
**RULES, STANDARDS AND
SPECIFICATIONS
OF THE
MUHLENBERG TOWNSHIP
AUTHORITY**

MUHLENBERG TOWNSHIP AUTHORITY
BERKS COUNTY, PENNSYLVANIA

October 2024

Specification No. 100608.0021

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Amended: By motion of the Authority on November 9, 2023

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PART 1
INTRODUCTION TO RULES, STANDARDS AND SPECIFICATIONS

1.1 SCOPE OF RULES, STANDARDS AND SPECIFICATIONS.

- 1.1.1. These Rules, Standards and Specifications are adopted by the governing body of Muhlenberg Township Authority, a Pennsylvania municipal authority incorporated by Muhlenberg Township, Berks County, PA (the "Authority"). These Rules, Standards and Specifications cover various topics and, as the context requires, internal references sometimes refer to "Rules" or "Standards" or "Specifications", but in each instance such reference shall apply to the entire text of the Rules, Standards and Specifications of Muhlenberg Township Authority.
- 1.1.2. These Rules, Standards and Specifications are binding upon every person who accepts water or sewer service from Authority and every person, by taking water or discharging sewer, agrees to be bound hereby.
- 1.1.3. The Authority owns and operates its water and sewer systems. These Rules, Standards and Specifications are administered by the Authority, which is solely responsible for any required decision or approvals.
- 1.1.4. These Rules, Standards and Specifications are not intended to conflict with any local, state or federal legislation or regulations. Any provisions that are found to be in direct conflict with such legislation or regulation shall not be applicable, and such legislation or regulation shall apply instead.
- 1.1.5. When used in these Rules, Standards and Specifications, unless the context requires otherwise, the "Act" shall mean the Pennsylvania Municipality Authorities Act, codified at 53 P.S. Section 5601, et seq.
- 1.1.6. The definitions set forth at Section 1.2 shall apply to all parts of the Rules, Standards and Specifications. Part 2 generally sets forth Rules which govern and control with respect to all customers of the Authority. Part 3 generally sets forth Standards which apply to any person intending to extend the water or sewer systems of the Authority in the context of the new development, or reconfiguration of existing development. Subsequent parts generally set forth Standards and Specifications which apply to specific improvements, hardware, and work associated with installation of improvements, including detail sheets with regard to equipment approved by the Authority for use in connection with municipal water and sewer service in the service area of the Authority.

1.2 DEFINITIONS.

Unless otherwise expressly stated, the following terms shall, for the purpose of these Rules, Standards and Specifications, have the following meaning indicated:

- 1.2.1. Words in the singular shall include the plural and words in the plural shall include the singular.
- 1.2.2. Words used in the present tense include the future tense.

Air Gap. The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying potable water to a tank, plumbing fixture, or other device and the flood level rim of the receptacle. The differential distance shall be at least double the diameter (2 x D) of the supply pipe measured vertically above the top of the rim of the vessel. In no case, shall the air gap be less than one inch.

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Approved. The words “approved”, “acceptable”, “satisfactory”, or words of like import, shall mean approved by, or acceptable, or satisfactory, to the Engineer, unless another meaning is plainly intended or otherwise specifically stated.

Authority. The Muhlenberg Township Authority, a municipal authority incorporated pursuant to provisions of the Municipality Authorities Act, and rendering water treatment and distribution service, and sanitary sewer collection, and conveyance service.

Backflow. The flow of water or other liquids, mixtures or substances into the distribution system of the Authority from any source or sources other than its intended source. Back siphonage and back pressure are two types of backflow specifically contemplated by these Standards.

Backflow Prevention Device. Three types of devices: reduced pressure principal device (RPPD), double check valve assembly (DCVA) and air gap (AG) which are designed to prevent the occurrence of backflow.

Building. A structure or structures containing one or more Consumer Units served, or intended to be served, with water or sewer, or both, by the Authority.

Collection Sewer. The Authority's collection sanitary sewers located under highways, roads, streets, and rights-of-way with branch service laterals that collect and convey sanitary sewage or industrial wastes or a combination of both to a pumping or treatment facility.

Commercial Establishment. Any room, group of rooms, building or enclosure used or intended for use in the operation of one business enterprises for the sale and distribution of any product, commodity, articles or service or used or intended for use for any social, amusement, religious, educational, charitable or public purpose and continuing plumbing. “Commercial Establishment” includes institutional dormitories, but does not include personal care boarding homes licensed by the Commonwealth.

Completion Certificate. The Certificate of the Engineer approved by the Authority indicating the completion and acceptance of all work specified and performed under the Contract.

Consumer. A person who, prior to, upon or after the Effective date hereof, has contracted or contracts for and/or is receiving or shall receive water and/or sewer service for each existing dwelling unit, with respect to the water and/or sewer system.

Consumer Unit. Shall mean: (i) a building under one roof and occupied by one family or business; or (ii) a combination of buildings in one enclosure or group and occupied by one family or business; or (iii) one side of a double building or house having a solid vertical partition wall; or (iv) each room or group of rooms in a building occupied or intended for occupancy as a separate business or as separate living quarters by a family or other group of Persons living together or by a Person living alone; or (v) each apartment, office or suite of offices in a building or house having several such apartments, offices or suites of offices and using in common one or more hallways and one or more means of entrance; or (vi) any trailer occupied by one family or business; or (vii) any Industrial Establishment; or (viii) any other unit or category listed in the schedule of rates for use of the Water System or Sewer System, adopted by action of this Authority.

Contamination. An impairment of water quality to a degree which creates an actual or potential health hazard such as but not limited to chemical poisoning or spread of diseases, or impairs the composition and odor of the water to such an extent that it is considered by said odor or composition to be not acceptable by the Authority for human consumption.

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Contractor. The person(s), firm, or corporation with whom the Developer has executed a contract, formally or informally, for the construction of the Work.

Cross Connection. An arrangement allowing either a direct or indirect connection through which backflow, including backsiphonage, can occur between the drinking water in a public water system and a system containing a source or potential source of contamination, or allowing treated water to be removed from any public water system, used for any purpose or routed through any device or pipes outside the public water system, and returned to the public water system. The term does not include connections between public water systems and connections between water mains.

Customer. The word "Customer", as used herein, means the owner or tenant contracting for or using water and/or sewer service on a single Property; and the word "Customers" means all so contracting for and using service.

Customer Charge. The cost of service due to the Authority by Customers using Authority water service or sewer service, or both, which shall be a fixed charge per billing period. The Customer Charge will vary depending on the meter size (for purposes of water billing). The Customer Charge may vary due to other circumstances, as determined by the Authority. The Customer Charge due, for differing meter sizes and other differing circumstances, shall be as set forth in the Schedule of Rates and Charges in effect from time to time. The water/sewer usage volume permitted in each billing period in exchange for payment of the Customer Charge and for which no additional rates are due is referred to herein as the "periodic allowance." The periodic allowances corresponding to the schedule of Customer Charges is set forth on the Schedule of Rates and Charges in effect from time to time.

Customer Facilities Fee. That fee due and payable, in accordance with the Rate Resolution of the Authority in effect from time to time, applicable to installation of a meter on a new service connection to one or more Consumer Units on a Property served with water or sewer, or both, by the Authority.

Developer. Any landowner, agent or such landowner, tenants with permission of such landowner, or equitable owner, who makes or causes to be made, an application for a subdivision or land development.

Development. Any man-made change to improved or unimproved real estate, including but not limited to the construction, reconstruction, renovation, repair, expansion, or alteration of buildings or other structures; the placement of manufactured homes; streets and other paving; utilities; filling, grading, and excavation; mining; dredging; drilling operations; storage of equipment or materials; and the subdivision of land.

Development Plan. The design or site layout plan required for certain land uses and development design options which cover the entire property.

Double Check Valve Assembly. A device composed of two independent operating approved check valves with tightly closing shut-off valves on each side of the check valves, plus necessary appurtenances for testing. To be approved by the Authority or its designated agent the device must be readily accessible to maintenance and testing and installed in a location where no part of the device will be subject to outside flooding. The device shall be used on service connections which may be subject to backflow and where there is a possibility of pollution that constitutes an actual or potential pollution hazard.

Engineer or Authority Engineer. The Consulting Engineer appointed by the Authority. The person or organization duly employed by the Authority as consultant and authorized to

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inspect the results of the performance of the work under Contract by the Contractor, acting directly or through properly authorized agents, engineers, assistants, inspectors, or other representatives acting severally within the scope of the particular duties entrusted to them. The word "Engineer" shall include the officers, agents, and employees of the Engineer.

Health Hazard. An actual or potential threat of contamination or pollution to the Authority water system to such a degree or intensity that there would be a danger to the public health of the Authority's water system Customers.

Industrial Establishment. Any room, group of rooms, building or other enclosure used or intended for use in the operation of one business enterprise for manufacturing, processing, cleaning, laundering or assembling any product, commodity or article pursuant to which water and/or sewer is required in the operation of such business.

Industrial Wastes. Any solid, liquid or gaseous substance or waterborne wastes or forms of energy rejected or escaping in the course of any industrial, manufacturing, trade or business process or in the course of the development, recovery or processing of natural resources, as distinct from Sanitary Sewage.

Inspection. The examination of the work performed by the Contractor to ascertain its conformity with the Specifications.

Interconnection. Interconnection is a physical arrangement whereby a public water system is connected with another water system, public or private, in such a manner that a flow of water into such public water supply system from other water system is possible. Specifically it is the intent of these Standards to regulate any source or system containing water or substances, the quality and quantity of which cannot be approved by the County, State or Federal regulatory agencies.

Mains. Distribution and collection pipelines which are located in streets, highways, public ways or private rights of way and which are used to serve the general public.

Main Extensions. Extension of distribution or collection pipelines beyond existing facilities and exclusive of service line connections.

Municipality. Muhlenberg Township, and any other Borough or Township in which work may be performed by a developer and/or developer's Contractor.

Nonpotable Water. Water which is not safe for human consumption or is of questionable potability.

Owner. The word "Owner", whenever the same appears herein, means the person, firm or corporation or association having an interest as owner, or a person, firm or corporation representing itself to be the owner, whether legal or equitable, sole or only partial, in any Property, which is or is about to be supplied with water and/or sewer by the Authority; and the word "Owners" means all so interested.

Person. Any individual, firm, partnership, company, association, society, corporation, trust, governmental body or any agency, department or political subdivision thereof or any other group or entity.

Pollution/Hazard. The presence of any foreign substance (organic, inorganic or biological) in water which tends to degrade its qualities so as to constitute a hazard or impair the usefulness or quality of the water to a degree which does not necessarily create an actual

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public health hazard but which does adversely or unreasonably affect such water for domestic use.

Pollution. An actual or potential impairment to the physical properties and potability of the Water System which constitutes a nuisance or is aesthetically objectionable or can cause physical damage to the community water system but would not be dangerous or threatening to public health.

Potable Water. Water which is safe for human consumption according to recognized state and federal standards.

Property. Any Building, group of Buildings or land upon which Buildings are to be constructed which is or may be serviced with water service or sewer service, or both, by the Authority.

Project. The entire construction to be performed as provided in the Plans and Specifications.

Rate Schedule. The entire body of effective rates, rentals, charges and fees, as adopted by the Authority from time to time are made a part of these Standards. The Rate Schedule is also referred to herein as the "Schedule of Rates and Charges."

Reduced Pressure Principle Device. A device that shall incorporate two or more check valves and an automatically operating differential relief valve located between the two check valves, two tightly closing shut-off valves, and equipped with necessary appurtenances for testing. The device shall operate to maintain the pressure in the zone between the two check valves, less than the pressure on the Authority water system side of the device. At cessation of normal flow, the pressure between the check valves shall be less than the supply pressure. In case of leakage of either check valve, the differential relief shall operate to maintain this reduced pressure by discharging to the atmosphere, thereby providing an air gap in the device. To be approved by the Authority or its designated agents, the device must be readily accessible for maintenance and testing and installed in a location where no part of the device will be subject to outside flooding. The device shall be used on service connections which may be subject to backflow and where there is a possibility of contamination that constitutes an actual or potential health hazard.

Sanitary Sewage. The normal water-carried household and toilet wastes discharged from residences, apartments, business buildings, institutions, commercial and industrial establishments or any other improved Property, excluding, however, hazardous substances, garbage, effluent from septic tank or cesspools, rain, storm and ground water, roof or surface water, drainage or percolating or seeping waters, or accumulation thereof, whether underground or in cellars or basements.

Sanitary Sewer Facilities. Any pipe, lateral, manhole, valve, vault, controls and appurtenances utilized for the collection and conveyance of sanitary sewage.

Service. Provision of water and/or sewer service to or from a Consumer Unit.

Sewer Lateral. (Authority Portion) That part of the sewer system extending from a Collection Sewer to the curb line, right-of-way line or if there shall be no curb or right-of-way line to the property line.

Sewer Service Line. That part of the sewer system on the Property extending from the sewer service clean-out, or if no clean-out exists, from the curb line, right-of-way line or if there shall be no curb or right-of-way line from the Property line to the Consumer Unit(s) in the Building or Buildings served by the Authority.

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Solicitor or Authority Solicitor. The legal counsel appointed by the Muhlenberg Township Authority.

Specifications. The Technical Section(s) and standard detail(s) adopted by the Authority or the Township, or both, including any and all amendments, revisions and supplements hereto as may be approved by the Authority from time to time.

Subcontractor. A person, firm or corporate having a direct contract with the Contractor to perform part of the latter's contract; such as one who installs or furnishes and installs equipment forming a permanent part of the Contract Work, or who furnishes work required by the Contract in accordance with the Plans and Specifications. This term does not include individual workmen furnishing labor only, nor one who merely finished material not worked to a special design.

Temporary Service. A service for circuses, bazaars, fairs, construction work, irrigation of vacant property, trailers or trailer camps and similar uses that, because of their nature, will not be used steadily or permanently.

Tenant. Any Person not an Owner, occupying any Property.

Township. Muhlenberg Township, Berks County, Pennsylvania, a political subdivision of the Commonwealth, acting by and through its Board of Commissioners or, in appropriate cases, acting by and through its authorized representatives.

Usage Charge. The amount due to the Authority by Customers using Authority water service or sewer service, or both, determined by applying the usage rate expressed as the cost of water and/or sewer used, in volume increments of 100 cubic feet (or 1000 gallons), on a monthly or quarterly basis (depending on the billing period of a particular Customer.) Rates for water or sewer usage shall apply to the volume of usage beyond the periodic allowance applicable to a specific Customer. The periodic allowance and the rate or rates for water and/or sewer usage beyond the periodic allowance shall be as set forth in the Schedule of Rates and Charges in effect from time to time.

Wastewater. Sanitary Sewerage or Industrial Wastes or any combination thereof.

Water Facilities. Any pipe, water service, valve, valve box, controls and appurtenances utilized for the treatment and distribution of potable water.

Water Lateral. The pipe, valves and other facilities by means of which the Authority conducts water from its distribution mains to the curb stop to be located at the curb line or property line of the Property, and specifically includes the corporation stop or other means of connection to the main, the lateral line connected to the corporation stop and extending to the point of connection to the curb stop, the curb stop, the service box and such other facilities. The Water Lateral is to be distinguished from the Water Service Line.

Water Service Line. The pipe, valves and other facilities by means of which water is conducted from the curb stop to Consumer Unit(s) on the Property, and specifically includes the service line extending from a point of connection to the curb stop to a point inside the walls of the Building or meter box, where approved, a stop cock or compression valve and backflow preventer on the line at this point, connections for the inlet and outlet sides of the meter, a stop and waste cock on the outlet side of the meter and such other facilities.

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Water System or Distribution System. Shall mean the distribution system that furnishes water for general use, is owned and operated by the Authority and is recognized by regulatory agencies as a community water system.

Work ("Developer's System"). The entire completed construction, or the various separately identifiable parts thereof, required to be furnished to perform the intended function. Work includes, and is the result of, performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the various plan submittals, review letters, agreements, and as required by the various Federal, State, Township and Authority regulations that have jurisdiction.

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**PART 2
RULES**

2.1 INTRODUCTION TO PART 2 OF THE RULES, STANDARDS AND SPECIFICATIONS OF THE AUTHORITY

This Part 2 generally sets forth rules which are applicable to all water and/or sewer customers of the Authority, including new customers following the procedures of Part 3 with respect to additions or extensions to the water or sewer systems of the Authority.

2.2 SERVICE CONTRACTS

- 2.2.1. Applications are merely written requests for service line connections and/or water or sewer service. All applications are subject to approval of the Authority and are subject to payment of all required fees and compliance with all regulations relative thereto prior to commencement of the work or service requested therein.
- 2.2.2. The application for service shall be a binding contract on both the Customer and the Authority upon approval by the Authority. Rates for water and sewer service shall accrue from the date the water and/or sewer service has been connected and water is available to the Property.
- 2.2.3. No agreement will be entered into by the Authority with an applicant for water or sewer service, whether owner or tenant, until all arrears for water or sewer rents, bills for meter repairs or other charges due from applicant at any Property now or theretofore owned or occupied by him, shall have been paid or until satisfactory arrangements for payment of such unpaid bills shall have been made.
- 2.2.4. All contracts covering metered water supply service shall continue in force from month to month or quarter to quarter, subject to the billing period, unless ten days' written notice is given by either party of a desire to terminate the contract. Excepting in the case of delinquent accounts and those cases when written notice is turned off at the curb at the end of any month or quarter, subject to the billing period, no further charge for water/sewer service will be made from the date of such turn-off until service is again turned on.
- 2.2.5. Community swimming pools requesting service shall be billed on a basis of the actual period for which service is required.
- 2.2.6. The Authority may require, prior to approval of service, a special contract other than application for service under the following conditions:
 - A. If required by provision of the Rate Schedule, the duration of the contract to be as specified in the schedule.
 - B. If the construction of an extension and/or other facilities is necessary.
 - C. For providing temporary service, including water service for building or other special purposes. Water for building purposes shall be used only from a temporary connection approved by the Authority, and shall not be permitted to flow into the house fixtures.
 - D. For standby or fire protection service.
 - E. For connections with other qualified utilities or municipal subdivisions.

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- F. For extensions from the water supply system, whether or not such facilities are to be conveyed to the Authority.
 - G. Where service is provided from a main which does not abut the frontage of the Property to be served.
 - H. If deemed necessary by the Authority.
- 2.2.7. All contracts for water service shall be subject to such changes or modifications as may be directed by action of the Legislature of the Commonwealth of Pennsylvania or other regulatory body.
- 2.2.8. A new application must be submitted and approved by the Authority upon any change in ownership of the property when the owner is the Customer, or in any tenancy where the tenant is the Customer, or upon any change in the service as described in the application; and the Authority shall have the right, upon five days' notice, to discontinue the water supply until such new application has been made and approved.
- 2.2.9. In connection with a change in service, any Customer making any material change in the size, character or extent of equipment or operations utilizing water and sewer service, or whose change in operations results in an increase in the use of water or sewer, shall immediately give the Authority written notice of the nature of the change and, if necessary, amend their application.
- 2.2.10. In instances where conditions change such that water and/or sewer usage increases, the Customer shall be liable for an additional tapping fee computed in accordance with the resolutions of the Authority then in effect.
- 2.2.11. Water and sewer service will be renewed following repairs to a service line connection or service line extension under a property application when the conditions under which such service was discontinued are corrected and upon the payment of all charges due from the applicant.
- 2.2.12. The piping and fixtures on the Property of the Customer shall be in satisfactory condition at the time service facilities (including meters) are connected and water furnished or sewer service provided and at all times thereafter. If piping is not suitable for a meter connection, service will not be provided. The Authority will not be liable in any case for any accidents, breaks or leakage that in any way are due to the connection with the supply of water (including leakage or plumbing problems arising at the time of work performed by the Authority), or failure to supply the same, or for the freezing of piping and fixtures of the Customer, nor for any damage to the Property which may result from the usage or non-usage of water supplied to the Property.

2.3 DEPOSITS

The following general conditions shall apply to deposits in connection with applications for water service:

- 2.3.1. Cash deposits are required from Customers taking service for a period of less than thirty days, in an amount equal to the estimated gross bill for such temporary period. Cash deposits may be required with all applications for service and may be required in any cases involving contracts with tenants and service to Customers in bankruptcy proceedings, provided that in no instance will deposits be required in excess of the estimated gross bill for any single billing period plus one additional billing period, the maximum period not to exceed

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six (6) months with a minimum deposit of \$60.00 (residential) and \$300.00 (commercial and industrial). Deposits may be required from applicants who are indebted to the Authority or who have impaired their credit with the Authority in any manner.

- 2.3.2. The deposit will not bear interest.
- 2.3.3. Any Customer having a deposit will pay bills for water service as rendered in accordance with these Standards and the deposit shall not be considered as payment on account of a bill during the time the Customer is receiving water service.
- 2.3.4. Where the Customer may desire to discontinue service, the Authority will apply said deposit to the final bill once a notice to discontinue service has been received.

2.4 CONDITIONS OF SERVICE

- 2.4.1 General: The Authority will furnish water and sewer service only in accordance with these Standards as they may be amended from time to time. These Standards are hereto made and are a part of every application, contract, agreement or license entered into between the Owner or Customer and the Authority. These Standards are applicable in the entire existing and future service area of the Authority.

The Authority hereby reserves the right, so often as it may deem necessary, to alter, amend, and/or repeal the Rates and/or these Standards, or any part, and in whole or in part to substitute new Rates, Standards, which when altered and amended shall forthwith, without notice, become and thereafter be a part of every such application, contract, agreement or license for water service in effect at the time of such alteration, amendment and/or adoption.

- 2.4.2. Service Conditions – General. Before water or sewer service will be provided by the Authority, the applicant for service shall be in compliance with all of the terms of these Standards, and the applicant shall have paid any applicable connection fees, customer facilities fees and tapping fees, as referenced herein, and shall have paid any other fees and charges due to the Authority.
- 2.4.3. Turn-Off Without Authorization. The Customer shall not turn the water off at any corporation stop or curb stop, or disconnect or remove the meter, or permit its disconnection or removal without the consent of the Authority. Breach of this provision shall subject the Customer to permanent discontinuance of service.
- 2.4.4. Suspension of Service Due to Emergency. The Authority shall have the right as necessity may arise in any case of breakdown, emergency or for any other unavoidable cause, to shut off the water supply temporarily in order to make necessary repairs, connections, and to do such other work. The Authority will use all reasonable and practical measures to notify the Customer of such discontinuance of service. In such cases, the Authority shall not be liable for any damage or inconvenience suffered by the Customer or any claim against it at any time for interruption in service, lessening of the supply, inadequate pressure, poor quality of water or for any other cause beyond its control; and such temporary shut-off of the water supply shall not entitle the Customer to any abatement or deduction in or from the water service charges, nor the refund of any portion of such service charges paid in advance during or for the time of such shut-off. When a supply of water is to be temporarily shut off, notice shall be given, when practicable, to all Customers affected by the shutting off, stating the probable duration of the interruption of service and also the purpose for which the shut-off is made. Nothing in these Standards contained, however, shall be construed as a guarantee, covenant or agreement of the Authority to give notice of any shut-off due to emergencies or otherwise.

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- 2.4.5 Suspension of Service Without Notice. Delivery of water shall be discontinued immediately and without notice to such Customers or areas of its water system as the Authority shall, in its reasonable discretion, determine to be necessary and appropriate if Muhlenberg Township, the Pennsylvania Department of Environmental Protection or the U.S. Environmental Protection Agency determines that the Authority water distribution system is being or is in immediate danger of being contaminated or polluted.
- 2.4.6. Reserve Supply. The Authority shall have the right to reserve a sufficient supply of water at all times in its storage facilities to provide for fire and other emergencies, or may restrict or regulate the quantity of water used by Customers in case of scarcity or whenever the public welfare may require it.

2.5 METERS

- 2.5.1. General: All meters, unless otherwise indicated, will be furnished and installed by the Authority, subject to the fees and charges currently in effect, and will remain the property of the Authority and be accessible to and subject to its control and maintenance. Meters of the Fire Type will not be installed for General Service. A meter will be required for each Consumer Unit and for each separate service line connection/extension supplying a Consumer Unit, except as otherwise provided herein.
- 2.5.2. Size of Meter: The Authority reserves the right in all cases to stipulate the size and type of the meter to be installed on each service line and to require the installation of a larger size meter in any case where the peak use of water places any meter under undue or unusual strain and/or exceed the recommended meter capacity, and reserves the right to charge the Customer Charge currently in effect for the larger meters.
- 2.5.3. Locations: The location for the meter and/or remote reading equipment shall be subject to the approval of the Authority, shall be at a convenient and accessible point, shall permit control of the entire supply and shall allow proper protection of the meter from freezing or other harm. No fixture shall be attached to, or any branch made in, the service pipe between the meter and the street main.
- 2.5.4. Meter Pits: In cases where it is not practical to place the meter within a building, or if Authority in its sole discretion believes it to be in its best interests, the Authority may require the property owner to furnish, inside the property line, an approved meter pit with a suitable cover, such installations to be made in accordance with a plan furnished or approved by the Authority. The design of the meter pit shall permit adequate access to the meter and its ready installation or removal.
- 2.5.5. Installation of Meter: All piping fittings, valves, check valves, gauges, bolts, nuts, meter pit structures, manholes or other accessories or materials, and the labor for installing the same, used in connection with meter settings within the property line of the Property, shall be at the expense of the applicant. The Customer shall employ for this work the services of skilled tradesmen, who shall cooperate with the Authority and install all the piping and appurtenances in accordance with the dimensions and requirements for each specific case, so that the meter or meters can be properly installed and connected by the Authority.

The Customer shall furnish and install on the service line a valve on the street side immediately before the meter, and a valve on the outlet side immediately after the meter. A suitable backflow preventer check valve shall be furnished and installed by the Customer at a point beyond the service side of the discharge valve, and as provided in these Standards.

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Under certain conditions where there is a demand or necessity for uninterrupted water service in order to eliminate inconvenience to both the Customer and the Authority when repairs to or replacement of the meter is necessary, the Authority may, at its option, require the installation of parallel meters on the one service line, with approximately equal capacity. Such installations shall be properly valved to control or cut any single meter out of service and permit its removal without interruption of service through the remaining meter or meters.

- 2.5.6. Maintenance, Care and Responsibility for Damage: The Authority will maintain all meters at its expense, except that the Customer is liable and responsible for all damage to all meters while on his Property, and for the condition of internal plumbing under Section 2.2.12 above. In the event of damage to or failure of the meter, the Customer shall promptly notify the Authority. The Authority will furnish and set another meter to replace the one frozen or damaged. The cost of the repairs, including replaced parts, labor and transportation charges, as well as the cost of testing and costs for reinstallation or changing of the meter shall be billed to the Customer if the replacement was necessitated by damage caused by the Customer.
- 2.5.7. Meter Tests: Should the Customer or the Authority at any time doubt the accuracy or correctness of the meter measuring water delivered to the Customer's Property or to any Consumer Unit within such Property, the Authority will, upon a written request of the Customer make a test of the accuracy of the meter.

If the meter so tested shall be found to be accurate within industry standards, the actual cost of the test shall be paid to the Authority by the Customer requesting such test. If the meter is found to be defective, the cost of the test shall be borne by the Authority. When making such request, the Customer agrees to these terms, and must pay the test charge in advance if required by the Authority.

A report of each test shall be made to the Customer.

In the event the meter so tested is found to have an error in registration in accordance with industry standards, the cost of the test will be borne by the Authority and any fee paid by the Customer in advance will be refunded. The bill, based on the last reading of such meter or meters, shall be corrected accordingly. This correction shall apply both for over and under registration for a period not to exceed two billing periods.

The Authority reserves the right to remove and test any meter at any time at its own expense and, if such meter is found to be inaccurate, to substitute another meter of the same size in its place, either permanently or temporarily.

- 2.5.8. Change in Location of Meters: The Customer shall pay for the cost of relocation of all meters made at his request or for his convenience.
- 2.5.9. Seals: No seal placed by the Authority for the protection of any meter, valve, fitting or other water connection shall be tampered with or defaced. It shall not be broken except upon authorization from the Authority or in the presence of an Authority representative. Where the seal is broken, the Authority reserves the right to remove the meter for test at the expense of the Customer, even though said meter registers accurately.
- 2.5.10. Leaks: Customers are responsible for investigating and monitoring higher than expected water usage, and urged to give careful attention to their plumbing and fixtures and make immediate correction of all leaks. No allowance will be made by the Authority for water used, lost, stolen or otherwise wasted through the water meter. Notwithstanding, the Authority recognizes this may be a hardship for some customers and consideration may be given for

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a one-time water or sewer charge adjustment for underground or unknown and undiscovered leaks to a retroactive period not more than thirty (30) days (or one billing cycle) to the date of repair. Water leak adjustments must be requested by contacting the Authority Manager and must be accompanied by a plumber's receipt or other proof of repair. The cost of service for any future leaks shall be borne by the Customer.

