing shall be capable of handling all radial thrust loads. The lower bearing shall have the additional ability to handle the downward axial thrust produced by the impeller and cutters by design of angular contact roller races. The pump housing shall be of the concentric design thereby equalizing the pressure forces inside the housing which will extend the service life of the seals and bearings. Additionally there shall be no cutwater in the housing volute in order to discourage the entrapment of flowing debris. The pump shall be furnished with stainless steel handle having a nitrile grip.

5.9.5 Electrical Power Cord

The submersible pump shall be supplied with 25 feet of multiconductor power cord. It shall be cord type SJOOW (1-phase), capable of continued exposure to the pumped liquid. The power cord shall be sized for the rated full load amps of the pump in accordance with the National Electric Code. The power cable shall not enter the motor housing directly but will conduct electricity to the motor by means of a water tight compression fitting cord plate assembly, with molded pins to conduct electricity. This will eliminate the ability of water to enter internally through the cord, by means of a damaged or wicking cord.

5.9.6 Motors

Single phase motors shall be oil filled, capacitor start / capacitor run, class B insulated NEMA B design, rated for continuous duty. Three phase motors shall be oil filled, class B insulated NEMA B design, rated for continuous duty. At maximum load the winding temperature shall not exceed 135 degrees C unsumerged. Since air filled motors are not capable of dissipating heat they shall not be considered equal. The pump motor shall have an integral thermal overload switch in the windings for protecting the motor. The capacitor circuit shall be mounted internally in the pump. Single phase motors shall have an integral solid state starting circuit switch for switching the start winding off.

5.9.7 Bearings And Shaft

An upper radial and lower thrust bearing shall be required. The upper bearing shall be a single ball / race type bearing. The lower bearing shall be an angular contact heavy duty ball / race type bearing, designed to handle axial grinder pump thrust loads. Both bearings shall be permanently lubricated by the oil, which fills the motor housing. The bearing system shall be designed to enable proper cutter alignment from shut off head to maximum load at 10 ' of TDH. The motor shaft shall be made of 300 or 400 series stainless steel and have a minimum diameter of .670".

5.9.8 Seals

The pump shall have a dual seal arrangement consisting of a lower and upper seal to protect the motor from the pumping liquid. The lower seal shall be a FKM fluoroelastomer OR Buna N molded double lip seal, designed to exclude foreign material away from the main upper seal. The upper seal shall be a unitized silicon carbide hard face seal with stainless steel housings and spring equal to Crane Type T-6a. The motor plate / housing interface shall be sealed with a Buna-N o-ring.

5.9.9 Impeller

The impeller shall be a investment cast stainless steel impeller, with pump out vanes on the back shroud to keep debris away from the seal area. it shall be keyed and bolted to the motor shaft.

5.9.10 Cutter Mechanism

The cutter and plate shall consist of 440 stainless steel with a Rockwell C hardness of 55-60. The Stationary cutter plate shall have specially designed orifices through it, which enable the slurry to flow

through the pump housing at an equalized pressure and velocity. The Stationary cutter shall consist of V shapes to maximize cutting action and arc shape exclusion slots to outwardly eject debris from under the rotary cutter. The rotary cutter shall be designed with a recessed area behind the cutting edge to prevent the accumulation and binding of any material between rotary cutter and the stationary cutter. Cutter designs incorporate close tolerance and those that grind on the outside circumference of the rotary cutter shall not be considered equal.

5.9.11 Controls

a. Single Phase Duplex Control Panel

i. General

Contractor shall furnish all labor, materials, equipment and incidentals required to provide a duplex motor control panel as specified herein.

The motor control panel shall be assembled and tested by a controls system manufacturer meeting the Standards of UL 508A for industrial controls and be UL labeled and serialized accordingly. The motor control panel shall be assembled and tested by the manufacturer so as to insure suitability in matching controls to motors and to insure single source responsibility for the equipment.

The panel shall contain all components required by the pump manufacturer for starting and protecting the motor as well as features required by the pump manufacturer for warranty of the pumps. Items such as thermal overload detection or seal failure detection shall be included when required.

Incoming pump power shall be single-phase, 60 Hz, 240 volts AC.

Incoming control/alarm power shall be single-phase, 60 Hz, 120 volts AC.

The control panel shall incorporate three (3), normally open, mechanically-activated control switches with pipe clamps. Floats shall be labeled in the panel as stop, lead, lag/alarm. Floats shall be non-mercury, contact activated type.

Controls shall provide a three-way selector switch for ON-OFF-AUTOMATIC mode. ON turns the pump on, regardless of the liquid level in the basin; OFF turns the pump off, regardless of the liquid level in the basin; and AUTOMATIC operates the pump in conjunction with the floats within the basin.

1. In Automatic Mode

- A. The pump Starts and Stops on rise or fall of water level.
- B. Alternate running of pumps.
- C. Activate the alarm light and sound horn in the event the water continues to rise and start second pump.

2. The pump and alarm circuit shall be controlled by a direct acting three (3) float system.

- A. The bottom float energizes the Automatic Control circuit on its rise, and de-energizes the circuit turning off the pump on its fall.
- B. The second float starts the pump on its rise.
- C. The third float activates the Alarm Light & Horn and starts second pump.

ii. Panel Construction

The controls for the pump shall be housed in a NEMA 4X enclosure with a hinged door and neoprene gasket. The enclosure shall have provisions for a padlock.

The panel shall be furnished with an secondary swing out inner door which allows access to only the breaker and on-off-auto switch when the outer door is opened. The secondary door must be opened to service all other control components.

There shall be an hour meter and cycle counter for each pump.

A nameplate shall be permanently affixed to the panel. A ratings label shall include the model number, voltage, phase, frequency, ampere rating and horsepower rating and shall be affixed to the inside of the enclosure. A warning label against electric shock shall be permanently affixed to the outer door and shall include a note that the disconnect breakers are located under this (outer) door. The interior of the enclosure shall have a clear envelope with "as built" schematics located within.

All power shall be disconnected without requiring the inner door to be opened.

A removable back plate shall be provided for mounting all circuit breakers, motor starters, etc. All components mounted to the back plate shall be secured by type 25, self-tapping screws in extruded holes. Rivets shall not be acceptable for securing any component to the backplate.

The duplex pump controller shall be composed of mechanically controlled circuitry. There shall be no electronic boards for control circuitry. A green run light and an "on-off-auto" switch shall be provided for the pump circuit. The run light and "on-off-auto" switch shall be mounted on the outside of the inner door. A blue LED light connected to the control power supply shall be mounted on the outside of the outer door of the panel. A permanent sign shall be mounted below the blue light with the words "If light is NOT on, Call for Service, 260-665-9865" in lettering a minimum of one-half inch (1/2") in height

Circuit breakers shall be used as branch circuit protection for each pump. Circuit breakers shall be thermal magnetic and sized to meet NEC requirements for interrupt capacity and amp rating.

The magnetic motor starters shall be general purpose type rated for the pump horsepower and include a contactor with a minimum mechanical life of 500,000 operations and a minimum contact life of 100,000 operations. Pump overloads, if not included in the pump, shall provide overload protection for the pump circuit and shall be sized to meet NEC requirements for the pump full load ampere rating specified.

A high-level alarm condition shall activate the main alarm light (red, mounted on the top of the panel) and alarm horn. The alarm light shall remain illuminated until the problem is corrected. The alarm horn shall be rated 85 dB minimum. A Test-Normal-Silence toggle switch labeled and placed adjacent to the horn, shall be included.

Wire ties shall be used to maintain panel wiring in neat bundles for maintenance and to prevent interference with operating devices. All grounding conductors shall be securely connected to assure a proper ground.

The alternator shall consist of an alternating circuit which alternately switches pumps upon the next pumping cycle. The alternation circuitry shall be integrated into the pump controller.

5.9.12 Paint

The exterior of the casting shall be protected with Powder Coat paint.

5.9.13 Support

The pump shall have cast iron support legs, enabling it to be a free standing unit. The legs will be high enough to allow solids and long stringy debris to enter the cutter assembly.

5.9.14 Serviceability

Components required for the repair of the pump shall be shipped within a period of 24 hours.

5.9.15 Factory Assembled Tank Systems With Guide Rail And Quick Disconnect Discharge

Mounted guide rail system with pump suspended by means of bolt on quick disconnect which is sealed by means of nitrile grommets. The disconnect system shall have an internal ball check. The Discharge piping shall be schedule 80 PVC and furnished with a PVC shut-off ball valve. The Tank shall be wound fiberglass. A rubber inlet hub shall be provided with the fiberglass systems.

The Tank System Shall Include the following:

- a. Stainless steel Guide Rail
- b. Stainless steel float mounting system
- c. 36 "diameter of basin size
- d. 96", 120", or 144" height of basin size
- e. 60 "distance from top of tank to discharge pipe outlet
- f. Fiberglass cover
- g. Duplex Control Panel System with Outdoor panel and alarm

5.9.16 Testing

The pump shall have a ground continuity check and the motor chamber shall be Hi-potted to test for electrical integrity, moisture content and insulation defects. The motor and volute housing shall be pressurized, and an air leak decay test is performed to ensure integrity of the motor housing. The pump shall be run, voltage current monitored, and the tester checks for noise or other malfunction.

A start up report for each pump shall be provided and include serial numbers and testing technician's name.

5.9.17 Quality Control

The pump shall be manufactured in an ISO 9001 certified Facility.

5.9.18 Warranty

The warranty shall be for all workmanship and materials for a period of two (2) years from the date of start up.

5.10. SUBMERSIBLE PUMP STATIONS

5.10.1 General:

The sewage pump stations shall be constructed at the location and grade as shown on the drawings.

The Contractor shall furnish all materials, labor, equipment, and services for the complete installation of sewage pump stations complete with all appurtenances, electrical connections, and controls to make ready for continuous operation.

Unless otherwise noted, all materials and equipment supplied under this Section shall be new, of good quality, and in good condition.

Each pump station shall include any necessary bypass pumping, earth excavation, rock removal, backfill, granular material and stone, sheeting, bracing, shoring, disposal of excess materials, surface restoration, and all concrete reinforcing steel, masonry work, steps, frame and cover, pipe and fittings, and all other materials and operations necessary to complete the pump stations as set out in the specifications and plans.

5.10.2 Submittals:

a. Shop Drawings:

Provide the Engineer with copies of the shop drawings (number of copies and format set forth elsewhere in these specifications).

The following data shall be included for each pump station submittal.

- i. Performance Charts
- ii. Pump Outline Drawing
- iii. Station Drawing for Accessories
- iv. Detailed Electrical Data
- v. Control Drawing and Data
- vi. Elevation drawings showing dimensional information and conduit routing locations
- vii. Access Frame Drawing
- viii. Typical Installation Guides
- ix. Technical Manuals
- x. Parts List
- xi. Printed Warranty
- xii. Manufacture's Equipment Storage Recommendations
- xiii. Manufacture's Standard Recommended Start-Up Report Form
- xiv. Motor Performance Curve
- xv. Equipment outline drawings showing elevation, plan and interior views, front panel arrangement, dimensions, weight, shipping splits, conduit entrances and anchor bolt pattern. Indicate all options, special features, ratings, and deviations from the specifications.
- xvi. Power and control schematics including external connections. Show wire and terminal numbers and color coding. External connections shall be labeled. Include reference schematic line numbers.
- xvii. VFD performance specifications and publications.
- xviii. The specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specification are identified, the supplier shall be bound by the specification.

xix. Harmonic filtering. The manufacturer shall, with the aid of the buyer's electrical power single line diagram, providing the data required by IEEE-519, perform an analysis to initially demonstrate the supplied equipment will meet the IEEE standards after installation. If, as a result of analysis, it is determined that additional filter equipment is required to meet the IEEE recommendations, then the cost of such equipment shall be included in the bid. A harmonic analysis shall be submitted with the approval drawings to verify compliance with the latest version of IEEE-519 voltage and current distortion limits as shown in 10.2 and 10.3 at a point of common coupling (PCC). The PCC shall be defined as the consumer-utility interface or primary side of the main distribution transformer.

b. Operation and Maintenance Manuals:

The Contractor shall provide SLRWD with three (3) copies of a standard operation and maintenance manual for each pump station.

The instructions shall be bound and shall provide at least the following as minimum:

- i. A comprehensive index.
- ii. A complete As-Built set of approved shop drawings.
- iii. Detailed service, maintenance and operation instructions for each item supplied.
- iv. A table listing the "as left" drive set up parameters and alarm and trip settings.
- v. The operating instructions shall also incorporate a functional description of the entire system, with references to the systems schematic drawings and instructions.
- vi. Complete parts list with stock numbers, including spare parts.

5.10.3 Wet Well, Valve Vault, and Meter Pit:

The pump station wet well and valve vault shall be precast reinforced concrete sections conforming to ASTM C-478 placed on a dry compacted subgrade with a leveling course and have flat slab reinforced concrete tops. The structures shall be of the size and depth as shown on the drawings.

The joints of the structures shall be sealed with rubber gaskets conforming to ASTM C-443.

Joint between sewer pipe and structure wall shall be sealed with a rubber gasket conforming to ASTM-923.

Fastening hardware used inside structures shall be stainless steel.

Drains from the valve pits shall discharge back to the wet well.

The interior of all concrete structures shall be coated with a corrosion protective material as specified elsewhere after all jointing compound has cured. Concrete treated with Conshield Additive may be substituted for the coating material if the treatment is shown to be as effective as the coating material and is pre-approved by the SLRWD.

a. Access Hatches:

Aluminum hatches shall be furnished and installed for both wet well and valve vault with a live load capacity of 300 pounds per square foot. The material shall be Aluminum Alloy 6063-T5 and T6 1/4" (inch) tread plate, flush type lock with inside spoon handle.

The frame shall be complete with hinged and hasp-equipped cover, upper guide holders, chain holders, drain hole, and stainless steel cable holder. Frame shall be securely mounted directly above the pumps or valves. The door(s) shall be torsion bar loaded for ease of lifting and shall have safety locking handle in open position.

The wet well shall be provided with a two (2) door hatch. The hatches shall be sized to allow for easy pump installation and removal, but shall have a minimum 48" x 30" (inch) clear opening.

The valve vault and meter pit shall be provided with a single door hatch.

b. Guide Rails:

Guide rails for each pump shall be installed to permit raising and lowering of the pumps. The guide rails shall be 316 stainless steel and of adequate length and strength to extend from the lower guide holders on the pump discharge connection to the upper stainless steel guide holder mounted on the access frame. Guide rails shall be installed plumb with stainless steel intermediate supports and fasteners as required.

c. Wiring Channel:

A wiring channel shall be mounted below the pump well cover for the pumps and shall provide cord grip holders for the pump cords and the control cords.

The channel box shall have a removable cover for easy adjustment of the cords.

All cords shall extend from one end of the box and be taken through conduit in the sump cover to the control panel.

No splices shall be made in the wiring channel. Continuous cords must be used from the control panel to the pumps and controls.

