

KEARNS IMPROVEMENT DISTRICT

# DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS



Adopted by the Kearns Improvement District Board of Trustees  
**September 2016**

DESIGN STANDARDS &  
CONSTRUCTION SPECIFICATIONS  
Cover Page – September 2016



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## Table of Contents

|                  |   | PAGE |
|------------------|---|------|
| <b>Section 1</b> | <b>GENERAL</b>                                      |      |
| 1.01             | Definitions and References .....                    | 4    |
| 1.02             | New Project Development Procedures                  |      |
| 1.02.01          | Development Checklist .....                         | 7    |
| 1.02.02          | Developer’s Project Engineer’s Responsibility ..... | 9    |
| 1.02.03          | Drawings & Specifications .....                     | 10   |
| 1.02.04          | As-built Drawings .....                             | 11   |
| 1.02.05          | Land and Rights-of-Way and Easements .....          | 12   |
| 1.02.06          | Pre-Construction Meeting Agenda .....               | 13   |
| 1.02.07          | Bonding Procedures .....                            | 14   |
| 1.02.08          | Coordination of Work .....                          | 16   |
| 1.02.09          | Change / Corrections in the Work .....              | 17   |
| 1.02.10          | Quality Requirements .....                          | 18   |
| 1.02.11          | Warranty .....                                      | 21   |
| 1.02.12          | Indemnification .....                               | 22   |
| 1.02.13          | Surveying .....                                     | 23   |
| 1.02.14          | Emergencies.....                                    | 25   |
| 1.02.15          | Hazardous Material .....                            | 26   |
| 1.02.16          | Permits, Regulations, and Fees .....                | 27   |
| <b>Section 2</b> | <b>MATERIALS</b>                                    |      |
| 2.01             | Water Systems .....                                 | 28   |
| 2.01.01          | Water Systems Material Summary Table .....          | 28   |
| 2.01.02          | Pipe .....  | 32   |
| 2.01.03          | Hydrants .....                                      | 35   |
| 2.01.04          | Water Service Connections .....                     | 36   |
| 2.01.05          | Meter Boxes.....                                    | 36   |
| 2.01.06          | Valve Boxes.....                                    | 36   |
| 2.01.07          | Gate Valves .....                                   | 37   |
| 2.01.08          | Butterfly Valves.....                               | 37   |
| 2.01.09          | Fittings.....                                       | 38   |
| 2.01.10          | Bedding.....  | 38   |
| 2.01.11          | Vaults.....   | 38   |
| 2.02             | Sewer Systems .....                                 | 39   |
| 2.02.01          | Sewer System Material Summary Table .....           | 39   |
| 2.02.02          | Pipe .....  | 42   |
| 2.02.03          | Manholes .....                                      | 44   |
| 2.02.04          | Acid Resistant Polymer Manholes.....                | 45   |
| 2.02.05          | Sewer Flow Meter .....                              | 47   |



|                  |   |       |
|------------------|---|-------|
| 2.02.06          | Sewer Lift Stations .....                           | 49    |
| 2.03             | Concrete .....                                      | 51    |
| 2.03.01          | Materials .....                                     | 51    |
| 2.04             | Trench Excavation .....                             | 58    |
| 2.04.01          | Trench Excavation .....                             | 58    |
| 2.05             | Trench Backfill and Compaction .....                | 60    |
| 2.05.01          | Trench Backfill and Compaction .....                | 60    |
| 2.06             | Secondary Water Systems .....                       | 64    |
| 2.06.01          | Secondary Water System Material Summary Table ..... | 64    |
| 2.06.02          | Pipe .....  | 67    |
| <b>Section 3</b> | <b>CONSTRUCTION STANDARDS</b>                       |       |
| 3.01             | General .....                                       | 69    |
| 3.02             | Emergencies .....                                   | 70    |
| 3.03             | Surface Restoration .....                           | 71    |
| 3.04             | Tunneling or Auguring .....                         | 72    |
| 3.05             | Construction Water .....                            | 73    |
| 3.06             | Water Systems .....                                 | 74    |
| 3.07             | Sewer Systems .....                                 | 77    |
| <b>Section 4</b> | <b>INSPECTIONS AND TESTING</b>                      |       |
| 4.01             | District Inspections .....                          | 87    |
| 4.02             | Testing Agencies .....                              | 87    |
| 4.03             | Water System Inspections .....                      | 88    |
| 4.04             | Sewer System Inspections .....                      | 90    |
| 4.05             | Inspection Checklist .....                          | 92    |
| <b>Section 5</b> | <b>DESIGN STANDARDS</b>                             |       |
| 5.01             | Water System Design Standards .....                 | 94    |
| 5.02             | Sewer System Design Standards .....                 | 98    |
| <b>Section 6</b> | <b>STANDARD DRAWINGS</b>                            |       |
| <b>6.01</b>      | <b>Water System</b>                                 |       |
|                  | Typical Water Line Trench Detail .....              | CW 1  |
|                  | Typical Gate Valve Detail .....                     | CW 2  |
|                  | Thrust Block Details .....                          | CW 3  |
|                  | Fire Hydrant Installation .....                     | CW 4  |
|                  | Typical Wash-Out Valve Detail .....                 | CW 5  |
|                  | Typical Service Tap Detail 3/4" – 2" .....          | CW 6  |
|                  | Typical Meter Box Detail 3/4" – 1" .....            | CW 7  |
|                  | Water Meter Vault 1 1/2" – 2" .....                 | CW 8  |
|                  | Typical Large Meter Vault .....                     | CW 9  |
|                  | Parallel Bends w/ Thrust Block .....                | CW 10 |
|                  | Typical Waterline Loops .....                       | CW 11 |
|                  | Typical Water Main MJ Loop Detail .....             | CW 12 |
|                  | Typical Irrigation Sub-Meter Installation .....     | CW 13 |



|                                       |       |
|---------------------------------------|-------|
| Steel Casing for Water Pipe.....      | CW 14 |
| Fire Hydrant Location.....            | CW 15 |
| Hill Side Hydrant Installation.....   | CW 16 |
| 4” Detector Check Meter Vault.....    | CW 17 |
| 8” Detector Check Meter Vault.....    | CW 18 |
| 8” Fire Line Meter.....               | CW 19 |
| 3” Compound Meter w/ 3” Bypass.....   | CW 20 |
| 4” Compound Meter w/ 4” Bypass.....   | CW 21 |
| 6” Compound Meter w/ 6” Bypass.....   | CW 22 |
| 8” Compound Meter w/ 6” Bypass.....   | CW 23 |
| Air/Vacuum Relief Station Detail..... | CW 24 |
| Typical Water Sampling Station.....   | CW 25 |

**6.02 Sewer System**

|   |       |
|---|-------|
| Typical Sewer Line Trench Detail.....                     | SS 1  |
| Standard Manhole.....                                     | SS 2  |
| Typical Outside Drop Manhole Detail.....                  | SS 3  |
| Sewer Service Connection.....                             | SS 4  |
| Grease Trap Detail.....                                   | SS 5  |
| Sampling Manhole Detail.....                              | SS 6  |
| Sewer Manhole on Existing Pipe.....                       | SS 7  |
| Typical Sewer Service Connection and Cleanout.....        | SS 8  |
| Steel Casing for Sewer Pipe.....                          | SS 9  |
| Sewer Pipe Anchor Detail.....                             | SS 10 |
| Typical Sewer Repair Detail.....                          | SS 11 |
| 60” Diameter Sewer Metering Manhole & Parshall Flume..... | SS 12 |
| Sewer Metering Manhole Requirements.....                  | SS 13 |
| Sewer Lift Station.....                                   | SS 14 |

**SECTION 7 FORMS**

|                          |  |
|--------------------------|--|
| 7.01 Easement Grant..... |  |
|--------------------------|--|



## Section 1 – GENERAL

### 1.01. Definitions and References

- A. **AS-BUILT DRAWINGS:** Drawings which depict the improvements as installed, including field changes, revisions, etc. Sometimes called “Record Drawings”.
- B. **BONDS / LETTER OF GUARANTEE:** Instruments of security, furnished by the Developer and his surety in accordance with KID Policy to assure the installation of improvements or to guarantee their performance.
- C. **CONTRACTOR:** The person, firm or corporation retained by the developer who is responsible for all construction work in the development.
- D. **DISTRICT:** The Kearns Improvement District (KID)
- E. **DISTRICT ENGINEER:** The Licensed Engineer, employed or retained by KID, including such agents and assistants as are authorized to represent him, who represents KID.
- F. **DRAWINGS:** The part of the approved plans which show the characteristics and scope of the WORK to be performed and which have been approved by the District Engineer.
- G. **ENGINEER:** The Company or firm and its employees retained by the developer providing the engineering services for the development; also referred to as project engineer or engineer of record.
- H. **INSPECTOR:** The authorized agent of KID or District Engineer assigned to make detailed inspections of any or all portions of the water and sewer system construction.
- I. **LATERAL:** The sewer line and appurtenances extending from 2 feet outside of the building to the public sewer, including the connection to the sewer main.
- J. **OWNER or DEVELOPER:** The person, firm or corporation who initiates the project and authorizes expenditures for its construction.
- K. **PROJECT:** The undertaking to be performed as provided in the Drawings and Specifications.
- L. **SECONDARY WATER SYSTEM:** A water system, separate from the culinary or potable system, which is intended to provide irrigation water. The water used in such a system may be reuse water, canal water, well water, or combinations of such.
- M. **“SHALL”/“SHOULD”:** Where the term “shall” is used, it is intended to specify a mandatory requirement. Other terms such as “should”, “may”, and “recommend” indicate discretionary use.
- N. **SPECIFICATIONS:** A written description of a technical nature of materials, equipment, construction systems, standards and workmanship.
- O. **SUBCONTRACTOR:** An individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work.
- P. **SUBSTANTIAL COMPLETION:** That date when the construction of the Project or a specified part thereof is sufficiently complete, in accordance with the Drawings and Specifications, so that the Project or specified part can be utilized for the purposes for which it is intended such acceptance shall be the date when the Board of Trustees of KID accepts the improvements which comprise the Project or designated part of the Project.
- Q. **SUPPLIER:** Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the work site.
- R. **WORK:** All labor necessary to produce the construction required by the Drawings and Specifications, and all materials and equipment incorporated or to be incorporated in the Project.
- S. **AWWA References (use latest edition)**
  - 1. AWWA C104/A21.4, ANSI Standard for Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
  - 2. AWWA C110/A21.10, ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3” through 48”, for Water.
  - 3. AWWA C111/A21.11, ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.



4. AWWA C151/A 21.51 ANSI Standard for Ductile Iron Piping, Centrifugally Cast, for Water or Other Liquids.
5. AWWA C500, Metal Seated Gate Valves for Water Supply Service.
6. AWWA C502, Dry-Barrel Fire Hydrants.
7. AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.
8. AWWA C605, Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
9. AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings 4 In. Through 12 In. for Water Distribution.
10. AWWA C909 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. Through 12 In. for Water Distribution.

T. ASTM References (use latest edition)

1. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
3. ASTM A185 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
4. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
5. ASTM B62 Standard Specification for Composition Bronze or Ounce Metal Castings.
6. ASTM B88 Standard Specification for Seamless Copper Water Tube.
7. ASTM B124 Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes.
8. ASTM C33 Standard Specification for Concrete Aggregates.
9. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
10. ASTM C150 Standard Specification for Portland Cement.
11. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete.
12. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
13. ASTM C478 Standard Specification for Pre-cast Reinforced Manhole Sections.
14. ASTM D3034 Standard Specification for Type PSM Poly(vinyl chloride) (PVC) Sewer Pipe and Fittings.
15. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
16. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals.

U. Miscellaneous References

1. Federal Specification SS-S-210(A) Sealing Compound, Preformed Plastic, for Expansion Joints & Pipe Joints.
2. MSS SP-11 Gray-Iron and Ductile-Iron Tapping Sleeves.
3. AASHTO T-180 (Method D-Modified), Moisture-Density Relation of Soil using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop.
4. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
5. ACI 305R Hot Weather Concreting
6. ACI 306R Cold Weather Concreting
7. ACI 347 Guide to Formwork for Concrete



## V. Abbreviations

1. AWWA: American Water Works Association
2. ASTM: American Society for Testing and Materials
3. MSS: Manufacturer's Standardization Society
4. AASHTO: American Association of State Highway and Transportation Officials
5. ACI: American Concrete Institute
6. ANSI: American National Standards Institute



## 1.02 New Project Development Procedures

### 1.02.01 Development Checklist

| <b>Name of Project:</b> |   |                  |             |
|-------------------------|---|------------------|-------------|
| <b>Location:</b>        |   |                  |             |
| <b>Item No.</b>         | <b>Item Description</b>   | <b>Completed</b> | <b>Date</b> |
| 1.                      | Request for Letter of Availability for service  |                  |             |
| 2.                      | Submittal of Preliminary Design Drawings (2 sets)   |                  |             |
| 3.                      | Preliminary Design review – Returned to Developer’s engineer for red-line corrections   |                  |             |
| 4.                      | Re-submittal of corrected Design Drawings (3 sets)  |                  |             |
| 5.                      | Upon review & KID acceptance – 3 sets approved (1 to file, 1 to Engineering, 1 to Inspector)  |                  |             |
| 6.                      | Submittal of subdivision mylar for KID General Manager signature  |                  |             |
| 7.                      | Bond/Letter of Guarantee amount calculated. Provide to Developer & Engineer   |                  |             |
| 8.                      | Review fees, connection fees, and impact fees determined. Provide to developer & engineer   |                  |             |
| 9.                      | Bond/Letter of Guarantee accepted, payment of review fees, connection fees, and impact fees received by KID   |                  |             |
| 10.                     | Project Pre-construction meeting is set, participants notified (Developer, District Engineer, KID Inspector, Project Engineer)  |                  |             |
| 11.                     | Hold Pre-construction meeting at KID Office. Contractor to sign Pre-construction meeting form.  |                  |             |
| 12.                     | Construction Inspection (See inspection checklist <ul style="list-style-type: none"> <li>a. Approved plans to be used by Inspector for all inspections</li> <li>b. Inspection log to be kept</li> <li>c. Inspection reports to be completed</li> <li>d. Inspections to be conducted at least daily while work is in progress</li> </ul> |                  |             |
| 13.                     | Upon project completion, Contractor requests project inspection punch list  |                  |             |
| 14.                     | Contractor provides video, pressure, and mandrel test results of sewer lines.   |                  |             |
| 15.                     | Contractor provides pressure tests and certified laboratory test results of successful bacteria testing of water lines.   |                  |             |
| 16.                     | KID Inspector creates a punch list which is provided to Contractor  |                  |             |
| 17.                     | A set of “As-built” construction drawings in electronic ACAD format and a full sized 24” x 36” paper copy is provided to the District Engineer for review.  |                  |             |
| 18.                     | Contractor requests a review of corrected punch list items. Inspector sign off on punch list when all items are corrected.  |                  |             |
| 19.                     | Inspector provides a copy of all field notes and field marked construction drawings to the District Engineer. The District Engineer compares the “As-built” submittal to original approval and field marked plans. Lists of discrepancies, or problems, are provided to the Project Engineer.   |                  |             |
| 20.                     | Final corrected “As-built” drawings in electronic ACAD format and a full sized 24” x 36” paper copy is provided to the KID District Engineer for project acceptance.  |                  |             |
| 21.                     | With written approvals from the KID Inspector and KID Engineering, the KID District Engineer prepares a request for bond/Letter of Guarantee reduction for the KID Board of Trustees consideration on the next KID Board of Trustees meeting agenda. A copy of the request is provided to the Contractor.                               |                  |             |





|     |   |  |  |
|-----|---|--|--|
| 22. | “As-built” drawings are added to the KID –GIS mapping system  |  |  |
| 23. | Upon completion of the 1 year warranty period, the KID Inspector conducts a final inspection of the utility installation to identify any deficiencies which may have occurred as a result of poor materials or workmanship.   |  |  |
| 24. | Upon finalization and approval by the KID Inspector, the District Engineer prepares a request for Bond/Letter of Guarantee release for the KID Board of Trustees consideration on the next KID Board of Trustees meeting agenda. A copy of the request is provided to the Contractor. |  |  |
| 25  | Project complete. KID accepts responsibility of project sewer and water infrastructure.   |  |  |



**1.02.02 Developer's Project Engineer's Responsibility**

- A. Developer's Project Engineer shall design the sewer system in accordance with these Design Standards and Construction Specifications, good engineering practices and the normal standard of care.
- B. The Developer's Project Engineer shall upsize the sewer system as required by the District Engineer.
- C. Where required by the District Engineer, detailed computations, including hydraulic calculations showing, flow, pressure, velocity, head loss, depth of flow, water surface profiles, and gradients shall be submitted with the project plan submittal.
- D. KID shall not be responsible for any errors in the design, construction changes required due to an oversight of the Developer and/or the Developer's Project Engineer, or upgrades required because of a lack of planning, incompetence or negligence by the Developer and/or the Developer's Project Engineer.



### **1.02.03 Drawings and Specifications**

- A. Drawings shall be prepared on D sized drawings, shall be drawn to scale, and shall provide sufficient detail to allow construction of the required improvements with no other information other than that provided in the Specifications and Drawings. Plan and profile drawings shall be provided, showing existing and final grades at a scale no greater than 1"= 40' horizontal scale, and 1" = 4' vertical scale. A material take-off, listing the quantities of proposed pipe, manholes, valves, hydrants, etc., shall be provided for bond calculation purposes.
- B. Any Part of the Work which is not mentioned in the Construction Specifications but is shown on the Drawings, or any part not shown on the Drawings but described in the Construction Specifications shall be furnished and installed by the Contractor as if fully described in the Construction Specifications, and shown on the Drawings.
- C. All minor details of Work and materials which are not shown on the Drawings, as well as such items which are not specifically mentioned in the specifications, but are obviously necessary for the proper completion of the Work, shall be considered as incidental, and as being a part of and included with the work.
- D. In case of conflict between the Drawings and these Design and Construction Specifications, the Design Standards and Construction Specifications shall govern.
- E. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings.
- F. Any discrepancies found between the Drawings and these Design Standards and Construction Specifications and site conditions or any inconsistencies or ambiguities in the Drawings or Design Standards and Construction Specifications shall be immediately reported to the Developer and the District Engineer. The Developer or Developer's Engineer shall promptly have such inconsistencies or ambiguities corrected in writing. Work done by the Contractor after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the Contractor's risk.
- G. In the event that construction does not proceed within six (6) months of submitting Drawings for approval, said Drawings, whether approved or not, shall be resubmitted for additional review and re-approval.
- H. Drawings will be reviewed by the District Engineer, and the Project Engineer will be informed of any required corrections or deficiencies. Upon receipt of 4 sets of drawings not requiring further corrections, the Drawings will be stamped approved, and will, together with these Design Specifications, become the design upon which all construction shall be based.



#### **1.02.04 As-built Drawings**

- A. Upon completion of the work, the Engineer shall prepare a set of AS-BUILT Drawings which incorporate all field changes. Upon approval and acceptance of the AS-BUILT Drawings, and as a condition of bond reduction, the Engineer shall provide a digital copy, by electronic means, to KID suitable for incorporation into KID's GIS System.
- B. Two dimensional ties are required to the 2x4 lateral markers. These ties shall be from the two front property corners, or a "nail-in-curb" projected from the property corner, from the same side of the roadway, unless other points of reference are specifically approved by the District Engineer.
- C. Stationing at all laterals and manholes is required to be shown with regard to actual field conditions.
- D. Any changes differing appreciably from the approved design drawings (i.e. sewer line and manholes relocated to opposite sides of roadways; sewer line shortened or lengthened 5 feet or greater; invert elevation changes) shall be shown graphically correct to reflect field conditions.
- E. All items shown on the profile, including slopes, inverts, and lengths, are required to be changed to reflect field conditions. These items are also required to be shown graphically correct.
- F. The Engineer shall provide written certification that a field survey of existing "as-built" sanitary sewer and waterline information assessment (field verifiable information) has been performed.
- G. The Engineer shall certify, to the best of his/her knowledge and available information, which has been incorporated into the AS-BUILT Drawings that all construction and procedures have been completed in general accordance with KID Final Design Approved Drawings and any approved revisions. The Engineer shall provide his/her stamp and signature on all AS-BUILT Drawings.
- H. The AS-BUILT Drawings shall include all sheets which comprise the original set of Drawings.
- I. Type and size of pipe installed shall be indicated on the AS-BUILT Drawings.
- J. The location of "as-built" sewer and water lines within easements or platted Rights-of-way shall be verified. If revised easements are required, they shall be obtained by Developer, in form and substance acceptable to KID, and be filed for record with the Salt Lake County Recorder. A copy of all required recorded easements shall be submitted with the AS-BUILT Drawings.
- K. "As-built" or final manhole rim elevations are not required to be presented on the AS-BUILT Drawings.
- L. Any pertinent field information obtained by the Contractor shall be required to be shown on the AS-BUILT Drawings.



**1.02.05 Land and Rights-of-Way and Easements**

- A. The Developer shall obtain all land and rights-of-way necessary for carrying out and completing the Work to be performed pursuant to the approved Drawings and Specifications, unless otherwise mutually agreed. The requirements of the Utility Extension Agreement shall prevail in all such matters.
- B. The Developer shall record the subdivision plat with the County Recorder, which plat shall indicate all easements and rights-of-way necessary for the installation of the Project improvements. One copy of the plat shall be submitted to KID with the design drawings for approval.
- C. The Developer shall provide to the Contractor information, which delineates and describes the lands owned, and rights-of-way and easements acquired. Copies of the easements and permits that have been acquired by the Developer will be available to the Contractor.
- D. The Developer shall record with the County Recorder any other off-site easements that are required to complete the Project, without liability to KID, and provide a copy of the recorded easements to KID before bond reduction. Such easements shall be clearly in favor of KID, allowing access for maintenance, repair, excavation, etc., shall be prepared in a form acceptable to KID and shall be graphically shown on the Drawings.
- E. It shall be the Contractor’s responsibility to determine the adequacy of the easements obtained in every case and to abide by all requirements and provisions of the easements.
- F. The Contractor shall provide without liability to the District any additional land, access and easements thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.
- G. Easements shall be of sufficient width to allow for maintenance, repair, and replacement of the improvements installed there in.
  - 1. The required easements and access permits shall be obtained before construction is commenced.

**Right- of -Way and Construction Easements Required for KID Utility Installation Projects**

(All Numbers are in Feet)

Any Deviation from the following must be approved by the KID General Manager

| Pipe Size | 8” – 12”     |                    |                     | 15” – 18”         |                    |                           | 21”- 27”          |                    |                           | 30” – 36”         |                    |                           |
|-----------|--------------|--------------------|---------------------|-------------------|--------------------|---------------------------|-------------------|--------------------|---------------------------|-------------------|--------------------|---------------------------|
|           | Trench Depth | Right of Way Width | Construct. Easement | Total Width Req’d | Right of Way Width | Construct. Easement Width | Total Width Req’d | Right of Way Width | Construct. Easement Width | Total Width Req’d | Right of Way Width | Construct. Easement Width |
| 0-6       | 15           | 15                 | 30                  | 20                | 10                 | 30                        | 25                | 5                  | 30                        | 25                | 10                 | 35                        |
| 6-8       | 15           | 20                 | 35                  | 20                | 15                 | 35                        | 25                | 10                 | 35                        | 25                | 10                 | 35                        |
| 8-10      | 15           | 20                 | 35                  | 20                | 15                 | 35                        | 25                | 15                 | 40                        | 25                | 15                 | 40                        |
| 10-12     | 15           | 25                 | 40                  | 20                | 20                 | 40                        | 25                | 15                 | 40                        | 25                | 20                 | 45                        |
| 12-14     | 15           | 25                 | 40                  | 20                | 25                 | 45                        | 25                | 20                 | 45                        | 25                | 20                 | 45                        |
| 14-16     | 15           | 30                 | 45                  | 20                | 25                 | 45                        | 25                | 25                 | 50                        | 25                | 25                 | 50                        |
| 16-18     | 15           | 35                 | 50                  | 20                | 30                 | 50                        | 25                | 35                 | 55                        | 25                | 30                 | 55                        |
| 18-20     | 15           | 40                 | 55                  | 20                | 35                 | 55                        | 25                | 30                 | 55                        | 25                | 35                 | 60                        |



**1.02.06 Pre-Construction Meeting Agenda**

**PRECONSTRUCTION MEETING AGENDA**

|                                      |                                  |
|--------------------------------------|----------------------------------|
| <b>Project:</b>                      |                                  |
| <b>Location:</b>                     |                                  |
| <b>Date:</b>                         |                                  |
| <b>Meeting Location:</b>             | 5350 West 5400 South, Kearns, UT |
| <b>Time:</b>                         |                                  |
| <b>Developer:</b>                    |                                  |
| <b>Contractor:</b>                   |                                  |
| <b>Project Engineer:</b>             |                                  |
| <b>KID Support Services Manager:</b> |                                  |
| <b>KID Inspector:</b>                |                                  |

**ATTENDING**

| <b>NAME</b> | <b>REPRESENTING</b> | <b>TELEPHONE No.</b> | <b>EMAIL</b> |
|-------------|---------------------|----------------------|--------------|
|             |                     |                      |              |
|             |                     |                      |              |
|             |                     |                      |              |
|             |                     |                      |              |
|             |                     |                      |              |
|             |                     |                      |              |

**MAIN AGENDA ITEMS**

1. The KID Inspector will provide an Inspection Report to the contractor for each visit. If a KID Inspector is not present at least once each day that work is performed, Contractor is to call for an inspection. Call the KID Inspector. If he is unavailable, please call the office at 801-968-1011.
2. The approved plans and KID Design Standards are to be available on site.
3. It is critically important that the pipe bedding and backfill be done correctly. Compaction test results and copies of field inspection reports may be required by the District Engineer.
4. Deviations from the approved plans must be approved prior to installation.
5. The Contractor is to video log and mandrel the sewer line, conduct pressure tests, and request bacteria tests as outlined in the Design Standards and in the Inspection Checklist. This must be done, and all testing must be successfully completed prior to any request for a reduction in Bond / Letter of Guarantee amounts
6. The Project Engineer is to provide “AS-BUILT” drawings in ACAD electronic format and one (1) - 24” x 36” paper copy. A Bond / Letter of Credit Guarantee reduction will not be considered without this item.
7. If required, discussion of Hazardous Material Handling (See Section 1.02.15
8. Other Items:

Developer acknowledges receipt of a copy of this document by signing below.

DEVELOPER: \_\_\_\_\_



**1.02.07 Bonding Procedures**  
**KEARNS IMPROVEMENT DISTRICT**  
**BONDING PROCEDURES**

In order to assure proper receipt and release of bonds, the following procedures are to be followed:

- A. The plans are to be reviewed by the District Engineer and Staff to determine compliance with KID Design Standards. The applicant is provided with KID Design Standards with which he is required to comply.
- B. Based on the approved plans, the District Engineer and Staff will calculate the required fees and Bond / Letter of Credit Guarantee amounts associated with the project. These amounts will use values that reflect the cost that KID might incur in hiring an outside contractor to construct the project two years hence.
- C. The applicant is notified as to the fees and the Bond / Letter of Credit Guarantee amount and is provided with the appropriate agreement forms and extension agreement form.
- D. The applicant submits the Bond / Letter of Credit Guarantee. For cash bonds, the KID Finance Department will notify the District Engineer when the bond has been received. Upon receipt of the Bond / Letter of Credit Guarantee, a record of the bond status will be kept by the District Engineer.
- E. A preconstruction meeting will be held. KID will conduct the meeting, and review the project scope and the Design Standards that are expected to be met. Inspection procedures will be outlined to the applicant. Any changes to the approved plans must be reviewed and approved by KID before implementation.
- F. KID will perform inspections on a regular basis. Inspections may be made on request by the Contractor, or randomly as determined by the Inspector. A log will be kept of all inspections performed. For serious violations, the Inspector may order the work to be stopped until the correction is implemented.
- G. Partial releases of a Bond / Letter of Credit Guarantee may be requested before the Project is complete; however, such partial releases will be limited to a maximum of two draws, and generally will not be considered for bond amounts under \$50,000.00. To reduce the Bond / Letter of Credit Guarantee to 50% will require the project to be at least 65% complete. Partial releases are subject to review by the District Engineer and approval by the Kearns Improvement District Board of Trustees at a regularly scheduled Board meeting.
- H. When the applicant has determined that the bonded work is complete, he may call for a Bond / Letter of Credit Guarantee reduction inspection. This request should be in writing to the District Engineer. Designated KID staff will perform an inspection, and a single punch list will be provided to the Contractor. The Contractor will be required to video and mandrel test the sewer line, and provide a digital copy of the video to the KID engineering staff who will review it. The Contractor shall also provide a set of As-built drawings which will be reviewed by KID engineering staff prior to approval.
- I. The Contractor will correct any deficiencies, and provide As-built drawings in paper copy and electronic format to KID. The air test, hydrostatic tests, and bacterial tests will have been passed and copies placed on file with KID. KID engineering staff will confirm that these corrections and submittals are complete, and then prepare a request for ninety percent (90%) Bond / Letter of Credit Guarantee reduction for submittal to the KID Board of Trustees. The prepared KID engineering staff request for a bond reduction must be provided to the District Engineer at least one



week prior to the normally held KID Board of Trustees monthly meeting in order to be considered on the agenda.

- J. The remaining ten percent (10%) of the Bond / Letter of Credit Guarantee will be held as a warranty amount for a period of twelve (12) months to guarantee the workmanship and materials of the installation.
- K. If deficiencies in materials or workmanship are found during the twelve (12) month warranty period, the Contractor will be required to correct them at the Contractor's expense. If the District makes the correction either because it was an emergency situation, and water or sewer service to the residents might be interrupted, or because the Contractor has failed to respond to a reasonable request to correct the deficiency, KID will retain a portion of the Bond/Letter of Credit Guarantee to cover the expenses incurred. KID will maintain records of the expenses related to such repairs.
- L. At the twelve (12) month mark of the warranty period, KID engineering staff will initiate a process to allow for full release of the Bond / Letter of Credit Guarantee. Designated KID engineering staff will inspect the installation. Any corrections required will be identified to the Contractor, who is required to correct such deficiencies at the Contractor's sole cost. Upon correction of the deficiencies, KID engineering staff will provide a request to the District Engineer, who will review the information and prepare the request for consideration by the KID Board of Trustees to fully release the Bond / Letter of Credit Guarantee at the next regularly scheduled Board meeting.
- M. Upon approval of the release by the KID Board of Trustees, KID will take appropriate steps to release the remaining funds. At this point in time, KID will assume full responsibility for the Project improvements.





**1.02.08 Coordination of Work**

- A. The Contractor shall review the drawings and specifications and shall report any discrepancies to the District Inspector and obtain from him written instructions for necessary changes.
- B. Before installation, the Contractor shall make proper provision to avoid interferences in a manner approved by the District Inspector. All changes required in the Work of the Contractor caused by Contractor's neglect to do so shall be made by Contractor at Contractor's own expense.



**1.02.09 Changes / Corrections in the Work**

- A. KID may at any time as the need arises, order changes in the scope of the Work. If such changes increase or decrease the amount due under the agreement between the Developer and the Contractor, an adjustment shall be worked out between these two parties, unless otherwise mutually agreed to by KID and the Developer and/or the Contractor.
- B. Developer shall ensure that such corrections or repairs as may be necessary by reason of any defects, including the repairs of any damage to other parts of the Project resulting from such defects, are promptly made without any cost to KID.
- C. The District may at any time, by issuing a field order, make changes in the details of the Work. If such changes increase or decrease the amount due under the agreement between the Developer and the Contractor, an adjustment shall be worked out between these two parties, unless otherwise mutually agreed to by KID and the Developer and/or the Contractor.
- D. When the Developer or Contractor requires change(s) in the Work, said change(s) shall be submitted for review by, and approved by, the District Engineer prior to construction of said changes. Proposed changes in the Work shall conform to these Design Standards and Construction Specifications. If such changes increase or decrease the amount due under the agreement between the Developer and the Contractor, an adjustment shall be worked out between these two parties, unless otherwise mutually agreed to by KID and the Developer and/or the Contractor.
- E. The Contractor shall promptly remove from the premises all Work rejected by the District Engineer for failure to comply with the approved Plans and Specifications whether incorporated in the construction or not, and the Contractor shall promptly replace and re-execute the Work in accordance with the approved Plans and Specifications.
- F. All removal and replacement Work shall be done at the Contractor's expense.
- G. The District Engineer shall have authority to cause further Work to be suspended or stopped until remedial action on substandard work has been undertaken and/or completed.



### **1.02.10 Quality Requirements**

- A. Developer and/or Contractor shall employ and pay for services of an independent testing or inspection agency to perform specified services.
- B. Employment of such agency in no way relieves Contractor of any obligation to perform Work in accordance with requirements of the Construction Specifications.
- C. Contractor and Developer Employed Agency:
  - 1. Testing agency: Comply with requirements of ASTM E329, ASTM E 548, ASTM E543, and ASTM C1077.
  - 2. Inspection agency: Comply with requirements of ASTM D290.
  - 3. Laboratory: Authorized to operate in the State in which Project is located.
  - 4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
  - 5. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable of either National Bureau of Standards or accepted values of natural physical constants.
- D. District reserves the right to hire an independent testing firm(s) to perform test(s) the District determines to be necessary.
- E. Quality Control - Contractor shall:
  - 1. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of a specified quality.
  - 2. Comply with manufacturers' instructions, including undertaking each step in sequence.
  - 3. Request clarification from District Inspector before proceeding, should manufacturers' instructions conflict with Design Standards or Construction Specifications.
  - 4. Comply with specified standards as to minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
  - 5. Have Work performed by persons qualified to produce required and specified quality.
  - 6. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
  - 7. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.
- F. Tolerances - Contractor shall:
  - 1. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
  - 2. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with these Construction Specifications, request clarification from District Inspector before proceeding.
  - 3. Adjust products to appropriate dimensions; position before securing products in place.
- G. See individual Construction Specifications for required testing.
- H. Testing Agency Duties:
  - 1. Provide qualified personnel at site. Cooperate with District Inspector and Contractor in the performance of services.
  - 2. Perform specified sampling and testing of products in accordance with specified standards.
  - 3. Ascertain compliance of materials and mixes with requirements of the Construction Specifications.



4. Promptly notify District Inspector and Contractor of any observed irregularities or non-conformance of Work or products.
  5. Perform additional tests and inspections required by District Inspector.
  6. Attend preconstruction meetings and progress meetings, when requested.
  7. Submit reports of all test/inspections specified.
- I. Test Reports: After each test/inspection, promptly submit two copies of report to District Inspector and to Contractor; within maximum of 24 hours.
1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test/inspection.
    - h. Date of test/inspection.
    - i. Results of test/inspection.
    - j. Conformance with the Construction Specifications.
    - k. When requested by District Inspector, provide interpretation of results.
  2. Test reports are submitted for the District or District Inspector's knowledge, for information and for the limited purpose of assessing conformance with information given and the design concept expressed in the Construction Specifications.
- J. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Design Standards and Construction Specifications.
  2. Agency may not approve or accept any portion of the Work.
  3. Agency may not assume any duties of Contractor.
  4. Agency has no authority to stop the Work.
- K. Contractor Responsibilities:
1. Deliver to testing agency, at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
  2. Cooperate with laboratory personnel, and provide access to the Work.
  3. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at the source of products to be tested/inspected.
    - c. To facilitate testing/inspections.
    - d. To provide storage and curing of test samples.
  4. Notify District Inspector and laboratory at least 24 hours prior to expected time for operations requiring testing/inspection services.
  5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  6. Arrange with District' testing agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.



- L. Re-testing required because of non-conformance to specified requirements shall be performed by the same testing agency on instructions from the District Inspector. District shall not be responsible for the costs of any re-testing.
- M. Manufacturers' Field Services
  - 1. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
  - 2. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.



## **1.02.11 Warranty**

- A. Except for those portions of the Project installed in any fill area as defined herein, the Developer shall warrant and guarantee for a period of one (1) year from the date of final acceptance of the Work by KID (the “Standard Warranty Period”) that the completed Project is free from all defects due to faulty materials and/or workmanship.
1. It is hereby expressly understood and agreed that KID shall not finally accept the Work before the expiration of the Standard Warranty Period, and then only in the case that all necessary repairs have been made according to standard methods approved by KID or the District Engineer.
  2. A ten (10) percent retainage of the Bond/Letter of Guarantee shall remain in full force and effect through the Standard Warranty Period and until the conditions of the warranty are fulfilled.
- B. For those portions of the Project installed in any fill areas as defined, herein, the Developer shall warrant and guarantee for a period of two (2) years from the date of final acceptance of the Work by KID (the “Extended Warranty Period”) that all portions of the completed Project which are located in a fill area are free from all defects due to faulty materials and/or workmanship.
1. For purposes of this Section, “fill area” means a length of Sewer Main Line where the invert elevation of the Sewer Main Line or Water Main line is located above the natural ground surface which existed prior to any site grading for the development.
  2. The Developer shall furnish to KID a performance bond satisfactory to the District in an amount equal to one hundred percent (100%) of the District Engineer’s estimated cost of the Work located within all fill areas, which bond shall be issued within ten (10) days after the date of final acceptance of the Sewer Main Line or the Water Main Line by KID, by a qualified surety company licensed to do business in the State of Utah. The security required to be provided by the Developer for the Standard Warranty period shall be separate and distinct from the surety bond provided under this Subsection for those portions of the Project which are installed in a fill area.
- C. Developer shall ensure that such corrections or repairs as may be necessary by reason of any defect, including the repairs of any damage to other parts of the Project resulting from any such defect, are promptly made without any cost to KID.
1. The District Engineer and/or District Inspector will give notice of observed defects with reasonable promptness.
  2. In the event that the Developer should fail to make, or cause to be made, such repairs, and adjustments, or to perform other Work that may be made necessary by such defects, KID may do so and charge the Developer the cost thereby incurred.
- D. Developer shall provide all warranty documentation for all equipment installed during the Work, including pumps, controls, and hatches. Except for items put into use with KID’s permission, the warranty period does not commence until the District’s final acceptance of the Project is obtained.
- E. The determination of the necessity for repairs required under this Subsection rests entirely with KID, whose decision shall be final and obligatory upon the Contractor.
- F. If warranty work is performed, a new warranty period should start for the warranty work.



## **1.02.12 Indemnification**

- A. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless KID and its officers, agents, representatives and employees from and against all claims, damages, losses and expense including, but not limited to, attorneys' fees and costs arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense is (a) attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself including the loss of use resulting therefrom, and (b) caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused by a party indemnified hereunder.
- B. In any and all claims against KID, or any of its officers, agents, representatives or employees, by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under any Worker's Compensation Act, disability benefit act or other employee benefit act.



## 1.02.13 Surveying

### A. Developer's Responsibilities

1. The Developer or Developer's Engineer shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the Work together with a suitable number of bench marks adjacent to the Work, as indicated in these Design Standards and Construction Specifications.
2. The Developer's Engineer shall furnish alignment and grade data in the form of offset stakes or markers located a convenient distance from the centerline of the pipe, structures, etc., and referenced to the centerline of the Work.
3. Line and grade stakes shall be provided at sewer manholes and boxes for laser instrument setting and at a distance of 50 feet therefrom to check the setting. KID requires the use of laser instruments for the installation of sewer lines and appurtenances. No string lines will be used, unless otherwise approved by the District Inspector. The Contractor shall be responsible for establishing additional control stakes, as required.
4. Prior to commencement of work under the Project, the Developer shall establish lot corner stakes showing plan and elevation references to curb and gutter and sidewalks.
5. Offsets to water lines and appurtenances in subdivisions shall be referenced from lot corner or curb and gutter stakes. For water line extensions beyond the Project boundaries or in any development other than subdivisions, line stakes shall be provided at valves, bends, hydrants, and at intervals of not to exceed 100 feet.
6. Structures. A maximum of eight (8) line and grade stakes shall be provided for each rectangular or square structure.
7. KID may check the alignment and grades of the various parts of the Work from time to time, if deemed necessary.
8. The Contractor shall, without additional costs, give such assistance and provide such ladders, lights, and other equipment as may be required in establishing and checking lines and grades.
9. KID will not be responsible for surveys conducted by others.
10. Upon completion of the Project, the new water/sewer lines, valves, manholes, etc. shall be surveyed to ensure that all utility lines and components are installed within the public right(s)-of-way or recorded utility easements, and that the edge of valve/manhole collars are located at least five (5) feet away from the edge of the asphalt.

### B. Contractor's Responsibilities

1. Verify locations of survey control points prior to starting Work.
2. Promptly notify District Inspector of any discrepancies discovered.
3. Contractor shall locate and protect benchmarks, survey monuments, reference points, control stakes and survey control points.
4. Control datum for survey that is indicated on Drawings.
5. Protect survey control points prior to starting site Work; preserve permanent reference points during construction.
6. Promptly report to District Inspector the loss or destruction of any reference point or relocation required because of any change in grades or other reason.





7. Developer's surveyors will replace dislocated survey control points based on original survey control and make no changes without prior written notice to District Inspector, including:
  - a. Utilize recognized engineering survey practices.
  - b. Establish elevations, lines, and grades. Which are located and laid out by instrumentation and similar appropriate means.
  - c. Periodically verify layouts by same means.
  - d. Finish grade elevation for manholes, fire hydrants, etc. shall be transferred from property corners and curb elevations, or as directed by the District Inspector.
  - e. Maintaining a complete and accurate log of control and survey work as it progresses.
8. The Contractor shall transfer line and grade from the stakes or marks referred to above, to the Work and shall be responsible for the accuracy of the measurements from the stakes or marks to the Work.
9. The Contractor shall be responsible for the accuracy of all stakes for alignment and grade established by the Contractor. However, KID shall have the discretionary right to check the Contractor's stakes alignment and grades at any time.
  - a. Survey stakes, marks, grades, etc. set by the Contractor shall be established far enough ahead of their use so that KID has at least 24 hours during normal working time to check the Work prior to use by the Contractor.
  - b. The Contractor shall notify the District Inspector when the Work is ready to be checked. Over time costs and other cost incurred by KID to accelerate the schedule for the Contractor's convenience shall be charged against the Contractor
  - c. The Contractor shall be responsible for the protection of all control stakes established by the Developer's Engineer or KID.
  - d. The Contractor shall not disturb any survey monuments found in the line of the Work unless written authority to do so is given by the District Engineer. All costs incurred by KID in replacing monuments that have been disturbed by the Contractor without written approval shall be paid by the Contractor.



#### **1.02.14 Emergencies**

- A. Emergencies may arise during the progress of the Work which may require special effort or require extra shifts or personnel to continue the Work beyond normal working hours. The Contactor shall be prepared, in case of such emergencies from whatever cause, to do all necessary Work promptly.



### **1.02.15 Hazardous Materials**

- A. If the Contractor, during the course of work, observes the existence of any hazardous material, including but not limited to asbestos pipe, chemicals, or gasoline, the Contractor shall promptly notify the Developer and the District Inspector. The Developer and the District Inspector shall consult regarding the removal or encapsulation of the hazardous material and the Contractor shall not perform any Work pertinent to the hazardous material prior to receipt of special instructions from the Developer and the District Inspector. All handling and removing of hazardous material shall be handled by qualified and certified personnel complying with the State of Utah and OSHA Standards and requirements.



**1.02.16 Permits, Regulations, and Fees**

- A. The Contactor shall give all notices and comply with all laws, ordinance, rules and regulations bearing on the conduct of the Work as drawn and specified.
- B. If the Contractor observes that the Specifications and Drawings are at variance therewith, he shall promptly so notify the District Engineer in writing.
- C. Permanent easements and rights-of-way shall be secured by the Developer, as described in subsection 1.02.05.
- D. All required District fees must be paid to KID prior to commencement of any Work.
- E. All required permits, licenses, both governmental and authoritative shall be secured prior to commencement of any Work.
- F. Permits, and licenses, and approvals of a temporary nature necessary for the prosecution of the Work shall be secured and paid for by the Contractor.



**SECTION 2 MATERIALS**

**2.01 Water Systems**

**2.01.01 Water Systems Material Summary Table**

**Water Works**

| ITEM   | DESCRIPTION   | MANUFACTURER  | MODEL                                       |
|--|---|---|---|
| <b>PIPE (Must be NSF approved)</b>                     |   |   |   |
| 4" to 10" PVC  | C-900 Class 305 (DR 14) or Class 235 (DR18)   | JM Eagle, Vinyl Tech, North American Pipe                       |   |
| Ductile Iron Pipe 12" to 30"                           | Class 52 or Pressure Class 350 psi, AWWA C151 with Push On Joints, AWWA C111.   | American Ductile Iron, Pacific States Cast Iron Pipe, U.S. Pipe |   |
| Copper Tubing  | Type K, ASTM B 88 Table 3, "Dimension, Weight, and Tolerances," Capable of Connecting to AWWA Standard Water Service Taps and Fittings                        | Cerro Flow Products, Mueller, or approved equal                 |   |
| Mega Lug Followers                                     | Approved by District Engineer   |   |   |
| <b>VALVES (4" and Larger)</b>                          |   |   |   |
| Butterfly Valves                                       | 12" to 48", Cast Iron Body, Bronze Mounted. Conform to requirements of AWWA C504  | Mueller, Clow, American   | Lineseal III, Style 4500 & 1450 Series 2500 |
| Gate Valves  | 4" to 12", Resilient Wedge, Cast Iron Body, Bronze Mounted. Non-Rising Stems with "O" Ring Seals Conform to requirements of AWWA C504. Open Counterclockwise. | Mueller M&H American  | A-2360 Style 7000 Series 2500               |
| <b>VALVES (3" and Smaller)</b>                         |   |   |   |
| Gate Valve   | 2"-3" Resilient Wedge   | Mueller American Clow   | Series 2360 Series 2500 Model 2639          |
| Ball Valve   | 3/4" to 2"  | Ford Meter Box Mueller  | Model B11 Mueller 300                       |
| Corporation Stop                                       |   | Ford  | N/A   |
| Compression Angle Valve                                |   | Ford  | N/A   |
| Corporation Valves                                     |   | Ford  | N/A   |
| Angle Meter Valve                                      |   | Ford  | N/A   |
| Curb Valve   |   | Ford  | N/A   |
| <b>CHECK VALVE (Outside Weight and Lever Required)</b> |   |   |   |
| Valves 2 1/2" and Smaller                              | 200 psi Working Pressure, Y-Pattern, Bronze, Regrinding, Swing Check Valve with Screwed Ends  |   |   |
| Valves 3" and  | Iron Body, Bronze Mounted, Silent   |   |   |



|   |                                |   |   |  |
|---|--------------------------------|---|---|--|
|   | Larger                         | Check Valves, Flanged Ends, Swing Valves with Stainless Steel Hinge Pins  |   |  |
| <b>FIRE HYDRANTS (AWWA C502)</b>                    |                                |   |   |  |
|   | Standard Fire Hydrant          | High Pressure Dry Barrel, 5 ¼" Valve Opening. Operating Cap and Nuts: Pentagon 1 ½" Point to Flat   | Mueller<br>Clow<br>Or Approved Equal                            | Centurion<br>Model F2500                                 |
|   | Pipe and Fittings              | 6" Ductile Iron, PVC  | See Pipe Section  |  |
|   | Gate Valves                    | 6", Resilient Wedge, Cast Iron Body, Bronze Mounted. Non-Rising Stems with "o" Ring Seals. Conform to requirements of AWWA C504, Open Counterclockwise. | Mueller<br>M&H<br>American<br>Or Approved Equal                 | A-2360<br>Style 7000<br>Series 2500                      |
| <b>BACKFLOW PREVENTER</b>                           |                                |   |   |  |
|   | RP Backflow Device             | Reduced Pressure Backflow Device as Approved by the State of Utah Division of Drinking Water  |   |  |
| <b>METERS (KID will Provide and Install Meters)</b> |                                |   |   |  |
|   | ¾" – 2"                        | Typical Service Meter   | Sensus  |  |
|   | 3" – 6" Compound               | For wide flow rate applications   | Sensus  | Tru/Flo  |
|   | 6" - 8" Fire Services          | Specified for fire service fed from a single line   | Sensus  | HP Protects III Fire Service Meter                       |
|   | 3" - 8" HP Turbine             | For Moderate to High Flow Rate Applications   | Sensus  | High Performance Turbine                                 |
| <b>PIPE FITTINGS</b>                                |                                |   |   |  |
|   | Service Fitting                | Compression Connection  | Ford  | 110 Compression  |
|   | Ductile Iron Fittings          | Tees, Class 250 AWWA C110   | American Ductile Iron<br>Clow<br>U.S. Pipe<br>Or Approved Equal |  |
|   | Ductile Iron Fittings          | Bends, Reducers, and End Caps, Class 250, AWWA C110   | American Ductile Iron<br>Clow<br>U.S. Pipe<br>Or Approved Equal |  |
|   | 1.5" – 24" Coupling            | Coupling and Repair Clamp, AWWA C-219, AWWA C-230, NSF-372, and NSF-61  | Versa-Max   |  |
|   | 6" – 30" Ductile Iron Fittings | Mechanical Joint Connection   | One Lok<br>Or Approved Equal                                    | Mechanical Joint<br>SLDE Wedge<br>Restraint Gland<br>Pak |
|   | 6" – 14" PVC Fittings          | Mechanical Joint Connection   | One Lok<br>Or Approved Equal                                    | Mechanical Joint<br>SLCE Wedge<br>Restraint Gland<br>Pak |
|   | 6" – 30" Ductile Iron Fittings | Gasket per ANSI/AWWA C111/AR111   | U.S. Pipe<br>Or Approved Equal                                  | Tyton Gasket   |
|   | Copper Fittings                | 45° & 90° Copper Fittings, Per  |   |  |



|                           |  |   |                                    |  |
|---------------------------|--|---|------------------------------------|--|
|                           |  | AWWA C800. AWWA C110  |                                    |  |
|                           | Copper Fittings                        | Service Connections, Type K, with Flare 200 psi Compression Fittings, per AWWA C800   |                                    |  |
| <b>VAULTS</b>             |  |   |                                    |  |
|                           | Pre-Cast Vault                         | Per Standard Drawing  | AMCOR<br>Old Castle<br>Dura-Crete  |  |
|                           | Meter Box 2"                           | 4' x 4' Precast Concrete Box  |                                    |  |
|                           | Meter Box 1" or Less                   | 21" for 1" meter<br>18" for ¾" meter  |                                    |  |
|                           | Vault Ladder                           |   | Anything larger than a 4' x 4' box |  |
| <b>LOCATING WIRE TAPE</b> |  |   |                                    |  |
|                           | Wire                                   | 12 Gauge Insulated Copper   |                                    |  |
|                           | Wire Splice                            | Direct Bury (DBR) Splice Kit  |                                    |  |
|                           | Warning Tape                           |   |                                    |  |
| <b>COVERING / LIDS</b>    |  |   |                                    |  |
|                           | Valve Cover                            | 8" Outside Diameter, Cast Iron, "Water" should be Cast on the Cover   |                                    |  |
|                           | Meter Box Cover                        | 24" Cover with Inset Lid  | The Ford Meter Box Company, Inc.   |  |
|                           | Standard Vault Lid                     | H-20 Load Rating  |                                    |  |
|                           | Traffic Rated Vault Lid                | H-20 Load Rating  |                                    |  |
|                           | Valve Box: Buried in Traffic Areas     | 2 Piece, Cast Iron, Slip Type, Class 35 Heavy Duty, 5 ¼" Shaft with a Drop Lid  | C.I. – 562A vb or Approved Equal   |  |
|                           | Valve Box: Buried in Non-Traffic Areas | 2 Piece, Cast Iron, Slip Type, Class 35 Heavy Duty, 5 ¼" Shaft with a Drop Lid  | C.I. – 562A vb or Approved Equal   |  |
| <b>FIRE SERVICES</b>      |  |   |                                    |  |
|                           | DDC                                    | Reduced Pressure Backflow Device  | Sensus                             |  |
|                           | Combo Fire & Domestic                  |   | Sensus<br>Or approved Equal        |  |
| <b>MISCELLANEOUS</b>      |  |   |                                    |  |
|                           | Bolts                                  | Stainless Steel, American Standard Machined Heavy Hexagon Heads with Class 2 Fit and Threads. ASTM A325 (1/2" to 1 ½")                |                                    |  |
|                           | Anchor Bolts                           | Stainless Steel, American Standard Machined Heavy Hexagon Heads with Class 2 Fit and Threads. ASTM A307 or ASTM F593 Stainless Steel. |                                    |  |
|                           | Washers                                | Grey Iron, ASTM A126  |                                    |  |
|                           | Meter Bushing                          | 1" x 1 ¼" Thread Size   |                                    |  |

|  |                           |  |                                  |                                     |
|--|---------------------------|--|----------------------------------|-------------------------------------|
|  | Steel Pedestal            | Steel Pedestal Pipe Support Under Each Meter or as Directed by Inspector                               |                                  |                                     |
|  | Valve Stem Extension      | Steel, Welded Construction, Red Primer with Top Centering Ring and 2" Operating Nut or Approved Equal. |                                  |                                     |
|  | Valve Slip Can            | Steel Slip Can to Fit Cover, Class 35 Heavy Duty (Minimum of 90 lbs.)                                  | C.I. – 562A vb or Approved Equal | Casting, Inc.                       |
|  | Valve Can Tube            | 5" Cast Iron or Approved Equal   |                                  |                                     |
|  | Valve Cover               | 8" Outside Diameter, Cast Iron   |                                  |                                     |
|  | Tapping Saddle            | 1" Tap if Meter is New Bronze Double Strap<br>Direct Tap into D.I. As Approved                         | Ford<br>Or Approved Equal        |                                     |
|  | Poly-wrap                 | Buried Mechanical Ductile Iron Joints, Grease and 8 mil Vinyl Wrap Plastic Cover                       |                                  |                                     |
|  | Bond Breaker              | 8 mil Poly Wrap for Concrete to Fitting Separation   |                                  |                                     |
| <b>COMBINATION AIR / VACUUM VALVES</b> |                           |  |                                  |                                     |
|  | Air / Vacuum Valve        | 1" – 4" Single Body  | APCO<br>Val-matic                | 140C<br>201C & 203C                 |
|  | Air / Vacuum              | 1" – 4" Dual Body  | APCO<br>Val-matic<br>Crispin     | 1800 Series<br>101S/22 &<br>104S/38 |
| <b>TAPPING SLEEVES AND SADDLES</b>     |                           |  |                                  |                                     |
|  | 3" to 24" Tapping Sleeve  | Stainless Steel  |                                  |                                     |
|  | 3/4" to 2" Service Saddle | Bronze/Brass w/ Double Strap   |                                  |                                     |
|  |                           |  |                                  |                                     |





## 2.01.02 Pipe

This section covers water transmission pipe and fittings for the pressurized transmission and distribution of potable water for municipal service.