- 2.5.11. Reading and Registration of Meters: Conditions permitting, readings of meters shall be taken monthly or quarterly, at the option of the Authority. The quantity recorded by the meter shall be taken to be the amount of water passing through the meter, which amount will be conclusive on both the Customer and the Authority, except when the meter has been found to be registering inaccurately or has ceased to register. In such cases, and in cases where a meter reading cannot be made for any reason, billing shall be made on estimated consumption based on prior usage.
- 2.5.12. Access to Meters: The Authority at all reasonable times shall have access to a Customer's Property and each of the Consumer Units thereof containing a water meter, and to meters, service connections and other property owned by it on Customer's Property, for the purpose of meter installation, maintenance, operation and reading. The failure to permit reasonable access shall be sufficient cause for discontinuance of service.
- 2.5.13. Notification Relative to Condition of Meter: The Customer shall notify the Authority of damage to or of the malfunction of the meter, or of the breaking of the seal wire, as soon as the Customer is aware of such a condition.

2.6 COMPUTATION OF SEWER AND WATER CHARGES

2.6.1. Computation of Sewer and Water Charges.

- A. Water and sewer charges shall be based principally upon actual metered water consumption with exceptions as hereafter noted. The size of the water service (meter size) and the volume of water actually used and metered shall generally form the basis for billing water charges. The volume of water used in calculation of sewer charges shall include any and all metered water purchased from the Authority and, in addition, all metered water obtained from any other source. All water and sewer charges shall be computed in accordance with the rate schedule for water and sewer charges as adopted by the Authority and then in effect. All water used from any source by commercial or industrial establishments must be metered and shall be billed in accordance with Authority rates then in effect.
- B. Whenever any person discharges or permits to be discharged any material into the sewer system by any means other than through a connection approved in accordance with these Standards, the Authority reserves the right to estimate the quantity and strength of the material and to make an appropriate charge based on such estimate.

2.6.2. Metered Water Service.

- A. General Rule. Each Consumer Unit shall be served through a separate Water Service Line with a separate curb stop or valve, and through a separate meter.
- B. Waiver by Board. The Board of the Authority may, in its sole discretion, permit multiple Consumer Units to be served through a single meter. Provided, however, that every such request shall be made in writing and approved by the Authority before such service is installed.

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- C. Multiple Consumer Units Served Through Single Meter. In situations pre-dating these Rules, or under subparagraph B above where water service to separate Buildings (or separate Consumer Units within one or more Buildings) owned by the same party, whether on the same or separate lots and occupied by separate tenants, is supplied through one meter, the following provisions apply:
- (1) Water Billing. With respect to water billing, the Customer shall be charged a Customer Charge (monthly or quarterly) based on the size of the water meter and in accordance with Customer Charges set forth in the Schedule of Rates and Charges in effect from time to time. The Customer shall be provided an allowance for water usage corresponding to the usage allowance (periodic allowance) fixed by the Authority for that Customer's meter size. Water usage in excess of the periodic allowance shall be billed a Usage Charge at the water consumption rate in effect from time to time; and
 - (2) Sewer Billing. With respect to sewer billing, each separate Consumer Unit so supplied (whether in one or more Buildings) shall be subject to the same Customer Charge as would be applied if separate appropriately sized service connections had been made (typically the Customer Charge for a 5/8" meter, i.e. "residential"). In addition, to the extent the aggregate sewer flow exceeds the periodic allowance of sewer flow determined by multiplying the number of Consumer Units times the periodic allowance per Consumer Unit, sewer Usage Charges shall be due (in addition to multiple Customer Charges) calculated in accordance with the Schedule of Rates and Charges in effect from time to time. The Authority's determination of the appropriate Customer Charge per Consumer Unit (based on what would be the appropriate meter size) shall be conclusive.
 - (3) Owner Billing Only. Charges for service where more than one Consumer Unit is billed through one meter shall be billed to the owner only (not to Tenants).
 - (4) Billing Review and Adjustment. The owner of a multiple residential unit served by a single meter may request, in writing addressed to the Authority Manager, a review of usage data over the preceding consecutive five (5) year period for comparison against actual usage to determine if the amount billed exceeds the actual usage by thirty percent (30%) or more. Owner shall provide supplemental data and/or sampling to the Authority as part of its review, as may be deemed necessary. If the usage data shows that an adjustment is needed, the Authority shall appropriately adjust the billing and use the adjusted amount going forward, which may include up to ten percent (10%) over the amount used. After an initial adjustment, the owner may not request another adjustment for five (5) years after the adjustment was completed. The Authority reserves the right to request submission of new data from owner on an annual basis in order to reassess any adjustment. Requests for adjustment that are made, but not deemed eligible under this subparagraph, shall be limited to once annually. The Authority shall have sixty (60) days from the date of receipt of the request to complete its review of usage data, unless such review period is extended for cause. The Authority shall notify owner of the results of the billing review in writing, addressed to the billing address of record.

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- D. Customer Charges Non-Abatable. In instances covered by Part C above involving multiple Consumer Units billed through a single meter, Customer Charges due shall be non-abatable and due, irrespective of tenant vacancy or non-use of water in one or more Consumer Units.

2.6.3. Sewer Service Only Situations.

- A. General Rule. The majority of Properties, and Consumer Units contained within those Properties, serviced by the Authority for sewer service are also served by the Authority for water service. In those instances, sewer charges shall be determined based on water meter readings and the number of Consumer Units served in each Property in accordance with Section 2.6.2 above and in accordance with the Schedule of Rates and Charges then in effect.
- B. Sewer Service Only. The following provisions apply in instances where a Property (or one or more Consumer Units contained within a Property) are served by the Authority with sewer service only (where water is provided by a different authority, municipality or private well):
- (1) Where the Authority has access to metered water usage for that Property, sewer rates shall be determined in accordance with Section 2.6.2.C(2) above, notwithstanding the fact that water service is not provided by the Authority;
 - (2) Where water usage to the Property is either not metered, or where the Authority does not have access to meter readings, a fixed sewer Customer Charge shall apply on a per-Consumer Unit basis, established in accordance with the Schedule of Rates and Charges in effect from time to time.

- 2.6.4. Duty to Notify Authority of Changes in Consumer Units. The Customer or Customers shall notify the Authority promptly relative to any changes in the number of Consumer Units, the number at any time being subject to verification by the Authority.

- 2.6.5. Billing Tenants. Should the owner desire that the Authority conduct business directly with the Tenant of any Property, he must first provide means of controlling the supply and housing of the meter or meters for each Consumer Unit within the Property separately, and/or provide means of billing and collecting the water charges therefor. The property owner shall be secondarily liable on all tenant billings according to the terms of Act, 53 P.S. Section 5607(d)(10) and (11).

2.7 BILLS, PAYMENT AND TERMINATION OF SERVICE

- 2.7.1. Place of Payment. All bills are payable at any office or any pay agency as designated by the Authority.
- 2.7.2. Basis for Preparation of Bills. All bills for services furnished by the Authority will be based on the Rate Schedule of the Authority then in effect. All bills shall be rendered and are due and payable monthly or quarterly or such other period, at the option of the Authority.

Each Property served will be subjected to a fixed monthly or quarterly Customer Charge based on the number of Consumer Units situate on the Property and the meter size in accordance with the Rate Schedule, the use of certain quantities of water being allowed without additional charge (periodic allowance) being determined for each customer account

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depending on the number of Consumer Units served, and the size of the service meter or meters. Such Customer Charges shall be nonabatable for a nonuser of water, and noncumulative against subsequent consumption. In the case of fractional bills covering less than a month or a quarter, charges and allowances of water shall be prorated. The Usage Charges for the use of water in excess of the quantities allowed for each size meter will be in accordance with the Usage Charges set forth in the Schedule of Rates and Charges. Usage Charges shall apply with respect to water used in excess of the periodic allowance with respect to each billing period.

The Owner of every Property shall be liable for the payment of all bills as rendered. If tenant neglects to make such payments, it will be the responsibility of the Owner to make such payments, subject to the provisions of 53 P.S. §5607(d)(10) and (11). The charges for private fire service shall be due when rendered.

The charges for temporary service and other miscellaneous service shall be set forth elsewhere herein and/or in the Rate Schedule.

2.7.3. Bills Rendered and Due.

All bills are due and payable immediately. Bills must be paid within forty-five (45) days to avoid a late payment penalty. A late payment penalty shall be imposed five (5) days after the designated due date. Acceptance or remittance of bills on the last day of this period shall be determined as evidenced by the postmark of the United States Post Office.

If bills are not paid within the required period during which the gross amount shown thereon applies, a delinquent notice shall be served as provided hereafter and service may be terminated as provided hereafter.

If service is thus discontinued it will not be restored until all unpaid bills and charges, including the turn-off and turn-on charges, are paid or satisfactory arrangements made for payment.

The Authority shall mail or deliver the bills and notices to the consumer at the address given in the application for service and the Authority shall not be responsible for the delivery thereto. Failure to receive bills will not be an excuse for nonpayment.

Any check received by the Authority in payment of any bill due the Authority which check is returned unpaid by the bank for any reason, shall be charged against the account involved and, in addition, charges shall be made against said account for cost of handling, for each call for collection and for any other costs involved, such charges to be as currently in effect.

2.7.4. Discontinuance of Service By Customer: Any Customer may terminate his service contract with Authority and have his water service discontinued upon giving notice thereof to the Authority, and upon the lapse of a reasonable time thereafter to permit the Authority to take final meter readings and attend to other details in connection with such discontinuance of service. The Customer shall remain liable for water furnished to the Property described in his application until the Authority has received notice from him and the termination of service has taken effect as stated above.

2.7.5. Discontinuance Without Notice. The Authority reserves the right to discontinue water service to a customer, without prior notice or on such notice as the Board or Authority management shall determine appropriate or possible, for any of the following reasons:

- A. In cases of theft of services, or use of unmetered water without the express permission of the Authority.

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- B. In case of vacancy of the Property, not previously reported to the Authority.
- C. In cases where discontinuance of water service is necessary, in the reasonable judgment of either the Authority Manager or Board of the Authority, to insure and protect the public health and safety, or in order to prevent or repair water leakage through other components of the Authority's water system. In the event of discontinuance of service without prior notice, the Authority shall provide notice of termination by mail or hand delivery as soon as feasible but in any event within seventy-two (72) hours.

2.7.6. Discontinuance for Non-Payment.

- A. For those accounts that are aged more than sixty (60) days past due, the Authority reserves to itself the right to terminate water service for non-payment of any water or sewer bills, fees, charges or other sums due to the Authority. Termination of water service shall be regulated by these Standards.
- B. A Shut-Off Notice shall be mailed to the Customer by regular mail. This notice informs the Customer that delinquent bill must be paid in full by the date specified or water service will be terminated.

2.7.7. Discontinuance on Notice. The Authority reserves the right to discontinue water service, after fifteen (15) days notice to a Customer, for any of the following reasons, provided that the issue raised by the Authority in such notice is not satisfactorily addressed in the time provided in the notice:

- A. For the use of water for any Property or purpose other than that described by a Customer in an application for service to the Authority.
- B. For the refusal of a Customer to allow the Authority access to Property for the purpose of inspection, or for the reading of, caring for, or removal of a meter or meters, or for any other purpose necessary for proper maintenance or repair of the water system.
- C. For misrepresentation in the application.
- D. For the use of water for or in connection with, or for the benefit of, any Property or purposes other than those described in the application.
- E. For willful waste of water through improper or imperfect pipes, fixtures or otherwise.
- F. For tampering with or in any other way interfering with any service pipe, meter, meter box, curb stop, curb box or with any seal on any meter or other fixtures and appliances of the Authority.
- G. In case of continued vacancy of the Property.
- H. For making or refusing to sever, upon notice, any cross connection between a pipe or fixture carrying water furnished by the Authority and a pipe or fixture carrying water from any other source, except as agreed upon by the Authority.
- I. For Properties where the demand for water is greatly in excess of past average or seasonal use, or where such excessive demands for water by the Properties are

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or may be detrimental or injurious to, or in any way impair water service furnished to other Customers.

- J. For Properties where apparatus, appliances or equipment using water is dangerous, unsafe and not in conformity with any laws or ordinances.
- (1) For fraud or abuse.
 - (2) For disturbing, tampering with or interfering with any meter, curb stop, or seal, or any of the components of the water system of the Authority.
 - (3) For failure to maintain in good order, the Water Service Line, Sewer Service Line or fixtures beyond the curb and owned by the Customer.
 - (4) For violation of any of the Rules, Standards and Specifications of the Authority not otherwise specifically addressed in this section.

2.7.8 Termination of Water Service at Request of Sewage Authorities.

- A. Pursuant to the Act of April 14, 2006, P.L. 85, codified at 53 P.S. §3102.502, et seq., as now or hereafter amended, whenever an owner or occupant of a Property containing one or more Consumer Units served by another public or municipal sewer provider shall be thirty (30) or more days delinquent in paying for sewage service, the Authority shall, upon receipt of written evidence that the Board of such authority has passed a Resolution requesting termination upon notice to the Authority, initiate water service termination procedures by the mailing and posting (at a main entrance to the Property) of a Notice advising of the sewer bill delinquency and the fact that water service will be terminated if payment is not made within a time specified.
- B. If water service is terminated pursuant to this Section, it shall not be reconnected until all sewage bill delinquencies, interest and penalties are paid in full, together with a turn-on fee payable to the Authority.

2.7.9 No Liability/Municipal Lien Rights. If the Authority shall deem it necessary to discontinue water service under the provisions of this section, in no event shall the Authority be liable for any damage or inconvenience suffered by the customer due to discontinuance of service.

Nothing herein shall prevent the Authority from providing additional notice to any delinquent customer, or from accepting any repayment proposal deemed to be in the best interest of the Authority in the reasonable discretion of the Board. No informal notice delivered to any customer, nor any payment arrangement agreed upon by the Board with any customer, shall impair or affect the Authority's right to strictly enforce these Rules concerning delinquent accounts.

The Authority reserves all of its rights to file municipal liens for delinquent water and sewer charges as well as for other charges due by any customer. Pursuant to resolution previously adopted, the Authority shall include, in the amount of any lien, attorney's fees and costs of filing.

2.7.10. Reinstatement of Service After Discontinuance. Service may be reinstated under a proper application when the conditions under which such service was discontinued are corrected and upon the payment of all proper charges or amounts provided in the schedule of rates

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and standards of the Authority due from the applicant, including payment of any required deposit.

2.8 INSTALLATION AND MAINTENANCE OF WATER SERVICE LINES

2.8.1 Responsibility. The installation of the Water Service Line, that is, the service line extending from the outlet side of the curb stop to the Property, and all required appurtenances, shall in each instance be installed by and at the expense of the Customer. The Customer shall permanently own and maintain the Water Service Line, and shall be responsible for all associated costs and expenses. The installation shall be in accordance with the following requirements:

- A. General. The portion of the service line extension installed by the Customer shall be not greater in size nor lesser in quality than the Water Lateral in the street laid by the Authority, and shall be laid not less than four feet below the surface, and shall not be covered until the tap on the Main is made and both the lateral and service line are tested. If any defects in workmanship are found, the service shall not be turned on until such defects are remedied. All plumbing connections should be able to withstand a pressure of at least 150 psi.
- B. Installation Details. The installation shall include a connection of the service line to the outlet side of the curb stop, extension of the service line from the outlet side of the curb stop to a point within the building wall or facilities housing the meter, a valve approved for the use of water and meeting current Plumbing Codes, the same size as the service line, on the street side and immediately before the meter, a valve approved for the use of water and meeting current Plumbing Codes and backflow preventer on the outlet side of the meter. All facilities inside the building shall be located so as to be readily accessible, protected from freezing and shall provide proper drainage for the piping in the building. The installation shall be made by skilled and qualified workmen. The Contractor for the Customer shall notify the Authority when the service line extension will be installed, in order to permit the Authority to inspect the placement of the meter setting. The service line extension shall be laid in a straight line between the curb stop and the Property unless otherwise approved in writing by the Authority.
- C. Additional Requirements. The Authority reserves the right to require any owner to install on or in conjunction with his service line extension, such valves, stop cocks, check valves, relief valves, pressure regulator, air chamber, tank, float valve, backflow preventer or other apparatus of approved design, when and where, in its opinion, the conditions may require it for the safeguarding and protection of the Authority's property or the water supply.

2.8.2. Requirement of Meter Pits: In cases where the length of the Water Service Line exceeds 60 feet and in all other cases where the Authority determines it to be appropriate, the Authority may require the Customer to furnish, at his expense, an approved meter pit provided with a suitable cover and constructed in accordance with a plan furnished by the Authority, said meter pit to be constructed at the property or curb line and to be used for the housing of the meter required for the service of the Property.

2.8.3. Maintenance of Water Service Lines: All Water service lines and related equipment shall be owned by the Customer and shall be maintained by the Customer in satisfactory condition; and all valves, meters and appurtenances furnished and owned by the Authority and on the property of the Customer, if any, shall be protected properly and cared for by said Customer. When repairs, renewals or replacements or other necessary work are required on the

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aforesaid facilities of the Customer, the Customer shall employ, without delay, competent tradesman to do the work. All said work shall be done at the expense of the Customer. All leaks in the Water Service Line or any other pipe or fixture or in or upon the Property supplied must be repaired immediately by the owner or occupant of the Property, under penalty of discontinuance of service by the Authority.

The Authority shall in no event be responsible for maintaining any portion of the water service line owned by the Customer, or for damage done by water escaping therefrom, or from lines or fixtures on Customer's property; and the Customer shall at all times comply with municipal regulations with reference thereto and make changes therein required on account of change of grade, relocation or mains or otherwise.

In cases where services are frozen, the Authority will, at its own expense, thaw out the Water Lateral to the curb stop. The thawing out of the Water Service Line from the curb stop to the Buildings on the Property shall be done by the Customer at his own expense. To avoid a recurrence of freezing, the Authority will make an examination of Customer's Water Service Line and if the same is not at a depth of four feet as required, the Authority shall have the right to require it to be relocated before service is resumed.

2.9. INSTALLATION OF SEWER SERVICE LINES, INTERCEPTORS AND SEPARATORS

2.9.1. Responsibility. The installation of the Sewer Service Line, that is, the service line on the owner's side of the clean-out or curb line, and all required appurtenances shall in each instance be installed by and at the expense of the Customer. The Customer shall permanently own and maintain the Sewer Service Line, and shall be responsible for all associated costs and expenses. The installation shall be in accordance with the following requirements:

A. General. The portion of the service line extension installed by the Customer shall be not greater in size nor lesser in quality than the Sewer Lateral in the street laid by the Authority, and shall be laid not less than four feet below the surface, and shall not be covered until the tap on the Main is made and both the lateral and service line are tested. If any defects in workmanship are found, the service shall not be put into service until such defects are remedied.

B. Installation Details. The installation shall include a connection of the service line to the sewer lateral, extension of the service line from the sewer lateral to a point within the building wall or facilities to be connected to the sanitary sewer piping only. All facilities inside the building shall be located so as to be readily accessible, protected from freezing and shall provide proper drainage for the piping in the building. The installation shall be made by skilled and qualified workmen. The Contractor for the Customer shall notify the Authority when the service line extension will be installed, in order to permit the Authority to inspect the property. The Sewer Service Line extension shall be laid in a straight line between the sewer lateral and the Building on the Property, unless otherwise approved in writing by the Authority.

2.9.2 General. Harmful discharges to the sewer system are prohibited. Interceptors and/or separators shall be required to be installed as set forth below or wherever in the sole judgment of the Authority they are deemed necessary to protect the integrity and safety of the sewer system.

2.9.3 Grease Interceptors. A grease interceptor shall be required to receive the grease-laden drainage from plumbing fixtures and equipment located in the food preparation areas of

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commercial and industrial establishments. This includes, but not by way of limitation, facilities such as: restaurants, motels, hotels, bars, cafeterias and schools.

- 2.9.4 Oil Interceptors. An oil interceptor shall be required to receive drainage from work areas of commercial and industrial establishments where the possibility exists that petroleum products could become mixed with wastewater. This includes, but not by way of limitation, repair garages, gasoline stations and factories.
- 2.9.5 Special Purpose Interceptors. Interceptors shall be required at commercial and industrial establishments where the nature of their operation is such that a substance detrimental to the sewer system could enter the wastewater stream. Sand or grit from car washes, string or rags from commercial laundries, and animal parts from butcher shops are examples of facilities where special purpose interceptors may be required.
- 2.9.6 Accessibility and Maintenance. Each interceptor or separator shall be installed so as to be readily accessible for service and maintenance. Interceptors and separators shall be maintained by periodic removal of accumulated grease, scum, oil, solids, etc. and by disposal of the material in a lawful manner.
- 2.9.7 Specifications. The style, type and location of each interceptor or separator shall be approved by the Township Plumbing Inspector using the specifications of the latest edition of the BOCA Basic National Plumbing Code as guidelines.
- 2.9.8 Inspection and Records. The Township Plumbing Inspector may make periodic inspections of these facilities and associated records to assure proper installation, maintenance and disposal procedures are being practiced. Written records, maintained by the property owner or facility management, shall be required to document required maintenance and lawful disposal of all accumulated material.

2.10 MAINTENANCE OF SEWER SERVICE LINES

- 2.10.1. Responsibility for Maintenance/General. The maintenance of Sewer Service Lines from Building to curb line shall be the obligation of the property owner or customer. Further, in the event the Authority determines that the property owner or customer was responsible for causing blockage in an area which would ordinarily be the responsibility of the Authority by placing inappropriate material into the Sewer Service Line, the Authority reserves the right to require reimbursement from the customer.
- 2.10.2. Blockage/Roots. In the event that tree roots are found to be the cause of a blockage in a Sewer Lateral and the property owner refuses to remove the offending tree when it is within his legal authority to do so, the property owner shall be solely responsible for all future maintenance of the Sewer Lateral affected by such blockage.
- 2.10.3. Replacement of Sewer Service Line. In the event it becomes necessary to replace a Sewer Service Line the property owner or customer shall notify the Authority and such a replacement shall be subject to the specifications and inspection provisions of these Standards. The Owner/Customer shall be responsible for all costs of replacement of the Sewer Service Line.

2.11 GENERAL RULES

- 2.11.1. No Abatement of Water or Sewer Rentals or Charges. There shall be no abatement of water or sewer rentals or service charges imposed by these Standards unless the property with respect to which an abatement is requested shall have been physically disconnected from

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the water and sewer system in a manner satisfactory to the Authority. It is intended by this Section to prohibit any abatement of water or sewer rentals or water or sewer service charges for any period during which a Property connected to the water or sewer systems of the Authority shall have been vacant or unoccupied unless the property is physically disconnected, as aforesaid.

- 2.11.2. Inspection. Authorized employees of the Authority, identified by proper badges, shall have access to the Customer's Property at all reasonable hours, for the purpose of turning the water on or off; inspection, repair and/or replacement of service lines and service line extensions; inspections, setting, reading, repairing, replacing and removal of meter; and for all such justifiable purposes.

The Authority shall have the power to make such excavations as are required for the proper execution of the work.

- 2.11.3. Turn-On Charge. Where there is no unpaid bill, water will be turned off and on without charge for consumers who wish to discontinue or renew service. When water has been turned off because of an unpaid bill or violation of the terms of the application or standards of the Authority, a turn-on charge, currently in effect must be paid before water service is restored.

- 2.11.4. Interference with Authority's Property. No workman, owner, tenant or other unauthorized person shall turn the water on or off at any corporation cock or curb stop or break the seals, disconnect or remove the meter, or otherwise interfere with the Authority's property.

For unauthorized operation of street valve, curb stop, service cock or other service connection, the person owning the Property served by the line connected to said street valve, curb stop, service cock or other service connection shall be required to pay the fee in effect and any costs required in connection with damage to these facilities.

- 2.11.5. Only Standards Binding. No agent or employee of the Authority shall have authority to bind it by any promise, agreement or representation not provided for in these Standards without the approval of the Authority Board.

- 2.11.6. Service of Notices. All notices and bills relating to the Authority or its business shall be deemed to have been properly served if left upon the Property of the Customer or if mailed to the Customer, directed to, or left at his address as shown on the records of the Authority. Failure on the part of the Customer to receive a notice or a bill following proper service by the Authority shall not excuse the Customer for payment of all amounts due, including penalties for late payment.

The Authority will send all such notices and bills to the address given on the application for water supply until a notice or change, in writing, has been filed with the Authority by the applicant.

All notices of a general character, affecting or likely to affect a large number of Customers, shall be deemed to have been properly given or served if advertised in the newspaper designated by the Authority.

- 2.11.7. Complaints. Complaints relative to the character of the service furnished or the reading of meters or of bills rendered must be made in writing and delivered to the main office of the Authority.

- 2.11.8. Service Not Guaranteed. Nothing in these Standards, nor any contract, nor representation, verbal or written, of the Authority or any of its employees shall be taken or construed in any

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manner to be or constitute a guarantee to furnish a given quantity of water through any service connection, whether for domestic, commercial, industrial, manufacturing or other general uses, or for public or private fire protection purposes, or for any other special purposes; but the Authority will at all times and under all conditions endeavor to maintain the efficiency of its service.

The Authority shall have the right to temporarily cut off the water supply in the case of breaks, emergencies, or for any other reasonable cause, in order to make necessary repairs, connections and do such other work. In such cases, the Authority shall not be liable for any damage or inconvenience or any claim for interruption of service, lessening of supply, inadequate pressure, poor quality of water and such other reasons.

2.11.9. Restriction of Supply. The Authority reserves the right to restrict the supply of water in case of scarcity or whenever the public welfare may require it, and to reserve a sufficient supply of water at all times in its reservoirs to provide for fire and other emergencies.

2.11.10. Ground Wire Attachments. All Customers are forbidden to attach any ground wire or wires to any plumbing which is or may be connected to a service line connection/extension or main belonging to the Authority, and the Authority will hold the Customer liable for any damage to its property occasioned by such ground wire attachments.

2.11.11. Water Hammer. No use of water will be permitted which may or does cause water hammer. Water booster pump station(s) dedicated to the Authority shall incorporate surge valve protection features as are necessary to safeguard the station piping and the water distribution system from adverse water hammer conditions resulting from the operation of the station.

2.11.12. Swimming Pools. The filling of swimming pools shall, in general, be subject to the following:

- A. The rate of filling shall not be excessive and/or cause any disturbance or serious pressure drop in the existing Authority system, and be subject to approval of the Authority.
- B. No swimming pool shall be filled except through a metered connection.
- C. There shall be an approved backflow preventer on all swimming pool fill lines or a visible air gap.
- D. The Authority shall permit a one-time waiver of sewer charges with respect to water used to fill a swimming pool, provided that each customer requesting such a waiver shall provide the Authority with a certification from the supplier of the pool as to its water capacity

2.11.13. Miscellaneous Work and Service Furnished by the Authority. The cost of repair and/or restoration of Authority facilities damaged due to the actions of others, including the cost of lost water, shall be paid for by those responsible therefor. All bills for such work and services furnished by the Authority shall be rendered by the Authority and be due and payable within fifteen days after the date of presentation. Acceptance or remittance of such bills on the last day of this fifteen day period shall be determined as evidenced by the postmark of the United States Post Office. The Authority, if necessary, will take appropriate legal action to recover all monies due if payment is not made to the Authority.

2.11.14. Tapping Fees. Pursuant to 53 P.S. § 5607(d)(24), the Authority has established a tapping fee schedule for all connections to main water lines and sewer lines, such fees to vary, subject to the conditions under which the main line or lines have been installed and such

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other factors, as set forth in the tapping fee schedule. The tapping fee varies for each individual size connection, amount of water usage, tapping district in which the property is situate and may differ depending on whether the connection is on a line installed by the Authority and/or others, whether the main line is subject to an agreement with others involving reimbursement conditions as related to connections to the line or lines, whether the main line was installed under an assessment program, and to whether there are any other special conditions.

2.11.15. Unauthorized Usage Fee. The Authority hereby imposes a fee payable immediately upon demand by any person who uses unmetered water of the Authority without prior written authorization to do so. The Unauthorized Usage Fee shall be in an amount as established by the Authority from time to time as reflected on the Schedule of Rates and Charges. The Authority reserves all of its rights to prosecute criminal theft of service charges under the Pennsylvania Crimes Code, 18 P.S. §3926, and all its rights to the imposition of a municipal lien against property on which unauthorized use of water occurred.

2.11.16. Manual Meter Read Fee. The Authority seeks to increase efficiency of its water system by installation of radio-read water meters. To the fullest extent possible, the Authority intends to retrofit pre-existing water meters to allow for radio-read capability, and to require radio-read meters in all new water service installations in the Authority's service area. To the extent that, for any reason, the Authority is incapable of installing a radio-read meter, or measuring water use through its radio technology, the Authority may impose a meter read charge applicable to manual meter reads. Such charge shall be reflected on the separate Schedule or Rates and Charges adopted by the Authority Board from time to time.