Wiring channel shall mount on supports fastened to access cover frame.

d. Plug Valves:

Plug valves shall be of the non-lubricated, eccentric type with stainless steel plug with acrylonitrile-butadiene coated facing, cast iron bodies, and Class 125 ANSI Flanges. Port areas shall be 100% of full pipe area. Valves shall have permanently lubricated, 316 stainless steel bearings. All valves shall have bolted bonnets designed so they can be repacked without removing the bonnet or actuator, packing should be adjustable.

All valves 8 inches and larger shall be equipped with a gear actuator with handwheel. All gearing shall be enclosed in a semi steel housing and be suitable for running in a lubricant, with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and quadrant shall be supported on permanently lubricated bronze bearings. The actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque.

All exposed nuts, bolts, springs, and washers shall be stainless steel.

All eccentric plug valves less than 8 inches shall be crossbar operated. A mechanical brake shall be provided and capable of locking the valve in any intermediate position between full closed and full open.

e. Check Valves:

Check valves shall be of cushioned swing type and shall meet the materials requirement of AWWA C508. The valve shall be of cast iron body, bronze mounted, single gate for non-shock working pressure of 175 psi and have a 316 stainless steel hinge pin with bronze support bearings. The valve shall be constructed so that the internal working parts may easily be removed and replaced by unbolting and lifting the cover without removing the valve from the line. The valve shall be furnished with an outside lever and spring or outside lever and weight with non-corrosive adjustable air cushion shock chamber. Check valves shall be suitable for mounting in either horizontal or vertical lines when water flows is up. Check valves should close without any hammer action.

f. Flow Meter Equipment:

A Siemens Magnetic Model 3100W flow meter, or approved equal, shall be furnished and installed for the purpose of measuring flow at specific locations as shown on the plans.

All components shall be installed and tested in accordance with the manufacturer's written instructions

The flow meter shall provide an instantaneous flow in gpm and pulse totalizing flow signal for monitoring in the pump control system. Each pulse will equal one hundred (100) gallons. The

instantaneous and totalized flow signals for the discharge header will be indicated and summed in the pump control system to obtain pump station discharge instantaneous flow and pump station discharge total flow.

g. Bypass Valve and Tee:

A tee, valve, quick couple with cap shall be provided in the meter pit.

h. Fasteners:

All fasteners used in structures shall be stainless steel.

5.10.4 Access Drive:

An access drive and parking/service area for each station shall be of size and type as shown on the drawings.

5.10.5 Pumps:

a. General:

Each pump shall be suitable for service in raw, unscreened sewage with 3 inch solids and shall conform to the requirements shown on the Drawings for flow rate, total dynamic head, voltage and phase. Pumps shall be pre-approved by the SLRWD.

b. Qualifications of Manufactures:

The pump manufacturer shall have a minimum of 10,000 heavy-duty submersible wastewater pumps installed and operating for no less than 5 years.

c. Quality Assurance:

The pumps shall be heavy duty, electric submersible, centrifugal non-clog units designed for handling raw, unscreened sewage and wastewater and shall be fully guaranteed for this use. The pumps shall be capable of operating in a liquid temperature up to 104° F. as specified NEMA standards.

The pump and motor unit shall be capable of continuous operation at full nameplate load while the motor is submerged, partially submerged, or totally non-submerged. The use of shower systems, secondary pumps or cooling fans to cool the motor shall not be acceptable.

The pump, mechanical seals, and motor units provided shall be from the same manufacturer.

The pump station shall be completely wired at the factory except for the power feeder lines.

All components and workmanship shall be UL-certified and bear the UL serialized label.

The pump shall be tested at the factory under simulated field conditions for excessive vibration, leaks, and operation of all automatic systems.

The controls shall be adjusted to start and stop the pumps to satisfy field conditions.

For each unit, a pump performance curve shall be produced from the factory testing. Its veracity shall be certified and the curves shall be identifiable by serial numbers of pumps and motors. Manufacturer shall submit size copies of the certified curves to SLRWD. SLRWD will judge adequacy of performance and distribute copies of curves appropriately.

d. Pump Design:

i. Requirements:

Submersible non-clog wastewater pumps shall be installed at each pump station. Pump shall be installed in such a way that solids are fed in an upflow direction to the non-clog impeller with no feet, rails, or other obstructions below the inlet. Pump shall not be intended to handle abrasive materials or sewage containing large amounts of sand, grit, or other stone-like compositions.

Each pump shall be equipped with a close coupled, submersible electric motor connected for operation on the specified voltage with submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards. The power cable shall be of adequate length so not to be in tension.

The pump shall be supplied with mating cast iron discharge connection of the size shown on the plans and be capable of delivering the design flow and total discharge head. The design operating point shall be as near as possible to the best efficiency point of the selected motor. Each pump shall be fitted with a stainless steel (304 S.S.) lifting chain. The chain shall be a minimum of 5-feet longer than the total depth of the wet well. The working load of the lifting station shall be 50% greater than the pump unit weight.

ii. Performance Criteria:

The pumps shall meet the criteria of the design capacity at design head and shall not exceed the specified horsepower.

iii. Design:

The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two parallel guide bars extending from the top of the station to the wet well mounted discharge connection. There shall be no need for personnel to enter the wet-well to remove and replace pumps. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. The entire weight of the pump/motor unit shall be borne by the pump discharge elbow. No portion of the pump/motor unit shall bear on the sump floor directly or on a sump floor mounted stand.

Power and pilot cable supports shall be provided and consist of a stainless steel wire braid sleeve with attachment loops or tails to connection to the under side of the access frame.

e. Pump Construction:

Major pump components shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other casting irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel. All metal surfaces coming into contact with the pumped media, other than stainless steel, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate metal-to-metal contact between machined surfaces. Pump/Motor unit mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Joint sealing will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific bolt torque limit. Rectangular cross sectioned rubber, paper or synthetic gaskets that require specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

f. Cooling System:

Motors shall be sufficiently cooled by the surrounding environment or pumped media.

g. Cable Entry Seal:

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the cable entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

h. Pump Motor

The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air or oil filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180° C (356° F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be specifically designed for submersible pump usage and designed for continuous duty pumping media of up to 40°C (104°F) with an 80°C temperature rise and capable of at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches shall be embedded in the stator end coils to monitor the temperature of each phase winding. The thermal switches shall open at 125° C (260° F), stop the motor, and activate an alarm. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of at least 65 feet.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

The motor shall be able to operate continuously while nonsubmerged without damage while pumping under load.

i. Bearings:

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.

The minimum L10 bearing life shall be 100,000 hours at any point along the usable portion of the pump curve at maximum product speed.

The lower bearing housing shall include an independent thermal sensor to monitor the bearing temperature. If a high temperature occurs, the sensor shall activate an alarm and shut the pump down.

j. Mechanical Seal:

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The lower seal shall be independent of the impeller hub. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating

corrosion resistant tungstencarbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment and shall be capable of operating in either clockwise or counter clockwise direction of rotation without damage or loss of seal. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub is not acceptable. For special applications, other seal face materials shall be available.

Should both seals fail and allow fluid to enter the stator housing, a port shall be provided to direct that fluid immediately to the stator float switch to shut down the pump and activate an alarm. Any intrusion of fluid shall not come into contact with the lower bearings.

The following seal types shall not be considered acceptable or equal to the dual independent seal specified:

- i. Shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces.
- ii. Cartridge type systems will not be acceptable.
- iii. No system requiring a pressure differential to offset pressure and to affect sealing shall be used.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication.

Seal lubricant shall be FDA Approved, nontoxic.

k. Pump Shaft:

Pump and motor shaft shall be a solid continuous shaft. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable.

The pump shaft shall be AISI type 431 stainless steel or shall be of carbon steel ASTM A 572 Grade 50 and be completely isolated from the pumped liquid.

l. Impeller:

The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, multiple vane, double shrouded non-clogging design having long through-lets without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Whenever possible, a full vaned, not vortex, impleer shall be used for maximum hydraulic efficiency to help reduce operating costs. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. Impeller(s) shall be keyed to the shaft, retained with an expansion ring and shall be capable of passing a minimum 3-inch diameter solid. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

m. Wear Rings:

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a Nitrile rubber coated steel or brass ring insert that is drive fitted to the volute inlet.

The pump shall also have a stainless steel impeller wear ring heat-shrink fitted onto the suction inlet of the impeller.

n. Volute:

Pump volute(s) shall be single-piece gray cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum in let and discharge size shall be four (4) inches.

o. Protection:

- i. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125° C (260° F), stop the motor and activate an alarm.
- ii. A leakage sensor shall detect water in the stator chamber. When activated, the sensor shall stop the motor and activate a local and/or remote alarm.
- iii. Use of voltage sensitive solid state sensors and trip temperature switches shall not be acceptable.
- iv. The thermal switches and the leakage sensor shall be connected to a Mini Control and Status (CAS) monitoring unit designed to be mounted in any control panel.

p. Pump Motor Electrical Material:

All materials shall be new and shall conform to the applicable standard or standards where such have been established for the particular material in question.

Materials of the same type shall be the product of one manufacturer.

Publication and Standards of the organizations listed below are applicable to materials specified herein:

- i. American Society for Testing and Materials (A.S.T.M.)
- ii. Underwriters' Lab (U.L.)- Underwriters' Laboratory listed material shall bear U.L. Label.
- iii. National Electrical Manufacturer Association (N.E.M.A.)
- iv. Insulated Power Cable Engineers Association (I.P.C.E.A.)
- v. Institute of Electrical and Electronic Engineers (I.E.E.E.)
- vi. Edison Electrical Institute (E.E.I.)
- vii. National Fire Protection Association (N.F.P.A.)
- viii. American National Standards Institute A.N.S.I.)
- ix. American Iron and Steel Institute (A.I.S.I.)

5.10.6 Pilot Cable:

The pilot cable shall be designed specifically for use with submersible pumps and shall be type SUBCAB (Submersible Cable). The cable shall be shielded, multi-conductor type with a chloroprene outer jacket and the tinned copper conductors insulated with ethylene-propylene rubber. The conductors shall be arranged in twisted pairs. The cable shall be rated for 600 Volts and 90°C (194°F) with a 40°C (104°F) ambient temperature and shall be approved by Factory Mutual (FM). The cable length shall be adequate to reach the junction box without the need for splices.

5.10.7 Control System

a. General:

All of the automatic control equipment shall be supplied by one manufacturer. Panel shall be assembled, wired, tested, and covered by complete electrical drawings and instructions.

All equipment, materials, and work on these panels shall be in total compliance with all state, local, federal guidelines, and shall conform to the standards by the NEC, NEMA, and IEEE.

b. Control Panel

A pump station control panel shall be provided for each pumping station. The electrical control equipment shall be mounted within a NEMA Type 4X dead front enclosure, constructed of not less than 14 gauge Type 304 stainless steel. The enclosure shall be equipped with an inner door and shall incorporate a removable back panel on which control components shall be mounted. Back panel shall be secured to enclosure with collar studs. Enclosure shall be equipped with a

stainless steel drip lip. The enclosure shall be equipped with a single handle actuated three point latch closing mechanism and continuous hinge.

Panel must be UL approved.

The control panels shall be built in an UL-listed manufacturing facility. The equipment shall be designed to have a useful operating life of no fewer than fifteen (15) years with standard servicing and replacement of parts.

The control panel shall be completely wired at the factory except for the power feed lines. Wiring diagrams matching the unit shall be provided.

- i. A transformer shall be supplied to give a 115 volt control circuit. The transformer shall be sized to supply power to all 120 volt components within the panel as well as all external equipment that will be supplied power from within the panel.
- ii. A backup power supply shall be provided of adequate size to provide power to electrical control equipment in the panel for a time period equal to two (2) times the time it takes for the generator to start providing adequate power.
- iii. A single weatherproof 20 amp ground-fault-protected duplex convenience outlet shall be provided on the side of the control panel enclosure and supplied power from panel.
- iv. Motor status run light shall be provided.
- v. There shall be a hour meter and cycle counter for each pump.
- vi. An internal control panel light shall be provided to illuminate the inner panel door(s).
- vii. Light Switch – A 120 volt 20 amp light switch inside of the control panel to activate the outside area/security light and internal control panel light.
- viii. Heaters – Each panel shall include a thermostatically controlled heater for moisture control. The heater shall be 120 V AC and rated as required by enclosure size.
- ix. Power Terminal – A main power terminal shall be provided for single point service termination of adequate size to accept the full size wire of the service required.
- x. Wire – Wire shall be of Type, THWN, THHN, or THW 600V, 90°C. Wiring shall be as shown on plans, or as a minimum, as indicated by applicable codes (NEC, etc.) Minimum wire size shall be No. 12.
- xi. Wire Markers – All control wiring to be numbered on both ends for ease of future trouble shooting. Lift station wires shall be marked on both ends.
- xii. Circuit breakers shall be used in lue of fuses.
 1. Control Circuit, Circuit Breaker – Single Pole, electromagnetic circuit breaker sized no larger than 125% of the total control circuit current.
 2. Circuit Breakers shall comply with the latest applicable standards of NEMA PB-1 and UL 67.
 3. Were circuit breakers are used as service entrance equipment, they shall comply with all NEC and UL requirements for service entrance and UL service entrance label shall be provided.
 4. Breakers must be bolt-in type, heavy duty, quick-make, quick-break, thermal-magnetic molded case circuit breakers. Breakers shall be large E-frame type. Q-frame breakers are NOT acceptable. Multi-pole breakers shall be common trip. Anti-turn solder less, pressure type connectors shall be provided suitable for aluminum/copper wire.
- xiii. Six 20A/Single Pole breakers and two 15A/2P transformer breakers (one primary and one secondary, if applicable) shall be provided.
- xiv. Control terminal blocks shall be of the screw clamp type, rated 600 volts.

- xv. Do not splice conductors in circuit breaker enclosure.
- xvi. Group and lace conductors within enclosure with nylon tie straps.
- xvii. An outer door switch shall be provided to indicate access to the panel.
- xviii. Circuit breakers shall have engraved plastic nameplates indicating the load served and the load rating. (Ex. HP-15HP, 30ph, 460V).
- xix. Engrave nameplates shall be supplied for marking all components. The labels shall be attached with a 5 mil thick, 3M type adhesive. No foam tape will be acceptable. The labels shall be uniform in size with 1/4" minimum letter sizes.
- xx. The exterior of each enclosure is to have a weather resistant adhesive placard indicating the control panel identification number, address, and emergency contact telephone number; lettering to be a minimum of 3/4-inches tall.

For example: 'Station Identification: STATION #, ADDRESS Please call (260) 665-9865 to report alarm conditions or other problems' (Contractor to verify Station ID and telephone number prior to fabrication).

- xxi. The control panel shall be equipped with a high level alarm system consisting of a weatherproof red Lexan light and horn. Upon high level activation the light will flash and the horn will sound. The control panel shall be equipped with an alarm silence switch to provide maintenance personnel a means to silence the horn while corrective actions are underway however, the light shall remain on until the high level condition clears. After silencing the alarm, manual reset of the alarm signal shall provide automatic reset of the alarm silence relay.

c. Variable Frequency Drive (VFD)

The Variable Frequency Drive (VFD) system shall contain all components required to meet the performance, protection, safety and certification criteria of this specification.