### A. PVC

1. Polyvinyl Chloride (PVC) Pipe shall meet or exceed the requirements of AWWA C900 or AWWA C909. The pipe shall be homogeneous throughout; and free from visible cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform as commercially practicable in color, opacity, density and other physical properties. Pipe surfaces shall be free from nicks, scratches, gouges and other imperfection that might weaken the pipe wall or cause leakage at joints. The PVC pipe shall bear the seal of approval of the National Sanitation Foundation for potable water service.
2. Pressure class rated pipe shall provide not less than the following allowable working pressures as determined by AWWA C900 or AWWA C909:

| <u>Allowable Working Pressure Class</u> | <u>psi</u> | <u>Pressure Dimension Ratio (DR)</u> | <u>Minimum</u> |
|---|------------|--------------------------------------|----------------|
| 235                                     | 150        | 18                                   |                |
| 305                                     | 200        | 14                                   |                |

3. The dimensions and tolerances of the pipe barrel and bell ends shall conform to the applicable requirements of AWWA C900 or AWWA C909 for the pressure-class specified for cast iron outside diameter pipe.
4. All fittings and accessories shall be as manufactured or recommended by the pipe manufacturer, or approved equal, and have bell and spigot configurations identical to that of the pipe. The pipe fittings may be manufactured from PVC, ductile iron or welded steel, and shall have strength equal to or greater than the pipe to which they attach. Fittings shall be installed as specified by the manufacturer.
5. The pipe and fittings shall be furnished with integrally thickened bell and spigot ends; for joining with a solid, uniform cross-sectional elastomeric gasket as the sealing element. Couplings are not permitted. The gasket shall be contained within the bell end. The gasket shall not be required to support the weight of the pipe when two sections are joined; but shall serve only as a seal, and shall conform to ASTM D3139. The critical sealing dimensions of the bell, spigot, and gasket shall be in accordance with the manufacturer's standard dimensions and tolerances. The gasket shall provide an adequate compressive force against the sealing surfaces of the bell and spigot so as to affect a positive seal under all combinations of the joint tolerances. The gasket shall be the only element depended upon to make the joint flexible and watertight. Solvent welded joints are not permitted unless written approval is obtained from the District Engineer prior to welding the joint.
6. Special Requirements.
  - a. Marking on the pipe shall include the nominal cast iron pipe size, AWWA C900 or AWWA C909 Class and dimension ratio (DR), the NSF seal of approval, and the manufacturer's name or trademark. Marking interval shall be not more than 5 feet.
  - b. PVC pipe is permitted for 10" and smaller pipe sizes; 12" and larger pipe shall be ductile iron, unless specifically approved by the District Engineer.
  - c. A tracer wire must be included to facilitate location of the pipe after burial.

### B. Ductile Iron

1. Pipe shall conform to all requirements of the latest revision of AWWA C151/A 21.51.

2. Minimum thickness for Ductile Iron Pipe shall be Pressure Class 250, unless otherwise shown on the approved plans.
3. Joints
  - a. Mechanical Joints. All mechanical joints shall meet requirements of AWWA C110/A21.10 and AWWA C111/A21.11. All gasket surfaces shall be smooth, except for specified masking, and free from imperfections. Gaskets shall conform to tests in accordance with specifications, and shall not be over one year old. Bolts shall meet all requirements of the above specification, honoring all characteristics, tolerances and tests.
  - b. Push-on Joints. All push-on joints shall meet the requirements of AWWA C111/A21.11. Gaskets shall be free from defects and not over one year old. Lubricants shall be non-toxic and have no deteriorating effects on gasket material. It shall not impart taste to water in a pipe. Lubricants shall conform in every way to AWWA C111/A21.11.
  - c. Flanged Joints. Flanged joints shall be bolted firmly with machine; stub or cap bolts of proper size. Flanges shall be cast integrally with the pipe; or shall be screwed on for threaded pipe. Flanges shall be faced and drilled and of proper dimensions for size and pressure required. All flanges shall meet requirements of AWWA C110/A21.10. Unless otherwise specified, bolts and nuts shall be made of the best quality steel and have clean, well-fitting threads. Bolts shall be provided with standard hexagonal nuts and standard hexagonal heads. Bolts shall be of the diameter required for each flange; and shall be of a length so that when installed, no more than 3/8-inch or less than 1/8-inch extends past face to nut. A gasket of proper size shall be installed for each flanged joint: ring type or full face as shown on the drawings.
  - d. Compression Joints. Compression joints shall be mechanical joint sleeve, Smith-Blair 441; or flange adapter, Smith-Blair Type 900; or approved equal.
4. Linings and Coatings. All ductile iron pipes shall have cement mortar lining and conform to AWWA C104/A21.4. All ductile iron pipes shall be coated with coal tar pitch varnish.
5. Fittings.
  - a. Mechanical Joint Fittings. Mechanical joint fittings shall conform to AWWA C110/A21.10 and shall be coated with coal tar pitch varnish.
  - b. Push-on Fittings. Push-on fittings shall conform to AWWA C111/A21.11 and shall be coated with coal tar pitch varnish.
  - c. Flanged Fittings. Flanged fittings shall conform to AWWA C110/A21.10 and shall be coated with coal tar pitch varnish.

#### C. HDPE

High Density Polyethylene Pipe (HDPE) shall not be permitted without written approval of the District Engineer. Developers proposing such pipe shall be required to provide a specification for review and approval by the District Engineer. If approved, a tracer wire must be included to facilitate location after burial.

#### D. Copper

1. Pipe. Copper pipe and tubing shall conform to ASTM B88. Copper pipe for direct burial or concrete encasement shall be Type "K" soft copper. Copper pipe for other exposure shall be Type "L" hard drawn copper.
2. Fittings. Fittings for pipe ½-inch and larger shall be pure wrought copper (no bronze or brass) of the solder-joint type. The fittings shall have a thickness of not less than the



thickness of the pipe. The use of flare-type joints and compression couplings is also acceptable. Solder for use on solder-joint fittings shall be Sil-fos or equal soldering alloy. Lead-tin solder shall not be used under any circumstances. Joints shall be made strictly in accordance with the manufacturer's instructions.

- E. Polyethylene. Polyethylene pipe shall not be permitted for water service connections between the water main and the meter without written approval of the District Engineer. Developers proposing such pipe shall be required to provide a specification for review and approval by the District. If approved, a tracer wire must be included to facilitate location after burial.



### **2.01.03 Hydrants**

General. Fire hydrants shall be provided with auxiliary gate valves and cast iron valve boxes as indicated on the drawings and specified herein. Hydrants shall conform to requirements of AWWA C502, as supplemented and modified herein.

- A. Hydrants shall be as manufactured by Mueller, or approved equal.
- B. Hydrants shall have 5-inch size main valve opening.
- C. Hydrants shall be designed for 200 psig minimum working pressure. Hydrants shall be constructed in three sections with bolted joints; and the entire internal operating mechanism shall be repairable from above ground without any digging, when the hydrant is in place.
  - 1. Hydrants shall have two 2-1/2-inch hose nozzles and one 4-1/2-inch pumper nozzle. Nozzle threads shall be National Standard.
  - 2. Inlet connections shall be mechanical joints or flanged, conforming to AWWA C110.
  - 3. The hydrant shall have a breakable flange, at ground level when installed: flange and internal mechanism shall be designed so that, in case of accidental breaking, the hydrant sections will separate without damage to the barrel, and the main valve will remain closed to prevent flooding. Safety flanges depending only on notched bolts for frangibility will not be acceptable.
  - 4. Opening Rotation. Operating nut shall turn counterclockwise to open the main valve.
  - 5. Drain Valve. The drain valve shall be threaded, NPT.
- D. Buried portions of the hydrant shall be painted with two coats of coal tar enamel. Exposed portions shall be painted with a primer coat and a finish coat which shall be vermilion red.
- E. An auxiliary gate valve and cast iron valve box shall be supplied. The valve shall be the same size as the hydrant inlet connection, and the valve and valve box shall conform to requirements for valves, Section 2.01.06.
- F. Concrete for thrust blocks and collars shall be as specified in Section 2.03 CONCRETE



#### **2.01.04 Water Service Connections**

- A. Service connections shall be made by means of a service saddle, brass double strapping tapping saddle Ford 202B series or approved equal on PVC mains. Direct taps may be used with approval of the District Engineer.
- B. The corporation stop shall be a Ford 700B or approved equal, of the same size as the diameter of the water service lateral.
- C. The yoke or setter shall be Ford 70 Series Coppersetter, model VBHC72-21W-11-33, or approved equal. Model may be adjusted as required for meter size.

#### **2.01.05 Meter Boxes**

- A. Meter boxes for 5/8 inch meters in 3/4 inch setters shall be 18” diameter precast concrete, provided with a cast iron lid suitable for wand reading of meters, and with “Water Meter” cast into the top. White ADS meter boxes may be utilized with prior approval of the District Engineer.
- B. Meter boxes for 1” meters in 1 inch setters shall be 21” diameter precast concrete, provided with a cast iron lid suitable for wand reading of meters, and with “Water Meter” cast into the top. White ADS meter boxes may be utilized with prior approval of the District Engineer.

#### **2.01.06 Valve Boxes**

- A. All valves to be buried shall have cast iron valve boxes, firmly supported and maintained, centered and plumb over the wrench nut of the valve. The boxes shall be of the extension type with 39- to 60-inch extension. Boxes shall be equal to those manufactured by Tyler Pipe Industries #664-S, or approved equal. Lids shall have the designation “Water” and “K.I.D.” cast into them.



## **2.01.07 Gate Valves**

- A. General. Valves shall be bronze-mounted, double-disc, iron body gate valves, and, when so indicated or specified, shall have enclosed spur or bevel gearing. Valves shall have minimum working pressure rating of 200 psi. Valves shall be non-rising stem, unless rising stems are indicated on the drawings. Valves shall meet the requirements of AWWA Specification C-500, except as modified herein. Valves shall operate drip tight with full pressure on either side of the valve and no pressure on the other side. Packing and gearing shall be replaceable while the valve is in service. End connections shall be flanged, push-on joint, mechanical joint, or slip joint.
- B. The flanges and drilling shall conform to dimensions of ANSI Standards for Class 125 or Class 250, for cold water. The joints shall be manufactured to conform to requirements of AWWA C110/A21.10.
- C. Valves shall be so designed that the gates and stem are clear of the full specified diameter when open.
- D. All valves shall turn clockwise to close.
- E. When so indicated or specified, valves shall have cut steel spur gears or bevel gears in a factory-installed, enclosed gear case. The case shall be air, water, and oil tight with seals on all shafts. A worm gear position indicator shall be provided with geared valves.
- F. The operating nut or wrench nut shall be cast iron, and shall be carefully fitted to the top of the valve stem, secured to the stem by a threaded nut; with threads' ½-inch minimum, National Coarse. The operating nut shall be 1-15/16-inch square at the top, 2-inch square at the base, and at least 1-3/4-inch high. There shall be a round flange at the base with a distinct arrow cast on the nut, and lettering to indicate direction to close or open.
- G. The stems for all valves shall be of corrosion resistant material.

## **2.01.08 Butterfly Valves**

- A. General. Butterfly Valves shall be cast iron body, bronze mounted. Use butterfly valves on 14" and larger water mains. Valves shall conform to the requirements of AWWA C504, except as modified herein. Short body or long body at contractor's option or short body only where disc will not interfere with adjacent fittings. Valves shall operate drip tight with full pressure on either side of the valve and no pressure on the other side. Packing and gearing shall be maintenance free. End connections shall be flanged or mechanical joint.
- B. The flanges and drilling shall conform to dimensions of ANSI Standards for Class 125 or Class 250, for cold water. The joints shall be manufactured to conform to requirements of AWWA C110/A21.10.
- C. Valves shall be so designed that the gates and stem are clear of the full specified diameter when open.
- D. All valves shall turn clockwise to close.
- E. When so indicated or specified, valves shall have cut steel spur gears or bevel gears in a factory-installed, enclosed gear case. The case shall be air, water, and oil tight with seals on all shafts. A worm gear position indicator shall be provided with geared valves.
- F. The operating nut or wrench nut shall be cast iron, and shall be carefully fitted to the top of the valve stem, secured to the stem by a threaded nut; with threads' ½-inch minimum, National Coarse. The operating nut shall be 1-15/16-inch square at the top, 2-inch square at the base, and at least 1-3/4-inch high. There shall be a round flange at the base with a distinct arrow cast on the nut, and lettering to indicate direction to close or open.
- G. The stems for all valves shall be of corrosion resistant material.

**2.01.09 Fittings**

- A. All pipe fittings shall be suitable to the pipe to which they are connected, and shall be installed in accordance with the manufacturer's recommendations.

**2.01.10 Bedding**

- A. All water piping shall be bedded in sand.

**2.01.11 Vaults**

- A. Vaults shall be constructed of concrete, either cast-in-place or pre-cast. They shall be constructed to the dimensions shown on and otherwise in conformance with the approved plans. Concrete shall conform to the requirements of Section 2.03 CONCRETE.



2.02 Sewer Systems

2.02.01 Sewer Systems Material Summary Table

2.02.01 Sewer System Material Summary Table

|                               | ITEM   | DESCRIPTION   | MANUFACTURER   | MODEL        |
|-------------------------------|--|---|--|--------------|
| <b>2.02.02 SEWER PIPE</b>     |  |   |  |              |
|                               | 4" to 24" PVC  | PVC SDR 35 – ASTM F679 & ASTM D3034<br>Bell & Spigot with Rubber Gasket   | JM Eagle, Vinyl Tech,<br>North American Pipe         |              |
|                               | Nose-on Lateral Connection to Main Line Sewer          | "Inserta Tee" or Equal  |  |              |
|                               | Sewer Pipe Connectors                                  | Fernco<br>Or Approved Equal   |  |              |
| <b>2.02.03 MANHOLES</b>       |  |   |  |              |
|                               | 8" Entry Pipe<br>48", 60", 72" Dia.                    | Precast Concrete Sections<br>Conforming to ASTM C478<br>(See Std. Dwg. SS2)   | Dura-crete<br>Old Castle<br>Amcor                    |              |
|                               | 10" – 24" Entry Pipe<br>48", 60", 72" Dia.             | Precast Concrete Sections with Con Shield Additive or Polymer<br>Manhole System   | Dura-crete<br>Old Castle<br>Amcor<br>Armorock        |              |
|                               | Force Main Discharge Manhole<br>72" Diameter           | Precast Concrete Sections with Con Shield Additive or Polymer<br>Manhole System   | Dura-crete<br>Old Castle<br>Amcor<br>Armorock        |              |
|                               | Joint seal for Concrete Manholes & Grease Interceptors | Kent Seal<br>Preformed Plastic Gaskets – Federal Specification SS-S-210(A) – RUB'R-NEK L-T-M  | K.T. Snyder Co., Houston,<br>Texas or Approved Equal |              |
|                               | Ring & Cover   | D&L Foundry A1180 or Equal<br>22-3/4" Diameter Clear Opening,<br>Solid, Non-Rocking, Heavy Duty<br>Type with "Kearns Improvement District |  |              |
|                               | Manhole Steps  | Cast-in-Place Copolymer<br>Polypropylene-encased, 60,000 psi<br>Tensile Strength Steel,   | M.A. Industries, Inc., or<br>Approved Equal          | Model PS1-PF |
|                               | Drop Manhole   | <b>NOT PERMITTED</b> without<br>Specific Approval of District<br>Engineer   |  |              |
| <b>GREASE INTERCEPTOR</b>     |  |   |  |              |
|                               | Grease Interceptor                                     | Precast Concrete – Minimum 1000<br>gallon. See Standard Drawings for<br>Sizing Requirements & Details                                     | Dura-crete<br>Old Castle<br>Amcor                    |              |
| <b>2.02.05 SEWER METERING</b> |  |   |  |              |
|                               | Support  | Supports, mounting posts, poles and   |  |              |

**MATERIALS**

**Sewer System**

**2.02.01 Material Summary Table – September 2016**





|  |   |   |                                |  |
|--|---|---|--------------------------------|--|
|  |   | rails as required.  |                                |  |
|  | Prefabricated Manhole with Integral Flume | Parshall Flume & Metering Manhole   | Virtual Polymer Compounds, LLC |  |
|  | Controller                                | Siemens (Milltronics) OCM III mounted indicator transmitter, housed in a NEMA 4X enclosure complete with one weather proof power outlet, located on a pole next to the metering manhole.  | Siemens                        |  |
|  | Temperature Sensor                        | Siemens TS-2 Temperature Sensor   | Siemens                        |  |
|  | Flow and depth sensor                     | Echomax XRS-5 Ultrasonic continuous level measurement transducer  | Siemens                        |  |
|  |   |   |                                |  |
|  | Open Channel Flow Meter and Depth Sensor  | Flow meter including depth sensor and flow transmitter shall be ultrasonic type. The system electronics for the flow transmitter shall measure and convert the time lapse between transmitted and received ultrasonic signal at the sensor into a usable current signal. The electronics shall also compensate the liquid level signal for the time delay variation caused by temperature changes and then characterize the resultant signal by the “flow-to-head” curve for the respective flow element being monitored to yield a 4-20mA dc output signal that shall be linearly proportional to flow. The 4 mA dc value of the output signal shall correspond to zero head and a zero flow, while the 20 mA dc value of the output signal shall correspond to maximum head and maximum flow for the open channel flow metering equipment being installed |                                |  |
|  | Fiberglass Grating                        | Square Duragrate Molded Fiberglass Grating  |                                |  |
|  | GE PLC                                    | GE Versamax PLC with CPU E-05 Power Supply PWR202 and Analog Input Card AL G262   |                                |  |
|  | Communication Equipment – Radio           | GE MDS INET 900 IP radio with PCTEL Maxrad 710-970 MHZ Yagi Antenna and all required connectors and cabling.  |                                |  |
|  | Cabling                                   | ½” Heliac Times Microwave LMR-600 or equal  |                                |  |
|  | Lightening Protector                      | PolyPhaser IS-50NX-C2-MA bulkhead mounted   |                                |  |
|  | Grounding Kit                             | Wireless Solutions WGK-U2H5-UT or equal   |                                |  |

**2.02.06 SEWER LIFT STATION**

|  |  |  |  |  |
|--|--|--|--|--|
|  | Lift Station Site                            | Paved Access – Minimum 30’ x 30’ Parcel Conveyed to KID        |  |  |
|  | Sewer Lift Station Wet Well 60”-72” Diameter | Top Fiberglass Reinforced Polyester (FRP) basin by Flygt       |  |  |
|  | Submersible Non-Clog Wastewater Pumps        | Flygt Pump (Spare pump provided to KID with each installation) |  |  |
|  | Discharge Piping                             | Ductile Iron Pipe CL-50  |  |  |

**MATERIALS**

**Sewer System**

**2.02.01 Material Summary Table – September 2016**



|  |                                  |   |  |  |
|--|----------------------------------|---|--|--|
|  | Piping Flange                    | Ductile Iron CL-125   |  |  |
|  | Level Sensor                     | Multitrode level control system with backup float by Flygt  |  |  |
|  | Electrical Conduit               | PVC Schedule 40   |  |  |
|  | Anchor Bolts                     | Stainless Steel, American Standard Machined Heavy Hexagon Heads with Class 2 Fit and Threads. ASTM A307 or ASTM F593 Stainless Steel.   |  |  |
|  | Access Hatch                     | Safe Hatch by Flygt   |  |  |
|  | Automatic Flush Valve            | Flygt   |  |  |
|  | Check Valves                     | Ball Valves   |  |  |
|  | Electrical Supplies & Components | Comply with National Electrical Code requirements for Class 1, Group D, Division 1. Enclosure to meet NEMA 4X with a stainless steel dead front enclosure and aluminum inner door |  |  |
|  | Standby Generator                | Natural Gas or Propane fueled manufactured by Caterpillar/Olympian  |  |  |
|  | Control Building                 | See Design Standards  |  |  |
|  |                                  |   |  |  |



## **2.02.02 Pipe**

This specification identifies pipe and fittings suitable for non-pressure drainage of wastewater.

### **A. PVC Sewer pipe**

1. All PVC Pipe and fittings shall be suitable for use as gravity sewer conduit. Provisions shall be made for contraction and expansion at each joint with a rubber ring, and the pipe shall be constructed with integral-wall bell-and-spigot push-on type joints. All PVC gravity sewer pipe and fittings shall meet or exceed all of the requirements of ASTM D3034. Minimum wall thickness shall be SDR-35.
2. Fittings. All fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal, and shall have bell and spigot configuration's compatible with that of the pipe. The fittings shall be manufactured of the same materials as the pipe to which they attach, and shall be installed as specified by the pipe manufacturer.
3. Joints. The pipe and fittings shall be furnished with push-on type bell and spigot ends for joining with a solid, uniform cross-sectional rubber gasket as the sealing element. The rubber gasket shall meet the requirements of ASTM 3212. The bell shall consist of an integral wall section with the rubber gasket factory-assembled and securely locked to prevent displacement. The critical sealing dimensions of the bell, spigot and gasket shall be in accordance with the manufacturer's standard dimensions and tolerances. The gasket shall provide an adequate compressive force against the sealing surfaces of the bell and spigot so as to affect a positive seal under all combinations of the joint tolerances. The gasket shall be the only element depended upon to make the joint flexible and watertight. Solvent welded joints will not be allowed for pipe sizes greater than 6" unless written approval is obtained from the District Engineer prior to welding the joint.
4. Each pipe shall be clearly marked at 5-foot intervals to show the manufacturer's name or trademark, nominal pipe size, ASTM Designation, and have the material designation "PVC". All fittings shall be marked in a similar manner.

### **B. HDPE Sewer Pipe**

1. HDPE sewer pipe shall be PE3408 striped high density polyethylene pipe manufactured in accordance with, and conforming to all requirements of ASTM D-3350 and ASTM F-714; including ASTM standards for PE3408, Type III, Category 5, Class C, Grade P34. Minimum wall thickness to be SDR 17 for Sewer Main lines and SDR 11 for pressure Sewer Laterals. Exact wall thickness for force mains and pressure Sewer Laterals shall be determined based upon operating pressures. All HDPE sewer pipes shall be color coded according to the color striping codes developed by the Utility Location and Coordination Council of the American Public Works Association (APWA).

### **C. HDPE Joints**

1. HDPE pipe is to be joined by butt fusion method conforming to ASTM D 2657 and manufacturer's recommendations; to provide heat weld as strong as pipe wall.

### **D. Electronic Marker**

1. Omni Marker model 162 Electronic Marker as produced by Industrial Technology.

E. Geotextile Fabric

1. Non-biodegradable, non-woven, drainage fabric; Amoco No. 4547, Tyvar No. 3401, or approved equal.

F. Polymer Concrete Pipe

1. Polymer concrete pipe shall be manufactured in accordance with ASTM D6783. Resin shall be polyester or vinyl ester to suit intended use with no Portland cement. Joints shall meet the performance requirements of ASTM D6783 at 35 psi when tested in accordance with ASTM D4161. Stainless steel joint sleeves/couplings shall meet the requirements of ASTM A276 with ASTM F477 gaskets. Assembled joints shall be flush with outside diameter. US Composite Pipe South or approved equivalent.

G. Casing Pipe Materials

1. Welded Steel Pipe: ASTM A53, Grade B or approved equivalent.
2. Casing Insulators: Stainless steel casing insulators with 12-inch wide band and 2-inch wide glass reinforced plastic runners; Model S12G-2, manufactured by Pipeline Seal and Insulator, Inc. or approved equal.
3. Casing End Seals: Flexible S-shaped seals fabricated on synthetic rubber with stainless steel bans and clamps; Model S Pull-on End Seals, manufactured by Pipeline Seal and Insulator, Inc., or approved equal.
4. Casing End Seals: Flexible seals fabricated of synthetic rubber with stainless steel bans and clamps; Model C Pull-On End Seals, manufactured by Pipeline Seal and Insulator, Inc. or approved equal.

The minimum wall thickness of casings shall be as follows:

| Item | Casing Size   | Casing Wall Thickness |
|------|---|-----------------------|
| 1    | 12" and under                                       | 0.188"                |
| 2    | 14" thru 18"  | 0.312"                |
| 3    | 20" thru 22"  | 0.375"                |
| 4    | 24" thru 26"  | 0.438"                |
| 5    | 28" thru 32"  | 0.500"                |
| 6    | 34" thru 42"  | 0.562"                |
| 7    | Larger casings as directed by the District Engineer |                       |

H. Bedding and Cover Materials

1. Pipe Bedding Material as specified.
2. Trench Backfill Material as specified.



### 2.02.03 Manholes

- A. Pre-cast Sections. Except as otherwise specified herein or indicated on the drawings, manholes shall be constructed using pre-cast base, riser, cone or flat slab top, and grade ring sections conforming to ASTM C478, Pre-cast Reinforced Manhole Sections.
- B. Concrete. Cast-in-place concrete, and grout, shall conform to applicable requirements of Section 2.03 Concrete.
- C. Base. Pre-cast base shall be manufactured by W.R. White Company, or Amcor, Inc., or approved equal. Clear inside dimensions shall be 48", 60" or 72" diameter, as indicated in the design drawings.
- D. Riser. Riser section(s), extending from the top of the base to the bottom of the cone section or flat slab top, shall be pre-cast sections. Clear inside dimensions shall be 48", 60" or 72" diameter, as indicated in the design drawings.
- E. Top Sections. Manhole tops shall be pre-cast sections, either eccentric cone sections or flat slab tops. Top opening shall be 30-inches minimum. Flat slab tops shall be used only where indicated on the drawings. Design shall be based on H-20 live load and one-foot maximum earth cover.
- F. Joints. Wall joints, except grade rings, shall have male and female ends so that when the riser(s) and top are assembled, the interior wall surface of the manhole shall be a uniform and continuous surface within the tolerance of ASTM C478. Joints between pre-cast sections, except grade rings, shall be sealed with preformed plastic gaskets conforming to Federal Specifications SS-S-210(A), or with approved bituminous mastic sealant. Plastic gaskets shall be RUB'R-NEK L-T-M as manufactured by K.T. Snyder Company of Houston, Texas, or approved equal.
- G. Grade Rings. Grade rings shall be precast, as required, to adjust height of manhole lid and frame. Grade rings shall use mastic sealer to insure watertight installation. Maximum height is 12-inches.
- H. Frames and Covers. Frames and covers shall have a 22-3/4-inch diameter clear opening; and shall be gravity, solid, non-rocking, heavy duty type meeting requirements for standard manhole rings and covers. Covers shall have pickholes for opening, lockable lid if indicated, vented lid design in improved areas and solid lid design in unimproved areas, H-20 highway load rating. Covers shall have 3/4" diameter vent holes. Castings shall be of uniform quality free of porosity, hard spots, and shrinkage defects. Covers shall have a low profile waffle pattern similar to D&L Supply A 1181-WP and shall have "Sewer" and "Kearns Improvement District" cast into them.
- I. Manhole Steps. Provide plastic encased steel steps in walls, at spacing and orientation indicated on standard drawings, Manhole Details. Steps shall be cast in place and shall be copolymer polypropylene-encased, 3/4-inch diameter minimum, 60,000 psi tensile strength steel, Model PS1-PF manhole steps as manufactured by M.A. Industries, Inc., or approved equal. Steps shall be installed at 12" on center vertically, set into manhole wall directly under opening.
- J. Collars. Collars shall be constructed of concrete as indicated on the drawings.
- K. In locations with pipes 12 inches in diameter or larger, and in locations where required by the District Engineer, concrete materials shall be cast with CONSHIELD admixture or approved equal.
- L. Drop Manholes. Drop manholes shall **not** be permitted without specific approval of the District Engineer.
- M. Laterals. Sewer laterals to customer properties shall be located at a depth and location so as to provide gravity service to any portion of the property.



## **2.02.04 Acid Resistant Polymer Manholes**

- A. Provide acid resistant polymer manhole sections, base sections and related components conforming to ASTM C 478. ASTM C 478 material and manufacturing is allowed compositional and dimensional differences required by a polymer product.
- B. Provide base riser section with integral floors, unless shown otherwise.
- C. Provide riser sections joined with a flush flat end, alignment guides and gaskets so that on assembly, manhole base, riser and top section make a continuous and uniform manhole.
- D. Construct riser sections for polymer manholes from standard polymer manhole sections of the diameter indicated on drawings.
- E. Use various lengths of manhole sections in combination to provide correct height with the fewest joints.
- F. Design wall sections for depths and loading conditions with wall thickness (minimum 3 inches)
- G. Provide tops to support HL-93 vehicle loading and receiving cast iron frame covers, as indicated on drawings.
- H. Design Criteria

Manhole risers, flat lids, grade rings and manhole base sections shall be designed by manufacturer, to meet the intent of ASTM C 478 with allowable compositional and sizing differences required by a polymer product.

- 1. AASHTO LRFD HL-93 design live loading applied to manhole cover and transition and base slabs.
  - 2. Polymer manholes will be designed based upon live and dead load criteria in ASTM C 857
  - 3. Unit soil weight of 120 PCF located above portions of manhole, including base slab projections.
  - 4. Internal liquid pressure based on unit weight of 63 PCF.
  - 5. Dead load of manhole sections fully supported by transition and base slabs.
- I. Design

Manhole risers, flat lids, grade rings and manhole base sections shall be designed, by manufacture, to requirements of ASTM C 478 and ASTM C 857 as modified to accept polymer construction in lieu of concrete as follows:

- 1. Polymer Mixture – the mixture shall consist solely of thermosetting resin sand and aggregate. No cementitious materials shall be allowed.
- 2. Required wall thickness for all members will be that stated by polymer manhole manufacturer based upon loading conditions and material properties. The minimum wall thickness for risers and bases shall be 3 inches. The minimum thickness for flat lids shall be 1 foot. The wall thickness of risers and flat tops shall be not less than that prescribed by the manufacturer’s design by more than 5%. A wall greater than the prescribed design shall not be cause for rejection.
- 3. Thermosetting Resin – The resin shall have a minimum of deflection temperature of 158° F when tested at 264 psi (1.820 mPa) following Test Method D648. The resin content shall not be less than 7% of the weight of the sample as determined by test method D 2584. Resin selection shall be suitable for applications in the corrosive conditions to which the structures will be exposed.
- 4. Each manhole component shall be free of all defects, including indentations, cracks, foreign inclusions and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part. The internal diameter of manhole components shall not vary more than 1%. Variations in height of two opposite sides of risers and conical tops shall

not be more than 5/8 inch. The under run in height of a riser or conical top shall not be more than 1/4 in/ft. of height with a maximum of 1/2 inch in any one section.

5. Marking and Identification – Each manhole shall be marked on the inside and outside with the following information – Manufacturer’s name or trademark, Manufacturer’s location and Production Date.
  6. Manhole joints shall be formed with a flush flat end, alignment guides and gasket so that on assembly, manhole base, riser and top section make a continuous and uniform manhole. Joint sealing surfaces shall be free of dents, gouges and other surface irregularities that would affect joint integrity.
  7. Minimum clear distance between two wall penetrations shall be a minimum of 6” on 48” to 72” diameter manholes and a minimum of 8” on larger diameter manholes. A clearance of 3” is required between wall penetration and joint.
  8. Construct invert channels to provide smooth flow transition waterway with no disruption of flow at pipe manhole connections. Invert slope through manhole is as indicated on drawings. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts. Unexposed support areas for enclosed invert and bench areas may be constructed of fill material and coated with a covering that will interlink with wall resins to prevent fill material corrosion.
  9. Provide resilient connectors conforming to requirements of ASTM C 923 or as required by the District Engineer. All connectors are to be water tight. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer’s instructions.
  10. Exceptions to ASTM C 478 – components shall be designed for the intended combinations of manufacturing materials. Component designs may be as non-reinforced members or reinforced members as recommended by the manufacturer. Steel reinforcement is not required for circumferential reinforcement, joint reinforcement, base slab reinforcement or hoop reinforcement, but may be placed for the purpose of product handling.
  11. Polymer manholes shall not contain any ladder rungs or ladders.
- J. Grouting
1. All materials needed for grouting and patching will be a polyester mortar compound provided by the manufacturer or an approved equal.



## 2.02.05 Sewer Flow Meter

### A. Submittals

1. Provide component construction data, meter data, manhole data, flow transmitter and depth sensor data, temperature sensor data, controller data, connection wiring drawings and details.
2. Shop drawings shall be submitted.
3. If required, indicate special procedures required to install products specified.
4. Certify that products meet or exceed specified requirements.
5. Provide record location of all facilities.
6. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

### B. Materials

1. Support: Contractor shall provide supports and mounting posts, poles and rails as required, sized to support the specified equipment and communications antenna and solar power panels.
2. Prefabricated Manhole with Integral Flume: Flume shall be full-length molded fiberglass reinforced polyester and shall be of an appropriate throat width and operating range for the intended use. Manhole manufactured by Virtual Polymer Compounds or approved equivalent.
3. Controller: Siemens Milltronics Continuous measurement Open Channel OCM III Ultrasonic Controller wall mounted indicator transmitter, housed in a NEMA 4X enclosure complete with one weather proof power outlet.
4. Temperature Sensor: Siemens TS-2 Temperature Sensor
5. Flow and Depth Sensor: Echomax XRS-5 Ultrasonic continuous level measurement transducer as manufactured by Siemens.
6. Flow Meter, Depth Sensor, and Flow Transmitter: Flow meter including depth sensor and flow transmitter shall be ultrasonic type. The system electronics for the flow transmitter shall measure and convert the time lapse between transmitted and received ultrasonic signal at the sensor into a usable current signal. The electronics shall also compensate the liquid level signal for the time delay variation caused by temperature changes and then characterize the resultant signal by the "flow-to-head" curve for the respective flow element being monitored to yield a 4-20mAdc output signal that shall be linearly proportional to flow. The 4 mAdc value of the output signal shall correspond to zero head and a zero flow, while the 20 mAdc value of the output signal shall correspond to maximum head and maximum flow for the open channel flow metering equipment being installed.
7. Fiberglass Grating: Square Duragrate Molded Fiberglass Grating or approved equivalent and required stainless steel supports.
8. GE PLC: Contractor shall provide a GE Versamax PLC with CPU E-05 Power Supply PWR202 and Analog Input Card ALG262.
9. Communication Equipment
  - a. Radio
    - i. Contractor shall provide a GE MDS INET 900 IP radio with PCTEL Maxrad 710-970 MHz Yagi Antenna and all required connectors and cabling. Cable shall be ½" Helix Times Microwave LMR-600 or equal.
  - b. Contractor shall provide a PolyPhaser IS-50NX-C2-MA Lightning Protector or equal. Lightning protector shall be bulkhead mounted on the antenna cable entrance into the equipment enclosure.





- c. Contractor shall provide a grounding kit Wireless Solutions WGK-U2H5-UT or equal.
10. Solar Power System (where necessary)
- a. Solar Panels
  - b. Batteries
  - c. Mounting Hardware
  - d. Solar Power System shall be designed to provide two consecutive cloudy days, including nights, during the winter time. System shall be designed to provide continuous power assuming radio transmissions every 20 seconds for 4 second duration.
11. Appurtenant Items
- a. Equipment Enclosure
    - i. Contractor shall provide corrosion resistant NEMA 4X enclosure.
  - b. Grounding System: Contractor shall provide ground rods and grounding in accordance with manufacturers' recommendations.
  - c. Conduits and Wiring: Contractor shall provide all conduits and wiring for electrical power and signal transmission required for a complete and functional installation. All connections shall be weatherproofed and suitable for the outdoor location.
  - d. Support: Contractor shall provide supports and mounting posts, poles and rails as required, sized to support the specified equipment and communications antenna and solar power panels.
12. Miscellaneous Components: Other items shall be corrosion resistant as approved by the District Engineer.



## 2.02.06 Sewer Lift Stations

### A. Components

1. Pumps: As manufactured by Flygt and including Neva-clog or N series impellers and seal failure protection. Three phase power shall be supplied where available.
2. Hatch: Shall be Safe-Hatch as manufactured by Flygt. Size as indicated on the drawings. Hatches shall be manufactured of aluminum with heavy duty stainless steel hardware with a minimum 300 pounds per square foot load rating.
3. Stand by Generators: Natural gas or propane fueled standby generator as manufactured by Caterpillar/Olympian.
4. Control Panels: As fabricated by Utility Management Systems, Inc. and including the following features/functions.
  - a. Cellular remote monitoring equipment as required by the District.
  - b. NEMA 4X with stainless steel dead front enclosure and aluminum inner door.
  - c. Incoming power terminals with neutral and ground terminations.
  - d. NEMA rated circuit breakers.
  - e. NEMA rated motor starters with overload for each pump.
  - f. NEMA rated control circuit breakers.
  - g. NEMA rated control voltage transformer. If 460 B or 230V three phase panel.
  - h. NEMA 4X hand off automatic selector switches.
  - i. Run lights.
  - j. Elapsed time meters.
  - k. High level alarm light with flasher.
  - l. Alternator.
  - m. Pump thermal and level sensor terminal strips
  - n. 50W heater with thermostat.
  - o. Phase monitor.
  - p. Surge arrestor.
  - q. Single phase capacitor kits on single phase panels.
  - r. UL 508 serialized.
5. Level Control: Multitrode level control system and a backup float set above alarm level as manufactured by Flygt.
6. Fiberglass Basin: TOP fiberglass reinforced polyester rated (FRP) basin as manufactured by Flygt.
7. Riser Sections: Precast riser sections of appropriate size and length, extending from top of base section to bottom of top section.
8. Sump Base: Precast concrete base of appropriate size.
9. Joints: Base section, riser sections, and top section shall have lipped male/female ends, which shall provide uniform and continuous interior wall surface.
  - a. Joints shall be sealed with pre-lubricated rubber gaskets, conforming to requirements of ASTM C443 and C 361. Forsheda No. 114 Seal, manufactured by Forsheda Pipe Seal Company or equal.
10. Provide appropriate size flexible sleeves of synthetic rubber, with stainless steel clamps and bolts, for all gravity pipe openings in base section, Kor-N-Seal flexible type boot or equal.
11. Automatic Flush Valves: Automatic sump desludging flush valve as manufactured by Flygt.



12. Check Valves: Corrosion resistant ball type check valves as approved by the District Engineer or his or her designee.
13. Isolation Valves: Corrosion resistant eccentric plug valves as approved by the District Engineer or his or her designee.
14. Ventilation: Corrosion resistant ventilation as approved by the District Engineer or his or her designee.
15. Alarm System: As provided by Utility Management Systems, Inc.
16. Miscellaneous Components: Other items shall be corrosion resistant as approved by the District Engineer or his or her designee.
17. Vinyl Fence: As approved by the District Engineer or his or her designee.



## 2.03 Concrete

General. Concrete for use in the Work shall conform to the requirements of this section.

### 2.03.01 Materials

|                                   | ITEM                  | DESCRIPTION  | MANUFACTURER  | MODEL |
|-----------------------------------|-----------------------|--|---------------|-------|
| <b>2.03.01 Concrete Materials</b> |                       |  |               |       |
|                                   | Type II Cement        | General Use  |               |       |
|                                   | Type III Cement       | Ambient Temperature lower than 40°F                                |               |       |
|                                   | Type V                | Sulfate Resistant – Exposed to Sewage                              |               |       |
|                                   | Air Entraining        | Exposed Concrete -4% - 8%  |               |       |
|                                   | Retarding Densifier   | Water Reducer  | Sika Chemical |       |
|                                   | Curing Materials      | 8 mil Polyethylene Sheet<br>ASTM C309, Type 1 Clear or Translucent |               |       |
|                                   | Fibrous Reinforcement | 1.5 lbs./cubic yard – minimum 1” long                              |               |       |
|                                   | Reinforcing Bars      | Grade 60 steel   |               |       |
|                                   | Slump                 | 2” to 4”   |               |       |

**A. Cement.** Cement shall conform to ASTM C150.

1. Type II low-alkali cement shall be used for all work, except that Type III low-alkali shall be used when the ambient temperature is lower than 40 degrees F.
2. Type V Sulfate Resistant Portland Type, when exposed to sewage.

**B. Aggregates** Concrete aggregates shall conform to the requirements of ASTM C33.

1. Coarse aggregates shall consist of crushed stone or gravel, graded to meet the grading requirements of ASTM C33. The maximum limits for deleterious substances in coarse aggregate shall be as listed in ASTM C33. The maximum size of coarse aggregate shall be as specified elsewhere for the type of concrete work but in no case larger than 2”. When not otherwise specified, aggregate shall be the largest size which is not larger than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, or three-fourths of the minimum clear spacing between individual reinforcing bars. Fine Aggregates.
2. Fine aggregate shall be within the following limits when tested in accordance with ASTM C136.

| Sieve   | Percent Passing |
|---------|-----------------|
| 3/8”    | 100             |
| No. 4   | 95 - 100        |
| No. 8   | 80 - 100        |
| No. 16  | 50 - 85         |
| No. 30  | 25 - 60         |
| No. 50  | 10 - 30         |
| No. 100 | 2 - 10          |

Fine aggregate shall have not more than 45 percent retained between any consecutive screens.

**C. Fly Ash.** Fly Ash shall conform to ASTM C618, Class F.

- D. **Calcine Pozzolan.** Calcined Pozzolan shall conform to ASTM C 618, Class N.  
E. **Synthetic Fiber Reinforcement** shall comply with ASTM C 1116; ½” length.

**F. Water**

1. Water shall be of drinkable quality; clean, fresh, and free of deleterious amounts of acids, alkalis or organic materials.
2. The quantity of mixing water measured into the batch shall be reduced by the amount of free water contained in the fine and coarse aggregates. The weight of coarse and fine aggregates shall be increased by the weight of water contained in them.

**G. Admixtures.**

1. Air-Entrainment. Air-entraining admixtures shall conform to ASTM C260.
2. Retarding Densifier. Retarding admixture shall be water-reducing and retarding type: Plastiment as manufactured by Sika Chemical Corporation or approved equal.
3. Curing Materials. Provide curing materials, when required, as follows:
  - a. Moisture Barrier. Moisture barrier shall be 8-mil polyethylene sheet, polyethylene-coated barrier paper, or 1/8-inch thick asphalt core membrane sheet.
  - b. Curing Compound. Curing compound shall be membrane-forming, conforming to ASTM C309, Type 1, clear or translucent.
4. CONSHIELD admixture when required for acid-resistance by the District Engineer.

**H. Mix Design**

1. Standard. Concrete mixes shall be designed using the absolute volume method as described in ACI 211.1. Concrete shall be 6.3 bag mix, with a maximum water cement ratio of 0.50, and shall be from an approved ready-mix plant.
2. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
3. Fibrous Reinforcement is to be added where indicated, add to mix at a rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific Project conditions.
4. Normal Wight Concrete:
  - a. Compressive Strength, per ASTM C 39 at 28 days: 4,000 psi.
  - b. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
  - c. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
  - d. Cement Content: Minimum 592.2 lb. per cubic yard; 6.3 bag mix.
  - e. Water-Cement Ratio: Maximum 48 percent by weight.
  - f. Total Air content: 4 to 6 percent for concrete exposed to freezing and thawing; and 2 to 4 percent for other concrete; per ASTM C 173.
  - g. Slump: 4 to 2 inches for structures; 3 to 1 ½ inches for blocks and pavement.
  - h. Maximum Aggregate Size: one inch.

**I. Entrained Air**

1. Use air-entraining admixture in all concrete, providing not less than 4 percent or more than 6 percent entrained air for concrete exposed to freezing and thawing, and from 2 percent to 4 percent for other concrete.

**J. Retarder**

1. Add Plastiment, or approved equal, to the concrete mix when ambient temperatures exceed 85 degrees F. Retarder shall be added in amounts as recommended by the manufacturer.



### **K. Adjusted Mixes**

1. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. The total water content per bag of cement shall not be exceeded. The cement content per cubic yard of concrete shall not be reduced. Do not use revised concrete mixes.

### **L. Grout**

1. Provide cement grout mixture of 1 part Portland Cement to 3 parts fine aggregate (1/4-inch maximum), by volume, with minimum water required for placement and hydration. Adjust formulation as required for use of special admixtures. Admixtures used in grout shall be acceptable to the District Engineer.
2. Minimum Compressive Strength at 48 hours: 2,400 psi,
3. Minimum Compressive Strength at 28 days: 7,000 psi.

### **M. Epoxy Bonding**

1. System per ASTM C881, type as required by Project conditions.

### **N. Joint Devices and Materials**

1. Waterstops: PVC type, COE CRD-C 572.
2. Joint Filler: ASTM D 1751; Asphalt impregnated fiberboard or felt, 1/2" thick with a tongue and groove profile.

### **O. Reinforcement**

1. Reinforcing Bars. Steel for reinforcing bars to be embedded in concrete shall be deformed bars of the size indicated on the drawings. Bars shall be free from defect and kinks, and from bends not shown on the drawings. The bars shall conform to the requirements of ASTM A615. Bars shall be Grade 60. All bars shall be new stock, free from rust scale, mill scale, or excessive rust when placed in the work. A thin coating of red rust resulting from short exposure will not be considered objectionable; any bars having rust scale, mill scale or a thick rust coat shall be thoroughly cleaned, or shall be rejected and removed from the premises upon the order of the District Engineer.
2. Reinforcing Mesh. The wire mesh or fabric shall be of the size, number of wires and weight indicated on the drawings or directed by the District Engineer. It shall conform to ASTM A185. All reinforcing mesh shall be of new stock, free from excessive rust when placed in the work.
3. Wire. Plain wire shall conform to ASTM A82-02.
4. Installing Reinforcement
  - a. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
  - b. Install wire fabric in maximum possible lengths, and offset end laps in both directions. Slice laps with tie wire.
  - c. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

### **P. Mixing**

1. Transit Mixers: shall comply with ASTM C 94.
2. During hot weather or under other conditions contributing to rapid setting of concrete, mixing times will be reduced as follows;
  - a. When air temperature is between 85 and 90 degrees (F), reduce mixing time and delivery time from 90 minutes to 75 minutes.

- b. When air temperature is above 90 degrees (F), reduce mixing time to 60 minutes.
3. Provide batch ticket for each batch used in the Work. Ticket shall indicate Project identification name and number, date, mix type, mix time, quantity, and amount of water added.

**Q. Preparation**

1. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
2. Forms shall be mortar tight, properly aligned, as indicated, to produce concrete surfaces meeting the surface requirements specified herein.
3. Forms shall be constructed so they can be removed without hammering on or prying against concrete, and without damaging concrete in any way.
4. Verify that forms are clean before applying release agent.
5. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.
6. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
7. In locations where new concrete is doweled to existing Work, drill holes in existing concrete, clean holes of dust and debris, fill holes with epoxy bonding agent, and insert steel dowels.
8. The District Engineer's review of formwork will not relieve the Contractor from any responsibility as to the adequacy of the formwork, shoring and bracing design. All formwork installed by the Contractor shall be solely at his risk. The District Engineer's review will not lessen or diminish the Contractor's liability.

**R. Alignment and Tolerances.** Formwork shall be designed and constructed so that concrete surfaces of finished structures will comply with the tolerances specified in ACI 347; and will conform to the following:

1. Vertical Alignment shall have a maximum allowable variation, from bottom to top of a wall, is plus or minus 3/8 inch.
2. Plumb maximum allowable variations are as follows:
  - a. In plumb and surfaces of columns and walls is plus or minus 1/4 inch in any 10 feet of length; and a maximum of one-inch for entire length.
  - b. In plumb for exposed corner, control-joint grooves, or other conspicuous lines is plus or minus 1/4 inch in any 20 feet of length; and a maximum of 1/2 inch for the entire length.
  - c. Wall thickness: shall not vary more than minus 1/8 inch or plus 1/2 inch.
  - d. Level or Grade: maximum variation from level or grade indicated shall not exceed plus or minus 1/4 inch in any 10-feet of length; or plus or minus 3/8 inch in any 20 feet of length.
  - e. Distance: maximum variation in distance between walls, columns, or other members shall not exceed plus or minus 1/4 inch in any 10 feet of length; and not more than one-inch total variation.

**S. Placing Concrete**

1. Place concrete in accordance with ACI 304R.
2. Place concrete for floor slabs in accordance with ACI 302 1R.
3. Notify District Inspector not less than 24 hours prior to commencement of placement operations. No concrete shall be placed until all formwork, construction joints, reinforcing steel, and other items have been completed and accepted by the District Inspector.



4. Before placing concrete, inspect and complete formwork installations, reinforcing steel placement, and items to be embedded or cast-in.
5. Notify other crafts involved in ample time to permit installation of their work; cooperate with other trades in setting such work.
6. All dirt, chips, sawdust, debris, mud, water and other foreign matter shall be removed from within forms or within excavated areas adjacent to forms before any concrete is placed.
7. Ensure reinforcement, inserts, waters-tops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
8. Separate slabs on grade from vertical surfaces with ¼ inch thick joint filler.
9. Install joint devices in accordance with manufacturer's instructions.
10. Concrete shall be conveyed from mixer to forms as rapidly as possible with specified time limits; and by methods that will prevent segregation of concrete mix.
11. Concrete shall be placed within 15 minutes after it has been discharged from mixer.
12. Provide adequate equipment and labor for conveying concrete to ensure a continuous flow of concrete at delivery point.
13. Concrete shall be deposited as close as possible to its final position in the forms; there shall be no vertical drop greater than 8 feet, except where suitable equipment is provided to prevent segregation of concrete and where specifically authorized.
14. Deposit concrete so that it will be defectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in single layer.
15. Where placement consists of several layers, place each layer while the preceding layer is still plastic to avoid cold joints, and within 30 minutes after placement of preceding layer.
16. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
17. Place concrete continuously between predetermined expansion, control, and construction joints.
18. Do not interrupt successive placement; do not permit cold joints to occur.
19. Do not use concrete which becomes non-plastic or unworkable, does not meet the required quality control limits, or which has become contaminated by foreign materials. Do not use re-tempered concrete. Remove rejected concrete from the Project site and dispose of in an acceptable manner.
20. Place floor slabs in checkerboard or saw cut pattern indicated.
21. Saw cut joints within 24 hours after placing. Use 3/16-inch thick blade, cut into ¼ depth of slab thickness.
22. Screed floors and slabs on grade level, maintaining surface flatness of maximum variation of ¼ inch in 10 feet.
23. Concrete shall not be placed in water, nor shall water be allowed to rise over freshly placed concrete until the concrete has set sufficiently to prevent its being damaged thereby.

#### **T. Consolidating**

1. Consolidate each layer of concrete immediately after placement with internal vibrators in accordance with ACI 309, except for slabs 4 inches thick or less.
2. Vibrators shall be inserted vertically at uniform spacing over entire area of placement; spacing to be approximately 1-1/2 times radius of action of vibrator. Vibrators shall penetrate rapidly to bottom of layer being placed, and at least 6 inches into the preceding layer.





3. Vibrators shall be supplemented by hand spading adjacent to forms on exposed surfaces. Concrete shall be compacted and well worked into all corners and angles in forms, and around reinforcement and embedded items.

#### **U. Concrete Finishing**

1. Repair and patch surface defects, including tie holes, on all surfaces immediately after removing formwork.
2. Unexposed Form Finish: Rub down or chip off fins or other raised areas ¼ inch or more in height.
3. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas ¼ inch or more in height. Provide finish as follows.
4. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
5. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.