2.11.17. Attorney's Fees. In accordance with 53 P.S. Section 7106, and in accordance with its Resolution previously adopted in that regard, the Authority reserves the right to impose attorney's fees upon delinquent Customers, which are delinquent in payment of any rates or other charges due to the Authority, in accordance with the procedures set forth in Title 53 P.S. Section 7101, et seq., and in accordance with the fee schedule set forth in Resolution 1996-2, as amended, from time to time.

2.11.18. Conditional Waivers of Service. The Authority asserts its primary right to provide water and sewer service in its service area comprising Muhlenberg Township, the Borough of Laureldale, and portions of Alsace Township, Berks County, Pennsylvania. Notwithstanding the Authority's primary right to provide such service, the Authority may, upon written consent of the Authority after consideration by the Board, waive its right to provide service in order to permit an applicant to receive service from another water or sewer service provider. The tender of such waiver shall provide that in the event adequate service capabilities are installed by or for the benefit of the Authority in the future, upon written notice, that applicant will switch its water or sewer service (as the case may be) to service by the Authority within ninety (90) days of such notice. Any applicant seeking such a waiver shall agree in writing to these terms and provisions as a condition of such a waiver being granted by the Authority.

2.11.19. Copies of Standards. Copies of these Standards may be obtained at the office of the Authority for a fee. Copies are available for review at the office of the Authority at all times during regular working hours.

2.12 GROUND SOURCE HEAT PUMP REGULATION

2.12.1. Approval Required. No person shall install, construct, drill or excavate to facilitate the construction or installation of a ground source heat pump ("GSHP") for use as a heating and/or cooling system for a structure without first obtaining written approval from the Authority for the GSHP system proposed. No person shall drill or excavate to repair or modify or to

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facilitate the repair or modification of a GSHP system without first obtaining a GSHP system approval from the Authority.

2.12.2. Regulations for GSHP Systems. All GSHP systems installed and/or repaired or modified after the effective date of this Section shall comply with all of the following Authority specifications:

- A. All ground source heat pump systems shall be closed systems. No open loop ground source heat pump systems shall be permitted.
- B. The installation specifications and drawings for the GSHP system shall be submitted to and approved by the Authority as conforming to the International Ground Source Heat Pump Association (IGSHPA) installation standards, as same may be amended and updated from time to time and currently found in Appendix 1 of the GSHP Manual of the DEP.
- C. The vertical GSHP well (or wells) installation shall be made only by a Pennsylvania licensed well driller.
- D. All GSHP system wells shall be grouted from top to bottom after the piping has been completed within the wells.
- E. Grout shall be mixed, pumped and placed in accordance with the procedures recommended by the International Ground Source Heat Pump Association (IGSHPA) in its publication entitled "Grouting Procedures for Ground Source Heat Pump Systems" (available from Ground Source Heat Pump Publications, Oklahoma University, Stillwater, Oklahoma). Acceptable grout materials are as follows:
 - (1) Neat cement (no more than six (6) gallons of water per ninety-four (94) pound bag of cement).
 - (2) High solids of clay bentonite grout (NOT BENTONITE GEL).
 - (3) A material approved for use by the Authority's consulting engineer or other Authority representative.
- F. No GSHP system shall be located within one hundred (100) feet of any existing drinking water wells or any planned drinking water wells.
- G. With respect to each GSHP well installation, the Pennsylvania licensed well driller shall provide the Authority prior to activation of the GSHP system:
 - (1) Accurate written records and a written geologic log.
 - (2) Accurate records with respect to grouting for each such well.
 - (3) "As-built" plans and related documentation for each such system and provide well location map.
 - (4) Written documentation of the GSHP system testing and certification.

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- (5) A written plan for the operation of the GSHP system (which meets specifications of the manufacturer of the GSHP system equipment and is approved by the system installer) which, among other matters, provides that:
 - a. Any GSHP system leaks or releases will be reported by the applicant (and subsequent owners) to the Authority and the Township Police Department within twenty-four (24) hours of the discovery of same, and the applicant (and subsequent owners) covenants and agrees to take all appropriate action to minimize any fluid releases to the ground and to promptly repair any system leaks.
 - b. In the event of the proposed discontinuance of the use of the GSHP system, a system closure plan will be prepared and submitted to the Authority for its approval.
- 2.12.3. All GSHP systems in areas underlain by carbonate bedrock must be vertical loop systems. Outside the carbonate bedrock areas, either vertical or horizontal closed loop GSHP systems may be used, subject, however, to the review and approval of the plans for same by the Township.
- 2.12.4. No GSHP system shall be connected in any way to any sewage disposal system.
- 2.12.5. The piping for GSHP systems must be made of polyethylene or a material approved by the Authority.
- 2.12.6. Only water, potassium acetate or propylene glycol may be used as the circulating fluid for GSHP systems.

2.13 PUBLIC FIRE SERVICE

- 2.13.1. Application for Fire Hydrant and Location. A written application prepared on the form furnished by the Authority must be submitted by any Municipality that is served water by the Authority, for the purpose of requesting the installation of public fire hydrants, said application to be signed by duly authorized officials of the municipality.

The application must be accompanied by a plan showing the proposed location of each fire hydrant on the public highway or public property, showing the line and grade of the highway or area and such other data.

The Authority will determine whether proper service can be furnished at the fire hydrant under normal and ordinary conditions, subject to the size of the existing street main, to the sizes of the lines in the surrounding distribution system, to the available pressures and to such other factors. The municipality will be advised relative thereto.

The entire cost of a fire hydrant installation shall be paid in accordance with the agreement governing its installation.

A fire hydrant installation is intended to include a tee and other fittings required in the main line, a branch 6-inch line extending from the tee placed in the main line to the fire hydrant, proper thrust blocking of the fire hydrant design for thrust of 150% above the main test pressure, the tee and other fittings, and such other work as is indicated on the standard plans of the Authority relative to fire hydrant installations.

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2.13.2. Maintenance. All fire hydrants will be inspected by the Authority at its own cost and expense, provided that any expense for repairs caused by carelessness or negligence of the employees of the particular municipality or the member of the fire department thereof shall be paid for by the municipality.

2.13.3. Hydrant Use. Only persons with prior authorization from the Authority shall be permitted to remove water from any public fire hydrant or hose plug, except for firefighting purposes or for use by fire departments in case of fire, in which events prior approval shall not be required. Specifically, no public fire hydrant shall be used for sprinkling streets, flushing sewers or gutters or for any other purpose (except firefighting) without the approval and issuance of a permit by the Authority, said permit being subject to revocation at any time. If a fire hydrant is used for a fire department, municipality or other person for firefighting purposes, such party or parties shall thereafter immediately notify the main office of the Authority of such use, to allow the Authority an opportunity to check the condition of the hydrant or hydrants after such use.

Private individuals, developers or contractors desiring to use a fire hydrant, for other than firefighting purposes, must first make application to the Authority. After application has been made, if permission to use a fire hydrant is granted by the Authority, the permittee will be required to pay a hydrant opening fee and shall be required to pay for all water used based upon the fee water rates then in effect. Use of a fire hydrant, upon appropriate application and permission, may only be performed under the direct supervision of an authorized agent of the Authority.

The use or opening of any fire hydrant for private usage without the authorization of the Authority is a summary offense as specified in 18 Pa. C.S.A. §3306.

2.13.4. Change of Locations. Whenever a municipality or person or persons desires a change in the location of any fire hydrant, the Authority, upon receiving written notice to do so, will make such a change if determined feasible, at the expense of the municipality or person or persons making the request, subject to the right of the Authority to refuse such location because of size or main pressure, condition of distribution system and other reasonable causes. Authority reserves the right to require prepayment of all costs.

2.13.5. Inspection. Upon request of the duly authorized officials of any municipality, the Authority will make inspections at convenient times and at reasonable intervals to determine the condition of the fire hydrants, such inspections to be made by a representative of the Authority and a duly authorized representative of the municipality.

2.14 GENERAL RESTRICTIONS OF HARMFUL AND CLEAR WATER DISCHARGES

2.14.1. Harmful Discharges Prohibited. The Authority reserves the right to refuse permission to connect to the sewer system, to compel discontinuance of use of the sewer system, or to compel treatment of wastewaters by any person using the sewer system in order to prevent discharges deemed harmful, or to have a deleterious effect upon any portion of the sewer system.

2.14.2. Clear Water and Sump Pump Discharges Prohibited. It shall be unlawful for any Customer, owner, occupant or user of any premises connected to the Authority's sewage collection system to direct or discharge into or allow any stormwater, surface water, groundwater, well water or water from industrial or commercial air-conditioning systems to drain or discharge, either directly or indirectly, into the public sanitary sewer system. No rain spout, or other form of surface drainage, and no foundation drainage or sump pump shall be connected to or discharged, either directly or indirectly, into any public sanitary sewer system.

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It shall be unlawful for any Customer, owner, occupant or user of any premises in the Township to maintain any connection with the public sanitary sewer system from sources carrying roof water, groundwater, surface water or any other natural precipitation.

2.15. CROSS CONNECTIONS AND INTERCONNECTIONS

2.15.1. Purpose and Intent. It is the purpose and intent of this Section of the Standards to protect the Water System of the Authority from the possibility of contamination or pollution by isolating within its Customers' private water distribution system or systems, such contaminants or pollutants which could backflow into the water distribution system of the Authority. It is the intent of this regulation to provide for the maintenance of a continuing program of cross connection prohibition and interconnection control which will systematically and effectively prevent contamination or pollution of the water distribution system of the Authority.

2.15.2. Responsibility of Customer. Each Customer shall take proper precautions in order to protect the Water System from contamination or Pollution due to backflow through the water service connection. The Authority or designated agent shall determine the degree of hazard to the Water System and require, at the Customer's expense, installation of an approved Backflow Prevention Device at the water service connection. The Authority or its designated agent also shall give notice in writing to said Customer to install such an approved Backflow Prevention Device at each service connection. The Authority or its agent shall require at the Customer's expense annual or more frequent testing, proper maintenance and repair, and adequate records of each test and subsequent repair, including material or replacement parts for each installed, approved Backflow Prevention Device. The Customer as a condition of service or continued service must send to the Authority the written test results and/or repair information on forms supplied by the Authority. Failure, refusal, or inability on the part of the Customer to install, test, maintain, repair, or keep record of safe devices, shall constitute a ground for the Authority to discontinue the water service of said Customer. The testing of backflow prevention devices shall be done only by individuals who are deemed as qualified and approved prior to said testing by the Authority.

2.15.3. General Requirements Concerning Cross-Connections/Inter-Connections. No Cross-Connections shall be permitted. Cross-Connections are defined in these standards. No water service connection to any Customer shall be installed or maintained in the Authority water system unless said connection is adequately protected for backflow prevention as required by these Standards. Service of water to any Customer shall be discontinued by the Authority or its agents if any approved Backflow Prevention Device, required by these Standards is (a) improperly installed, or (b) not installed, or (c) not regularly tested and maintained, (d) removed, bypassed or inaccessible to the Authority water system's personnel or agents for the purpose of inspection or testing, or (e) if adequate records of test results for approved Backflow Prevention Devices are not kept and forwarded in writing to the Authority.

Interconnections shall be permitted, only at the acceptance of the Authority, provided the Customer maintains positive Backflow Prevention Devices between the interconnection piping of the two separate systems. The Customer shall submit an application for an acceptable interconnection and shall include in the application the specific type of device to be installed for the Authority's approval.

2.15.4. Inspection of Backflow Devices.

A. Inspection Responsibility by Customer. It shall be the responsibility of the Customer at any Property where a Backflow Prevention Device or devices are installed or already in place to have a thorough inspection and operational test

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performed at least once a year or more often if previous inspections indicate a need. Inspection and operational tests shall be performed immediately following installation of or maintenance and repair to a backflow prevention device. Each device shall be repaired, overhauled or replaced at the expense of the Customer whenever it is found to be necessary.

- B. By Authority. Customer's water system shall be open for inspection at all reasonable times to authorize representatives of the Authority or its agents, to determine the adequacy of Backflow Prevention Device records, whether cross connections or violations of these Standards exists, the degree of hazard to the Authority water distribution system or for the inspection and operational testing of backflow prevention devices. Each Customer, as a condition of the continued delivery to said Customer's Property of community water supply, shall be considered as having consented to entry upon said Customer's Property by Authority personnel for the purposes stated herein.

2.15.5. Instances Requiring Backflow Device. An approved Backflow Prevention Device shall be installed at the expense of the Customer on each service line connection/extension after the water meter or immediately inside the building being served, but, in all cases before the first branch line leading off the service connection lines wherever the following conditions exist:

- A. In the case of the Customer having an auxiliary water supply which is not approved by a duly authorized regulatory agency or acceptable to the Authority, the Authority's water supply shall be protected by installing an approved backflow prevention device in the Customer's service line or lines.
- B. In each case when a Customer has any industrial fluids or any other objectionable substance being handled in such a manner as to create an actual or potential hazard to the Water System including handling of Authority water which has been processed or otherwise subjected to deterioration in quality; or
- C. In each case when a Property has an internal cross connection which cannot be permanently corrected or controlled, or intricate plumbing and piping arrangements, or entry to all portions of the Property not readily accessible for inspection purposes, making it impracticable or impossible to ascertain whether or not cross connections or the hazard they impose exist.

2.15.6. Type of Device Required. The type of Backflow Prevention Device required shall depend upon the degree of hazard, as determined by the Authority or its designated agent, which exists as follows:

- A. In the case of health hazards as defined in the definitions hereto, a reduced pressure principle device (RPPD) or Air Gap shall be installed in the Customer's service line or lines at the Customer's expense.
- B. When an Air Gap is used at the service connection to prevent the contamination or pollution of the public potable water system, it is required that an emergency by-pass be installed around the air gap system and an approved reduced pressure principal device shall be installed in the by-pass system.
- C. In a case of pollution hazards as defined hereinbefore, a double check valve assembly (DCVA) shall be installed in the Customer's service line or lines at the Customer's expense.

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All presently installed Backflow Prevention Devices which do not meet with the requirements of an "approved" device which can be shown to have been adequately inspected, tested and maintained, shall be acceptable and approved as long as the Authority is assured that these devices can adequately protect the Water System. If, however, the existing device is moved from its present location, requires more than minimum maintenance, or maintenance will constitute a health hazard, the device must be replaced by an approved device.

- 2.15.7. No Alteration of Device. No Customer shall alter, bypass or render ineffective or inoperable any Backflow Prevention Device approved and covered by these Standards without the written consent of the Authority.
- 2.15.8. Private Well Connections. Customers who have previously obtained their water supply from a private well or wells located on their property and who will or have applied for a water service line connection from the Authority shall physically disconnect the well supply from their internal plumbing system. The disconnect shall serve as an air gap type backflow prevention device. Once the physical disconnect/air gap is completed, the Customer shall notify the Authority in writing that the disconnect requirement has been met. Authority personnel shall be granted permission from the customer to visit the Customer's property for the purposes of verifying the disconnect.

2.16. HIGH VOLUME WATER USAGE/BOILER REQUIREMENTS

- 2.16.1. Should the use of water through a Water Service Line become excessive during periods of peak use, and cause a substantial decrease in pressure in the distribution system of the Authority to the extent that normal water service to other Customers is impaired, the Authority may require the installation of properly designed and adequate storage and other required facilities on the system of the Property involved. Such facilities shall include all piping, valves, fittings, storage structures, pumps, automatic controls and other appurtenances as are required to permit the storage of water and delivery there from during periods of peak water use on the Property, and thereby avoid a direct use from the system of the Authority during such periods. The design of such systems shall be subject to approval by the Authority. The cost of design and installation, together with Authority's engineering review fees, if any, shall be the responsibility of the Customer.
- 2.16.2. In instances in which steam boilers take a supply of water directly from the Water Service line and depend upon the hydraulic or hydrostatic pressure in the water system of the Authority for their supply under working pressure, it will be at the sole risk of the parties making such attachments, and the Authority will not be responsible for any accidents or damages to which such devices are frequently subject. House boilers for domestic use must in all cases be provided with vacuum valves to prevent collapse when water is shut off from the distribution systems. The Authority will in no case be responsible for accidents or damages resulting from failure to observe this rule or due to conditions in its distribution system or from the imperfect action of any such valves, or due to any other causes.

2.17 SEWAGE BACKFLOW VALVES

- 2.17.1 Exterior installation. Sewage backflow valves, if installed on the exterior of the home, shall be the Rectorseal Clean Check Extendable Backwater Valve or approved equal. Valve must have replaceable flapper and unit shall be such that all maintenance can be accomplished without excavation. The sewage backflow valve shall comply with UPC, IPC and IRC codes and ASME and ICC-ES standards. Flapper shall be rated for 75 psi.

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- 2.17.2. Interior Installation. Sewage backflow valves, if installed in the interior of the home, shall be Mainline Fullport Backwater Valve or approved equal. Valve shall be fully accessible in the floor of the home for inspection, cleaning and maintenance. Backflow valve shall comply with UPC, IPC, and IRC codes and ASME and ICC-ES standards.
- 2.17.3. Installation, Maintenance and Repair. Customer is solely responsible for installation, maintenance and repair of the valve. The Authority will in no case be responsible for accidents or damages resulting from the installation and/or use of a backflow valve, regardless of cause.

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**PART 3
DEVELOPER RULES AND REGULATIONS
FOR EXTENSIONS TO WATER AND/OR SEWER SYSTEMS**

3.1. INTRODUCTION TO PART 3 OF THE RULES, STANDARDS AND SPECIFICATIONS OF THE AUTHORITY

This Part 3 generally sets forth required Standards and Specifications for additions and extensions to the Authority water and/or sanitary sewer systems. All additions, extensions, connections to and modifications of the Authority's water and/or sanitary sewer facility shall be completed in accordance with these Standards and Specifications.

- 3.1.1. The installation of water and/or sanitary sewer facilities shall include the furnishings of all detailed plans, survey stakeout, plans, labor, new materials, equipment, supplies, transportation, fuel, power and all other requirements necessary to perform the work.
- 3.1.2. The Authority reserves the right to establish special and/or supplemental requirements for any given addition, extension or modification based upon unique features of the specific project, recent changes in standard public works operating and construction practices which may not be reflected within these Standards and Specifications, or for other legal or administrative reasons which the Authority may identify.

3.2. GENERAL SEQUENCE OF EVENTS

The following general sequence of events is offered as a guide for anyone planning to install water and/or sanitary sewer facilities:

- 3.2.1. Determine if the proposed project is in the Authority's water and/or sewer service area, and determine if the Authority has capacity available to offer for new connections.
- 3.2.2. Prepare a layout and design of the proposed water and/or sanitary sewer facilities in accordance with these Guidelines.
- 3.2.3. Submit two (2) copies of plans for review, along with a signed Escrow Agreement and escrow funds for engineering and legal services. The amount of escrow funds, as shown on the fee schedule, shall be determined and/or modified by the Authority in its sole discretion.
- 3.2.4. Revise and modify the plans/application as necessary to satisfy comments by the Authority, engineer, or solicitor.
- 3.2.5. Submit the required legal descriptions for approval to be incorporated into the Authority's grant of easement.
- 3.2.6. Prior to construction, execute a municipal improvements agreement and/or easement agreements, and pay the prevailing tapping fees. Establish the appropriate financial security for the proposed improvements.
- 3.2.7. Submit for review, a Certificate of Insurance, the necessary shop drawings and material certifications, prior to initiating the work.
- 3.2.8. Contact the Authority's designated representative to schedule inspection 3 days prior to commencing with the Work.

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- 3.2.9. Maintain accurate field measurements during the course of the Work, and submit a record plan of "as-built" conditions at the Completion of the Work.
- 3.2.10. Upon satisfactory completion of the work, the Authority will authorize flow from the water system and/or discharge of flow into the authority's system upon acceptance of an offer of dedication to become part of the Authority's system. Approved record plans, descriptions and offer of the facilities to the Authority must be completed prior to the start of the maintenance period.
- 3.2.11. Prior to the end of the eighteen (18) month maintenance and correction period, Authority may require a final walk through and repair of damaged work to the water and/or sewer system prior to expiration of the maintenance period.

3.3. CONCEPTUAL LAYOUT AND DESIGN OF THE PROPOSED SANITARY SEWER FACILITIES

- 3.3.1. Property Plans shall be prepared by a Registered Surveyor. Sewer and water facilities shall be designed by a Professional Engineer. Plans shall show the locations of the proposed sanitary sewer and water facilities, including all main lines, manholes, gate valves, fire hydrants, lateral and service lines and other appurtenances required for the completion of the work. All drawings shall include a plan and profile view. The plans shall show the location of all storm sewer lines and any other existing or proposed underground utilities. Unless otherwise approved by the Authority, all plans shall be prepared at 1"=50' horizontal and 1"=5' vertical scale. Plans shall show the estimated floor elevation in relation to the sewer. Details should be sufficient for construction of the facilities, and should include, but not necessarily be limited to, restoration details, utility crossing details, standard installation details and details of connections to the existing system(s). An overall plan, at the appropriate scale, shall be provided showing the entire development and the entire proposed sewer and water line layout.
- 3.3.2. All sanitary sewer and water lines shall be designed to extend to the far property line of the last property proposed to be served, or extend to a point deemed reasonable by the Authority for good planning of future extensions. Layout of extensions shall be performed in all cases to avoid the use of pump stations. Construction of sanitary sewer lines at above average depths and/or off-site improvements or extensions shall be investigated. Only in rare circumstances will the authority approve a sewage pump station.
- 3.3.3. The Design of sanitary sewer facilities shall comply with the latest edition of the Domestic Wastewater Facilities Manual of the Pennsylvania Department of Environmental Protection and with good engineering practice. The Design of water distribution facilities shall comply with the latest edition of the Public Water Supply Manual of the Pennsylvania Department of Environmental Protection and with good engineering practice.
- 3.3.4. The Specifications in this document are written as if they were included in the Contract Documents executed by and between the Developer and the Contractor. Whether they are so used is at the discretion of the Developer; however, the Authority will not accept the sanitary sewer and water distribution extensions provided by the Developer unless and until they conform to the requirements of these Standard Specifications.

3.4. SUBMITTAL OF PLANS FOR REVIEW

- 3.4.1. Developer shall submit to the Authority two (2) sets of plans and supporting material to describe the project. The Authority will cause the plans to be reviewed by the engineer and Authority staff personnel. The plans shall be revised or amended as necessary until they are unequivocally approved by the Authority's engineer and by the Authority. In the case of

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submissions which are clearly incomplete or which are significantly non-responsive to the Authority's Standards for system additions and extensions, the Authority will reject the proposed submission without an extensive review. It shall not be the Authority's responsibility to design the developer's sanitary sewer and water distribution facilities.

- 3.4.2. When the plans describing the Work proposed to be performed are found to be acceptable for construction, three (3) copies of the final plans shall be submitted to the Authority for its use during observation of the construction. Additional sets of plans may be required for attachments to legal agreements that address the provisions through which the extension or addition to the system may be constructed.
- 3.4.3. The Authority's approval of the Contract Drawings shall not relieve the Developer from responsibility for errors or discrepancies in such drawings. All Contract Drawings shall be prepared and submitted in conformance with the requirements of these Rules, Standards and Specifications. Deviations from the Drawings or Specifications required during construction will be determined by the Engineer only, and authorized in writing. At all times the Contractor shall keep on the Project, available to the Engineer and his representative, one (1) copy of the Drawings, and Specifications.

3.5. SEWER LATERALS AND SERVICE CONNECTIONS/PROCEDURE AND SPECIFICATIONS

- 3.5.1. **General Requirements:** When used in these Standards, the term "sewer lateral" refers to the sewer line connected into a sewer main owned by the Authority, under the street right-of-way, extending to a point usually at or about the ultimate right-of-way or curb line of the street, and typically ending at a sewer house trap. The installation of all lateral connections to Authority sewer mains is subject to the submission of a written application to the Authority with plans and drawings in such detail as the Authority may require, and to approval of those plans by the Authority. No connection shall be made to the Authority's sanitary sewer system unless the manner in which the connection is made and the materials and workmanship employed in effecting such connection shall comply with the requirements set forth at Section 3.5.3 below as well as the Township plumbing code and the Authority's standard construction specifications. It shall also be necessary for all sewer connections to comply with any special requirements imposed under these Standards. The Authority reserves the right to determine the size and the kind of sewer laterals, from the sewer main to the house trap.

3.5.2. SEPARATE SEWER LATERAL AND SERVICE CONNECTIONS:

- A. **General Rule** - Each Unit shall be connected separately and independently with a sewer main through a separate sewer lateral and sewer service connection.
- B. **Special Exception** - Grouping of more than one unit on one sewer service shall not be permitted except under special circumstances and for good sanitary reasons or other good cause shown and then only after special permission of the Authority, in writing, shall have been secured and subject to such standards, regulations, and conditions as may be prescribed by the Authority. Further, in the event a single connection is permitted to serve a double house or multiple condominiums, it will be necessary for the property owners to sign an agreement (which the Authority may record in the office of the Recorder of Deeds) relieving the Authority of any responsibility or obligation caused by or resulting from installation of a single sewer connection. The agreement shall provide that any disagreement between the parties concerning future maintenance of the common sewer line will be sufficient cause for the Authority to require the installation of additional connections to the sewer main to provide individual service to each

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Unit, or to perform such work with Authority personnel. The installation of such separate Sewer Laterals and sewer service connections shall be made at the joint and several expense of the property owners signing the agreement.

3.5.3. NEW SEWER LATERALS/COSTS AND PROCEDURE.

- A. **Tapping Fees.** Each owner or developer shall pay the Authority's tapping fee then in effect, in full, before installation of any sewer lateral.
- B. **Cost.** Cost of sewer lateral shall be as set forth in the Schedule of Rates and Charges.
- C. **Private Contractors.** Subject to subparagraph F. below, the owner/developer may decline installation by the Authority and cause the installation of the lateral to be performed by a private contractor, in accordance with the following. All contractors shall be qualified to perform the work and shall be reputable and fully insured. Owner and contractor are jointly and severally liable to the Authority for any damage caused to the Authority sewer system in the course of private installation, and all such damages must be paid to the Authority in full before service will be instituted. Owner shall be responsible for applying for and obtaining all necessary street opening permits from the Township or from PennDOT, and for payment of all associated fees. All contractors engaged by owner shall comply with all federal, state and local requirements, and with these standards. All privately installed laterals shall be dedicated to the Authority as set forth in these Standards.
- D. **Inspection/Costs.** All sewer laterals installations performed by private contractors shall be subject to inspection and approval by the Authority. Any defects noted shall be corrected to the satisfaction of the Authority. All costs and charges for Authority's personnel or consulting engineer to observe and inspect private installations shall be paid by owner/developer, in full, before the institution of sewer service commences.
- E. **Deposit**
 - (1) **Sewer Lateral Only.** In instances where only a sewer lateral is being installed (and where the property is already served with Authority water), the Authority will require advance payment of all anticipated inspection and construction observation costs, permit fees and other foreseeable costs as a condition of commencement of the work;
 - (2) **General.** In all other cases, where the Authority will perform sewer lateral installation, the Authority reserves the right to require advance payment from the owner/developer of a deposit in the amount of the cost estimate prepared by the Authority, plus all anticipated inspection and construction observation costs, permit fees and other foreseeable costs, and in instances where a contractor will perform the work, Authority may require a deposit for inspection and construction observation costs.
- F. **Reservation of Right to Install.** The Authority reserves the right to require, in any particular instance or instances, that the sewer lateral installation shall be performed by it and not by a private contractor. Such determination shall be made at the sole discretion of the Authority.