The VFD shall be a PowerFlex 400 Low Voltage AC Variable Frequency Drive as manufactured by Allen-Bradley or approved equal

i. RATINGS

- 1. The VFD shall operate from an input frequency range of 48 to 63 Hz.
- 2. The VFD shall have a power rating of and designed to operate in one of the following input voltage classes with $\pm 10\%$ voltage tolerance:
- 3. 200 to 240V, 3 phase: 2.2 to 37 kW / 3.0 to 50 HP.
- 4. 380 to 480V, 3 phase: 2.2 to 250 kW / 3.0 to 350 HP.
- 5. The displacement power factor of the VFD shall be 0.98 across the entire speed range.
- 6. The efficiency of the VFD shall be 97.5% at rated amps, nominal line voltage.
- 7. The overload capability shall be 110% for up to 1 minute.
- 8. The VFD shall have a programmable output frequency range of 0 to 320 Hz.
- 9. The VFD shall provide UL Listed Class 10 motor overload protection to comply with N.E.C. Article 430.
- 10. The VFD shall be designed to operate in ambient temperature range of -10°C to 50°C (14°F to 122°F) without derating and a relative humidity range of 0% to 95% non-condensing.

ii. CONSTRUCTION

- 1. The variable frequency drive (VFD) shall be optimized for a variable torque application.
- 2. The VFD shall be able to be panel-mounted.

3. The VFD shall be protected:
4. Against short circuits, between output phases and to ground.
5. Against undervoltage and overvoltage.
6. The VFD shall have an RS-485 (DSI) port for connecting a single peripheral device or for supporting standard communications protocol.
7. The VFD shall have embedded control I/O.
8. The VFD shall have an integral keypad for display, alarm indication, control and programming.
9. The terminal shall include a 2-line by 16-character LCD display with LED backlight and be capable of showing parameters and faults in English.
10. Control keys shall include HAND, AUTO and OFF.
11. Digital speed control keys and programming navigation keys shall be provided.
12. The terminal shall include LED indicators for program status, fault status and status of the control keys.
13. The VFD shall have optional Type 4X remote and Type 1 handheld keypads available.
14. The VFD shall have a cooling fan.

iii. CONFIGURATION/PROGRAMMING

1. The variable frequency drive (VFD) shall be configurable through its integral RS-485 communications.
2. The VFD shall be compatible with software:
3. Connected Components WorkBench™ – This software offers controller programming, device configuration and integration with HMI editor.
4. DriveTools™ SP – This software can be used to program, monitor and control the VFD.
5. COMMUNICATIONS
6. The variable frequency drive (VFD) shall have integral RS-485 communications and shall support DSI.
7. Modbus RTU protocol shall be embedded in the VFD and selectable via a parameter without any field programming to download software prior to operation:
8. Optional adapters for EtherNet/IP, DeviceNet, ControlNet, LonWorks, BACnet, PROFIBUS DP and Bluetooth shall be available.

iv. CONTROL FEATURES

1. The variable frequency drive (VFD) shall operate via Volts per Hertz control.
2. The VFD's internal adjustments shall include:
3. Acceleration time 0.1 to 600 seconds.
4. Deceleration time 0.1 to 600 seconds.
5. 4 preset speeds.
6. PWM frequency, allowing tuning to the motor.
7. The VFD's protections shall include:
8. Ability to sense a loss of load and signal a fault.
9. Ability to issue a warning if the input analog reference is lost, with a programmable response of:

10. Stop and display the fault.
11. Run at a preset speed.
12. Run at minimum or maximum frequency.
13. Ability, upon VFD fault, to store the DC bus voltage, out current and output frequency in readable parameters.
14. The VFD's control features shall include:
15. Process PID control:
16. The VFD's PID regulator shall allow a pressure or flow signal to be connected for closed loop control.
17. The PID set point shall be adjustable from the terminal, by analog input or through communication network.
18. Skip frequencies/bands:
19. The VFD shall have at minimum 3 programmable set points that lock out continuous operation at frequencies (mechanical resonance).
20. The set points shall have adjustable bandwidth.
21. Flying start – The VFD shall be capable of determining the speed and direction of a spinning motor, allowing its output to "pick-up" a rotating motor.
22. Start at power-up – With a maintained 2-wire start input, the VFD shall be able to use its programmable restart function to automatically restore power after an outage.
23. Sleep/wake mode:
24. The VFD shall be able to cycle off for low demand (sleep) and automatically restart for increased demand (wake).
25. Sleep/wake time and level shall be programmable.
26. Auto restart – The VFD shall have the ability to attempt 9 automatic restarts at programmable intervals following a fault before locking out and requiring manual intervention.

v. CONTROL I/O

1. The variable frequency drive (VFD) shall have 1 optically isolated analog input (-10 to 10V or 0 to 20 mA), user selectable, and 1 non-isolated analog input (0 to 10V or 0 to 20 mA), user selectable.
2. 1. Analog inputs shall have 10 bit resolution or better.
3. 2. Both analog inputs shall be able to be used simultaneously in either voltage or current modes or a combination of each.
4. The VFD shall have 2 analog outputs (0 to 10V or 0 to 20 mA), user selectable.
5. Analog outputs shall have 10 bit resolution or better.
6. Both analog outputs shall be able to be used simultaneously in either voltage or current modes or a combination of each.
7. The VFD shall have 7 digital inputs (24 VDC), user programmable.
8. Inputs shall be configurable as sink or source.
9. The VFD shall have 1 dedicated digital input for a purge function. The purge input shall override all "Stop" commands over the network as well as 1 customer interlock.
10. The VFD shall have 2 dedicated digital inputs for customer interlocks:

12. One interlock causes a drive fault and requires control system to reset prior to returning to ready condition. This input will always be active even during purge.
13. The VFD shall have 2 relay outputs, form C (1 N.O. and 1 N.C.), user programmable.
14. Both relays shall be programmable for a minimum of 16 different combinations including Drive Ready, At Frequency, Motor Running, Motor Overload, Above Frequency, Above Current and others.
15. The VFD shall have 1 digital optocoupler output, user programmable with N.O. or N.C. configuration.
16. The digital optocoupler output shall be programmable for a minimum of 16 different combinations including Drive Ready, At Frequency, Motor Running, Motor Overload, Above Frequency, Above Current and others.

5.10.8 Pump Controller:

a. General:

The manufacturer shall be capable of providing start up service.

The pump controller shall consist of all the components, hardware and software to provide a non-proprietary, trouble-free pumping station. The system shall be designed and specifically produced for the surveillance of the pump station. The system shall provide for interface to other RTU's and SCADA systems for remote control and data collection. The RTU shall control the pumps as a stand alone unit in the event of a communications loss. The controller shall be a MicroLogix 1400 as manufactured by Allen Bradley or proven and approved equal.

b. Operation:

Pump controller shall provide continuous monitoring of the wet well level via analog level signal (4-20mADC). The pump controller shall start and stop pump based upon wet well level and operator programmed setpoints. The controller shall have provision for a float switch backup in event of analog signal failure. The controller shall also have provision for redundant analog level sensor. The pump controller shall alternate pump cycles to ensure equal run times. The pump controller shall monitor pump protection features to provide alarms in event of impending pump failure. It shall also monitor pump performance data to provide operations personnel the ability to evaluate station performance.

c. Hardware:

i. Operator Interface:

The pump controller shall be programmed via built-in operator interface. The interface shall be via a Panel View C600 by Allen Bradley.

The front panel operator interface shall be rated IP65 (applicable to Nema 4 standard).

ii. Processor:

The pump controller shall contain a standard currently produced processor with sufficient memory storage to contain the required programming and for any data storage required. There shall be a provision for a minimum of 6 hours of memory protection.

iii. Inputs/Outputs:

A minimum of 16 digital inputs, 8 digital outputs (6 relay normally open, 2 solid state normally open), and 4 analog inputs to be connected to, or included with, the controller shall be provided. The inputs/outputs shall meet the following:

1. All inputs/outputs shall be optically isolated.
2. Digital inputs shall be 11-30vdc, selectable logic.
3. Digital outputs shall have a max load of 2A at 250VAC/DC (relay) or have an output capacity of 100mA at 250VAC/DC (solid state).

4. Analog inputs shall be 4-20mADC with 12bit resolution and inaccuracy of 0.1%

iv. Power Supply:

The pump controller shall operate from a supply voltage of 24VDC (-15% to +20%), and have a current consumption of 1A (no load). The controller shall be protected internally with a fuse rated at 2A.

d. Functions:

i. Operator Interface:

The pump controller shall operate the pumps in accordance with operator programmed setpoints. The following information shall be observed on the front panel display:

1. Wet well level
2. Cross-section areas of the wet well
3. Start-stop pump levels
4. Alarm levels for low level, and high level
5. Nominal capacities of the pumps
6. Current flow (gal per min.) and accumulated flow (gal per min)
7. Number of starts for each pump
8. Run time for each pump
9. Amp draws for each pump
10. Voltage for each pump

The pump controller shall provide for local display, acknowledgment and remote notification of alarm conditions. The controller shall log up to 1000 alarm events. Alarm capabilities shall include, as a minimum:

1. Wet Well High Level
2. Wet Well Low Level
3. Power Failure
4. Generator Run
5. Pumps not in Auto
6. Pump Fail/Fault
7. Pump Over Temperature
8. Pump Seal Fail
9. Standby Generator Fail

ii. Standby Generator:

The pump controller shall provide contact inputs to indicate status of standby generator: run/fail shall be indicated, and generator runtime and number of starts shall be recorded and displayed. The controller shall also allow for load shedding function to provide capability to limit the total number of pumps allowed to run simultaneously when the generator is active. The power fail alarm shall also be disabled when the generator is running.

iii. Data Storage:

The pump controller shall contain a real-time clock and shall time and date stamp all logged data. The controller shall store logged data for a period of up to 7 days. Stored data shall be accessible via network communication to a central station (HMI).

e. Communications:

i. Type:

The pump controller shall include communication ports to connect to the VFDs, SCADA system, and any other PLC or RTU that is required for operation of the lift station. Any necessary adapters connect the pump controller with correct communication protocols shall be included.

The pump controller shall be capable of communicating through RS-232, RS-485, and RJ45 communication ports

The controller shall be capable of toggling between user-configured communication parameters and factory default settings for ease of switching between Modbus RTU or ASCII protocols to DF-1 full-duplex.

The controller shall include pre-programmed setups for all connected devices, or provide for user-input modem settings.

ii. Protocols:

The controller shall support all serial protocols through RS-232 ports and 9-pin RS-232 ports; DH-485, DF1 half-duplex master/slave, ASCII, and Modbus RTU master/slave networks, DNP 3 slave using 1763-NC interface through RS-485 ports; and EtherNet/IP, Modbus TCP/IP, and DNP3 over IP through RJ45 ports.

iii. Data transfer to Central HMI Software:

The pump controller shall communicate through an RTU to HMI software (Central) that is Windows based, with intuitive menu-type navigation.

The HMI software is Scadata Software Suite provided by SCADATA. The HMI software includes templates to facilitate future system expansion by operations personnel. The templates allow for a complete system setup without requiring the programming of individual screens or stations. All input/out register tagging is included in the template files, requiring no systems integration programming by the end user. The software provides the ability to observe station operating conditions, observe setpoints, monitor and acknowledge alarms, log system historical data and generate reports and trend charts.

So the Central HMI software can provide Historical data trend charts based on 1-30 minute time periods, the pump controller shall provide the following information to the Central HMI software:

1. Wet well levels
2. Motor Currents
3. Calculated capacity of wet well
4. Inflow

In addition to the available historical data, the following weekly reports are provided:

5. Pump run times
6. Number of pump starts
7. Average value of pump capacity
8. Pumped volume

5.10.9 Liquid Level Sensor

Liquid level sensor shall be waste water submersible pressure transmitter/transducer type. All elements of the instrument, except the transducer, shall be contained in NEMA 4X enclosure. The Transducer shall be sealed and encapsulated for operation in the environment of a wet well. The transducer shall have a quick acting internal thermal sensor the temperature correction and shall have a minimum operation range of -20 to 150 degrees Fahrenheit. Measurement range of transducer shall be 1-50 feet with a blanking zone of twelve (12) inches. Surface turbulence, electrical noise, and pump to give reliable and accurate readings. Installation shall be by manufacturers instructions.

5.10.10 Float Switches

Float switches shall be provided for back-up operation if the liquid level transducer fails.

The entire float switch assembly shall be designed for use in raw sewage.

Switches shall be of the floating ball type, with a nominal five and one-half inch (5-1/2") diameter, Teflon-coated stainless steel float ball that contains a sealed switch assembly.

The float shall be supported with a flexible synthetic rubber hinge fastened to an adjustable mounting bracket. The hinge shall also act as housing for the lead wires from the alarm switch.

The lead wire shall be a waterproof cable of such length that no splice or junction box is required in the wet well.

Stainless steel mounting accessories shall be furnished.

The switch contacts shall be single-pole-double-throw rated 4 A at 250 V AC.

5.10.11 Backboard

The backboard shall be sized as required to mount electrical panels and controls, not to be more than 6' (feet) tall and 8' (feet) long, once constructed. The backboard shall be aluminum. The posts shall be a minimum size 8" x 3.75" aluminum channel sunk into place a minimum of 3.5 foot. The posts shall be set with concrete and allowed to cure. As a minimum, 3000 p.s.i. concrete shall be used. The posts shall be level and plumb when the cement is cured. All equipment mounting to the backboard shall be accomplished by Stainless Steel hardware.

5.10.12 Installation:

Installation of the pump station and all equipment shall be done in strict accordance with written instructions by the Manufacturer. Manufacturer shall provide four (4) bound copies and one electronic copy in pdf format of these instructions to SLRWD.

The Contractor shall furnish the services of factory service personnel of the equipment manufacturer to supervise the final adjustments of the system, perform operating tests, assure the SLRWD that the equipment is in proper adjustment and satisfactory operating condition, and to instruct and train the SLRWD's personnel in the use of this equipment. This service will be rendered after installation of the equipment has been completed and the entire system is ready for operation. Start-up and operator training shall be accomplished on two (2) separate trips to the job site.

5.10.13 Confined Space Signage

The Contractor shall provide a sign reading "DANGER – PERMIT REQUIRED CONFINED SPACE, DO NOT ENTER". The signs shall be furnished with rounded or blunt corners and shall be free from sharp edges. The ends or heads of the fasteners shall be located so as not to be a hazard. The colors red, black, and white shall be those of opaque glossy samples as specified in Table 1 of Fundamental Specification of Safety Colors for CIE Standard Source "C", American National Standards Z53.1-1967.

5.10.14 Quality Control And Field Testing:

a. Contractor shall:

- i. Test all equipment for actual operating conditions to show that each unit operates satisfactorily without overheating or overloading and is free from excessive vibration and noise throughout the complete head and capacity range at rated speed.
- ii. Adjust operating mechanism for free mechanical movement.
- iii. Touch-up scratched or marred surfaces to match original finish.

The SLRWD shall observe all field tests. Contractor shall give three (3) days written notice to the SLRWD before performing tests.

Successful operation shall be demonstrated to the satisfaction of the SLRWD.

The Contractor shall make, at his expense, all necessary changes, modifications, and/or adjustments required to assure satisfactory and efficient operation.