#### **V. Concrete Slabs:** Finish to requirements of ACI 301, 1R, and as follows:

1. Wood float surfaces that will receive trowel finish or other finishes, as indicated.
2. Steel trowel surfaces that will be left exposed.
3. Broom finish exterior concrete to provide no-slip finish.
4. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:50 nominal.
5. All exposed edges to be chamfered; ¾ inches minimum.

#### **W. Curing and Protection**

1. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
2. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
3. Normal concrete: Not less than 7 days.
4. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
5. Surfaces Not in Contact with Forms:
6. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-fog spray, or saturated burlap, as acceptable to the District Engineer.
7. Begin final curing after initial curing but before surface is dry.
8. Moisture retaining cover: Seal in place with waterproof tape or adhesive.
9. Curing compound: Apply in two coats at right angle, using application rate recommended by manufacturer.

#### **X. Field Quality Control**

1. An independent testing agency will perform field quality control tests, as specified.
2. Provide free access to concrete operations at Project site and cooperate with appointed firm.
3. Submit proposed mix design to the District Engineer and testing firm for review prior to commencement of concrete operations.
4. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
5. Compressive Strength Tests: ASTM C39. For each test, make and cure three concrete test cylinders. Obtain test samples for every 50 cubic yards or less of concrete placed each day.

6. Take two additional test cylinders during cold weather concreting, cured on job site under same conditions as concrete it represents.
7. Perform one slump test for each load at point of discharge; and perform slump test with each set of test cylinders taken.
8. If maximum slump for the application is exceeded, it will be assumed that the water content is excessive and the load shall be rejected.
9. If slump is less than the minimum for the application, a measured quantity of water may be added to the mix; quantity shall not exceed 1/6 gallon of water per bag of cement.
10. Water shall be added only in the presence of the District Inspector and after a slump test has been made.
11. If concrete has been mixed for more than one hour, the loss of slump shall be considered as being caused by setting of the concrete; water shall not be added, and the load shall be rejected.
12. Perform test to determine air content in accordance with ASTM C231; a minimum of one test shall be done each time a slump test is made. Air content shall be within specified limits.

**Y. Defective Concrete**

1. Test Results: The testing agency shall report test results in writing to the District Inspector and Contractor within 24 hours of test.
2. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
3. The District Inspector will determine repair or replacement of defective concrete. The cost of additional testing shall be borne by the Contractor when defective concrete is identified.
4. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of the District Inspector for each individual area.

**Z. Schedule – Concrete Types and Finishes**

1. Structure not exposed to View: 4,000 psi at 28 day concrete cure; form finish surface, with honeycomb and holes filled and repaired.
2. Exposed Structures: 4,000 psi at 28 day concrete cure; air entrained, smooth rubbed finish



## 2.04 TRENCH EXCAVATION

General - Trench Excavation for the Work shall conform to the requirements of this section.

### 2.04.01 Trench Excavation

- A. Call “Blue Stakes” 48 hours in advance of excavation work to mark existing underground utility locations. Verify locations and elevations of existing utility lines in the area of the Work. Protect all utility lines from excavating equipment and vehicular traffic.
- B. Verify that Survey bench marks and intended elevations for the Work are as indicated. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, curbs, and other improvements from excavating equipment and vehicular traffic.
- C. Protect plants, lawns, and other features to remain.
- D. Notify utility company to remove and relocate utilities, where and as required.
- E. Trench Excavation
  1. Excavate trenches as required to allow Project pipe to be installed to design alignment and grade.
  2. Notify the District Inspector of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.
  3. It is recommended that all trench excavation be done according to OSHA Standards and other applicable regulations,
  4. Do not interfere with adjacent foundations.
  5. Excavate trenches to width, depth and cross section as indicated on the trench detail drawings.
  6. Hand trim excavations. Remove loose matter.
  7. Remove large stones and other hard matter which could damage piping or impede consistent backfilling or compaction.
  8. Remove excavated material that is unsuitable for re-use on the Project from site and dispose of in an acceptable manner.
  9. Where approved by the District Inspector, stockpile excavated material to be re-used in areas designated on site.
  10. Remove excess excavated material from site and dispose of it in an acceptable manner.
  11. During construction, provide and maintain sufficient means and devices to promptly remove and properly dispose of all water entering excavations or other parts of the Work.
    - a. Dispose of water from work area in an acceptable manner, without damage to adjacent property.
    - b. No pipe, concrete footings, foundations or floors shall be installed in water.
    - c. Water shall not be allowed to rise over concrete until it has set for at least 24 hours.
    - d. Water shall not be allowed to rise against walls and supporting beams for a period of 14 days after completion of walls and beams.
    - e. Any damage to pipe work or concrete work caused by water shall be repaired by the Contractor, at Contractor’s expense.



12. The use of explosives will **not** be allowed, unless specifically reviewed and accepted by the District Inspector and District Engineer. All blasting shall be done by a reputable contractor specializing in the use of explosives, who is acceptable to the District Inspector and District Engineer.
  13. Contractor shall provide, at no cost to the District, excavation and safety equipment for test holes used in quality assurance testing as directed by the District Inspector.
- F. Preparation for Water Line Placement
1. Cut out soft areas of subgrade not capable of compaction in place. Backfill with bedding material, Fill Type II, or stabilization material, Fill Type V, or other acceptable material, as directed by the District Inspector.
  2. Correct areas that are over-excavated.
    - a. Fill Type II or Fill Type III flush to required elevation, compacted to at least 96 percent of the maximum dry density as determined by the standard Proctor method (ASTM D-698) or at least 91 percent of the maximum dry density as determined by the modified Proctor method (ASTM D-1557).
- G. Remove unused stockpiled materials; leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water



## 2.05 TRENCH BACKFILL AND COMPACTION

### 2.05.01 Trench Backfill and Compaction

- A. Separate differing materials with dividers or stockpile separately to prevent intermixing. Prevent contamination of the stockpiled material and protect from erosion and deterioration of the materials
- B. No frozen materials shall be used as backfill.
- C. Backfill materials shall be free of organic materials.
- D. No man made materials shall be used as backfill, unless otherwise approved by the District Engineer.
- E. Trench Backfill Materials
  - 1. General Fill – Fill Type 1: Imported borrow or soil excavated on site if acceptable to the District Engineer; conforming to Type A-2 of AASHTO Classification of Soils and Soil-Aggregate Mixtures.
    - a. Graded.
    - b. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
  - 2. Fill Type II: Native or imported material meeting the following requirements.
    - a. Graded.
    - b. Free of lumps larger than 3 inches, rocks larger than 2 inches, organic material and debris.
    - c. Not more than 20% of material passing No. 200 sieve.
  - 3. Fill Type III: Angular crushed washed stone; free of shale, clay, friable material, organic material and debris, all material being between  $\frac{3}{4}$  inch and 1  $\frac{1}{2}$  inch in size, unless otherwise specified by the pipe manufacturer and approved by the District Engineer.
  - 4. Fill Type IV: Natural stone; washed, free of clay, shale, and organic matter.
    - a. Graded in accordance with ASTM C 136, within the following limits:
      - i. Minimum Size:  $\frac{1}{4}$  inch
      - ii. Maximum Size  $\frac{5}{8}$  inch
  - 5. Fill Type V: Free draining granular backfill material; natural or crushed aggregate.
    - a. Graded in accordance with ASTM C-136, within the following limits:
      - i. 2-inch sieve: 100 percent passing.
      - ii. 1-inch sieve: 95 to 100 percent passing.
      - iii.  $\frac{1}{2}$ -inch sieve: 25 to 60 percent passing.
      - iv. No. 4 sieve: 0 to 10 percent passing.
  - 6. Fill Type VI: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
    - a. Graded in accordance with ASTM C-136, within the following limits:
      - i. No. 4 sieve: 100 percent passing.
      - ii. No. 14 sieve: 10 to 100 percent passing.
      - iii. No. 50 sieve: 5 to 90 percent passing.
      - iv. No. 100 sieve: 4 to 30 percent passing.
      - v. No. 200 sieve: 0 percent passing.
  - 7. Fill Type VII: Top Soil excavated on-site.
    - a. Graded.



- b. Free of roots, rocks larger than ½ inch, subsoil, debris, large weeds and foreign matter.
  - c. Acidity range (pH) of 5.5 to 7.5.
  - d. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.
  - e. Conforming to ASTM D2487 Group Symbol OL or OH.
8. Fill Type VIII: Material excavated during trenching operations, not conforming to Type II requirements.
- a. May only be used as trench backfill if recommended by the geotechnical engineer of record and approved by the District Inspector and the District Engineer.
  - b. Geotechnical engineer of record shall define placement and compaction methods.
  - c. Contractor and/or Developer shall employ and pay for full time quality control services of the geotechnical engineer of record.
  - d. Upon completion of the project, the geotechnical engineer of record shall prepare a letter summarizing:
    - i. Testing methods, test frequencies and observations.
    - ii. Any non-conforming conditions (s) and corrective action(s) taken to remedy the non-conformity(ies).
    - iii. Compliance of the work to the project specifications.
9. Concrete for Fill: Lean Concrete.
- a. Conforming to Flowable Fill, Section 605 of the Utah Department of Transportation’s Standard Specifications.
10. Fill Type IX – Low Permeable Fill
- a. Free of lumps larger than 3 inches, rocks larger than 2 inches and debris.
  - b. 20 to 40 percent of material passing the No. 200 sieve.
  - c. Liquid Limit 30 to 50.
- F. Trench Backfill
- 1. Fill to finish contours and elevations indicated.
  - 2. Fill up to subgrade elevations where indicated.
  - 3. Employ a placement method that does not disturb or damage other work.
  - 4. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
  - 5. Maintain moisture content of fill materials within two (2) percent of optimum moisture as determined by ASTM D-698 or ASTM D-1557 to attain required compaction density.
  - 6. Place and mechanically compact materials in equal continuous layers not exceeding 8 inches in compacted depth.
  - 7. Reshape and re-compact fills subjected to vehicular traffic.
  - 8. Pipe Zone:
    - a. Use Natural river or bank sand, Fill Type VI; or other acceptable material.
    - b. Fill under, around and over water pipe as indicated on the “Standard Water Trench Detail” Drawing.



- c. Use Lean Concrete fill material in areas of excessive cover over pipe, as directed by the District Inspector.
        - i. Excessive cover shall be determined by pipe manufacturer and approved by District Inspector.
        - ii. Compact to at least 96 percent of the maximum dry density as determined by the standard Proctor method (ASTM D-698) or to at least 91 percent as determined by the modified Proctor compaction method (ASTM D-1557).
  - 9. Trench Backfill Above Pipe Zone:
    - a. Use fill Type II or local governing body's specification if more stringent.
    - b. Fill up to subgrade elevations or finish grade, as indicated.
    - c. Compact to at least 96 percent of the maximum dry density as determined by the modified Proctor compaction method (ASTM D-1557) or to local governing body's specification, if more stringent.
  - 10. Under curb and gutter, sidewalks, slabs-on-grade, and other concrete work:
    - a. Use granular fill, Fill Type III
    - b. Compact to at least 96 percent of the maximum dry density as determined by the standard Proctor method (ASTM D-698) or to at least 91 percent of the maximum dry density as determined by the modified Proctor compaction method (ASTM D-1557).
  - 11. At Landscaped Areas.
    - a. Use general fill. Fill Type 1.
    - b. Fill up to 4 inches below finish grade elevations.
    - c. Compact to at least 91 percent of the maximum dry density as determined by the modified Proctor compaction method (ASTM D-1557) or to local governing body's specification, if more stringent
  - 12. After placement, compaction and testing of mechanically compacted backfill is completed, Contractor may utilize other compaction methods when accepted by the District Inspector and/or District Engineer.
  - 13. Where required, restore surface to as near original condition as is reasonably possible.
- G. Quality Control
- 1. All testing is to be done by an independent testing company for the Contractor or Developer; test results for all tests will be sent to the District within 24 hours after the tests have been completed.
  - 2. Perform compaction, moisture and density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
  - 3. Evaluate results in relation to compaction curve determined by testing material in accordance with ASTM D-698 ("Standard Proctor"). ASTM D-1557 ("Modified Proctor").
  - 4. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
  - 5. Frequency of Tests as directed by the District's Inspector with a least one test for each 200 CY of material.



6. The District Inspector shall have the right to determine when and where all soil testing shall be performed.
7. Contractor shall provide excavation and safety equipment for test holes used in quality assurance testing as directed by the District Inspector, at no cost to the District.
8. The District may perform additional quality assurance testing to verify conformance with these specifications.
  - a. Contractor shall provide excavation and safety equipment for test holes used in quality assurance testing as directed by the District Inspector.





## 2.06 Secondary Water Systems

### 2.06.01 Secondary Water Systems Material Summary Table

|  | ITEM                         | DESCRIPTION   | MANUFACTURER  | MODEL                                       |
|--|------------------------------|---|---|---|
| <b>PIPE (Must be NSF approved)</b>                     |                              |   |   |   |
|  | 4" to 10" PVC                | C-900 Class 305 (DR 14) or Class 235 (DR18) – Colored with purple dye 512   | JM Eagle, Vinyl Tech, North American Pipe                       |   |
|  | Ductile Iron Pipe 12" to 30" | Class 52 or Pressure Class 350 psi, AWWA C151 with Push On Joints, AWWA C111.   | American Ductile Iron, Pacific States Cast Iron Pipe, U.S. Pipe |   |
|  | Copper Tubing                | Type K, ASTM B 88 Table 3, "Dimension, Weight, and Tolerances," Capable of Connecting to AWWA Standard Water Service Taps and Fittings                        | Cerro Flow Products, Mueller, or approved equal                 |   |
| <b>VALVES (4" and Larger)</b>                          |                              |   |   |   |
|  | Butterfly Valves             | 12" to 48", Cast Iron Body, Bronze Mounted. Conform to requirements of AWWA C504  | Mueller, Clow, American   | Lineseal III, Style 4500 & 1450 Series 2500 |
|  | Gate Valves                  | 4" to 12", Resilient Wedge, Cast Iron Body, Bronze Mounted. Non-Rising Stems with "O" Ring Seals Conform to requirements of AWWA C504. Open Counterclockwise. | Mueller M&H American  | A-2360 Style 7000 Series 2500               |
| <b>VALVES (3" and Smaller)</b>                         |                              |   |   |   |
|  | Gate Valve                   | 2"-3" Resilient Wedge   | Mueller American Clow   | Series 2360 Series 2500 Model 2639          |
|  | Ball Valve                   | ¾" to 2"  | Ford Meter Box Mueller  | Model B11 Mueller 300                       |
|  | Corporation Stop             |   | Ford  | N/A   |
|  | Compression Angle Valve      |   | Ford  | N/A   |
|  | Corporation Valves           |   | Ford  | N/A   |
|  | Angle Meter Valve            |   | Ford  | N/A   |
|  | Curb Valve                   |   | Ford  | N/A   |
| <b>CHECK VALVE (Outside Weight and Lever Required)</b> |                              |   |   |   |
|  | Valves 2 ½" and Smaller      | 200 psi Working Pressure, Y-Pattern, Bronze, Regrinding, Swing Check Valve with Screwed Ends  |   |   |
|  | Valves 3" and Larger         | Iron Body, Bronze Mounted, Flanged Ends, Swing Valves with Stainless Steel Hinge Pins   |   |   |
| <b>BACKFLOW PREVENTER</b>                              |                              |   |   |   |
|  | RP Backflow Device           | Reduced Pressure Backflow Device as Approved by the State of Utah Division of Drinking Water  |   |   |

| METERS (KID will Provide and Install Meters) |                                   |   |  |  |
|--|-----------------------------------|---|--|--|
|  | ¾" – 2"                           | Typical Service Meter   | Sensus                                     |  |
|  | 3" – 6" Compound                  | For wide flow rate applications   | Neptune                                    | Tru/Flo  |
| PIPE FITTINGS                                |                                   |   |  |  |
|  | Service Fitting                   | Compression Connection  | Mueller                                    | 110 Compression  |
|  | Ductile Iron Fittings             | Tees, Class 250 AWWA C110   | American Ductile Iron<br>Clow<br>U.S. Pipe |  |
|  | Ductile Iron Fittings             | Bends, Reducers, and End Caps,<br>Class 250, AWWA C110                                    | American Ductile Iron<br>Clow<br>U.S. Pipe |  |
|  | 1.5" – 24"<br>Coupling            | Coupling and Repair Clamp,<br>AWWA C-219, AWWA C-230,<br>NSF-372, and NSF-61              | Versa-Max                                  |  |
|  | 6" – 30" Ductile<br>Iron Fittings | Mechanical Joint Connection   | One Lok                                    | Mechanical Joint<br>SLDE Wedge<br>Restraint Gland<br>Pak |
|  | 6" – 14" PVC<br>Fittings          | Mechanical Joint Connection   | One Lok                                    | Mechanical Joint<br>SLCE Wedge<br>Restraint Gland<br>Pak |
|  | 6" – 30" Ductile<br>Iron Fittings | Gasket per ANSI/AWWA<br>C111/AR111  | U.S. Pipe                                  | Tyton Gasket   |
|  | Copper Fittings                   | 45° & 90° Copper Fittings, Per<br>AWWA C800. AWWA C110                                    |  |  |
|  | Copper Fittings                   | Service Connections, Type K, with<br>Flare 200 psi Compression Fittings,<br>per AWWA C800 |  |  |
| VAULTS                                       |                                   |   |  |  |
|  | Pre-Cast Vault                    | Per Standard Drawing  | AMCOR<br>Old Castle<br>Dura-Crete          |  |
|  | Meter Box 2"                      |   |  |  |
|  | Meter Box 1" or<br>Less           |   |  |  |
|  | Vault Ladder                      |   |  |  |
| LOCATING WIRE TAPE                           |                                   |   |  |  |
|  | Wire                              | 12 Gauge Insulated Copper   |  |  |
|  | Wire Splice                       | Direct Bury (DBR) Splice Kit  |  |  |
|  | Warning Tape                      |   |  |  |
| COVERING / LIDS                              |                                   |   |  |  |
|  | Valve Cover                       | 8" Outside Diameter, Cast Iron,<br>"Reuse Water" should be Cast on<br>the Cover           |  |  |
|  | Meter Box Cover                   | 24" Cover with Inset Lid  | The Ford Meter Box<br>Company, Inc.        |  |
|  | Standard Vault Lid                | H-20 Load Rating  |  |  |
|  | Traffic Rated Vault               | H-20 Load Rating  |  |  |



|  |  |   |                                  |                                     |
|--|--|---|----------------------------------|-------------------------------------|
|  | Lid                                    |   |                                  |                                     |
|  | Valve Box: Buried in Traffic Areas     | 2 Piece, Cast Iron, Slip Type, Class 35 Heavy Duty, 5 ¼" Shaft with a Drop Lid  | C.I. – 562A vb or Approved Equal |                                     |
|  | Valve Box: Buried in Non-Traffic Areas | 2 Piece, Cast Iron, Slip Type, Class 35 Heavy Duty, 5 ¼" Shaft with a Drop Lid  | C.I. – 562A vb or Approved Equal |                                     |
| <b>MISCELLANEOUS</b>                   |  |   |                                  |                                     |
|  | Bolts                                  | Stainless Steel, American Standard Machined Heavy Hexagon Heads with Class 2 Fit and Threads. ASTM A325 (1/2" to 1 ½")                |                                  |                                     |
|  | Anchor Bolts                           | Stainless Steel, American Standard Machined Heavy Hexagon Heads with Class 2 Fit and Threads. ASTM A307 or ASTM F593 Stainless Steel. |                                  |                                     |
|  | Washers                                | Grey Iron, ASTM A126  |                                  |                                     |
|  | Meter Bushing                          | 1" x 1 ¼" Thread Size   |                                  |                                     |
|  | Steel Pedestal                         | Steel Pedestal Pipe Support Under Each Meter or as Directed by Inspector  |                                  |                                     |
|  | Valve Stem Extension                   | Steel, Welded Construction, Hot Dipped Galvanized with Top Centering Ring and 2" Operating Nut or Approved Equal.                     |                                  |                                     |
|  | Valve Slip Can                         | Steel Slip Can to Fit Cover, Class 35 Heavy Duty (Minimum of 90 lbs.)   | C.I. – 562A vb or Approved Equal | Casting, Inc.                       |
|  | Valve Can Tube                         | SDR 35 or Approved Equal  |                                  |                                     |
|  | Valve Cover                            | 8" Outside Diameter, Cast Iron  |                                  |                                     |
|  | Tapping Saddle                         | 1" Tap if Meter is New  |                                  |                                     |
|  | Poly-wrap                              | Buried Mechanical Ductile Iron Joints, Grease and 8 mil Vinyl Wrap Plastic Cover  |                                  |                                     |
|  | Bond Breaker                           | 8 mil Poly Wrap for Concrete to Fitting Separation  |                                  |                                     |
| <b>COMBINATION AIR / VACUUM VALVES</b> |  |   |                                  |                                     |
|  | Air / Vacuum Valve                     | 1" – 4" Single Body   | APCO Val-matic                   | 140C<br>201C & 203C                 |
|  | Air / Vacuum Valve                     | 1" – 4" Dual Body   | APCO Val-matic<br>Crispin        | 1800 Series<br>101S/22 &<br>104S/38 |
| <b>TAPPING SLEEVES AND SADDLES</b>     |  |   |                                  |                                     |
|  | 3" TO 24" Tapping Sleeve               | Stainless Steel   |                                  |                                     |
|  | 1" to 2" Service Saddle                | Bronze/Brass w/ Double Strap  |                                  |                                     |



**2.06.02 Pipe:**

This section covers water transmission pipe and fittings for the pressurized transmission and distribution of secondary water. All piping for Secondary Water Systems shall be Polyvinyl Chloride, unless otherwise approved by the District Engineer.

- A. Polyvinyl Chloride (PVC) Pipe shall meet or exceed the requirements of AWWA C900 or AWWA C909. The pipe shall be homogeneous throughout; and free from visible cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform as commercially practicable in color, opacity, density and other physical properties. Pipe surfaces shall be free from nicks, scratches, gouges and other imperfection that might weaken the pipe wall or cause leakage at joints.
- B. Pressure class rated pipe shall provide not less than the following allowable working pressures as determined by AWWA C900 or AWWA C909:

| <u>Allowable Working<br/>Pressure Class</u> | <u>Pressure<br/>psi</u> | <u>Minimum<br/>Dimension Ratio (DR)</u> |
|---|-------------------------|---|
| 150   | 150                     | 18                                      |
| 200   | 200                     | 14                                      |

- C. The dimensions and tolerances of the pipe barrel and bell ends shall conform to the applicable requirements of AWWA C900 or AWWA C909 for the pressure-class specified for ductile iron outside diameter pipe.
- D. All fittings and accessories shall be as manufactured or recommended by the pipe manufacturer, or approved equal, and have bell and spigot configurations identical to that of the pipe. The pipe fittings may be manufactured from PVC, ductile iron or welded steel, and shall have strength equal to or greater than the pipe to which they attach. Fittings shall be installed as specified by the manufacturer.
- E. The pipe and fittings shall be furnished with integrally thickened bell and spigot ends; for joining with a solid, uniform cross-sectional elastomeric gasket as the sealing element. Couplings are not permitted. The gasket shall be contained within the bell end. The gasket shall not be required to support the weight of the pipe when two sections are joined; but shall serve only as a seal, and shall conform to ASTM D3139. The critical sealing dimensions of the bell, spigot, and gasket shall be in accordance with the manufacturer’s standard dimensions and tolerances. The gasket shall provide an adequate compressive force against the sealing surfaces of the bell and spigot so as to affect a positive seal under all combinations of the joint tolerances. The gasket shall be the only element depended upon to make the joint flexible and watertight. Solvent welded joints are not permitted unless written approval is obtained from the District Engineer prior to welding the joint.
- F. Special Requirements.  
Marking on the pipe shall include the nominal cast iron pipe size, AWWA C900 or AWWA C909 Class and dimension ratio (DR) and the manufacturer’s name or trademark. Marking interval shall be not more than 5 feet.
- G. Pipe shall be colored with a purple dye, pantone 512.
- H. A tracer wire must be included to facilitate location of the pipe after burial.
- I. All valves to be buried shall have cast iron valve boxes, firmly supported and maintained, centered and plumb over the wrench nut of the valve. The boxes shall be of the extension type with 39- to 60-inch extension. Boxes shall be equal to those manufactured by Tyler Pipe Industries #664-S, or approved equal. Lids shall be triangular in shape, and have the designation “Reuse Water” cast into them.
- J. Valves.
  - 1. Valves shall be bronze-mounted, double-disc, iron body gate valves, and, when so indicated or specified, shall have enclosed spur or bevel gearing. Valves shall have minimum working pressure rating of 150 psi. Valves shall be non-rising stem, unless



rising stems are indicated on the drawings. Valves shall meet the requirements of AWWA Specification C-500, except as modified herein. Valves shall operate drip tight with full pressure on either side of the valve and no pressure on the other side. Packing and gearing shall be replaceable while the valve is in service. End connections shall be flanged, push-on joint, mechanical joint, or slip joint.

2. The flanges and drilling shall conform to dimensions of ANSI Standards for Class 125 or Class 250, for cold water. The joints shall be manufactured to conform to requirements of AWWA C110/A21.10.
3. Valves shall be so designed that the gates and stem are clear of the full specified diameter when open.
4. All valves shall turn clockwise to close.
5. When so indicated or specified, valves shall have cut steel spur gears or bevel gears in a factory-installed, enclosed gear case. The case shall be air, water, and oil tight with seals on all shafts. A worm gear position indicator shall be provided with geared valves.
6. The operating nut or wrench nut shall be cast iron, and shall be carefully fitted to the top of the valve stem, secured to the stem by a threaded nut; with threads- 1/2-inch minimum, National Coarse. The operating nut shall be 1-15/16-inch square at the top, 2-inch square at the base, and at least 1-3/4-inch high. There shall be a round flange at the base with a distinct arrow cast on the nut, and lettering to indicate direction to close or open.
7. The stems for all valves shall be of corrosion resistant material.



## **SECTION 3 – CONSTRUCTION STANDARDS**

### **3.01 General**

- A. The Contractor and Developer shall employ suitable and competent mechanics for every kind of work. If any person employed by the Contractor is incompetent, disorderly or disobedient to the District Engineer or the District Inspector, or rude or abusive to any of the general public he shall be removed from the Work and not again be employed upon the Work without the consent of the District Engineer.
- B. The Contractor shall, and will, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery, equipment facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by these Specifications and approved Plans, and in accordance with the directions of the District Engineer as given from time to time during the progress of this Work. He shall furnish, erect, maintain, and remove such construction plant and such temporary works as may be required.
- C. The Contractor shall observe, comply with and be subject to all terms, conditions, requirements, and limitations of the Specifications and approved Plans, and shall do, carry on, and complete the entire work to the satisfaction of the District Engineer.
- D. Coordination of work. The Contractor shall review the Drawings and Specifications and shall report any discrepancies to the District Engineer and obtain from him written instructions for changes necessary to avoid interference. Before installation, the Contractor shall call Blue Stakes and make proper provision to avoid interferences in a manner approved by the District Engineer. All changes required in the work of the Contractor caused by his neglect to do so shall be made by him at his own expense.
- E. Damage to utilities. If, during the execution of the Work, any utility or private property is damaged, the Contractor shall immediately notify the utility company, department or person responsible for the utility or the property, and shall satisfactorily repair or replace any utility or property which is damaged or broken due to the execution of the Work, or he shall arrange for the owner to perform the repair.
- F. Safety standards and accident prevention. With respect to all work performed the Contractor shall:
  - 1. Comply with the safety standards provisions of applicable laws and building and construction codes, and
  - 2. Exercise every precaution at all times for the protection of persons (including employees) and property which shall include, as needed, the use of shoring, bracing, barricades, guards, night watchmen, red lighting and the elimination of hazardous conditions.



### **3.02 Emergencies**

- A. Emergencies may arise during the progress of the work which may require special effort or require extra shifts or persons to continue the work beyond normal working hours. The Contractor shall be prepared in case of such emergencies from whatever cause to do all necessary work promptly. Such emergencies will be based on the District's ability to deliver water and sewer services to its customers, or to protect the life, health, safety and/or property of the general public.



### **3.03 Surface Restoration**

- A. Protection of Surfaces. In order to avoid unnecessary damage to existing paved surfaces, track equipment shall use rubber cleats when operating on or crossing paved surfaces, and shall follow all requirements of the jurisdiction having control over the surface. Damaged surfaces outside the Project limits shall be repaired or replaced by and at the expense of the Contractor in a manner satisfactory to the jurisdiction having control over the surface.
- B. The Contractor shall provide temporary surfaces in good condition within one (1) day after trench backfill has been placed; and shall complete street repairs with seven (7) days from the date structural and trench backfill has been placed, unless more stringent requirements are imposed by the jurisdiction having control over the surface.
- C. Cutting and Removal. Existing pavement to be removed shall be cut vertically in straight lines, and the portion to be removed shall be excavated in a manner that will not damage pavement which remains.





### **3.04 Tunneling or Auguring**

- A. Casing pipe shall be used to protect the carrier pipe at railroad crossing, canal crossings, and highway crossings where shown on the drawings or where directed by the District Engineer. Casing pipe and installation shall meet the requirements of the railroad, highway department, or other utility being crossed, as well as these Specifications. Alignment and grade of the casing pipe shall be maintained so that the carrier pipe can be installed to the line and grade as shown on the drawings.
- B. Steel casing pipe shall be welded steel pipe meeting the requirements of ASTM A53. Casing driven in place by jacking, tunneling or auguring methods shall be provided with cathodic protection.
- C. Size and Wall Thickness. Steel casing pipe shall be as per the minimum specified requirements within these Design Standards.
- D. Casing shall be installed by jacking, tunneling, auguring, or other method that may be approved by the owner of the railroad, canal, or highway, and the District Engineer. The hole for the casing shall be same size as the outside of the casing. Over-break shall be filled with sand or grout pumped into the opening after setting the casing. The casing shall be watertight. The carrier pipe shall be placed to line and grade on a bed of sand, and the void space between casing and carrier shall contain approved spacers.
- E. Responsibility for Work. All of the operations of the Contractor in constructing the portions of the work under railroad tracks, canal, or highway shall be subject to the approval of the railroad, canal, or highway owner. The Contractor shall enter any agreements with and shall furnish any and all indemnity and other Bonds that may be required by them for the protection of the railroad, canal, or highway owner against injury and interference with traffic and service by operations of the Contractor. The Contractor shall provide services of guard, flag person, etc., as required by the authority having jurisdiction. The Contractor shall secure permission from the affected utility before commencing on the portion of the work within the right-of-way and under the tracks, canal, highway or other improvements. The Contractor shall be solely responsible for the safety and adequacy of his construction plans and methods and for any damage which may result from their failure.



### **3.05 Construction Water**

- A. The Contractor shall make arrangements for and provide all necessary water at his own expense. If the Contractor purchases water from KID at a fire hydrant on or near the project, all arrangements shall be made by him at his own expense and payment shall be made to KID on basis of the actual quantity of water metered or by other approved methods. A fire hydrant meter must be obtained from KID, and KID must authorize the opening of any KID hydrants. Application for service shall be made to the KID office located at 5350 West 5400 South.
- B. The Contractor shall use hydrants in strict accordance with KID requirements for hydrant use and shall provide backflow or air gap protection.



### 3.06 Water Systems

The construction requirements for culinary water systems will apply to Secondary Water Systems unless otherwise noted.

#### A. Excavation and backfill

1. Earthwork for pipe trenches shall include trench excavation, providing and placing bedding, borrow for backfill and bedding, backfill within the pipe zone, backfill above pipe zone, shoring, compaction of material, and consolidation of material.
2. Standards. All applicable standards and rules applying to pipe excavation and installation shall be strictly adhered to, including, but not limited to, the following:
  - a. AWWA C605.
  - b. AWWA C600.
  - c. Specifications for excavation on State Highways, latest revision.
  - d. General Safety Order Covering Utah Industries - Section 69, trenches.
  - e. United State Department of Labor OSHA Publication 2085 - "Employer - Employee, Safe Practice for Excavation and Trenching Operation".
  - f. Utah Occupational Safety and Health Rules and Regulations - General Standard (UOSHA).
  - g. AASHTO T-180.

#### B. Excavation.

1. Excavation shall be accomplished to allow the pipe to be laid to the line and grade shown on the drawings or as directed by the District Engineer.
2. The Contractor, at his option, may leave all or part of the trench unshored or unbraced. If this is the case, the sides of the trench shall be sloped to meet safety standards. Trenches less than four feet deep may be constructed with vertical walls. Trenches not meeting UOSHA standards will not be entered by the District Inspector, and pipes will not be inspected or accepted.
3. The District Inspector may require that unsuitable materials located beneath the pipe zone be over-excavated, backfilled and compacted to 95% maximum density as defined in AASHTO T-180.

#### C. Laying Pipe

1. Pipe shall be bedded in sand, as specified in these Standard Specifications free of loam and organic matter for a minimum of 6" below the pipe and 12" above the pipe. Gravel bedding or the use of other bedding materials is not permitted. Tees, elbows, crosses, and reducers shall be used for changes in direction and outlets. Where cap screws or stud bolts are needed, flanges shall be tapped to support cap screws or stud bolts. Anchors and thrust blocks shall be placed at valves, elbows, tees, etc. as shown on approved plans and standard details. All flanges shall be faced and drilled.
2. Valves which are not located in a dedicated right-of-way shall have a sign posted near the valve so that it may be easily located. The sign will be provided by KID; the Developer is responsible for providing a metal post, and placing it near the valve, so that the sign will be approximately 4 feet above grade.
3. All below grade bolted joints shall be coated with Poly FM (food grade) grease and wrapped in 8-mil black plastic. The plastic shall be held in place by 2-inch wide plastic backed adhesive tape, Polyken No. 900, Scotchrap No. 50, or approved equal.
4. A 12 gage tracer wire shall be laid with PVC pipe, terminating at accessible locations in the valve boxes.
5. A warning tape, marked "Buried Water Line", 3M EMS or similar, shall be placed directly above the water line approximately 12 inches above the top of pipe.

- #### D. Compaction.
- Trenches over waterlines shall be backfilled and compacted in accordance with requirements of the City or County having jurisdiction.



- E. Alignment. Waterlines shall be placed in accordance with the approved plans. Curved alignments are permitted within tolerances of the pipe manufacturer, and as shown on the plans. Deviations from the approved plans are permitted only with approval by the District Engineer. Such deviations shall be shown on the AS-BUILT Drawings. The Contractor is responsible for verifying the maximum degree of curvature allowed according to the AWWA standards and the manufacturer's recommendations for the type and size of pipe being installed. Where field conditions require deflection for curves not anticipated by the approved plans, methods to be used shall be presented to the District Engineer for approval.
- F. Tapping. The cast iron tapping sleeve and cast iron tapping valve shall be of the sizes indicated, and designed for 200 psi working pressure, intended to permit tapping the existing waterline with pressure in the line. Tapping sleeve and tapping valve shall be products of the same manufacturer and shall comply with MSS SP-11.
1. Tapping Sleeve. The tapping sleeve shall be a mechanical joint type with Class 125 cast iron outlet flange. End gaskets shall be duck-tipped type. Provide H615 tapping sleeve as manufactured by Mueller Co. or approved equal.
  2. Tapping Valve. The tapping valve shall have mechanical joint inlet with Class 125 cast iron flange. Outlet shall be slip-on joint end. Tapping valve shall be Model H667 as manufactured by Mueller Co. or accepted equal.
  3. Valve Box. Cast iron valve box shall be extension type, Tyler Pipe Industries #664-S with 39- to 60-inch extension or accepted equal. Install centered and plumb over the wrench nut of the valve.
- G. Water Service Connections
1. Furnish and lay, or install by jetting, type "K" copper tubing as specified under "Copper Tubing" with a diameter equal to the size of the service connection. Where the service lateral is longer than 50 feet from main to meter, the diameter shall be one size larger than the meter. Fittings may be flair or compression type. Tubing shall extend from corporation stop to the meter yoke or meter valve and from meter yoke or meter valve to a point fifteen feet beyond the property line. Tubing shall be capped and marked with a 2x4. An expansion loop shall be formed in the soft copper tubing in a horizontal plane at the connection to the corporation stop. See detail on drawings.
  2. The water service line shall be bedded in sand bedding the entire length of service line. No joints or connections are permitted between the corporation stop and the yoke or setter.
  3. The meter box shall be installed in the park strip between back of curb and sidewalk and shall not be located in driveways or drive approaches. See also Section 1.2.1.2. Variances from these requirements shall be permitted only by approval of the District Engineer. If relocation of a meter box to avoid interference with a driveway or drive approach is required, an application for a Sub-Standard Agreement shall be completed, and applicable fees shall be paid to the District, submitted to the District and approved by the District Engineer.
  4. Service connections shall be installed, as above described, as soon as possible after installation, testing and flushing of the water main. Service connections shall not be made closer than 2 feet to one another, or to a joint or valve.
  5. Across State Highway rights-of-way, service lines shall be installed by auguring, open cut trench, or other method that may be approved by the Utah Department of Transportation. In other than State Highway rights-of-way, service lines shall be laid in an open cut trench; except that pipe 2-inches or smaller may be jetted under existing improved surfaces.
  6. Inspection. Before backfilling, contact the District Inspector for inspection and approval of service connection.



- H. Frost protection
  - 1. Water lines shall be placed at a depth that will provide at least 48 inches to the finished ground surface. Excavations, while open, shall be protected from frost to assure that pipes are not placed in or on frozen ground.
- I. Flushing and testing. See Section 4.03 A. Water Quality Tests
- J. Waterline loops
  - 1. Where it is necessary to provide a loop for a waterline to prevent interference with an existing storm drain or other utility, such loop shall be of shop welded steel pipe, with mechanical joints or flanged fittings at each end. No non-welded joints are permitted in the loop.
- K. Hydrants
  - 1. Hydrants shall be thoroughly cleaned of dirt or foreign matter before setting. Hydrants shall stand plumb and shall have their nozzles parallel with, or at right angles to, the curb, with the pumper nozzle facing the curb.
  - 2. Hydrants shall be set to final finish grade, with nozzles at least 18-inches above the ground. A concrete pad shall be provided at all fire hydrants as shown on standard details. Bolts at breakaway flanges shall be fully accessible.
  - 3. Concrete thrust blocks shall be provided for the hydrant bowl, auxiliary gate valve, and elsewhere as indicated on the drawings.
  - 4. Below grade bolted joints shall be coated with food grade grease and wrapped in 8-mil black plastic. The plastic shall be held in place by 2-inch wide plastic backed adhesive tape, Polyken No. 900, Scotchrap No. 50, or approved equal. To provide for drainage of the hydrant, a short pipe nipple shall be extended through the plastic to drain the water to the gravel outside the film wrap.
  - 5. The hydrant, valve and connecting piping shall be flushed, tested and disinfected. The hydrant shall be flushed with all outlet valves open.
  - 6. The Contractor shall use only hydrant wrenches to open hydrants. He shall also make certain that the hydrant valve is open “full”, since “cracking” the valve causes damage to the valve, and promotes washout under the hydrant due to leakage at the drain port. An approved auxiliary valve shall be provided on the outlet line for control purposes. Fire hydrant valves must be closed slowly and completely to avoid a surge on the system which creates undue pressure on the water lines. The Contractor shall carefully note the importance of following these directions.
  - 7. If one of the Contractor’s employees shall knowingly or unknowingly damage any hydrant valve system, the Contractor shall be responsible for all resulting costs and damages. He shall immediately notify KID so that the damage can be repaired as quickly as possible.
  - 8. Upon completing the use of the hydrants, the Contractor shall notify KID, so that the hydrants may then be inspected for possible damage. Any damage resulting from the use of the hydrants by the Contractor will be repaired if necessary by KID and the cost thereof shall be borne by the Contractor.
  - 9. The Contractor shall furnish all connectors, wrenches, valves, and small tools that may be necessary to meet the requirements of KID pertaining to hydrant use.
  - 10. Violation of these requirements may result in fines and will leave the Contractor liable for damage suits because of malfunctioning of damaged fire hydrants, in the event of fire.
- L. Crossing Secondary Water Lines
  - 1. Where secondary water lines cross potable water lines, joints of the secondary line shall be located at least 5 feet away from the potable water line.



### 3.07 Sewer Systems

#### A. Excavation and backfill

1. Earthwork for pipe trenches shall include trench excavation, providing and placing bedding, borrow for backfill and bedding, backfill within the pipe zone, backfill above pipe zone, shoring, compaction of material, and consolidation of material.
2. Standards. All applicable standards and rules applying to pipe excavation and installation shall be strictly adhered to, including, but not limited to, the following:
  - a. Specifications for excavation on State Highways, latest revision.
  - b. General Safety Order Covering Utah Industries - Section 69, trenches.
  - c. United State Department of Labor OSHA Publication 2085 - "Employer - Employee, Safe Practice for Excavation and Trenching Operation".
  - d. Utah Occupational Safety and Health Rules and Regulations - General Standard (UOSHA).
  - e. AASHTO T-180.
3. Excavation.
  - a. Excavation shall be accomplished to allow the pipe to be laid to the line and grade shown on the drawings or as directed by the District Engineer.
  - b. The Contractor, at his option, may leave all or part of the trench unshored or unbraced. If this is the case, the sides of the trench shall be sloped to meet safety standards. Trenches less than four feet deep may be constructed with vertical walls.
  - c. The District Inspector may require that unsuitable materials located beneath the pipe zone be over-excavated, backfilled and compacted to 95% maximum density as defined in AASHTO T-180.

#### B. Compaction

1. Compaction of materials located above the pipe zone shall be in accordance with requirements of the authority having jurisdiction over the road.

#### C. Alignment & Grade

1. Sewer lines shall be constructed in a straight line between manholes, in accordance with the approved plans. Lines shall be constructed to slope uniformly between manholes without bellies or sags. Grades shall be consistent with the approved plans.

#### D. Sewer Main line Pipe

1. Sewer main lines shall be installed in public right-of-ways or within District easements.
2. Verify that trench cut is ready to receive Work and excavations, dimensions, and elevations are as indicated on Project plan and profile drawings.
3. Where required by the District Inspector and/or District Engineer, install fabric encasement as indicated on drawings and according to manufacturer's written instructions and recommendations.
4. Install pipe, fittings, electronic markers and accessories, for sewer main lines, in accordance with appropriate ASTM standards and manufacturer's instructions. Seal joints water tight.
5. Unless otherwise approved by the District Engineer, pipe shall be laid to the alignment and grades indicated on the approved Construction Drawings within the following limits.
  - a. Alignment - 2"
  - b. Elevation -  $\pm 1/2$ "
  - c. When pipe is designed and/or installed within  $\pm 0.1\%$  of the minimum allowable grades, as defined in Section 5.02 Sewer System Design Standards the variation in grade listed above shall not be applicable.

- d. The District reserves the right to require whatever action is necessary to correct (including replacement of all affected sections of line) any unacceptable results of pipe installations at less than minimum allowable slopes.
- e. A minimum of four (4) feet of cover shall be required over all main sewer lines.
- f. Pipe plugs shall be installed during construction at the end of each length of pipe installed to prevent water and debris from entering pipe.
- g. Install electronic markers over all HDPE and curved sewer lines, at intervals as per the manufacturer's recommendations and as directed by the District Inspector but not more than twenty (20) feet, and at depths no greater than four (4) feet.
- h. In locations with steep slopes (i.e. greater than 15%) concrete anchor restraints shall be installed on the pipe at spacing and in a manner as indicated on the standard detail Drawing SS10.

#### E. Sewer Laterals

1. Sewer service lateral shall extend from a wye branch or other fitting as approved by the District Inspector, installed in the main line, to a point at least ten (10) feet inside the property line, as indicated on the drawings and as directed by the District Inspector.
2. Verify that trench cut is ready to receive Work and excavations, dimensions, and elevations are as indicated on Project plan and profile drawings, and as directed by the District Inspector.
3. Install pipe, fittings, and accessories, for sewer laterals, in accordance with appropriate ASTM standards and manufacturer's instructions. Seal joints watertight.
4. Install a 22 ½ or 45 degree bend, or combinations of bends as required, on the wye, rotated so the proper alignment and grade is established.
5. Install pipe to alignment as directed by the District Inspector and with uniform slope, free of low spots or adverse grades. Recommended minimum slope shall be ¼-inch per foot (approximately 2.0 percent grade) where practical; but in no case less than 1/8-inch per foot (approximately 1.0 percent grade).
6. Where laterals are to be connected to a manhole, the manhole wall shall be core-cut with the appropriate size machine and the lateral pipe shall be connected to the manhole with appropriate type flexible coupling.
7. Service laterals shall be cleaned, flushed and tested in accordance with applicable requirements of this Section. After flushing has been complete, the end of the service lateral shall be beveled and plugged, with a Burke Duo Seal Pipe Plug or equivalent equal as per District Inspector's requirements. Prior to backfilling a 2x4 shall be extended to the surface for future location.
8. A brass lateral marker shall be installed in the curb, directly above each lateral crossing, as per the District Inspector's instructions. If curb and gutter is not available in a subdivision, brass lateral markers shall be installed as per the District Inspector's instructions.
9. A minimum of four (4) feet of cover is required over all sewer laterals, unless otherwise approved by the District Engineer.
10. The District recommends that no trees be planted in the proximity of laterals.
11. Cleanouts shall be installed at not more than one hundred (100) feet spacing.
12. No more than two bends in excess of forty-five (45) degrees shall be installed without a cleanout.
13. Flows discharged from a sump shall be pumped, by automatic pumping equipment, via a pressure Sewer Lateral and discharged into a gravity flow Sewer Lateral, connecting at a cleanout, or the Sewer Main, connecting in a manhole constructed of Dynastone with approved restrained coupling(s).
14. Pumping equipment and pressure Sewer Laterals shall be designed to meet or exceed the anticipated use requirements. Unless otherwise approved by the District Engineer, pressure Sewer Laterals shall be constructed of HDPE and constructed on a constant reverse grade.



Professional advice should be obtained prior to installing pumping equipment, which shall be done per manufacturer's recommendations.

F. Installation – Casing Pipes

1. See Sections 2.04 Trench Excavation and 2.05 Trench Backfill and Compaction for trench excavation, backfill, and additional requirements.
2. Install casing pipes by ramming process, bore and jack, or open cut where indicated as that method to be acceptable to the District Inspector and any other governing authority. If open cut installation method is used under a canal, river or other such area, the impacted area shall be lined with concrete, conforming to the governing authority requirements.
3. Install casing pipes at the line and grade as required to allow carrier pipes to be installed within the casing pipes at the design line and grade, as indicated on the drawings.
4. Place casing insulators on carrier pipes to properly center and position carrier pipe inside the casing pipes; space insulators as recommended by the pipe and/or insulator manufacturer.
5. Seal each end of casing with appropriate size flexible end seals; install according to manufacturer's instructions and recommendations.
6. Seal voids created by bore, around periphery of casing, with grout or impervious clay as approved by the District Inspector.
7. Contractor shall be solely responsible for the accuracy, safety and adequacy of construction methods and procedures for installing casing pipes, and for any damage, which may result from their failure. All operations of the Contractor for installation of casing pipes shall be subject to approval by the agency having jurisdiction over the item being crossed, such as the Flood Control Department, Utah Department of Transportation, canal companies, and railroad companies.
8. Contractor shall enter into any agreement with, and furnish any and all indemnity and other bonds that may be required by, the agencies listed above, for their protection against injury and interference with flow of water caused by the operations of the Contractor.
9. Contractor shall secure required permission from the agencies referenced above before commencing with the installation of casing pipes and related Work along and across the respective areas.

G. Connections to Existing Sewer Manhole

1. Connection of Project pipe into an existing manhole includes:
  - a. All excavating required for the connection; and backfilling excavations after the connection is completed and compacting backfill as required.
  - b. Removing existing pipes where and if required.
  - c. Cutting hole through wall and base of existing manhole with appropriate size coring machine as required and as directed.
  - d. Installing new pipe in place and connecting to manhole wall with appropriate type flexible coupling, as recommended by the coupling manufacturer.
  - e. Reforming manhole floor and invert channel to provide smooth channel transitions to accommodate new connected pipes.
  - f. Sealing around new pipe where it intersects manhole wall, make connection watertight.
  - g. Perform all other operations necessary to restore existing manhole to condition acceptable to the District Inspector.
  - h. If existing manhole does not have steps, connection shall also include furnishing and installing new manhole steps. Steps shall be installed as described in Section 2.02.03.
  - i. Connection to existing manholes shall not be completed until new pipelines have been cleaned, tested, and accepted by the District Inspector.







- a. Infiltration Test: Infiltration test required when pipe is below ground water level. Amount of water leaking into pipe shall be measured. Leakage into pipe shall not be more than 1 gallon per day per inch diameter per mile of pipe.
  - b. Air Test: Low-pressure air test may be performed. Section of pipe being tested shall be sealed; line being tested shall be pressurized to approximately 4.0 psi; and pressure allowed stabilizing for a minimum of two minutes. During this period, air shall be added if the pressure drops below 4.0 psi. After this stabilization period, timing shall begin. The time of test, in minutes, shall be equal to the pipe diameter in inches. The maximum allowable pressure drop during the specified time period shall be 0.5 psi.
7. Deflection Test – HDPE, Fiberglass, and PVC Sewer Pipe: After sewer pipe has been cleaned, perform deflection test on each section of pipeline between manholes, where required by the District Inspector. The maximum allowable pipe deflection, the reduction in vertical inside diameter, shall be 5 percent. Maximum allowable deflection shall be applied to the base inside diameters shown in Table 10.14, Base Inside Diameter for Deflection Measurements of ASTM D 3034 SDR35 PVC Sewer Pipe, Table 10.15 Base Inside Diameters for Deflection Measurements ASTM F 679 or Table 10.16 Base Inside Diameters For Deflection Measurements ASTM 794 in the Uni-Bell “Handbook of PVC Pipe”, to determine minimum permissible diameter, or other appropriate sources. Testing devices shall include deflectometer, calibrated television or photography, or properly sized mandrel.
8. Televised Inspection: After the sewer pipe has been installed and cleaned; and the trench has been filled, the District will televise the sewer pipe to locate defects in the sewer pipe.
- a. The Contractor shall arrange for the televised inspections.
  - b. The Contractor shall ensure safe access to each manhole for the District’s television truck.
  - c. If the District is called for a televised inspection and cannot perform such inspection due to defects in Work by Contractor, i.e. inaccessible manholes, dirty sewer pipe, etc., the Contractor shall be charged a call back fee according to the current District Fee Schedule.
  - d. Any Work not conforming to these Design Standards and Construction Specifications shall be promptly removed, replaced and retested at no cost to the District.
9. Hydrostatic Test
- a. A hydrostatic test shall be performed on the following installed pipes:
    - i. Force Sewer Main Lines.
    - ii. Private pressure Sewer Laterals.
  - b. Prior to the hydrostatic test, the line shall be flushed with an adequate flow volume and rate to remove any debris, silt, gravel or other material in the line.
  - c. Method of Test:
    - i. The lines to be tested shall be filled with clean water.
    - ii. All air in the system shall be expelled before the test.
    - iii. The test pressure shall be the greater of 150% of the maximum design pressure or 100 psi.
    - iv. Leakage shall not be permitted.
    - v. Locate and repair defective joints and retest until leakage rate is less than allowable.
    - vi. Repair any noticeable leakage even if total leakage is less than allowable.

J. Protection

- 1. Protect pipe and bedding material from damage or displacement until backfilling operation is in progress.



#### K. Bedding

1. All sewer pipes shall be bedded in UDOT free draining granular backfill per Section 02056 of the UDOT Standard Specifications. Crushed gravel gradation shall pass the  $\frac{3}{4}$ " screen, and none shall pass the  $\frac{3}{8}$ " screen. Bedding shall be placed at a minimum of 6" below the pipe and 12" above the pipe. Sand bedding or the use of other bedding materials is not permitted.

#### L. Manholes.

1. Precast Base. Flexible sleeves of synthetic rubber with stainless steel clamps shall be provided in all pipe openings in pre-cast bases. After pipe is clamped in place, openings around the sleeves shall be filled with cement grout. Install precast concrete manhole base level on a compacted foundation.
2. Base Gravel. Pre-cast bases shall be founded on gravel or other material satisfactory to the District Engineer, of minimum thickness indicated on the drawings.
3. Cast Base. Cast-in-place bases shall not be permitted without approval of the District Engineer, and shall be as indicated on the drawings. Surfaces of the water channel and interior shall be float finished. Concrete shall conform to Section 2.3.
  - a. After manhole has been completed, saw-cut into top of existing sewer pipe, remove section of pipe as required, and dispose of the removed material; construct pipe line, as directed. Invert channel shall be formed to direct sewage flows through the manhole as indicated.
  - b. Divert existing sewage flows around work area to allow connection to existing pipeline to be made.
4. Pipe Openings. A plastic seal or water stop shall be installed to make watertight connections in manhole pipe openings.
  - a. Place manhole riser section plumb and level, from the manhole base to top section, as indicated and according to manufacturer's instructions; anchor to base: align steps perpendicular to sewer line, and seal joints.
  - b. Place top section, cone section or flat slab, on top riser section, with opening positioned over steps. Top of cone section or flat slab shall be from 10-inches to 18-inches below final surface elevation, as directed by the District Inspector.
5. Grade Rings. Precast grade rings shall be provided as required to adjust the height of the manhole. A maximum of 2 grade rings, not to exceed 12" total height, is permitted in new construction. Brick shall not be used in lieu of, or in addition to, grade rings. Cast-iron grade rings are not permitted. The manhole shall be provided with a concrete collar, and the finished product shall be parallel to and one-half inch below the asphalt road grade. (See standard drawings).
6. Connect pipe to manhole with appropriate type flexible coupling as recommended by manufacturer. Provide pipe joint or flexible coupling on all pipes approximately 18" from outside of manhole. Grout around pipe after installation is complete. Make connections watertight.
  - a. Provide sewer pipe stubs for future connections of the same type of pipe used on the Project, and of the size indicated.
  - b. Alignment and grade of stub to be determined by the District Inspector.
  - c. Install permanent, watertight plug or cap on end of stub, outside of the manhole.
  - d. Grout inside of manhole base sections to form channel between connected pipes, as indicated. Trowel smooth. Top of channel shall be at same elevation as top of outlet pipe.
  - e. Set cover frames and lids to match street elevation and slope. After placement, grout around the exterior of frame from top of concrete top section to top of frame, as indicated, to ensure watertight condition.