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- 3.5.4. **DEDICATION OF LATERALS:** All sewer laterals shall be offered for dedication to the Authority, and shall become part of the municipal sewer system of the Authority upon acceptance of dedication. In instances where the Owner, through its contractor or plumber has installed one or more Sewer Laterals, those laterals shall be offered for dedication on forms prescribed by the Authority. In such instances, the Authority shall accept dedication only after the laterals have been properly inspected, tested and depicted on "as built" drawings satisfactory in form and substance to the Authority and delivered to the Authority in as many counterparts and in such form (paper, electronic, etc.) as the Authority shall require. In instances where Sewer Laterals are installed by Owners' contractor and dedicated to the Authority, the Owners shall remain responsible for maintenance of such Sewer Laterals for a period of eighteen (18) months from the date of acceptance of dedication.
- 3.5.5. **SPECIAL REQUIREMENTS:** Whenever, in the opinion of the Engineer or other duly authorized representative of the Authority, special conditions require additional safeguards or more stringent specifications to be observed, then, and in that event notwithstanding any other provisions of these Standards or requirements of the Township's Plumbing Code, the Authority specifically reserves the right to refuse to permit a connection to be made to its sewer system until such special requirements or specifications as may be stipulated by the Authority or its Engineer have been satisfied.
- 3.5.6. **MAINTENANCE OF SEWER LATERALS:** The Authority will maintain all Sewer Laterals, provided however that Sewer Laterals installed by or at the request of a property Owner shall remain the maintenance responsibility of the party requesting the installation of such Sewer Lateral for a period of eighteen (18) months from acceptance of dedication of each such Sewer Lateral by the Authority as set forth at paragraph 3.5.4 above.
- 3.5.7. **OWNER RESPONSIBLE FOR COSTS:** All costs and expenses for the construction of all Sewer Laterals and Sewer Service Lines, including all labor, materials, costs of pressure testing, and all costs of construction observation and inspection by the Authority, shall be paid by the Owner of the Improved Property to be connected; and such Owner shall indemnify and save harmless the Authority from all loss or damage which may be occasioned, directly or indirectly, as a result of construction of each Sewer Lateral and Sewer Service Line. The Owner shall be responsible for all costs associated with compliance with these Standards concerning Sewer Laterals and Sewer Service Lines generally.
- 3.5.8. **WATER CONTAMINATED BY USE:** All water contaminated by use must be discharged into the sewer, including water from sinks and washing machines. Conversely, the discharge to the sanitary sewer system of roof, storm, surface, or building foundation water or drainage is expressly prohibited. Floor drains in basements subject to groundwater infiltration or flooding must be removed or permanently and thoroughly sealed.
- 3.5.9. **LIABILITY FOR IMPROPER DISCHARGE:** Any person who discharges or permits to be discharged any material to the Authority's sanitary sewer system except through approved connections will be subject to such charges as the Authority may establish and shall hold harmless and indemnify the Authority from any costs and charges imposed by any governmental agency with jurisdiction, in addition to being subject to any penal provisions imposed by the City of Reading, DEP or the U.S. EPA
- 3.5.10. **INSTALLATION OF BUILDING SEWERS, SEWER LATERALS, INTERCEPTORS AND SEPARATORS:** See Section 2.7

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3.6. WATER LATERALS AND SERVICE AND SPECIFICATIONS

3.6.1. **GENERAL REQUIREMENTS:** When used in these Standards, the term “water lateral” refers to the pipe tapped into a water main of the Authority, under the street right-of-way, extending to a point usually at or about the ultimate right-of-way or curb line of the street, and typically ending at a curb stop valve or meter pit, if a meter pit for water service is required by the Authority. The installation of all water laterals to Authority water mains is subject to the submission of a written application to the Authority with plans and drawings in such detail as the Authority may require, and to approval of those plans by the Authority. No lateral shall be connected to the Authority’s water system unless the manner in which the connection is made and the materials and workmanship employed in effecting such connection shall comply with the requirements set forth at Section 3.6.3 below as well as the Township plumbing code and the Authority’s standard construction specifications. The Authority reserves the right to determine the size and the kind of water laterals, from the water main to the curb stop (or meter, in cases where meter pits are required).

3.6.2. **SEPARATE WATER LATERALS AND SERVICE CONNECTIONS:**

- A. **General Rule** - Each Unit shall be connected separately and independently with a water main through a separate Water Lateral and Water Service connection. Grouping of more than one unit on one Water Service shall not be permitted. The Water Lateral connection shall be installed from a main located in front of the Premises. However, the Authority reserves the right to approve Water Lateral connections at locations other than immediately in front of the Premises when it is determined to be in the best interests of the Authority water system to do so. All Water Lateral connections must be made to main mains which abut the property for which service is requested.
- B. **Special Exception** – In those instances in which, for any reason, two or more Customers are supplied water through a single water Service Line, any violation of the Standards of the Authority by either or any of said Customers shall be deemed to be a violation as to all; and unless said violation is corrected after reasonable notice, the Authority may take such action as can be taken for a single Customer, except that such action shall not be taken until the innocent Customer who has not violated the Authority’s Standards has been given a responsible opportunity to provide a separately controlled service line connection/extension.

3.6.3. **NEW WATER LATERALS – COSTS AND PROCEDURE:**

- A. **Tapping Fees.** Each owner or developer shall pay the Authority’s tapping fee then in effect, in full, before installation of any water lateral.
- B. **Cost.** Cost of a ¾-inch to 1-inch lateral shall be as set forth in the Schedule of Rates and Charges.
- C. **Private Contractors.** Subject to subparagraph F. below, the owner/developer may decline installation by the Authority and cause the installation of the lateral to be performed by a private contractor, in accordance with the following. All contractors shall be qualified to perform the work and shall be reputable and fully insured. Owner and contractor are jointly and severally liable to the Authority for any damage caused to the Authority water system in the course of private installation and all such damages must be paid to the Authority in full before water service will be instituted. Owner shall be responsible for applying for and

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obtaining all necessary street opening permits from the Township or from PennDOT, and for payment of all associated fees. All contractors engaged by owner shall comply with all federal, state and local requirements, and with these Standards. All privately installed laterals shall be dedicated to the Authority as set forth in these Standards.

- D. **Inspection/Costs.** All water laterals installations performed by private contractors shall be subject to inspection and approval by the Authority. Any defects noted shall be corrected to the satisfaction of the Authority. All costs and charges for Authority's personnel or consulting engineer to observe and inspect private installations shall be paid by owner/developer, in full, before water service commences.
 - E. **Deposit.** The Authority reserves the right, in instances where the Authority will perform water lateral installation, to require advance payment from the owner/developer of a deposit in the amount of the cost estimate prepared by the Authority, plus all anticipated inspection and construction observation costs, permit fees and other foreseeable costs, and in instances where a contractor will perform the work, Authority may require a deposit for inspection and construction observation costs.
 - F. **Reservation of Right to Install.** The Authority reserves the right to require, in any particular instance or instances, that the water lateral installation shall be performed by it and not by a private contractor. Such determination shall be made at the sole discretion of the Authority.
- 3.6.4. **DEDICATION OF LATERALS:** All water laterals shall be offered for dedication to the Authority, and shall become part of the municipal water system of the Authority upon acceptance of dedication. In instances where the owner, through its contractor or plumber has installed one or more water laterals, those laterals shall be offered for dedication on forms prescribed by the Authority. In such instances, the Authority shall accept dedication only after the laterals have been properly inspected, tested and depicted on "as built" drawings satisfactory in form and substance to the Authority, and delivered to the Authority in as many counterparts and in such form (paper, electronic, etc.) as the Authority shall require. In instances where Water Laterals are installed by Owners' contractor and dedicated to the Authority, the Owners shall remain responsible for maintenance of such water laterals for a period of eighteen (18) months from the date of acceptance of dedication.
- 3.6.5. **REPLACEMENT/CHANGE OF LOCATION OF WATER LATERAL:** Where replacement of a water lateral from the street main to the curb is found necessary, the Authority will renew said service in the same location as the old one. If the property Owner or Customer, for his own convenience, desires the new water lateral at some other location and agrees to pay all expenses of such relocation, the Authority may approve the new water lateral and connection at the location desired, provided a new water service connection is approved and installed in accordance with plans delivered to the Authority, at the sole cost and expense of the customer.
- 3.6.6. **MAINTENANCE OF WATER LATERALS:** The Authority will maintain all Water Laterals, provided however that Water Laterals installed by or at the request of a property Owner shall remain the maintenance responsibility of the party requesting the installation of such Water Lateral for a period of eighteen (18) months from acceptance of dedication of each such water lateral by the Authority as set forth at paragraph 3.7.7.D. below.

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3.6.7. **INSTALLATION OF WATER SERVICE LINE:** See Section 2.5.

3.6.8. **GENERAL: PIT METERS/CURB STOPS/SIDEWALKS:**

- A. **Pit Meters** - When pit meters are located at the curb, the riser pipes and connections therein will be installed by and at the expense of the Customer, and no Customer or workman shall alter, change or in any way tamper with the meter box, meter, or piping and connections therein without authorization from the Authority.
- B. **Curb Stops** - Curb stops at the curb line shall not be used by the Customer for turning on or shutting off the water supply. The control of the water supply by the Customer shall be by means of a separate stop cock located, in general, just inside the building wall. Curb stops are for the exclusive use of the Authority. If obstructions are placed over, in or around curb boxes in such manner as to prevent normal operation of the curb stop or to result in damage to the curb box, curb stop or service line extension, the Authority will shut the water off at the curb stop and plug the curb box or disconnect the service line or turn the water off at the corporation stop or ferrule, as it may deem necessary. Before service will be renewed, the Customer shall pay to the Authority the expenses incurred in shutting the water off and in turning it on again, including the cost of necessary trenching and backfilling, or cutting and replacing pavement, sidewalk or curbing, or any municipal permit or permits for opening the pavement, and also shall settle any unpaid bill for water or other service and make a satisfactory deposit to ensure the payment of future water bills; the minimum charge to be as is then in effect.
- C. **Sidewalks** - Prior to a customer constructing new concrete sidewalks, making changes in grade or other changes in sidewalk construction, the Customer shall notify the Authority, in order that the Authority may relocate the curb box at the proper grade. Meter or curb box height shall be adjusted to the new grade. If such notice is not given and the box or boxes are covered or concreted over, thereby necessitating additional expense to the Authority for finding and relocating the same, the Customer shall be billed for such additional expense and the Authority will, under no circumstances, be responsible for damages to the sidewalk.

3.6.9. **OWNER RESPONSIBLE FOR COSTS:** All costs and expenses for the construction of all Water Laterals, including all labor, materials, costs of pressure testing, disinfection and all costs of construction observation and inspection by the Authority shall be paid by the Owner of the Improved Property to be connected; and such owner shall indemnify and save harmless the Authority from all loss or damage which may be occasioned, direction or indirectly, as a result of the construction of each Water Lateral and Water Service Line. When meter pits are installed at the curb, the entire installation including pit, cover, riser pipe and other appurtenances shall be installed at the expense of the customer. The meter installation will be done by Authority. The Owner shall be responsible for all costs associated with compliance with these Standards concerning Water Laterals and Water Service Lines generally.

3.7. NEW SERVICE/WATER AND SEWER MAIN EXTENSIONS/DEVELOPER AGREEMENTS AND RELATED MATTERS

3.7.1. **GENERAL:** The extension of water and sewer mains to and from, or connected to, the utility system of the Authority, as well as the installation of capital improvements which may

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become necessary by virtue of additional development and demands upon service by the Authority such as water storage tanks, sewer pump stations, water booster pump stations and other capital improvements, shall be installed in accordance with the following Standards and in accordance with the Municipality Authorities Act, 53 Pa.C.S.A. §5601, et seq. All water and sewer Main extensions shall be connected to main water and sewer lines owned by the Authority (unless expressly agreed in writing by the Authority to the contrary), and all such improvements shall be dedicated to and become property of the Authority after inspection and acceptance by the Authority, in accordance with these Standards.

3.7.2. **WHEN MAIN EXTENSION OR CAPITAL IMPROVEMENTS ARE REQUIRED:** A Main extension or capital improvements shall be required by the Authority in all or any one of the following instances:

- A. For the furnishing of Service to an individual Premise whose property line does not abut a Main water and/or sewer line installed in a public or private right of way and owned by the Authority.
- B. For the furnishing of Service to a group of individual Premises whose property lines do not abut Main water and/or sewer lines installed in a public or private right of way and owned by the Authority.
- C. For the furnishing of Service to a group of Premises located within the limits of a recorded plan of lots where the developer of the plan is desirous of obtaining Service for the lots.
- D. For the furnishing of public or private fire service to a municipality or a private individual, firm or corporation or others requesting such service where no Authority-owned Mains are installed in public rights of way, or where existing Authority-owned lines are not capable of producing the requested fire flows.
- E. For the furnishing of a requested quantity or pressure of water service for a Premises or group of Premises which is beyond the capability of the existing Authority system in the area where service is required.
- F. For furnishing sewer service in an area which will not gravity flow to the municipal system of the Authority, and where pumping is required.
- G. Such other similar instances.

3.7.3. **MINIMUM LENGTH OF WATER MAIN EXTENSION/WATER BOOSTER PUMP STATION(S)/WATER STORAGE TANK(S):** The extension of a Main shall include the entire quantity of pipeline and appurtenant facilities required to conduct the supply of water from the existing distribution system of the Authority to the midway point of the frontage of the last property for which the owner has requested water service.

All developers shall extend water Mains for the entire length of any roads or cartways, as those roads or cartways are shown on the approved subdivision plans, from the point of connection to the existing Authority water Main to the terminus of such roads or cartways at the property line of the developer, or to the end of any cul-de-sac. The Authority may waive this provision regarding spur roads in whole or in part, but only by Board action taken at a regular or specially convened meeting of the Authority.

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Where an individual Premise for which Service is requested is situated on land having extensive frontage on the public right of way beyond the Premises, the limit of the required extension shall be based on the minimum frontage required for a buildable lot as set forth in the zoning code of the municipality in which the property is located.

In the event that water pressure within any development or subdivision is insufficient to allow for adequate flow and pressure of water, as determined by the Authority or by DEP regulation, to serve the residences or commercial or industrial users within the development, the Developer shall be responsible for the planning, construction and dedication to the Authority of a water booster pump station, water storage tank or other capital improvements sufficient to provide adequate water pressure within the development. The plans for such pumping facilities and/or water tanks shall be subject to the review procedure set forth in these Standards. Upon the satisfactory completion of such facilities, such pumping facility and/or water tanks shall be offered for dedication in accordance with the provisions of these Rules, Standards and Specifications. All costs associated with the planning, construction and maintenance (for the required 18-month period) of such pumping facility and/or water tank shall be the sole responsibility of the applicant/developer.

- 3.7.4. **MINIMUM LENGTH OF SEWER MAIN EXTENSION/SEWER PUMP STATION(S):** The extension of a sewer main shall include the entire quantity of pipeline and appurtenant facilities required to conduct the flow of sewage from the Premises constructed or to be constructed to the existing sewer collection system of the Authority. Sewer collection mains in existing Authority rights-of-way shall extend, at a minimum, to the mid-way point of the frontage of the last property for which the owner has requested sewer service.

All developers shall extend sewer mains for the entire length of any roads or cartways, as those roads or cartways are shown on the approved subdivision plans, from the point of connection to the existing Authority main or any main otherwise installed by the developer to the terminus of such roads or cartways to the property line of the developer or to the end of any cul-de-sac. The Authority may waive this provision regarding spur roads in whole or in part, but only by Board action taken at a regular or specially convened meeting of the Authority.

For an individual Premises for which sewage service is requested situated on land having extensive frontage on the public right-of-way beyond the Premises, the limit of the required extension shall be based on the minimum frontage required for a buildable lot as set forth in the zoning code of the municipality in which the property is located.

In the event that sewer main extensions within any subdivision shall require pumping in order to allow for flow of sewage into the collection system of the Authority, the developer shall be responsible for the planning, construction and dedication to the Authority of such sewer pump station. The plans of such pumping facilities shall be subject to the review procedure outlined in these Rules, Standards and Specifications. Upon the satisfactory completion of such facilities, such pumping facilities shall be offered for dedication in accordance with the provisions of this Section. All costs associated with the planning, construction and maintenance (for the required 18-month period) of such pumping facilities shall be the sole responsibility of the applicant/developer.

- 3.7.5. **SEWER PUMP STATION(S)/WATER BOOSTER PUMP STATION(S)/ WATER STORAGE TANK(S)/CAPITAL FACILITIES:** In the event a sewer pump station, water booster pump station, water storage tank or other structure or capital improvement is necessary in order for the water and sewer systems of the Authority to be made adequate to meet the needs of an owner or developer, the owner or developer shall cause such

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improvements to be constructed on a lot or lots owned or acquired by the owner or developer, with such lot to be shown as a separately conveyable lot on a zoning and subdivision plan, subject to Township approval, and subject to all subdivision and/or land development requirements of Muhlenberg Township. Such lot, with improvements thereon, shall be dedicated to the Authority by a Deed of Dedication by which good and marketable title is conveyed to the Authority, upon the final completion, inspection and satisfactory testing of the capital improvements located and constructed on the lot, and upon acceptance of the lot by the Authority.

- 3.7.6. **EXTENSION OF WATER/SEWER SYSTEMS/CAPITAL IMPROVEMENTS:** Extensions of water or sewer lines may, at the option of Authority, be performed by the Authority for the benefit of the owner or developer, on such conditions and after the provision of such owner or developer of financial security adequate to cover the full cost of the work. Generally, water and sewer improvements necessary to serve new development within the Township shall be constructed and installed by the owner or developer seeking service (or qualified contractors engaged by such owner or developer), subject to these Standards.

- 3.7.7. **DEVELOPER AGREEMENT/AUTHORITY REQUIREMENTS.** In all instances where an Owner or Developer seeks to extend the water or sewer systems of the Authority in order to meet development needs, or to construct capital improvements necessary to provide adequate service to its property, such improvements shall be installed with the intent that the improvements, once completed, shall become part of the municipal water and sewer systems of the Authority. An owner or developer seeking water or sewer service from the Authority at a location or locations not previously served by the Authority, or through laterals, meter chambers or water and/or sewer Mains proposed by the Developer, service will be provided by the Authority only if all improvements contemplated by the Developer are performed under and subject to the terms of these Standards. In each such instance in which the project is to be performed by the Owner/Developer, the Authority will require (i) the execution between the Owner/Developer and the Authority of a binding Municipal Improvements Agreement, (ii) the Authority will require dedication of portions of the water and sewer system improvements as determined by the Authority to become part of the municipal water and sewer systems of the Authority, (iii) the Authority will require easement agreements (if necessary) in accordance with these Standards, and (iv) the Authority will require conformity with the installation standards of the Authority, in accordance with these Standards. Owner/developer shall be responsible for all costs associated with capital work performed to meet its needs, or at its request, in accordance with Section 6.10 hereof.

- A. **Municipal Improvements Agreement.** The terms and conditions of the required Municipal Improvements Agreement shall incorporate the requirements of the Authority as set forth in these Standards. The Municipal Improvements Agreement shall contemplate dedication of completed water system improvements and sewer system improvements to the extent the Authority requires those improvements to become part of its municipal systems following satisfactory completion, testing and acceptance of the work. The Municipal Improvements Agreement also shall provide for the Developer, or the party in fee title to the development real estate, to grant the Authority an easement or easements, satisfactory in size, scope, terms and conditions to the Authority, providing for full access, ingress, regress and such rights as the Authority may require to repair, replace and maintain water and sewer system improvements to be dedicated to the Authority. The Developer shall be responsible for preparation of a drawing of each easement area required by the Authority, together with a separate legal description, in metes and bounds format, to be attached to such easement agreements. The Municipal Improvements Agreement shall set forth the cash escrow requirements, financial security

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requirements and maintenance financial security requirements of the Authority, as provided by law and as set forth elsewhere in these Standards. The Municipal Improvements Agreement shall provide:

- (1) A statement of the cost of all work to be borne by the owner/developer, which cost shall be subject to prior review and approval by Authority.
- (2) The materials and workmanship shall be in accordance with the Specifications of the Authority. Certain specified requirements in this regard are set forth in paragraph 3.7.11 hereof.
- (3) A statement of required insurances, which shall include, at a minimum \$1.0 million of Comprehensive General Liability Insurance with the Authority and its consulting engineers named as additional insured parties by endorsement;
- (4) The Contractor shall provide the Authority with certificates of insurance in the amounts specified by the Authority.
- (5) The highway, streets, alleys and lanes in which the extension is to be located must be dedicated to public use, the lines and grades thereof established and the rough grading completed. Where a line is located in a private right of way, said right of way shall be dedicated to the Authority for its use and benefit, in a form acceptable to the Authority.
- (6) The ownership and title to all installations shall be conveyed to and vested in the Authority following completion, inspection, pressure testing, bacteria testing (as needed) and acceptance by Authority.
- (7) The owner shall be responsible for all Authority costs incurred in connecting to existing Authority facilities.
- (8) The Authority will accept dedication of improvements only after delivery to the Authority of two bound copies of equipment and process improvement shop drawings, two bound copies of Operation and Maintenance Manuals, and one CD of AutoCAD (latest version) and two full size record "as-built" plans and drawings, including exact locations, elevations and distances of all water and sewer system improvement work performed by the Developer, both onsite and offsite (if applicable), which as-built plans shall show all deviations in the field from the original plans delivered to the Authority, in which as-built drawings shall be delivered in both paper and electronic (CAD) format. The as-built drawings shall be subject to approval by the Authority and its consulting engineer.
- (9) All work shall be inspected on a full-time basis by the Authority's representative, the owner to be responsible for the payment of all inspection costs.
- (10) All water lines and sewer lines shall be constructed in complete accordance with the Authority's standards and specifications, and in accordance with applicable federal, state and local statutes, ordinances and regulations.

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- (11) The Municipal Improvements Agreement shall additionally include such other related requirements as the Authority, in its reasonable discretion, may deem necessary in view of the particular circumstances and facts involved with the development.

- B. **Plans.** Plans and specifications for extensions and additions to the water or sewer systems of the Authority which are prepared by persons other than the consulting engineer for the Authority must be prepared by qualified engineering firms. The plans shall show the proposed location of water mains and sewer mains, the existing or proposed location of extensions to be made by the developer, the layout of streets and roads, the layout of existing and proposed plans of lots, the location of existing Authority facilities, the location of proposed and existing easements and all other pertinent data, such plans to be in sufficient detail to permit the Authority and its consulting engineers to fully review the plans. Such plans and specifications so prepared shall be signed and sealed by a responsible official of the engineering firm of the owner or developer and submitted for approval of the Authority. No construction of any water or sewer main intended to be connected to the systems of the Authority shall be undertaken until such plans and specifications are approved and until a permit is issued by the Pennsylvania Department of Environmental Protection, Berks County Conservation District and other regulatory agencies, when approvals and permits are required.
- C. **Dedication/Easements.** All extensions shall be located on dedicated streets or on rights of way dedicated for public use. Where required rights of way are not recorded, the Authority shall be provided with a written right of way suitable for recording. Rights of way shall be a minimum width of 20 feet and to the extent possible the right-of-way shall be uniform in shape, and parallel to property lines with the water and/or sewer line placed in the middle area of the right-of-way. The entire post-construction right-of-way shall be accessible for maintenance. The right-of-way document shall be accompanied by individual legal descriptions and plots for each lot on which the right-of-way is located, as well as an overall right-of-way location plan for the entire project. Such descriptions and plots shall be in form acceptable to the Authority.
- D. **Developer and Maintenance Responsibilities.**
- (1) The developer or owner shall be responsible for maintenance of any water or sewer main extensions for a period of 18 months following acceptance and dedication of such improvements by the Authority. The owner shall be responsible for maintaining cash security, on deposit with the Authority or under a letter of credit acceptable in form and substance to the Authority of an amount equal to a minimum of 10% of the construction costs as security for owner's maintenance responsibilities for such 18-month period.
- (2) For work on state highways, and certain other work, the correction period will be extended to comply with those regulatory agency requirements. The financial security will be held until the completion of any extended maintenance and correction period that is required by state highway or other regulatory permits.
- (3) During the maintenance and correction period, the developer or his contractor shall be responsible to make all repairs or replacements.

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Should the Developer or his contractor fail to promptly address defects, which may be identified by the Authority, the Authority after notice to the developer may draw on the financial security and perform the necessary repairs, or corrections. In addition, where the developer and/or its contractor is not responsive to notices to correct defects, the Authority reserves the right to suspend further connections from the developers project, until such time as the corrections have been satisfied.

- E. **Future Extensions.** All extensions shall be designed in such manner as will permit future extensions thereof with rights of way dedicated there for whenever applicable. The Authority shall have the right to make further extensions beyond or laterally from extensions installed by an owner or developer, such extensions not to be considered as connections subject to any refund.
- F. **Financial Security/Developer Work.** The owner shall post with the Authority under written agreement, an amount sufficient to pay for the Main extension or other capital work, all in accordance with the provisions of Section 3.6.9 hereof.

3.7.8. FINANCIAL SECURITY TO AUTHORITY:

- A. **Payment of Costs.** The owner or developer shall deposit with the Authority, prior to the commencement of any work, a sum of money sufficient to pay all the estimated costs contemplated by the Authority, including Authority's engineering, legal and administrative costs associated with the proposed development and the proposed extension of water and sewer system improvements, with the escrow amount to be determined by the Authority in its reasonable discretion. The deposit shall be made upon submittal of plans for review and as a condition of review of those plans and preparation by the Authority of the necessary Municipal Improvements Agreement in order for the work to proceed for extension of the water or sewer systems of the Authority.
- B. **Financial Security.** The owner or Developer shall provide the Authority with financial security, in the form of cash, a bond in form and substance satisfactory to the Authority, or a letter of credit issued by a commercial bank, subject to such terms and conditions as shall be satisfactory to the Authority, all in form and amount satisfactory to the Authority and providing that the Authority may draw upon such financial security at any time if the Authority determines that the owner/developer has failed to comply with any term or condition of its Municipal Improvements Agreement with the Authority. The amount of such financial security shall be determined after developer has provided Authority with a written estimate of the total cost of the water system improvements and sewer system improvements included within the development, or required offsite (if applicable) plus a 10% contingency. The Municipal Improvements Agreement shall provide the terms and conditions by which the Authority may release financial security in conjunction with completion of construction, testing, approval and acceptance of water and sewer system improvement work, as the project shall proceed.
- C. **Maintenance Security.** The owner or developer shall, following completion of the work, dedication to the Authority and acceptance of water and sewer system improvements by the Authority, be responsible for maintenance for an 18-month period and shall be responsible for providing Authority with financial security for the full term of that maintenance period. That financial security may be in the form of cash, a letter of credit or bond. Generally, the Authority prefers that the letter of credit issued for the construction phase remain in place, reduced in

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amount to the maintenance security amount required, through the maintenance period. However, owner or Developer may place financial security with the Authority, satisfactory to the Authority and in conformity with the Municipality Authorities Act and the Municipality Planning Code. Such financial security for the maintenance period shall equal, at a minimum, 10% of the total construction costs of the water system improvements and sewer system improvements, both on site and off site, constructed and installed by the Developer as part of the project.

3.7.9. **INSURANCE INDEMNITY REQUIREMENTS:** The Developer shall not commence work until all protections required under this section are in full effect and verified to the satisfaction of the Authority

- A. **Duties of the Developer:** Four (4) copies of the original certificates shall be prepared as indicated in the following subparagraphs and forwarded to the Engineer. In addition, the Authority or its representative, shall have the right to reject any form of security which does not meet nationally recognized standards for financial strength as indicated below. Contractors and subcontractors shall satisfy all conditions to the same extent unless otherwise specified herein. Protections as described shall be maintained until work in connection with the Project has been accepted by the Authority. In the case of wrap up policies or claims made policies, coverage's shall be maintained for a minimum of two years after the project has been completed.
- B. **Coverages to be maintained by the Developer:** The insurance types to be provided are General Liability, Automobile Liability, and Workers' Compensation, and Railroad Protective Liability when Contract includes work on, under or adjacent to Railroad rights-of-way or properties. The specific insurance coverage and limits of liability shall be those normally carried by the Developer and/or his Contractors and Subcontractors and subject to the review and approval of the Authority.
- C. **Coverage Modifications Which Shall be Obtained:** Authority and Engineer and each of their Officers, Agents and Employees shall be named as additional insured with respect to all work performed in connection with this Project. This applies to General Liability, Automobile Liability and Railroad Protective Liability coverage.

Authorities shall be notified by Registered United States Mail thirty (30) days in advance of any cancellation or any material change resulting in the elimination or reduction of any protection.

Waiver of Subrogation in favor of the Authority and Engineer and each of their Officers, Agents, and Employees applying to all Workers' Compensation coverage's shall be provided by the Developer unless not permitted by laws of the state in which this Agreement applies.

- D. **Indemnification of Authority and Engineer by Developer:** Developer is responsible for all liabilities and duties assumed by Developer including but not limited to the indemnity liability in the Agreement between Authority and Developer and the provisions of this subparagraph (D) and shall provide such protections for the Authority and Engineer whether or not such claims, losses, liabilities or expenses are covered by insurance.

The Developer shall at all times, indemnify and save harmless the Authority and the Engineer, of and from all claims of whatsoever nature, including without

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limitation claims which may be made by any of the employees of the Developer or by any employees of any Contractor or Subcontractor to whom the Developer may have let the performance of any part of the work and the Developer will appear for and defend the Authority and Engineer against any and all such claims.