Pump and pump controls Manufacturers' authorized representatives shall provide written report(s) to the SLRWD noting that pumps and controls have been installed in accordance with Manufacturers' recommendations, the materials used in construction of the pumps and controls are the same as submitted for the shop drawing approval, are in conformance with project performance requirements, and are ready for operation.

An authorized representative(s) shall be present for start-up of the pumps and controls.

On-site training in the operation and maintenance of all equipment shall be performed by factory authorized personnel with personnel from the SLRWD.

b. Pump Test

Testing performed upon each pump shall include the following inspections:

- i. Impeller, motor rating and electrical connections shall be checked for compliance with this specification.
- ii. Prior to submergence, each pump shall be run dry to establish correct rotation.
- iii. Each pump shall be run submerged in water.
- iv. Motor and cable insulation shall be tested for moisture content or insulation defects.

Upon request, a written quality assurance record confirming the above testing/inspections shall be supplied with each pump at the time of shipment.

Each pump shall be tested in the field to provide a field certified pump curve with the initial draw down documentation submitted in accordance to lift station data sheets.

The pump(s) shall be rejected if the above requirements are not satisfied.

c. Start-up Service:

After the pumps have been completely installed and wired, the contractor shall have the manufacturer do the following:

- i. Perform pre-power check
- ii. Megger stator and power cables.
- iii. Verify system grounding per manufacturer's specifications
- iv. Verify power and signal grounds
- v. Check power supply voltage.
- vi. Check connections
- vii. Check seal lubrication.

- viii. Check for proper rotation.
- ix. Drive power-up and commissioning:
- x. Measure incoming power phase-to-phase and phase-to-ground
- xi. Measure DC bus voltage
- xii. Measure AC current unloaded and loaded
- xiii. Measure output voltage phase-to-phase and phase-to-ground
- xiv. Verify input reference signal
- xv. All measurements shall be recorded.
- xvi. Drive shall be tuned for system operation.
- xvii. Drive parameter listing shall be provided.
- xviii. Measure motor operating load and no load current.
- xix. Check level control operation and sequence.

Pumps shall clear the hatch of the wet well top without impedance.

During this initial inspection, the manufacturer's service representative shall review recommended operation and maintenance procedures with the owner's personnel.

5.10.15 Final Inspection / Acceptance

a. Field Pumping Test:

Perform a minimum of two pump tests with each pump for a minimum of three flow discharges with each pump pumping with the discharge valve set as follows:

- i. Closed
- ii. Full Open
- iii. Throttled

5.10.16 Spare Parts:

The Contractor shall furnish one (1) complete set of recommended spare parts for each size pump. All spare parts are to be conveyed to the SLRWD.

5.10.17 Cleaning

Remove all rubbish and debris from inside and around the equipment. Remove dirt, dust or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint-free rags. Do not use compressed air.

5.10.18 Warranty

- a. Manufacturer shall warrant equipment for a period of Two (2) Years from Acceptance, except pumps. Warranty shall include 'On Site' repair or replacement of equipment found defective within the warranty period.
- b. The pump manufacturer shall warrant the pumps in writing against defects in workmanship and material for a period of five (5) years of normal use, operation and service. The warranty shall be in printed form and apply to all similar units. The warranty shall cover 100 percent labor and materials cost, all shipping and delivery costs, and include 'On Site' repair or replacement of equipment found defective within the warranty period.
- c. Contractor shall warrant the installation of equipment for a period of Two (2) Years from acceptance; and shall include labor required to repair, replace or reinstall equipment found to be inoperative or unsatisfactory due to defective equipment or improper installation.

5.11 STANDBY ELECTRICAL POWER SYSTEM

5.11.1 General:

The Contractor shall provide, install, and test a complete and operable emergency/standby electrical generating system, including all devices and equipment specified herein, required for services. Equipment shall be new, of good quality, and in good condition.

Installation shall include the labor, equipment, tools, supplies and materials, and performance of all operations necessary for the installation of the engine-generator set, switch gear, and auxiliary equipment herein specified.

5.11.2 Quality Assurance

The standby engine powered generator shall be manufactured in the U.S. by a reputable manufacturer with at least ten (10) years of experience in manufacture of similar types of engine powered generators.

5.11.3 System Description:

a. General

The equipment specified herein is intended for outdoor installation and use and operation in closed standby and/or peak shaving mode separate from the utility power source.

b. Rating

The generator set rating shall not be less than the available electrical loads at the pump station. These ratings as a minimum should be acceptable for site conditions of altitude up to 1000 ft and temperatures up to 122 deg. F.

c. Operation

Operation shall be fully automatic and shall have the capability of being monitored and initiated in response to an external contact input that shall be wired from a SCADA remote terminal unit.

d. Connections

It is intended that the equipment specified herein will be arranged for closed transition standby and/or peak shaving operation and shall otherwise be electrically separate from the utility source.

e. Performance

The manufacture shall thoroughly familiarize himself with the conditions and scope of the labor and material to be furnished as a part of this Specification.

5.11.4 References:

All equipment covered by these Specifications shall be new and shall conform to the latest applicable standards of ANSI and NEMA, except where the standards conflict with the requirements of these specifications. All electrical equipment shall require UL approval for the intended use.

5.11.5 Submittals:

a. Shop Drawings

Shop drawings shall be furnished in accordance with specifications elsewhere in the Contract Documents and shall include the physical size, weight, arrangement, dimensions, mechanical and electrical characteristics, wiring and piping diagrams, and other pertinent data for the equipment that is to be furnished. Overall wiring and piping diagrams shall be included. Cooling system capacity and operating calculations shall be submitted as part of a descriptive data shop drawings. Cold cranking ampere and ampere-hour calculations shall be submitted as part of descriptive data shop drawings.

Installation plans shall be provided and shall include the following:

- i. Engine-generator layout dimensions

- ii. Wiring diagrams for the generator and for connection to existing system
- iii. Conduit layouts
- iv. Switchgear interconnection drawings
- v. Engine and generator installation diagrams
- vi. All other interconnection drawings.

b. Operation and Maintenance Manuals

Three (3) sets of operation and maintenance manuals for all equipment, including written renewal parts lists.

5.11.6 Delivery, Storage, and Handling:

All equipment and materials shall be delivered, stored and handled in strict accordance with the Manufacturer's recommendations.

5.11.7 Warranty

Provide a no deductible warranty for all products in this section, against defects in materials and workmanship for a period of two (2) year after final acceptance. Warranty documents shall be executed in the name of the owner as defined in the Contract Documents.

5.11.8 Approved Supplier

The emergency/standby power systems shall be obtained from a supplier whom shall be the manufacturer's authorized distributor, who shall provide initial start-up services, conduct field acceptance testing, and warranty service. The supplier shall have a 24-hour service availability and factory trained service technicians authorized to do warranty service on all warrantable and non-warrantable products. Technicians are to be available on site within two (2) hours of a call.

5.11.9 Manufacturer and Supplier Information:

a. Manufacturer's Nameplate

A manufacturer's nameplate shall be securely and permanently mounted to each individual piece of equipment furnished under this Section. The nameplate shall be constructed of a durable, non-corrosive material. Critical information shall be clearly engraved or otherwise permanently stamped on the nameplate, and shall be fully legible. The information contained on the manufacturer's nameplate shall include at least the following:

- i. Manufacturer's serial number
- ii. Name, address, and telephone number of equipment manufacturer
- iii. Model and/or part numbers
- iv. Performance criteria
- v. Motor size, speed, and voltage
- vi. Any other pertinent information

Note: All equipment shall include a nameplate with a Manufacturer's serial number validating the equipment as new. Failure to meet these requirements will be cause for rejection of the equipment.

b. Supplier And Service Information

A durable nameplate, stamp, or sticker shall be adhered to each individual piece of equipment containing the name, address, and telephone number of the local business that supplied the equipment, and the name, address, and telephone number of the local business that can provide service and replacement parts for the equipment. A twenty-four (24)-hour emergency service telephone number shall also be included.

5.11.10 Electrical System:

Distances shown on plans are approximate and intended to allow the Contractor to estimate conduit and conductor requirements. Allowance should be made for additional conductor that may be required for makeup in individual equipment enclosures. Conduit type shall be as previously described in the electrical section of these Specifications. All electrical installations shall comply with the latest edition of the NEC and Applicable Local Codes.

5.11.11 Products:

a. Materials

Miscellaneous materials shall include all material and equipment necessary to allow fully automatic operation of the units at the completion of the project. Miscellaneous materials shall include, but shall not be limited to, conduit and wiring for control and connection to the facility electric supply.

b. Engine-Generator Set

Shall be equipped with a 4-cycle, 1800 rpm diesel or natural gas engine generator set with low reactance brushless generator, torque-matched excitation, 3-phase RMS sensing automatic voltage regulator, set-mounted control panel, and high ambient cooling system (50 degrees Celsius). When a natural gas connection is available, a natural gas powered engine shall be used.

The equipment shall have a prototype test to be performed on a complete and functional unit, component level type tests will not substitute for this requirement.

The generator set shall include an automatic voltage regulator. The voltage regulator shall be immune from misoperation due to load-induced voltage waveform distortion. The voltage regulator shall be equipped with three-phase voltage sensing. The regulator shall control build up of the AC generator voltage to provide a linear rise and to limit overshoot. The regulator shall include torque-matching characteristics, which shall reduce output voltage in proportion to frequency below a threshold of (58-59) HZ. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off.

The AC generator shall be; synchronous, four pole, revolving field, drip proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc(s). All insulation system components shall meet NEMA MG1 temperature rise measured by resistance method at full load shall not exceed 125 degrees Centigrade. The broad range generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage within the broad.

The set control shall have automatic remote start capability from a panel-mounted 3-position (Stop, Run, Remote) switch. The unit shall provide cycle cranking of 15 seconds (ON)/ 15 seconds (OFF) for three attempts (75 seconds). If engine fails to start a lockout of the engine shall be in place and indicated over crank on alarm status panel. The control shall shut down and lock out upon: failing to start (over crank), overspend, low lubricating oil pressure, high engine temperature, or operation of a remote manual stop station. A panel mounted switch shall reset the engine monitor and test all the lamps. Lamps indications on the control panel shall include:

- i. Over crank shutdown – red
- ii. Overspend shutdown – red
- iii. Low oil pressure shutdown – red
- iv. High engine temperature shutdown – red
- v. High engine temperature prealarm – yellow
- vi. Low engine oil pressure prealarm – yellow
- vii. Low coolant temperature – yellow

- viii. Run – green
- ix. Not in automatic start – flashing red
- x. Auxiliary (2 each(- red (Customer identified)

The NEMA 1 enclosed control panels shall be mounted on the generator set within the weather protective housing with vibration isolators. A front control panel illumination lamp with ON/OFF switch shall be provided. Control panel mounted indicating meters and devices shall include : Engine Oil Pressure Gauge, Coolant Temperature Gauge, DC Voltmeter, Running time Meter (hours), Voltage adjusting rheostat, locking screwdriver type, to adjust voltage +/- 5% from rated value; Analog AC Voltmeter, dual range, 90 degrees scale, 2% accuracy; Analog AC Ammeter, dual range, 90 degrees scale, +/- 0.6 Hz accuracy; Seven position phase selector switch with OFF position to allow meter display of current and voltage in each phase. When supplied with reconnectable generators, the meter panel shall be reconnectable for the voltage specified.

The engine shall be 4 cycle, radiator and fan cooled. Two cycle engines are not acceptable. A governor shall provide automatic frequency regulations adjustable to 5% drop. The governor shall have provision for paralleling with the addition of load sharing controls. The engine shall be cooled by a mounted closed loop radiator system rated for full load operation in 122 degrees Fahrenheit (50 degrees Celsius) ambient as measured at the generator air inlet. Radiators shall be provided with a duct adaptor flange. The cooling system shall be filled with 50/50 ethylene glycol/water mixture by the equipment supplier. Rotating parts shall be guarded against accidental contact and meet all OSHA requirements.

The engine-generator set shall include the engine accessories as follows: An electric starter capable of three complete cranking cycles without overheating, before over crank shutdown (75 seconds) Positive displacement, mechanical, full pressure, lubrication oil pump. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Replaceable dry element air cleaner with restriction indicator. Flexible supply and return fuel lines. Engine mounted battery charging alternator, 45 ampere minimum, and solid-state voltage regulator.

The engine-generator set shall be mounted on a heavy duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold down clamps within the rails. The base shall be mounted on shock or anti-vibration mounts on a structural concrete base pad.

c. Accessories

Generator Set Auxiliary Equipment and Accessories shall include the following provisions:

- i. Engine mounted thermostatically controlled water jacket heater sized as recommended by the equipment supplier. Heater voltage shall be as required in the shop drawings.
- ii. An outdoor weather-protective housing, factory assembled to genset base and radiator cowling. Housing shall supply ample airflow for genset operation. The housing shall have hinged side access doors and rear control door. All doors shall be lockable. All sheet-metal shall not be less than 16 gauge hot rolled sheet steel and will be primed for corrosion and finished painted with the manufacturer's standard color. All openings in the bottom of the housing shall be closed with expanded metal or similar screening. All external hardware shall be stainless steel square neck carriage bolts. These bolts shall be removable only from the inside of the unit. Provide direction rain hoods to protect all intake air louvers. Construction shall be 14 gauge galvanized steel, painted. Roof shall be domed and provide with rain gutters where required to prevent water from entering the enclosures.
- iii. The Contractor shall furnish and install all exhaust piping, thimbles, silencers, mufflers, vibration isolators, etc. The exhaust muffler for the engine shall be size and type as recommended by the generator set manufacturer. The muffler shall supply "critical" grade exhaust silencing. Exhaust system shall be supplied within the weather-protective housing and terminated outside the housing with a weight rain cap. Exhaust mufflers mounted outside the weather-protective

housing shall protect the muffler from rain and weathering. Weight of exhaust system shall be prevented from bearing on engine by a flexible, stainless steel connection installed in exhaust piping at engine. Protective guard shall be provided to minimize possibility of injury due to accidental contact. Exhaust gas emissions shall meet or exceed applicable local regulations and ordinances. Size shall be sufficient to ensure that exhaust back pressure does not exceed maximum limitations specified by engine manufacturer.