- f. After manhole base has been completed, furnish and install temporary pipe plugs to seal all interior pipe openings; plugs to be Brandt DuoSeal Pipe Plug by Burke Rubber Company, Cherne Pipe Plug by Cherne Manufacturing Company, or acceptable equal. Pipe plugs shall remain in place until final review and acceptance of completed sewer. Plugs shall then be removed; and shall be property of Contractor.
7. In paved areas, collars shall be constructed around manhole covers as indicated. Collars shall be constructed of either concrete or bituminous asphalt; and shall be constructed after new pavement has been placed and accepted by the District Inspector and/or Local Governing Body. Concrete collars shall contain synthetic fiber reinforcement as per “Cast in Place Concrete” Section 2.03 CONCRETE.
  8. Manholes which are located in unimproved areas (not in a finished, paved road) shall have the rim raised above surrounding grade to minimize surface water infiltration.
  9. Manholes placed in roadway shoulders, within 10 feet of the edge of pavement shall be set horizontal and extend two to four inches above finished grade, allowing for access, maintenance and drainage, and to minimize adverse effects of snow plows.
  10. Debris in Manholes. Manholes are to be kept clean during construction. Plywood or prefabricated false bottoms are to be used through all construction phases, until the manhole has been raised to grade and grouted.
  11. Cure time. Precast concrete products shall not be installed until seven days has passed since the product has been manufactured. The date stamped on the concrete product will be used as the starting date in determining this time period. Any concrete product installed without this seven-day period will not be accepted by the District Engineer and will be required to be removed and replaced.
  12. Signs. Manholes which are not located in a dedicated Right-of-Way shall have a sign posted near the manhole so that it may be easily located. The sign will be provided by KID. The developer is responsible for providing a metal post, and placing it near the manhole, so that the sign will be approximately 4 feet above grade.
  13. Drop Manholes. Drop manholes are not allowed unless approved by the District Engineer.
- M. Connections to Main
1. Connections to main (laterals). All pipe and fittings shall be PVC plastic meeting requirements stated in Section 2.2.1.1. Fittings shall be shop-fabricated. Joints shall be rubber gasket. Welded joints may not be used. A flexible connection shall be provided for manhole connections. Connections shall be a minimum of 30 degrees above the horizontal centerline. Provide cleanouts as required by the Plumbing Code. Laterals shall be extended to 15 feet past the property line, and identified with a 2x4 location board.
  2. Coordinate with other sections of work to provide correct size, shape, and location.
- N. Proximity to Water lines
1. Separation between sewer and water lines shall conform in every way to the State of Utah Division of Drinking Water requirements. Sewer lines shall be located at least 10 feet horizontally from culinary water lines. Where such separation is not possible, the water line shall be located above the sewer line on an excavated shelf or in a separate trench, maintaining at least 18” vertical separation.
  2. Where sewer and water mains must cross and the vertical separation required above is not possible, water mains shall be constructed of mechanical-joint ductile iron pipe, or equivalent, for a distance of 10 feet on either side of the point of crossing.
- O. Flushing and testing
1. Sewer lines shall be kept clean and free from debris during construction. Flushing and testing shall be in accordance with Section 4.03.



P. Grease Traps

1. Grease traps (grease Interceptors) shall be a minimum of 1000 gallon capacity, shall be precast concrete, and shall be consistent with the standard drawings. Grease traps shall be provided for all commercial or industrial properties where the discharge of fats, oils, or grease may occur in excessive quantities as determined by the District Engineer. An approved sampling station shall be located immediately downstream of the grease trap.

Q. Sewer Flow Meter

1. Install all equipment furnished under this Section in accordance with appropriate ASTM standards, construction drawings and in accordance with manufacturer's recommendations.
2. All equipment specified in this Section shall be electrically complete, in that the Contractor is required to furnish and install exterior power, signal wiring, conduits, fittings, etc. necessary for complete operation. Labeled terminal strips shall be provided.
3. Sewer Flow Monitoring Station
  - a. Construct sewer flow monitoring station at manhole shown, as acceptable to the District Inspector. Antenna shall be mounted 12" above finished grade on a 2" minimum diameter mast with weather head unless shown otherwise. Equipment enclosure shall be rail mounted 4' above finished grade unless shown otherwise. Solar Panel (where applicable) shall be mounted 9' above finished grade unless shown otherwise. Rails shall be adequately supported with concrete bases to provide a sturdy installation.
  - b. Install equipment as per manufacturer's recommendations and as acceptable to the District Inspector. Provide 1 day of startup by manufacturers' representative to calibrate and startup equipment.
4. Quality Control
  - a. Final field test for each flow metering system shall demonstrate the following:
    - i. That the flow metering system has been properly installed, properly calibrated, and is functioning as specified.
    - ii. That the flow metering system indicates the correct flow for two different depths of flow for the flume.
    - iii. That the correct flow generated output signal is provided from each flow transmitter to the data logger.
    - iv. That the flow data can be stored in memory and viewed on a data logger display.
  - b. That the flow data can be transferred to a PC computer and stored in a data file.

R. Sewer Lift Stations

1. Where native material that is encountered at the foundation depth of the lift station is considered unsuitable, remove unsuitable material; and place and compact bedding material to limits directed by the District Inspector.
2. Construct lift station as per the approved Design Drawings.
3. Unless otherwise approved by the District Engineer, lift stations will require three phase power.
4. Install precast concrete base level on a compacted foundation, according to manufacturer's recommendations.
5. Install top fiberglass base according to manufacturer's recommendations.
6. Place riser sections plumb and level, from the concrete base to the top section, as indicated and according to manufacturer's instructions; anchor to base and seal joints. No steps will be allowed in lift stations.
7. Place flat slab, on top riser section, with opening positioned to allow easy removal and replacement of each pump.
8. Connect gravity pipes to station with appropriate type flexible coupling as recommended by manufacturer. Provide pipe joint or flexible coupling on all pipes approximately 18



- inches from outside of manhole. Grout around pipe after installation is complete. Make connections watertight.
9. Set hatch level to correct elevations. A hole shall be installed in hatch for testing of wet well atmosphere. Hole must be provided in hatch for atmospheric testing as per the District Inspector's instructions.
  10. Install all components as per manufacturer's recommendations.
  11. Construct concrete valve vault as indicated on the design drawings.
  12. Construct corrosive resistant ventilation components as indicated on the design drawings.
  13. The entire site shall be paved with 3 inches of asphalt over 8 inches of compacted road base.
  14. A 6 foot tall vinyl fence shall be installed around the perimeter of the site, with a 12 foot double swing locking gate.
  15. An emergency yard light shall be installed at the site.
  16. The site shall include a permanent receiving bracket for a portable crane to be used in removing and replacing the pumps.
  17. All electrical systems and components (i.e. Motors, lights, cables, conduits, switchboxes, and control circuits) shall be installed as per manufacturer's recommendations.
  18. Electrical systems and components (motors, lights, cables, conduits, switchboxes, control circuits) in wet wells or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National Electrical Code requirements for Class 1, Group D, Division 1 locations. In addition, equipment located in the wet well shall be suitable for use under corrosive conditions. Each flexible cable shall be provided with a watertight seal and separate strain relief. A fused disconnect switch located above ground shall be provided. When such equipment is exposed to weather, it is to meet the requirements for NEMA 3R.
  19. An alarm system shall be installed per manufacturer's recommendations.
  20. Standby generator shall be installed per manufacturer's recommendations. Provisions shall be made for automatic generator start-up and load transfer upon power failure.
  21. Control panels and electrical equipment shall be located in a control building constructed in accordance with the following requirements:
    - a. The building floor plan and layout shall provide adequate space for the control panels and other electrical equipment and access for maintenance and repairs. The minimum inside dimensions of the control building shall be 8 feet by 12 feet. Minimum inside height shall be 8 feet.
    - b. The building shall be architecturally comparable with the existing buildings in the area or the future buildings planned for the area.
    - c. At a minimum, the buildings shall be constructed of Atlas brick on concrete footings with a concrete floor. The roof shall be pitched, with a minimum slope of 4:12, with a 26 gauge standing seam steel roof, over ¾ inch plywood sheathing and building paper. Roof fascia and soffits shall be aluminum. Gables shall be Atlas brick. The interior of the roof shall be insulated with R-38 fiberglass batt insulation. The ceiling shall be 5/8 inch painted sheetrock.
    - d. The building shall have at least one 3 foot by 7 foot hollow metal man-door with metal frame, threshold, lock set and 12 inch square ventilation louver with insect screen.
    - e. The building shall have at least two fluorescent lighting fixtures with 4-40 watt lamps each, or LED equivalency, and two electrical outlets.
    - f. The building shall have a thermostat-operated ventilation fan with roof exhaust capable of providing 10 air changes per hour.
    - g. Building construction shall otherwise conform to the building code and other requirements of the local jurisdiction.



22. Field Quality Control
  - a. Lift Stations wet wells shall be tested by an independent testing company, using vacuum test method to demonstrate integrity of installed materials and construction procedures. Method and material for repair shall be as acceptable to the District Inspector.
  - b. Each station shall be tested immediately after assembly and backfilling.
  - c. Plug any lift holes with an acceptable non-shrink grout.
  - d. Plug all pipes entering station; securely brace plugs during test.
  - e. Test head shall be placed at inside top of cast iron frame, or as accepted by the District Inspector; and the seal shall be inflated in accordance with manufacturer's recommendations.
23. Testing shall conform to ASTM C 1244, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.
24. If station fails initial test, make all necessary repairs on the outside of box with non-shrink grout or other acceptable material. Box shall be re-tested until satisfactory test is obtained.
25. A factory trained representative shall be present for startup and as necessary to provide training.



## SECTION 4 INSPECTIONS AND TESTING

### 4.01 District Inspections

- A. The District Inspector shall act as a District representative during the construction period.
- B. The District Inspector shall decide questions that may arise as to quality and acceptability of materials furnished and Work performed.
- C. The District Inspector shall interpret the intent of these Design Standards and Construction Specifications in a fair and unbiased manner.
- D. The District Inspector will make visits to the site and determine if the Work is proceeding in accordance with the Design Standards and Construction Specifications. The Inspector shall at all times have access to the Work. The Contractor shall provide proper facilities for such access and observation of the Work and also for any inspection or testing thereof.
- E. If any Work is covered contrary to the instructions in these Specifications, it must, if requested by the District Inspector, be uncovered for his observation and if rejected be replaced at the Contractor's expense.
- F. If the District Engineer considers it necessary or advisable that covered Work be inspected or tested, the Contractor, at the District Engineer's request, shall uncover, expose or otherwise make available for observation, inspection and/or testing as the District Engineer may require, that portion of the Work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such Work is defective, the Contractor shall bear all of the expenses of such uncovering, exposure, observation, inspection, and testing and satisfactory reconstruction.
- G. No Work shall proceed unless the Contractor has informed the District Inspector of such Work. While continuous inspection by the District Inspector is not required, daily inspection may be expected. If daily inspection does not occur, the Contractor should so notify the District Engineer.
- H. The Contractor will be held strictly to the requirements of the Design Standards and Construction Specifications in regard to the quality of materials, workmanship and execution of the Work.
- I. Inspections may be made at the factory or fabrication plant or the source of material supply.
- J. The District Inspector will not be responsible for construction means, controls, techniques, sequences, procedures, or safety.
- K. The District Inspector shall promptly make decisions relative to the interpretation of the Design Standards and Construction Specifications.
- L. The decisions, actions, or inactions of the District Inspector shall not relieve the Contractor of any of the Contractor's responsibilities.
- M. The District Inspector shall have the right to reject any Work which does not conform to these Design Standards and Construction Specifications. Such Work shall promptly be removed, replaced and retested at no cost to the District.
- N. The District Inspector shall have the right to determine when and where all testing shall be performed.

### 4.02 Testing Agencies

- A. All required tests of compaction, concrete, or other materials or processes shall be performed by agencies qualified to perform such work. Evidence of such qualification may be required by the District Inspector. The results of these tests shall be provided to the District Inspector at no expense to KID.





## 4.03 Water System Inspections

### A. Water Quality Tests

1. **Disinfection.** The Contractor shall be responsible for maintaining the disinfected condition of existing water lines when connecting to, cutting into, repairing or tapping existing water lines. Disinfection procedures for these operations shall be in accordance with the AWWA Standard C651-99. Mains shall be flushed unless approved by the District Engineer. Taps required by the Contractor for chlorination or flushing purposes shall be provided by him as part of the construction of water mains.
2. **Disposal of Treated Water.** The Contractor shall be responsible for disposal of heavily chlorinated treated water flushed from mains and shall neutralize the waste water for protection of the environment before disposal into any natural drainage channel, sanitary sewer, storm drain, curb and gutter or onto the ground. The Contractor shall be responsible to confirm the acceptable point of discharge with the District Engineer prior to chlorination of the waterline.
3. **Bacteriological Samples.** Twenty four (24) hours after the line is flushed the Inspector will take samples from the installed pipe line. The locations of the samples shall be at intervals along the pipeline as selected by the Inspector. The sampling bottles and methods used will be in accordance with the Utah State Board of Health “Public Drinking Water Regulations”, or other similar applicable regulating agencies.
4. **Records and Documentation.** All disinfection operations shall be observed by, and will be recorded by the District Inspector. The Contractor shall provide to the District Inspector information regarding the length of pipe disinfected, size of pipe, type of pipe, location of pipe, date, time and duration of disinfecting operations, complete list of equipment used and personnel performing the disinfection, and any comments about the disinfection operations.
5. **Repetition of Flushing and Testing.** Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained.
6. **Inapplicable to Secondary Systems.**

### B. Pressure tests

1. All pipe and fittings or other items to hold or convey liquids shall be tested for leakage in the presence of the District Inspector. Testing for leakage shall be done after the pipe has been cleaned and tested for alignment when applicable, before disinfection when applicable, and before painting or embedding in concrete when applicable. Prior to testing for leakage, underground pipelines shall be backfilled to a level acceptable to the District Inspector, and the backfill in place shall have been compacted or consolidated to Project density requirements.
2. All valves, joints, seams, couplings, fittings, flanges, welds, etc., in pipelines shall be watertight.
3. Leakage is defined as the release of any water, air or smoke passing through the pipes, including joints, fittings, outlets, etc. Measurement shall be made by direct measurement of the amount of water, air or pressure lost or by the amount required to be added to maintain the original level of pressure. Drops of water or evidence of smoke or bubbles will be considered as evidence of leakage.
4. Valves, hydrants, gates, fittings, and special fittings shall be tested for water tightness. Each valve and hydrant shall be closed so that reaches of pipe between valves can be tested. Reaches being tested shall have approved taps placed in high points, to release trapped air and to be used as access points for filling and testing. Lines shall be filled with water of similar quality to the water the line will carry. Pressure shall be raised to not less



than 200 psig (except 150 psig maximum against butterfly valves) and continuously maintained for two (2) hours. During this test period, no loss of pressure shall occur. If make-up water is required to maintain pressure, the cause for the leak shall be identified and corrected and the line shall be retested until there is no leakage or loss of pressure.

5. Records and Documentation. The pressure tests shall be recorded by the Contractor with the District Inspector present. Records shall contain the length of pipe tested, size of pipe, type of pipe, rated working pressure of pipe, time and duration of test(s), pressure(s) used, complete list of test equipment used, list of personnel performing the test(s), and any comments about the test. Test records shall be submitted to the Inspector before the water line will be accepted. A “Contractor’s Materials and Test Certificate for Underground Piping” shall be completed and submitted to the District Inspector.

### **C. Compaction tests**

1. Compaction tests shall be performed by qualified, independent soils testing firms in accordance with standards established by the prevailing authority for roads. Where compaction of soil under or around pipes is required due to over-excavation, testing shall be to not less than 95% in accordance with AASHTO T-180.



## **4.04 Sewer Systems Inspections**

### **A. Pressure tests**

1. The Contractor shall retain an approved testing agency to perform the following leakage tests on all pipe installed, including laterals and/or service stubs. The methods and equipment used to make the test shall be mutually determined by the District Inspector and the Contractor before any testing is started. The Contractor shall, at his own expense, locate and correct any excess leakage and repair any damage to the pipe or its appurtenances indicated by, or resulting from, the test. For the purpose of testing, a section of the sewer shall be considered as the length of sewer between successive manholes. Any section that fails a test shall be repaired and retested at the Contractor's expense. Any excavation or surface restoration required in fixing leaks shall be in conformance applicable standards.
2. An infiltration test will be required when the pipeline is below the groundwater level. The amount of water leaking into the pipe shall be measured and it shall not be more than 10 gallons per inch diameter per mile of pipe.
3. In areas where the groundwater is below the pipe, a low pressure air test shall be performed. The section of pipe between successive manholes shall be sealed with suitable plugs. One of the plugs shall have an orifice through which to pass air into the section of pipe being tested. The air supply line shall have a positive on-off valve and suitable means for readily disconnecting it at the control panel. A second orifice in the plug shall be used for constantly reading the internal pressure of the pipe. This orifice shall be continuously connected to a pressure gauge having a range of from 0 to 10 psi. The gauge shall have minimum divisions of 0.10 psi and shall have an accuracy of +/- 0.04 psi.
4. The line under test shall be pressurized to approximately 4 psi. The air supply shall then be shut off and the pressure allowed to stabilize for a minimum of 2 minutes. If during this period the pressure drops below 3.5 psi, more air shall be introduced to raise the pressure to a minimum of 3.5 psi. After this stabilization period, the air supply line shall be disconnected and timing shall begin. The time of the test, in minutes, shall be equal to the pipe diameter, in inches. The maximum allowable pressure drop during the specified time period shall be 1.0 psi. A copy of the successful air test report shall be provided to KID.

### **B. Compaction tests**

1. Compaction tests shall be performed by qualified, independent soils testing firms in accordance with standards established by the prevailing authority for roads. Where compaction of soil under or around pipes is required due to over excavation, testing shall be to not less than 95% in accordance with AASHTO T-180.

### **C. Mandrel testing**

1. Sewer pipe shall at the request of the District Inspector be deflection tested by pulling a solid, pointed mandrel through the completed pipeline. The diameter of the completed mandrel shall be 95% of the pipe diameter. Testing shall be conducted on a manhole to manhole basis and shall be done after the line has been completely flushed with water. The Contractor shall be required, at his expense, to locate and repair any and all sections of pipeline which fail this test, and retest each such section.

### **D. Video Inspection.**

1. As a prerequisite for final acceptance of all new sewer trunk lines (all sewer lines except service connections), the Contractor shall perform an internal television inspection and furnish to KID digital recordings which pictorially demonstrate that satisfactory watertight conditions exist at all joints in the lines, and that the pipe is free from deleterious cracks, leaks, deflections or other damaged conditions.
2. Television inspection shall be performed only after the sewer lines have been flushed and checked and accepted for grade and alignment, and have been satisfactorily tested for

infiltration and exfiltration. Standing or low-flow running water shall be present to facilitate the detection of bellies.

3. Television inspection equipment and methods to be used by the Contractor in performing the internal television inspection and video recording shall be suitable to provide the video tape recordings specified next hereinafter and shall be acceptable to KID.
4. Digital Video Recordings: Digital Video Recordings of sewer line inspections shall be provided on DVD format or Flash Drive Technology. The audio portion of the composite signal shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of the oral report. Audio reports shall be recorded by the operating technician on the video tapes as they are being produced and shall include the location of the sewer, the names or numbers or the manholes involved, a manhole-to-manhole direction of travel, and a description of the conditions in the sewer line as they are encountered. The purpose of the video tape recording shall be to supply a permanent visual and audio record of the sewer pipe section, and the video tapes shall become the property of KID upon completion of the Project.
5. A schematic drawing of the sewer system, showing all manholes and connecting lines, shall be provided. The schematic shall indicate the direction of the camera, and shall include a sequential numbering system beginning with the first manhole in the survey to the last. A north arrow shall also be provided. Any other documentation that is necessary to understand the video survey should be included on or with the schematic.

#### **E. Lateral Inspections**

1. The lateral connecting the structure's DWV system to the stub installed by the Developer (see Drawing SS4) shall be inspected by the INSPECTOR for conformance to the Plumbing Code and these Design Standards and Specifications.



#### 4.05 Inspection Checklist

Requests for inspection shall be made to KID offices at least one working day in advance.

The following is a list of items that will be inspected or must be completed prior to requesting a Bond / Letter of Credit Guarantee reduction. The list is not intended to cover every item or issue, but is to be used as a guideline together with good workmanship.

|                       |  |
|-----------------------|--|
| <b>Waterline</b>      |  |
| 1.                    | Proper Depth and Size & Material                             |
| 2.                    | Properly bedded and backfilled                               |
| 3.                    | Disinfected  |
| 4.                    | Flushed  |
| 5.                    | Chlorinated  |
| 6.                    | BT Sample taken  |
| 7.                    | Thrust blocks as required                                    |
| 8.                    | Pressure Test  |
| <b>Fire Hydrants</b>  |  |
| 1.                    | Plumb & proper elevation                                     |
| 2.                    | Proper orientation   |
| 3.                    | Concrete pad   |
| 4.                    | Bolt accessible  |
| 5.                    | Thrust block   |
| 6.                    | Auxiliary valve in street                                    |
| 7.                    | Gasket seating   |
| 8.                    | Flushed  |
| <b>Meter Boxes</b>    |  |
| 1.                    | Located in park strip (not driveway)                         |
| 2.                    | Level with curb  |
| 3.                    | Meter set at 18" – 20" below lid                             |
| 4.                    | Box supported by 12x6x1 pavers                               |
| <b>Water Valves</b>   |  |
| 1.                    | Set level with lids  |
| 2.                    | Clean  |
| 3.                    | Workable   |
| 4.                    | Concrete collar at grade                                     |
| <b>Sewer Manholes</b> |  |
| 1.                    | Set to grade   |
| 2.                    | Manhole grouted and clean                                    |
| 3.                    | Lifting holes grouted  |
| 4.                    | Steps in manhole   |
| 5.                    | Debris and boards removed                                    |
| 6.                    | Grade rings grouted  |
| 7.                    | Concrete collars around manholes                             |
| <b>Sewer Lines</b>    |  |
| 1.                    | Proper elevation and alignment                               |
| 2.                    | Properly bedded and backfilled                               |
| 3.                    | No bellies   |
| 4.                    | Laterals connected in 10:00 O'clock or 2:00 O'clock position |
| 5.                    | Sewer line video data provided                               |

|    |                                      |
|----|--------------------------------------|
| 6. | Air tested                           |
| 7. | Flushed and rocks and debris removed |
| 8. | Sewer line mandrel test results      |



## SECTION 5 DESIGN STANDARDS

**General** - DRAWINGS shall be prepared on D sized drawings, shall be drawn to scale, and shall provide sufficient detail to allow construction of the required improvements with no information other than that provided in the Specifications and Drawings. Plan and profile drawings shall be provided, showing existing and final grades at a scale no greater than 1"= 40' horizontal scale, and 1" = 4' vertical scale. A material take-off, listing the quantities of proposed pipe, manholes, valves, hydrants, etc., shall be provided for bond amount calculation purposes.

### 5.01 Water System Design Standards

All Water System Installation and design must conform to the Kearns Improvement District Design Standards and Specifications.

#### A. Culinary Pipe Main Standards

1. The pipe diameter used shall be approved by the District Engineer (or his representative) and must adhere to the KID Culinary Water Master Plan.
  - a. Minimum allowable main shall be eight inches (8") in diameter.
  - b. If the Master Plan is not clear in the area about pipe size and location, then the District Engineer shall give final approval.
2. Allowable culinary water pipe material for all projects within the Kearns Improvement District service area shall conform to Section 2.01.
3. Standard centerline alignment within the public right-of-way shall be 10 feet (10') north or 10 feet (10') east of the centerline.
4. Horizontal clearance between a water main and any parallel aligned utility shall be at least 10 feet (10'). When another utility crosses a water line then:
  - a. The other utility shall cross perpendicularly.
  - b. Only dry utilities shall cross above the water main. If this is determined to be unfeasible by the District Engineer then:
    - i. A minimum 20 foot (20') long sleeve is required for the sewer line.
  - c. A minimum of 18 inch (18") vertical separation is required between the two mains.
    - i. If a vertical separation of 18 inches (18") is determined unfeasible by the District Engineer then:
      - a) A reinforced concrete cradle is required (reinforcement shall meet current specifications).
      - b) No joints of either utility will be allowed within a 10 foot (10') radius of the crossing.
  - d. If the water line crosses under the sewer line, then a minimum 20 foot (20') long sleeve is required for the sewer line.
5. Minimum cover required shall be 48 inches (48").
  - a. Cover over utilities and between roadways or rail road tracks shall be sufficient to protect from potential loading either during construction or final finished surface.
    - i. Should cover be insufficient to adequately protect the utility from any loading, encasement or casings shall be provided to protect the affected utility.
6. Pressure Test of the water line is required to hold 225 pounds per square inch (225 psi) test pressure for two (2) hours unless otherwise required.
  - a. If pipe fails the pressure test, locate and repair any defective materials in the line and retest.
  - b. Pressure testing against any valve is prohibited.
7. Tracer wire shall be installed directly above the top of all culinary water pipe.
  - a. Tracer wire shall be 12 gauge insulated copper wire.



- b. Tracer wire shall be located a maximum of six inches (6") from the top of the main.
- B. Disinfection
  - 1. All new waterlines are to be disinfected and a passing bacteria test obtained prior to connecting to any KID water infrastructure.
    - a. Chlorination of the completed water lines shall be completed by the Contractor at no additional cost to KID.
  - 2. Bacteria samples will be collected by KID Personnel at the request of the KID Inspector.
- C. Culinary Water Trench Standards
  - 1. Compaction tests are required every 200 linear feet (220') at half and full depth for any water main installation. Contractor is responsible to provide test results to KID.
  - 2. Compaction shall be to 95% or greater relative to a standard proctor density.
  - 3. If groundwater is encountered, trenches must be kept free from water during excavation, pipe installation, and the installation of material in the pipe zone.
  - 4. Excavation of any trench must be to OSHA Safety Standards.
- D. Valves
  - 1. Valves shall be located in all intersections and shall equal the number of legs.
  - 2. All valves larger than 12 inches (12") shall be butterfly design.
- E. Joints
  - 1. Joints shall be restrained at all valves, tees, crosses, bends, wyes, and mega lug fittings.
  - 2. The number of joints that need to be restrained back from thrust producing fittings shall be determined by the project design engineer. The lengths must also be approved by the District Engineer.
- F. Fire Hydrants
  - 1. Fire Hydrant spacing:
    - a. Shall not exceed 300 feet (300') in areas of multi-family dwellings, commercial and manufacturing uses.
    - b. In single family dwelling use areas hydrant spacing shall not exceed 500 feet.
  - 2. Major roads shall have fire hydrants placed on both sides of the roadway every 300 feet or 500 feet to provide for Fire Department access to such hydrants.
  - 3. Hydrants shall be connected to the main using a minimum six inch (6") diameter pipe.
  - 4. All newly constructed fire hydrants shall be flow tested and then painted according to the NFPA color-coding.
    - a. The flow test must be witnessed by the KID Inspector.
    - b. The fire hydrant bonnet shall be painted by the Developer or Contractor and approved by KID.
    - c. All fire hydrants shall be classified based upon the actual flow-rate and shall be painted based upon the following color coding per NFPA:
      - i. Green - 1000 gallons per minute or more
      - ii. Orange - 500 to 999 gallons per minute
      - iii. Red - 0 to 499 gallons per minute
  - 5. Permanent dead-end lines shall require a fire hydrant to be installed.
- G. Concrete Thrust Blocks
  - 1. Provide concrete thrust blocks at all taps, temporary dead ends and at the base of all hydrants.
    - a. Place thrust blocks directly against undisturbed earth.
    - b. Provide bond breakers on all thrust blocks.
  - 2. All other locations shall rely on restrained joints to handle thrust unless directed otherwise by the District Engineer.
- H. Water Vaults/Meter Boxes
  - 1. No meter box shall be allowed in any street, driveway, driveway flare, or sidewalk.





I. Service Laterals

1. Connection fees for a water tap and meter will be assessed at the time a permit is issued.
2. No common use laterals shall be allowed.
  - a. Common use laterals shall be eliminated as redevelopment of the site occurs, or if repair or replacement is needed. The construction or repair costs will be the responsibility of the Owner.
3. Allowable service line shall be constructed as per Section 2.01.01
4. Minimum size shall be one inch (1") diameter for residential connections.
5. Location of water service shall generally be located 10 feet to 15 feet (10' to 15') from either side property line of the lot being served.
6. Location of the service line shall be stamped onto the face of the adjacent curb with a "W".
  - a. Location of extended service lateral toward building shall be located via a 2"x 4" with a blue colored end visibly extended above adjacent surface.
7. Minimum static pressure allowed to each individual service shall not drop below 50 psi (50 pounds per square inch) as measured at the water main without approval of the District Engineer.
8. Three (3) piece unions shall not be allowed unless approved by the District Engineer.

J. Construction Drawings

1. The Construction Drawings shall include the following information:
  - a. Street names and widths.
  - b. Subdivision lot numbers
  - c. Street centerline stations and property line stations; plan stations must agree with profile stations.
  - d. Drawing scale.
  - e. North arrow.
  - f. County or District benchmark elevations.
  - g. Roadway centerline finish grades or, if in an easement, the finished grade above the utility line.
  - h. Top of curb finish grades at property lines and at hydrant locations.
  - i. Finish grades at valve locations.
  - j. Finish grades at air/vacuum assembly locations.
  - k. Water line pipe size, type, and class.
  - l. The following notes:
    - i. "Contractor shall field verify locations and invert elevations of existing utilities before staking or constructing any new KID utility lines".
    - ii. "All construction shall comply with the Kearns Improvement District Design Standards and Specifications."
  - m. Commercial plans shall have the following note: "Four feet of cover is required over all sewer and water lines."
  - n. Commercial subdivision plats, to be signed prior to utility plans being approved, shall have the following note written on them: "The signature of the Kearns Improvement District on this plat does not constitute any guarantee of availability of water and sewer service to the property or approval of any utility line or facilities. The owner(s) of the property must provide satisfactory plans to the Kearns Improvement District for review and approval before connecting to the District's utility system and will be required to comply with the District's rules and regulations."
2. Any potential conflicts between new utility lines and all other existing utilities, including but not limited to culinary water lines, secondary water lines, and/or storm drains shall be noted on the drawings.
3. Dimensions to water lines from monument lines or property lines shall be shown.



4. “Match to Drawing” notes shall refer reader to adjacent drawings.
5. Connecting utility lines shall be labeled as existing or proposed.
6. Drawing shall be designed, signed and stamped by a professional licensed engineer.
7. Construction Drawings shall include a signed dedication plat.
8. Construction Drawings shall include a final grading plan.
9. Construction Drawings shall contain plan and profile views of all sewer main line. Profile views shall show existing and final surface profiles.



## 5.02 Sewer System Design Standards

- A. Design shall conform to these Design Standards and Specifications.
- B. The design of the sewer system shall comply with all applicable Pretreatment Rules and Regulations.
- C. All sewer lines shall be designed to protect them from freezing.
- D. Unless otherwise approved by the District Engineer, sewer line capacity shall be designed for a peak flow of 400 gallons per capita per day. Sewer line capacity for commercial developments shall be designed based upon a study of actual and projected contributions from existing developed areas and comparable data.
- E. Wherever possible, sewer lines shall be located in public streets. In the locations where sewer lines must leave the public right-of-way, a twenty-foot wide sanitary sewer easement will be required unless the District Engineer specifies a different width.
  1. Easements shall be centered on the sewer line, unless otherwise approved by the District Engineer.
  2. Sewer easements shall extend ten feet beyond dead end manholes.
  3. Easements shall be shown on the development plat and be granted to the District on the District's Standard Easement form(s).
  4. Easements must be executed by or on behalf of all owners and lien holders having an interest in the property, and be returned in recordable form to the District Office prior to final approval being granted.
- F. Manholes and pipes shall be located within a five (5) foot offset from the street centerline, wherever possible. If circumstances warrant and as specifically approved by the District Engineer, manholes and pipes shall be located within the pavement with a minimum distance of five (5) feet required between the edge of the pavement, concrete curb or gutter, and the edge of the manhole collar and pipes.
- G. All sewer lines shall be located a 10-foot minimum horizontal distance from culinary waterlines.
- H. Where possible, sewer shall be located a 10-foot minimum horizontal distance from all other public utilities, including but not limited to storm drains, and secondary waterlines.
- I. Sewer grades shall be based upon Salt Lake County Surveyor or District benchmark elevations.
- J. Gravity Sewer Main
  1. Sewer Main Lines shall be at least 8 inches in diameter.
  2. Unless otherwise approved by the District Engineer, the minimum sewer slopes shall be as follows:

| Pipe Dia (IN) | Min                | KID Min Slope Requirement | Max                | KID Max Slope Requirement |
|---------------|--------------------|---------------------------|--------------------|---------------------------|
|               | Velocity (V) (FPS) |                           | Velocity (V) (FPS) |                           |
| 4             | 2.00               | 2.00%                     | 10.00              | 30.36%                    |
| 6             | 2.00               | 1.00%                     | 10.00              | 17.69%                    |
| 8             | 2.00               | 0.50%                     | 10.00              | 12.05%                    |
| 10            | 2.00               | 0.36%                     | 10.00              | 8.95%                     |
| 12            | 2.00               | 0.28%                     | 10.00              | 7.02%                     |
| 15            | 2.00               | 0.21%                     | 10.00              | 5.22%                     |
| 18            | 2.00               | 0.16%                     | 10.00              | 4.09%                     |
| 21            | 2.00               | 0.13%                     | 10.00              | 3.33%                     |
| 24            | 2.00               | 0.11%                     | 10.00              | 2.79%                     |
| 27            | 2.00               | 0.10%                     | 10.00              | 2.39%                     |
| 30            | 2.00               | 0.10%                     | 10.00              | 2.07%                     |



3. Unless otherwise approved and/or required by the District Engineer, sewer lines eight (8) through fifteen (15) inches in diameter shall be designed to flow no more than half full during peak flow. Sewer lines larger than fifteen (15) inches in diameter shall be designed to flow three-fourths full.
4. The minimum sewer depth shall be at least 11.0 feet unless otherwise approved by the District Engineer.
  - a. In areas of shallow sewer, the following note shall be written on the development plat: "Shallow Sewer Depths! Contractor shall verify sewer lateral depth and set foundation elevation to provide adequate fall into sewer lateral. Buildings with a basement may not have sewer service available for basement."
5. A minimum of four (4) feet of cover shall be placed over all main sewer lines, unless additional cover is required by the District Engineer.
6. The invert of new sewer lines shall tie into existing sewer lines at the 0.75 depth point of the existing sewer main; except where otherwise approved by the District Engineer.
7. Sewer Main Lines shall be extended to property lines as per District Engineer's directive to service future development.
8. Ten-foot sewer stubs shall be extended beyond terminal manholes to facilitate future development.
9. No connections may be made to a sewer stub.
10. Curved sewer, where approved by the District Engineer, shall be designed as follows:
  - a. Sewer shall be constructed of HDPE sewer pipe.
  - b. Minimum radius shall be 150 feet, unless otherwise approved by the District Engineer.
  - c. Installed pipe must be surveyed by a qualified licensed surveyor every 10' to demonstrate that a 3% slope is maintained.
  - d. Surveyed coordinates and elevations shall be submitted to the District, in a format and coordinate system acceptable to the District.
11. In locations with steep pipe slopes (i.e. greater than 15%), pipe shall be constructed of HDPE and concrete anchor restraints shall be installed on the pipe at a spacing and in a manner as indicated on the Standard Detail Drawing SS 10.

#### K. Sewer Laterals

##### 1. General

- a. Wherever possible, buildings shall be discharged to the Sewer Main Line with a gravity flow Sewer Lateral.
- b. Sewer Laterals shall conform to the requirements of the Salt Lake County Department of Health Regulations and the Uniform Plumbing Code.
- c. Each unit of separate ownership shall be required to have a separate sanitary Sewer Lateral, unless otherwise approved by the District Board of Trustees.
- d. Sewer Laterals shall have at least four (4) feet of cover, unless otherwise approved by the District Engineer.
- e. Sewer Laterals may tie directly into manholes.

##### 2. Gravity Sewer Laterals

- a. The size of Sewer Laterals shall be determined on the basis of the total fixture units drained by such sewer, in accordance with the Uniform Plumbing Code. The minimum size for gravity Sewer Laterals shall be four (4) inches in diameter.
- b. Sewer Laterals shall be run at a uniform slope of not less than 2% grade. Where it is impractical to run the sewer at a 2% grade due to the depth of the Sewer Main Line.
- c. Cleanouts shall be installed at not more than 100 foot spacing.



- d. No more than two (2) bends in excess of 45 degrees will be installed without a cleanout.
  - e. Lateral pipe size shall not be reduced in diameter in the direction of flow.
3. Pressure Sewer Laterals
- a. Professional advice should be obtained prior to installing pumping equipment or pressure Sewer Laterals.
  - b. In locations where buildings cannot be discharged to the Sewer Main by a gravity flow Sewer Lateral, flows shall be discharged into a tightly covered and vented sump from which the flows shall be pumped by automatic pumping equipment and discharged into a gravity flow Sewer Lateral, connecting at a cleanout, or the Sewer Main, connecting in a manhole with an approved restrained coupling(s).
  - c. Pumping equipment and pressure Sewer Laterals shall be designed to meet or exceed the anticipated use requirements.
  - d. The total maximum system head shall not exceed the pump manufacturer's recommended allowable head for the pump system being proposed.
  - e. Unless otherwise approved by the District Engineer, pressure Sewer Laterals shall be constructed of HDPE.
  - f. Pressure Sewer Laterals shall be sized to provide a minimum velocity of 2.0 feet per second at the design pumping rate.
  - g. Pressure Sewer Laterals shall be designed and constructed on a constant reverse grade.

L. Sewer Casings

- 1. Sewer casings shall be required at locations where sewer lines cross rivers, streams, canals, aqueducts, railroads, box culverts and/or other locations as required by the District Engineer or other governing authority.
- 2. Sewer casings shall be sized at least twice the inner diameter of the sewer pipe, unless otherwise approved by the District Engineer.
- 3. Sewer pipe shall be supported in casing by casing insulators and sealed with manufactured end seals.
- 4. Casing wall thickness shall be as shown on the standard steel casing detail.

M. Sewer Manholes

- 1. The minimum manhole size shall be 4 foot diameter.
- 2. Manholes shall be installed at both ends of each main line segment; at all changes in grade or direction (unless a curved gravity flow main line), at changes in pipe type, and at intervals not to exceed 450' for lines 15" in diameter or smaller, or 500' for lines 18" in diameter and larger, unless otherwise approved by the District Engineer.
- 3. Manholes must be constructed at the ends of sewer lines.
- 4. Drop manholes are **not** allowed without prior approval of the District Engineer.
- 5. Where connections are made to existing sewer lines, a minimum five (5) foot diameter manhole shall be constructed over the existing sewer line.

| Pipe Diameter | Situation                                       | Manhole Diameter |
|---------------|---|------------------|
| 8" - 12"      | 5' to 12' deep – Thru Flow                      | 48"              |
| 8" - 12"      | Intersection of 3 or more pipes                 | 60"              |
| 8" - 12"      | Where deflection of thru pipe is 45° or greater | 60"              |
| 8" - 12"      | 12' to 18' deep                                 | 60"              |
| 8" - 12"      | Connecting into an existing pipe                | 60"              |
| 8" - 12"      | 12" or greater fall through manhole             | 60"              |
| 15" - 18"     | 5' to 18' deep – Thru Flow                      | 60"              |
| 8" - 30"      | 18' deep or greater                             | 72"              |
| 15"-18"       | Where deflection of thru pipe is 45° or greater | 72"              |



|           |                                 |     |
|-----------|---------------------------------|-----|
| 21" – 36" | 7' deep or greater              | 72" |
| 15" – 36" | Intersection of 3 or more pipes | 72" |

6. A minimum of five feet shall be maintained between the edge of all manhole collars and the edge of the street pavement.
7. Unless otherwise approved by the District Engineer, the minimum drops through manholes shall be as follows:

| <b>Minimum Drops thru Sewer Manholes</b> |                                       |
|--|---------------------------------------|
| <b>Angle</b>                             | <b>Drop Across Manhole</b>            |
| Greater than 90°                         | 0.3'                                  |
| 75° - 90°                                | 0.2'                                  |
| 25° - 75°                                | 0.2'                                  |
| 0° - 25°                                 | No less than grade of downstream pipe |

8. In three way manholes the grade through the manhole shall be designed to ensure that flows will not back up into any of the pipes.
9. The maximum allowable drop between inlet and outlet inverts, through a manhole, is eighteen (18) inches.
10. When incoming slopes at manholes are greater than or equal to 5 percent and the deflection angle within the manhole is greater than or equal to 45°, but less than 90°, a six-foot manhole with an extra deep trough is required.
11. Manholes with pipes 18 inches in diameter and larger and in areas with high hydrogen sulfide potential, as determined by the District Engineer, shall be constructed of corrosion resistant materials, ConShield or Acid Resistant Polymer Manholes, or approved equal.

**N. Sewer Force Mains**

1. Force mains shall be designed for a minimum velocity of 2 feet per second at the average design flow.
2. Force mains shall be at least 4 inches in diameter, unless otherwise approved by the District Engineer. Parallel force mains of different diameters will be required to accommodate widely varying flows.
3. Force main piping shall be high-density polyethylene (HDPE) pipe. Minimum wall thickness shall be SDR 17. Exact wall thickness shall be determined based upon operating pressures.
4. Force main piping and thrust restraint shall be designed for the design operating pressure of the pump system, including surge pressures.
5. Force mains shall be designed to ensure that there are no high points in the force main.
6. Force mains shall enter the gravity sewer system into a ConShield or an Acid Resistant Polymer manhole, or approved equal, at an elevation not lower than the top of the existing pipe and not greater than 2 feet above the flow line of the manhole and shall be arranged to minimize splashing and turbulence in the manhole.

**O. Sewer Lift Stations**

1. Lift stations will be permitted only by special approval of the Board of Trustees.
2. These Design Standards apply to lift stations with a capacity up to one million gallons per day (1.00 mgd). Design standards for lift stations larger than 1.00 mgd will be developed on a case-by-case basis by the District Engineer.
3. Lift stations shall be located on a site at least 30 feet by 30 feet in size. Property shall be conveyed by warranty deed to the District. Lift stations shall be located so as to be readily accessible by maintenance vehicles during all weather conditions.



4. Sewer lift stations must remain fully operational and accessible during a 25-year flood. Sewer lift stations shall be protected from physical damage that would be caused by a 100 year flood.
5. The lift station will include at least two submersible pumps. Pumps shall have the same capacity and shall be capable of handling the peak flow with one pump out of service. Pump controls shall provide for alternating operation of the pumps. Pumps shall be specifically designed for submerged operation and shall be capable of passing spheres of at least 3 inches in diameter. Pump suction and discharge piping shall be at least 4 inches in diameter. Pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well. Pumps shall be manufactured by Flygt and shall include Neva-clog or N series impellers. Unless otherwise approved by the District Engineer, lift stations will require three phase power.
6. One automatic flush valve, manufactured by Flygt, shall be required per lift station.
7. One spare pump shall be provided to the District for each lift station, unless otherwise approved by the District Engineer.
8. Pumps and motors shall be sized for the 20-year peak flow.
9. The design engineer shall submit system-head calculations and curves. System-head curves for C values of 100, 120, and 140 in the Hazen Williams equation for calculating head loss corresponding to minimum, median, and maximum water levels shall be developed.
10. A system-head curve for a C value of 120 corresponding to median water level shall be used to make preliminary selection of pump and motor. The pump and motor must operate satisfactorily over the entire range of specified flows for the system-head curves for C values of 100 and 140 corresponding to minimum and maximum water levels intersected by the head-discharge relationship of a given pump.
11. The wet well size and level control shall be designed to avoid excessive pump cycling and septic conditions due to excessive detention time.
12. TOP fiberglass reinforced polyester (FRP) basin, manufactured by Flygt, shall be installed in the bottom of each wet well.
13. Access to the wet well shall be provided through a locking, rectangular aluminum hatch with stainless steel bolts and accessories. The hatch shall be sized to allow easy removal and replacement of the pumps. Access hatches shall be Safe-Hatch manufactured by Flygt.
14. Isolation and check valves shall be placed in the discharge line of each pump. Valves shall be located in a separate vault located near the wet well that is protected from physical damage, weather and freezing, with proper access for operation and maintenance. Isolation valves shall be eccentric plug valves. Check valves shall be ball-check type valves.
15. The valve vault shall include piping, valves and quick-connect couplings to allow bypass pumping from the wet well to the force main using a portable pump.
16. Passive ventilation of the wet well shall be provided. Active ventilation and odor control may be required depending on the size, location and operational characteristics of the lift station and the proximity of dwellings.
17. The entire site shall be paved with 3-inches of asphalt over 8-inches of compacted road base.
18. A 6-foot vinyl fence shall be installed around the perimeter of the site, with a 12-foot double-swing locking gate.
19. An emergency yard light shall be installed at the site.
20. The site shall include a permanent receiving bracket for a portable crane to be used in removing and replacing the pumps.
21. Electrical systems and components (i.e., motors, lights, cables, conduits, switchboxes, control circuits) in wet wells or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National Electrical Code requirements for Class 1, Group D, Division 1 locations. In

addition, equipment located in the wet well shall be suitable for use under corrosive conditions. Each flexible cable shall be provided with watertight seal and separate strain relief. A fused disconnect switch located above ground shall be provided. When such equipment is exposed to weather it shall meet the requirements for NEMA 4X with a stainless steel dead front enclosure and aluminum inner door.

22. Lift station shall include a Multitrode level control system and a backup float set above alarm level manufactured by Flygt.
23. Lift stations shall include remote monitoring equipment as required by the District Engineer.
24. An alarm system shall be provided that is activated upon power failure, high water level, or other malfunction. Alarms shall be transmitted by an integrated automatic cellular telephone dialer, unless otherwise approved and/or directed by the District Engineer.
25. Lift stations shall be provided with a standby generator. Standby generators shall be natural gas or propane fueled. Provisions shall be made for automatic generator start-up and load transfer upon power failure. Standby generators shall be manufactured by Caterpillar/Olympian.
26. The District may require more area when deemed necessary by the District Engineer.
27. Control panels and electrical equipment shall be located in a control building constructed in accordance with the following requirements:
  - a. The building floor plan and layout shall provide adequate space for the control panels and other electrical equipment and access for maintenance and repairs. The minimum inside dimensions of the control building shall be 8 feet by 12 feet. Minimum inside height shall be 8 feet.
  - b. The building shall be architecturally comparable with the existing buildings in the area or the future buildings planned for the area.
  - c. At a minimum, the buildings shall be constructed of Atlas brick on concrete footings with a concrete floor. The roof shall be pitched, with a minimum slope of 4:12, with a 26 gauge standing seam steel roof, over ¾-inch plywood sheeting and building paper. Roof fascia and soffits shall be aluminum. Gables shall be Atlas brick. The interior of the roof shall be insulated with R-38 fiberglass batt insulation. The ceiling shall be 5/8-inch painted sheetrock.
  - d. The building shall have at least one 3-foot by 7-foot hollow metal man-door with metal frame, threshold, lock set and 12-inch square ventilation louver with insect screen.
  - e. The building shall have at least two fluorescent lighting fixtures with 4-40 watt lamps each, or LED equivalent, and two electrical outlets.
  - f. The building shall have a thermostat-operated ventilation fan with roof exhaust capable of providing 10 air changes per hour.
  - g. Building construction shall otherwise conform to the building code and other requirements of the local jurisdiction.

P. Sewer Flow Meters

1. In locations where KID water meters are not installed or where KID water meters may not accurately represent the amount of flow discharged to the sewer system, a sewer flow meter shall be installed, unless otherwise approved by the District Engineer.
2. Flow meters and control panel shall be installed in a location accessible to the District personnel as shown on the development plans.
3. Power shall be provided by local power provider or solar panels, as necessary.
  - a. Solar Power System shall be designed to provide power during two consecutive cloudy days, including nights, during the winter time. System shall be designed to provide continuous power assuming radio transmissions every 20 seconds for 4 second duration.





4. Flow meter site shall include:
  - a. Prefabricated Metering Manhole (48", 60" or 72" diameter as determined in paragraph M above), height as required, with Integral Parshall Flume (throat width determined by flow requirements), as manufactured by Virtual Polymer Compounds or approved equivalent. Manhole body and flume shall be fabricated from molded fiberglass reinforced polyester. Manhole shall include an FRP ladder, mounting brackets for ultrasonic transducer and temperature sensor, and mounting back plate for the open channel flow meter indicator transmitter. Fiberglass grating shall be installed over the channel.
  - b. The open channel flow meter shall be a Siemens (Milltronics) OCM III wall mounted indicator transmitter, housed in a NEMA 4X enclosure complete with one weather proof power outlet, located on a pole next to the metering manhole. System includes an XRS-5 non-contacting ultrasonic level sensor, TS-2 temperature sensor for automatic temperature compensation and a removable hand held programmer. An internal data logger, 4-20 mA signal output and (3) programmable dry contact alarm relays shall also be included. System operates on 110 VAC single phase power.
  - c. Communications shall include;
    - i. Radio: GE MDS INET 900 IP radio with PCTEL Maxrad 710-970 MHz Yagi Antennas and all required connectors and cabling. Cable shall be ½" Heliac Times Microwave LMR-600 or equal.
    - ii. PolyPhaser IS-50NX-C2-MA Lightning Protector or equal. Lightning protector shall be bulkhead mounted on the antenna cable entrance into the equipment enclosure.
    - iii. A grounding kit Wireless Solutions WGK-U2H5-UT or equal.

Q. Grease and Sand/Oil Interceptors

1. A grease interceptor, oil separator or sand interceptor, located outside the facility or building, shall be provided as part of the Private Lateral Wastewater line of any commercial, industrial, and institutional facility or building that has the potential of introducing substances that would be detrimental to the Sewer Treatment Facility or Collection System, as determined by the District according to the KID Pretreatment Program.
2. All wastewater from "FOG" (Food, Oil, Grease) -bearing fixtures must be routed to the Interceptor.
3. All Interceptors shall be installed and located so as to be readily accessible for cleaning by the User and inspection by KID employees. Interceptor access manholes should not be located in parking spaces or near the entrance or exit of a building.
4. All interceptors shall be constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, water tight and equipped with easily removable covers which are gas and water tight.
5. The working capacities of Interceptors connected to the District's sewer system must be at least 1000 gallons, but no more than 2000 gallons. Interceptors must be sized to provide a minimum hydraulic retention time of 30 minutes. This is calculated by multiplying the maximum peak wastewater flow in gallons per minute times 30 minutes.
6. Interceptors shall be precast concrete and have a minimum of two compartments.
  - a. The basic configuration and dimensional characteristics of a typical Interceptor are shown in Drawing SS 5.
  - b. In a two stage interceptor, the first (upstream) compartment should be approximately twice the liquid volume of the second (downstream) compartment.
  - c. The intermediate baffle(s) must extend the full width of the Interceptor, and from the bottom to within three (3) inches of the top.

- d. The design and construction of the interceptor must ensure that there is no flow between compartments around the bottom or side edges of the baffle(s).
- e. The Interceptor must be sealed to prevent leakage to or from the adjacent soil.
- f. Interceptors shall be engineered to withstand anticipated surface loads such as vehicular traffic.
- g. Interceptors shall be vented through a vent stack, through the inside of the building to the roof, independent from other vents and away from any air intakes on the roof.

R. Sampling Manholes

- 1. A sampling manhole is required downstream of all Grease and Sand/Oil Interceptors and upstream of any sanitary sewer connections.
- 2. Sampling manholes shall be five (5) feet in diameter.
- 3. The depth and width of the manhole trough shall be equivalent to the inlet pipe.
- 4. The invert of the inlet pipe shall be at least 3 inches above the trough through the manhole.