The status of the Developer in the work to be performed by him is that of an Independent Contractor and as such he shall properly safeguard against any and all personal injury including death, or damage to the public, to public and private property, materials and things; and as such, he alone shall be responsible for any and all damage, loss or injury to persons or property that may arise, or be incurred, in or during the conduct or progress of said work without regard to whether or not the Developer, Contractor, his Subcontractors, Agents, Employees, Authority or Engineer have been negligent; and the Developer shall keep the Authority and Engineer indemnified from and discharged of, and from any and all responsibility and liability for risks and casualties of every description, as provided in the Agreement between the Authority and Developer.

The Developer shall assume and be liable for all blame and loss of whatsoever nature by reason of neglect or violation of any federal, state, county, or local laws, regulations or ordinances.

- E. **Minimum Standards of Financial Strength and Policyholder Service Required of Insurance Carriers Providing Coverage for the Work:** Insurance Companies used shall be admitted carriers authorized to transact business in the Commonwealth of Pennsylvania unless Authority is notified and waives this requirement.

Insurance Companies used shall be rated (A 10) or better by Best's Rating Service unless Authority is notified and waives this requirement.

- 3.7.10. **DEDICATION:** If, after completion of any Main installed by a person or a contracting firm other than the Authority, and if an acceptable offer of dedication is not received immediately upon completion of the work, at the Authority's option, the Authority may withhold water or sewer service, or the Authority may discontinue any service improperly instituted by the developer, or the Authority may require the installation of a master meter at the point of connection to the Authority's main, and the installation of all appropriate valves and other appurtenances necessary in order that all water used in the development may be accurately metered at such master meter, with all costs thereof to be borne by the developer/customer.

- 3.7.11. **RESPONSIBILITY FOR COST:** The entire cost of the requested water and/or sewer Main extension, including fire hydrants and other appurtenances shall be borne by the person or persons requesting or requiring the extension, the Authority to be subject to no cost. The Authority will be subject to payment of such refunds as are agreed in writing.

The cost of a water and sewer Main extension or installation shall include the following as applicable:

- A. The cost of all design and/or plan review.
- B. The cost of pipe of at least eight (8) inch diameter.

The minimum size shall be eight (8) inches in all locations where the line will service as a main line and/or is necessary for proper future expansion and

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development of the system, except a minimum size of twelve (12) inches shall be provided in high density residential, commercial, industrial and institutional areas. At the Authority's option, the Authority may require the installation of a main larger than eight (8) inches in low density residential areas. If the Authority requires an installation of a main larger than eight (8) inches, the Authority shall be responsible for the difference in material costs only between an eight (8) inch main and the main size required by the Authority.

- C. The cost of connections to the existing main lines, including all costs incurred by the Authority.
- D. The cost of all valves, valve boxes, fittings, fire hydrants, air valves, air valve chambers, and all related work, including the testing of the extension.
- E. The cost of all land and rights of way.
- F. The cost of all inspection.
- G. The cost of all governmental permits and inspection.
- H. All legal and administrative and overhead costs.

3.7.12. **INSTALLATION SPECIFICATIONS:** All water and sewer lines shall be installed in accordance with the detailed specifications of the Authority, some of the pertinent requirements being as follows:

- A. The pipe shall be in accordance with the applicable specifications of the American National Standards Institute and of the class required for the pressure conditions in the area and the installation conditions required.
- B. The valves shall be in accordance with the Authority Specifications and of the same manufacture as the majority of the valves on the remainder of the comprehensive system, unless otherwise approved.
- C. The fire hydrants shall be in accordance with the Authority Specifications.
- D. All water lines shall be laid with a minimum depth of cover of four (4) feet, properly bedded, backfilled, blocked, subjected to a hydrostatic test for leakage and subject to such other requirements.
- E. All connections to existing mains shall be completed by the Authority at the cost of the applicant.
- F. All extensions shall be subjected to a hydrostatic test of 150 p.s.i. or 1.5 times normal operating pressure, whichever is greater and shall be disinfected in accordance with industry standards.
- G. All water system extensions shall be properly disinfected and tested for coliform bacteria. Certified satisfactory test results must be submitted to the Authority prior to institution of service.

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3.7.13. CONDUCT OF WORK:

- A. The work shall be executed in the best and most workmanlike manner by qualified, careful and experienced workman, with proper regard to alignment, grade, bedding, materials, direct cover, backfill and restoration. All materials shall be new, free from defects, have producer's certification as to grade, weight, gauge and quality. All materials shall comply with the latest specification and be installed according to the manufacturer's instructions.

The Contractor shall employ only competent and efficient superintendents, foreman, clerks, timekeepers, equipment operators, laborers, and mechanics or artisans, for every kind of work. These requirements shall not operate against the employment of physically handicapped persons otherwise employable, where such persons may be safely assigned to work which they can ably perform. No person under the age of sixteen (16) years, and no person currently serving sentence in a penal or correctional institution, shall be employed to perform any work under the Contract.

The Contractor shall provide a competent and reliable person, who is delegated to be readily available and have full authority to act in the behalf of the Contractor, in case it is necessary to deal with any emergency situations, which may arise in connection with the project during off working hours, evenings, weekends or holidays.

B. Submittals:

- (1) Prior to commencing the work, the contractor shall submit a Certificate of Insurance that demonstrates compliance with the Authority's insurance requirements. A listing of the Authority's insurance requirements may be requested from the Authority.
- (2) Prior to commencing the work, the contractor shall submit for review a minimum of three (3) copies of all shop drawings and material certifications for the products proposed to be utilized in the work.

C. Highway Permits and Traffic Control:

- (1) The developer shall secure the necessary State Highway and Township permits for work within state highway and Township streets. The developer's contractor shall comply with all Pennsylvania Department of Transportation (PaDOT) requirements and comply with all municipal laws, rules, and regulations, ordinances, including but not limited to furnishing bonds and insurance where required, and paying the cost of inspection of the work on state or municipal highways.
- (2) The developer, acting through its contractor, shall make use of all reasonable means to maintain the normal flow of traffic on municipal streets and state highways during all phases of construction. Should it become necessary to close or encroach upon any street or highway, the developer shall obtain the necessary permits prior to making such closure or encroachment. The developer shall comply with the applicable PennDOT traffic control procedures, including the erection of suitable warning lights, signs, channelization, and provision of flag persons to control traffic in a safe manner.

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- (a) All cuts in State or municipal highways shall be restored with temporary paving at the end of each work day.

D. Other Permits and Licenses:

- (1) The Contractor or Developer shall, unless otherwise specified, procure all necessary permits and licenses, pay all charges and fees therefore, and shall give all notices necessary and incident to the proper and lawful prosecution of the work. The Authority requires the Developer to complete all necessary permit applications.
- (2) Certain permits required in connection with a sewer and/or waterline extension shall be obtained in the Authority's name. The permit applications shall be submitted to the Authority for review prior to submission to permitting agencies. The following permits, as applicable, shall be acquired in the Authority's name:
 - (a) DEP Bureau of Water Quality Management Sewerage Permit and DEP Public Water Supply Permit – Obtain and complete all applicable DEP permit applications and submit to the Authority. Construction plans, soil erosion and sediment pollution control plan and narrative, and DEP filing fee shall also be included.
 - (b) PennDOT Highway Occupancy Permit – If the sewer and/or waterline extension is to be located in a State highway, obtain and complete the Highway Occupancy Permit application form and submit to the Authority.
 - (c) Railroad Occupancy License – If the sewer and/or waterline extension is to cross or be located in railroad property, the Developer shall determine the requirements of the railroad. He shall complete all application forms and ensure that the design conforms to the requirements of the railroad. The Developer shall submit to the Authority the completed forms and design information necessary for submission to the railroad.
 - (d) Any pavement cut "or excavations that cause pavement cuts" require a permit from Muhlenberg Township.
 - (e) After review of the applications by the Authority, the Developer shall make any corrections, if required, and submit corrected copies to the Authority. The Authority will forward the applications and fees to the applicable agency unless the Authority directs otherwise.

The Developer shall be responsible for compliance with and payment of costs (fees, inspectors, etc.) in connection with all permits, licenses, and regulations applicable to sanitary sewer extension construction.

Information on the permit forms specific to the Authority as applicant may be obtained from the Authority Engineer.

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- (f) The Developer shall also be responsible for obtaining and complying with any and all other local, state and Federal permits required for the work.

E. Construction Observation of the Work:

- (1) All work shall be observed throughout the construction by the Authority's designated construction observer. The developer shall pay all costs.
- (2) Typical items of interest for construction observation are: subgrade, bedding, pipe installation, direct cover, testing, manner of connection to Authority's system, protection of Authority's system from receiving debris from construction, condition of manholes valves and fire hydrants prior to backfilling, and final lamping of sanitary sewer at completion. The presence or absence of construction observation shall not relieve the developer or his contractor from the obligations of complying with the Authority specifications.
- (3) The developer, acting through its contractor, shall notify the Authority's designated construction observer three (3) days in advance, when construction work is proposed to commence, so that appropriate construction observation time may be scheduled.
- (4) No nights, Sunday, or legal holiday work, requiring the presence of the Engineer or his representative, will be permitted, except in cases of emergency, and then only with the written consent of the Engineer, and to such an extent as he may judge necessary. No work shall be done when in the opinion of the Engineer, the weather is unsuitable for good and careful work to be performed. Should the severity of the weather continue, such that the work cannot be prosecuted successfully, the Contractor, upon order of the Engineer, shall cease all such work until directed to resume the same.
- (5) No work may be covered without being viewed by the Authority's designated construction observer. Any work performed without construction observation shall be re-excavated, exposed and observed by the Authority's designated construction observer.
- (6) Any defective work or work not conforming to the specifications is to be replaced to the satisfaction of the Authority, at no expense to the Authority.

F. Engineer's Duties, Examination and Inspection:

- (1) The work shall at all times be subject to the examination and inspection of the Engineer and his authorized assistants, who shall have free access to the work, and be furnished by the Contractor with every reasonable facility for examination of the work, to the extent of uncovering, testing or removing finished portions thereof. The Contractor shall provide all labor equipment necessary for such examinations. The Engineer may require the Contractor to uncover for examination, or to remove any work done or placed in violation or disregard of instructions issued to the Contractor by the Engineer or his representative.

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- (2) The Engineer will not perform or be responsible for any hiring, firing, supervision, superintendence, direction of personnel, use of equipment, construction site safety, safety programs or the direction of the manner of methods of construction employed by the contractors, their subcontractors, agents, servants or employees.
- (3) All inspections and tests shall be performed without unnecessarily delaying the work. All material and workmanship, if not otherwise designated by the Specifications shall be subject to inspection, examination and test by the Engineer or his duly authorized representatives. The Engineer shall have the right to reject defective material or workmanship, or require its correction. Rejected material and/or workmanship shall be satisfactorily replaced with proper material and workmanship, and the Contractor shall promptly segregate and remove rejected material from the premises. If the Specifications, the Engineer's instructions, laws, ordinances, or any public authority require the work to be specially tested or approved, the Contractor shall give the Engineer timely notice of its readiness for inspection.
- (4) The Engineer shall, within a reasonable time after presentation to him, determine all questions in relation to the construction of the Project, and in all cases decide every question which may arise relative to the performance of the work covered by the Contract.
- (5) The Engineer shall have full authority to decide all questions which may arise under the Contract relative to the quality and acceptability of materials furnished and the manner, rate of progress, quality and acceptability of work performed, and the interpretation of any or all Plans and Specifications.
- (6) Any verbal opinion or suggestion which the Engineer may give the Contractor shall in no ways be construed as binding the Authority in any way.
- (7) In case of any dispute relative to the quality of materials or work, the Engineer shall have authority to reject materials and to advise the Authority to suspend the work. He shall not be authorized to revoke, alter, enlarge, relax or release any requirements of the Specifications, nor to approve or accept any portion of the work, or issue instructions contrary to the Specifications.
- (8) Within ten (10) working days after the Developer notifies the Authority in writing that the facilities have been completed and are ready for final inspection, the Authority, or the Authority's agent, shall begin to inspect the facilities in order to verify that the system has been completed in accordance with the approved plans and Specifications. The costs incurred in performing the inspection and testing will be the responsibility of the Developer. The Developer agrees that all defects, problems, damages, or items of poor workmanship that may be found as a result of the inspection, field testing or by any other manner or means, shall be repaired by the Developer in proper manner under the direction and inspection of the Authority's representative prior to acceptance by the Authority. After the acceptance of the facilities, the Authority will issue the required connection permits.

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G. Defective Work:

- (1) When any material not conforming to the requirements of the Specifications and Drawings, has been delivered upon the Site of the Project, or incorporated in the work, or when any work performed is of inferior quality, such material or work shall be considered as defective and shall be immediately removed and renewed or made satisfactory as directed by the Engineer. Failure or neglect on the part of the Engineer to condemn or reject any bad or inferior work or materials, shall not be construed as to imply an acceptance of such work or materials, if such bad or inferior material or work becomes evident at any time prior to the delivery of the Completion Certificate by the Authority to the Developer.
- (2) The Contractor shall remove any work or material condemned, and shall rebuild and replace the same.
- (3) The Contractor shall promptly move from the premises all materials condemned by the Engineer as failing to conform to the Specifications, whether incorporated in the structure or not, and the Contractor shall promptly replace his own work in accordance with the contract.

H. Engineering Stakes: The Contractor shall furnish, set and maintain without cost to the Authority, suitable stakes, grade boards, temporary structures, templates, and other materials for establishing and maintaining points, marks, and lines. The Contractor shall be held responsible for the preservation of all stakes and marks. Provide a level and rod for use by the Authority to verify accuracy of installation. The project bench mark shall be set within the project area for use by the Engineer.

I. Record Plans:

- (1) At the completion of the work, but prior to any new connections, the developer shall prepare and deliver to the Authority a record copy in .tif or the most recent version of AutoCAD on CD/DVD, and one (1) set of plans affixed with engineer's professional seal, showing the actual locations of the completed facilities. The Record Plans shall show all changes made from the initial plans, show the location of all water and sewer main lines, manholes, laterals, gate valves, curb boxes, and show the location of all utilities encountered during the construction of the sanitary sewer and water distribution facilities. The pipe material, size, depth, slope, manhole inverts, lateral stations, lateral length, lateral depth and all other pertinent information shall be shown for all sanitary sewer and water distribution facilities installed. Manhole tops and inverts shall be measured and recorded in USGS datum.
- (2) Record Plans shall be submitted 30 days after the completion of the installation.
- (3) Two (2) sets of all final equipment shop drawings, operation manuals, etc. shall be provided. The Muhlenberg Township Authority, in its sole discretion, shall determine the adequacy and completeness of the submittals.

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- J. **Authorization to Discharge Flow to the Authority's Facilities:** Upon satisfactory completion of the work and all associated requirements set forth herein, the Authority shall allow discharge of sanitary sewage into its facilities.
- K. **Advertising:** No advertising will be permitted on any part of buildings, scaffolding, fences, materials, obstructions, barricades or work.
- L. **Pennsylvania One Call System:**
- (1) If public or privately owned utility pipelines, cables or structures exist below the surface within the construction area, no sub-surface work shall be done in the area without the presence or approval of an authorized representative of the utility company or agency having jurisdiction.
 - (2) Attention is directed to the provisions of the Underground Utility Line Protection Law Act No. 287 (1974), as amended, and full compliance therewith is required of the Contractor.
 - (3) The Contractor shall not proceed with construction operations in any work area where subsurface utility pipelines, cables or structures may exist until he has:
 - (a) Notified the facility owners through the One Call System (1-800-242-1776), not less than 3 or more than 10 working days prior to excavation.
 - (b) Determined from the owners of such and by use of other prudent techniques the precise locations of such pipelines, cables or structures;
 - (c) Made necessary arrangements with said owners for, and has had the locations of the existing pipelines, cables or structures shown on the surfaces by painted markings (or with wood stakes in earth surfaces) and also the kind of utility pipeline, cable or structure shown by painted markings (or markings on wood stakes in earth surfaces).
 - (d) Maintained such painted markings and stakes until such time as the work in the area has been completed, and renewed such markings whenever deemed necessary by the Engineer during the maintenance period.
 - (e) Otherwise complied with the requirements of Act No. 287 (1974) as amended.
- M. **Safety Requirements:**
- (1) The Contractor is solely responsible for implementing any and all safety requirements.
 - (2) The safety provisions or applicable laws, and regulations of the Pennsylvania Department of Labor and Industry, and building and construction codes shall be observed. Machinery, equipment, and other hazards shall be guarded in accordance with the safety provisions of the

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"Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, to the extent that such provisions are not in contradiction of applicable state and local laws.

- (3) Observance of, and compliance with, said regulations shall be solely and without qualification, the responsibility of the Contractor, without any responsibility whatsoever on the part of the Authority Engineer. The duty of enforcing such laws and regulations lies with the said Department, not with the Authority or Engineer.
- (4) The provisions of the "OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970" of the U.S. Department of Labor shall be complied with in the performance of all work. Observance of, and compliance with, said Act should be solely and without qualification the responsibility of the Contractor, without reliance on superintendence of, or direction by, the Authority or Engineer. The duty of enforcement of the provisions of the Act lies with the U.S. Department of Labor, not with the Authority or Engineer.
- (5) Confined Spaces:
 - (a) The Contractor is hereby advised that confined space entry may be required in the performance of this work. No confined spaces shall be entered by Contractor personnel until Contractor written confined space entry procedures are developed for the Project in accordance with the provisions contained within 29 CFR 1910.146 Permit Required Confined Spaces – effective April 15, 1993. These procedures require the identification of potential hazards, safety precautions, protective equipment requirements and rescue procedures [29 CFR 1926.21 (b) (6)]. If respiratory protection is required for entry, the Contractor shall have a written respiratory protection program in effect and which defines attendant responsibilities, communication procedures and safety equipment utilization [29 CFR 1910.134 (e) (3)].

N. **Regulations of the Department of Labor and Industry:** The Contractor shall comply with regulations of the Pennsylvania Department of Labor and Industry relating to wage scales, trenches and excavations, tunnel construction, equipment, materials, labor, safety, sanitation, and other regulations on which the Contractor shall be fully informed. Observance of and compliance with said regulations shall be solely and without qualification, the responsibility of the Contractor, without reliance or superintendence of, or direction by, the Authority or Engineer. The duty of enforcing such laws and regulations lies with the said Department.

O. **Observance of Laws:** The Contractor at all times shall observe and comply with all Federal and State laws and regulations, and local bylaws, ordinances and regulations in any manner affecting the conduct of the work or applying to employees on the Project, as well as all safety precautions and orders or decrees which have been promulgated or enacted, or which may be promulgated or enacted, by any legal bodies or tribunals having authority or jurisdiction over the work, materials, equipment, employees or the Contract; such observance and compliance shall be solely and without reliance on superintendence or direction by the Authority or Engineer. The duty of enforcement of all of said laws,

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ordinances, regulations, orders or decrees lies with the body or agency promulgating them, not with Authority or Engineer.

3.7.14. **REFUNDABLE AGREEMENTS:** Under the terms of the Act, a developer or owner assuming financial responsibility for extension of water or sewer Mains may be entitled to enter into an agreement with the Authority, termed a Refundable Agreement, by which the owner or developer is entitled to a portion of tapping fees received by the Authority by virtue of developer's construction of capital improvements comprising the "distribution part" or sewer mains comprising the "collection part" of the municipal system of the Authority in a specified area, along a specified street, etc. The terms of such Refundable Agreements shall provide for refunds of tapping fees to developers, only with respect to new customers who connect directly to the water or sewer mains installed by the developer and pay a tapping fee to the Authority. Those Refundable Agreements shall apply only to the portion of the tapping fee applicable to the work performed by the developer, and Refundable Agreements shall remain in force for no longer than ten (10) years. No refunds of tapping fees under such an agreement shall be made by the Authority to a developer unless the distribution or collection part of the tapping fee is actually received from other consumers or customers for the privilege of obtaining direct service from the extension installed by the developer, or through a service line connection or sewer lateral connected directly to the improvements installed by the developer.

3.7.15. **CAPITAL IMPROVEMENTS BY AUTHORITY:** In the event the Authority elects to construct an extension to its water or sewer system, or other capital improvements in order to meet the needs of a property owner or developer, the party requesting such service shall be furnished with a preliminary estimate of the project costs. The Authority and the party requesting service shall enter into a written agreement which shall provide that the developer shall furnish a cash escrow and financial security to the Authority, substantially in accordance with the Authority's escrow and financial security requirements in cases where developers perform work to extend the systems of the Authority. The party requesting service shall be responsible for the entire project costs, including consulting engineer fees, legal fees, permit fees, insurance costs and all contractors' charges.

In instances where the Authority is to perform capital improvement work to meet the specific needs of an owner or developer, the Authority shall, pursuant to State statute, bid said work in the name of the Authority and award the contract for installation to the lowest responsible bidder. The Authority reserves the right to require and request a predetermination as to qualifications of any contractor requesting to bid for said work, and to require evidence by same of any prior experience in work of a similar nature. The Contractor shall be required to provide the Authority with performance and payment bonds in the full amount of the work construction cost. Upon the receipt of bids in instances where the Authority is performing work to meet the specific needs of an owner or developer, the owner or developer shall have the right to direct the Authority to reject all bids. In that event, developer shall be responsible for all costs incurred by the Authority for preparation of engineered specifications, advertisement costs, legal costs and all other costs associated with the proposed contract. The Authority does not warrant nor guaranty its cost estimates and the owner is responsible for all actual costs regarding Main extensions and capital improvements performed by the Authority to meet the specific needs of an owner or developer.

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3.8. FIRE PROTECTION CONNECTIONS, NON-RESIDENTIAL AND RESIDENTIAL

Non-Residential Private Fire Service

- 3.8.1. **APPLICATION FOR PRIVATE FIRE PROTECTION SERVICE:** A written application prepared on the form furnished by the Authority must be submitted to the Authority for the purpose of requesting a special fire connection for private fire protection service, such application to be signed by the owner of the Premises or his duly authorized agent, said application to be subject to such fees and terms and conditions as are hereinafter set forth and included therein, and to the execution of a contract, which applications, together with the Standards of the Authority, shall regulate and control the furnishing of such services to such Premises, and said application to be submitted at least two months before the service line is required.

The application shall be accompanied by accurate plans showing the proposed fire protection system and appurtenances and showing any other water supply system and appurtenances which may exist on the Premises. No fire protection facilities involving the use of Authority water shall be installed at any time and no changes in or additions to said fire protection facilities shall be made without prior approval by the Authority, said fire protection facilities to include all pumping and/or mechanical means of taking water from the Authority system, storage tanks and all such facilities. All approvals will be subject to Section 3.9 Responsibility for Fire Service and shall be subject to such restrictions and limitations as established by the Authority.

- 3.8.2. **APPROVAL OF APPLICATIONS:** The application does not bind the Authority to approve the requested special connection. The Authority will study each proposed installation to determine whether such a connection is reasonable and practical, and whether such a connection will in any way endanger the general water service in the vicinity; the Authority reserving the right to refuse approval of an application relative thereto. The Authority further reserves the right to make an approval subject to the installation of adequate storage facilities and related appurtenances on the Premises thereof, if found necessary in order to permit maintenance of adequate water service to other Customers.

- 3.8.3. **TERMS AND CONDITIONS:** The final approval of an application and furnishing of private fire protection service will be subject to the execution of a contract between the responsible parties and the Authority, containing the following terms and conditions and containing such other terms and conditions as are found necessary:

- A. The Authority, by its representative, shall have the right to enter the Premises of the applicant at any reasonable time for the purpose of making such inspections as it may deem necessary, and it shall have the right to attach any testing device or use any means which it may elect to ascertain the condition of the pipe and appurtenances and uses made of same.
- B. The fire service line connection from the street main up to and including the curb or valve box and control valve shall be installed at the expense of the applicant and shall be maintained by the Authority: that all other pipe, fixtures and appurtenances shall be installed in accordance with the requirements set forth relative to service line and/or water main extensions and maintained in good condition by and at the expense of the applicant. In such instances where the service connection is approved to provide fire protection service and other metered service, always being subject to a design satisfactory to the Authority, the control valves on the fire service line may be installed on the property of the Premises at approved locations.

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- C. The Authority may require a metered detector check.
- D. The said control valve shall be under the control of the Authority, except during times of fire when it shall be under the control of the Chief of the Fire Department of the municipality in which the Premises are located.
- E. All fixtures and openings (other than the controlling valves) shall be kept closed and sealed and not opened or used except during times of fire. Upon the extinguishment of each fire, the applicant shall immediately notify the Authority so that said fixtures and openings can again be closed and sealed.
- F. The applicant agrees the Authority shall not be considered in any manner an insurer of property of persons, or to have undertaken to extinguish fire or to protect any person or property against loss or damage by fire or otherwise.
- G. The applicant shall furnish, attach and make a part hereof an accurate sketch showing the pipes, valves, hydrants, tank openings and appurtenances contemplated in this application. Such sketch must also show any other water supply system and pipelines and appurtenances which may exist on the Premises. There shall be no connection between the private fire service line and the Authority's system.
- H. The rights and obligations of the applicant hereunder shall be further subject at all times to the Standards of the Authority that now exist or which may hereafter be adopted.
- I. The applicant agrees to obtain in advance the approval of the Authority for any change, alteration, addition or deduction contemplated in the fixtures, openings and uses herein specified.
- J. Upon acceptance by the Authority and the completion of the fire service connection herein contemplated, the application shall be in force as a contract and shall continue as such until cancelled by notice, given by the applicant to the Authority.
- K. The Authority has the right to discontinue or disconnect said service pipe and terminate the application, for failure to pay any bill when due or for any violation of any of the terms and conditions of this application, or for any violation of its standards; and, in emergencies, also has the right, without notice, to shut off all or any part of its facilities and discontinue the service when deemed necessary by the Authority for the purpose of making any repairs, alterations, additions or to prevent possible contamination through cross-connected facilities of the applicant or to prevent negligent or willful waste of water through the facilities of the applicant.

- 3.8.4. **METER REQUIREMENTS - PRIVATE FIRE SERVICE CONNECTIONS:** Meters and detector checks will be installed on connections providing service for fire protection. The fire service shall be subject to the rates established for Private Fire Service.

The metered water used in connection with this type of service shall be paid for in accordance with the regular metered rates for Private Fire Protection Service, subject to the applicable minimum meter charge and other water charges.

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The Customer shall pay under this arrangement, for all water used, in accordance with the regular schedule of service and consumption charges for general and private fire service.

- 3.8.5. **GENERAL CONDITIONS - PRIVATE FIRE HYDRANTS:** The private fire hydrant or fire hydrants installed on a separate fire service main, subject to all the foregoing requirements, will be subject to charges as set forth under the Rate Schedule.

When permission is granted by the Authority to a private party for a private fire hydrant which is to be located in a public street or thoroughfare, said hydrant, with service connection, will be installed at the expense of the applicant.

When a hydrant is to be located within the yard of the Customer's Premises, the entire installation, from the street main to and including the hydrant, shall be installed at the expense of the Customer.

Such connections, where allowed, are to be used solely for the extinguishment of fire and for no other purpose, except upon the written consent of the Authority.

- 3.8.6. **COST OF FIRE SERVICE CONNECTION:** All service connections for flat rate fire service, also those for metered fire service, which are specified to be at the expense of the Customer, shall be installed by the Authority and the Customer will be charged with the exact cost of labor and materials used in the work, with an addition of a percentage fee to cover the cost of supervision, use of tools, etc., plus such other applicable fees.

Residential Fire Service

- 3.8.7. **RESIDENTIAL SPRINKLER SYSTEMS:** In instances involving residential construction following adoption by Muhlenberg Township of revisions to the Uniform Construction Code requiring installation of sprinkler systems, each contractor or owner seeking water service for a new residence shall conform, with respect to installation of water service and its internal fire suppression system, with the configuration permitted by the Authority's Standard Water Specifications. Prior to installation of a residential service, the Authority shall be advised of the fire suppression system connection details with respect to each new residence to confirm compliance with the Standard Water Specifications. The owner shall be responsible for payment of all costs and fees incurred by the Authority, if any, in review of the fire suppression plan for new residential construction.

- 3.8.8. **SPRINKLER STANDARDS:** Dwellings required to meet NFPA 13D Standard for Installation of sprinkler systems shall install meter box and appurtenances in accordance with these Standards and with the Authority's Standard Water Specifications. A separate fire line shall be required, allowing the domestic service to be shut off separately from the fire line.

3.9. RESPONSIBILITY FOR FIRE SERVICE

- 3.9.1. **RESPONSIBILITY FOR SERVICE:** It is agreed by the parties receiving public fire service, private fire service, or any other service, that the Authority does not assume any liability for injury of persons or property and that the Authority does not guarantee any special service, pressure, capacity or facility other than can be supplied by the ordinary and changing operating conditions of the Authority, as the same exist from day to day. It is agreed by the parties receiving service that the Authority shall be free and exempt from any and all claims for injury to persons or property by reason of fire, water, failure to supply water pressure or capacity.