- iv. Fuel tank shall be Double Wall design, made of corrosion resistance steel. Provide an automatic leak detection system in the space between the walls, supply vents, lockable fill cap, tank drain with peacock valve, fuel strainer, float switch to activate low fuel reserve warning signal, level gauge and fuel lines as required. Fuel tank shall be UL listed and Labeled.
- v. Low fuel reserve warning signal shall be provided for tank, consisting of an alarm bell and pilot light with self-restoring silencing switch (pilot light to remain on when bell is silenced) to indicate when fuel level in tank goes below the minimum level allowed by the signal float switch setting.
- vi. Starting batteries, lead acid type, sized as recommended by the genset manufacture shall be supplied along with battery cables and connectors. Batteries shall be a premium storage battery set of heavy-duty diesel starting type. Battery voltage shall be compatible with starting system. Battery set shall be of sufficient capacity to provide for one and one half minutes total cranking time without recharging. Battery rack and necessary cables and clamps shall be provided. Battery shall be built and guaranteed by acceptable established manufacturer for a period of not less than 3 years when maintained in proper charged condition. Life covered shall be from date of final acceptance of work to date of final acceptance of work to date on which battery cannot produce, when fully charged, 80 percent of its rated capacity at 77 degrees Fahrenheit, at specific gravity of not over 1,220. Cells having defective plates or chipped jars or covers shall be rejected. All required battery electrolyte shall be provided.
- vii. A voltage regulated battery charger of not less than 10 amp shall be supplied. Input AC voltage and output DC voltage shall be required. Charger shall be equipped with float, taper and equalize charge setting. Operational monitors shall supply visual output for : Loss of AC, Low Battery voltage, High Battery Voltage and AC Power On. Battery charger shall be located in Automatic Transfer Switch unless shown otherwise. Charger float and equalize voltage shall be specifically designed for battery provided. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressors, DC ammeter, and fused AAC input. Required output amperes shall be calculated to fully charge batteries within 8 hours following discharge to 87.5% of rated voltage.

d. Grounding

The generator and all other metallic equipment shall be bonded and grounded as required by the NEC and applicable Local codes. Grounding conductors shall be soft-drawn stranded copper sized in accordance with the applicable codes and shall be enclosed in PVC conduit in poured concrete.

5.11.12 Execution:

a. Preparation

i. Earthwork

1. General

The Contractor shall perform all grubbing, excavation, trenching, backfilling, and patching necessary for the execution of the construction.

2. Excavation

The contractor shall excavate, allowing sufficient space to permit erection of forms, sheeting, shoring, and bracing. Excavations carried below the required depths, without specific directions, shall be refilled to the proper grade with thoroughly compacted suitable fill.

Trenches for ducts shall have a width to afford a minimum of four inches (4") of clearance between trench walls and extreme outside dimension of the conduit structure in order to provide space for making the joints.

Contractor shall at all times during construction of the work provide and maintain ample means and equipment with which to promptly remove and properly dispose of all waste entering excavations or other parts of the work and keep excavation dry until duct lines or other structures to be built therein completed.

b. Installation

All equipment and materials shall be installed in strict accordance with the Manufacturer's recommendations and as shown on the Contract Drawings.

On completion of installation, start-up shall be performed by a factory-trained dealer service representative. Operating and maintenance instruction books shall be supplied upon delivery of unit. Contractor shall provide 4-hour training instruction of Owner's designated personnel in operation and maintenance of generating set. Training shall cover testing of unit and actual transfer from normal operation to emergency operation.

c. Switchgear

The Contractor shall be required to receive and completely install the switchgear. All conduit, wiring, and connections for power supply and control wiring shall be supplied as part of the work of these Specifications.

5.11.13 Operations and Testing:

a. General

Generators set factory tests on the equipment to be shipped, shall be performed at rated load and 0.8 PF. Generator sets that have been factory tested at 0.8 PF will not be acceptable. Test shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and safety shutdowns. Provide a factory certified record of the production testing.

b. On site acceptance test

The complete installation be tested for compliance with the specifications following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two hour full load test, and a one step rated load pickup test in accordance with NFPA.

The Contractor shall provide a resistive load bank and make temporary connections for full load test. Site test shall conform to NFPA 110 paragraph 5-13.2.3 including strip chart documentation to verify voltage and frequency.

c. Transfer switch requirements:

Transfer Switch Equipment shall include complete factory transfer equipment with electronic control designed for surge voltage isolation, voltage sensors on all phases of both sources, linear operator, permanently attached manual handles, positive mechanical and electrical interlocking, and mechanically held contacts. Equipment rated 1000 amps and less shall include quick-make, quick-break contact mechanisms for manual transfer under load. (With center off). Switches shall be furnished in NEMA 4X stainless steel or fiberglass enclosure.

All transfer switches and accessories shall be UL listed and labeled, tested per UL Standards 1008, and CSA Approved.

Main contacts shall be rated for 600 Volts AC minimum on transfer switches 40 – 1000 amps; and 480 Volts AC minimum on transfer switches 1200 – 3000 amps.

Transfer switches shall be rated to carry 125 percent of rated current continuously in the enclosure. Circuit breaker type transfer switches do not meet this specification.

Transfer switches shall be continuously rated in ambient temperatures of 40 to +50 degrees Celsius, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet.

Transfer switch equipment shall have a withstand and closing rating (WCR) in RMS symmetrical amperes greater than available faults currents shown on the drawings.

i. Transfer switch construction

Transfer switches shall be double-throw, electronically and mechanically interlocked,, and mechanically held in both positions.

Transfer switches rated through 1000 amperes shall be equipped with permanently attached manual operating handles and quick-break, quick-make-over center contact mechanisms suitable for safe manual operation under load. Transfer switches over 1000 amperes shall be equipped with manual operators for service use only under de-energized conditions.

Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.

Transfer switches shall be UL listed NEMA 4X and shall be stainless steel construction. The enclosure shall provide NEC wire bend space. The cabinet door shall be key-locking. Controls on cabinet door shall be key-operated. Provide switch position indicator lamps and power available lamps for both sources (four total) an the outside cabinet door.

d. Automatic Controls

Control shall be solid-state and designed for high level of immunity to power line surges and transients, demonstrated by test to IEEE Standard 587-1980. The Control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs.

Solid-state under voltage sensors shall simultaneously monitor all phases of both sources. Pick-up and drop-out settings shall be adjustable. Voltage sensors shall allow for adjustment to sense partial loss of voltage to nominal system voltage.

Automatic controls shall signal the engine-generator set to start upon signal from normal sources sensors. Solid-state time delay start, adjustable from 0 to 15 seconds (factory set at 2 seconds) to avoid nuisance start-ups. Battery voltage starting contacts shall be gold, dry type contacts factory wired to a field wiring terminal block.

The switch shall transfer when the emergency source reaches the set Point voltage and frequency. Provide a solid-state time delay on transfer, adjustable form 0 to 120 seconds.

The switch shall transfer the load to the normal source after a time delay retransfer, adjustable from 0 to 30 minutes. Retransfer time delay shall be immediately bypassed if the emergency power source fails.

Controls shall signal the engine-generator set to stop after a time delay, adjustable from 0 to 10 minutes, beginning on return to the normal source.

Power for transfer operation shall be from the source to which the load is being transferred.

The Control shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time, as follows: Source 1 OK, Start Gen Set, Source 2 OK, Timing for Stop, Transfer Timing, Transfer Complete, Retransfer Timing, and Retransfer Complete.

The control shall include provisions for remote transfer inhabit and area protection.

e. Front Panel Device

Front Panel Device shall include a key-operated selector switch to provide the following positions and functions:

- i. Test-Stimulates normal power loss to control for testing of generator set.
 - ii. Controls shall provide for a test with or without load transfer.
 - iii. Normal- Normal operating position.
 - iv. Re-transfer- Momentary position to override re-transfer time delay and cause immediate return to normal source, if available.
- f. Transfer Switch Accessories
- Transfer switches as designated in the Contract Documents shall be equipped with accessories as follows:
- A solid-state exerciser clock to set the day, time, and duration of generator set exercise/test period. Which provides with/without load selector switch for the exercise period.
- A timer to allow the transfer switch to delay in a off position to allow induced voltages to decay. The timer shall allow a 0 to 7 seconds off period, set at 2 seconds.
- g. Transfer Equipment Factory Test Requirements
- Each transfer switch supplied shall be factory tested before shipment. Factory tests shall include a complete functional test of the transfer switch controls, including calibration of the voltage sensors.

5.11.14 Installation of Standby Power System

The installation shall comply with applicable state and local codes as required by the authority having jurisdiction. The Contractor shall install the equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products. Additional electrical/electronic connections will be performed as indicated in the Contract Documents.

The emergency/standby power system shall be mounted on a suitable foundation as indicated in the Contract Documents.

5.11.15 Installation of transfer system

Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. The Contractor shall install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products. Additional electrical/electronic connections will be performed as indicated in the Contract Documents.

5.12 SCADA SYSTEM

5.12.1 General:

This section covers work necessary for the documentation, factory test, installation, on-site radio survey, field testing and startup and final documentation for the Supervisory Control and Data Acquisition (SCADA) system for the Steuben Lakes Regional Waste District (SLRWD) Pump Stations constructed under this work.

The SCADA system will communicate, via radio system, with the current Scadata Software Suite by Scadata, Inc. on the Central HMI System located at the SLRWD Office Building

The control/monitoring system specified is an Allen Bradley MicroLogix 1400 with a Panelview C600. An alternate system that monitors and controls the items specified and records and provides the operating information specified may be provided if approved by SLRWD prior to ordering the materials required under this section or the Submersible Pump Station Section.

Provide RTUs, PLCs, Radios, antennas, additional modules, cables, and software as required.

5.12.2 Responsibility for Complete System

The Contractor shall be responsible for and shall provide for the supply, delivery, installation, certification, calibration and adjustment, software configuration, testing and startup, of a complete, coordinated system which shall perform the specified functions. This shall include completing all necessary on-site radio signal survey and acquiring all permits.

The SLRWD and Engineer will review system technical information as submitted by the Contractor for software, operating system, database, control logic and the graphical user interface, i.e. report and log formats, graphics, trends, alarming, etc. for complete compliance with these specifications.

The Contractor shall provide the SLRWD with all services and hardware to ensure that proper communications are established throughout the system. This work shall include, but not be limited to:

- a. Provide and install all hardware necessary for the system.
- b. Provide a written report of a Physical Propagation Study indicating the signal strength, antenna height required, etc. from each RTU location to the Waste Water Treatment Plant site. This shall be completed prior to final shop drawing submittal.

5.12.3 Submittals

a. Hardware Submittals

Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the Engineer for his review submittal documents as specified elsewhere in these specifications. Submittals shall include full details, shop drawings, catalog cuts and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications. Specifically, the Contractor shall submit the following materials:

- i. Block diagram and operation description of the system showing all major components and their interconnections and interrelationships. Label each diagram and specify all external power and communications interfaces. All diagrams shall be in an 11 by 17 format.
- ii. Drawings of equipment to be supplied shall include, as a minimum:
 1. Overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations.
 2. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring requirements identified.
 3. Operation Description shall include the principal functions/capabilities of the RTUs, as provided, configured and programmed. Included shall be a description of system communications.

- iii. Provide detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.
- b. Software Submittals
 - i. User manuals for all supplier generated software and firmware.
 - ii. Sample communication and control database programs for project in hardcopy form. As a minimum, hardcopy form shall be fully documented, including code, comments, addressing data and cross-references, etc. Every line or section of code shall be accompanied by a comment describing its function.
 - iii. Provide initial graphic display and report format layouts as described later in this specification.
- c. Test Outlines and Procedures Submittals

Test descriptions shall be sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with this specification.
- d. Spares and Expendables Recommendations

The Contractor shall provide a list of recommended spare and expendable items. The list shall be exclusive of any spares furnished under this Contract. A total purchase cost for the recommended list shall be provided in addition to the unit cost for each item.

5.12.4 On Site Supervision

The Contractor shall provide experienced personnel to supervise, perform, and coordinate the installation, adjustment, testing, and startup of the SCADA system. The personnel shall be present on-site as required to effect a complete and operating system.

5.12.5 Testing and Startup

All elements of the SCADA system shall be tested to demonstrate that the total system satisfies all of the requirements of the Specification. All special testing materials and equipment shall be provided by the Contractor. The Contractor shall coordinate and schedule all of his testing and startup work with the SLRWD. As a minimum, the testing shall include both a factory test and a field test. Testing requirements are as follows:

5.12.6 Field Tests

All system components shall be checked to verify that they have been installed properly and that all terminations have been made correctly. Witnessed field tests shall be performed on the complete system. Each function shall be demonstrated to the satisfaction of the SLRWD and Engineer on a paragraph-by-paragraph basis. Each test shall be witnessed and signed off by the Contractor and the Engineer upon satisfactory completion. The Contractor shall notify the SLRWD at least one (1) week prior to the commencement date of the field tests.

5.12.7 Training

The training program shall educate operators, maintenance, engineering, and management personnel with the required levels of system familiarity to provide a common working knowledge concerning all significant aspects of the system being supplied. The training program shall consist of a minimum 8-hour day. Both classroom-type and field site sessions shall be provided. At least two weeks prior to the requested start of the program, the proposed dates of training shall be submitted to the SLRWD and the Engineer for approval.

The supplier shall provide all instructional course material, equipment and manuals to conduct the training program. The supplier shall provide training for use of the equipment and modification of all specified functions, report generation, and the addition of new equipment to the system. SLRWD shall provide facilities for the training.

5.12.8 Operation and Maintenance Manuals

The Contractor shall provide (3) complete sets of hard-covered ring bound loose-leaf O&M manuals. In addition to "as-built" system drawings, the manuals shall include internal wiring diagrams and

operating and maintenance literature for all components provided under this section. The submitted literature shall be in sufficient detail to facilitate the operation, removal, installation, programming and configuration, adjustment, calibration, testing and maintenance of each component and/or instrument.

The contents of the O&M manuals shall be generally organized as follows:

- a. System Hardware/Installation
- b. System Software
- c. Operation
- d. Maintenance and Troubleshooting
- e. A separate section containing all data pertinent to the radio system shall be provided. This section shall include:
 - f. Radio system block diagram.
 - g. Computer generated radio path signal strength calculations and related support materials.
 - h. Test results from the use of a Spectrum Frequency Analyzer (IFR).

5.12.9 Definition of Acceptance

System acceptance shall be defined as that point in time when the following requirements have been fulfilled:

- a. All O&M documentation has been submitted, reviewed and approved.
- b. The complete SCADA system and instrumentation have successfully completed all testing requirements specified herein and have successfully been started up. All site(s) shall be communicating to the central software system on a consistent basis.
- c. Verify all required data specified herein is being transmitted in proper format.
- d. Verify all functions verified herein are being performed.
- e. All SLRWD's staff personnel required training programs have been completed.
- f. SLRWD/Engineer sign a document indicating SCADA system has formally been accepted.

5.12.10 Products:

a. General

The functions and features specified herein are the minimum acceptable requirements for the SCADA system. The provided system shall equal or exceed each requirement.

In some cases, the specifications may allow the accomplishing of certain functions by means of more than one hardware/firmware/software approach. Any approach that is proposed shall equal or exceed all functional, operational, convenience and maintenance aspects of the one described.