S. Construction Drawings

The Construction Drawings shall include the following information:

- 1. Street names and widths.
- 2. Subdivision lot numbers
- 3. Street centerline stations and property line stations; plan stations must agree with profile stations.
- 4. Drawing scale
- 5. North arrow
- 6. County or District benchmark elevations
- 7. Roadway centerline finished grades, or if in an easement the finished grade above the utility line.
- 8. Top of curb finish grades at property lines.
- 9. Finish grades at manhole locations with top of rim elevations shown.
- 10. Sewer line pipe size, type, and class.
- 11. The following notes:
  - a. “Contractor shall field verify locations and invert elevations of existing utilities before staking or constructing any new KID utility lines”
  - b. All construction shall comply with the Kearns Improvement District Design Standards and Specifications.”
- 12. Commercial plans shall have the following note: “Four feet of cover is required over all sewer and water lines.”
- 13. Commercial subdivision plats, to be signed prior to utility plans being approved, shall have the following note written on them: “The signature of the Kearns Improvement District on this plat does not constitute any guarantee of availability of water and sewer service to the property or any approval of utility line or facilities. The owner(s) of the property must provide satisfactory plans to the Kearns Improvement District for review and approval before connecting to the District’s utility system and will be required to comply with the District’s rules and regulations.”
- 14. Any potential conflicts between new utility lines and all other existing utilities, including but not limited to sewer lines, culinary water lines, secondary water lines, and/or storm drains shall be noted on the drawings.
- 15. Dimensions to sewer lines from monument lines or property lines shall be shown.
- 16. “Match to Drawing” notes shall refer reader to adjacent drawings.
- 17. Connecting utility lines shall be labeled as existing or proposed.
- 18. Drawing shall be designed, signed and stamped by a professional licensed engineer.
- 19. Construction Drawings shall include a signed dedication plat.
- 20. Construction Drawings shall include a final grading plan.



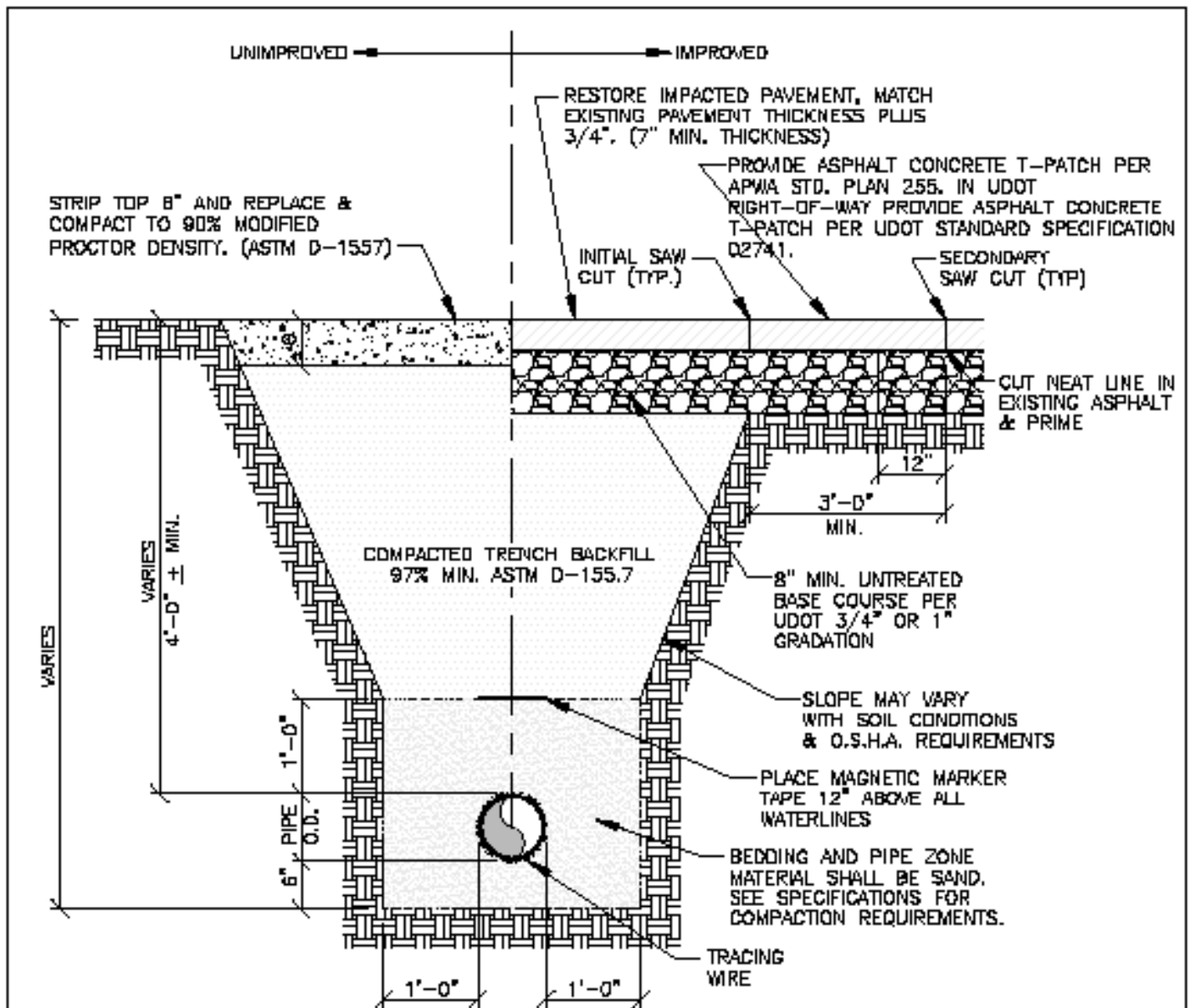
21. Construction drawings shall contain plan and profile views of all sewer main lines. Profile views shall show existing and final surface profiles.



**SECTION 6**

# **STANDARD DRAWINGS**





**Notes:**

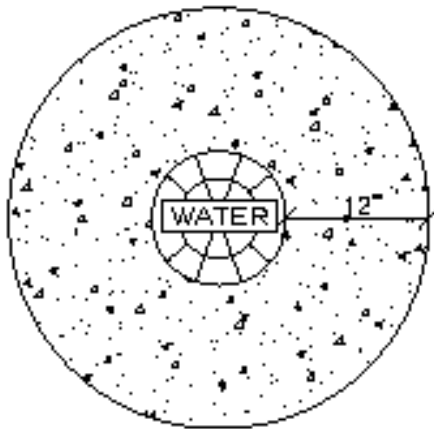
1. KID recommends contractor meet all of the requirements established for safe trenching. (See OSHA and OSHA requirements, latest additions.)
2. Contractor shall locate all underground utilities before laying pipe within 50' of said utilities which may be exposed, damaged or crossed as shown on the drawings or as "Blue Staked". The contractor will make arrangements with the Utility Company to move the Utility if necessary or obtain permission from the District Engineer to modify grade of pipeline in order to go around existing utilities.
3. Water pipe shall be laid on 6" sand. KID Inspector is required to determine the acceptability of the pipe bedding before backfilling of the pipe zone. Contractor is responsible for scheduling of the pipe bedding inspection.
4. All water lines to be installed in acceptable Public right-of-way or acceptable recorded easements unless otherwise approved by the Keams Improvement District.
5. KID inspection of pipe bedding placement and pipe zone backfill is required prior to placement of trench backfill.
6. Backfill above the pipe zone is as per the prevailing authority.
7. Pipe Location: Install pipe in the center of the trench.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:

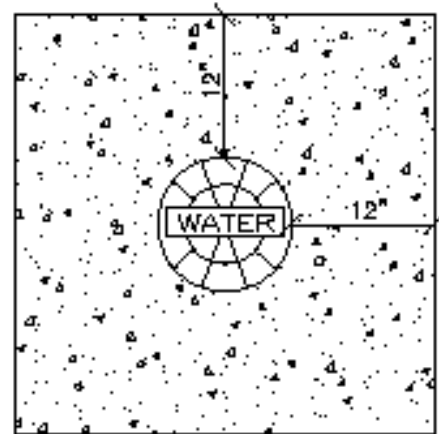


# Typical Water Line Trench Detail

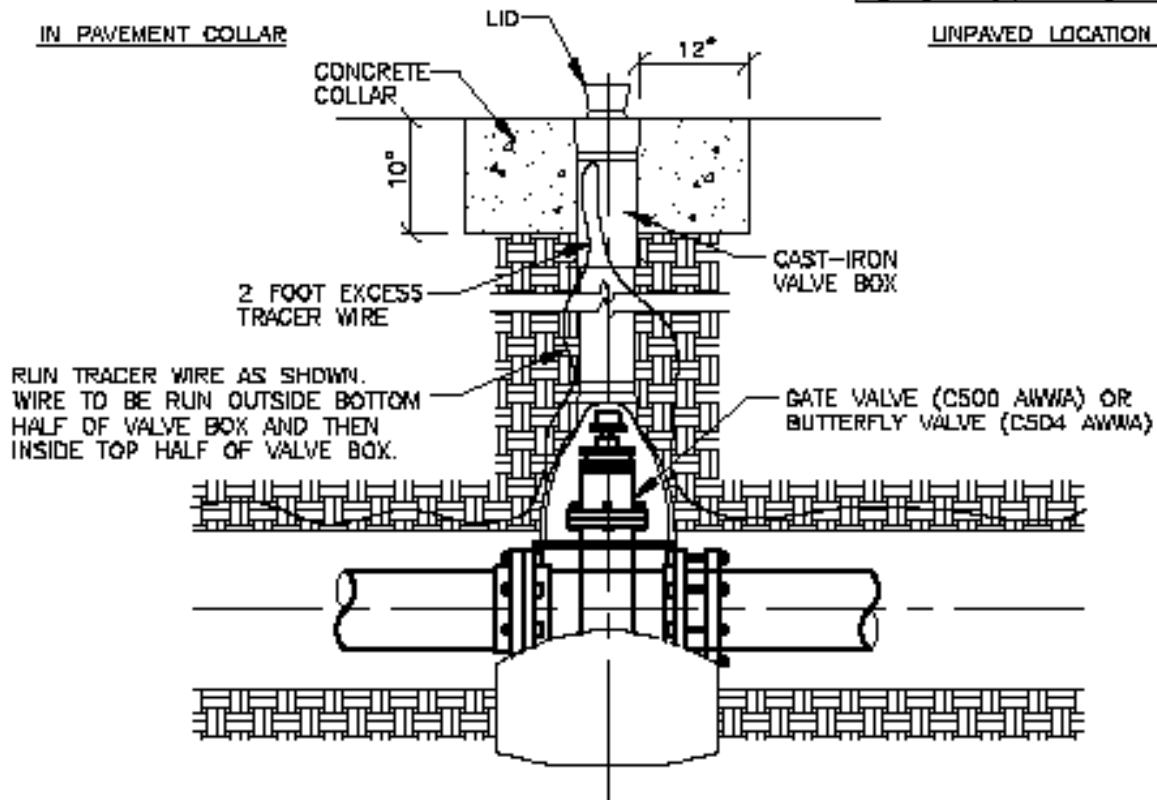
DATE:  
09-06-16  
DRWG NO.:  
**CW1**



IN PAVEMENT COLLAR



UNPAVED LOCATION PAD



**NOTES:**

1. **INSPECTION:** Prior to backfilling around valve, secure inspection of installation by district inspector.
2. **BACKFILLING:** Install all backfill material per specification requirements.
3. **GREASE:** Apply poly-fm grease to all bolts. Wrap with 8 mil thick polyethylene sheet and tape wrap.
4. **CONCRETE COLLAR:** Concrete per city or county specifications.
5. Valve Box must be vertical to allow for valve key access.
6. Provide valve stem extensions for valves deeper than 4 feet.

DRAWN:

R.H.

CHECKED:

CHECKED:



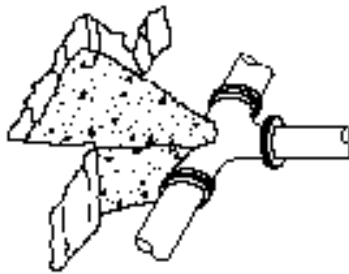
# Typical Gate Valve Detail

DATE:

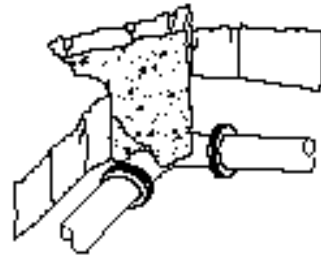
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DRWG NO.:

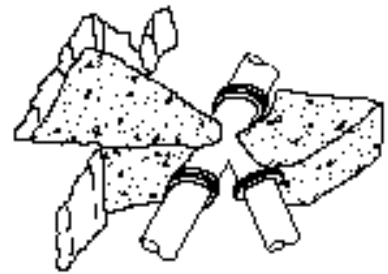
CW2



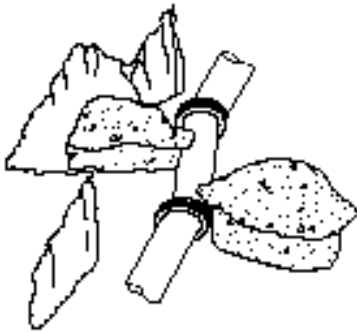
CONDITION I



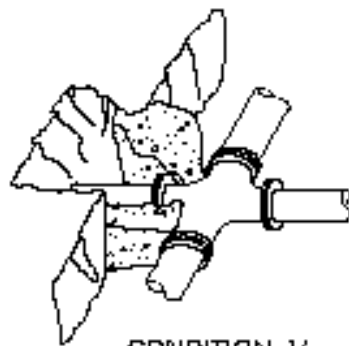
CONDITION II



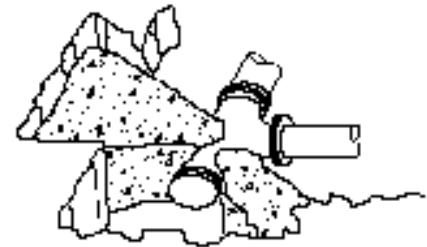
CONDITION III



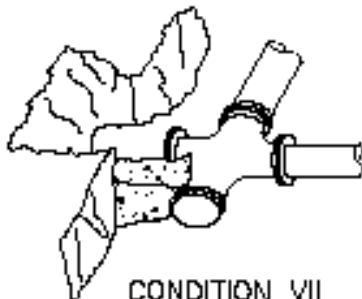
CONDITION IV



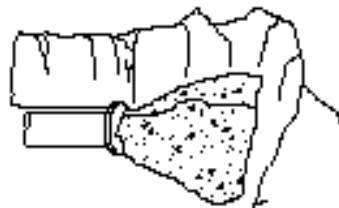
CONDITION V



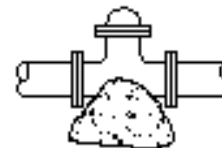
CONDITION VI



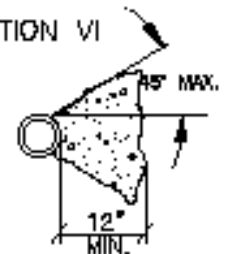
CONDITION VII



CONDITION VIII



VALVE ANCHOR  
REQUIRED FOR  
VALVES 12" OR  
LARGER



TYPICAL SECTION  
THROUGH THRUST  
BLOCKS

## Typical Thrust Block Details

| THRUST BLOCK BEARING AREA IN SQ. FEET |                      |           |       |       |       |      |       |       |       |
|---------------------------------------|----------------------|-----------|-------|-------|-------|------|-------|-------|-------|
| NOMINAL<br>PIPE SIZE<br>(IN.)         | DIP<br>I.D.<br>(IN.) | CONDITION |       |       |       |      |       |       |       |
|                                       |                      | I         | II    | III   | IV    | V    | VI    | VII   | VIII  |
| 4                                     | 4.3                  | 2.2       | 3.1   | 1.5   | 1.7   | 1.1  | 2.2   | 3.1   | 2.2   |
| 6                                     | 6.4                  | 4.8       | 6.8   | 3.4   | 3.7   | 2.4  | 4.8   | 6.8   | 4.8   |
| 8                                     | 8.6                  | 8.6       | 12.2  | 6.1   | 6.8   | 4.3  | 8.6   | 12.2  | 8.6   |
| 10                                    | 10.8                 | 13.2      | 18.6  | 9.3   | 10.1  | 6.6  | 13.2  | 18.6  | 13.2  |
| 12                                    | 12.8                 | 18.8      | 26.6  | 13.3  | 14.4  | 9.4  | 18.8  | 26.6  | 18.8  |
| 14                                    | 14.7                 | 25.6      | 36.2  | 18.1  | 19.6  | 12.8 | 25.6  | 36.2  | 25.6  |
| 16                                    | 16.8                 | 33.3      | 47.0  | 23.5  | 25.4  | 16.7 | 33.3  | 47.0  | 33.3  |
| 18                                    | 18.9                 | 42.0      | 59.4  | 29.7  | 32.1  | 21.0 | 42.0  | 59.4  | 42.0  |
| 20                                    | 20.8                 | 51.7      | 73.1  | 38.5  | 39.5  | 25.9 | 51.7  | 73.1  | 51.7  |
| 24                                    | 25.1                 | 74.0      | 104.6 | 52.3  | 56.6  | 37.0 | 74.0  | 104.6 | 74.0  |
| 30                                    | 31.2                 | 114.4     | 161.8 | 80.9  | 87.5  | 57.2 | 114.4 | 161.8 | 114.4 |
| 36                                    | 37.5                 | 164.4     | 232.5 | 116.3 | 125.9 | 82.2 | 164.4 | 232.5 | 164.4 |

### NOTES:

1. ALL THRUST BLOCK BEARING FACES SHALL BE POURED AGAINST UNDISTURBED SOIL OR APPROVED COMPACTED BACKFILL.
2. CONCRETE SHALL BE CLASS 6.0-B-3000.
3. ALL THRUST BLOCK SIDES SHALL BE FORMED.
4. CALCULATED ON 200 LB TEST PRESSURE AND ALLOWABLE BEARING PRESSURE OF 2000 LBS PER SQUARE FOOT.
5. IN POORER SOILS SPECIAL DESIGN IS REQUIRED.
6. THRUST RESTRAINT TO INCLUDE THRUST BLOCK AND JOINT RESTRAINT AT ALL BENDS.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



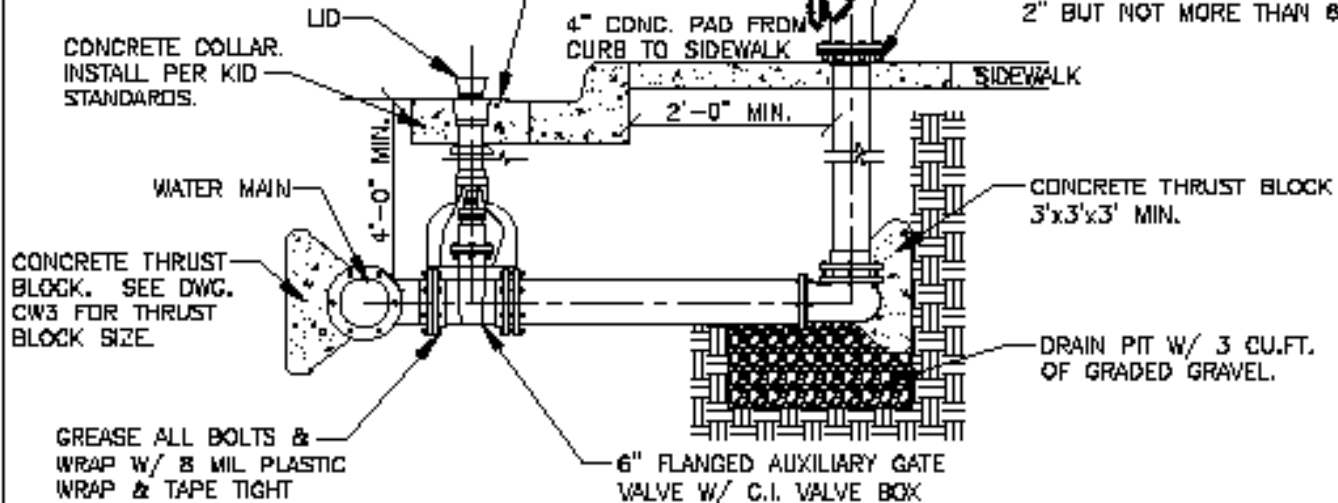
## Thrust Block Details

DATE:  
09-06-16  
DRWG NO.:  
CW3

NOTE:  
 AUXILIARY VALVE AND BOX  
 MAY BE LOCATED AT HYDRANT  
 WITH THE USE OF MEGA-LUG  
 FITTINGS WITH THE APPROVAL  
 OF THE DISTRICT ENGINEER.

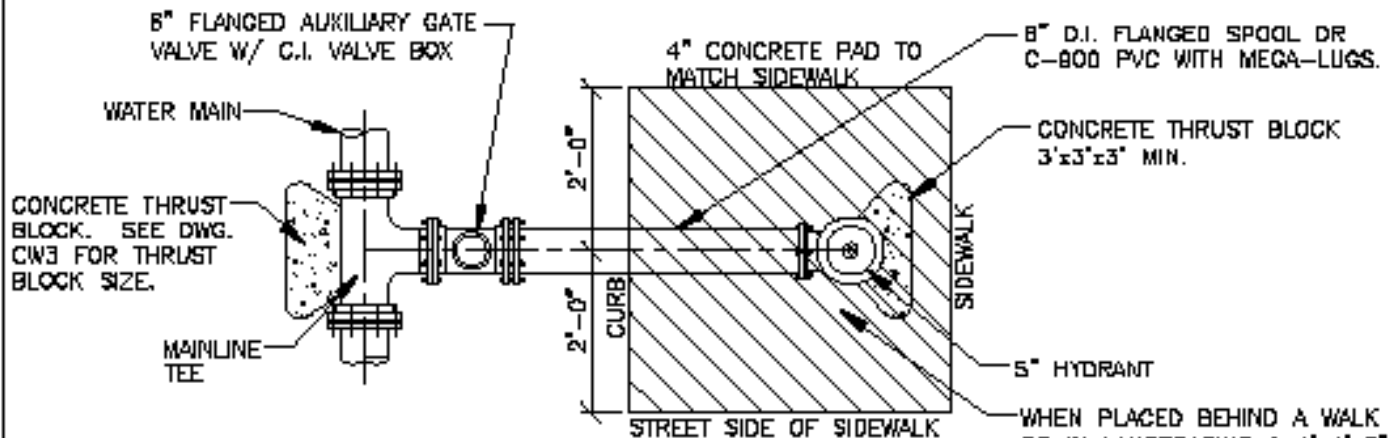
NOTE:  
 BEFORE INSTALLING HYDRANT  
 VALVE CONTRACTOR SHALL  
 VERIFY EXACT LOCATION.  
 HYDRANT SHALL NOT BE  
 ALLOWED IN ANY PART OF  
 THE GLITTER.

MEULLER "MODERN CENTURION"  
 OR CLOW 5" FLG FIRE HYDRANT  
 OR APPROVED EQUAL.  
 BOTTOM OF BOLT ASSEMBLY  
 MUST BE CLEAR OF CONCRETE  
 2" BUT NOT MORE THAN 6".



### Typical Hydrant Installation

PROFILE VIEW



### Typical Hydrant and Pad Detail

PLAN VIEW

1. AVERAGE SPACING BETWEEN HYDRANTS MUST NOT BE GREATER THAN 500'.
2. SELECT SAND BEDDING AND BACKFILL IS REQUIRED 6" UNDER, 12" ON SIDES, AND 12" OVER FIRE LINE.
3. MINIMUM TRENCH WIDTH SHALL BE EQUAL TO OUTSIDE PIPE DIAMETER PLUS 1' ON EACH SIDE OF PIPE.
4. IF DAMAGE IS CAUSED TO WATER MAIN, DUE TO FIRE HYDRANT INSTALLATION AND/OR OTHER MEANS, CONTRACTOR WILL BE HELD RESPONSIBLE FOR REPAIRS.
5. FIRE HYDRANT SHALL BE SET THAT THE BARREL OR STANDPIPE FLANGE IS 3" TO 6" ABOVE FINISHED GRADE.
6. GREASE AND WRAP ALL EXTERNAL FITTINGS AND BOLTS WITH FM GREASE AND 8-MIL POLYETHYLENE AND DUCT TAPE TIGHT.
7. WRAP D.I. PIPE WITH 8-MIL POLYETHYLENE TUBE WRAP AND DUCT TAPE TIGHT.
8. DRAINAGE PIT MUST HAVE 3 CUBIC FEET (MINIMUM) OF 3/4" MINUS GRAVEL.
9. ALL THRUST BLOCKING MUST BE REINFORCED BY A SECURE BANK.

DRAWN:

R.H.

CHECKED:

CHECKED:



# Hydrant Installation

DATE:

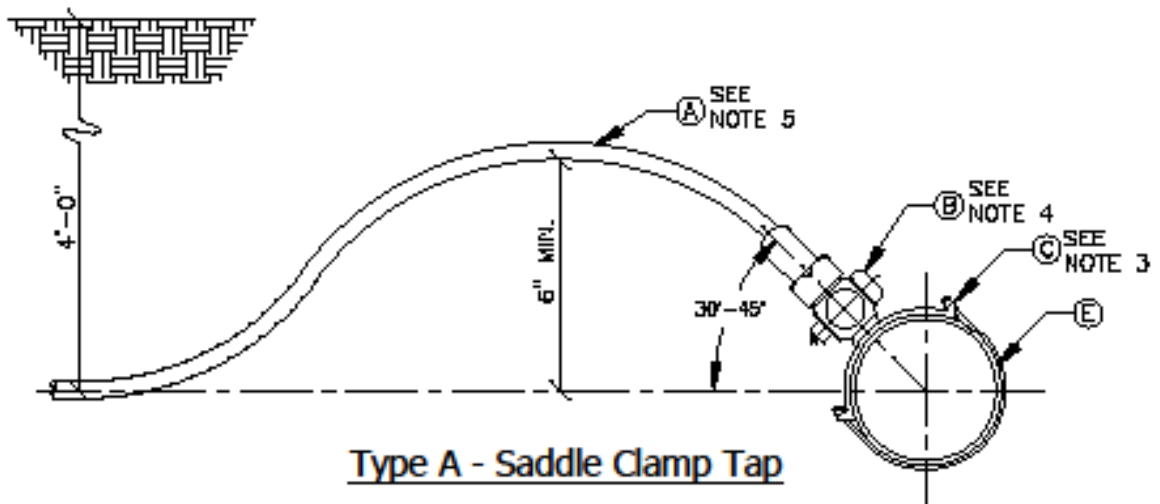
09-06-16

DRWG NO.:

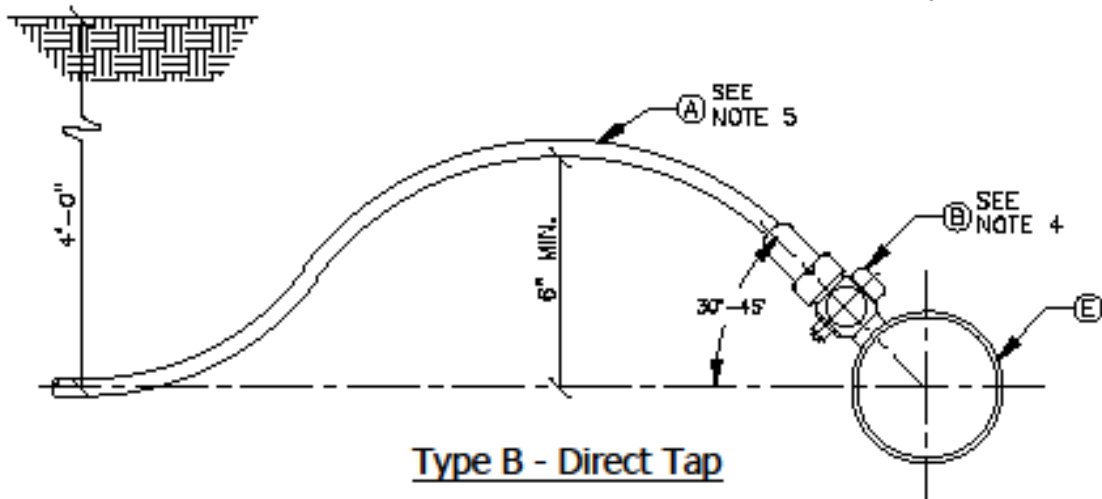
CW4







**Type A - Saddle Clamp Tap**



**Type B - Direct Tap**

| LEGEND |                      |                            |
|--------|----------------------|----------------------------|
| NO.    | ITEM                 | DESCRIPTION                |
| (A)    | COPPER PIPE          | TYPE K - SOFT (NOTE 5)     |
| (B)    | CORPORATION STOP     | BRASS (NOTE 4)             |
| (C)    | SERVICE SADDLE CLAMP | (D.I., P.V.C.) ** (NOTE 3) |
| (E)    | WATER MAIN PIPE      | (D.I., P.V.C.)             |

↔ D.I. PIPE MAY BE DIRECT TAPPED

**NOTES:**

1. INSPECTION: PRIOR TO BACKFILLING AROUND TAPS SECURE INSPECTION OF INSTALLATION BY KID INSPECTOR.
2. BACKFILL: AS PER SPECIFICATIONS.
3. PROVIDE BRASS DOUBLE STRAP TAPPING SADDLE FOR TAPPING DUCTILE IRON OR PVC PLASTIC PIPE, FORD SERIES OR EQUAL.
4. 3/4" FORD FB600 BALL CORP AWWA TAPER THREAD INLET, FLARE OR COMPRESSION FITTINGS ACCEPTED.
5. PROVIDE HORIZONTAL EXPANSION LOOP IN COPPER PIPE.
6. TAPPING: PLACE TAPS A MINIMUM OF 24 INCHES APART. USE A TAPPING TOOL WHICH IS SIZED CORRESPONDING TO THE SIZE OF THE SERVICE LINE TO BE INSTALLED. NO TAPS WITHIN 24 INCHES OF END OF PIPE.
7. TAPE: TEFLON TAPE IS REQUIRED ON ALL TAPS.
8. CONTRACTOR TO RETAIN ALL TAPPED PLUGS AND PROVIDE THE PLUGS TO DISTRICT INSPECTOR.
9. ALL DIRECT TAP TO UTILIZE "CC" THREADS.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



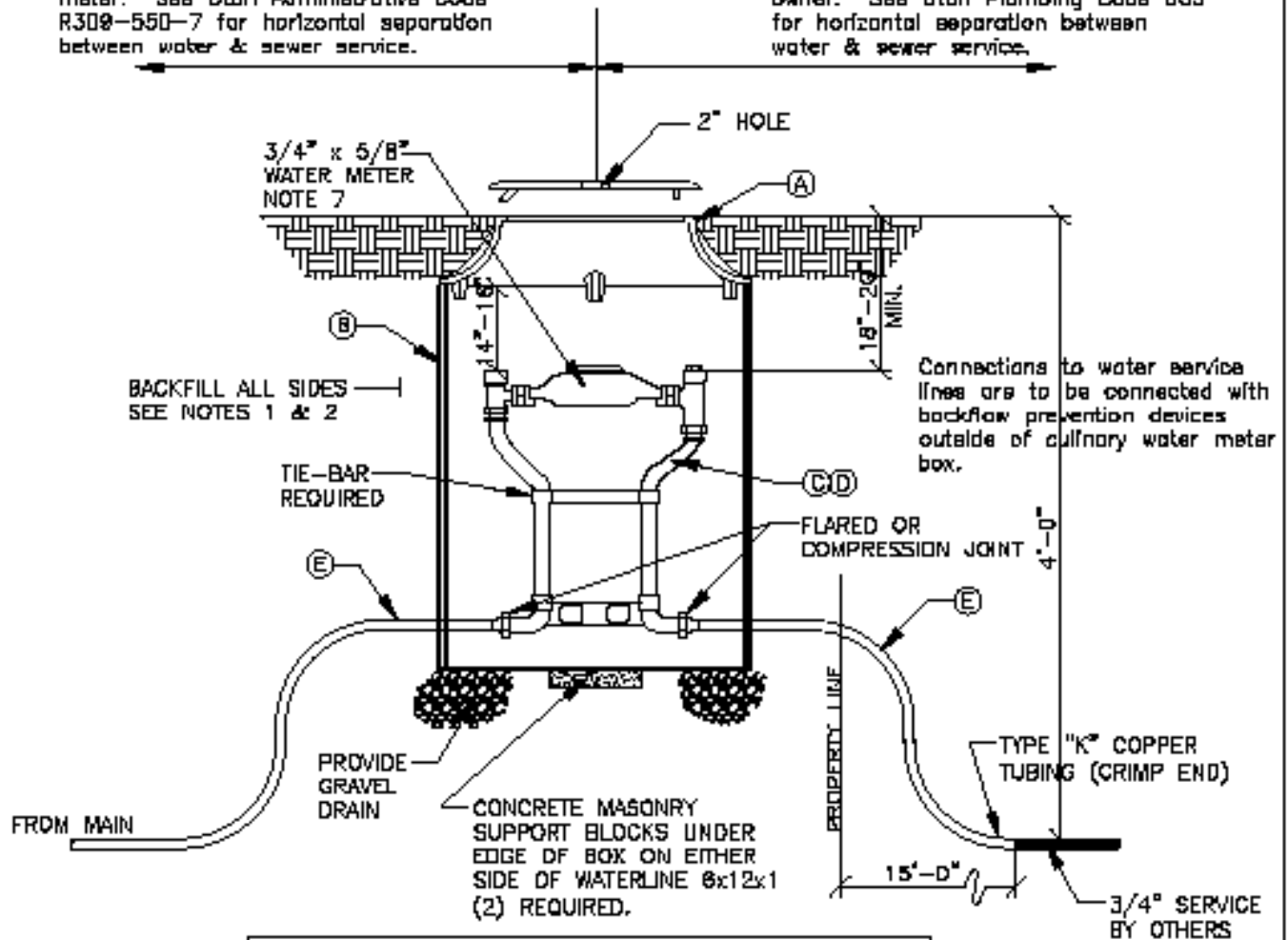
# Typical Service Tap Detail

3/4" - 2"

DATE:  
09-06-16  
DRWG NO.:  
**CW6**

KID owns, maintains, and repair to meter. See Utah Administrative Code R309-550-7 for horizontal separation between water & sewer service.

Culinary water service lateral owned, maintained & repaired by property owner. See Utah Plumbing Code 603 for horizontal separation between water & sewer service.



| LEGEND |                                |               |
|--------|--------------------------------|---------------|
| NO.    | ITEM                           | DESCRIPTION   |
| (A)    | FRAME & COVER                  | NOTE 3        |
| (B)    | METER BOX (19"-21"Ø)(30" DEEP) | NOTE 4        |
| (C)    | 3/4" METER (18" BOX)           | NOTE 5        |
| (D)    | 1" METER (21" BOX)             | NOTE 6        |
| (E)    | COPPER PIPE                    | TYPE K (SOFT) |

**NOTES:**

- INSPECTION: PRIOR TO BACKFILLING AROUND METER BOX SECURE INSPECTION OF INSTALLATION BY DISTRICT INSPECTOR.
- BACKFILLING: INSTALL ALL BACKFILL MATERIAL PER SPECIFICATION REQUIREMENTS IN LIFTS NOT EXCEEDING 5 INCHES AFTER COMPACTION. COMPACT EACH LIFT TO A MINIMUM RELATIVE DENSITY OF 85 PERCENT.
- D&L FOUNDRY AND SUPPLY MODEL L-2240 METER BOX AND LID AND RIM WITH 2" HOLE FOR RADIO READ. BRANDED "WATER METER" CAST IN TOP.
- METER BOX MAY BE ADS FURNISH SAMPLE BOX AND REVIEW WITH DISTRICT ENGINEER.
- 3/4" COPPER WATER METER VOILE FORD 70 SERIES FULL 3/4" METER SETTER VBHC 72-21W-11-33-NL WITH RESIDENTIAL CHECK VALVE OR WATTS #102A-UNUM BVDC WITH 21" TUBING.
- 1" SETTER VBHC 74-21W-11-44-NL OR EQUAL.
- WATER METER FURNISHED AND INSTALLED BY KEARNS IMPROVEMENT DISTRICT.
- PLACEMENT:
  - DO NOT INSTALL METER BOXES UNDER DRIVEWAY APPROACHES, SIDEWALKS, OR CURB AND GUTTER.
  - ALL METER BOXES TO BE INSTALLED IN PARK STRIP.
  - SEE SPECIFICATIONNS SEC. 1.2.1.2.

DRAWN:

R.H.

CHECKED:

CHECKED:



# Typical Meter Box Detail

3/4" - 1"

DATE:

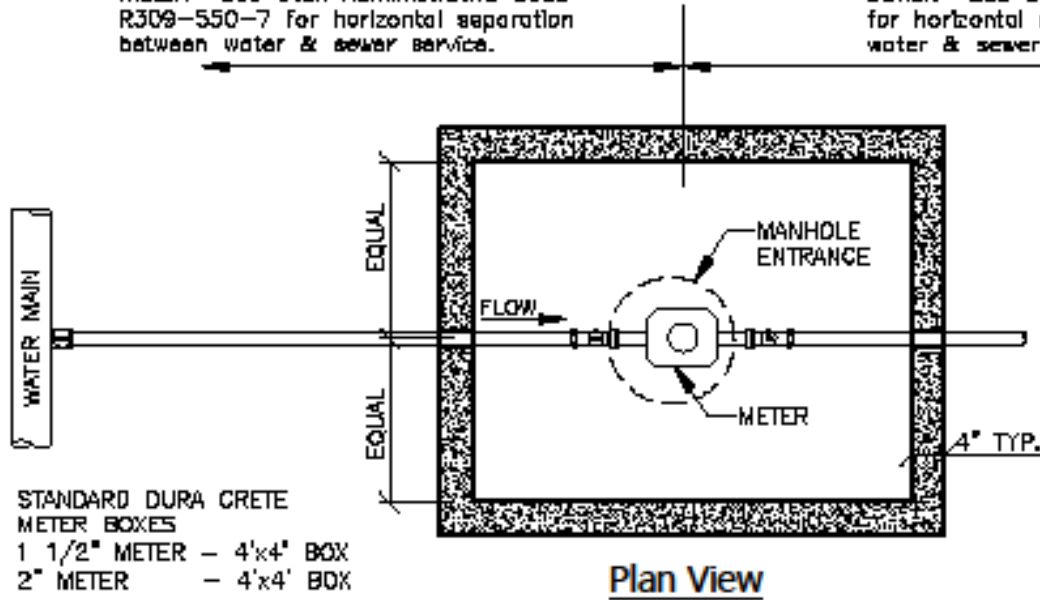
09-06-16

DRWG NO.:

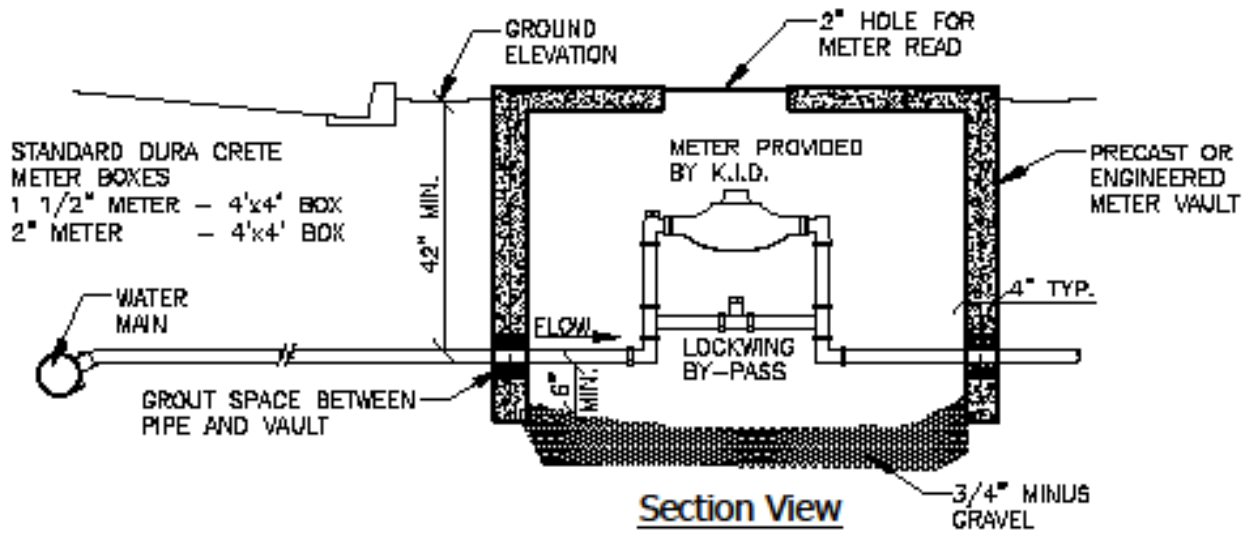
CW7

KID owns, maintains, and repair to meter. See Utah Administrative Code R309-550-7 for horizontal separation between water & sewer service.

Culinary water service lateral owned, maintained & repaired by property owner. See Utah Plumbing Code 603 for horizontal separation between water & sewer service.



Plan View



Section View

1. LOCATE MANHOLE OPENINGS DOWN CENTER LINE OF METER VAULT.
2. METER BOX SHALL BE MIN. 4" DEEP WITH GRAVEL BOTTOM.
3. BACKFLOW ASSEMBLY IS TO BE LOCATED OUTSIDE OF THE METER BOX.
4. METER SETTER FOR 1 1/2" AND 2" METERS ARE AS FOLLOWS:  
 FORD SERIES COPPERSETTERS FOR FLANGED METERS  
 1 1/2" VBHC76-21B-11-66-NL  
 2" VHB77-21B-11-77-NL
5. LID MUST HAVE 2" HOLE CENTERED FOR RADIO READ ASSEMBLY.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:

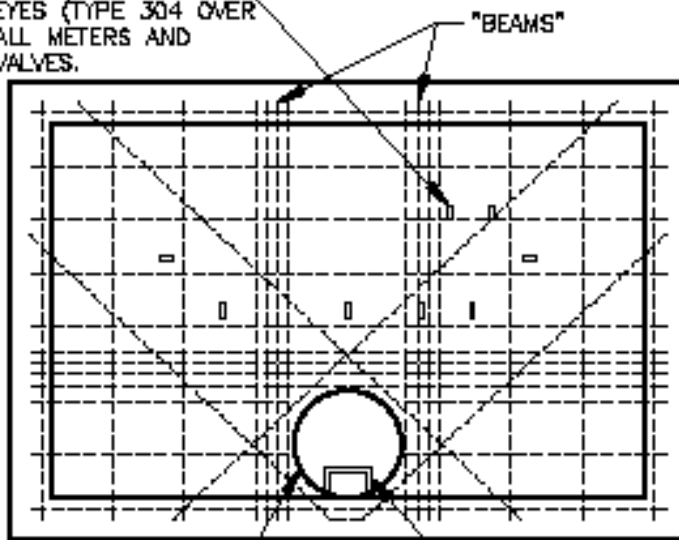


# Water Meter Vault

## 1 1/2" - 2"

DATE:  
09-06-16  
DRWG NO.:  
**CW8**

(8) 3/4" DIA. S.S. LIFTING EYES (TYPE 304 OVER ALL METERS AND VALVES.



26 1/2" VAULT OPENING WITH STANDARD WATER MAIN HOLE RING AND COLLAR

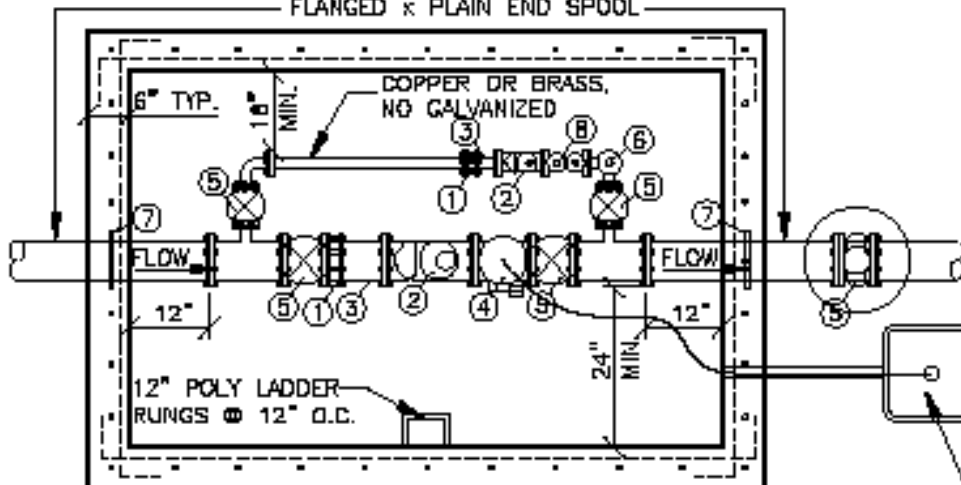
**Roof Plan**

12" POLY LADDER RUNGS @ 12" O.C.

**NOTES:**

1. ALL MANHOLES SHALL HAVE A CONCRETE COLLAR PER A.P.W.A. PLAN 574.
2. VAULT AND PIPE BEDDING SHALL BE COMPACTED TO 95% MINIMUM ASTM D-1557.
3. IF DAMAGE IS CAUSED TO WATER MAIN, DUE TO VAULT INSTALLATION AND/OR OTHER MEANS, CONTRACTOR WILL BE HELD RESPONSIBLE FOR REPAIRS.
4. NO MORE THAN ONE GRADE RING (1' MAX.) ALLOWED PER LID AND COLLAR.
5. ALL FLANGED & PLAIN END SPOOLS TO BE PRE-CAST INTO VAULT WALLS BY VAULT MANUFACTURER.
6. FOR TRAFFIC USE, VAULT WALLS SHALL BE 8" THICK (MIN.) WITH #5 EPOXY COATED REBAR 8" ON CENTER EACH WAY AND 4" ON CENTER AT "BEAMS."
7. FOR NON-TRAFFIC USE, VAULT WALLS SHALL BE 6" THICK (MIN.) WITH #5 EPOXY COATED REBAR 8" ON CENTER EACH WAY AND 8" ON CENTER AT "BEAMS."
8. GREASE AND WRAP ALL EXTERNAL FITTINGS AND BOLTS WITH F.M. GREASE AND 8-MIL POLYETHYLENE AND DUCT TAPE TIGHT.
9. WRAP ALL DUCTILE IRON PIPE WITH 8-MIL POLYETHYLENE TUBE WRAP.
10. NO BYPASS ON LOOPED SYSTEMS WITH TWO OR MORE MASTER METERS.
11. VAULT SHALL BE SUITABLE FOR H-20 LOADINGS.
12. BYPASS SHALL BE 2" MINIMUM.

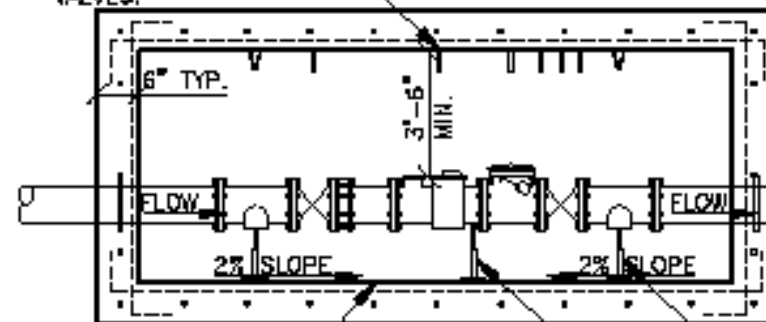
FLANGED & PLAIN END SPOOL



- ① FLANGED COUPLING ADAPTER
- ② SENSUS OMNI METER
- ③ FLANGED & PLAIN END PIECE, CUT TO FIT
- ④ SWING CHECK VALVE
- ⑤ GATE VALVE
- ⑥ 2" TEST PLUG
- ⑦ PIPE RESTRAINT CAST INTO WALL ALTERNATIVES AT DISCRETION OF ENGINEER
- ⑧ DUAL CHECK VALVE

(8) 3/4" DIA. S.S. LIFTING EYES (TYPE 304 OVER ALL METERS AND VALVES.

**Vault Plan**



VAULT FLOOR 2% SLOPE

**Vault Profile**

ADJUSTABLE PIPE SUPPORTS  
ADJUSTABLE PIPE SUPPORT ON BYPASS

12"x12" IRRIGATION BOX W/1 1/2" HOLE FOR TOUCH READ SENSOR. PLACE BOX IN LANDSCAPING. DRILL 2" HOLE IN VAULT TO RUN WIRE THROUGH. RUN 1 1/2" CONDUIT FROM VAULT TO SENSOR BOX.

12" CONCRETE APRON AROUND VALVE BOX.

ISOLATION GATE VALVE (M.I.) WITH C.I. VALVE BOX AND TRACER WIRE.

DRAWN:

R.H.

CHECKED:

CHECKED:



# Typical Large Meter Vault

DATE:

09-06-16

DRWG NO.:

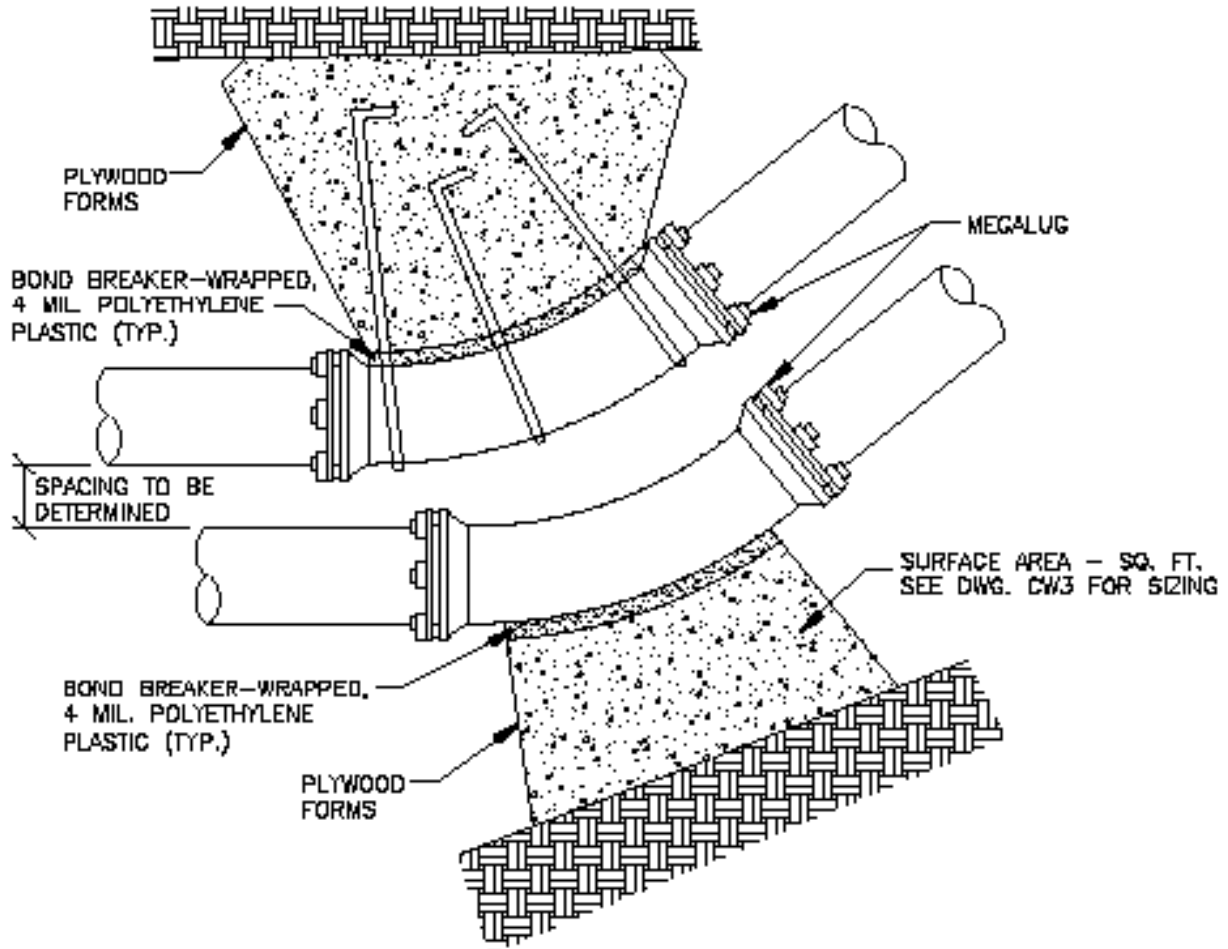
**CW9**

MINIMUM CUBIC YARDS OF CONCRETE

| PIPE SIZE | BENDS   |         |     |     |
|-----------|---------|---------|-----|-----|
|           | 11-1/4' | 22-1/2' | 45' | 90' |
| 4"        | 0.2     | 0.4     | 1.3 | N/A |
| 6"        | 0.2     | 0.5     | 1.8 | N/A |
| 8"        | 0.2     | 0.5     | 1.8 | N/A |
| 10"       | 0.2     | 0.8     | 2.7 | N/A |
| 12"       | 0.3     | 1.0     | 3.8 | N/A |

N/A - NOT ALLOWED

NOTE:  
LARGER THAN 12" TO BE SPECIFICALLY  
DESIGNED BY ENGINEER. FORMS SHALL  
BE 3/8" PLYWOOD OR DISTRICT  
APPROVED EQUIVALENT.