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3.10. EFFECTIVE DATE

These Rules, Standards and Specifications, including Part 4, 5 and 6 and all details set forth, therein which follows, compile the existing and presently effective and previously adopted rules, policies and requirements of Muhlenberg Township Authority, as amended and enacted this 9th day of July 2020 by Resolution of the Board of the Muhlenberg Township Authority at a regularly scheduled meeting of the Board held that date, a quorum being in attendance and upon motion made, seconded and unanimously adopted, being Resolution 2020-7.

The Rates and Charges shall be effective August 1, 2020.

END OF SECTION

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PART 4 DESIGN STANDARDS

4.1 INTRODUCTION TO PART 4 OF THE RULES, STANDARDS AND SPECIFICATIONS.

This Part 4 generally sets forth rules which are applicable to all sanitary sewer and water facilities. All sanitary sewer and water facilities shall be designed in accordance with the Pennsylvania Department of Environmental Protection's "Domestic Wastewater Facilities Manual", latest edition, and "Public Water Supply Manual", latest edition, in accordance with good engineering practice, and in accordance with the Muhlenberg Township Authority's Standard Technical Specifications and Requirements for the Construction of Water and Sanitary Sewer Systems.

4.2 COLLECTION SYSTEM

4.2.1. Sanitary sewer collection systems shall be designed in accordance with the following minimum guidelines:

- A. Per capita flows:
 - (1) 100 gallons per day (average)
- B. Sewer capacity flowing full:
 - (1) Laterals and sub-mains – 400 gallons per capita per day
 - (2) Main lines & interceptors – 250 gallons per capita per day
- C. Sewer location - in public streets; private easements to be avoided; where unavoidable, minimum easement width shall be 20 feet.
- D. Sewer diameter - minimum 8" diameter
- E. Sewer depth - minimum 4 feet deep (to invert)
- F. Slope/velocity - minimum 2 feet per second velocity, at full pipe
- G. Laterals - minimum 6", extend to right of way or property line
- H. Lateral/main connection - provide "wye" fitting on main line.
- I. Manholes - 48" diameter, tapered cone, with 0.1 ft. minimum drop across channel; install at maximum of 400 feet between manholes.
- J. Drop manholes - outside drop required whenever invert differential is greater than 2 feet; Ramp required if differential is less than 2'.
- K. Stream crossing - ceramic epoxy coated ductile iron pipe, encased with 6" of concrete. Pipe and encasement extending 10 feet beyond the stream bank each side of crossing.

Sanitary sewers shall be designed for basement service. Where basement service is not feasible, plans shall be so noted indicating which properties/homes will not have gravity service to a basement. Sanitary sewers installed at depths of 14 feet or greater, shall be ceramic epoxy lined ductile iron pipe and fittings.

Detailed engineering reports shall be submitted to justify special construction, pressure sewers, etc.

4.3 DISTRIBUTION SYSTEM

4.3.1. Water distribution systems shall be designed in accordance with the following minimum guidelines:

- A. Distribution system piping capacities:

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- (1) Provide for maximum daily and peak hourly demand at a minimum of pressure of 20 psig.
- B. Pressure:
 - (1) Minimum 20 psig at ground level
 - (2) Normal 60 psig
- C. Water main location:
 - (1) In public streets; private easements to be avoided; where unavoidable, minimum easement width shall be 20 feet.
 - (2) Installed a minimum 10' horizontally and 18" vertically from any existing or proposed sewer system.
- D. Water main diameter:
 - (1) Minimum 8" diameter
- E. Water main depth:
 - (1) Minimum 4 feet deep (to top of pipe)
- F. Services:
 - (1) Minimum ¾"-extend to right-of-way or property line
- G. Service/main connection:
 - (1) Provide corporation stop at main line and curb stop and box at right-of-way or property line
- H. Shut-off valves:
 - (1) Not more than 500' intervals in commercial districts and not more than one block or 800' in other areas of the distribution system at tees and crossings
- I. Hydrants:
 - (1) Locate at each street intersection and spacing at intermediate points as recommended by the State Insurance Services Office
 - (2) Leads a minimum 6" in diameter with auxiliary valve installed on all hydrant leads
- J. Air release valves:
 - (1) Installed at high points in the water mains
- K. Fire Protection:
 - (1) In accordance with the requirements of the State Insurance Services office, Local, State and Federal Code.

All water mains shall be sized from a hydraulic analysis based on flow demands and pressure requirements. Dead ends shall be minimized by looping all mains whenever practical. Where dead end mains occur, they shall be provided with an approved blow-off or flushing hydrant.

Backflow prevention devices shall be installed when water supply mains are connected to residential, commercial, and industrial customers which present a potential contamination hazard to the public water supply system.

Detailed engineering reports shall be submitted to justify special construction, pump stations, storage tanks, etc.

4.4 SEWAGE PUMP STATIONS

4.4.1. Conceptual approval of a sanitary sewer pump station shall be obtained from the Muhlenberg Township Authority prior to detailed design of the collection system and sewer facilities. The developer shall submit an engineering report with calculations and cost estimates evaluating other alternatives, including extensions/upgrade/improvements of off-site facilities, to justify that there is no other alternative but to utilize a sanitary sewer pump

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station for his proposed development. The Authority may require a capitalized operating and maintenance fund for the pump station. Private pump stations are prohibited.

4.4.2. When conceptual approval has been obtained for a sanitary sewer pump station, the pump station facilities shall meet the following standards:

- A. Type - submersible; Authority reserves the right to select the manufacturer to ensure compatibility with its other existing pump stations.
- B. Number of units - duplex pumps, each capable of handling peak design flow.
- C. Minimum solid - pumps must be capable of passing a 3" solid.
- D. Valves- protected in a separate valve vault, vented, with drain.
- E. Emergency Operation - independent stand-by power source, with automatic transfer and start-up.
- F. Alarms and telemetering - adjustable level control for 5 alarm levels, plus indication of power failure. RTU mounted in control panel with dry contact inputs, capable of being polled by the main PLC at the treatment plant. Provide and install phone line. Local flashing alarm light.
- G. Miscellaneous - site improvements on case by case basis, including yard lights, paved parking area, fencing, flow meter, well, sink and maintenance building.

4.5 BOOSTER PUMP STATIONS

4.5.1. Conceptual approval of a booster pump station shall be obtained from the Muhlenberg Township Authority prior to detailed design of the distribution system and water facilities. The developer shall submit an engineering report with calculations and cost estimates evaluating other alternatives, including extensions/upgrade/improvements of off-site facilities, to justify that there is no other alternative but to utilize a booster pump station for his proposed development. The Authority may require a capitalized operating and maintenance fund for the pump station. Private pump stations are prohibited.

When conceptual approval has been obtained for a booster pump station, the pump station facilities shall meet the following standards:

- A. Type:
 - (1) Authority reserves the right to select the manufacturer to ensure compatibility with its other existing pump stations
- B. Number of Units:
 - (1) Duplex pumps, each capable of handling the maximum daily demand for the system
 - (2) Bypass available
- C. Metering:
 - (1) Flow rate indicating and totalizing meter
- D. Emergency Operation:
 - (1) Independent stand-by power source, with automatic transfer and start-up
- E. Alarms and Metering:
 - (1) Indication of power failure. RTU mounted in control panel with dry contact inputs, capable of being polled by the main PLC. Provide and install phone line. Local flashing alarm light
 - (2) Automatic shut-off and low-pressure controller set at 20 psi on the suction line
- F. Miscellaneous:
 - (1) Site improvements on case by case basis, including yard lights, paved parking area, fencing, low meter, maintenance building

PART 5

STANDARD SPECIFICATIONS

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Project Location
- B. Project Description
- C. Scope of Work
- D. Owner Supplied Products
- E. Contractor's Use of Site and Premises
- F. Special Requirements

1.2 PROJECT LOCATION

- A. Project locations will be in and adjacent to Muhlenberg Township, Berks County, Pennsylvania.

1.3 PRELIMINARY REQUIREMENTS

- A. Street Regulatory Requirements: Where sewers and water lines are to be installed within the limits of existing streets, all removal and protection of street paving, backfilling of trenches, temporary and permanent replacement of street paving, restoration of shoulders and the maintenance and protection of traffic will be performed in strict conformance with the requirements of Muhlenberg Township, other governing municipalities in the immediate vicinity, or the Commonwealth of Pennsylvania Department of Transportation, where applicable.
 - 1. The cost of inspection by personnel of the Commonwealth of Pennsylvania Department of Transportation shall be paid by the Developer.
 - 2. Perform work within the right-of-way of State Highways in accordance with the requirement of the latest edition of the Commonwealth of Pennsylvania Department of Transportation, Chapter 459, Occupancy of Highways by Utilities. The Regulations are made a part of these Specifications.
- B. DEP Regulations and Requirements: The Contractor and Developer are advised that they will be required to conduct their work in complete compliance with all of the rules, regulations and requirements of the Pennsylvania Department of Environmental Protection (DEP).
- C. House or Building Sewer and Water Requirements: If as part of the work of this project, house or building sewers and water mains are constructed from the service connection to the house or building, use materials required by the current edition of the Muhlenberg Township Plumbing Code as amended.
- D. Sewer and Water Main Locations: New sewers shall be located in streets and paved areas to the maximum extent possible, where feasible, to facilitate access for maintenance purposes. If sewers and water mains must be located on private property, a right-of-way at least 20 feet wide centered on the main shall be dedicated from the Developer to the Owner.

1. The Owner will not grant final approval of the sanitary sewers and water mains for the project and will not grant approval to proceed with construction until the Owner is in receipt of executed deeds of easement for the rights-of-way by the property owners.
- E. Unauthorized Connections to Sewers: In general, stormwater or groundwater drainage connections to any sewer extension of the Owner's system are unauthorized connections.
1. No rain water leaders, roof drainage, area or yard drainage, basement, surface or water from fire hydrants, ground water or water from underground drainage fields shall be permitted to drain into or be admitted into the sanitary sewer system; nor shall any of these be admitted to the sanitary sewer system by the use of pumps of any type.
 2. The sanitary sewer system, and all extensions, are intended to convey sanitary sewage only and all sewer extensions will be strictly sanitary sewers.
- F. Interfacing Existing Construction
1. Do not permit ground or surface water to enter the existing sanitary sewer facilities through the new sewer piping connection.
 2. Do not flush, drain or deposit water or debris from the new sewer piping or related construction into the existing sanitary sewer facilities.
 3. Install a watertight plug in new sewer piping entering a new manhole. Maintain the plug until all debris and accumulated water have been removed from the new sewer facilities and the new sewer facilities have passed all specified acceptance tests.
- G. Fire Protection
1. Installation of private fire service connections shall comply with the rules and regulations covered in the Municipal Township Code Book.

1.4 PROJECT DESCRIPTION

- A. Without intending to limit or restrict the extent of the Developer/contractor work required under these Specifications, the work generally comprises construction of extensions to the existing wastewater collection system and water distribution system in accordance with these Specifications and the Detail Drawings bound herein.
- B. Drawings: The Detail Drawings represent the standards of construction of the Owner and are bound in the back of the Specifications.

1.5 SCOPE OF WORK

A. Scope of Work

The Work included in this Contract consists of furnishing all pipe, new materials, equipment, labor, transportation, fuel and power and performing all Work as required by the Contract in strict accordance with the Specifications, Schedules and Drawings, and Pennsylvania Department of Transportation Publication 408 Specifications, latest revision, all of which are made a part hereof; and including such detail Drawings as may be furnished by the ENGINEER from time to time during the construction in interpretation of

said Drawings. PennDOT Publication 408 shall be adhered to regarding construction methods and materials. Contract administration and payment basis shall be as specified in these Specifications. The Work shall be complete and all Work, materials, and services not expressly called for in the Specifications, or specially indicated on the Drawings, which may be necessary for complete and proper construction to carry out the Contract in good faith, shall be performed, furnished, and installed by the CONTRACTOR at no additional cost to the OWNER. The Work shall be executed in the best and most workmanlike manner by qualified, careful and experienced workers.

Any damage to facilities or structures within the PennDOT right-of-way shall be the sole responsibility of the Contractor to repair to the satisfaction of the Pennsylvania Department of Transportation. Contractor is hereby informed that it is his sole responsibility to utilize equipment, means, and methods to perform the work without damaging PennDOT facilities.

A general description of the Work to be accomplished is provided below:

1. Implement the project according to all building permits, approvals, inspections, and certifications as specified in the Specifications or required by the local municipality.
2. Furnishing and installing sediment and erosion control facilities.
3. Furnishing and installing all construction facilities and temporary controls as specified in Section 01500.
4. Performing all required site clearing, rough grading, finish grading, seeding, landscape restoration, and pavement restoration for the entire project.
5. Performing excavation, foundation bedding, and backfilling for all project structures.
6. Construction stake-out for all proposed facilities. Engineer shall provide control points and provide reference points for easements as may be required.
7. Furnishing & installing all water and sewer mains and services, fittings, and related structures.
8. Water and sewer main testing, which shall be performed by Contractor.
9. Perform restoration of paved and unpaved areas disturbed during construction. All trenches shall be backfilled completely and temporary restoration to be performed daily.

1.6 OWNER SUPPLIED PRODUCTS

A. OWNER'S Responsibilities: None

B. CONTRACTOR'S Responsibilities:

1. Review OWNER reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with OWNER.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

5. Supply all materials required for the execution of the Contract, complete.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Confine construction equipment, the storage of materials and equipment, and operations of workmen to within the project site.
- B. Assume full responsibility for materials stored on site.
- C. Transport materials remaining at the completion of the Project for which the OWNER will retain possession to a storage area designated by the OWNER.
- D. Maintain cleanliness of the site

1.8 SPECIAL REQUIREMENTS

- A. If the nature of construction work requires temporary disruption, relocation, or modification of utility services to businesses, public facilities, or residences adjacent to the Project, provide temporary services by methods approved by the utility company and the OWNER/ENGINEER. No extra compensation will be allowed for the cost of such temporary services. If the CONTRACTOR'S operations results in extended (in excess of one hour) interruption of services, OWNER or ENGINEER may direct utility company to correct such interruptions and the utility company's costs will be charged to the CONTRACTOR.
- B. In the event that utility relocations or modifications are required during the Work, make arrangements with the affected utility company to perform such relocations or modifications. No extra compensation will be allowed for the cost of such utility relocations or modifications.
- C. The CONTRACTOR shall strictly follow all applicable rules and regulations governing the control of sediment and erosion during construction.
- D. Record Drawings

Before the final release of retainage is made, the CONTRACTOR shall deliver to the ENGINEER, a clean, accurate set of Drawings which shall be annotated (with dimensions, where applicable) to show all changes made during construction, to reflect the as-built condition of the Work.

E. Work Schedule

Any Work performed during the absence of the OWNER and/or ENGINEER will be done at the risk and responsibility of the CONTRACTOR and may be subject to rejection upon later inspection.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures
- B. Construction progress schedules
- C. Proposed Products list
- D. Product Data
- E. Shop Drawings
- F. Samples
- G. Design data
- H. Test reports
- I. Certificates
- J. Manufacturers' instructions
- K. Manufacturers' field reports

1.2 REFERENCES

- A. AGC (Associated General CONTRACTORS of America) publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

1.3. SUBMISSIONS REQUIRED

- A. General Requirements: Developer shall make the various submissions as stated under the SUBMITTALS Article in each Specification Section. In addition, submit copies of Developer's plans and a construction progress schedule.
 - 1. Make each submission to the office of the Owner unless otherwise directed by the Owner.

1.4 PROCEDURES FOR SUBMISSIONS

- A. Preliminary Submissions: At the time of submission of preliminary plans for the subdivision to the Owner, complete the necessary documents and submit them to the Owner for review. Any documents requiring corrections will be returned to the Developer for correction and resubmission. Each time a submission is made to the Owner, two copies shall be provided. The required documents are as follows:
 - 1. Contract Drawings and Owner review fee: If the sanitary sewer and water distribution extension is part of a larger project, those sections of the project

specifications dealing with the sanitary sewer and water distribution extensions shall be submitted.

2. Copies of the Pennsylvania Department of Environmental Protection (DEP) Planning Module, Components, and a copy of DEP's approval of the Components.
 3. DEP Sewerage Permit Application form (Bureau of Water Quality Management), Erosion and Sediment Pollution Control Plan and Narrative, and filing fee.
 4. DEP Public Water Supply Permit and filing fee.
 5. Any other permit or license applications required to be in the Owner's name, including associated documents and fees.
 6. If the above documents meet the approval of the Owner, the Developer will be so notified. The Developer will then be required to furnish the DEP filing fee and additional copies of documents as may be required for submission to the permitting agency. (With current DEP procedures, four additional copies of all documents will be required in connection with DEP permit approval submissions.)
- B. The Developer may elect to submit the Contract Drawings for preliminary review and approval prior to completion of the required permit applications.

1.5 CONTRACT DRAWINGS – DEVELOPER SUBMISSION

- A. General Requirements: Submit two copies of drawings for review. After review of these drawings, make any corrections required and submit four corrected copies.
1. Sheet Size: 24-inches by 36-inches.
 2. Base elevations on the datum of the existing sewers.
 3. Include the following notes on the drawings:
 - a. Sanitary sewer and water distribution construction methods and materials shall conform to the latest standards of the Muhlenberg Township Authority (Owner), Pennsylvania and shall be subject to approval by the Owner's Engineer.
 - b. The Permittee for this sewer and/or water extension is the Muhlenberg Township Authority.
 4. For details of manholes, valves, fire hydrants, bedding, encasement, service connections, etc., make reference to the appropriate "Detail Drawing" bound herein.
 5. Bind drawings in sets and number them consecutively.
 6. Include on the drawings a list of Act 287 (as amended) users. The list of Act 287 users may be obtained from the Berks County Recorder of Deeds, and shall include the name, address, phone number, and person to contact of each utility maintaining facilities in the area of the proposed extension.
- B. Indicate on the drawings the following general items:
1. Name of the Design Engineer.

2. Seal of the Design Engineer.
 3. Signature of the Design Engineer.
 4. Name of the development and the owners.
 5. Date.
 6. Indicate by note on the Index Map(s) or Plan and Profile sheet(s) the Water Quality Management Permit Number of the existing facility that the proposed sewers are connecting into.
- C. Include the following drawings;
1. Location Plan: Showing approximate area of the municipality in which the project is located. No particular scale is required.
 2. Index Map(s): Drawn to a scale of 1-inch equals 400-feet and having the following items included thereon:
 - a. Name of each street.
 - b. Number designation of each manhole. (Contact Owner's Engineer to coordinate manhole numbering system.)
 - c. Location of water mains, valves, and hydrants.
 3. Detail Sheets (Plan and Profile): Plan View drawn to a scale of 1-inch equals 50-feet and Profile View drawn to a horizontal scale of 1-inch equals 50-feet and a vertical scale of 1-inch equals 10-feet, or 1-inch equals 5-feet, and having the following items included thereon:
 - a. Location of each existing or proposed building with elevation of the existing or proposed basement (Plan View). If proposed basement elevations are not known, the drawings shall include a note stating which lots are not intended to be provided with gravity basement drainage.
 - b. Sewer and water ties to existing permanent and semi-permanent features (Plan View).
 - c. Top elevations of manholes (Profile View).
 - d. Invert elevations of manholes (Profile View).
 - e. Manhole numbers corresponding to those on Index Map (Plan View and Profile View).
 - f. Distance between manholes (Profile View).
 - g. Grade of proposed sewer and water line (Profile View).
 - h. Size of proposed sewer and water line (Profile View).
 - i. Location, size and elevation of all existing and proposed underground utilities (Plan View and Profile View).
 - j. Location of all hydrants, valves, tees and crosses.

- k. Right-of-way limits (Plan View).
- l. Service Connection Ties:
 - 1) The measurement to locate the wye or tee branch is the horizontal distance measured along the centerline of the main sewer from the downstream manhole to the centerline of wye or tee branch.
 - 2) The ties and measurements necessary to locate the upper free end of the service connections are:
 - a) The horizontal distance measured to the closest tenth of a foot from the downstream and upstream property markers or house corners to the end of the service connection.
 - b) The horizontal distance from the centerline of the main sewer to the end of the service connection.
 - c) The depth from the ground surface or the top surface of curb to the invert of the service connection
- D. Submit the following information as a supplement to the construction drawings:
 - 1. Number of persons to be served initially.
 - 2. Number of persons to be served in the future.
 - 3. Number of acres to be served initially.
 - 4. Number of acres to be served in the future.
 - 5. Initial and future sanitary sewer flows and water demand if the development is other than residential.

1.6 SUBMITTAL PROCEDURES

- A. Transmit each submittal with ENGINEER accepted transmittal form.
- B. Number each submittal. Number shall consist of the following parts, each separated by a dash:
 - 1. Contract number
 - 2. Five-digit Specification Section number
 - 3. Two-digit sequence number starting for each Specification Section with 01 and continuing with 02, 03, etc., for subsequent submittals with the same Specification Section number.
 - 4. Use the fourth part of the number only for re-submittals. For the first re-submittal of a previous submittal, add -R1 to the previous number. For the second re-submittal, change to -R2, and so on.

As an example of the numbering process for Contract Number 1, the third submittal under Section 03300 would be numbered 1-03300-03 and the second re-submittal of this same submittal would be numbered 1-03300-03-R2.

- C. Identify project, CONTRACTOR, Subcontractor, equipment/material description, equipment/material supplier, pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply CONTRACTOR'S stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
- E. Schedule submittals to expedite the project, and deliver to ENGINEER at business address. Coordinate submittal of related items.
- F. For each submittal for review, allow fifteen (15) days excluding delivery time to and from the CONTRACTOR.
- G. Identify deviations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- H. Provide space for CONTRACTOR and ENGINEER review stamps.
- I. When revised for re-submittal, identify all changes made since previous submittal.
- J. The ENGINEER'S approval of the CONTRACTOR'S submittal is for general conformance with the design concept only. Although the ENGINEER may review submittals in more or less detail, such reviewing is an effort to discover errors and omissions in the CONTRACTOR'S submittals and to safeguard the OWNER from unnecessary costs and delays resulting from errors or omissions in the CONTRACTOR'S submittals. The ENGINEER'S review shall in no way relieve the CONTRACTOR of his obligation and responsibility to coordinate the WORK and plan the details of the WORK or to relieve him of his responsibility in fulfilling the purpose and intent of the CONTRACT. Review by the ENGINEER shall not be construed as placing on him or on the OWNER any responsibility for the accuracy, proper fit, functioning or performance of any phase of the WORK included in the CONTRACT.
- K. For all re-submittals except the first, ENGINEER and ENGINEER'S consultants will record manhours required for review of the re-submittal. At the discretion of the OWNER, CONTRACTOR may be charged for review of such repeat re-submittals at ENGINEER'S (and ENGINEER'S consultant's) current hourly rates. Charges for repeat re-submittals will be subtracted from CONTRACTOR'S next progress payment.
- L. Distribute copies of reviewed submittals to all affected parties (other prime contractors). Instruct parties to promptly report any inability to comply with requirements.
- M. Provide a record copy of reviewed submittals in the appropriate electronic format as specified in individual paragraphs below.
- N. Submittals not requested will not be recognized or processed.

1.7 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule in duplicate within fifteen (15) days after date of OWNER/ CONTRACTOR Agreement.
- B. Revise and resubmit as required.

- C. Submit revised schedules at the end of each month, identifying changes since previous version.
- D. Submit a CPM construction schedule with separate task for each major portion of Work or operation identifying first work day of each week.
- E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- F. Indicate estimated percentage of completion for each item of Work at each submittal.
- G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by OWNER and required by Allowances.

1.8 PROPOSED PRODUCTS LIST

- A. Within ten (10) days after date of OWNER/CONTRACTOR Agreement submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.9 PRODUCT DATA

- A. Product Data For Review:
 - 1. Submit to ENGINEER for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.
 - 2. After review, provide copies and distribute in accordance with submittal procedures article above and for record documents purposes described in Section 01700 - Contract Closeout.
- B. Product Data For Information:
 - 1. Submit for the ENGINEER'S knowledge as contract administrator or for the OWNER.
- C. Product Data For Project Closeout:
 - 1. Submit for the OWNER's benefit during and after project completion.
- D. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information specific to this Project.
- E. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- F. Submit at least eight (8) copies, two (2) copies will be retained by the ENGINEER, one (1) will be a field copy, one (1) will be given to the OWNER, and four (4) will be returned to the CONTRACTOR. If the CONTRACTOR requires more than four (4) copies, the number of copies submitted shall be increased accordingly. It may be determined by the Engineer if

electronic versions of the product data may be received via email and distributed in the same manner.

- G. Provide a record copy of all reviewed submittals in pdf, .tif or Microsoft Word format on CD/DVD. Electronic format record copies shall be provided for all major items of mechanical/process equipment.

1.10 SHOP DRAWINGS

- A. Shop Drawings For Review:

- 1. Submit to ENGINEER for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - 2. After review, produce copies and distribute in accordance with Submittal Procedures article above and for record documents purposes described in Section 01700 - Contract Closeout.

- B. Shop Drawings For Information:

- 1. Submit for the ENGINEER'S knowledge as contract administrator or for the OWNER.

- C. Shop Drawings For Project Closeout:

- 1. Submitted for the OWNER's benefit during and after project completion.

- D. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

- E. Submit in the form of one reproducible transparency and one opaque reproduction.

- F. Provide a record copy of selected reviewed submittals in .tif or the most recent version of AutoCAD on CD/DVD. Electronic format record copies shall be provided for all major items of mechanical/process equipment.

1.11 SAMPLES

- A. Samples For Review:

- 1. Submitted to ENGINEER for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - 2. After review, produce duplicates and distribute in accordance with submittal procedures article above and for record documents purposes described in Section 01700 - Contract Closeout.

- B. Samples For Information:

- 1. Submitted for the ENGINEER'S knowledge as contract administrator or for the OWNER.

- C. Samples For Selection:
 - 1. Submitted to ENGINEER for aesthetic, color, or finish selection by OWNER.
 - 2. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for OWNER selection.
 - 3. After review, produce duplicates and distribute in accordance with submittal procedures article above and for record documents purposes described in Section 01700 - Contract Closeout.
- D. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- E. Include identification on each sample, with full Project information.
- F. Submit the number of samples specified in individual specification sections; one (1) of which will be retained by ENGINEER.
- G. Reviewed samples which may be used in the Work are indicated in individual specification sections.
- H. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.12 DESIGN DATA

- A. Submit for the ENGINEER'S knowledge as contract administrator or for the OWNER.
- B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.13 TEST REPORTS

- A. Submit for the ENGINEER'S knowledge as contract administrator or for the OWNER.
- B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.14 CERTIFICATES

- A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the CONTRACTOR to ENGINEER, in quantities specified for Product Data.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to ENGINEER.

1.15 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to ENGINEER for delivery to OWNER in quantities specified for product data.

- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- C. Refer to Section 01400 - Quality Control, Manufacturers' Field Services article.

1.16 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for the ENGINEER'S benefit as contract administrator for the OWNER.

Manufacturer's Field Reports shall include, as a minimum, the following information:

1. Name of Field Service Representative
 2. Date(s) of site visit
 3. Duration of site visit - actual man-hours on-site
 4. Name of equipment manufacturer
 5. Complete list of equipment inspected and/or started up
 6. Description of any problems, unfinished work, required changes, etc. remaining at the conclusion of the site visit
 7. Statement that the installation is or is not acceptable to the equipment manufacturer.
 - 7A. If the installation is not acceptable, what is required to make it acceptable?
 8. Statement that the equipment is or is not operating properly according to the equipment manufacturer.
 - 8A. If the equipment is not operating properly, what is required to make it operate properly?
- B. Submit report in duplicate within thirty (30) days of observation to ENGINEER for information. Illegible or incomplete reports will be rejected.
 - C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance - control of installation
- B. Tolerances
- C. References and standards

- D. Inspecting and testing laboratory services
- E. Manufacturers' field services

1.2 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Specifications, request clarification from OWNER/ENGINEER before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Specifications, request clarification from OWNER/ENGINEER before proceeding.
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.4 REFERENCES AND STANDARDS

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

- B. Conform to reference standard by date of issue current on date of Specifications, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the OWNER/ENGINEER shall be altered from the Specifications by mention or inference otherwise in any reference document.