Major equipment, component and software items are specified; however the Contractor shall, at no additional cost, provide all appurtenant items, whether specifically reference herein or not, but which may be required for operation as hereinafter specified.

b. Functional Requirements

i. Basic System Overview

- 1. The SCADA System is intended to provide remote monitoring of the pump stations constructed as part of this work.

ii. Component Specifications

- 1. Pump Controller- See Submersible Pump Stations Specification.
- 2. Radio

A. The radio shall be a FGR2 Series Radio provided by Freewave or approved equal.

- B. Communication shall be via non-licensed radio communicating in the FCC Part 90 - 902-928 MHz frequency range. Spread spectrum radios shall use frequency hopping using 902-928 MHz range. Communication shall be encrypted either via dynamic key or 256-bit AES. Radios shall broadcast at 1 Watt.
 - C. Each radio shall have the capability of acting as a repeating radio creating a mesh network sites. Effective range with this type of communication system is unlimited.
 - D. The telemetry system provider shall provide all radio path surveys and design the system for at least 99.9% reliability. System manufacturer shall also provide all help necessary to the end user for radio frequency coordination and FCC licensing.
3. Radio Transceiver

The radio transceiver shall be a new current model FM, 2-way radio suitable for actual over the air data rates of up to 9600 bps in a 12.5 kHz channel. Units shall be FCC and NTIA approved for the intended application. Minimum acceptable technical specifications are as follows:

Transmitter

RF Power Output	1-5 watts
Frequency Range	902-928 MHz (FHSS)
Modulation	2 level GFSK, 115.2 kbps or 153.6 kbps
RF Data Rate	115.2 kbps Standard Speed, 153.6 kbps High Speed
Occupied Bandwidth	230 kHz
Hopping Patterns	15 per Band, 105 total, user selectable
Hopping Channels	50 to 112, user selectable
Frequency Zones	16 zones, 7 channels per zone

Receiver

Sensitivity	-105 dBm at High Speed; -109 dBm at Standard Speed
IF Selectivity	40 dB at $f_c \pm 230$ kHz
RF Selectivity	50 dB at 896 MHz, 935 MHz

Data Transmission

Data Security	AES 128/256 bit encryption and PSST
Data Throughput	115.2 kbps at High Speed RF Data Rate; 80 kbps at Standard RF Data Rate
Data Format	Asynchronous, Serial, Transparent
Parity	Even, Odd, or None
Handshake	RTS-CTS

4. Antennas, Cable, and Masts

The radio telemetry system supplier shall provide the antenna for each site as required to achieve the overall communications requirements of the system. Antennas shall be directional or omni-directional as required and suitable for outdoor environments. They

shall be of all aluminum construction and rated to withstand at least 100 MPH winds with 1/2 inch radial ice.

Adequate lengths of RG8/U coaxial cable shall be provided for connection of the antenna to the radio transceiver at each site. The transmission line shall be terminated only in connectors rated for the required service. A lightning arrestor shall be placed between the transceiver and coaxial cable.

Particular attention shall be given to the correct installation of the antennas to give adequate protection from nearby lightning strikes by providing a low resistance DC path to ground.

Contractor shall furnish all mounting masts or towers as required to support the antennas at the elevations and orientations required. Towers and masts shall be suitable for outdoor environmental conditions, provide adequate support and protection for transmission lines and be provided complete with all necessary mounting accessories. Minimum specifications of these devices are as follows:

Directional Antenna

Type	3 element Yagi, with a forward gain of at least 7 dB
Front to back ration	20 dB
Lightning protection	Direct ground
Feedpoint method	Weatherproof gamma match for coaxial feedline

Omni-Directional Antenna

Type	2 or 4 dipole array adjustable for omni or bi-directional patter
Gain	At least 3 dB omni, 6 dB offset
Lightning protection	DC ground through an all metal support pipe

Antennas shall be as manufactured by Antenna Specialists, Antennex, Cellwave, Maxrad, or approved equal.

Tower shall be constructed of galvanized steel and shall include concrete base and all anchors. Tower shall be of a monopole design.

iii. System Software

1. General

The central computer system employs a graphical user interface that allows operating personnel to perform all system functions without any knowledge of operating system commands.

2. Installation

The SCADA system shall be configurable by staff or appointed service provider using self loading templates allowing staff to communicate with Sewage Pump stations without engineering assistance and without interrupting the SCADA system (Live Installations). A typical installation will only require staff to enter basic prompted information of each site (Site number, telephone number, address etc).

3. SCADA System Performance

A. The SCADA system shall provide real time indication of all alarms (Listed Previously) present at each RTU site and PS site including:

1. Power Fail
2. Pump 1 High Temperature
3. Pump 2 High Temperature
4. Pump 1 Seal Leakage (Int Sensor)
5. Pump 2 Seal Leakage (Int Sensor)
6. High Wet Well Level
7. Low Wet Well Level
8. High Level Switch
9. Generator Run
10. High Current Pump 1
11. High Current Pump 2
12. Low Current Pump 1
13. Low Current Pump 2
14. Pump 1 Flow Rate Fault
15. Pump 2 Flow Rate Fault
16. Generator Alarm
17. Pump 1 not in Auto
18. Pump 2 not in Auto

B. The SCADA system shall also provide real time trending of:

1. Wet Well Level
2. Electrical Current Pump 1
3. Electrical Current Pump 2
4. Pump 1 Run
5. Pump 2 Run
6. Alarm Collection

4. Radio Monitoring

Radio monitoring software shall be provided to monitor radio signal strength, noise level, radio configurations, connectivity, antennae reflective power, and alarm for low signal strength.

c. Execution:

- i. Coordinate all work with the Engineer/SLRWD to avoid conflicts, errors, delays, and unnecessary interference with operation of the existing system during installation, testing, cutover, and startup.
- ii. Install all new equipment in accordance with the manufacturer's instructions and approved submittals.
- iii. System Supplier/Integrator shall be responsible for final coordination with the General and Electrical Contractors. This shall include providing any addition relays, contacts, terminals, etc. to complete the connection of all equipment. The General and Electrical Contractors shall be responsible to furnish and install all required power and control wiring and conduits to complete the interfacing as required by the System Integrator and Engineer.
- iv. No power wiring shall be placed in the same conduit of control and signal wiring.

5.13 CORROSION CONTROL CHEMICAL FEED BUILDING

5.13.1 GENERAL:

These facilities are designed to make chemical feed additions directly into selected pump stations to reduce the formation of Hydrogen Sulfide its offensive odor and its corrosive byproducts.

This process feeds Magnesium Hydroxide slurry at between 100 and 200 parts per million (PPM) by volume directly into the selected manhole. The slurry is fed using peristaltic chemical feed pumps that are interlocked with the pump station pumps.

The Magnesium Hydroxide slurry is stored in a Poly Tank within the chemical feed building and must be kept from freezing. Therefore the building is insulated and equipped with two (2) electric heaters. The heater thermostats should be set so that one activates approximately five degrees (5 deg.) before the other.

The Magnesium Hydroxide slurry must be intermittently mixed to prevent the solids from settling. A mixer is provided on a support base above the Poly Tank. The mixer is controlled by a 'repeat cycle timer' that has a repeatable, adjustable 'ON' cycle and an adjustable 'OFF' cycle.

The Building is designed to house the chemical supply tank, mixer, chemical feed pumps, heaters and electrical controls.

It is to be a wood framed structure with metal skin; a vented gable roof and an insulated metal door with stainless steel locking handle and deadbolt. The building is to be fully insulated, including Radiant Barrier Roof Sheathing and Insulating Sheathing under the siding together with fiberglass insulation within the walls and ceiling. Building is to be Green with White Trim, & Door. Dimensions are shown on plan.

5.13.2 BUILDING MATERIALS AND CONSTRUCTION:

- a. Metal Siding - 22 gauge ribbed metal siding panels. Flexrib by FlexoSpan, and factory coated with Flexshield vinyl plastisol in the appropriate color. Metal Screws are to match the siding and roof color. The metal siding is to be installed over 1/2" thick Louisiana-Pacific Radiant Barrier or Owens Corning Insulating Sheathing.
- b. Reinforced Concrete Foundation - Concrete is to be 4,000 PSI mix. Footers are to bear on compacted undisturbed soils with a minimum bearing capacity of 2,000 psi. A reinforced Free Floating slab shall rest on a prepared sub-grade that includes crushed stone, insulation and vapor barrier. The foundation is designed to have a 4" curb around the entire perimeter.
- c. Metal Door - Manufactured of 18 gauge cold rolled steel with reinforced hinge and lock edge. Doors are to be Insulated with a Polystyrene foam core. Doors are to have a 1 1/2 hour fire rating and come with an Underwriters Laboratories fire label. Finish paint door & frame (both interior & exterior) with industrial enamel - white. Provide Stainless Steel Hinges, SS Locking Door Handle and SS Deadbolt. All Chemical Feed Buildings are to be keyed alike.
- d. Roof - Roof material is the same material by the same manufacturer as the siding. Roof Material is to be Green. It is to be installed per the manufacturers instructions and use fasteners suitable for that service. The roof material is to be installed over 1/2 inch insulating sheathing, Louisiana-Pacific Radiant Barrier or equal, with the foil reflective side installed in accordance with the manufacturers instructions. The Roof is to incorporate a vented soffit and full length ridge vent.
- e. Interior Walls are to be covered and finished with 1/2 inch thick A/C grade exterior plywood and are to receive one primer (gray) and one finish coat (white) of EXTERIOR grade latex house paint.
- f. Electrical - Provide a 120/240 Volt, 200 amp electric service circuit breaker panel with 240 volt breakers for each electric heater, and for the 3 Hp mixer motor, also a separate circuit for the chemical feed pump (120 VAC), the lighting circuit, the duplex outlets and the control panel.
- g. Provide a Single Pole Light Switch inside the building at the door, Two (2) GFI Duplex Outlets as shown on the plan, and two (2) four foot long Fluorescent ceiling lights (Lithonia EIS 2 32 PCL, or equal), with electronic ballast for use with two (2) 32 Watt, T8 lamps.

- h. Heaters to be bronze finish with stainless steel heating element and aluminum fins designed for 240/208 VAC operation. Each unit to be rated at 750 watts, 2550 BTU's at 240 volts, and each is to be equipped with a built in DPST Thermostat rated for 22 amps at 240 volts.

Heaters to be Markel Products Co. # H2907-040C with Thermostat # CTBDB or approved equal.

- i. All wiring is to be in conduit, attached to the ceiling or wall.

5.13.3 CONTROL PANEL:

An electrical control panel shall be provided for Hand-Off-Automatic (H-O-A) control of both the Chemical Feed Pump and the Slurry Mixer.

- a. Chemical Pump Control - 'Hand' is continuous run or On, 'Off' is Off; and 'Auto' is Automatic mode, and is interconnected with the adjacent pump station pumps. In Automatic Mode the Chemical Feed Pumps start and run when the pump station runs, After the pump station stops, an Off-Delay time delay relay allows the chemical feed pump to continue to run for up to two minutes before it shuts off. This puts a priming dose of chemical into the wet well for the next cycle.
- b. Slurry Mixer Control - 'Hand' is continuous run or On, 'Off' is Off; and 'Auto' is Automatic mode which is controlled by a repeat cycle timer. The repeat cycle time allows independently an adjustable ON period up to 8,000 seconds and an adjustable OFF period up to 8,000 seconds.

5.13.4 ELECTRICAL CONTROL DIAGRAM / SCHEMATIC SUBMITTAL REQUIRED:

Contractor to submit Electrical control panel supplier shop drawings for approval. Submittals are to include manufacturers names, part numbers and quantities and wiring diagrams.

- a. Electrical Control Enclosures are to be Steel or fiberglass. NEMA 12 for interior dust tight service.
- b. Time Delay Relays are to be Allen-Bradley 700-HR Dial Timer series, or equal, for Delay On Release, to fit an 8-pin octal socket base. 120 VAC, with 10 amp output relay, DPDT contacts.
- c. Repeat Cycle Timer designed for operation on 120 VAC, with a 30 to 8,000 second timing range. For 8 pin octal base mounting. Timer to be Artisan Controls model 2600A-8-5, with DPDT Contacts rated for 20 amp at 120 VAC or approved equal.

5.13.5 PROCESS EQUIPMENT:

The Chemical to be handled, stored, mixed and fed into the waste stream is 'Thioguard' Brand, Magnesium Hydroxide Slurry from Martin Marietta Magnesia Specialties, L.L.C.

Its Physical Properties are:

- a. Total Solids: 60%
- b. Specific Gravity: 1.54
- c. Viscosity: 200 - 400 centipoises
- d. PH: 10.0±

5.13.6 STORAGE TANKS:

Natural color, Poly Plastic Tanks designed for 1.9 SG liquids, and including UV stabilizer within the resin; as manufactured by Assmann Corporation of America, Garrett, Indiana; or approved equal.

Tanks include:

- a. Vent - 4" PVC U-vent with EPDM Gasket
- b. Fill Fitting - 2" PVC Bulkhead Fitting with EPDM Gasket and anti-foam elbow - 2" PVC 45 degree elbow, with Fill Line of 2" PVC with Stainless Steel Bolts and Stainless Brackets
- c. Discharge Line - 2" Stainless Steel Bolted Coupler with EPDM gasket, and 2" PVC Outlet Siphon
- d. Tank Drain - 2" PVC Bulkhead Fitting with EPDM Gasket
- e. Access - 16" lever locking access hatch.

- f. Fabricated Steel or Aluminum Mixer Support Stand with mixer mounting plate.
- g. 2,400 Gal tanks are 96" Diameter x 75" SWD [95" total Height]

5.13.7 MIXERS:

Although the mixers are to be operated in an intermittent fashion, they are to be designed for continuous service, with mixer shaft and impeller blades suitable for mixing a slurry with the characteristics described above without shearing the slurry, and contained within tanks of the sizes indicated above.

Motors are to have a 1.15 SF rating.

Motors above 1 Hp are to operate on 230 VAC, 3 Phase, 60 Hertz power;

Fractional horsepower motors will operate on 115 / 120 VAC, Single Phase power.

Gear Reduction units are to be designed to accommodate shock and torque loads anticipated while mixing a slurry with the characteristics outlined above and while supporting the shaft and mixer blade(s) in a vertical or angular offset orientation.

Bearings are to be designed with a B10 life of 10,000 hours of continuous use; and gear reduction units are to incorporate an AGMA Service Factor of 1.5.

Furnish each mixer with single or multiple impellers with removable blades operating at speeds of between 40 and 90 RPM.

Impeller Shaft, Blades and Fasteners are to be 304 stainless steel.

Mixers for 2,400 gallon tanks are to be furnished with angled riser brackets.

Mixers for 2,400 gallon tanks are to be 3.0 horsepower.

Mixers are to be 'Lightnin' Series 10 mixers, with A510 Axial impellers, or approved equal.

5.13.8 SHOP DRAWING SUBMITTAL APPROVALS ARE REQUIRED FOR MIXERS AND IMPELLERS.

- a. CHEMICAL FEED PUMPS:
- b. The Chemical Feed Pumps are to be positive displacement Peristaltic pumps with variable speed brushless DC motors, operating at speeds between 0.1 and 220 RPM with an accuracy of 0.1% and deliver between 2 and 100 gallons of Thioguard per day.
- c. Each pump is to be furnished with Marprene pump tubing and one spare pump tube.
- d. Chemical feed pumps are to operate on 115 Volt, Single Phase, 60 Hertz electric power.
- e. Chemical Feed Pumps are to be Watson-Marlow Model 520U/R2 or approved equal.

5.13.9 SHOP DRAWING SUBMITTAL APPROVALS ARE REQUIRED FOR CHEMICAL FEED PUMPS.

5.13.10 WARRANTY

- a. Manufacturer shall warrant equipment for a period of Two (2) Years from Acceptance. Warranty shall include 'On Site' repair or replacement of equipment found defective within the warranty period.
- b. Contractor shall warrant the installation of equipment for a period of Two (2) Years from acceptance; and shall include labor required to repair, replace or reinstall equipment found to be inoperative or unsatisfactory due to defective equipment or improper installation.