**Top View**  
**Horizontal Parallel Bends**

GENERAL NOTES:

1. USE MEGALUG JOINT RESTRAINT DEVICES OR SIMILAR UPON PRIOR DISTRICT APPROVAL - POLY-WRAPPED PIPE TO SERVE AS BOND BREAKER (NOT TO INTERFERE WITH RESTRAINED JOINTS). ALL SURFACES OF THE RESTRAINED JOINTS SHALL BE ACCESSIBLE AND FREE FROM INTERFERENCE DUE TO THRUST BLOCK CONSTRUCTION.
2. MINIMUM AREA REQUIRED WILL BE THAT OF AN 8-INCH MAIN.
3. ALL THRUST BLOCKS SHALL BE FORMED. THE MINIMUM THICKNESS FORM MATERIAL SHALL BE 3/8" PLYWOOD OR DISTRICT APPROVED EQUIVALENT.
4. BEARING AREA BASED ON SOIL BEARING PRESSURE OF 2000 LB/SF.
5. EMBED THREE (3) NO. 4 EPOXY-COATED REBAR 18" INTO CONCRETE W/ ENDS BENT 90 DEGREES AS SHOWN.

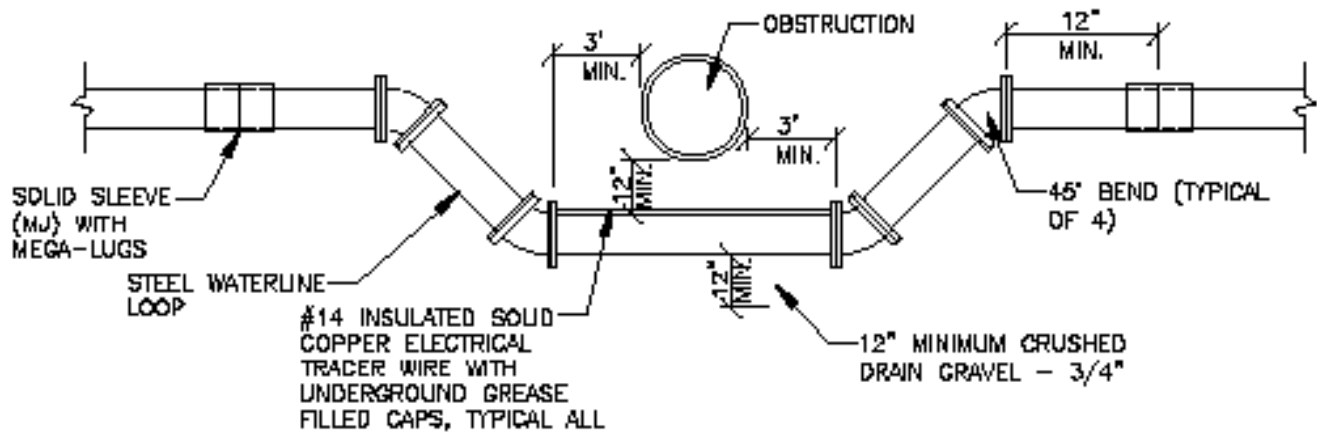
DRAWN:  
R.H.  
CHECKED:  
CHECKED:



**Parallel Bends w/  
Thrust Blocks**

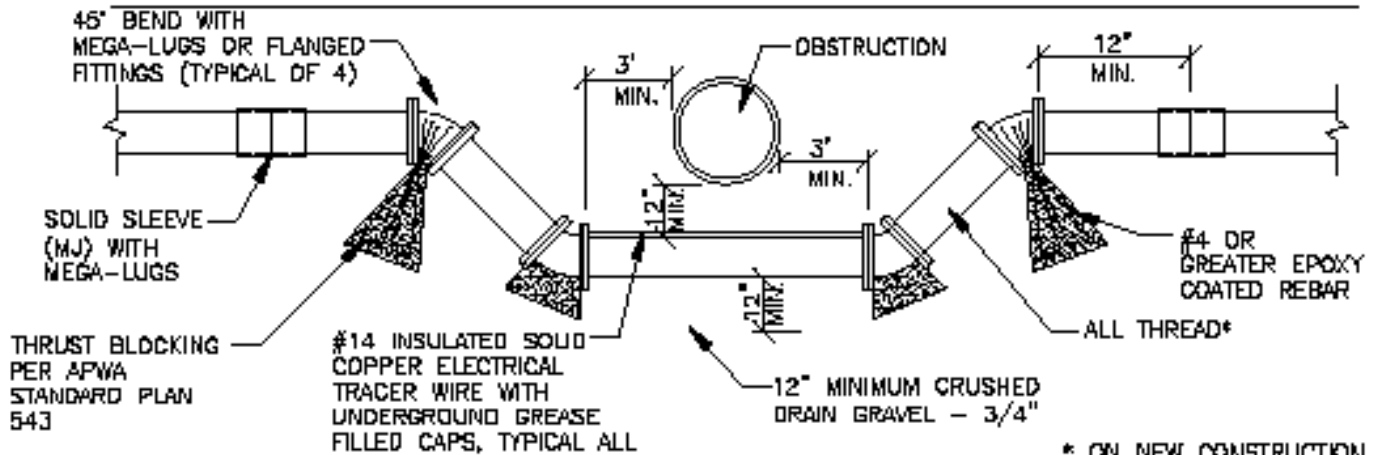
DATE:  
09-06-16  
DRWG NO.:  
**CW10**

GROUND SURFACE



**PRE-FABRICATED LOOP**  
STANDARD LOOP

GROUND SURFACE



**WATERLINE LOOP**  
MAY BE USED AT DISCRETION OF DISTRICT ENGINEER

\* ON NEW CONSTRUCTION USE BELL RESTRAINTS IN PLACE OF ALL THREAD

NOTES:

1. SELECT SAND SHALL BE USED AS BEDDING AND BACKFILL 12" UNDER, ON SIDES AND OVER WATERLINE LOOP. BEDDING SHALL BE COMPACTED TO 95% MIN. ASTM D-1557.
2. MINIMUM TRENCH WIDTH SHALL BE EQUAL TO OUTSIDE PIPE DIAMETER PLUS 1' EACH SIDE OF PIPE.
3. IF DAMAGE IS CAUSED TO WATER MAIN CONTRACTOR WILL BE HELD RESPONSIBLE FOR REPAIRS.
4. PRE-FAB WATERLINE PIPE AND FITTINGS SHALL BE BUTT WELDED A53 GRADE B SCH 80 STEEL FOR PIPES LESS THAN 12" DIAMETER AND COPPER ELECTRICAL TRACER WIRE WITH UNDERGROUND GREASE FILLED CAPS.
5. REFER TO APWA SECTION 33 05 09 FOR EPOXY LINING AND COATING DETAILS.
6. GREASE AND WRAP ALL EXTERNAL FITTINGS AND BOLTS WITH F.M. GREASE AND 8-MIL POLYETHYLENE AND DUCT TAPE TIGHT.
7. ALL THRUST BLOCKING MUST BE REINFORCED BY SECURE BANK.

DRAWN:

R.H.

CHECKED:

CHECKED:



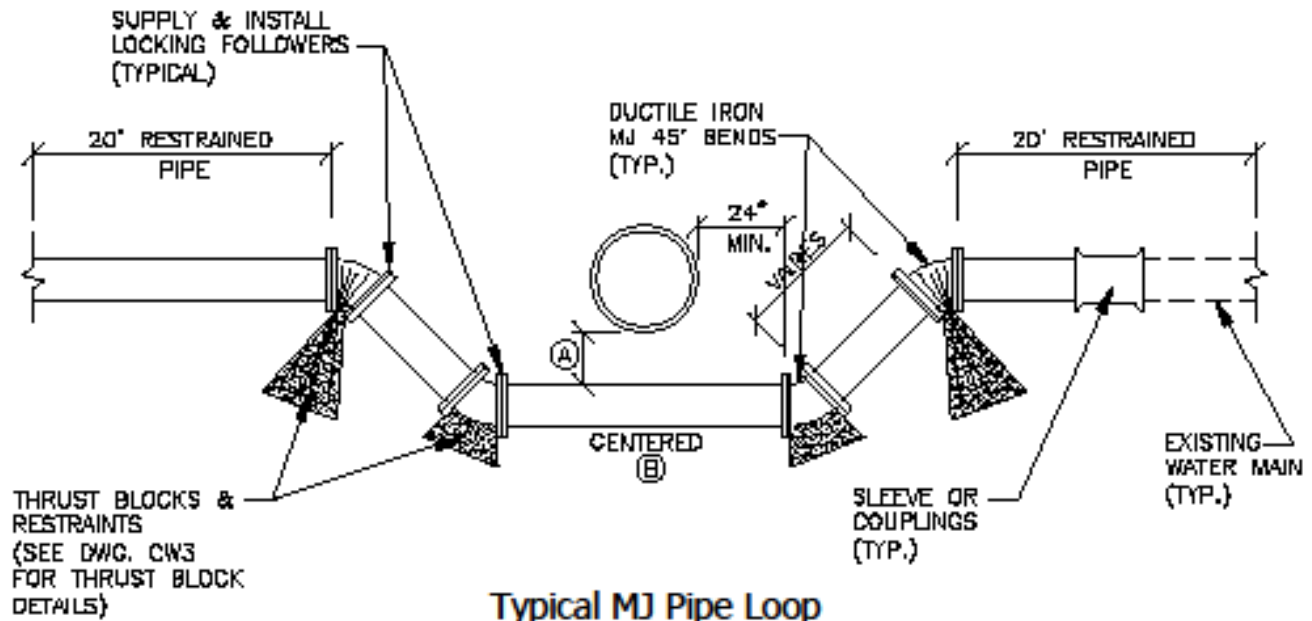
# Typical Waterline Loop

DATE:

09-06-16

DRWG NO.:

CW11



**Typical MJ Pipe Loop**

| TABLE OF DIMENSIONS |             |             |
|---------------------|-------------|-------------|
| OBSTRUCTION         | A           | B           |
| SEWER               | 18" MINIMUM | 20' MINIMUM |
| OTHER               | 12" MINIMUM | O.D. + 48"  |

**NOTES:**

1. BEFORE BACKFILLING, SECURE INSPECTION FROM KID INSPECTOR.
2. ALL DUCTILE IRON PIPE IS TO BE POLY WRAPPED AND ALL FITTING GREASED (FM).
3. THRUST BLOCKS - CONCRETE CLASS 4000.
4. REINFORCEMENT: DEFORMED, 60 KSI YIELD GRADE STEEL, ASTM 615.
5. GREASE: NON-OXIDE POLY-FM.

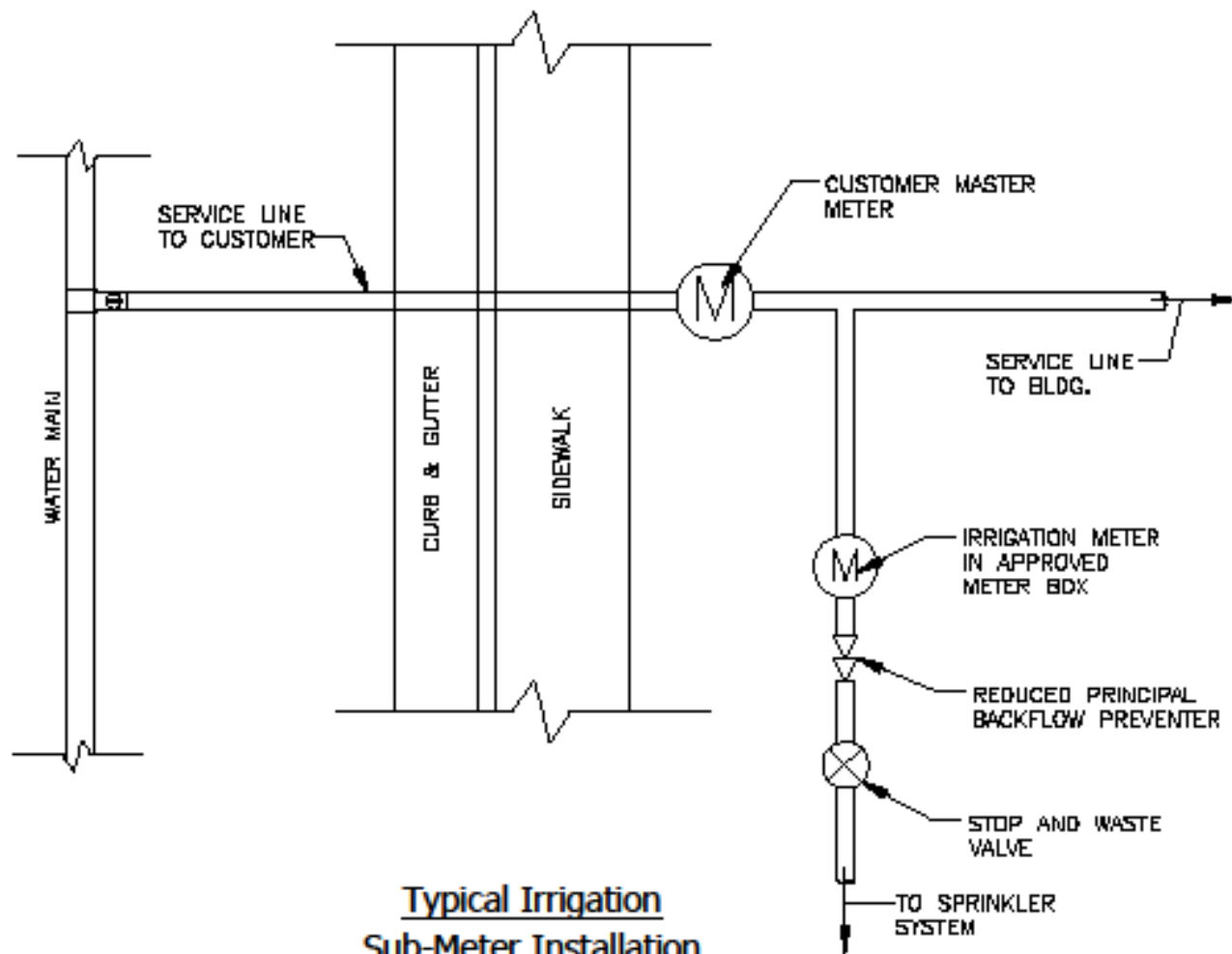
DRAWN:  
R.H.  
CHECKED:  
CHECKED:



**Typical Water Main  
MJ Loop Detail**

DATE:  
09-06-16  
DRWG NO.:  
**CW12**





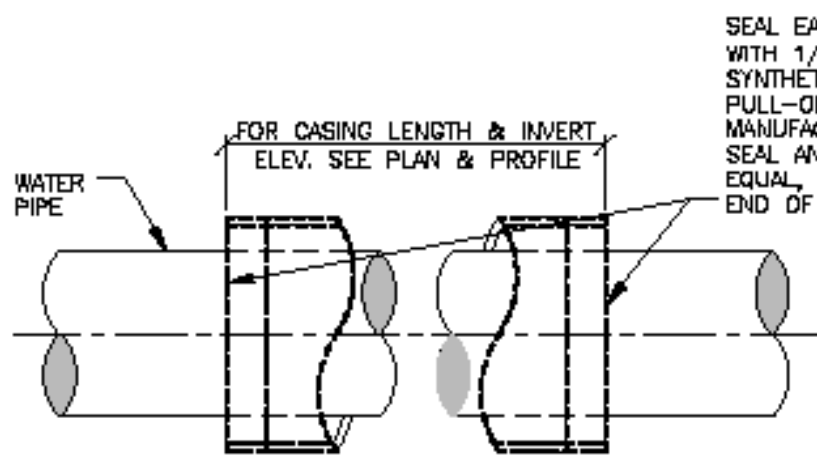
**Typical Irrigation  
Sub-Meter Installation**  
SCHEMATIC DETAIL NO SCALE

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



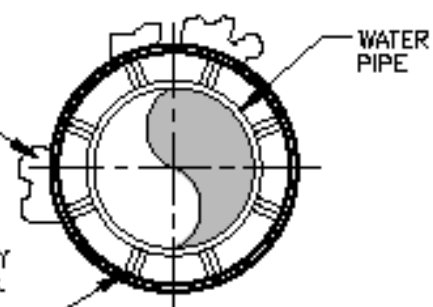
# Typical Irrigation Sub-Meter Installation

DATE:  
09-06-16  
DRWG NO.:  
**CW13**



SEAL EACH END OF CASING WITH 1/8-INCH THICK SYNTHETIC RUBBER, MODEL C PULL-ON TYPE END SEALS, AS MANUFACTURED BY PIPELINE SEAL AND INSULATOR, INC. OR EQUAL, LINK-SEAL AT EACH END OF CASING

ANY VOIDS CREATED BY BORING, JACKING, OR TUNNELING SHALL BE FILLED BY PRESSURE GROUTING



CASING SPACERS MANUFACTURED BY PIPELINE SEAL AND INSULATOR, INC. MODEL 512G-2 SPACED EVERY 5-FT TO CENTER THE PIPE INSIDE THE CASING. PIPE THROUGHOUT THE LENGTH OF THE CASING SHALL BE AT A CONTINUOUS GRADE AS SHOWN ON DRAWINGS.

Section

| PIPE SIZE | MINIMUM I.D. CASING SIZE | MINIMUM WALL THICKNESS |
|-----------|--------------------------|------------------------|
| 4"        | 12"                      | 0.188"                 |
| 6"        | 16"                      | 0.312"                 |
| 8"        | 18"                      | 0.312"                 |
| 12"       | 24"                      | 0.438"                 |
| 18"       | 30"                      | 0.50"                  |
| 18"       | 30"                      | 0.50"                  |
| 24"       | 36"                      | 0.625"                 |
| 30"       | 42"                      | 0.625"                 |

LARGER GASINGS AS DIRECTED BY THE DISTRICT ENGINEER

**NOTES:**

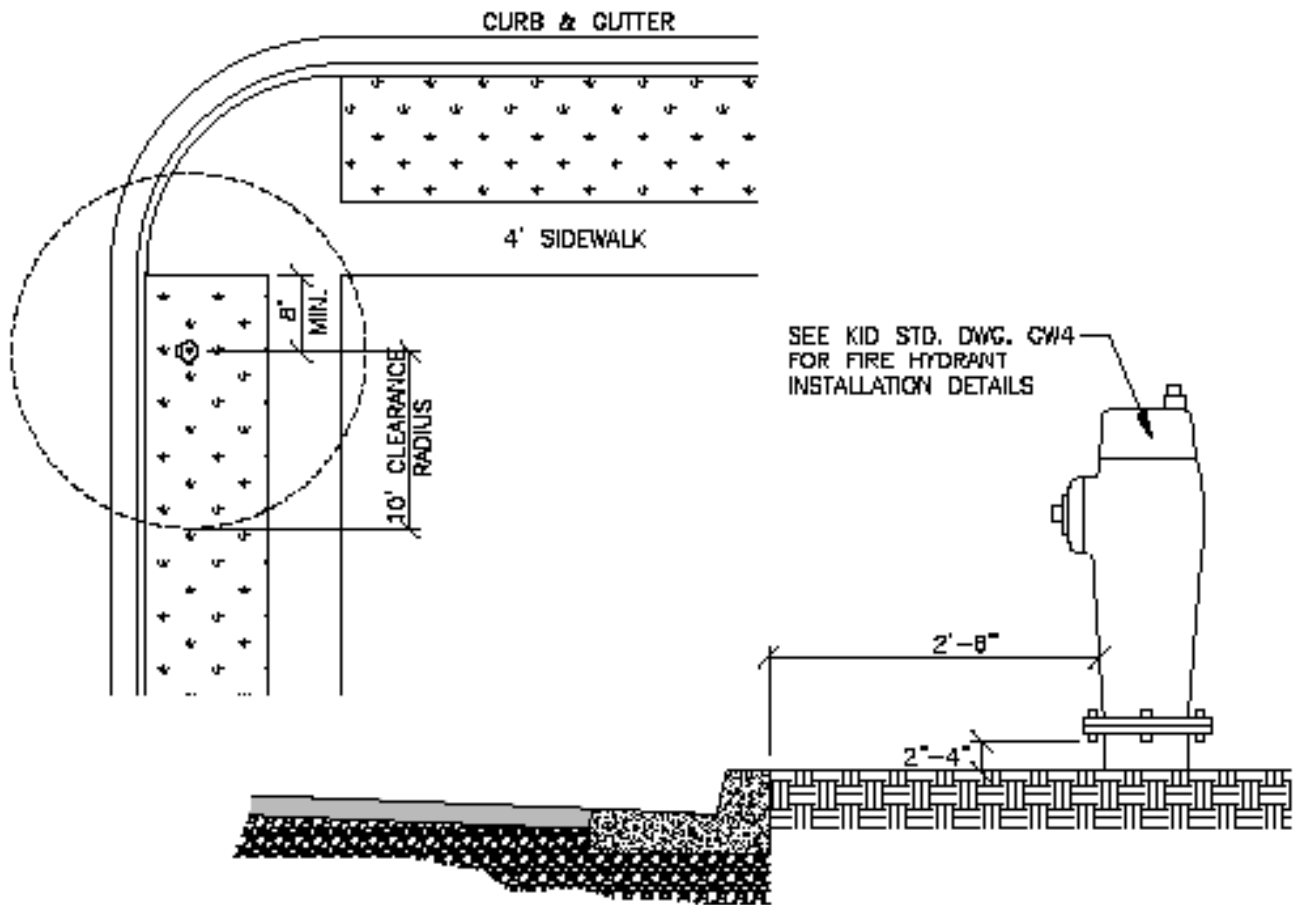
1. CASING PIPES SHALL BE REQUIRED AS INDICATED ON THE DRAWINGS AND/OR WHERE REQUIRED BY THE DISTRICT INSPECTOR OR ENGINEER.
2. CARRIER PIPE SHALL BE TESTED BEFORE SEALING THE ENDS OF THE CASING.
3. SPACERS SHALL BE SECURELY ATTACHED TO THE CARRIER PIPE PER THE MANUFACTURER'S REQUIREMENTS.
4. CASING PIPE SHALL BE WELDED STEEL, ASTM A53, GRADE B OR APPROVED EQUIVALENT.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



# Steel Casing For Water Pipe

DATE:  
09-06-16  
DRWG NO.:  
**CW14**



SEE KID STD. DWG. CW4  
FOR FIRE HYDRANT  
INSTALLATION DETAILS

**NOTES:**

1. PAINT TOP AND FACE OF CURB, 15' ON BOTH SIDES, WITH RED PAINT TO INDICATE NO PARKING.
2. NO TREES, PLANTS, FLOWERS, SHRUBS, OR ANY OTHER ITEM WHICH MAY OBSTRUCT THE VIEW OR ACCESS TO A FIRE HYDRANT, SHALL BE INSTALLED/PLANTED WITHIN 10' OF ANY FIRE HYDRANT.
3. HYDRANT SHALL BE 2'-8" BEHIND BACK OF CURB OR AS SPECIFIED BY THE DISTRICT ENGINEER.
4. MAJOR ROADS SHALL HAVE FIRE HYDRANTS ON BOTH SIDES OF THE ROADWAY.
5. INSTALL A 4'x4'x6" THICK CONCRETE PAD AROUND THE HYDRANT BASE.
6. FIRE HYDRANT SPACING:
  - A. SHALL NOT EXCEED A 500' RADIUS IN AREA WITH SINGLE FAMILY DWELLINGS
  - B. SHALL NOT EXCEED A 300' RADIUS IN ALL OTHER AREAS.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



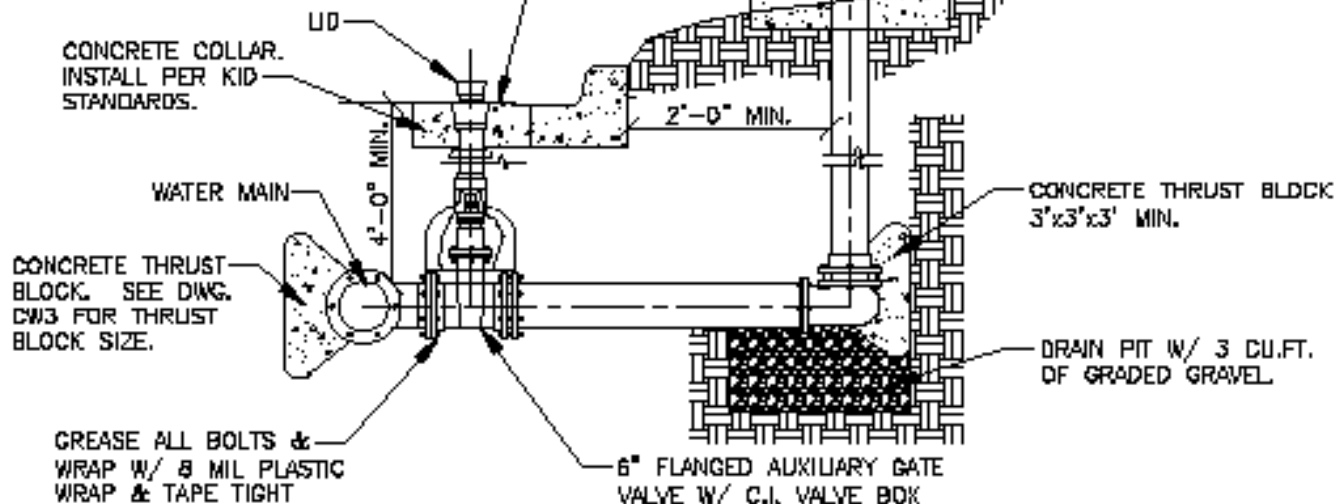
# Fire Hydrant Location Detail

DATE:  
09-06-16  
DRWG NO.:  
**CW15**

NOTE:  
 AUXILIARY VALVE AND BOX  
 MAY BE LOCATED AT HYDRANT  
 WITH THE USE OF MEGA-LUG  
 FITTINGS WITH THE APPROVAL  
 OF THE DISTRICT ENGINEER.

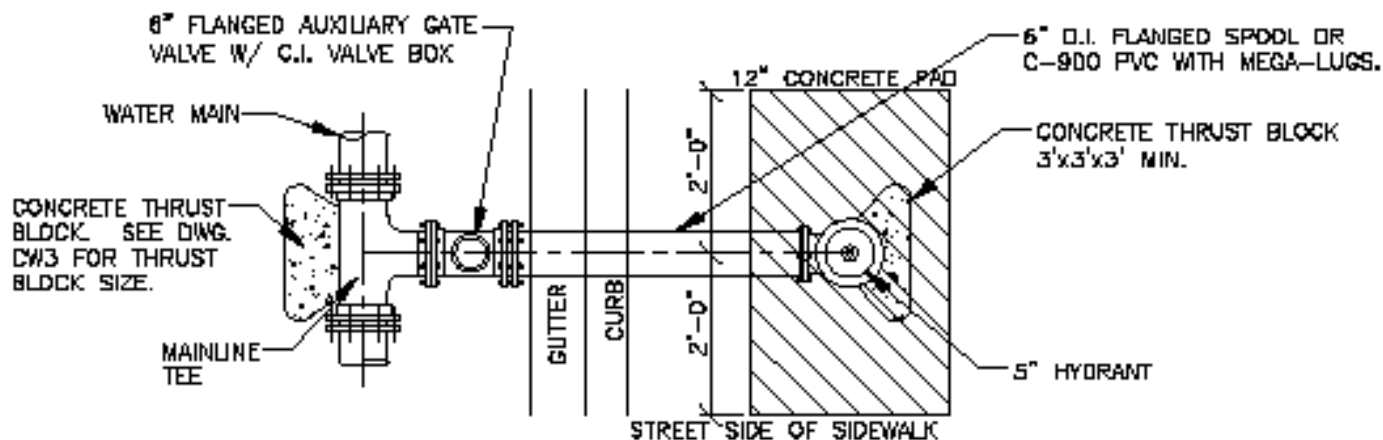
NOTE:  
 BEFORE INSTALLING HYDRANT  
 VALVE CONTRACTOR SHALL  
 VERIFY EXACT LOCATION.  
 HYDRANT SHALL NOT BE  
 ALLOWED IN ANY PART OF  
 THE GUTTER.

MEULLER "MODERN CENTURION"  
 OR CLDW 5" FLG FIRE HYDRANT  
 OR APPROVED EQUAL.  
 BOTTOM OF BOLT ASSEMBLY  
 MUST BE CLEAR OF CONCRETE  
 2" BUT NOT MORE THAN 6".



### Hillside Hydrant Installation

PROFILE VIEW



### Hillside Hydrant Installation

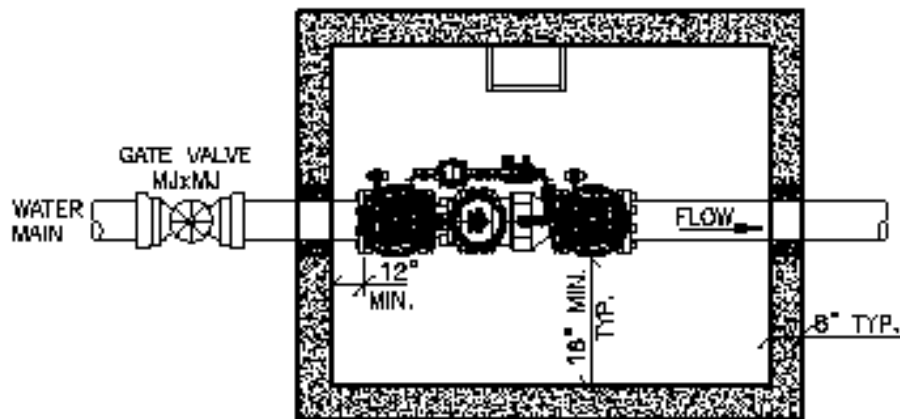
PLAN VIEW

DRAWN:  
 R.H.  
 CHECKED:  
 CHECKED:

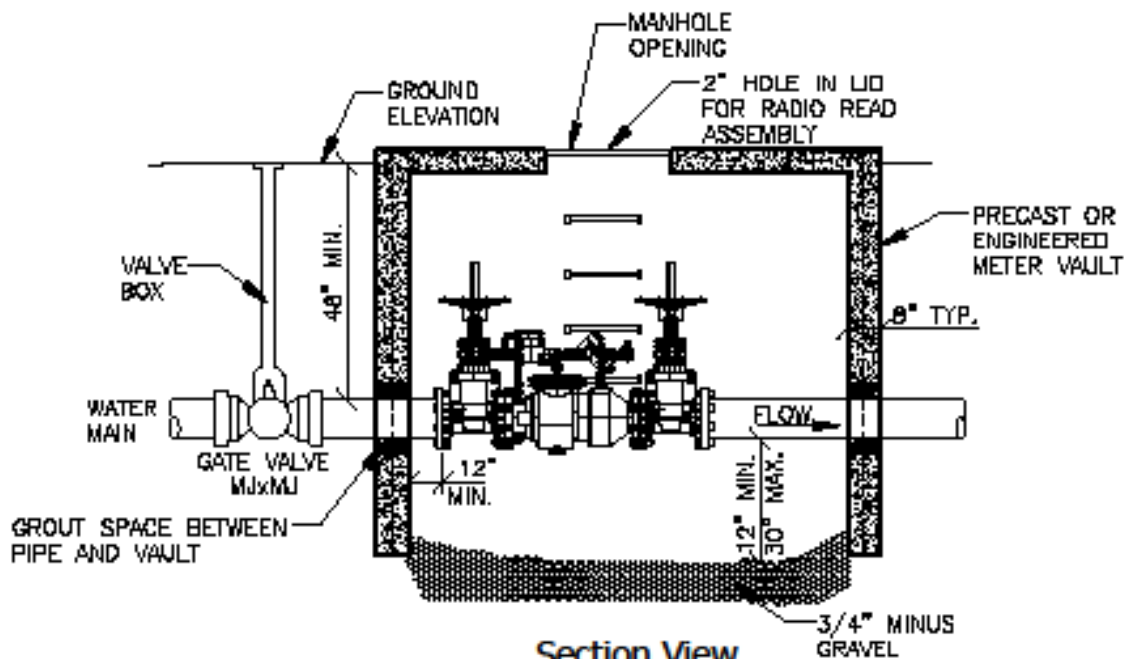


# Hill Side Hydrant Installation

DATE:  
 09-06-16  
 DRWG NO.:  
 CW16



**Plan View**



**Section View**

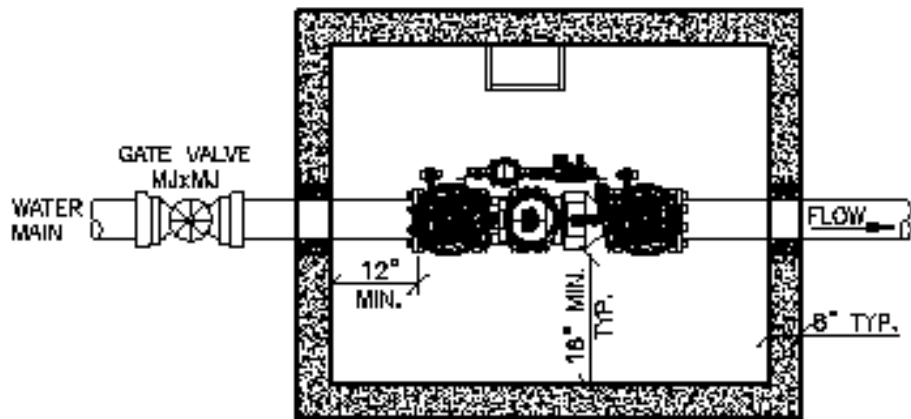
1. LOCATE MANHOLE OPENINGS DOWN CENTER LINE OF VAULT.
2. VAULT BOX SHALL BE MIN. 5" DEEP WITH GRAVEL BOTTOM.
3. CONTRACTOR SHALL PROVIDE A MINIMUM OF 18" CLEARANCE FROM THE DETECTOR CHECK AND THE VAULT WALLS. VAULT SHALL HAVE LADDER RUNGS.
4. INSTALL GATE VALVE & VALVE BOX OUTSIDE OF BUT ADJACENT TO VAULT.
5. FOR 6" AND LARGER INSTALLATIONS, CONTACT K.I.D. ENGINEERING DEPARTMENT.
6. DETECTOR CHECK TO BE WILKINS 350DA OR EQUAL. SUBMIT DATA CUT SHEET TO K.I.D. DISTRICT ENGINEER FOR APPROVAL.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:

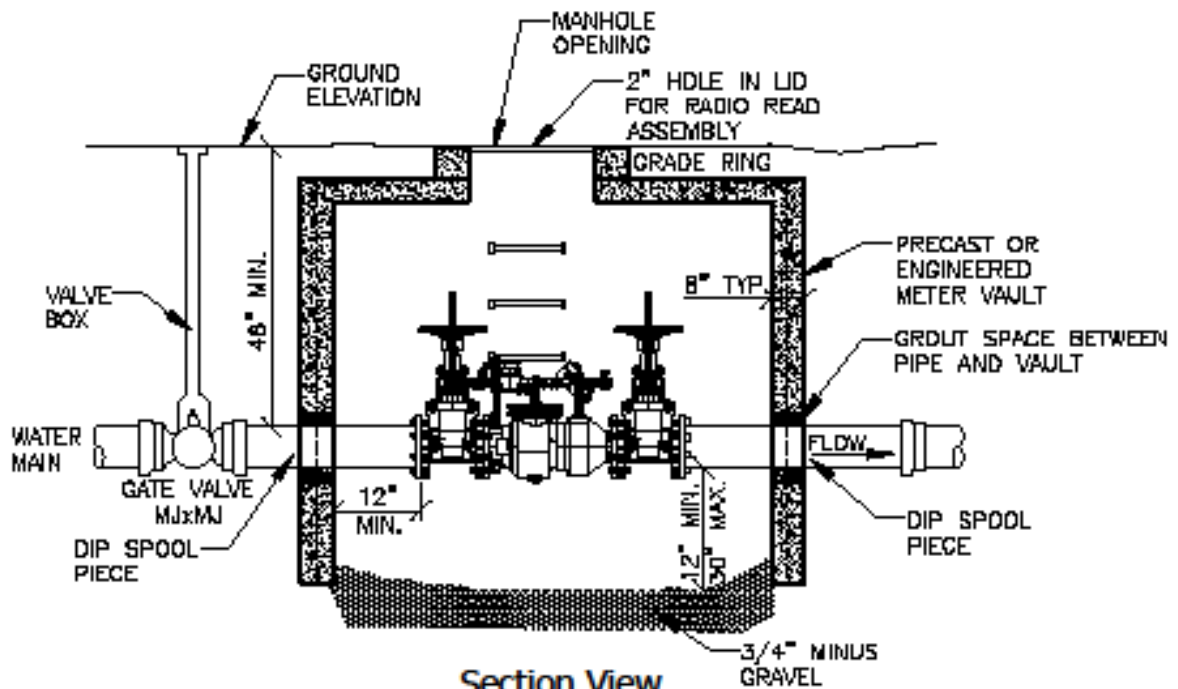


# 4" Detector Check Meter Vault

DATE:  
09-06-16  
DRWG NO.:  
**CW17**



**Plan View**



**Section View**

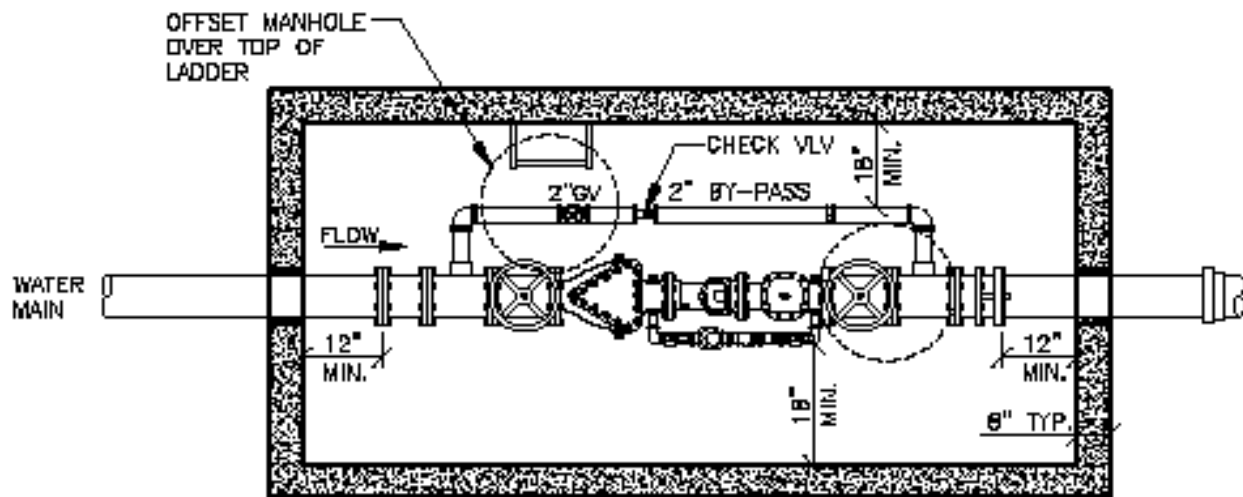
1. LOCATE MANHOLE OPENINGS DOWN CENTER LINE OF VAULT.
2. VAULT BOX SHALL BE MIN. 5' DEEP WITH GRAVEL BOTTOM.
3. CONTRACTOR SHALL PROVIDE A MINIMUM OF 12" CLEARANCE FROM THE DETECTOR CHECK AND THE VAULT WALLS. VAULT SHALL HAVE LADDER RUNGS.
4. INSTALL GATE VALVE & VALVE BOX OUTSIDE OF BUT ADJACENT TO VAULT.
5. DETECTOR CHECK TO BE WILKINS 350DA OR EQUAL. SUBMIT DATA CUT SHEET TO K.I.D. DISTRICT ENGINEER FOR APPROVAL.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:

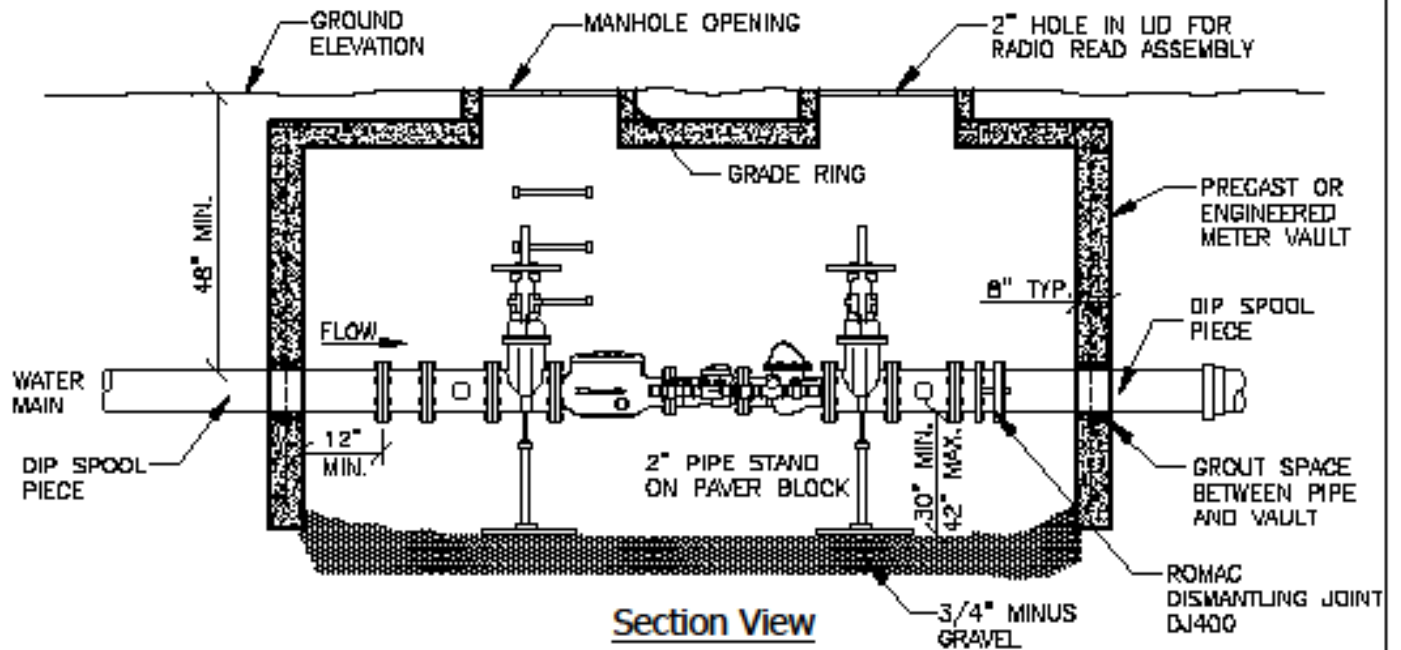


# 8" Detector Check Meter Vault

DATE:  
09-06-16  
DRWG NO.:  
**CW18**



Plan View



Section View

1. LOCATE MANHOLE OPENING OVER LADDER RUNGS.
2. VAULT BOX SHALL BE MIN. 5' DEEP WITH GRAVEL BOTTOM.
3. CONTRACTOR SHALL PROVIDE A MINIMUM OF 18" CLEARANCE FROM THE DETECTOR CHECK AND THE VAULT WALLS.
4. INSTALL GATE VALVES & FIRE LINE ASSEMBLY 30" TO 42" ABOVE VAULT FLOOR.
5. FIRE LINE METER ASSEMBLY TO BE FIRE LINE FM-720-R1 WITH SENSUS B" METER. ASSEMBLY SHALL BE FM OR UL APPROVED.

DRAWN:

R.H.

CHECKED:

CHECKED:



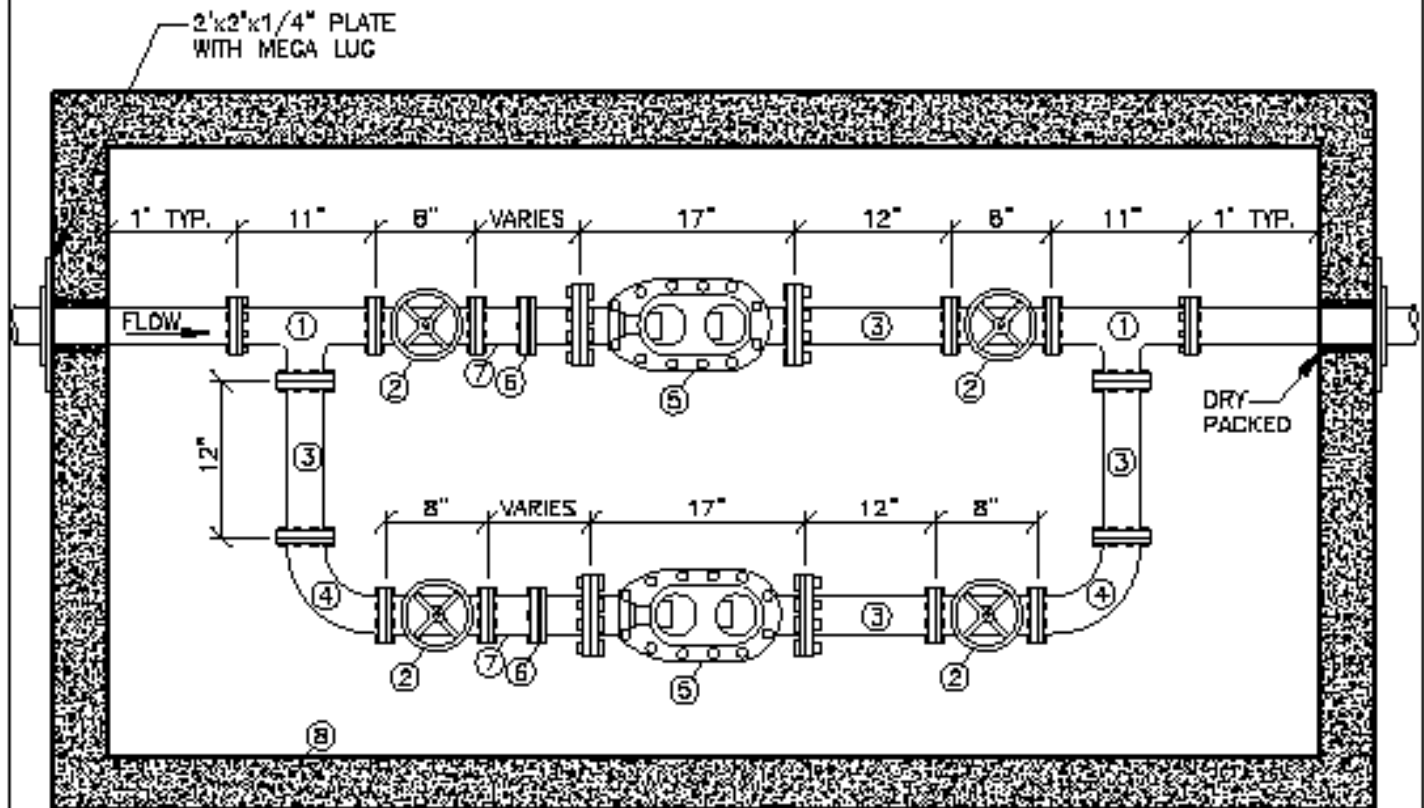
# 8" Fire Line Meter Vault

DATE:

09-06-16

DRWG NO.:

CW19



\*SEE CW9 FOR VAULT SIZES

**NOTES:**

1. CONTRACTOR TO PERFORM ALL CONSTRUCTION AND INSTALLATION OF THE WATER METER.
2. PROMDE AND PLACE BACKFILL PER APWA SECTION 31 23 23. COMPACT PER APWA SECTION 31 23 26 TO A DENSITY OF 95 PERCENT OR GREATER. MAXIMUM LIFT THICKNESS IS 6" WHEN USING RIDING COMPACTION AND 6" WHEN USING HAND HELD COMPACTION EQUIPMENT.
3. SEE CW9 FOR PRECAST VAULT SIZE. ALLOW 1" CLEARANCE AROUND THE LINE THROUGH THE VAULT WALL. DRY PACK REMAINING SPACE AROUND PIPE. SUPPORT WATER METER ON LATERAL AND BYPASS WITH JACK STANDS.
4. ALL JOINTS MUST BE RESTRAINED.

|      |     | APPROVED MATERIAL                    |             |
|------|-----|--------------------------------------|-------------|
| ITEM | QTY | DESCRIPTION                          | LIST NUMBER |
| 1    | 2   | 3"x3"x3" (FLxFLxFL) TEE              | 6-B         |
| 2    | 4   | 3" GATE VALVE (FLxFL) WITH HANDWHEEL | 2-B         |
| 3    | 4   | 3"x12" (FLxFL) SPOOL                 | 1-C         |
| 4    | 2   | 3" 90 DEGREE ELBOW (FLxFL)           | 6-C         |
| 5    | 2   | 3" METER                             | 13-C        |
| 6    | 2   | 3" DRESSER                           | 6-A         |
| 7    | 4   | 3" DUCTILE IRON PIPE (FLxCUT TO FIT) | 1-C         |
| 8    | 1   | VAULT (PRECAST)                      | -           |

\*ALL FITTINGS ARE FLANGED UNLESS OTHERWISE NOTED

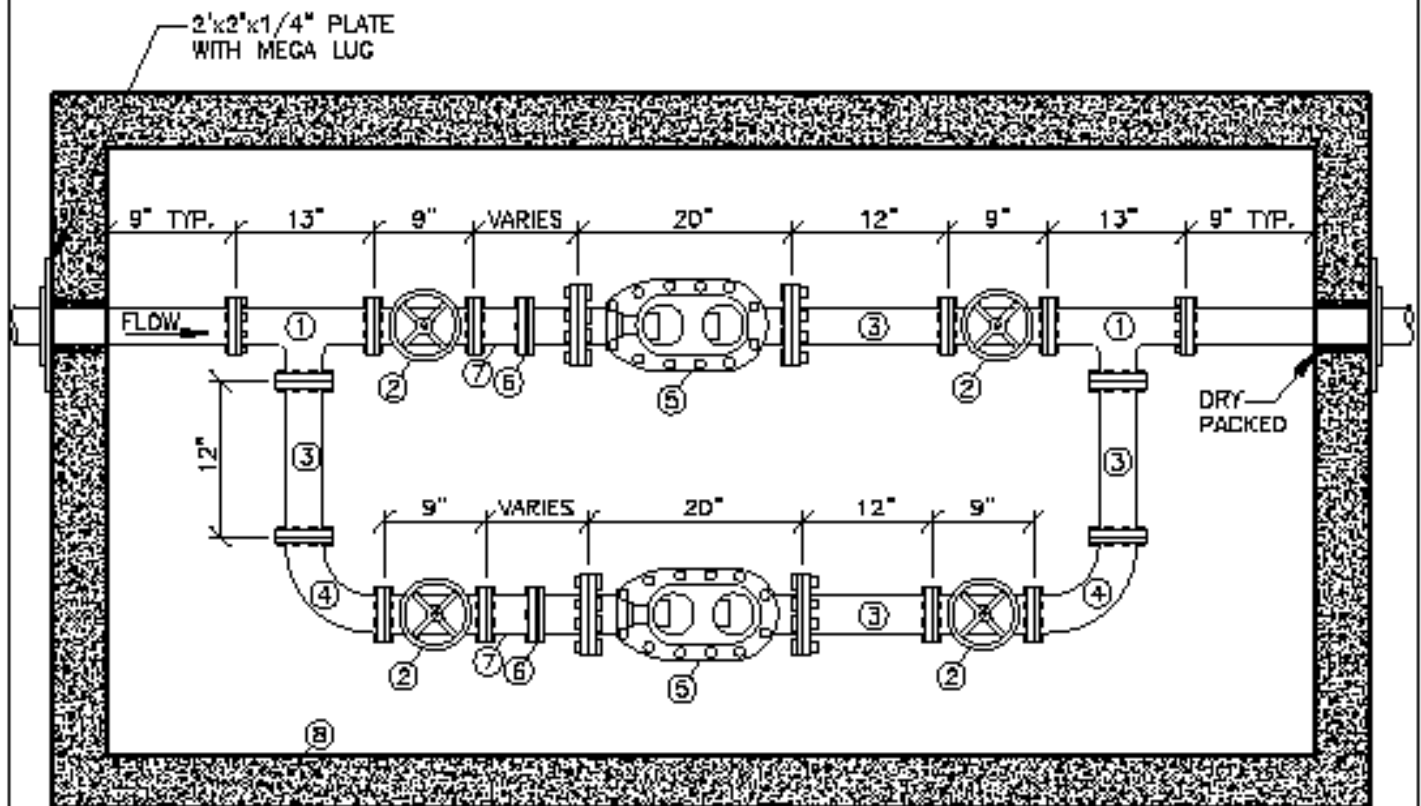
DRAWN:  
R.H.  
CHECKED:  
CHECKED:



# 3" Compound Meter w/ 3" Bypass

DATE:  
09-06-16  
DRWG NO.:  
**CW20**





\*SEE CW9 FOR VAULT SIZES

**NOTES:**

1. CONTRACTOR TO PERFORM ALL CONSTRUCTION AND INSTALLATION OF THE WATER METER.
2. PROVIDE AND PLACE BACKFILL PER APWA SECTION 31 23 23. COMPACT PER APWA SECTION 31 23 26 TO A DENSITY OF 95 PERCENT OR GREATER. MAXIMUM LIFT THICKNESS IS 6" WHEN USING RIDING COMPACTION AND 6" WHEN USING HAND HELD COMPACTION EQUIPMENT.
3. SEE CW9 FOR PRECAST VAULT SIZE. ALLOW 1" CLEARANCE AROUND THE LINE THROUGH THE VAULT WALL. DRY PACK REMAINING SPACE AROUND PIPE. SUPPORT WATER METER ON LATERAL AND BYPASS WITH JACK STANDS.
4. ALL JOINTS MUST BE RESTRAINED.

| ITEM | QTY | DESCRIPTION                          | APPROVED MATERIAL |  |
|------|-----|--------------------------------------|-------------------|--|
|      |     |                                      | LIST NUMBER       |  |
| 1    | 2   | 4"x4"x4" {FLxFLxFL} TEE              | 6-B               |  |
| 2    | 4   | 4" GATE VALVE (FLxFL) WITH HANDWHEEL | 2-B               |  |
| 3    | 4   | 4"x12" (FLxFL) SPOOL                 | 1-C               |  |
| 4    | 2   | 4" 90 DEGREE ELBOW (FLxFL)           | 6-C               |  |
| 5    | 2   | 4" METER                             | 13-C              |  |
| 6    | 2   | 4" DRESSER                           | 6-A               |  |
| 7    | 4   | 4" DUCTILE IRON PIPE (FLxCUT TO FIT) | 1-C               |  |
| 8    | 1   | VAULT (PRECAST)                      | -                 |  |

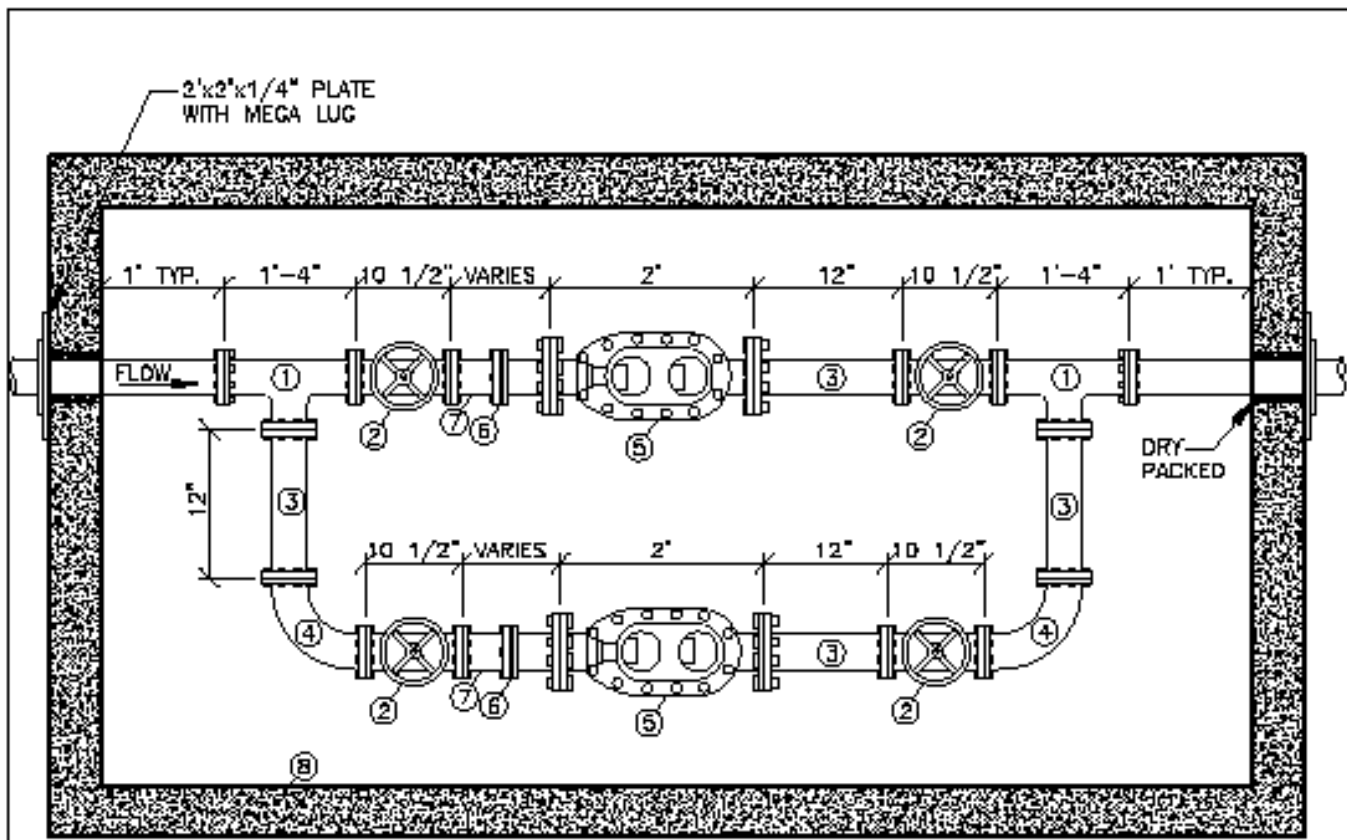
\*ALL FITTINGS ARE FLANGED UNLESS OTHERWISE NOTED

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



# 4" Compound Meter w/ 4" Bypass

DATE:  
09-06-16  
DRWG NO.:  
**CW21**



\*SEE CW9 FOR VAULT SIZES

**NOTES:**

1. CONTRACTOR TO PERFORM ALL CONSTRUCTION AND INSTALLATION OF THE WATER METER.
2. PROVIDE AND PLACE BACKFILL PER APWA SECTION 31 23 23. COMPACT PER APWA SECTION 31 23 28 TO A DENSITY OF 95 PERCENT OR GREATER. MAXIMUM LIFT THICKNESS IS 8" WHEN USING RIDING COMPACTION AND 6" WHEN USING HAND HELD COMPACTION EQUIPMENT.
3. SEE CW9 FOR PRECAST VAULT SIZE. ALLOW 1" CLEARANCE AROUND THE LINE THROUGH THE VAULT WALL. DRY PACK REMAINING SPACE AROUND PIPE. SUPPORT WATER METER ON LATERAL AND BYPASS WITH JACK STANDS.
4. ALL JOINTS MUST BE RESTRAINED.

|      |     | APPROVED MATERIAL                    |             |
|------|-----|--------------------------------------|-------------|
| ITEM | QTY | DESCRIPTION                          | LIST NUMBER |
| 1    | 2   | 6"x6"x6" (FLxFLxFL) TEE              | 6-B         |
| 2    | 4   | 6" GATE VALVE (FLxFL) WITH HANDWHEEL | 2-B         |
| 3    | 4   | 6"x12" (FLxFL) SPOOL                 | 1-C         |
| 4    | 2   | 6" 90 DEGREE ELBOW (FLxFL)           | 6-C         |
| 5    | 2   | 6" METER                             | 13-C        |
| 6    | 2   | 6" DRESSER                           | 6-A         |
| 7    | 4   | 6" DUCTILE IRON PIPE (FLxCUT TO FIT) | 1-C         |
| 8    | 1   | VAULT (PRECAST)                      | 9-A         |

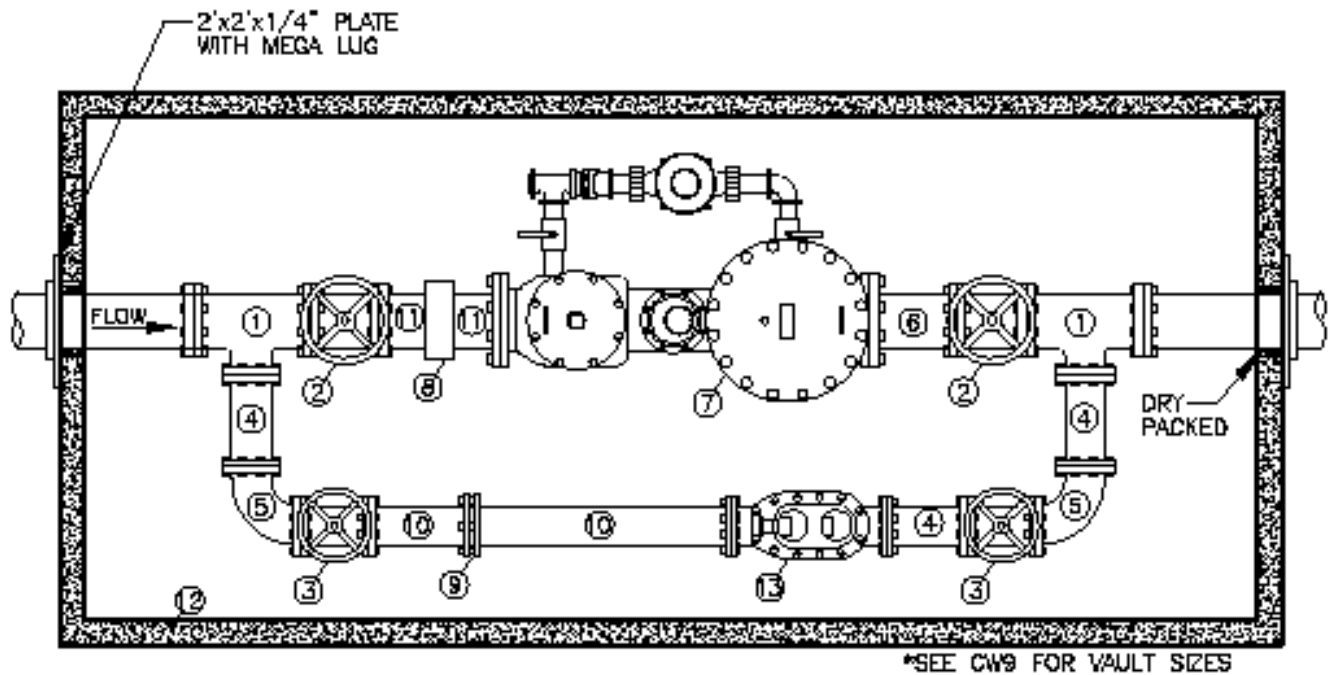
\*ALL FITTINGS ARE FLANGED UNLESS OTHERWISE NOTED

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



# 6" Compound Meter w/ 6" Bypass

DATE:  
09-06-16  
DRWG NO.:  
**CW22**



**NOTES:**

1. CONTRACTOR TO PERFORM ALL CONSTRUCTION AND INSTALLATION OF THE WATER METER.
2. PROVIDE AND PLACE BACKFILL PER APWA SECTION 31 23 23, COMPACT PER APWA SECTION 31 23 26 TO A DENSITY OF 95 PERCENT OR GREATER. MAXIMUM LIFT THICKNESS IS 8" WHEN USING RIDING COMPACTION AND 6" WHEN USING HAND HELD COMPACTION EQUIPMENT.
3. PRECAST VAULT TO BE DESIGNED BY A LICENSED STRUCTURAL ENGINEER. VAULT LAYOUT FOR AN 8" WATER METER WITH BYPASS MUST BE APPROVED BY KID DISTRICT ENGINEER. ALLOW 1" CLEARANCE AROUND THE LINE THROUGH THE VAULT WALL. DRY PACK REMAINING SPACE AROUND PIPE. SUPPORT WATER METER ON LATERAL AND BYPASS WITH JACK STANDS.
4. ALL JOINTS MUST BE RESTRAINED.

| ITEM | QTY | DESCRIPTION                          | APPROVED MATERIAL |
|------|-----|--------------------------------------|-------------------|
|      |     |                                      | LIST NUMBER       |
| 1    | 2   | 8"x8"x8" (FLxFLxFL) TEE              | 8-B               |
| 2    | 2   | 8" GATE VALVE (FLxFL) WITH HANDWHEEL | 2-B               |
| 3    | 2   | 8" GATE VALVE (FLxFL) WITH HANDWHEEL | 2-B               |
| 4    | 3   | 6"x12" (FLxFL) SPOOL                 | 1-C               |
| 5    | 2   | 6" 90 DEGREE ELBOW (FLxFL)           | 6-C               |
| 6    | 1   | 8"x12" (FLxFL) SPOOL                 | 1-C               |
| 7    | 1   | 8" WATER METER WITH RADIO HEAD       | 13-C              |
| 8    | 1   | 8" DRESSER                           | 8-A               |
| 9    | 1   | 6" DRESSER                           | 6-A               |
| 10   | 2   | 8" DUCTILE IRON PIPE (FLxCUT TO FIT) | 1-C               |
| 11   | 2   | 8" DUCTILE IRON PIPE (FLxCUT TO FIT) | 1-C               |
| 12   | 1   | VAULT (PRECAST)                      | 9-A               |
| 13   | 1   | 6" METER                             | 13-C              |

\*ALL FITTINGS ARE FLANGED UNLESS OTHERWISE NOTED

DRAWN:

R.H.

CHECKED:

CHECKED:



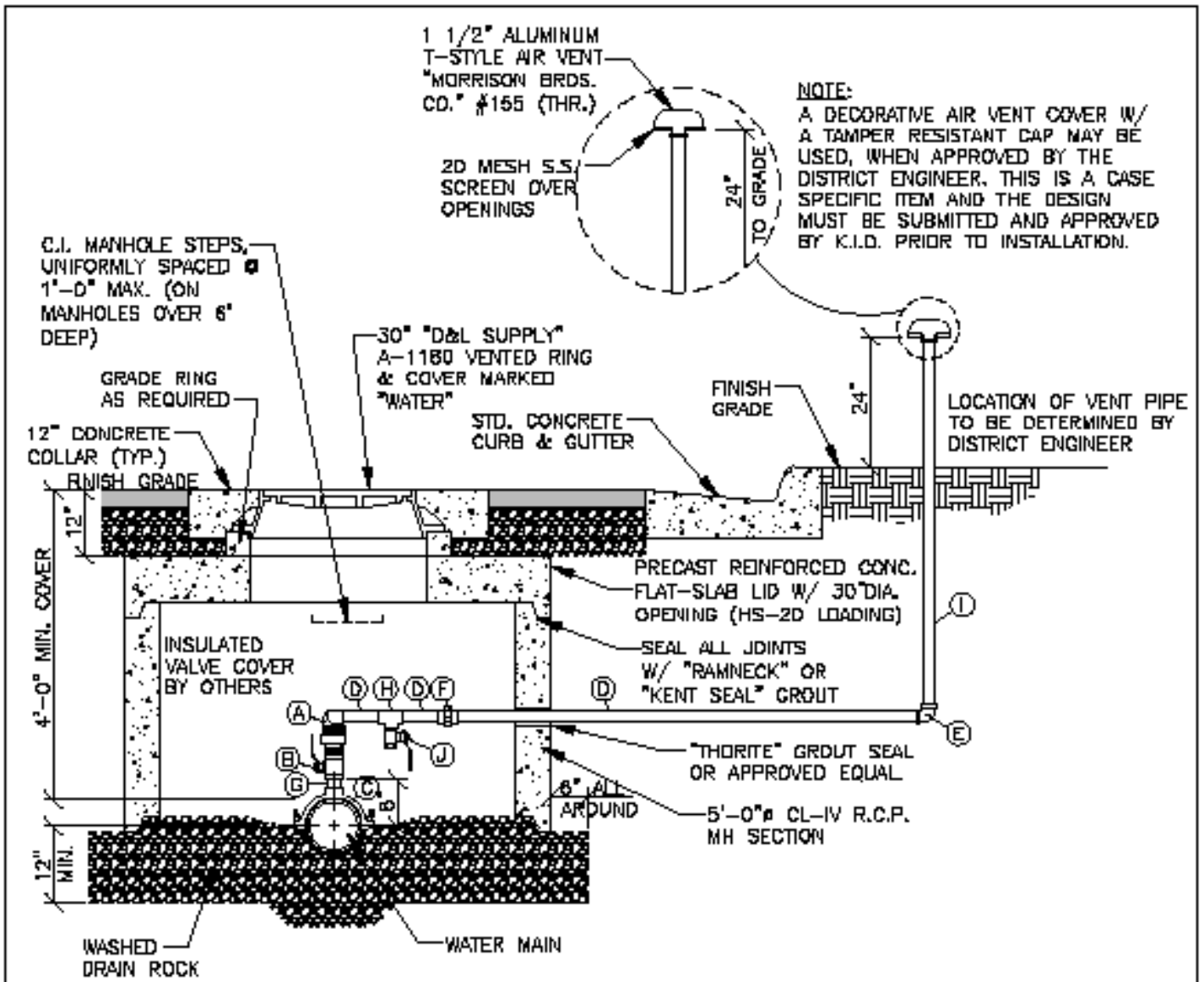
# 8" Compound Meter w/ 6" Bypass

DATE:

09-06-16

DRWG NO.:

CW23



| PIPE & FITTING SCHEDULE |  |         |
|-------------------------|--|---------|
| NO.                     | DESCRIPTION  | FITTING |
| A                       | 2" COMBINATION AIR-VACUUM RELIEF VALVE "A.R.I." MODEL D-040 P W/ NPT CONNECTIONS | THR.    |
| B                       | 2" BRASS BALL VALVE (1/4 TURN)   | THR.    |
| C                       | 2" NYLON COATED W/ DOUBLE S.S. STRAPS SERVICE SADDLE                             |         |
| D                       | 1 1/2" SCH. 80 PVC PIPE  | THR.    |
| E                       | 1 1/2" GALV. STEEL 90° ELBOW   | THR.    |
| F                       | 1 1/2" SCH. 80 PVC UNION   | THR.    |
| G                       | 2" BRASS PIPE  | THR.    |
| H                       | 1 1/2" SCH. 80 PVC TEE   | THR.    |
| I                       | 1 1/2" GALV. STEEL PIPE  | THR.    |
| J                       | 1 1/2" BALL DRAIN VALVE  | THR.    |

NOTE: USE A 2" HEAVY-DUTY COMBINATION AIR-VACUUM RELIEF VALVE - "APCO" MODEL 145C WHEN SPECIFIED BY THE DISTRICT ENGINEER.

DRAWN:

R.H.

CHECKED:

CHECKED:



## Air/Vacuum Relief Station

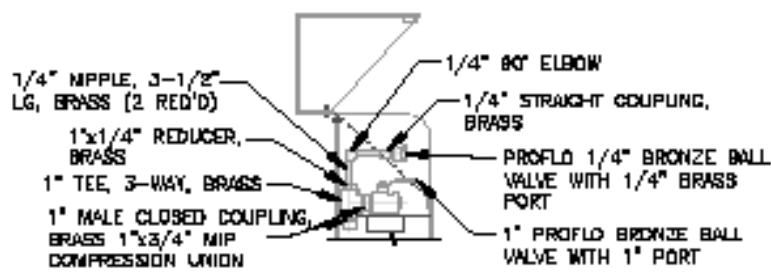
### Detail

DATE:

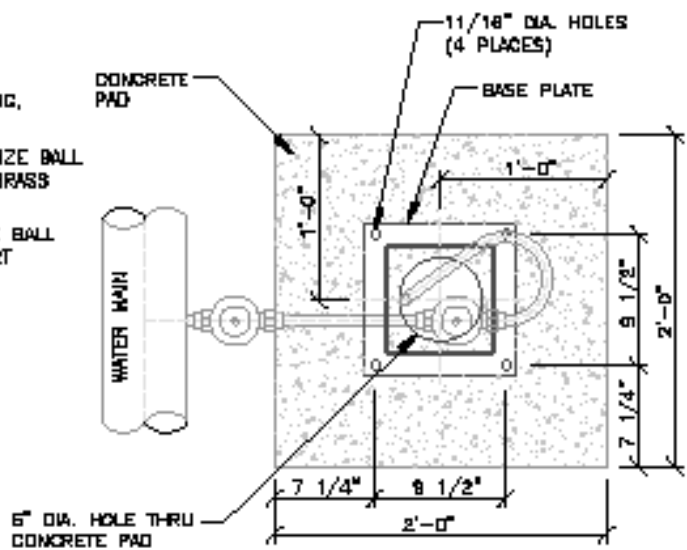
09-06-16

DRWG NO.:

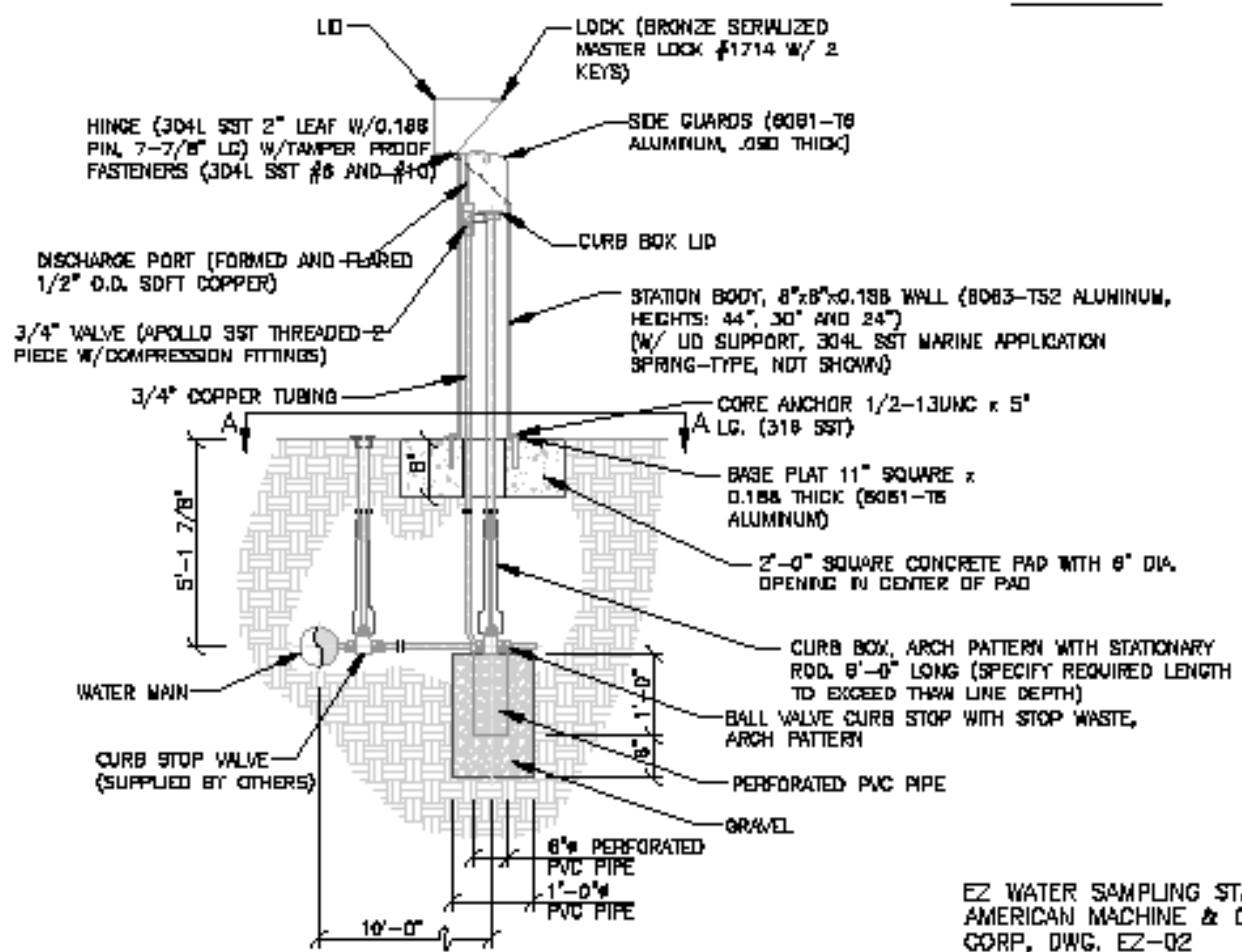
CW24



**1" Flush Valve Assembly**



**Section A-A**



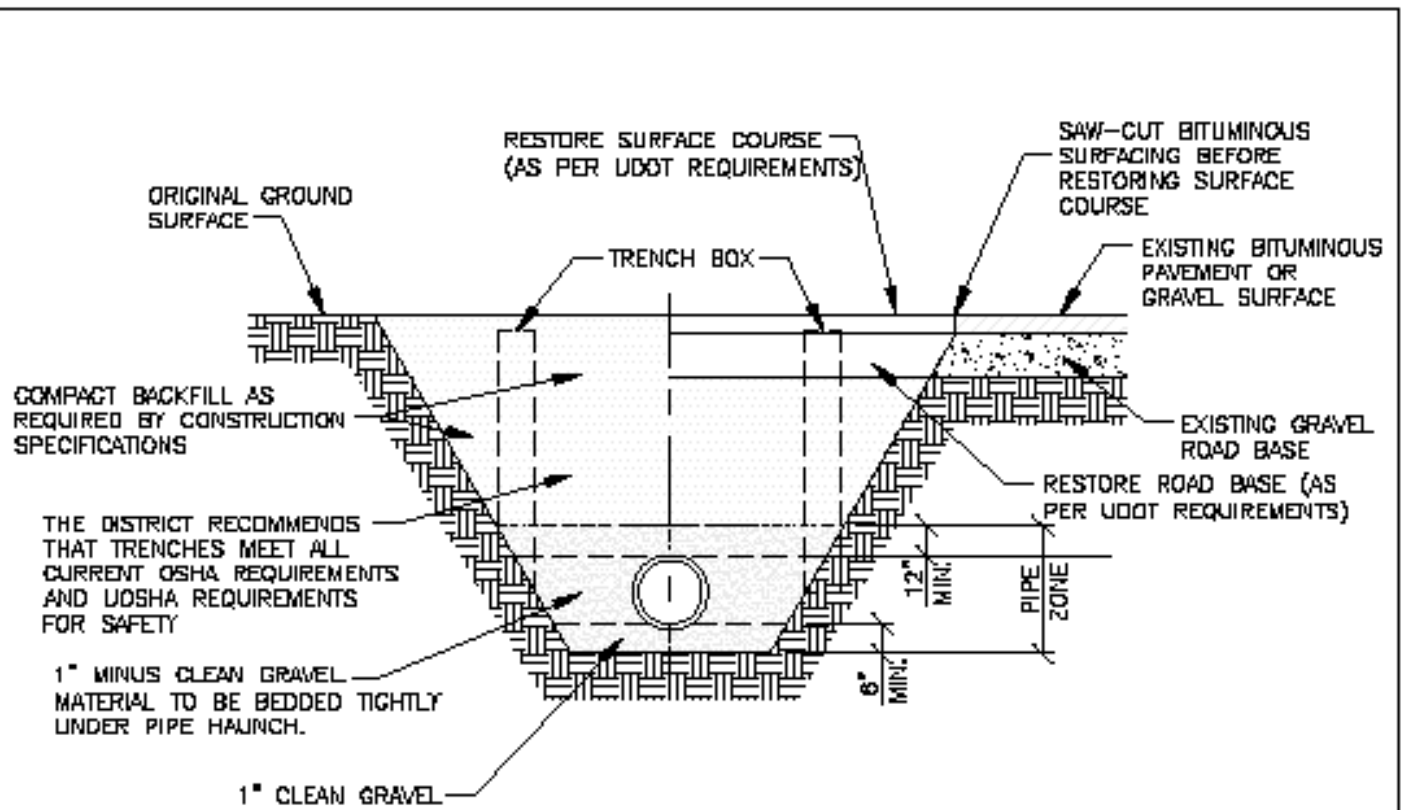
EZ WATER SAMPLING STATION,  
AMERICAN MACHINE & CONVEYOR  
CORP, DWG. EZ-02

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



# Typical Water Sampling Station

DATE:  
09-06-16  
DRWG NO.:  
CW25



**Notes:**

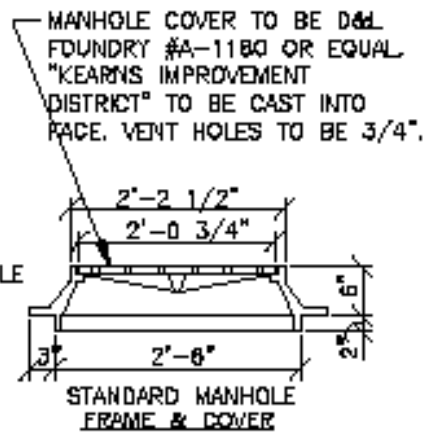
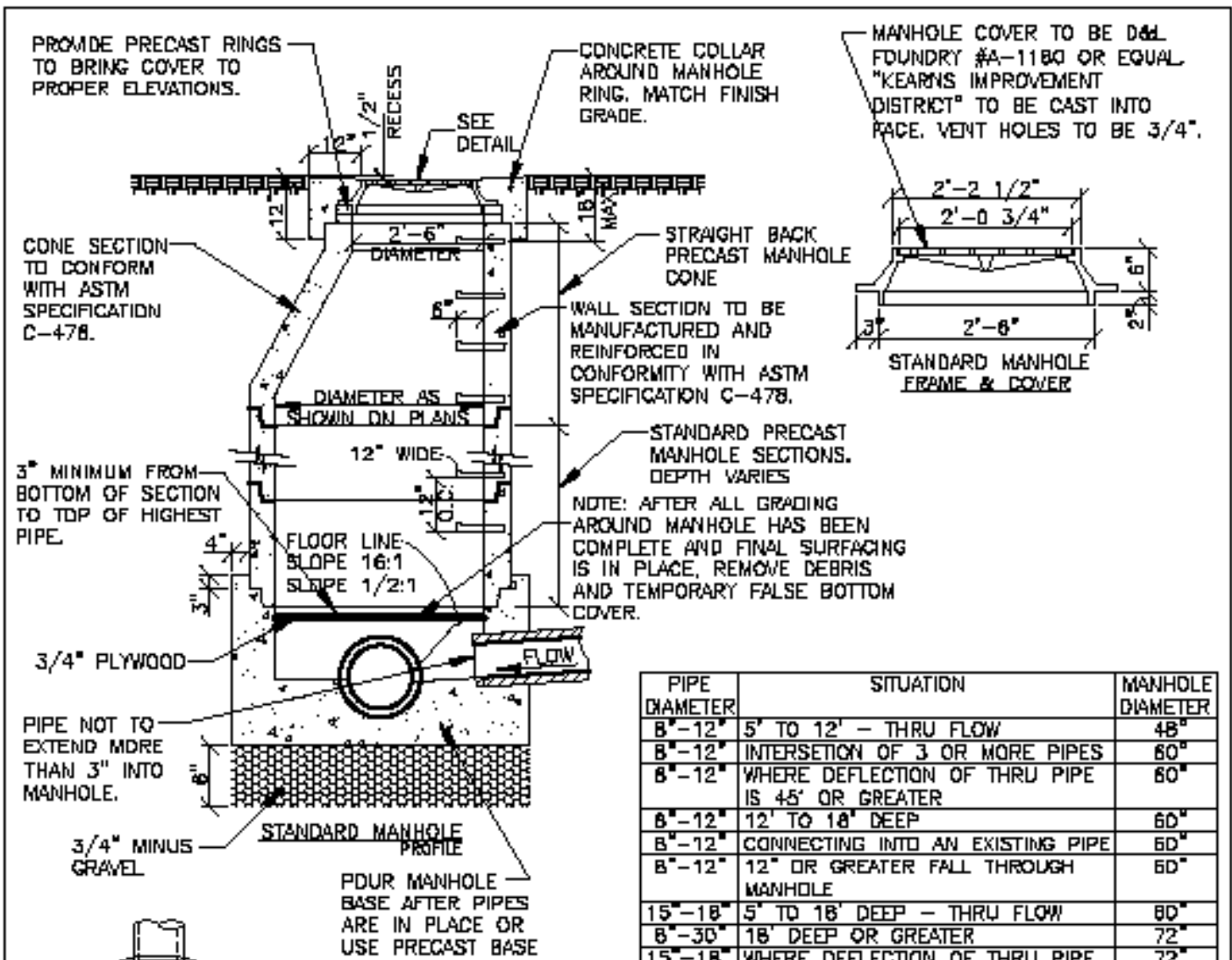
1. KID recommends contractor meet all of the requirements established for safe trenching. (See OSHA and UOSHA requirements, latest additions.)
2. Contractor shall locate all underground utilities before laying pipe within 50' of said utilities which may be exposed, damaged or crossed as shown on the drawings or as "Blue Staked". The contractor will make arrangements with the Utility Company to move the Utility if necessary or obtain permission from the District Engineer to modify grade of pipeline in order to go around existing utilities.
3. Testing: All new sanitary sewers to be "Telediscovered" and necessary repairs made before acceptance. All lines shall be pressure tested to a 3.5 psi minimum. A mandrel or ball can be used to verify deformation of a pipe as determined from the video unless specified otherwise.
4. All sewer lines to be installed in Public right-of-way or recorded sewer easements unless otherwise approved by the Keams Improvement District.
5. KID inspection of pipe bedding placement and pipe zone backfill is required prior to placement of trench backfill.
6. Sewer pipe bedding: Pipe shall be laid on a minimum of 6" of 1" clean gravel.
7. Sewer line pipe zone backfill within the pipe zone shall be 1" minus clean gravel placed a minimum of 1'-0" above the top of pipe. Compaction of fill material under the haunches of the pipe is required.
8. Backfill above the pipe zone is as per the prevailing authority.
9. Pipe Location: Install pipe in the center of the trench.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



# Typical Sewer Line Trench Detail

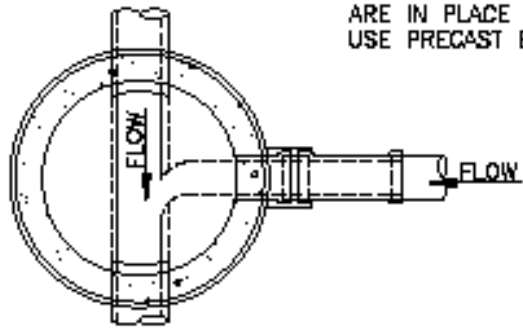
DATE:  
09-06-16  
DRWG NO.:  
**SS1**



| PIPE DIAMETER | SITUATION                                       | MANHOLE DIAMETER |
|---------------|---|------------------|
| 8"-12"        | 5' TO 12' - THRU FLOW                           | 48"              |
| 8"-12"        | INTERSECTION OF 3 OR MORE PIPES                 | 60"              |
| 8"-12"        | WHERE DEFLECTION OF THRU PIPE IS 45° OR GREATER | 60"              |
| 8"-12"        | 12' TO 18' DEEP                                 | 60"              |
| 8"-12"        | CONNECTING INTO AN EXISTING PIPE                | 60"              |
| 8"-12"        | 12" OR GREATER FALL THROUGH MANHOLE             | 60"              |
| 15"-18"       | 5' TO 18' DEEP - THRU FLOW                      | 80"              |
| 8"-30"        | 18' DEEP OR GREATER                             | 72"              |
| 15"-18"       | WHERE DEFLECTION OF THRU PIPE IS 45° OR GREATER | 72"              |
| 21"-36"       | 7' DEEP OR GREATER                              | 72"              |
| 15"-36"       | INTERSECTION OF 3 OR MORE PIPES                 | 72"              |

TABLE 1

- NOTES:
1. PROVIDE STUBS WHERE SHOWN ON THE PLAN DRAWINGS.
  2. FURNISH & INSTALL 3/4" PLYWOOD FALSE BOTTOM COVERS IN ALL NEW OR EXISTING MANHOLES AROUND WHICH GRADING OR SURFACING IS BEING PERFORMED. PLYWOOD BOTTOMS TO BE REMOVED AFTER PAVING.
  3. MANHOLES MAY BE 4'-0", 5'-0", OR 6'-0" AS SHOWN IN TABLE 1 OR AS SPECIFIED BY THE DISTRICT ENGINEER.
  4. PROVIDE STEPS ON WALLS OF MANHOLE SECTIONS @ 12" O.C. AND POSITIONED UNDER OPENING. STEPS SHALL BE CAST-IN-PLACE, VIBRATED INTO GREEN CONCRETE, OR PRESS-FIT INTO PREFORMED HOLES IN WALLS.
  5. STEPS SHALL BE CO-POLYMER POLYPROPYLENE COATED STEEL STEPS, MODEL PST-PF, AS MANUFACTURED BY M.A. INDUSTRIES, INC., OR ACCEPTABLE EQUAL.



STANDARD MANHOLE PLAN VIEW

| MINIMUM DROPS THRU SEWER MANHOLES |                                       |
|-----------------------------------|---------------------------------------|
| ANGLE                             | DROPS ACROSS MANHOLE                  |
| GREATER THAN 90°                  | 0.3'                                  |
| 75°-80°                           | 0.2'                                  |
| 25°-75°                           | 0.2'                                  |
| 0°-25°                            | NO LESS THAN GRADE OF DOWNSTREAM PIPE |

TABLE 2

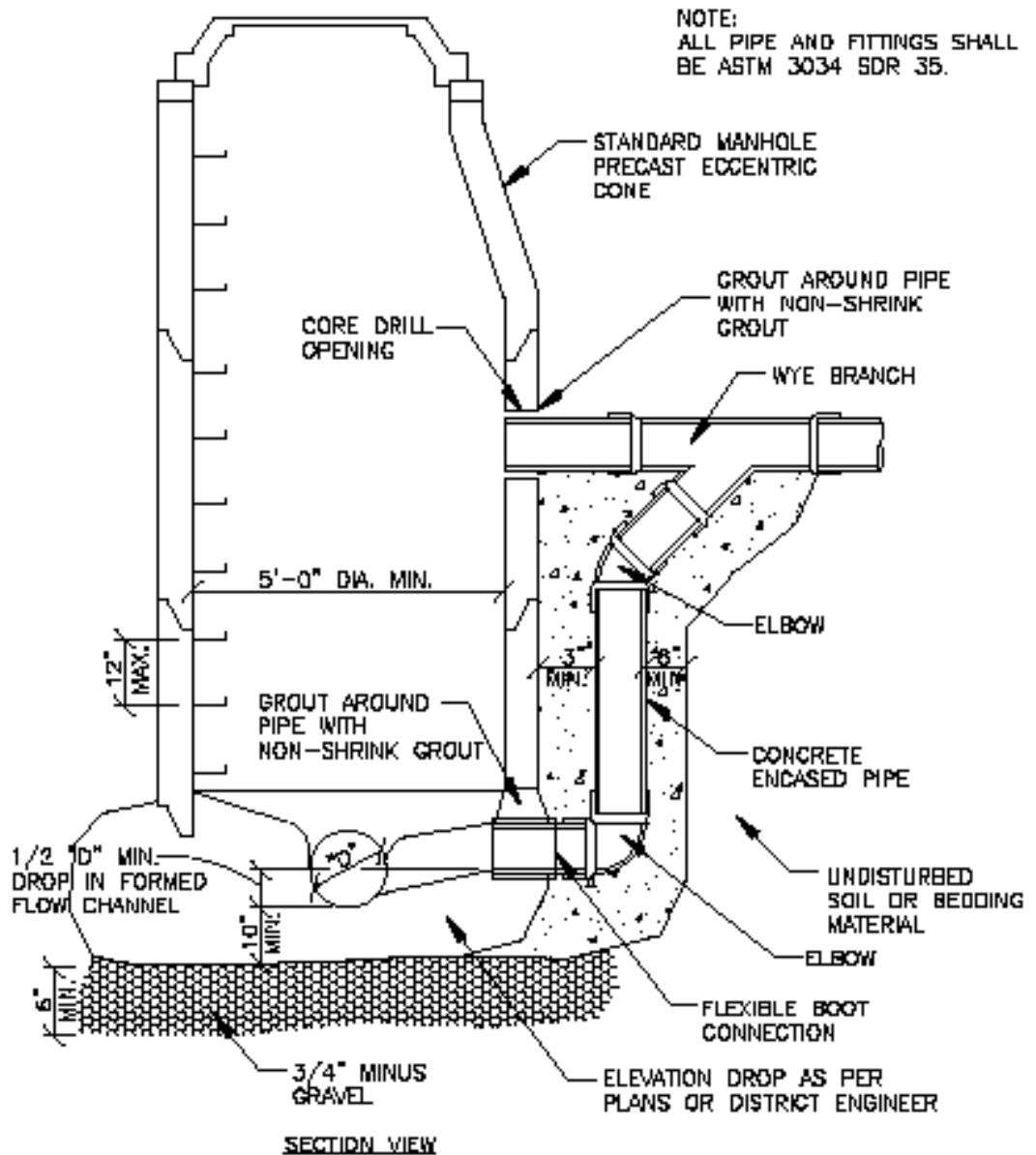
DRAWN:  
R.H.  
CHECKED:  
CHECKED:



# Standard Precast Manhole

## Detail

DATE:  
09-06-16  
DRWG NO.:  
SS2



NOTES:

1. INSPECTION: PRIOR TO BACKFILLING AROUND OUTSIDE DROP MANHOLE SECURE INSPECTION OF INSTALLATION BY DISTRICT INSPECTOR.
2. BACKFILLING: INSTALL ALL BACKFILL MATERIAL PER SPECIFICATION REQUIREMENTS.
3. CONCRETE: CLASS 4000 AS PER SPECIFICATIONS.
4. FINISH: PROVIDE SMOOTH AND NEAT FINISH ON INTERIOR OF GRADE RINGS.
5. FURNISH AND INSTALL 3/4" PLYWOOD FALSE BOTTOM COVER IN ALL NEW OR EXISTING MANHOLES AROUND WHICH GRADING OR SURFACING IS BEING PERFORMED.
6. DROP MANHOLES ARE TO BE USED ONLY WHEN APPROVED IN WRITING BY THE DISTRICT ENGINEER.
7. DROP MANHOLES REQUIRED FOR ANY LINE ENTERING MANHOLE TWO (2) FEET OR MORE ABOVE THE FLOWLINE OF MAIN LINE.

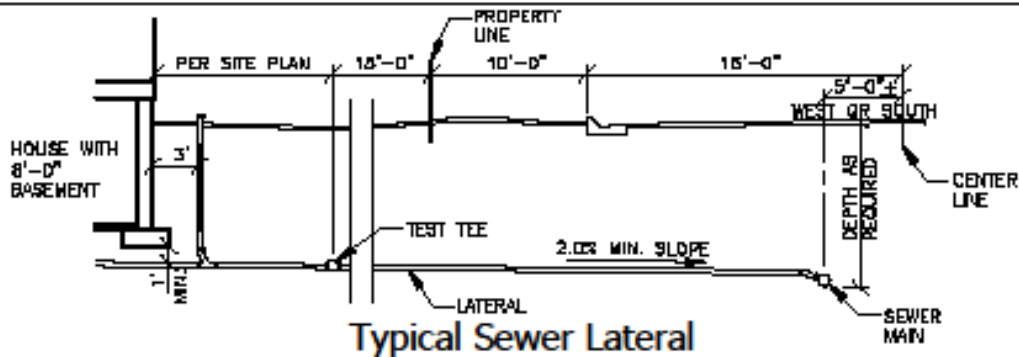
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R.H.  
CHECKED:  
CHECKED:



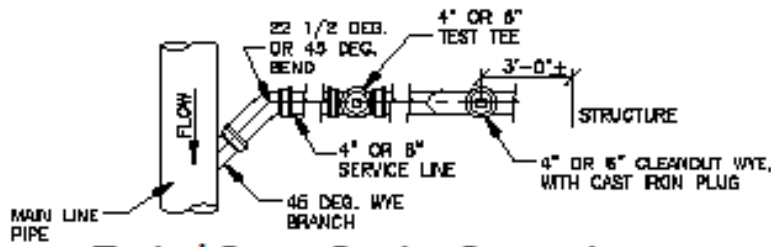
# Typical Outside Drop Manhole Detail

DATE:  
09-06-16  
DRWG NO.:  
**SS3**

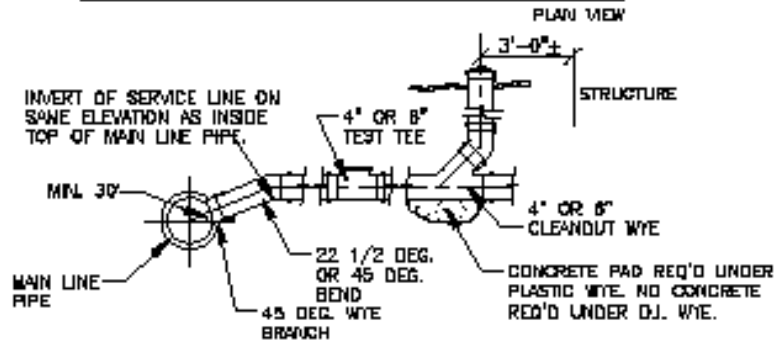




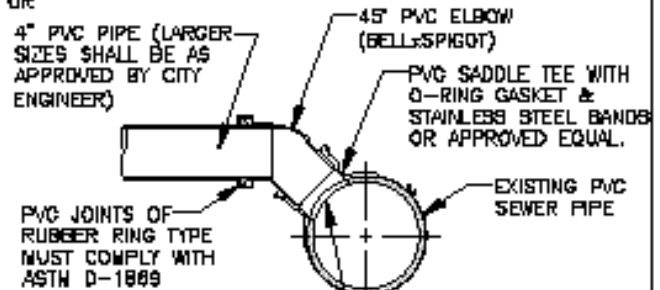
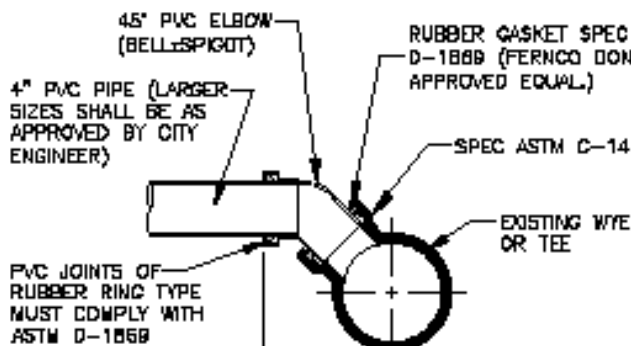
**Typical Sewer Lateral**



**Typical Sewer Branch Service Connection**



**Typical Sewer Branch Service Connection**



INDIVIDUAL USER RESPONSIBILITY CITY RESPONSIBILITY

NOTE:  
PVC PIPE FITTINGS ASTM D-3034 WITH A S.D.R. 35

**Connecting into Existing Wye or Tee**

TAPPING INTO EXISTING PIPE & CONNECTING SADDLE TO BE FURNISHED & INSTALLED BY CONTRACTOR AND PAID FOR AS A PART OF THE CITY SEWER CONNECTION FEE.

NOTE:  
PVC PIPE FITTINGS ASTM D-3034 WITH A S.D.R. 35

**Tapping into Existing PVC Pipe**

DRAWN:  
R.H.

CHECKED:

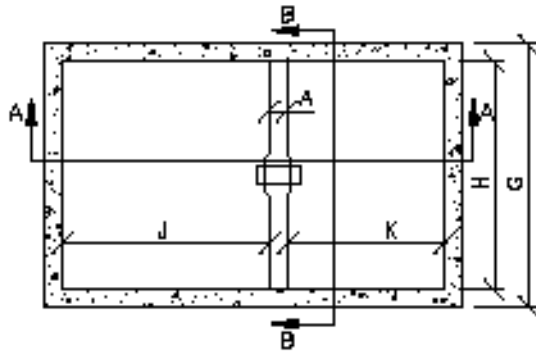
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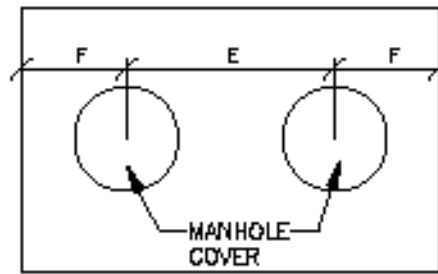
**Sewer Service Connection**

DATE:  
09-06-16

DRWG NO.:  
**SS4**



**Box Plan View**



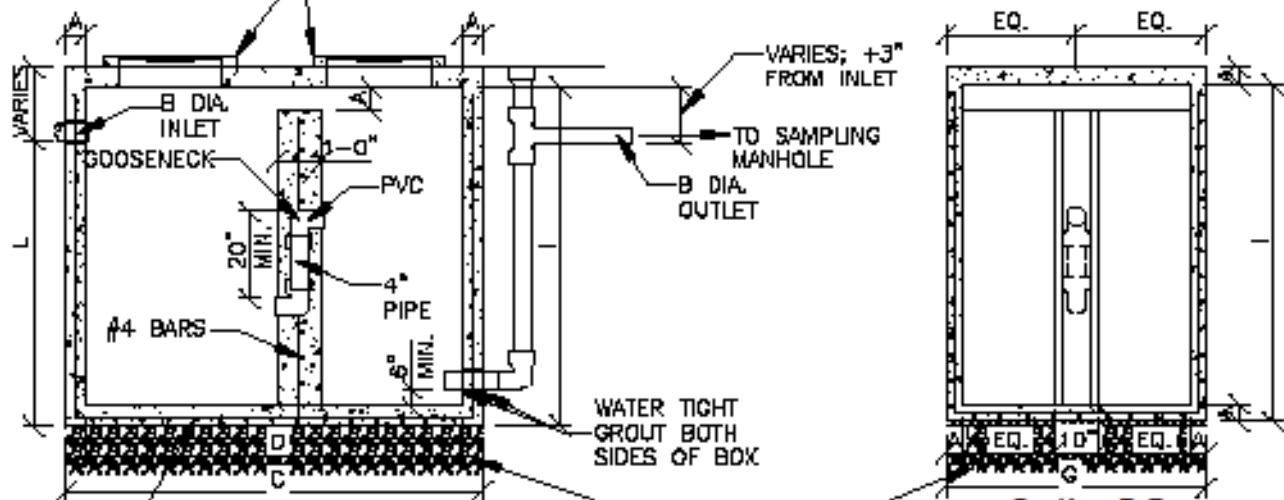
**Lid Plan View**

RING & COVER (A1100)  
OR EQUAL, IF APPROVED  
BY KID, TYPICAL OF 2.

NO MORE THAN ONE  
GRADE RING (1" MAX.)  
PER RING & COVER.