1.5 TESTING AND INSPECTION SERVICES

- A. OWNER will select an independent firm to perform testing and inspection from list of firms supplied by CONTRACTOR.
- B. The independent firm will perform tests, inspections, and other services specified in individual specification sections and as required by the ENGINEER. As a minimum, the following testing requirements are referenced:

Section 02225 – 3.10 – C

- C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the ENGINEER or the OWNER.
- D. Reports will be submitted by the independent firm to the OWNER/ENGINEER in duplicate, indicating observations and results of tests and indicating compliance or noncompliance with Specifications.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify OWNER/ENGINEER and independent firm twenty-four (24) hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for CONTRACTOR'S use.
- F. Testing does not relieve CONTRACTOR of obligation to perform Work in accordance with the contract requirements.
- G. Retesting required because of nonconformance to specified requirements shall be performed by the same independent firm on instructions by the OWNER/ENGINEER. Payment for retesting will be charged to the CONTRACTOR.

1.6 MANUFACTURERS' FIELD SERVICES

- A. 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 and test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of field service representative to OWNER/ENGINEER thirty (30) days in advance of required observations. Field service representative subject to approval of OWNER/ENGINEER.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

- D. Require manufacturer's field service representative to submit field service report for each visit to the site. Refer to Section 01300, Article 1.13 for required report format.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities: Water and sanitary facilities.
- B. Temporary Controls: Barriers, protection of the work, and water control.
- C. Construction Facilities: Access roads, parking, and progress cleaning.

1.2 RESPONSIBILITY FOR CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- A. The Contractor shall be responsible for providing and maintaining all construction facilities and temporary controls.

1.3 TEMPORARY WATER SERVICE

- A. Provide, maintain, and pay for suitable quality water service required for construction operations.
- B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.
- C. Use of water by any CONTRACTOR shall not interfere with OWNER'S ability to operate existing facilities

1.4 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

1.5 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for vegetation designated to remain. Replace damaged vegetation.
- D. Protect nonowned vehicular traffic, stored materials, site, and structures from damage.

1.6 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.7 PROTECTION OF INSTALLED WORK

- A. Protect installed work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

1.8 SECURITY

- A. Provide security and facilities to protect work, and existing facilities, and OWNER'S operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with OWNER'S security program.

1.9 ACCESS ROADS

- A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.
- B. Extend and relocate as work progress requires. Provide detours necessary for unimpeded traffic flow.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Designated existing on-site roads may be used for construction traffic.

1.10 PARKING

- A. Arrange for temporary gravel surface parking areas to accommodate construction personnel.
- B. When site space is not adequate, provide additional off-site parking.
- C. Do not allow vehicle parking on existing pavement.

1.11 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Collect and remove waste materials, debris, and rubbish from site periodically and dispose off-site.

1.12 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of two feet (2'). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.

- D. Restore existing and permanent facilities used during construction to original condition.
Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01501

TEMPORARY BYPASS PUMPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary portable sewage pumping system consisting of, but not limited to, the following components:
 - 1. two (as a minimum) skid or trailer mounted, self-priming, non-clog, engine driven, centrifugal sewage pumps
 - 2. pump controls capable of starting and stopping the pumps in order to match the incoming flow
 - 3. suction and discharge piping and any fittings needed to connect the piping to the pumps
 - 4. manpower required to operate, monitor, and maintain the pumping equipment

1.2 SCOPE

- A. The CONTRACTOR is required to furnish all materials, labor, equipment, power, fuel, maintenance, etc. to implement a temporary pumping system for the purpose of diverting sewage flow around existing sanitary sewer and/or equipment undergoing modifications as required to maintain flow through the sanitary sewer.
- B. The design, installation and operation of the temporary pumping system shall be the CONTRACTOR'S responsibility. The CONTRACTOR shall employ the services of a vendor who can demonstrate to the OWNER that he specializes in the design and operation of temporary bypass pumping systems.
- C. The bypass system shall be capable of pumping the total flows of wastewater not including the standby pump.
- D. It is required under this section that the CONTRACTOR provide all necessary means to safely convey the normal flows past the work area. It will not be permitted to stop or impede the sewage flow under any circumstances.
- E. The CONTRACTOR shall provide a minimum of two (2) pumps, one operating pump and one installed, ready for operation, stand-by pump.
- F. The CONTRACTOR shall provide a level control system to control the by-pass system. The limits of by-pass pumping shall be reviewed and approved by the OWNER/ENGINEER.

1.3 QUALIFICATIONS

- A. Vendor Experience
 - 1. The temporary by-pass pumping vendor shall have not less than five (5) successful years experience in the design and operation of by-pass pumping systems of the type specified at five (5) different sanitary sewers.

2. The OWNER may require evidence, in the form of operating records, from these sanitary sewer systems to substantiate any claims concerning the ability of the system to perform as required.
3. The by-pass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
4. Temporary by-pass pumping vendor shall be Godwin Pumps of America, Inc., Rain for Rent or approved equal.

1.4 SUBMITTALS

- A. The required items shall be submitted in accordance with Section 1300-SUBMITTALS.
- B. The CONTRACTOR shall prepare with the vendor a specific detailed description of the proposed pumping system and submit it along with the vendor's references.
- C. The submittal shall include a written description of the plan and shall address the quantity, capacity, and location of all pumping equipment. All pumping equipment submitted shall include the manufacturer's performance curves. The size, type and routing of all suction and discharge pipes and the means of connecting the system shall also be included.
- D. The vendor shall submit at least five (5) references of projects of a similar size and complexity as this project performed by his firm within the last five (5) years.

1.5 BYPASS SYSTEM

- A. Temporary Flow By-pass System
 1. The temporary flow by-pass system shall consist of the necessary pumps required to pump the total flows at that location and one (1) standby pump with a capacity equal to that of the largest operating pump. The bypass system shall be capable of pumping low flow rates without damage to the system.
 2. The pump control system shall be configured so that the standby pump will operate along with the primary pump in the event that the flow exceeds the capacity of the primary pump operating alone.
 3. Temporary bypass piping shall be laid as required to perform the bypass.
 4. Installation of the temporary pipes shall not disturb normal access through the site.

1.6 SPECIAL PRECAUTIONS

- A. The CONTRACTOR is notified that maintaining flow through the collection system is critical and must be maintained at all times. If any spills of wastewater occur due to the failure of the CONTRACTOR to maintain the temporary pumping when needed, the CONTRACTOR shall be responsible for any fines levied on the OWNER by the PADEP or any other agency or any damage claims from customers served by the sewage collection system.

PART 2 PRODUCTS

2.1 PUMPS

- A. The pumps and drives shall be rated for continuous duty and shall be capable of pumping the specified flow range without surging, cavitation, or vibration. The pump shall not overload the driver at any point on the pump operating curve. The pump shall be suitable for use with raw unscreened sewage and trash. The pump shall be a self-contained unit, designed for temporary use.
- B. All pumps used shall be fully automatic self priming units that automatically and continuously prime the pump. All pumps used must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of sanitary sewer flows.
- C. Pumps shall be engine driven on skid bases or trailers with centralized lifting bracket and integral fuel tank. The pump shall be direct coupled to an electric start diesel engine.
- D. Pump shall have a cast iron casting, suction cover, separation tank, open impeller front wear plate and non-return valve. Pump shaft shall be alloy steel.
- E. Pump seals shall be of the mechanical type, and shall be located in an oil bath. All metal parts shall be stainless steel.
- F. Pumps shall be provided with check valves on discharges of each pump.
- G. CONTRACTOR shall provide the necessary start/stop controls for each pump.
- H. Pump engine exhaust system shall be equipped with a residential silencer.

2.2 PIPING

- A. Suction hose shall be heavy duty, flexible PVC hose with synthetic braiding reinforcement and quick-disconnect fittings. Suction hose shall have a minimum rating of 28" Hg vacuum and 70 psi pressure.
- B. Discharge hose shall be either rigid pipe or heavy duty, nitrile rubber layflat hose with quick-disconnect fittings. Discharge hose shall have a minimum pressure rating of 300 psi.
- C. Provide suction screens and all fittings, adapters, tools, and appurtenances required for a complete operating system.

2.3 TEMPORARY PLUGS

- A. Plugs shall be inflatable plugs constructed of specially treated industrial fabric and reinforced neoprene. Plugs shall be equipped with steel pull rings and aluminum end clamps.
- B. All plugs shall be firmly attached to a stationary object at ground level by a steel cable in order to prevent loss of plug in the pipeline.

PART 3 EXECUTION

3.1 SAFETY REQUIREMENTS

- A. Maintain and be responsible for the safety of the operations at all times. Warnings: The wastewater may be in the stage of active decomposition and producing hazardous gases such as carbon dioxide, carbon monoxide, methane, hydrogen sulfide or other deleterious gases.
- B. Perform work in such manner to prevent damage to the OWNER'S equipment and property, and insure the safety of all personnel at the sanitary sewer site. The CONTRACTOR shall also be responsible for the safety of his personnel.
- C. Safety precautions include the detection of explosive gas mixtures, the use of non sparking tools if deemed necessary, furnishing forced air to non-ventilated spaces and using personnel safety lines and harnesses.

3.2 TEMPORARY INSTALLATION

- A. Equipment specified in this section shall be installed in strict accordance with the manufacturer's instructions and recommendations. Installation shall include furnishing oil, fuel, grease, lubricants, tools, and spare parts that may be required to maintain the operation of the pump through out the construction period, as recommended by the manufacturer. The CONTRACTOR shall be solely responsible for maintaining the temporary pumps and appurtenances. At the end of the construction period, the CONTRACTOR shall remove the pumps and appurtenances.
- B. The pumps are to be installed where specified. They shall be installed for temporary use only and shall be removed by the CONTRACTOR prior to completion of the contract. The CONTRACTOR shall be responsible for proper operation of the complete pumping system, which includes pump, driver, controls and appropriate pipe connections, during the construction period.
- C. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.
- D. The CONTRACTOR shall insure that the temporary pumping system is properly maintained and a responsible operator shall be on hand at all times when pumps are operating.
- E. The temporary pumping system shall be placed in service a minimum of 24 hours before any work may begin. It shall remain operable at least 72 hours after the work is completed and its removal is approved by the OWNER in writing.
- F. Once written permission is issued, the CONTRACTOR shall remove all components of the temporary pumping system. The CONTRACTOR shall perform all restoration work to the satisfaction of the OWNER.
- G. Pump supplier must be capable of replacing pump system within a 2-hour response time in the event of equipment failure.

END OF SECTION

SECTION 01555

TRAFFIC CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: This Section includes general guidelines for the control of traffic while work is being performed within street or roadway rights-of-way.

1. The goal of the work of this Section is to help ensure safe and efficient traffic movement through work areas and provide safety for the Contractor's work force.

1.2 QUALITY ASSURANCE

- A. Traffic Control on Township Roadways: Traffic Control on roadways other than state Highways shall conform to the requirement of Muhlenberg Township and their designated representative according to field conditions.

1. In general, Township roadways shall not be unnecessarily obstructed, and the Contractor shall take such measures to keep the roadways open and safe for at least one lane of traffic at all times.
2. After working hours to cover trenches with steel plate or wood planking, both of adequate strength to permit safe and unrestricted traffic movement.
3. Provide and maintain at closures, intersections, and throughout the Project, necessary approved barricades, required quantity of approved lights, approved reflectors, danger signals, warning, detour and closure signs.
4. Barricades, danger signals, signs and obstructions shall be illuminated from sunset until sunrise. Materials and safety devices (i.e., barricades, flashing warning lights, reflectors and signs) shall conform to the Pennsylvania Department of Transportation (PennDOT) Specifications.
5. When required by the Township regulatory agencies, provide a sufficient number of watchmen and take necessary and lawful precautions for protection of work and safety of the public.

- B. Traffic Control on State Highways: Provide traffic control in complete compliance with the rules and regulations of PennDOT, including but not necessarily limited to the following:

1. PA Code Title 67, Transportation: Chapter 213 – Work Zone Traffic Control.
2. PA Code Title 67, Transportation: Chapter 441 – Access to and Occupancy of Highways by Driveways and Local Roads.
3. PA Code Title 67, Transportation: Chapter 459 – Occupancy of Highways by Utilities.
4. Section 901 Maintenance and Protection of Traffic During Construction of the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, as supplemented, and such other sections therein which complement this Section.
5. The specific requirements for traffic control provided herein are for the convenience of the Contractor and shall in no way be construed as a release from the PennDOT requirements previously referenced.

- C. Penalties: Fines and related costs resulting from the Contractor's failure to provide adequate traffic control shall be borne solely by the Contractor.

- D. Police Traffic Control: When required by local traffic regulation provide traffic control in the form of uniformed police physically directing traffic.
 - 1. The costs for such police traffic control activity shall be the direct charges, without Contractor's mark-up, passed on to the Owner for payment directly to the local police force.

PART 2 PRODUCTS

2.1 MATERIALS

- A. PennDOT Compliant Traffic Control Devices: Materials and safety devices provided for the purpose of protecting the work and the safety of the public, and for maintaining and protecting traffic, shall conform to the requirements specified in Section 901 of the current edition of the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, as supplemented.
 - 1. Safety devices shall also conform to the requirements specified in the current edition of PA Code Title 67, Transportation, Chapter 213 – Work Zone Traffic Control which complements Section 901.
 - 2. Provide danger signals and warning signs in the approved orange color.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01600
MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products
- B. Transportation and handling
- C. Delivery, storage and protection
- D. Product options
- E. Substitutions

1.2 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work. Products may also include existing materials or components required for reuse.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Specifications.
- C. Provide interchangeable components of the same manufacture for components being replaced.

1.3 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 DELIVERY, STORAGE AND PROTECTION

- A. Deliver equipment and materials to the site in an undamaged condition. Exercise care when off-loading equipment to prevent damage.
- B. Inspect Products on delivery. Submit claims for transportation damage and replace damaged, defective, or deficient items.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Store sensitive products in weathertight, climate controlled, enclosures in an environment favorable to Product.
- F. For exterior storage of fabricated products, place on sloped supports above ground.
- G. Provide off-site storage and protection when site does not permit on-site storage or

protection.

- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution in accordance with the following article for any manufacturer not named.

1.6 SUBSTITUTIONS

- A. ENGINEER will consider requests for Substitutions only within fifteen (15) days after date of OWNER/CONTRACTOR Agreement.
- B. Substitutions may be considered when a Product becomes unavailable through no fault of the CONTRACTOR.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Specifications.
- D. A request constitutes a representation that the CONTRACTOR:
 - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - 2. Will provide the same warranty for the Substitution as for the specified Product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete.
 - 4. Will reimburse OWNER and ENGINEER for review or redesign services associated with re-approval by authorities.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request.
- F. Substitution Submittal Procedure:

1. Submit three (3) copies of Request for Substitution for consideration. Limit each request to one proposed substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
3. Indicate advantage to OWNER if substitution is allowed.
4. The ENGINEER will notify CONTRACTOR in writing of decision to accept or reject request.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures
- B. Final cleaning
- C. Adjusting
- D. Project record documents
- E. Operation and maintenance data
- F. Spare parts and maintenance products
- G. Warranties and bonds
- H. Maintenance service

1.2 CLOSEOUT PROCEDURES

- A. Submit written certification that Specifications have been reviewed, Work has been inspected, and that Work is complete in accordance with Specifications and ready for ENGINEER'S review.
- B. Provide submittals to ENGINEER that are required by governing or other authorities.

1.3 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean site; sweep paved areas, rake clean landscaped surfaces.
- C. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.4 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.5 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings
 - 2. Specifications
 - 3. Reviewed Shop Drawings, Product Data, and Samples
 - 4. Manufacturers' instructions for assembly, installation, and adjusting
- B. Ensure entries are complete and accurate, enabling future reference by OWNER.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.

- E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 - 1. Manufacturer's name and product model and number
 - 2. Product substitutions or alternates utilized
 - 3. Changes made by modifications
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations ($\pm 1''$) in relation to finish first floor datum.
 - 2. Measured horizontal ($\pm 8''$) and vertical ($\pm 4''$) locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract drawings.
 - 6. OWNER may request verification of record information. If the record information is correct as recorded, the cost of such verification shall be the responsibility of the OWNER. If the record information is incorrect or missing, the cost of such verification shall be the responsibility of the CONTRACTOR.
- G. Submit documents to ENGINEER prior to final approval.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable plastic covers.
- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project and subject matter of binder when multiple binders are required.
- C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on 24 pound white paper, in four parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of ENGINEER, CONTRACTOR, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Summary of important product data, including project number, order number, order date, complete list of equipment furnished, including quantity, model number, serial number, optional items.
 - 3. Part 3: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria

- b. List of equipment
 - c. Parts list for each component
 - d. Operating instructions
 - e. Maintenance instructions for equipment and systems
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents
- 4. Part 4: Project documents and certificates, including the following:
 - a. Shop drawings and product data
 - b. Air and water balance reports
 - c. Certificates
 - d. Originals of warranties and bonds
- E. Submit one (1) draft copy of completed volumes at least thirty (30) days prior to final inspection. This copy will be reviewed and returned after final inspection, with ENGINEER comments. Revise content of all document sets as required prior to final submission.
- F. Submit three (3) sets of revised final volumes, within ten (10) days after final inspection.
- G. It may be determined during this time if the requirement for the paper copies can be waived and the O&M manuals received in electronic format (i.e., Word or .PDF format).

1.7 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra Products in quantities specified in individual specification sections.
- B. Provide in unopened, durable, protective packaging suitable for long-term storage with clear, complete labeling on the outside of the package, identifying contents.
- C. Deliver to project site; obtain receipt prior to final payment.

1.8 WARRANTIES AND BONDS

- A. Provide duplicate notarized copies.
- B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.
- C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.

1.9 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections for one (1) year from date of final approval.
- B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or

replace parts whenever required. Use parts produced by the manufacturer of the original component.

- D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the OWNER.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 02072
MINOR DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A.
- B. Removal of designated construction
- C. Disposal of materials
- D. Identification of utilities

1.2 SUBMITTALS FOR REVIEW

- A. Section 01300 - Submittals: Procedures for submittals.
- B. Shop Drawings: Indicate demolition and removal sequence; location and construction of temporary work.

1.3 SUBMITTALS FOR CLOSEOUT

- A. Section 01700 - Contract Closeout: Procedures for submittals.
- B. Project Record Documents: Accurately record actual locations of capped utilities, subsurface obstructions, including foundation and slabs.

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable local code for demolition work, dust control, products requiring electrical disconnection, and public safety.
- B. Obtain required permits from authorities.
- C. Do not close or obstruct egress width to any building or site.
- D. Conform to procedures applicable when hazardous or contaminated materials are discovered.

1.5 SEQUENCING

- A. Section 01010 - Summary of Work: Work sequence.

1.6 SCHEDULING

- A. Section 01300 - Submittals: Work schedule.
- B. Schedule Work to coincide with new construction.
- C. Describe demolition removal procedures and schedule.
- D. Schedule utility shutdowns with OWNER one week in advance.

1.7 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent building areas.
- B. Cease operations immediately if structures appear to be in danger and notify ENGINEER. Do not resume operations until directed.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION

- A. Provide, erect, and maintain temporary barriers at locations indicated.
- B. Protect existing materials which are not to be demolished.
- C. Provide bracing and shoring.
- D. Notify affected utility companies before starting work and comply with their requirements.
- E. Mark location and termination of utilities.
- F. Provide appropriate temporary signage.

3.2 DEMOLITION

- A. Identify, disconnect, remove, and cap designated utilities within demolition areas.
- B. Demolish in an orderly and careful manner. Protect existing items to remain.
- C. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- D. Remove materials as Work progresses.
- E. Remove temporary Work.

3.3 Paving

- 1. Concrete pavements: Where it is necessary to make a cut in concrete paved areas the CONTRACTOR shall first score the concrete in neat straight lines to a depth of not less than 2-inches with an approved concrete cutting saw prior to removing concrete.
- 2. Bituminous pavements: Where it is necessary to make a cut in bituminous paved areas, the CONTRACTOR shall cut paving along neat straight lines using an approved pneumatic spade.
- 3. Restoration of paved areas: Restore all paved areas to their original condition using material of like type and quality as the removed paving approved by the OWNER. Repaired surfaces shall match existing adjacent paving.

END OF SECTION

SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Removal of surface debris
- B. Removal of trees, shrubs, and other plant life
- C. Topsoil excavation

1.2 REGULATORY REQUIREMENTS

- A. Conform to the Clean Streams Law and Pennsylvania Department of Environmental Resources Chapter 102 regulations.
- B. Coordinate clearing work with utility companies.
- C. Conform to local government ordinances for burning of debris on site.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Herbicide: Nonselective herbicide

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that existing plant life designated to remain is tagged or identified.
- B. Identify a waste area for placing removed materials. The waste area may be required to be off-site.
- C. Identify a stockpile area for topsoil that will be reused on site.

3.2 PROTECTION

- A. Locate, identify, and protect utilities that remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping
- C. Protect bench marks, survey control points, and existing structures from damage or displacement

3.3 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs as indicated. Remove stumps, and root system to a depth of 36-inches.

- C. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Remove and dispose of all perishable and objectional material including, but not limited to, trees, brush, vines, shrubs, bushes, logs, stumps, roots, weeds, rubbish, and other organic material.
- E. Apply herbicide to remaining stumps to inhibit growth.

3.4 REMOVAL

- A. Remove debris, loose rock, and extracted plant life from site.

3.5 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded without mixing with foreign materials.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on site in accordance with the sediment and erosion control plan.
- D. Remove excess topsoil, not intended for reuse, from site.

END OF SECTION

SECTION 02150
BORING, JACKING, TUNNELING

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Work of this section includes, but is not limited to:
 - 1. Approach trench excavation
 - 2. Installation of casing pipe or liner
 - 3. Installation of carrier pipe
- B. Related Work Specified Elsewhere:
 - 1. Trenching, Backfilling & Compacting: Section 02225
- C. Applicable Standard Details:
 - 1. Carrier Pipe and Casing Conduit Installation

1.2 REFERENCES

- A. American Association of State Highway Transportation Officials (H-20): (AASHTO) Loading for Conduits Installed Under Streets, Road, or Highways.
- B. American Railway Engineering Association (A.R.E.A.) (Cooper E-80).
- C. American Society for Testing and Materials:
 - 1. ASTM A53, Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless.
 - 2. ASTM A123, Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip.
 - 3. ASTM A139, Electric-Fusion (Arc) Welded Steel Pipe (NPS 4 in. and over).
 - 4. ASTM A307, Carbon Steel Externally and Internally Threaded Standard Fasteners.
 - 5. ASTM A569, Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
 - 6. ASTM A615 (S1), Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, including Supplementary Requirements.
 - 7. ASTM C32, Sewer and Manhole Brick (made from Clay or Shale), Spec. for.
 - 8. ASTM C33, Standard Specification for Concrete Aggregates.
 - 9. ASTM C144, Standard Specification for Aggregates for Masonry Mortar.
 - 10. ASTM C150, Standard Specification for Portland Cement.
 - 11. ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.
 - 12. ASTM C270, Standard Specification for Mortar for Unit Masonry.
 - 13. ASTM D638, Standard Test Method for Tensile Properties of Plastics.
 - 14. ASTM D695, Standard Test Method for Compressive Properties of Rigid Plastics.
 - 15. ASTM F467, Nonferrous Nuts for General Use.
 - 16. ASTM F468, Nonferrous Bolts, Hex Cap Screws and Studs for General Use.
- D. American Welding Society: AWS D1.1 Structural Welding Code.

E. Commonwealth of Pennsylvania Department of Transportation (PDT), Specifications Publication 408, as supplemented,

1. PDT Section 703.3 Select Granular Material.
2. PDT Section 703.2 Coarse Aggregate.

1.3 QUALITY ASSURANCE

A. CONTRACTOR Qualifications:

1. Construction operations shall be undertaken only by a contractor well experienced in operations of similar magnitude and condition under transportation arteries and surface areas which cannot be disturbed.

B. Design Criteria:

1. Pipe and joints of leakproof construction, designed for the earth and/or other pressure present, plus highway HW5 loading or railway E80 loading with the associated recommended impact loading.
2. Design bracing, backstops, and use jacks of sufficient rating so that the jacking can proceed without stoppage, except for adding pipe sections and as conditions permit, to minimize the tendency of the ground material to 'freeze' around the casing pipe.

C. Allowable Tolerances:

1. Do not overcut excavation by more than 1" greater than the outside diameter of the casing pipe.
2. Install casing pipe with the determined vertical and horizontal alignment prior to installation of the carrier pipe. For gravity carrier pipes, the slope of the casing pipe shall not deviate from the design slope by more than +/- 5%. CONTRACTOR shall be responsible to remove and reinstall any defective Work associated with the installation of the casing pipe, including any ancillary work needed to relocate or extend upstream or downstream carrier pipes to connect to the new location of the casing pipe.

D. Reference Codes and Specifications:

1. Comply with applicable federal, state and local ordinances, codes, statutes, rules and regulations, and affected jurisdictional bodies.
2. Pennsylvania Department of Transportation Publication 408 Specifications
3. Specifications for Pipeline Occupations of Railroad Property

1.4 SUBMITTALS

- A. Submit history of previous work completed of equivalent nature and scope. Include qualification and experience of key personnel.
- B. Submit description of proposed construction methods, including methods to establish and maintain vertical and horizontal alignment.

- C. Submit tunnel liner design calculations and manufacturer's data on tunnel liner plate showing sizes, shapes, methods of attachment and connection details, and details of grout holes.
 - 1. Highway Crossings: Design tunnel for earth and/or other pressure loads present, plus AASHTO H25 live loading.
 - 2. Railroad Crossings: Design tunnel for earth and/or other pressure loads present, plus Cooper's Railroad E80 live loading with 50-percent added for impact.
- D. Certificates
 - 1. Certified records or reports of results of laboratory tests, such record or reports to contain a sworn statement that laboratory tests have been made as specified.

1.5 JOB CONDITIONS

- A. Conduct operations so as not to interfere with, interrupt, damage, destroy, or endanger the integrity of surface or subsurface structures or utilities, and landscape in the immediate or adjacent areas.
- B. When boring, jacking or tunneling under state highways and railroads, comply with applicable right-of-way occupancy permits.
- C. If boring is obstructed or outside of acceptable tolerances for slope, relocate or jack or tunnel crossing as approved by the ENGINEER/OWNER.

PART 2 PRODUCTS

2.1 STEEL CASING PIPE

- A. ASTM A53; 35,000 psi minimum yield strength.
- B. Full circumference welded joints.
- C. Diameter and wall thickness as shown on the drawings.

2.2 REINFORCED CONCRETE CASING PIPE

- A. ASTM C76
- B. Determine pipe class from "Concrete Pipe Design Manual" prepared by the American Concrete Pipe Association.
- C. Tongue and groove joints. To avoid concentrated loads at the joints insert strips of plywood, asphalt roofing paper or similar resilient materials around the circumference in the joints.

2.3 TUNNEL LINER PLATE

- A. Steel: ASTM A569, Minimum Yield Strength 28,000 psi. Galvanized.
- B. Bolts and Nuts: ASTM A307, galvanized.

2.4 SAND (Fine aggregate)

- A. Section 703.1, Publication 408 Specifications. Type A.

2.5 GROUT

- A. One part portland cement (ASTM C150), and 6 parts mortar sand mixed with water to a consistency applicable for pressure grouting.

2.6 MISCELLANEOUS MATERIAL

- A. Aggregate Backfill: Aggregate material conforming to the following and the choice of material being as required according to the Engineer's direction in the field.
 - 1. AASHTO No. 8 Coarse Aggregate conforming to PDT Section 703.2.
 - 2. Select Granular Material conforming to PDT Section 703.3
- B. Brick: Commercially manufactured brick made from clay or shale and burned, meeting requirements of ASTM C32, Grade MS.
- C. Waterproofed Mortar: Conforming to requirements of ASTM C270 for Type M, 2500 psi (Parts by volume include: One part cement, ¼ part lime, and sand at not less than 2-1/4 nor more than three times the sum of the volumes of cement and lime used and of the following materials:
 - 1. Waterproofing Agent: Medusa Waterproofing Powder by Medusa Portland Cement Co.; Hydratite by Grace Construction Materials; or Hydrolox by ChemMaster Corp. Add the Medusa product in the ratio of two pounds per bag of cement; add the other products per manufacturer's recommendations.
 - 2. Portland Cement: Conforming to ASTM C150, Type I.
 - 3. Hydrated Lime: Conforming to ASTM C207, Type S.
 - 4. Sand: Conforming to ASTM C144.
 - 5. Water: Clean and free from deleterious amounts of acids, alkalis, and organic materials.
- D. Concrete: As specified in Section 03300, Class B (3,000 psi) quality.
- E. Lean Concrete: As specified in Section 03300, Class C plant mixed concrete of 2,000 psi compressive strength at 28 days with minimum cement content per cubic yard in accordance with current ready-mix plant standard practice.
 - 1. Reduced Aggregate: Lean concrete shall contain aggregate with particle size not less than 1/8-inch or more than ½-inch in any dimension and a maximum of five percent of particle passing a No. 8 sieve.
- F. Grout: Sand/Cement grout composed of the following materials:
 - 1. Portland Cement: Conforming to ASTM C150 Type II.
 - 2. Sand: Conforming to ASTM C33, fine aggregate.
 - 3. Water: Clean and free from deleterious amounts of acids, alkalis, and organic materials.
 - 4. Grout Quality: Mixture of one part Portland Cement, three parts fine aggregate and water.
- G. Sand: Conforming to ASTM C33, fine aggregate.