5.14 TESTING

- 5.14.1 General: After the pipe and appurtenance have been laid and backfilled, the various elements of the system shall be tested and certified to the SLRWD by the Contractor.
- 5.14.2 Pressure Sewers: The pressure sewers will need to be pressure/leak tested at 150% of the maximum anticipated sustained operating pressure (not to exceed the design pressure for the pipe) at point of test, but not less than 125% of normal working pressure at the highest elevation of the pressure sewer (not to exceed the design pressure of the pipe).

All pressure sewers shall be pressure tested with water following installation in accordance to manufacturer's recommendations held for a minimum of two (2) hours. The contractor shall furnish all special plugs, pump, gauges, relief valves and appurtenances for the performance of the test on each isolated section of force main under the observation of and subject to the approval of the SLRWD's authorized inspector. The drop in test pressure shall not exceed 5 psig during the 2-hour test period.

Leakage during the pressure test is defined as the quantity of water to be supplied into the newly installed pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

No ductile iron pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the following formula:

$$\text{AWWA Standard: } L = \frac{S \times D \text{ times square root of "P"}}{133,200}$$

in which L equals the allowable leakage in gallons per hour, S is the length of pipe line in feet, D is the nominal diameter in inches, and P is the average test pressure during the leakage test, in pounds per square inch gage.

PVC pipe testing procedures shall comply with the requirements as set forth in AWWA C605. No PVC pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the following formula:

$$\text{AWWA Standard: } L = ND * P/7,400$$

In which L equals the allowable leakage in gallons per hour, N is the number of joints in length tested, D is the nominal diameter in inches, and P is the average test pressure during the leakage test, in pounds per square inch gage.

Should any test of pipe laid disclose leakage greater than that specified, the Contractor shall, at his sole expense, locate and repair all defective joints until the leakage is within the specified allowance.

All visible leaks are to be repaired regardless of the amount of leakage. All flanged pipe shall be "bottle tight".

If the section under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

When testing HDPE pressure sewer pipe, the tests shall be conducted in accordance with the pipe manufacturer's written instructions.

Contractor shall submit a copy of the manufacturer's testing procedures and instructions.

- 5.14.3 Gravity Sewers: Each new gravity sewer, or any isolated section thereof, shall be subject to low pressure air test except those sewers that replace existing sewers and are required to be put into immediate service. The contractor shall furnish all weirs, bulkheads, catchments and/or special plugs, compressor, gages, relief valves and appurtenances for the air test, all as required for the performance of the test on each isolated section of sewer under the observation of and subject to the approval of the SLRWD. Where sewers are not otherwise tested for leakage such sewers shall be videotaped. The contractor shall correct any defects encountered by the videotape.
- 5.14.4 Procedure for Low Pressure Air Testing: After the pipe is installed, the joints completed, and the trench backfilled, the section of sewer to be tested is to be cleaned and suitably isolated with test plugs

securely braced in place. All air testing shall conform to ASTM F1417-92, Standard Test method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air, for Plastic pipe.

Add air slowly to the sewer under test through a suitable connection to one of the test plugs until the internal air pressure is raised to 4.0 psig plus any additional pressure as may be required to offset any backpressure due to ground water submergence of the sewer. Contractor's test equipment shall include a pressure relief valve designed and located in such a manner as to prevent the test pressure from exceeding 10.0 psig.

After the internal pressure of 4.0 psig is obtained, allow a minimum of two minutes for air temperature to stabilize, adding only the amount of air necessary to maintain a pressure near 4.0 psig.

When the stabilization period is over, the test pressure shall be allowed to drop from the 4.0 psig level. When the pressure decreases to 3.5 psig, the time shall be checked by means of stopwatch to determine the time in seconds for the test pressure to drop from 3.5 psig to 2.5 psig.

Allowable Air Loss: It is intended that the sewer pipe and joints be of tight construction. For $Q=0.0015$, the minimum time for the test pressure to drop from 3.5 psig to 2.5 psig per 100 feet of sewer shall be not less than the following:

Table 5.14.3

Pipe Diameter	Time (min:sec)	Pipe Diameter	Time (min:sec)
4"	3:46	21"	19:50
6"	5:40	24"	22:47
8"	7:34	27"	28:51
10"	9:26	30"	35:37
12"	11:20	33"	43:05
15"	14:10	36"	51:17
18"	17:00		

5.14.5 Deflection Testing of Gravity Sewers: Following installation, bedding, backfilling, and compaction of flexible (non-rigid) material gravity sanitary sewer pipes, the Design Engineer or SLRWD's authorized inspector will require all of these pipe sections tested for vertical ring deflection. The Contractor shall arrange at his expense for the tests to measure the internal deflection of these conduits. Maximum ring deflection of the conduit under load shall be limited to 5 percent of the vertical internal pipe diameter. This testing shall be accomplished using a hand-pulled deflectometer, a rigid go/no-go device or equal in accordance with ASTM D-2412. This test shall not be performed until after the pipe has been in place for a minimum of 30 days and shall not be performed with the aid of a mechanical pulling device.

5.14.6 Vacuum Testing of Manholes for Gravity Sewers: Each manhole shall be visually inspected after assembly and backfilling by the SLRWD's authorized representative for leakage or evidence thereof. The Contractor shall demonstrate the integrity of installed materials and construction procedures by conducting a Vacuum test in accordance with ASTM C1244-93. If the manhole shows leakage or signs thereof, the manhole shall be repaired to the satisfaction of the SLRWD's authorized representative and reinspected.

The vacuum test shall be conducted by plugging all incoming and outgoing sewer lines in the manhole at a location beyond the connection of the sewer pipe with the manhole. All plugs shall be blocked in place so as not to move during the test. The vacuum testing collar shall be inflated in the frame in accordance with the equipment manufacturer's recommendations. A vacuum of ten inches (10") of mercury shall be drawn and the vacuum pump turned off and the valve between the vacuum pump and the vacuum gauge shall be turned off.

The time period for the vacuum to fall from ten inches (10") of mercury to nine inches (9") of mercury shall be determined. If the time taken for the vacuum to reduce the ten inches (10") of mercury to nine inches (9") of mercury is less than the time indicated in the following Table, then the manhole work shall be considered not acceptable and shall be rejected. If the time is equal to or exceeds the time indicated below, the manhole work shall be accepted.

Table 5.8.4

Depth (ft)	Diameter (in)		
	48	60	72
Time (s)			
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

For each additional 2 feet add: 5 seconds for 48" manhole

- 5.14.7 Compaction Testing: All compaction testing shall be provided by and paid in full by the Contractor. The manner in which the Contractor achieves proper compaction shall be demonstrated at the beginning of the project (first 1,000 CYD) and this method shall be used for the duration of the project. The Contractor shall use independent testing to verify proper compaction.

Once proper compaction has been demonstrated, the Contractor shall notify the SLRWD's authorized inspector of any change in compaction material or method. When requested by the SLRWD's authorized inspector a new demonstration shall be performed as specified above at no additional cost.

Testing frequencies shall be as shown in Table 5.8.5

Table 5.8.5

#Number of Tests	Volume of Granular Fill
3	<input type="checkbox"/> 150 CYD
1 test per 100 CYD	<input type="checkbox"/> 1,000 CYD*
10 + 1 test per 1,000 CYD for any amount in excess of 1,000 CYD	<input type="checkbox"/> 1,000 CYD*

*Note: Testing frequency shall be adjusted so as to have a minimum of 3 tests on any given occasion.

- 5.14.8 Tracer Wire: Any tracer wire installed shall be tested for continuity in the presence of a SLRWD Authorized Representative. Any wire found not to be continuous shall be repaired or replaced.

5.15 WARRANTY

- 5.15.1 General: The Contractor/Developer shall warranty all workmanship and materials for a period of not less than two (2) year from the date of final acceptance.
- 5.15.2 Maintenance Bond: The warranty shall be provided in the form of a two (2) year maintenance bond. If there are any questions about the proper installation of any part or all of any system installed, the Contractor/Developer may be required to furnish an extended Maintenance Bond. The amount of the Bond shall be based on a certified Engineer's Estimate or by providing copies actual invoiced costs Certified by an Engineer. The Bond shall be in a form and in the amount approved by the SLRWD and shall be with an approved Bond provider.

SECTION VI
FORMS
INDEX

- 1.A Sewer Tap Permit Application Form
- 1.C Design Summary Form
- 2.A Conceptual Plan Application for Extensions or Additions
- 2.B Conceptual Plan Review Checklist
- 2.C Conceptual Plan Approval/Denial Letter
- 2.D Final Plan Review Checklist
- 2.E Final Plan Approval/Denial Letter
- 2.F Final Plan Application for Extensions or Additions
- 2.G Submersible Pump Stations

**CONSTRUCTION / PROPERTY IMPROVEMENT PERMIT APPLICATION FORM
STEUBEN LAKES REGIONAL WASTE DISTRICT**

APPLICANT INFORMATION:

Name: _____
Address: _____
City: _____ State: _____ ZIP: _____
Phone: _____, fax _____, cell _____,
Email _____

OWNER INFORMATION: (if different from Applicant):

Name: _____
Address: _____
City: _____ State: _____ ZIP: _____
Phone: _____, fax _____, cell _____,
Email _____

PROPERTY INFORMATION:

Lot #(s) _____, Addition: _____
Civil Township: _____ Section _____, T _____, R _____
Address: _____
City: _____ State: _____ ZIP: _____
Tax parcel #: _____, Anticipated date of connection: _____

DESIGN FLOW INFORMATION:

Residential: # Bedrooms: _____ Submit Design Summary (Form 1C) for Multi-Family, if more than 2 units.

Estimated ADF (Average Daily Flow): _____ gallons per day; Proposed (SIMPLEX)(DUPLEX) Pumps

Commercial, Industrial, Institutional, Governmental: (Circle One)

Description: _____

Bathrooms _____, # Fixtures _____ (If applicable)

Estimated ADF (Average Daily Flow): _____ gallons per day (Submit Design Summary (Form 1C))

Water Meter (required for facilities that discharge more than 310 gpd per 327 IAC 3-6-11)

Water Meter Size _____

CONTINUED ON FORM-1B

TYPE OF CONSTRUCTION

CHECK ALL THAT APPLY

- ☐ New Tap
- ☐ New or ☐ Relocating Grinder Tank
- ☐ New or ☐ Relocating Structure Sewer Service Line
- ☐ New or ☐ Relocating pressure sewer from tank to pressure main
- ☐ New or ☐ Relocating other utilities (specify which utilities) _____
- ☐ Building Addition, New Outbuilding, Landscaping, or Other Improvements,
Specify _____

In making this Application, the Applicant is Certifying that he is the Owner or Owners Authorized Representative and that he/she shall construct and maintain the proposed system in accordance with the rules and regulations of the STEUBEN LAKES REGIONAL WASTE DISTRICT and all applicable County, State and Federal regulations. Attach required supplemental data and check list to this Application.

OWNER/APPLICANT_____
DATE**FEES:**

TAP FEE	\$ _____
METER FEE (IF APPLICABLE)	\$ _____
PERMIT FEE	\$ _____
OTHER FEE	\$ _____
TOTAL	\$ _____
MONTHLY METER FEE (IF APPLICABLE)	
\$ _____ FEE X 1,000 GAL. OF USAGE	\$ _____

APPROVAL INFORMATION:

Approval #: _____, Date: _____, by: _____

Fee Paid: \$ _____, Sewer connection point: Segment _____, Station _____

Inspection date: _____, by _____

Pump(s) & Serial #: _____, _____

Control Panel Serial # _____

**DESIGN SUMMARY FORM
STEUBEN LAKES REGIONAL WASTE DISTRICT**

PROPOSED PROJECT NAME: _____

Design Flow

Number of Units

_____	1 Bdrm. Apts @ 200 gpd/unit	= _____ gpd
_____	2 Bdrm. Apts @ 300 gpd/unit	= _____ gpd
_____	Single family homes @ 310 gpd/unit	= _____ gpd
_____	Commercial lots @ _____ gpd/unit	= _____ gpd
_____	_____ @ _____ gpd/unit	= _____ gpd
_____	_____ @ _____ gpd/unit	= _____ gpd

Total average flow _____ gpd

Peaking factor _____ Peak flow _____ gpd

Pressure Systems:

Number of Grinder Pumps to be connected: _____

Number of Service Lines: _____

		Type (PVC) (HDPE)
Length of Main Line Sewer:	_____ L.F. 1½"	_____
	_____ L.F. 2"	_____
	_____ L.F. 3"	_____
	_____ L.F. 4"	_____
	_____ L.F. 6"	_____
Total	_____ L.F.	HDPE
Total	_____ L.F.	PVC

Gravity Systems:

Number of Service Lines: _____

Length of Main Line Sewer:	_____ L.F. 8"
	_____ L.F. 10"
	_____ L.F. 12"
Total	_____ L.F.

Number Manholes _____

OWNER/APPLICANT _____

DATE _____

Received by: _____, Date _____

APPROVAL INFORMATION:

Approval #: _____, Date: _____, by: _____

Fee Paid: \$ _____, Sewer connection point: Segment _____, Station _____

Inspection date: _____, by _____

Pump(s) & Serial #: _____

Control Panel Serial # _____

**CONCEPTUAL PLAN APPLICATION FOR EXTENSIONS OR ADDITIONS
TO THE
STEUBEN LAKES REGIONAL WASTE DISTRICT SEWER FACILITY**

PROPOSED PROJECT NAME: _____

Civil Township: _____ Section _____, T _____, R _____

Project Description: _____

Tax parcel #: _____, Anticipated date of connection: _____

APPLICANT INFORMATION:

Name: _____

Address: _____

City: _____ State: _____ ZIP: _____

Phone: _____, fax _____, cell _____, email _____

OWNER INFORMATION: (if different from Applicant):

Name: _____

Address: _____

City: _____ State: _____ ZIP: _____

Phone: _____, fax _____, cell _____, email _____

ENGINEERING COMPANY: _____

Engineers Name: _____

Address: _____

City: _____ State: _____ ZIP: _____

Phone: _____, fax _____, cell _____, email _____

CONNECTION INFORMATION:

Type Project:

of Residential units _____, # of Commercial EDU's _____, # of Industrial EDU's _____:

Commercial/Industrial Description: _____

_____ FIC Code if any _____

Estimated ADF (Average Daily Flow): _____ gpd; Peak Flow _____ gpd; Peak Flow _____ gpm;

In making this Application, the Applicant is Certifying that he is the Owner or Owners Authorized Representative and that he/she shall construct and maintain the proposed system in accordance with the rules and regulations of the STEUBEN LAKES REGIONAL WASTE DISTRICT and all applicable County, State and Federal regulations.