**Lid Section**



**Section A-A**

**Section B-B**

#4 @ 6" O.C.  
EACH WAY  
SEE NOTE 3

**NOTES:**

1. INSPECTION: PRIOR TO BACKFILLING AROUND CONCRETE BOX, SECURE INSPECTION OF INSTALLATION BY DISTRICT INSPECTOR.
2. BASE: PROVIDE 6" OF 3/4" MINUS GRAVEL UNDER GREASE TRAP.
3. IF PREFABRICATED GREASE TRAP IS USED, SUBMIT DESIGN DETAILS TO DISTRICT ENGINEER FOR APPROVAL.
4. SEE SSB FOR SAMPLING MANHOLE DETAIL.
5. GREASE TRAP INTERCEPTOR SHALL BE 1,000 GAL. MINIMUM CAPACITY. THIS INTERCEPTOR IS NOT A REPLACEMENT FOR AN APPROPRIATELY SIZED AND LOCATED INDOOR GREASE INTERCEPTOR. INDOOR GREASE INTERCEPTORS SHALL COMPLY WITH ALL LOCAL & IPC REQUIREMENTS AND SPECIFICATIONS AND BE PLUMBING AND DRAINAGE INSTITUTE CERTIFIED.
6. COVER SHALL BE FLUSH WITH FINISH GRADE.
7. NO MORE THAN ONE GRADE RING (1" MAX.) ALLOWED PER RING AND COVER. IF MORE RISE IS REQUIRED A SHELL SECTION WITH CENTER WALL SHALL BE INSTALLED.
8. SANITARY SEWER (S.S.) SHALL NOT RUN THROUGH THE SAMPLING MANHOLE AND/OR GREASE INTERCEPTOR. S.S. SHALL BE CONNECTED TO THE SEWER LATERAL DOWNSTREAM FROM THE SAMPLING MANHOLE.
9. WHEN JOINING TWO PIPES OF DIFFERENT COMPOSITION, USE FERNOCO COUPLERS. (NOTE: "NO HUB" BANDS ARE NOT ALLOWED).
10. BENDS TOTALING 90° MUST BE PROVIDED WITH A CLEANOUT.
11. DISTANCE BETWEEN CLEANOUTS NOT TO EXCEED 80'.
12. AT INSPECTION, FILL INTERCEPTOR WITH WATER ABOVE INLET AND OUTLET OF WATER TIGHT JOINTS.
13. GREASE INTERCEPTOR SHALL BE SUITABLE FOR H-20 LOADINGS.
14. 3/4" MINUS, OR PEA GRAVEL ARE TO BE USED FOR BEDDING AND BACKFILL.
15. GREASE INTERCEPTOR SHALL BE VENTED THROUGH BUILDING PLUMBING.

| GREASE TRAP DIMENSIONS |           |           |           |
|------------------------|-----------|-----------|-----------|
|                        | 1000 GAL. | 1500 GAL. | 2100 GAL. |
| A                      | 6"        | 8"        | 8"        |
| B                      | 4"        | 4"        | 6"        |
| C                      | 8'-6"     | 9'-6"     | 13'-0"    |
| D                      | 8'-6"     | 8'-6"     | 12'-0"    |
| E                      | 5'-6"     | 5'-6"     | 8'-0"     |
| F                      | 1'-6"     | 1'-6"     | 2'-0"     |
| G                      | 5'-6"     | 5'-8"     | 7'-0"     |
| H                      | 4'-8"     | 4'-8"     | 8'-0"     |
| I                      | 4'-6"     | 6'-0"     | 5'-0"     |
| J                      | 5'-6"     | 5'-0"     | 8'-0"     |
| K                      | 3'-0"     | 3'-0"     | 4'-0"     |
| L                      | 3'-6"     | 3'-0"     | 4'-0"     |

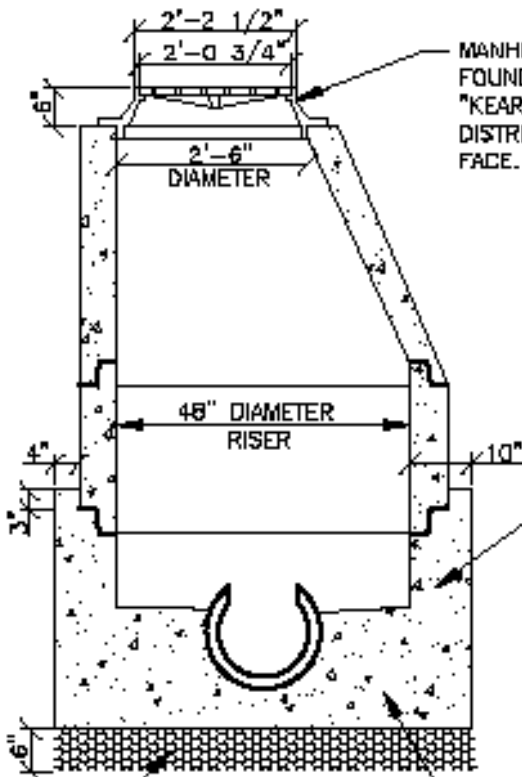
L\* MINIMUM

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



# Typical Grease Trap Detail

DATE:  
09-06-16  
DRWG NO.:  
SS5



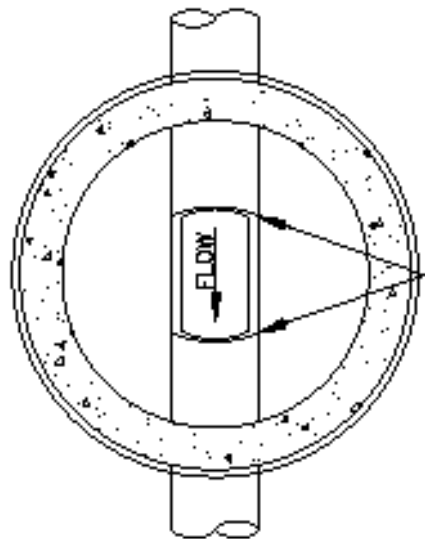
MANHOLE COVER TO BE D&L  
 FOUNDRY #A-1180 OR EQUAL  
 "KEARNS IMPROVEMENT  
 DISTRICT" TO BE CAST INTO  
 FACE. VENT HOLES TO BE 3/4".

STANDARD PRECAST  
 MANHOLE BASE

3/4" MINUS  
 GRAVEL

SAMPLING MANHOLE  
 PROFILE

POUR MANHOLE  
 BASE AFTER PIPES  
 ARE IN PLACE OR  
 USE PRECAST BASE



SAMPLING MANHOLE  
 PLAN VIEW

**NOTES:**

1. ALL LATERAL PLUGS SHALL BE SLIP IN SOLID PLASTIC PLUGS (BRANDT PLUGS ARE NOT ALLOWED).
2. IF DAMAGE IS CAUSED TO SEWER MAIN, DUE TO MANHOLE INSTALLATION AND/OR OTHER MEANS, CONTRACTOR WILL BE HELD RESPONSIBLE FOR REPAIRS.
3. SANITARY SEWER SHALL NOT RUN THROUGH THE SAMPLING MANHOLE AND/OR GREASE INTERCEPTOR. SANITARY SEWER SHALL BE CONNECTED TO THE SEWER LATERAL DOWNSTREAM FROM THE SAMPLING MANHOLE.
4. SAMPLING MANHOLE SHALL BE SUITABLE FOR H-20 LOADINGS.
5. THE EXISTING SEWER COLLECTION SYSTEM SHALL REMAIN IN SERVICE DURING CONSTRUCTION.
6. ALL MANHOLES SHALL HAVE A CONCRETE COLLAR PER A.P.W.A. PLAN 574.
7. SELECT BEDDING AND BACKFILL IS REQUIRED 6" UNDER, 12" ON SIDES AND 12" OVER SEWER SAMPLING MANHOLE, LATERAL, FITTINGS AND MAIN.
8. SELECT BEDDING AND BACKFILL SHALL BE 1" MINUS GRAVEL. PIPE BEDDING SHALL BE COMPACTED TO 95% MINIMUM ASTM D-1557.
9. MINIMUM TRENCH WIDTH SHALL BE EQUAL TO OUTSIDE PIPE DIAMETER PLUS ONE FOOT ON EACH SIDE OF PIPE.
10. TYPE OF PIPE SHALL BE P.V.C. SDR-35.
11. MINIMUM GRADE FOR 4" PVC SDR-35 IS 2% OR 1/4" PER FOOT.
12. BETWEEN TWO DIFFERENT MATERIALS, SUCH AS CLAY TO PVC, USE FERNCO COUPLERS OR EQUAL. NO HUB BANDS ARE NOT ALLOWED.
13. DISTANCE BETWEEN CLEANOUTS NOT TO EXCEED 60'.
14. BENDS TOTALING 90° MUST BE BACKED BY A CLEANOUT.
15. SEWER LATERALS MAY RUN UNDER A DRIVE APPROACH, PERMITTING TOP OF CLEANOUT IS NOT UNDER CONCRETE.

DRAWN:  
 R.H.  
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 CHECKED:

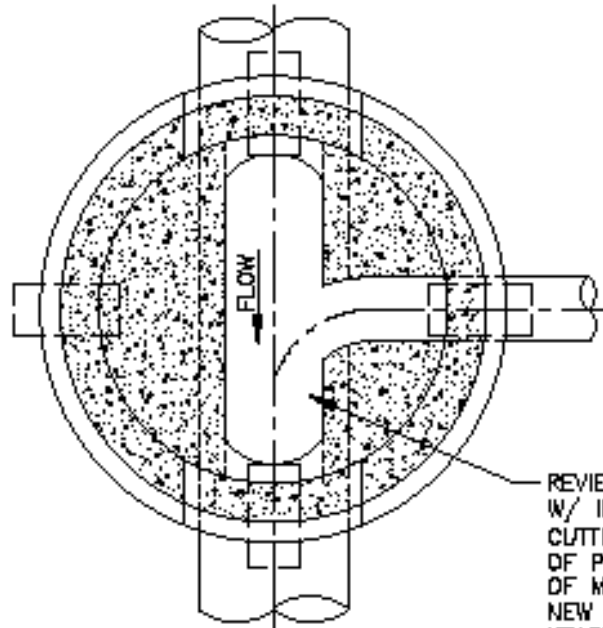


# Sampling Manhole Detail

DATE:  
 09-06-16  
 DRWG NO.:  
 SS6

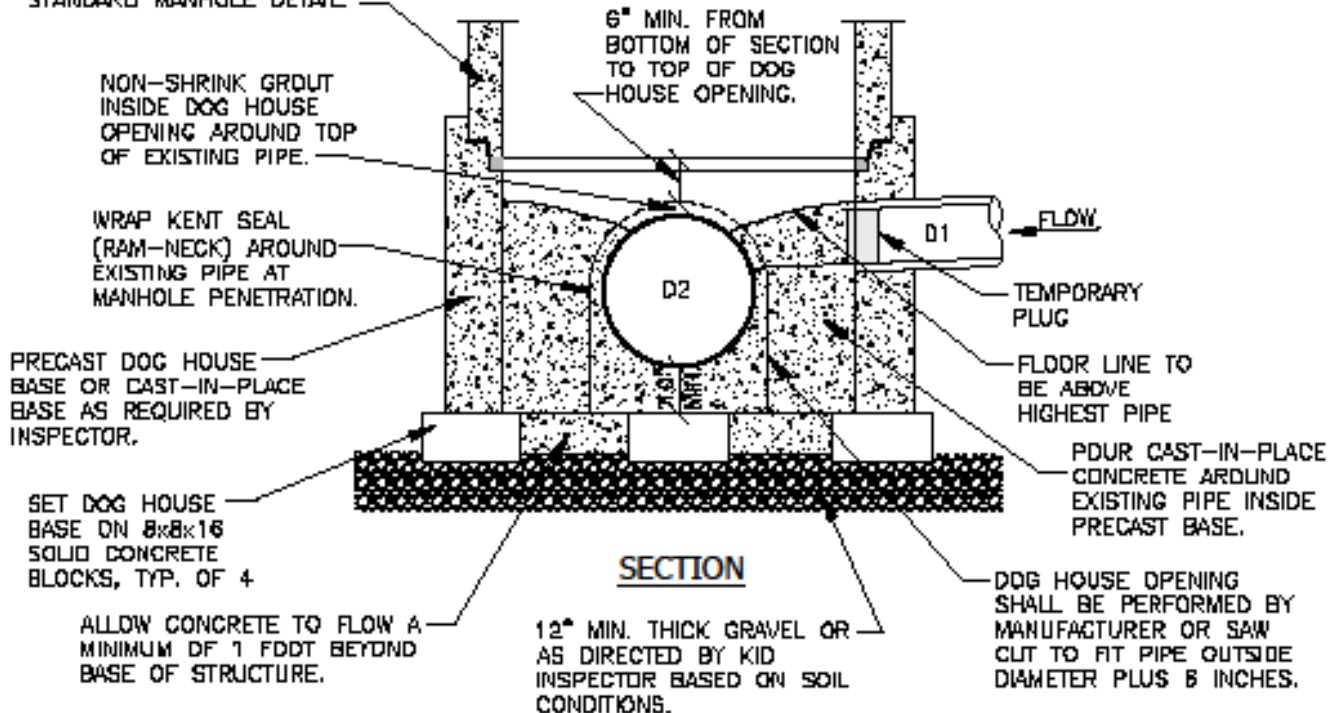
**NOTES:**

1. INVERT D1 SHALL MATCH THE 0.75 DEPTH POINT OF D2, UNLESS OTHERWISE APPROVED BY DISTRICT ENGINEER.
2. AFTER ALL GRADING AROUND MANHOLE HAS BEEN COMPLETED AND FINAL SURFACING IS IN PLACE, REMOVE DEBRIS AND TEMPORARY PLUGS OR PLYWOOD FROM INSIDE OF MANHOLES.
3. STUBS FOR FUTURE CONNECTIONS SHALL BE PLUGGED UNTIL ACTIVATION FOR SERVICE IS APPROVED BY KEARNS IMPROVEMENT DISTRICT.



**PLAN VIEW**

STANDARD PRECAST MANHOLE SECTIONS (DEPTH VARIES), SEE STANDARD MANHOLE DETAIL.



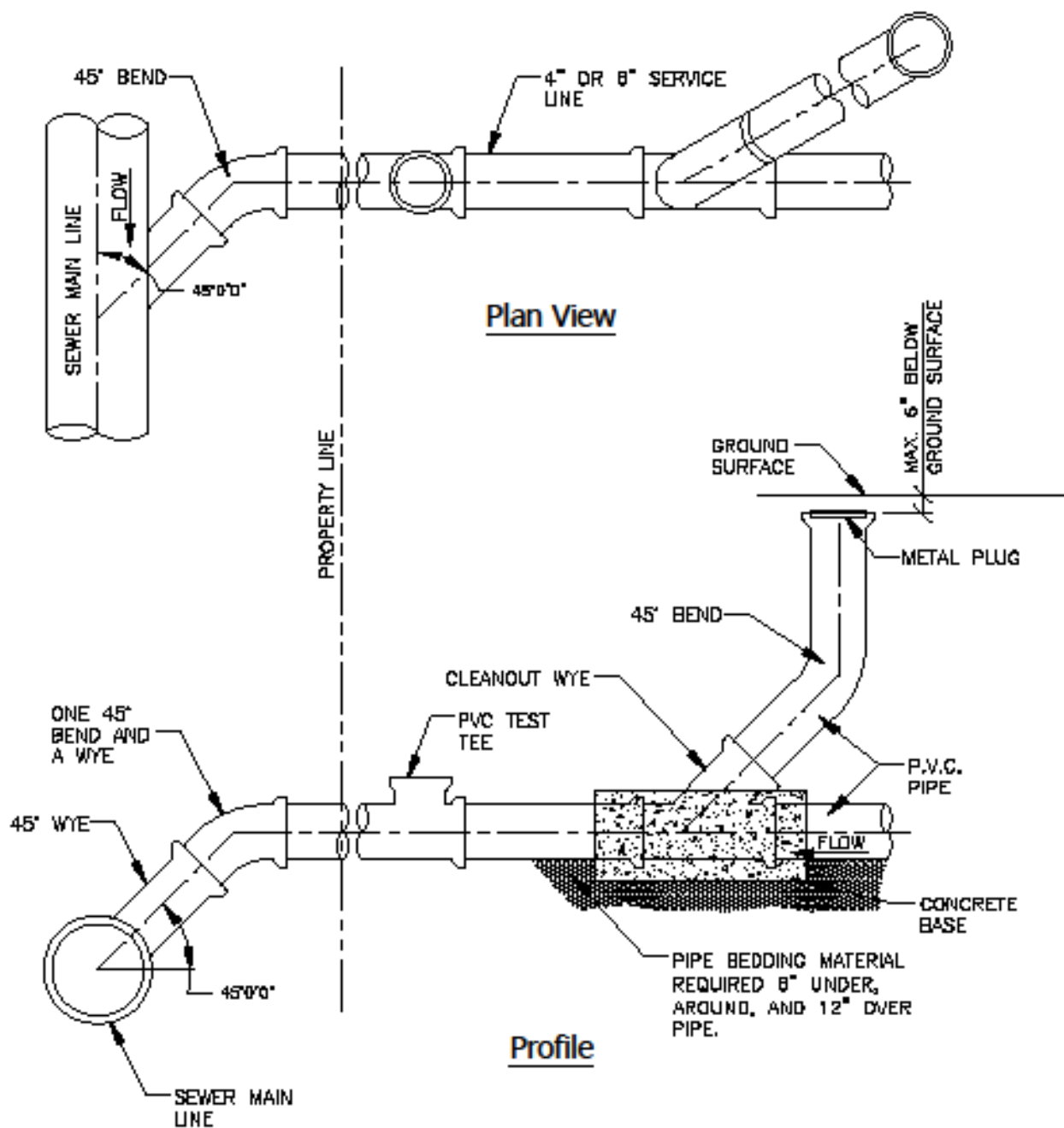
**SECTION**

DRAWN:  
R.H.  
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CHECKED:



# Sewer Manhole on Existing Pipe

DATE:  
09-06-16  
DRWG NO.:  
**SS7**



**NOTES:**

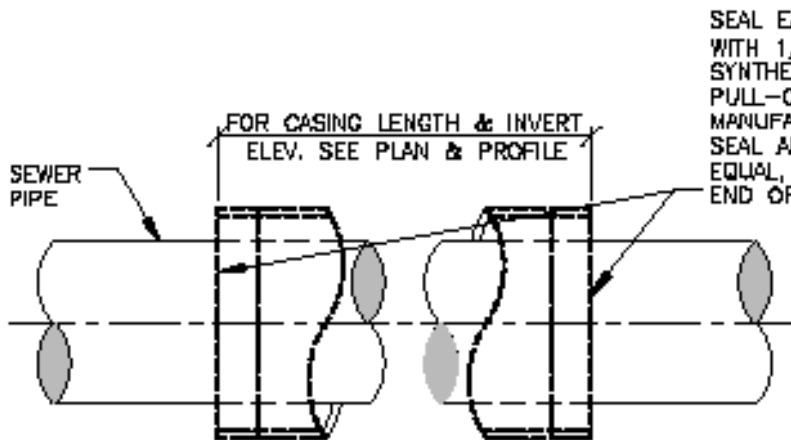
1. ALL SERVICES SHALL BE 4" DIAMETER MINIMUM AND SHALL BE EXTENDED FROM MAIN LINES TO 1.5' INSIDE OF PROPERTY LINES.
2. RECOMMENDED GRADE OF SEWER LATERALS IS 2% WHERE IT IS IMPRACTICAL TO RUN SEWER LATERALS AT 2% DUE TO THE DEPTH OF THE SEWER MAIN LINE, SEWER LATERALS MAY BE RUN AT 1% GRADE WHEN APPROVED BY THE DISTRICT ENGINEER.
3. CLEANOUTS SHALL BE INSTALLED EVERY 70 FEET.
4. ALL 90° CONNECTIONS TO MAIN MUST BE CONSTRUCTED WITH LONG SWEEP 90° BEND.
5. DIRECT NOSE-ON CONNECTIONS ARE USED WHEN CONNECTING TO EXISTING MAIN LINE.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



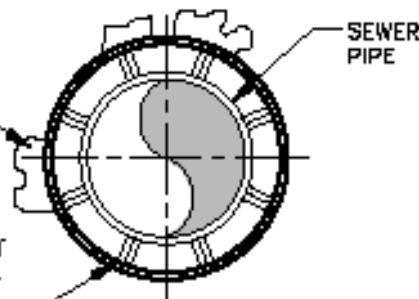
# Typical Standard Sewer Service Connection & Cleanout

DATE:  
09-06-16  
DRWG NO.:  
**SS8**



SEAL EACH END OF CASING WITH 1/8-INCH THICK SYNTHETIC RUBBER, MODEL C PULL-ON TYPE END SEALS, AS MANUFACTURED BY PIPELINE SEAL AND INSULATOR, INC. OR EQUAL, LINK-SEAL AT EACH END OF CASING

ANY VOIDS CREATED BY BORING, JACKING, OR TUNNELING SHALL BE FILLED BY PRESSURE GROUTING



CASING SPACERS MANUFACTURED BY PIPELINE SEAL AND INSULATOR, INC. MODEL 512G-2 SPACED EVERY 5-FT TO CENTER THE PIPE INSIDE THE CASING. PIPE THROUGHOUT THE LENGTH OF THE CASING SHALL BE AT A CONTINUOUS GRADE AS SHOWN ON DRAWINGS.

Section

| PIPE SIZE | MINIMUM I.D. CASING SIZE | MINIMUM WALL THICKNESS |
|-----------|--------------------------|------------------------|
| 4"        | 12"                      | 0.188"                 |
| 6"        | 16"                      | 0.312"                 |
| 8"        | 18"                      | 0.312"                 |
| 12"       | 24"                      | 0.438"                 |
| 16"       | 30"                      | 0.50"                  |
| 18"       | 30"                      | 0.50"                  |
| 24"       | 38"                      | 0.625"                 |
| 30"       | 42"                      | 0.625"                 |

LARGER CASINGS AS DIRECTED BY THE DISTRICT ENGINEER

**NOTES:**

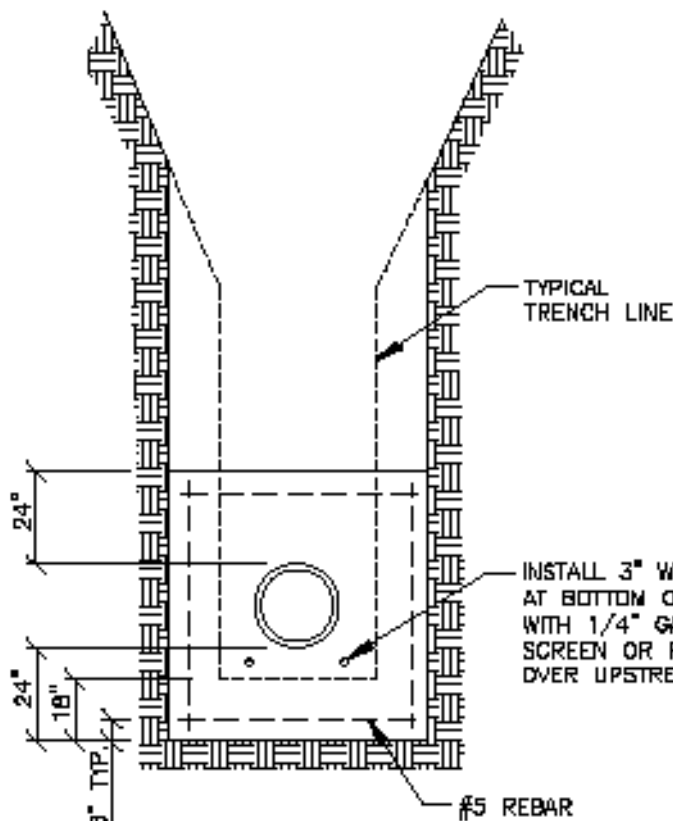
1. CASING PIPES SHALL BE REQUIRED AS INDICATED ON THE DRAWINGS AND/OR WHERE REQUIRED BY THE DISTRICT INSPECTOR OR ENGINEER.
2. CARRIER PIPE SHALL BE TESTED BEFORE SEALING THE ENDS OF THE CASING.
3. SPACERS SHALL BE SECURELY ATTACHED TO THE CARRIER PIPE PER THE MANUFACTURER'S REQUIREMENTS.
4. CASING PIPE SHALL BE WELDED STEEL, ASTM A53, GRADE B OR APPROVED EQUIVALENT.

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R.H.  
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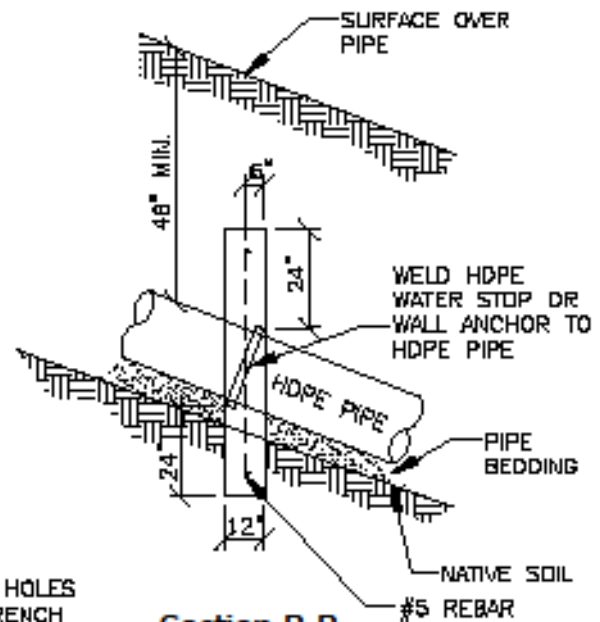


# Steel Casing for Sewer Pipe

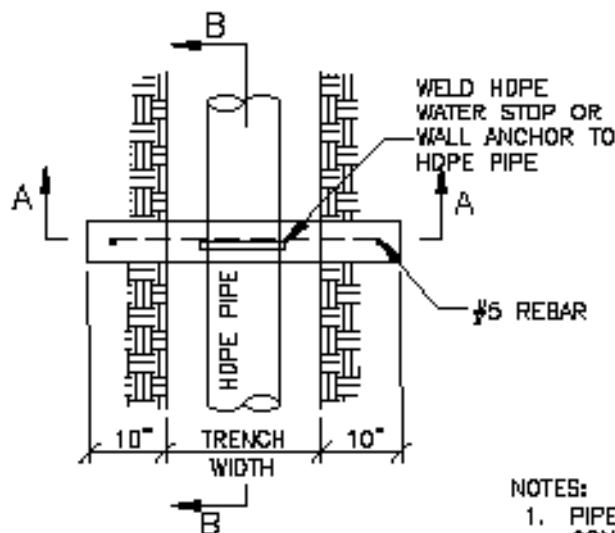
DATE:  
09-06-16  
DRWG NO.:  
**SS9**



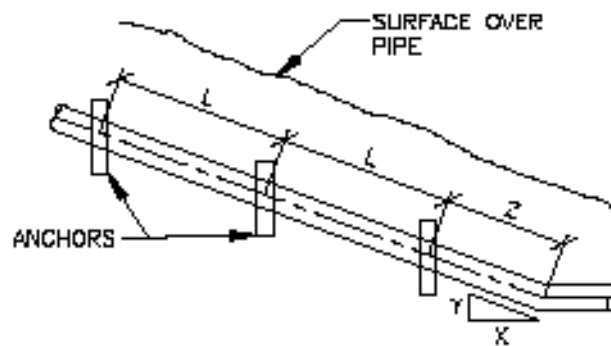
**Section A-A**



**Section B-B**



**Plan View**



**ELEVATION PIPE ANCHORS**

| TABLE "A"             |                        |                        |
|-----------------------|------------------------|------------------------|
| PIPE SLOPE (%)<br>Y/X | L<br>DISTANCE<br>(MAX) | Z<br>DISTANCE<br>(MAX) |
| 15-35                 | 36'                    | 36'                    |
| 35-50                 | 24'                    | 24'                    |
| 50 & OVER             | 18'                    | 12'                    |

**NOTES:**

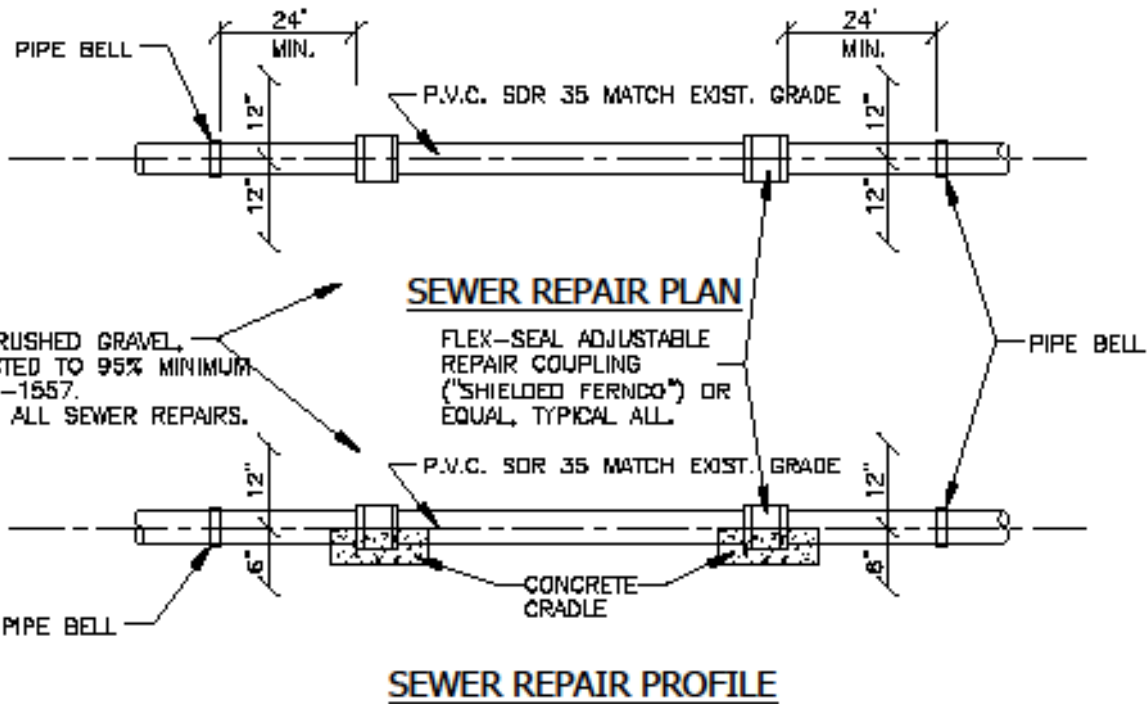
1. PIPE ANCHOR WALLS (CLASS 3000 CONCRETE) SHALL BE CONSTRUCTED USING FORMS. REMOVE FORMS PRIOR TO BACKFILLING TRENCH.
2. SEE TABLE "A" FOR SPACING OF ANCHORS VERSUS PIPE SLOPES.

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



# Sewer Pipe Anchor Detail

DATE:  
09-06-16  
DRWG NO.:  
**SS10**



**NOTES:**

1. SELECT BEDDING AND BACKFILL IS REQUIRED 6" UNDER, 12" ON SIDES AND 12" OVER PIPE, FITTINGS & MAIN.
2. IF DAMAGE IS CAUSED TO SEWER MAIN, DUE TO NOSE-ON AND/OR OTHER MEANS, CONTRACTOR WILL BE HELD RESPONSIBLE FOR REPAIRS.
3. SEWER SHALL BE VIDEO INSPECTED AND VIDEO PROVIDED TO KEARNS IMPROVEMENT DISTRICT.
4. IF EXCAVATION IS WITHIN 2 FEET OF A BELL, CONTRACTOR TO REMOVE BELL AND EXTEND REPAIR TO CUT.

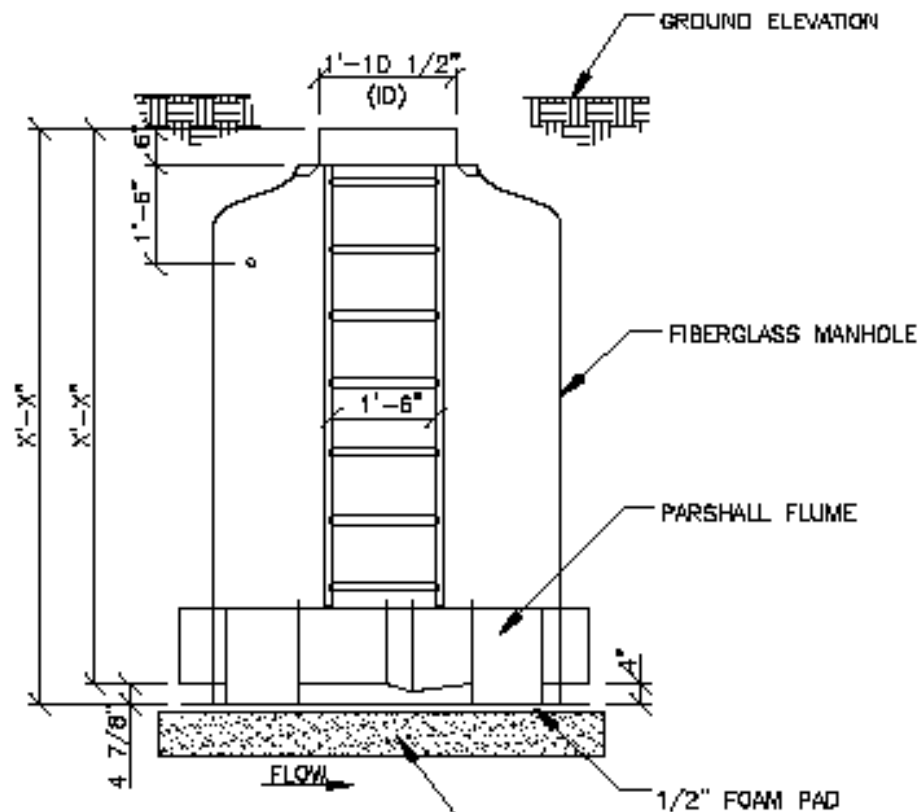
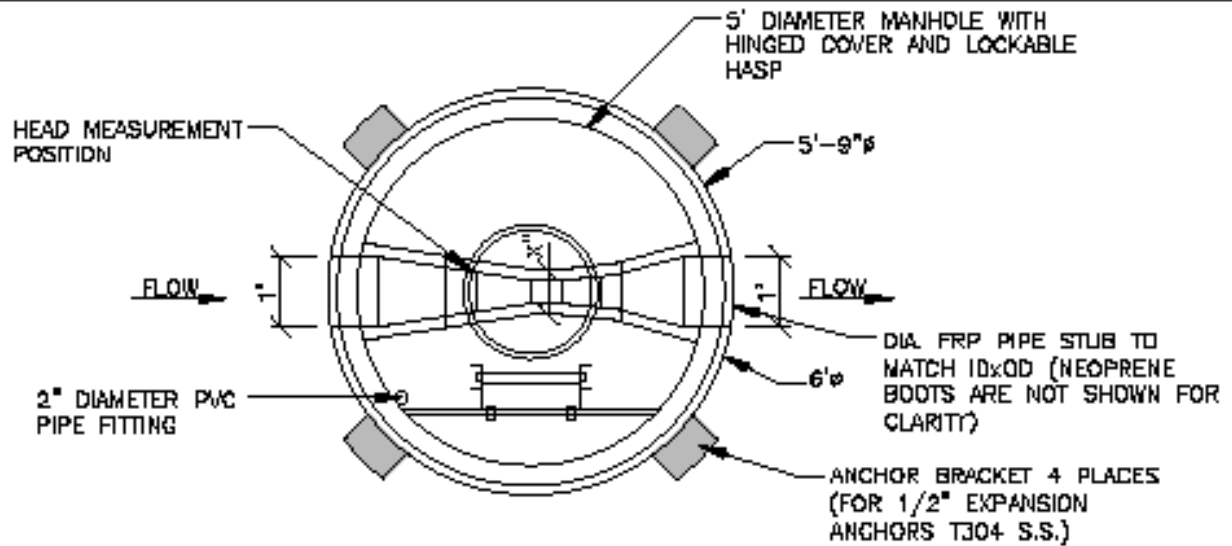
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R.H.  
CHECKED:  
CHECKED:



# Typical Sewer Repair Detail

DATE:  
09-06-16  
DRWG NO.:  
**SS11**





**NOTES:**

1. HINGE, HASP, ANCHOR BRACKETS & BOLTS ARE T-304 S.S.
2. THE MANHOLE BARREL IS 1/2" MINIMUM THICK FRP.
3. NEOPRENE BOOTS ARE SECURED WITH S.S. BANDS.
4. THE MATERIAL IS FRP (FIBERGLASS REINFORCED POLYESTER)

DRAWN:  
R.H.  
CHECKED:  
CHECKED:



# 60" Diameter Sewer Metering Manhole & Parshall Flume

DATE:  
09-06-16  
DRWG NO.:  
SS12

1. A PREFABRICATED 5' DIAMETER FIBERGLASS METERING MANHOLE, (VIRTUAL POLYMER COMPOUNDS OR APPROVED EQUAL) MEETING THE REQUIREMENTS OF ANSI/ASTM D-3753 STANDARD SPECIFICATIONS FOR FIBER-REINFORCED MANHOLES.
2. THE TOP OPENING SHALL BE A FULL OPENING HINGED LID. THE HINGE SHALL BE POSITIONED PARALLEL TO THE FLOW THROUGH THE METERING MANHOLE.
3. THE TOP RIM OF THE PREFABRICATED METERING MANHOLE SHALL NOT EXCEED 18 INCHES ABOVE GROUND LEVEL.
4. TWO 4 INCH FRP (FIBERGLASS REINFORCED POLYESTER) TAPS WITH PLUGS, ONE ABOVE GRADE, AND ONE BELOW GRADE, ARE TO BE PLACED THROUGH THE SIDE WALL ABOVE THE INLET PIPE.
5. A 8 x 10 FOOT CONCRETE PAD 6 INCHES THICK AND 2 INCHES ABOVE GRADE SHALL BE CONSTRUCTED SURROUNDING THE MANHOLE. THE SLAB SHALL BE POSITIONED SUCH THAT THE MANHOLE IS CENTERED IN THE 8 FOOT DIMENSION AND OFFSET IN THE 10 FOOT DIMENSION SUCH THAT A 3-FOOT SECTION OF THE SLAB IS ORIENTED OVER THE INLET PIPE AND A 2-FOOT SECTION IS OVER THE OUTLET PIPE.
6. ALLOWABLE SLOPE ENTERING AND EXITING THE METERING MANHOLE SHALL BE LIMITED TO A SPECIFIC MAXIMUM AND MINIMUM AS PER THE FOLLOWING TABLE:

| PIPE SIZE | MIN. % SLOPE | MAX. % SLOPE |
|-----------|--------------|--------------|
| 6"        | 2.00         | 2.2          |
| 8"        | 0.70         | 2.0          |
| 10"       | 0.50         | 1.8          |
| 12"       | 0.40         | 1.6          |
| 15"       | 0.30         | 1.5          |
| 18"       | 0.24         | 1.4          |
| 21"       | 0.19         | 1.4          |

7. NO BENDS, DROP MANHOLES, FLOW JUNCTIONS, ETC. SHALL BE LOCATED WITHIN 25 PIPE DIAMETERS UPSTREAM OF THE CENTER OF THE MANHOLE.
8. DOWNSTREAM SLOPE SHALL BE GREATER THAN OR EQUAL TO UPSTREAM SLOPE. THERE SHALL BE NO OBSTRUCTION DOWNSTREAM OF THE MANHOLE THAT WILL CAUSE FLOW TO BACK UP IN THE MANHOLE.
9. 8' LONG, 4" I.D. CAST IRON GUARD POSTS SHALL BE INSTALLED AS DIRECTED BY THE ENGINEER, TO PREVENT VEHICULAR DAMAGE TO THE METERING MANHOLE. GUARD POSTS SHALL BE FILLED WITH CONCRETE AND INSTALLED 2' DEEP SET IN CONCRETE.
10. THE PARSHALL FLUME SHALL BE APPROPRIATELY SIZED ACCORDING TO MANUFACTURER'S SPECIFICATION AND ANY OTHER ATTACHMENTS NEEDED FOR THE FLOW METER SELECTED. (NOTE: MINIMUM AND MAXIMUM FLOW RATES MUST BE DETERMINED TO SELECT THE APPROPRIATELY SIZED PARSHALL FLUME.)
11. A TWO OUTLET GFCI, 110 VOLT, AC ELECTRICAL SUPPLY SHALL BE SUPPLIED FOR EXCLUSIVE USE BY KID AT THE CONCRETE PAD OR WITHIN FIFTY FEET SO THAT THE ROUTE OF AN EXTENSION CORD WILL NOT CROSS A TRAFFIC ZONE. A FLOW METER SUITABLE FOR SITE SPECIFIC CONDITIONS AND FLOW PATTERNS SHALL BE INSTALLED AT THE METERING MANHOLE, AND MAINTAINED ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS AND THE KID INDUSTRIAL WASTEWATER FLOW METERING AGREEMENT AND REQUIREMENTS. THE OPEN CHANNEL FLOW METER SHALL BE A SIEMENS (MILLTRONICS) DCM III WALL MOUNTED INDICATOR TRANSMITTER, HOUSED IN A NEMA 4X ENCLOSURE COMPLETE WITH ONE WEATHER PROOF POWER OUTLET, LOCATED ON A POLE NEXT TO THE METERING MANHOLE. SYSTEM INCLUDES AN XRS-5 NDN-CONTACTING ULTRASONIC LEVEL SENSOR, TS-2 TEMPERATURE SENSOR FOR AUTOMATIC TEMPERATURE COMPENSATION AND A REMOVABLE HAND HELD PROGRAMMER, AN INTERNAL DATA LOGGER, 4-20mA SIGNALS OUTPUT AND (3) PROGRAMMABLE DRY CONTACT ALARM RELAYS SHALL ALSO BE INCLUDED.
12. ANY LOCKING MECHANISM SHALL UTILIZE DUAL LOCKS. ONE KID SUPPLIED LOCK IN ADDITION TO ANY PLACED BY THE USER.
13. KID MUST APPROVE THE MANHOLE AND METERING SYSTEM PRIOR TO INSTALLATION, AND ALL OTHER TERMS AND CONDITIONS OF KID.

| WIDTH<br>"W"<br>INCHES | HA<br>HEAD<br>FEET | MINIMUM FLOW RATE |       |       | HA<br>HEAD<br>FEET | MAXIMUM FLOW RATE |       |       |
|------------------------|--------------------|-------------------|-------|-------|--------------------|-------------------|-------|-------|
|                        |                    | CFS               | MGD   | GPM   |                    | CFS               | MGD   | GPM   |
| 1                      | 0.07               | 0.005             | 0.003 | 2.2   | 0.8                | 0.15              | 0.10  | 68.7  |
| 2                      | 0.07               | 0.011             | 0.007 | 4.9   | 0.8                | 0.31              | 0.20  | 137   |
| 3                      | 0.10               | 0.028             | 0.018 | 12.6  | 1.5                | 1.86              | 1.20  | 835   |
| 6                      | 0.10               | 0.054             | 0.035 | 24.2  | 1.5                | 3.91              | 2.53  | 1750  |
| 9                      | 0.10               | 0.091             | 0.059 | 40.8  | 2.0                | 8.87              | 5.73  | 3980  |
| 12                     | 0.10               | 0.120             | 0.078 | 53.9  | 2.5                | 18.10             | 10.40 | 7220  |
| 18                     | 0.10               | 0.174             | 0.115 | 78.1  | 2.5                | 24.80             | 15.90 | 11000 |
| 24                     | 0.15               | 0.423             | 0.273 | 190.0 | 2.5                | 33.10             | 21.40 | 14900 |
| 36                     | 0.15               | 0.815             | 0.397 | 276.0 | 2.5                | 50.40             | 32.80 | 22600 |

DRAWN:

R.H.

CHECKED:

CHECKED:



## Sewer Metering

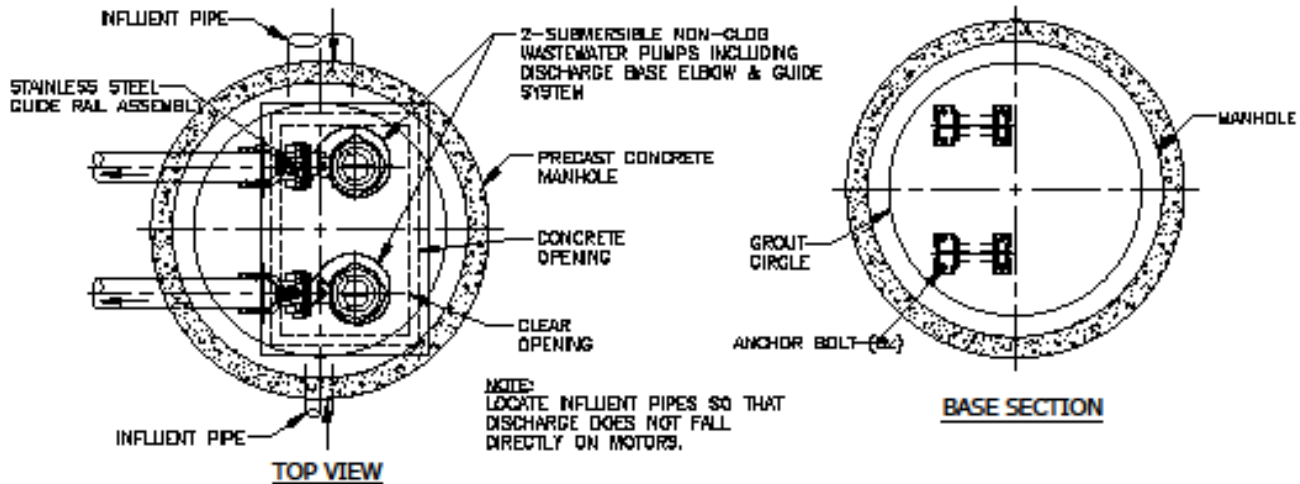
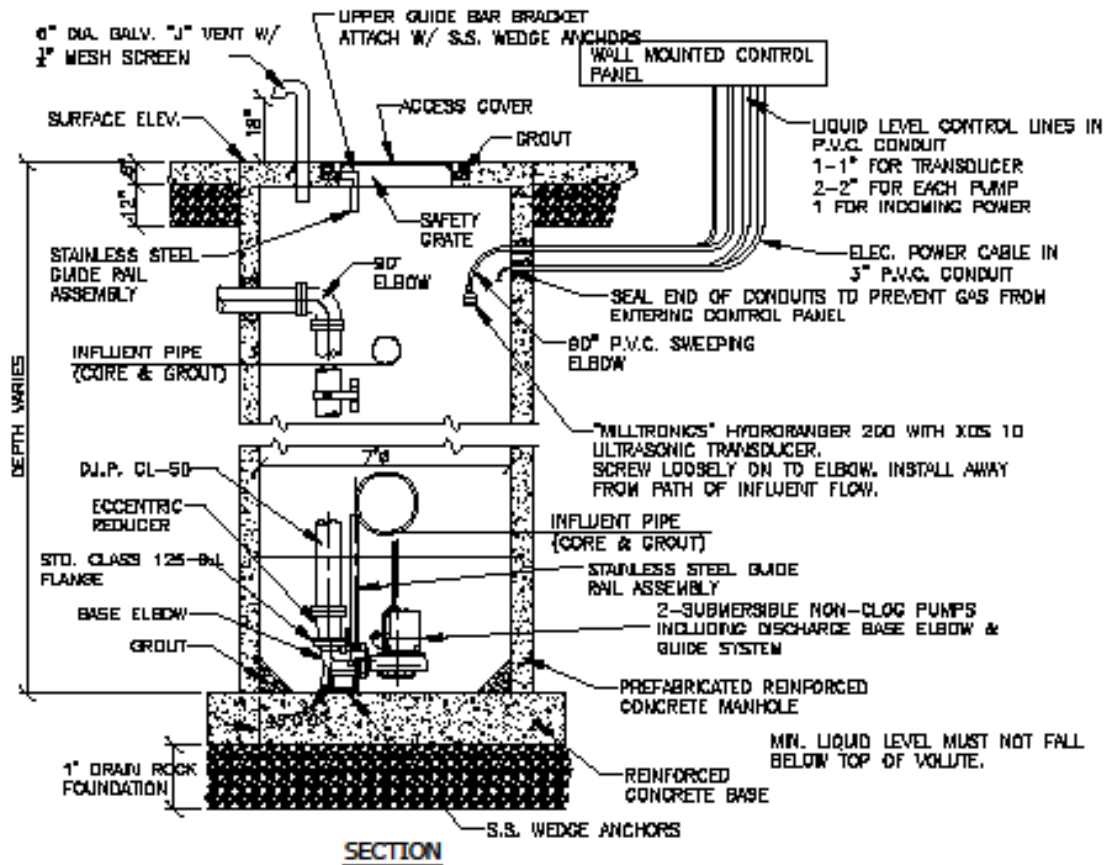
## Manhole Requirements

DATE:

09-06-16

DRWG NO.:

SS13



NOTE:  
EACH PUMP SHALL BE FITTED WITH 30' OF S.S.  
LIFTING CHAIN OR STAINLESS STEEL CABLE.

DRAWN:

R.H.

CHECKED:

CHECKED:



# Typical Sewer Lift Station Details

DATE:

09-06-16

DRWG NO.:

SS14

SECTION 7

# FORMS

When Recorded Return To:  
Pamela Gill, General Manager  
Kearns Improvement District  
5350 West 5400 South  
P.O. Box 18608  
Kearns, UT 84118

**EASEMENT GRANT**

AGREEMENT, made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between \_\_\_\_\_, hereinafter referred to as the "Grantor," and \_\_\_\_\_, hereinafter referred to as the "Grantee,"

**ACCESS WAIVER**

\_\_\_\_\_ in Salt Lake  
\_\_\_\_\_ may across Grantor's  
\_\_\_\_\_ primary sewer line  
\_\_\_\_\_ hand owned by  
\_\_\_\_\_ easement to Grantee as  
\_\_\_\_\_ of ONE DOLLAR and

Location: \_\_\_\_\_  
Legal Description: \_\_\_\_\_  
Assessor's Parcel No. \_\_\_\_\_

The undersigned is (are) the owner(s) of the subject property, located in the Kearns Improvement District, Salt Lake County, Utah. The sewer lateral that serves the property, connecting the home to the sewer main, belongs to the property owner; the main collection line is owned by the Kearns Improvement District (the "District") the main collection lines are being relocated by the District so that they are entirely in the street right-of-way.

By signing below, the owner acknowledges that District personnel will be working on the property to install a sewer lateral connecting the house located on the property to the new collection line. The District may utilize as much of the existing lateral as is practical, and install one or more new lateral sections as necessary to make the connection. The District may use boring or tunneling technology to install the sewer lateral, which may include going under the house or other improvements located upon the property.

The new collection line will be designed to replace the existing level of service. The existing sewer collection line that is being replaced is relatively shallow, and may not have the depth necessary to provide gravity flow service to basements added after the house was built. The undersi



**SECTION 7 FORMS**  
**7.01 Easement Grant**

When Recorded Return To:  
Pamela Gill, General Manager  
Kearns Improvement District  
5350 West 5400 South  
P.O. Box 18608  
Kearns, UT 84118

**EASEMENT GRANT**

AGREEMENT, made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between \_\_\_\_\_ of \_\_\_\_\_, hereinafter referred to as "Grantor," and KEARNS IMPROVEMENT DISTRICT, created, organized, and existing under the laws of the State of Utah, having its principal place of business at 5350 West 5400 South, Kearns, County of Salt Lake, State of Utah, hereinafter referred to as the "Grantee;"

**WITNESSETH**

WHEREAS, Grantor is the owner in fee simple of a tract of land located in Salt Lake County; and

WHEREAS, Grantee requires a permanent easement and right-of-way across Grantor's land for the construction, operation, and maintenance of utilities, including a sanitary sewer line and/or waterline, and appurtenant structures and facilities, across said tract of land owned by Grantor; and

WHEREAS, Grantor is willing to grant this right-of-way and easement to Grantee as set out below.

NOW, THEREFORE, for and in consideration of the sum of ONE DOLLAR and other good and valuable consideration paid by Grantee to Grantor, Grantor hereby grants, warrants and conveys unto Grantee, its successors and assigns, a permanent easement and right-of-way for the purpose of, but not limited to, construction, operation, repair, replacement, and maintenance of utilities, including a sanitary sewer line and/or a culinary waterline and the necessary accessories and appurtenances used in connection therewith, together with the right to enter upon Grantor's premises for such purposes, in, on, over, under, through, and along the portion of the land of Grantor which is transversed by the following easement and right-of-way located in Salt Lake County, Utah, which is more particularly described as follows:

See Exhibit "A" attached hereto and incorporated herein by this reference (the "Easement").

Grantor shall not construct or cause to allow to be constructed any permanent or temporary buildings or structures upon the Easement described herein, whether the same shall have been brought,

placed or constructed upon the said premises by Grantor or by Grantor's successors, guests, tenants, subsequent purchasers, assigns, invitees or anyone else. Should such structures be placed upon the Easement in violation of the preceding sentence, they shall be so placed at the Grantor's or the owner's sole risk and expense, and the owner, as from time to time constituted, shall solely be responsible for the cost and expense of removing and/or relocating the structure or improvement or any portion thereof from the Easement. In the event such removal is required for the maintenance, repair, operation or replacement of the Grantee's line or lines located within the Easement, neither Grantor nor the owner of the subject property nor any other persons shall have any recourse whatsoever against the Grantee in the event any structure or improvement, or any portion thereof, must be removed and/or relocated and Grantee shall not be liable for any damage to such structure or improvement resulting from such maintenance, repair, operation or replacement activities. Otherwise, Grantee shall restore the premises to substantially the same condition that existed prior to the work after completing any construction, repair, replacement or maintenance activity thereon.

This permanent grant and easement shall at all times be deemed to be and shall be a continuing covenant running with the land and shall be binding upon the parties and inure to the benefit of the successors and assigns of the respective parties hereto.

IN WITNESS WHEREOF, the parties have hereunto set their hands effective as of the day and year first above written.

GRANTOR

\_\_\_\_\_

GRANTEE

KEARNS IMPROVEMENT DISTRICT

By: \_\_\_\_\_

Title: \_\_\_\_\_

ATTEST:

\_\_\_\_\_  
District Clerk

STATE OF UTAH                    )  
  : ss  
COUNTY OF SALT LAKE    )

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ personally appeared before me \_\_\_\_\_, signer of the foregoing instrument, who duly acknowledged to me that he executed the same.

\_\_\_\_\_  
Notary Public

STATE OF UTAH                    )  
  : ss  
COUNTY OF SALT LAKE    )

Personally appeared before \_\_\_\_\_ and \_\_\_\_\_ of \_\_\_\_\_, a \_\_\_\_\_, who duly acknowledged to me that they are the \_\_\_\_\_ and \_\_\_\_\_ of \_\_\_\_\_ and that they signed the foregoing instrument on behalf of \_\_\_\_\_ and who duly acknowledged to me they executed the same with full authority.

\_\_\_\_\_  
Notary Public

STATE OF UTAH                    )  
  : ss  
COUNTY OF SALT LAKE    )

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ personally appeared before me \_\_\_\_\_ and \_\_\_\_\_ the signers of the above instrument, who duly acknowledged to me that they are the \_\_\_\_\_ and the \_\_\_\_\_ of the Kearns Improvement District and that they were duly authorized to and did execute the above instrument on behalf of the District.

\_\_\_\_\_  
Notary Public

**EXHIBIT "A"**

Description of Easement