Attachments: Sketch Plan _____; Location Map _____; Requested connection point _____;

Other _____

OWNER/APPLICANT

DATE

Received by: _____, Date _____

SLRWD
CONCEPTUAL PLAN REVIEW CHECKLIST

TO BE COMPLETED BY APPLICANT

Project Name: _____

Project Description: _____

Application Complete: _____ Yes _____ No

Sketch Plan includes: _____ Boundaries _____ Anticipated Point of Connection

_____ Prop. Easements _____ Intended Use _____ Site Layout

_____ Prop. Sewer & Other Utility Routes _____ Estimated Flow

Connection Point:

Road or Lane _____

TO BE COMPLETED BY SLRWD

Line _____ Station _____

Existing Size: _____ Existing Connection: _____ Existing Pressure: _____

Is capacity available at design flows? _____ Yes _____ No

Will require: _____ low pressure pumps: _____ high pressure pumps

Other _____

Comments:

Received by: _____, Date _____

(Completed Form to be attached to Conceptual Plan Application with Acceptance/Denial Letter)

SLRWD
CONCEPTUAL PLAN APPROVAL/DENIAL LETTER

Date: _____

To: _____

Address: _____

City: _____ State: _____ Zip: _____

Re: Project Name _____

Application Date _____

Dear _____ :

The SLRWD Superintendent or his authorized representative and the Board of Trustees have reviewed your Conceptual Plan Application for the project referenced above. Based upon this review your Conceptual Plan Application has been (Approved) (Denied)

(If Approved)

At the (date) _____ meeting of the Board of Trustees, this project has been approved for a connection to the SLRWD Sewage Collection System as follows:

At Station _____ + _____ of Segment _____

The existing design TDH at this point is _____ foot.

The existing design flow in this segment is _____ gpm.

The Tap Fee for this (Extension) (Addition)

is \$ _____ plus Plan Review fees and inspection fees.

This acceptance is based upon the following Special Conditions: (List)

(If Denied)

At the (date) _____ meeting of the Board of Trustees, this project has been denied for a connection to the SLRWD Sewage Collection System because: (List)

Respectfully,

Signature

Printed Name
SLRWD Superintendent

cc: Board of Trustees

FINAL PLAN APPLICATION FOR EXTENSIONS OR ADDITIONS
TO THE
STEUBEN LAKES REGIONAL WASTE DISTRICT SEWER FACILITY

PROPOSED PROJECT NAME: _____

Civil Township: _____ Section _____, T _____, R _____

Project Description: _____

Pressure Systems:

Number of Grinder Pumps to be connected: _____

Number of Service Lines: _____

		Type (PVC) (HDPE)
Length of Main Line Sewer:	_____ L.F. 1½"	_____
	_____ L.F. 2"	_____
	_____ L.F. 3"	_____
	_____ L.F. 4"	_____
	_____ L.F. 6"	_____
Total	_____ L.F.	HDPE
Total	_____ L.F.	PVC

Gravity Systems:

Number of Service Lines: _____

Length of Main Line Sewer:	_____ L.F. 8"
	_____ L.F. 10"
	_____ L.F. 12"
Total	_____ L.F.

Number Manholes _____

FINAL CONNECTION INFORMATION: (if different from Conceptual Plan Application)

Type Project:

of Residential units _____, # of Commercial EDU's _____, # of Industrial EDU's _____:

Commercial/Industrial Description: _____

_____ FIC Code if any _____

Estimated ADF (Average Daily Flow): _____ gpd; Peak Flow _____ gpd; Peak Flow _____ gpm;

Applicant to attach copy of Conceptual Plan Application form, completed IDEM Permit Application data, and completed Waste Allocation Letter.

In making this Application, the Applicant is Certifying that he is the Owner or Owners Authorized Representative and that he/she shall construct and maintain the proposed system in accordance with the rules and regulations of the STEUBEN LAKES REGIONAL WASTE DISTRICT and all applicable County, State and Federal regulations.

OWNER/APPLICANT _____

DATE _____

Received by: _____, Date _____

SLRWD
FINAL PLAN REVIEW CHECKLIST

Project Name: _____

Owner/Developer: _____

Engineer: _____

FINAL PLAN SUBMITTAL

- ☐ Completed "Final Plan Application for Extensions or Additions (Form 2D)
- ☐ Completed "Final Plan Review Checklist (Form 2E)
- ☐ Copy of the "Conceptual Plan Approval"
- ☐ Completed IDEM Permit Application
- ☐ Completed Waste Allocation Letter
- ☐ Three (3) sets of Plans and Specifications
- ☐ "Plan Review Fee"

PLAN SET

All Sheets:

- ☐ Title Block with Project Name and Sheet Description
- ☐ Sheet Numbers – Referenced in Index
- ☐ Engineering Firm's Name, Address, Phone Number
- ☐ Engineer's Name, Signature, and Seal
- ☐ Drawing Date and Revision Date(s)

Title Sheet:

- ☐ Owner/Developer's Name, Address, and Phone Number
- ☐ Engineer's Name, Address, and Phone Number
- ☐ Location Map
- ☐ Sheet Index
- ☐ Utility Contact List
- ☐ Separate Spec Note (if applicable)

Plan Portion of Sheet(s)

- ☐ Scale(s)
- ☐ North Arrow and Bar Scale
- ☐ Proposed/Existing Utility Legend(s)
- ☐ Plan Layout and Topography
- ☐ Street/Road Names
- ☐ Sewer Centerline Stationing
- ☐ Stationing and Identification of Bends, Fittings, Branches, Valves, & Structures
- ☐ Sewer Line Stationing Tied to Physical Features
- ☐ Match Lines with Stationing
- ☐ Existing and/or Proposed Utilities

Plan Portion of Sheet(s) (Con't)

- ☐ Reference Profile Sheets if not a Plan and Profile Sheet
 - ☐ Line Designations and Branch Line Designations
 - ☐ Sewer Flow Direction Arrows
 - ☐ Applicable Flood Plain Data
- Profile Portion of Sheet(s)**
- ☐ Scale(s)
 - ☐ Stationing to Match Plan Stationing
 - ☐ Match Lines with Stationing
 - ☐ Existing Grade Above Sewer Centerline
 - ☐ Proposed Grade Above Sewer Centerline (If Different than Existing)
 - ☐ Street/Road Crossing Centerline Stationing shown with Name
 - ☐ Existing/Proposed Utility Crossings with Stationing and appropriate Separation
 - ☐ Stationing of Bends, Fittings, Valves, and Structures
 - ☐ Stationing and Line Reference of Branches
 - ☐ Sewer Lengths, Sizes, and Material Type (As Applicable)
 - ☐ 5 Foot Cover Maintained (Where Req'd)
 - ☐ Proposed Elevation of Key Elements of the Profile
 - ☐ Existing/Proposed Utility Crossings With Stationing
 - ☐ Hydraulic Grade Line (If not shown in Tabular Form on Detail Sheet)

Detail Sheet(s):

- ☐ Scale(s)
- ☐ Project Specifications
- ☐ Reference SLRWD Development Standards, Details and Specification Manual or provide Specifications in a separate document
- ☐ Include Data Req'd by IDEM/ISBOH
- ☐ Special Conditions
- ☐ Special Details Req'd
- ☐ Tabular Form of Hydraulic Profile at Key Stations and Branches (If not Shown on Profile Sheets)

Received by: _____, Date _____

SLRWD
FINAL PLAN APPROVAL/DENIAL LETTER

Date: _____

To: _____

Address: _____

City: _____ State: _____ Zip: _____

Re: Project Name _____

Application Date _____

Dear _____ :

The SLRWD Superintendent or his authorized representative and the Board of Trustees have reviewed your Application and Plans for the project referenced above. Based upon this review your Application has been (Approved) (Denied)

(If Approved)

This Approval is based upon the connection of _____ EDUs in accordance with Plans and Specifications prepared by _____, Registered Professional Engineer with last certification date of _____, payment of tap fee in the amount of \$ _____ and posting appropriate performance bond.

This acceptance is also based upon the following Special Conditions: (List)

(If Denied)

The Plans for this project are deficient and require the following corrections, additions or modifications.

Upon receipt of the deficient items, Plans will again be reviewed for acceptance by the SLRWD. (after 2nd submittal add: "An additional review fee will be required")

Respectfully,

Signature

Printed Name
SLRWD Superintendent

cc: Board of Trustees

SUBMERSIBLE PUMP STATION

Pump shall be _____ or equal.

Pumps shall be of the submersible type, of cast iron construction with non-overloading type submersible motors attached directly to the pump.

Motors shall be designed for continuous duty and have double mechanical shaft seals and built in overload protection. Motors shall be of not less than _____ H.P. of the oil fitted type, suitable for operation on the _____ phase _____ volt 60 Hz. power supply.

Pump Impellers shall be of the non-clog type, close grained cast iron or high grade bronze machined and balanced, and securely keyed to an oil lubricated stainless steel shaft.

Pumps shall be capable of passing a minimum of _____ inch diameter solids.

Pumps shall be capable of pumping _____ G.P.M. at _____ ft. T.D.H. (See Pump vs. System Curves)

SECTION VII
APPENDICES
INDEX

Appendix "A" – Sample Easement Plat



RUSSELL ENGINEERING ASSOCIATES, INC.

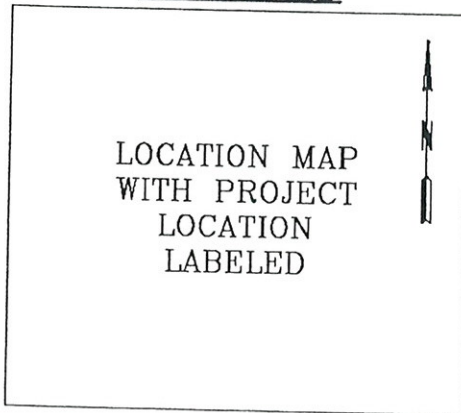
2527 SCOTSWOLDE DRIVE
FORT WAYNE, INDIANA 46808
(260) 482-5300

KENNETH J. RUSSELL P.E. & R.L.S.-R.L.S. NO. 890019
STEVEN A. MAXWELL P.E. & R.L.S.-R.L.S. NO. LS29900007
JAMES L. RUSSELL P.E. & R.L.S.-R.L.S. NO. 11679

SANITARY SEWER EASEMENT TO STEBEN LAKES REGIONAL WASTE DISTRICT FROM JOHN DOE

PERMANENT EASEMENT = _____ SQ.FT.
TEMPORARY CONSTRUCTION EASEMENT = _____ SQ.FT.

LOCATION MAP



CERTIFICATION IN LIEU OF FORM 170

I, THE UNDERSIGNED REGISTERED LAND SURVEYOR, DO HEREBY AFFIRM, UNDER PENALTIES FOR PERJURY, THAT I HAVE TAKEN REASONABLE CARE TO REDACT EACH SOCIAL SECURITY NUMBER IN THIS DOCUMENT, UNLESS REQUIRED BY LAW.
[IC 36-2-11-15(d)]

PROPERTY OF:
JOHN DOE
(ADDRESS)

LEGAL DESCRIPTION

A part of the South Half of Sec. 2-T37N-R13E Pleasant Twp., Steuben County, Indiana.

Being a part of the same property conveyed to the grantor by deed dated 01/01/2006, and recorded as Document Number 00000000.

NOTES:

- * All parcel dimensions are per deed of record.
- * No field survey was performed, easement was compiled from record documents.

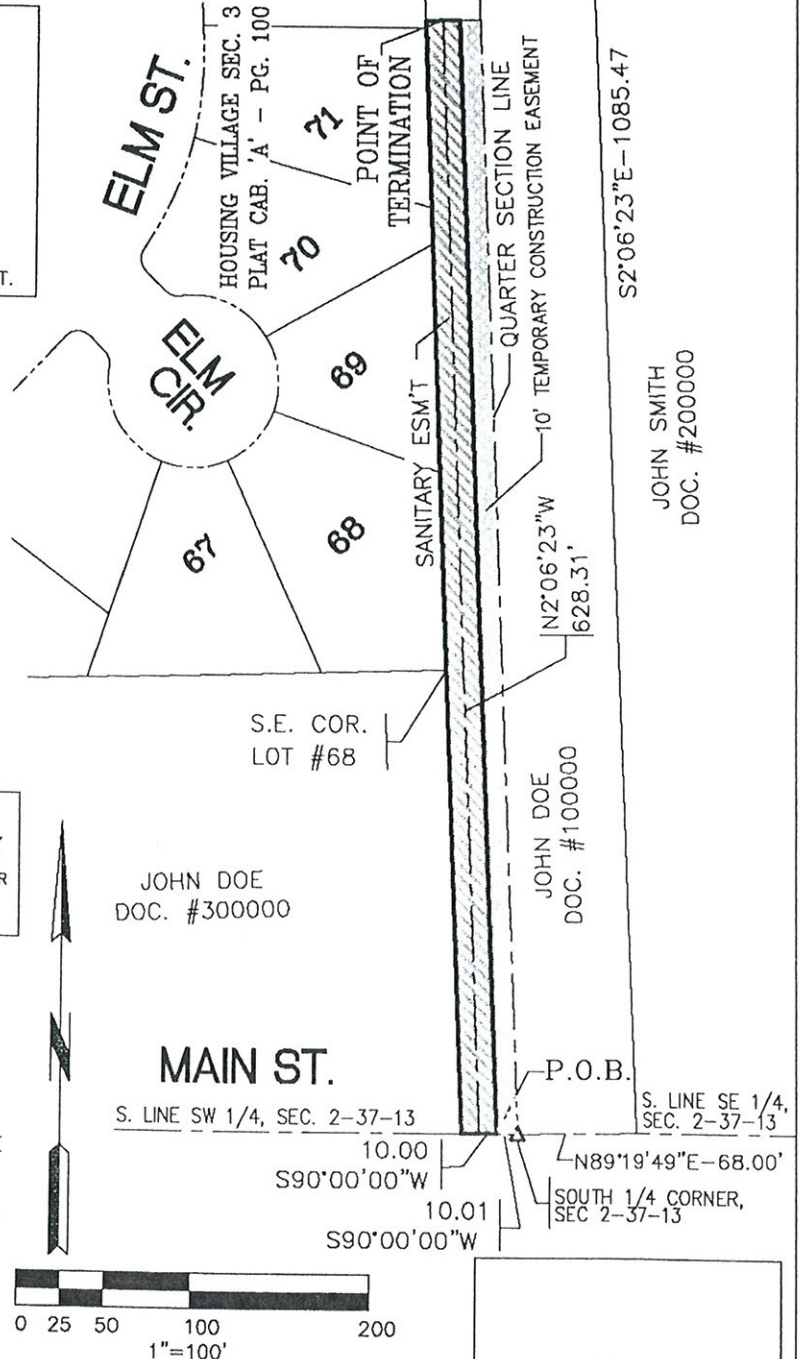
I hereby certify that this document was made under my supervision and is correct to the best of my knowledge and belief. Distances as shown on this document have not been adjusted. This easement document meets or exceeds the minimum standards of governing authorities.

LAND SURVEYOR'S SIGNATURE

LAND SURVEYOR'S NAME

LS #000000

CIVIL ENGINEERS * LAND SURVEYORS * LAND PLANNERS



S2°06'23"E-1085.47

JOHN SMITH
DOC. #200000

JOHN DOE
DOC. #100000

JOHN DOE
DOC. #300000

MAIN ST.

S. LINE SW 1/4, SEC. 2-37-13

S. LINE SE 1/4, SEC. 2-37-13

LAND
SURVEYOR
STAMP

APPENDIX "A"