- H. Hold Down Rod: Reinforcement bar conforming to ASTM A615, Grade 60, deformed.
1. Field coat hold down rods with a coal tar product such as No. 46-465 H.B. Tnemecol as manufactured by Tnemec Company, Inc., or equal.
- I. Pipe Support System (Casing spacers for pipe support in Encasing Conduit): Provide casing spacers to prevent direct contact between the carrier pipe and steel encasing conduit. Casing spacers may be either of the following types except that a mixture of the two types is not acceptable.
1. Banded Wood Skid/Blocking (Pipe Support in Conduit): Composed of stainless steel band strapping and preservative treated wood blocking. Material composition as follows:
 - a. Wood Skid/Blocks: Wood species of the allowable types under recognized grading rules and stamped to indicate product compliance with U.S. Dept. of Commerce Product Standard PS-20-70.
 - i. Preservative treatment shall conform to American Wood Preserves Association Standard P-5 (0.60 pounds per cu. ft. of wood) for soil contact service; Wolman CCA Type C, or equal.
 - b. Steel Bands: use one inch wide (minimum) stainless steel strapping to make the treated wood blocking attachment bands. Secure the bands in place with stainless steel compression style band clamps. Provide a minimum of two bands on each set of treated wood blocking.
 2. Casing Spacer System (Pipe Support in Conduit): Composed of coated steel band with plastic block/runners or skids. Material composition as follows:
 - a. Plastic Skid/Blocks: Glass reinforced molded plastic runner blocks having a compression strength of 18,000 psi according to ASTM D695, and a tensile strength of 17,600 psi according to ASTM D638.
 - b. Steel Band: 14 gauge steel, hot rolled and pickled. Two piece design through 36-inch carrier pipe size. Bands shall have deep embossed flanges and corner cut a angles greater than 90 degrees.
 - i. Bands shall contain an integral polyvinyl chloride (PVC) isolation liner of 0.90-inch thickness and Durometer hardness of A85-90.
 - ii. Bands provided with installation connection hardware consisting of cadmium plated 5/16-inch studs with hex nuts and washers; minimum of six studs on a 8-inch wide band.
 - iii. Bands factory finished in 10 to 16 mils thick fusion bonded PVC coating.
 - c. Acceptable Manufacturers:
 - i. PSI Pipeline Seal and Insulator, Inc.
 - ii. Cascade Waterworks Mfg. Co.
 - iii. APS Advance Products and Systems, Inc.
- J. Railroad Crossing Sign: Provide sign of dimensions and lettering as illustrated on the Drawings and of the following construction:
1. Sign Plate: Mill finish aluminum alloy 6061-T6, minimum 0.080 inch thick.

2. Steel Pipe Post: Conforming to ASTM A120 with schedule 40 wall thickness and galvanized finish.
3. Hardware: Aluminum U-bolts, nuts and washers conforming to ASTM F467 and ASTM F468.
4. Painting: Prior to painting, thoroughly clean the sign plate surfaces with the products for surface preparation as recommended by the paint material manufacturer. Perform painting using the following products or equal:
 - a. Apply one coat of Sherwin-Williams Zinc Chromate Primer No. B50Y1, which when thoroughly dry shall be followed by two coats of Sherwin-Williams Metalastic Enamel (White).
 - b. When the second coat of enamel has thoroughly dried, have a professional sign painter perform the required lettering to the satisfaction of the Engineer, using a grade of exterior black paint as recommended by the sign painting profession.

PART 3 EXECUTION

3.1 PREPARATION

- A. Excavation Work: As specified in Section 02324 and such added requirements as specified herein:
 1. Over Excavation: Should the Contractor in constructing an access pit excavate below the subgrade for the proposed crossing, he will be required to backfill the area excavated below the subgrade with Aggregate Backfill or with Class B concrete as required by the Engineer.
 2. Tunneling Pit: Construct tunneling pits as illustrated on the Sewer Detail Drawing entitled: Tunnel Work Pit and Tunnel Liner Plate.
 3. Access Pit for Boring or Jacking: Preliminary work shall consist of excavating and shoring an acceptable shaft on the downstream side of the crossing and the installation of a backstop and guide timbers.
 - a. Bracing and Backstop Design for Jacking: The bracing and backstops shall be so designed, and jacks of sufficient rating shall be used, so that the jacking can be progressed without stoppage except for adding lengths of pipe. Accurately place guide timbers on line and grade.
 4. Shoring: As specified in Section 02255. Follow OSHA requirements for excavation shoring as applicable to prevent excavation wall collapse.

3.2 CASING PIPE INSTALLATION METHODS

- A. Boring:

1. Push the pipe into the ground with a boring auger rotating within the pipe to remove the spoil. Do not advance the cutting head ahead of the casing pipe except for that distance necessary to permit the cutting teeth to cut clearance for the pipe. The machine bore and cutting head arrangement shall be removable from within the pipe. Arrange the face of the cutting head to provide a barrier to the free flow of soft material.
2. If unstable soil is encountered during boring retract the cutting head into the casing to permit a balance between the pushing pressure and the ratio of pipe advancement to quantity of soil.
3. If voids should develop greater than the outside diameter of the pipe by approximately one inch, grout to fill voids. Grouting to fill voids will be at the expense of the CONTRACTOR.

B. Jacking:

1. Construct adequate thrust wall normal to the proposed line of thrust.
2. Impart thrust load to the pipe through a suitable thrust ring that is sufficiently rigid to ensure distribution of the thrust load on the pipe.

C. Drilling and Jacking:

1. Use an oil field type rock roller bit or plate bit made up of individual roller cutter units solidly welded to the pipe which is turned and pushed for its entire length by the drilling machine to give the bit the necessary cutting action.
2. Inject a high density slurry (oil field drilling mud) to the head as a cutter lubricant. Inject slurry at the rear of the center units to prevent jetting action ahead of the pipe.

D. Mining and Jacking:

1. Utilize manual hand-mining excavation from within the casing pipe as it is advanced with jacks, allowing minimum ground standup time ahead of the casing pipe.

3.3 TUNNELING:

- A. Advance excavation for the tunnel liner in increments sufficient for the erection of one ring of liners and install liner plates immediately after each increment of excavation. Carry on excavation in such a manner that voids behind the liner plates are held to a minimum. Completely fill such voids with grout followed immediately by grout placed under pressure.
- B. Excavate to the lines, grades, dimensions and tolerances as specified and shown, to accommodate the initial support and permanent lining.
- C. Installation of Tunnel Linings:
 1. Install the tunnel lining in a manner that will not damage the lining or coating.
 2. Ensure that the edges are clean and free from material that could interfere with proper bearing.

3. Install bolts for liner plates in accordance with liner plate manufacturer's recommendations and retention or replace if necessary any bolt which does not meet the requirements.

3.4 DEWATERING

- A. Intercept and divert surface drainage precipitation and groundwater away from excavation through the use of dikes, curb walls, ditches, pipes, sumps or other means.
- B. Develop a substantially dry subgrade for the prosecution of subsequent operations.
- C. Comply with Federal and State requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.

3.5 PRESSURE GROUTING

- A. Pressure grout the annular space between the casing pipe and surrounding earth.

3.6 CARRIER PIPE INSTALLATION

- A. All provisions regarding cleaning, inspection and handling specified under pipe material sections apply to this work.
- B. Place the carrier as shown on the Standard Details. Exercise care to prevent damage to pipe joints when carrier pipe is placed in casing. Install Field Lok gaskets in all joints within any casing pipe or stream crossing.
- C. Support pipeline within casing so that no external loads are transmitted to carrier pipe. Attach casing spacers to barrel of carrier pipe; do not rest carrier pipe on bells.
- D. Close ends of casing.

END OF SECTION

SECTION 02210

CONTROLLED BLASTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Blasting techniques, such that the resulting ground vibrations and airblast overpressures are consistently maintained below the maximum levels specified in this Section.
- B. Protect new construction, adjacent property, trees and vegetation to remain.
- C. An audible warning system to indicate impending blasting.
- D. Blast monitoring.
- E. Cordon off all areas where blasting is taking place.

1.2 SUBMITTALS FOR INFORMATION

The following submittals are for information and record purposes only and will not be reviewed.

- A. Specifics of the proposed blasting procedures for a typical round to be used:
 - 1. Diameter, spacing, burden, depth, and orientation of each blast hole for typical round designs.
 - 2. Nomenclature and amount (in terms of weight and cartridges) of explosives and distribution of charge to be used within each hole, on each delay, and the total for the blast round.
 - 3. Nomenclature of detonators, delay pattern; wiring diagram for blast; type and size of hook up and lead lines; type and capacity of firing source; size, type, location of safety switches and lightning gap.
 - 4. Type(s) of stemming to be used in holes.
 - Calculations of anticipated peak particle velocity and airblast overpressure levels at the nearest adjacent structures.
 - Maximum charge weight per delay to be used versus distance away from the nearest adjacent structures.
- B. Methods of matting or covering of blast area to prevent flyrock and excessive airblast overpressure.
- C. Written evidence of the licensing, experience and qualifications of the blasters who will be directly responsible for the loading of each round and for firing it.
- D. Details of an audible advance signal system to be employed at the job site as a means of informing workers, ENGINEER, OWNER, and the general public that a blast is about to occur.
- E. List of instrumentation that is proposed for use to monitor particle velocity and airblast overpressure levels complete with performance specifications and user's manuals supplied

by the manufacturer.

- F. Recent calibration (within previous six (6) months) for the appropriate portions of the proposed blast monitoring instrumentation. Calibration shall be over the required frequency response range specified for instrumentation and to a standard traceable to the National Bureau of Standards.
- G. Submit a copy of the blasting permit obtained to conduct blasting on the site.
- H. Blast Monitoring Report: Each Blast Monitoring Report shall include the following items on the forms provided in this Section:
 - Sheet 1 of 2, Report of Blast Monitoring.
 - Sheet 2 of 2, Blast Monitoring Location Plan. Sheet 2 of 2 will be furnished by ENGINEER prior to start of work.
 - Copy of strip chart with a calibration and blast monitoring record marked with the date, time and location of the blast as well as the monitoring location.
- I. In the event that the typical round design results in particle velocities and/or airblast overpressures which exceed the blasting limit criteria specified in this Section, immediately revise the typical round design appropriately and submit the revised typical round design to the ENGINEER/OWNER.
- J. Report to the ENGINEER/OWNER in writing any blasting complaints received within 24 hours of receipt. Each report shall include the name and address of the complainant, time received, date and time of blast complained about, and a description of the circumstances that led to the complaint.

1.3 REGULATIONS OR REGULATORY AGENCIES

A. Codes, Permits and Regulations

- 1. Comply with all applicable laws, rules, and ordinances and regulations of the Federal, State and Local Government, regarding the transportation, storage, handling and the use of explosives. All labor, materials, equipment, and services necessary to make the blasting operations comply with such requirements shall be provided to the OWNER. Comply with the following regulations.
 - U.S. Department of Labor, Occupational Safety and Health Administration, Construction Standards and Interpretations, Support U - "Blasting and the Use of Explosives".
 - Code of the Manufacture, Transportation, Storage, and Use of Explosives and Blasting Agents (N.F.P.A. No. 495).
 - BOCA Fire Protection Code, Article 27, "Explosives, Ammunition & Blasting Agents".
- 2. Obtain and pay for all permits and licenses required to complete the Work of this Section.

1.4 EXPLOSIVES AND BLASTING REQUIREMENTS

- A. All explosives for blasting shall be stored, handled and used in accordance with the State Laws and all local regulations and practices supplemented by the latest relevant rules and

codes of the Institute of Makers of Explosives.

- B. Blasting operations shall be conducted in such a manner so as not to endanger persons or property and shall be covered or otherwise confined in an approved manner. In easement areas, blasting may not proceed without the permission of the property owner.
- C. Particular care shall be taken to prevent injury to existing utilities, water pipes, and other structures adjacent to or crossing the line of work. Light charges thoroughly protected shall be used at such locations. Provide pre and post blasting video inspection of all adjacent sanitary sewer and storm sewer lines. Blasting adjacent to gas lines and water lines shall not be allowed without written permission from the owner of the utility line.
- D. The work of this Section shall include the responsibility for payment or compensation for any damage of whatever nature caused by blasting or accidental explosion. IN addition, comply with the requirements of the clause regarding insurance.
- E. Explosives for blasting shall be stored, handled and used in accordance with the laws, ordinances and regulations of the Commonwealth of Pennsylvania, and all local regulations.
- F. The following procedures for controlled blasting shall be used:
 - 1. Conduct a survey of all structures adjacent to this blasting operations and be satisfied as to their structural condition prior to blasting.
 - 2. The drilling pattern and blast initiation procedure shall be selected to provide the greatest possible relief in a direction away from the closest facility to be protected, to keep the resulting vibration at a low level. Determine how many pounds of explosives can be fired with each delay cap without doing damage.
 - 3. Trained personnel in the employ for this work shall use seismograph recorders to record vibration and sound measurements at each blast. The maximum allowable peak particle velocity shall not exceed 2.0 inches per second, measured at the facility to be protected closest to the blast.
- G. Measurements shall be recorded on specified instrumentation. Results shall be made available to interested parties. Seismic instrumentation used shall allow for interpretation of readings at the job site.
- H. In addition, there may be sections where existing or newly constructed utilities are relatively close during excavation work, especially when rock blasting is contemplated. For this reason, the following requirements are set forth for the purpose of protecting these services:
 - No blasting will be permitted within a fifty foot (50') radius of any existing or newly constructed utilities without prior authorization of the ENGINEER/OWNER.
 - No blasting will be permitted within one hundred feet (100') of newly constructed walls or foundations without prior authorization of the ENGINEER/OWNER.
 - The maximum charge weight shall not exceed the following values, unless seismic instrumentation of each blast is provided and recorded.

Actual Horiz. Distance
(radius)

Charge Weight

6 - 10 feet
11 - 15 feet

1/8 pound total
1/8 pound per delay

16 - 20 feet	1/4 pound per delay
21 - 30 feet	1/2 pound per delay
31 - 40 feet	3/4 pound per delay

- Where seismic instrumentation of each blast is used in lieu of the above table, the maximum total peak particle velocity shall not exceed 2.0 inches per second measured directly above the facility closest to the blast. Submit a completed copy of the blasting log (Blast Monitoring Report) to the ENGINEER/OWNER within 24 hours after each blast.
- The drilling pattern and blast initiation procedure shall be selected to provide the greatest relief possible in a direction away from the blast, so as to keep the resulting vibration to the lowest possible level, (Controlled Blasting Technique).

1.5 DEFINITIONS

- A. Airblasting Overpressure: The pressure over and above atmospheric pressure resulting from blasting.
- B. Controlled Blasting: Excavation in which the various elements of the blast, including hole size, position, alignment, depth, spacing, burden, charge size, distribution and delay sequence are carefully controlled to excavate the material to the desired lines and grades with a relatively uniform surface, minimal overbreak and minimal fracture of material beyond the design excavation limits while maintaining resulting peak particle velocity and airblast overpressure levels below specified maximum limits.
- C. Excavation Grades or Elevations: The design vertical levels indicated on the Drawings (or revised during construction by the ENGINEER to accommodate field conditions) to which excavation shall be conducted. The actual vertical limits of excavation will be determined by the amount of overbreak below the design grades after removal of overbreak and cleaning of the resulting surface as specified.
- D. Flyrock: Fractured rock propelled through the air resulting from blasting, if not prevented by use of blasting mats.
- E. Geophone or Vibration Transducer: A sensor used to monitor ground vibrations (particle velocity components).
- F. Omnidirectional Transducer, or Airblast Overpressure Transducer: A sensor used to monitor airblast overpressure resulting from blasting.
- G. Overbreak: The excess amount of material removed by and/or resulting from blasting outside (beyond) the design lines and grades.
- H. Peak Particle Velocity: The maximum of any one of the three mutually perpendicular ground motion velocity components of a vibration measured in directions vertical, radial, and perpendicular to the vibration source.
- I. Seismograph: An instrument used to record and the magnitude and frequency of ground vibrations sensed by a geophone and airblast overpressure sensed by an omnidirectional transducer.
- J. Tights or Underbreak: Material which remains inside of the design lines or above the design grades after controlled blasting is completed. Tights shall be removed if required by the ENGINEER.

1.6 QUALITY ASSURANCE

- A. All blasting shall be conducted by persons qualified and experienced in drilling and controlled blasting procedures. Persons responsible for blasting shall be licensed by the Commonwealth of Pennsylvania and shall have had acceptable experience with similar excavations.

B. Peak Particle Velocity Limits

Conduct all blasting in such a manner that the resulting peak particle velocity does not exceed 2.0 inches per second at the ground line adjacent to existing structures in the vicinity of the project.

Conduct all blasting in such a manner that the peak particle velocity does not exceed the following limits adjacent to recently placed concrete:

MAXIMUM ALLOWABLE PARTICLE VELOCITIES, IN. PER SEC.

<u>Age of Concrete</u>	<u>Distance from Blast (Feet)</u>		
	<u>0 to 49</u>	<u>50 to 150</u>	<u>Over 150</u>
0 to 24 hours	6	4.5	3
1 to 3 days	8	6	4
3 to 7 days	10	7.5	5
over 7 days	15	11	7.5

C. Airblast Overpressure Limit

Conduct all blasting in such a manner that the peak airblast overpressure measured at the location of the nearest structure (considering wind direction) does not exceed 0.018 psi.

Refer to Instrumentation Mounting, Placement and Location of this Section for additional blast monitoring instrumentation placement and location criteria.

D. Blast Monitoring

Monitor peak particle velocities and airblast overpressure levels resulting from all blast rounds detonated for the project.

The ENGINEER may perform additional blast monitoring on a part time basis. Cooperate with the ENGINEER and coordinate blast detonations, such that additional blast monitoring records may be made.

Permit the ENGINEER to utilize blast monitoring equipment to conduct a test calibration at any time during the blast monitoring.

E. Blast Monitoring Reports

Following each blast, a Blast Monitoring Report shall be submitted to the ENGINEER within 24 hours of the blast as specified under Submittals.

- F. Blast Monitoring Instrumentation: All instrumentation proposed for use on the project shall have been calibrated within the previous six (6) months to a standard which is traceable to the National Bureau of Standards. Characteristics of required instrumentation are listed below:

Measure, display and furnish a permanent record on a strip chart of particle velocity

components and airblast overpressure. It is not acceptable for particle velocity to be calculated after the event from displacement or acceleration versus time waveforms.

Measure the three (3) mutually perpendicular components of particle velocity in directions vertical, radial, and perpendicular to the vibration source.

Have a flat velocity frequency response with a minimum broad band of 6 Hz to 150 Hz with a tolerance equal to or better than ± 10 percent.

Have a low frequency omnidirectional transducer for measuring airblast overpressure with a flat frequency response within the limits of 1 Hz and 300 Hz over a minimum range of 250 Hz with a tolerance equal to or better than ± 10 percent.

Request additional information from the ENGINEER regarding instrumentation required to monitor noise levels.

Cooperate with the ENGINEER in permitting observation of drilling and loading procedures, as well as providing detailed information on blasting operations.

Be completely responsible for all damages resulting from the blasting operations and shall, as a minimum, take whatever measures are necessary to maintain peak airblast overpressure and peak particle velocities within the specificized limits, and to minimize damage to rock left in place. Modifications to blasting and excavation methods required to meet these requirements shall be undertaken.

G. Tolerance of Rock Excavation

Overbreak at the perimeter of excavations shall be maintained less than two (2) feet outside the design line indicated on the Drawings. No underbreak at the perimeter of excavations shall be permitted inside of the design line or above design grade.

Actual grades resulting from blasting at the bottom of excavations shall be controlled such that no underbreak results above the design grades indicated on the Drawings and overbreak does not exceed two (2) feet below the same.

Overbreak below design grade shall be removed. Rock surfaces shall be cleaned and prepared and overbreak shall be backfilled as specified in Section 02200.

Due to vibration design criteria, all wall and footing foundations must bear on undisturbed intact bedrock. All blasting should be conducted to ensure overbreak does not extend to proposed footing levels. Any overbreak materials at footing levels shall be removed and backfilled with 2500 psi lean concrete.

1.7 JOB CONDITIONS

- A. Attention is directed to the probability of intense two-way radio activity in the project area. Given this situation, an evaluation of the suitability and hazard potential associated with the use of electric blasting caps for this project should be made and consideration given to the use of nonelectric standard delay blasting caps for this project.
- B. Blasting hours are restricted to 8:00 am to 5:00 pm Monday through Friday. No blasting is permitted on Saturdays, Sundays and on all legal state and federal holidays.

1.8 VIBRATION AND AIRBLAST OVERPRESSURE CONTROL

- A. Monitor blasting and peak airblast overpressure levels for every blast during the course of

the work.

- B. Blasting operations shall be controlled to conform with the requirements in this Section.
- C. If the data indicate that these requirements are not being met, take whatever measures are necessary including reducing the size of the charge, reducing the lift height (if applicable), and covering or matting blasts, to reduce airblast, overpressure and vibrations to below the maximum permissible levels specified.
- D. The Geotechnical Engineer and the ENGINEER may also take measurements to determine if blasting vibrations are exceeding the specified limits. Observation data will be made available.
- E. Install a signal system between the location of the blasting machine or switch and the monitoring instrument locations so instrument operators may be notified immediately prior to detonation. The signal system shall be relocated whenever the instruments are moved.
- F. Be completely responsible for all damages resulting from the blasting operations and take whatever measures are necessary to maintain peak airblast overpressure and peak particle velocities within the specified limits, and to minimize damage to material left in place. Modifications to blasting and excavation methods required to meet these requirements to be undertaken at no additional cost to the OWNER.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 GENERAL BLASTING PROCEDURES

- A. All blasting work shall be conducted pursuant to the requirements of Section 02200 for unclassified bulk blast and trench rock excavation.
- B. Notify the ENGINEER/OWNER at least 48 hours before blasting operations are to commence.
- C. Undertake initial test blast(s), as required, to define the relationship between the charge weight per delay and vibration and airblast overpressure in accordance with the approved submittal.
- D. Conduct blasting operations such that peak particle velocity and airblast overpressure levels do not exceed the specified limits at the locations specified.
- E. The amount of explosives utilized shall be no larger than is necessary to break the material it is intended to remove and shall be placed to minimize the overbreak.

3.2 SAFETY PRECAUTIONS

- A. During the progress and approach of a thunderstorm, the handling of use of explosives shall be discontinued and all personnel shall be moved to a place of safety until the danger has passed. All parts of an electrical blasting circuit (if utilized) shall be effectively insulated or protected from grounds or short circuits and adequately separated from power lines so as to prevent any possibility of electrical contact or entrance of stray current into the blast circuit.

- B. Mobile transmitters shall not be energized near electric caps or delays handled or used. If electric blasting caps are used, every effort shall be made to ensure that they are properly wired into the circuit and that ample current is supplied to detonate the blast.

It is equally important, when using a straight parallel hookup, to follow the manufacturer's instructions explicitly as to cutting off the current supply with the first cap or caps to detonate, in order to prevent possible arching, which could result in a "hangfire" (delayed explosion).

- C. No blasting shall be permitted until all personnel in the danger area have been removed to a place of safety. A loud, audible, warning system, devised and implemented as part of this work, shall be sounded before each blast. Familiarize all personnel on the project, Geotechnical Engineer, OWNER, ENGINEER and the general public with the implemented system. The danger area shall be patrolled before each blast to make certain that it has been completely cleared and guards shall be stationed to prevent entry until the area has been inspected following the blast.
- D. Explosives, caps, detonators and fuses shall be stored, handled and employed in accordance with federal, state and local regulations and in accordance with N.F.P.A. No. 495 as referenced above.
- E. Be responsible for determining any other safety requirements unique to blasting operations on this particular site so as not to endanger life, property, utility services, any existing or new construction, or any property adjacent to the site.
- F. Immediately after blasts involving excavation exceeding six (6) vertical feet depth, scale the sidewalks of the excavation.
- G. No requirement of, or omission to require, any precautions under this Section shall be deemed to limit or impair any responsibility or obligations assumed under or in connection with this Section; and, at all times, maintain adequate protection to safe-guard the general public and all persons engaged in the Work, and shall take such precautions as will accomplish such end, without undue interference with the public. Be responsible for and pay for any damage to adjacent structures and work resulting from work executed under this Section.

3.3 SPECIAL BLASTING REQUIREMENTS

- A. Each blast area shall be adequately confined with overburden materials or covered with blasting mats before firing to prevent flyrock and to reduce airblast overpressures.
- B. Conduct initial test blasts, as required, on the project in such a manner as to safety confirm assumed vibration and airblast overpressure vs. distance relationships. Initial blast monitoring results shall be used to confirm assumptions relative to the characteristics of the ground in transmitting vibrations. Initial blasts may also be monitored by the ENGINEER. Charge weights per delay for initial blasts shall be well below those weights estimated to produce the maximum permissible peak particle velocity and peak airblast overpressure levels specified in this Section, when monitored at the most critical of the locations specified in this Section.
- C. Blast monitoring requires that time of detonation be precisely known so that the seismograph(s) can be started just before detonation. Cooperate with the ENGINEER and establish a signal system which will allow independent records of blast vibrations to be

made.

- D. If the material excavated by means of controlled blasting is fractured and loosened outside of the design lines and grades, the fractured and loosened material shall be completely removed from the sides of the excavation and removed to the level of adjacent soil subgrades.
- E. Special attention shall be given to blasting operations adjacent to vegetation protection areas as indicated on Drawings to prevent damage to root systems of trees.

3.4 INSTRUMENTATION MOUNTING, PLACEMENT AND LOCATION

- A. Seismograph Type Sensors: The ground vibration sensor (particle velocity sensor) shall be mounted on a large hard surface where possible, such as a concrete sidewalk, bituminous concrete roadway, or firmly packed soil.

Mounting ground vibration sensors on loose soil, gravel or any other loose surface is not acceptable.

When a seismograph type unit is utilized, the sensor must be bolted down or strapped down to the ground with an apparatus capable of restraining force equal to at least twice the weight of the sensor. This will require devices such as metal shields to anchor the sensor to the ground. It is not acceptable to use sandbags placed on the sensor for restraint in lieu of anchoring devices.

- B. Accelerometer Type Transducers: If accelerometer transducers are used, they shall be mounted on the orthogonal faces of a metal cube utilizing beeswax recommended by the manufacturer or Eastman 910 adhesive.

The metal cube should then be epoxy glued to a concrete or asphalt surface such that measurement of ground motion in the desired direction is obtained. If no concrete or asphalt surface is available at the desired monitoring location, loose soil shall be removed and a twelve inch (12") long by three-quarter inch (3/4") diameter solid metal stake shall be hammered into firm ground until it is flush with the surface of the firm ground. The metal cube may then be epoxy glued or otherwise firmly attached to the stake.

- C. Particle Velocity Sensor Location: The particle velocity sensor shall be located at the nearest structure at the closest slant range to the blast, approximately ten feet (10') from the foundation wall closest to the blast location or at any other locations approved by the ENGINEER.

When blasting within a slant range of two hundred feet (200') of new concrete, determine if monitoring the location of new concrete or the closest adjacent structure is more critical to resulting particle velocity control. Monitor the more critical location.

- D. Omnidirectional Transducer: The omnidirectional transducer for airblast overpressure level monitoring shall be set up adjacent to the nearest structure or at other locations approved by the ENGINEER, approximately forty-eight inches (48") above the ground surface on a suitable stand or tripod.

3.5 BLAST MONITORING PROCEDURE

- A. Mount place, and locate instrumentation as specified in this Section.
- B. Align the axes of vibration measurement:
 - Axis 1: Vertical
 - Axis 2: Horizontal, radial direction to the blast location
 - Axis 3: Horizontal, perpendicular to the radial direction
- C. Set the strip chart(s) speed in accordance with instrumentation manufacturer's recommendations.
- D. Make a calibration strip chart before blast detonation in accordance with instrumentation manufacturer's recommendations.
- E. Clearly label the strip chart with calibration levels, control settings, time, date of blast and round number.
- F. Coordinate closely with the blaster such that the strip chart is advancing at the time the blast is detonated.
- G. During the measurement period, observe the instrumentation to ensure that the recorded vibrations correspond to blasting and not to some other source.

END OF SECTION

SECTION 02225

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cutting paved surfaces
- B. Blasting
- C. Trench excavation, backfill and compaction
- D. Support of excavation
- E. Pipe bedding requirements
- F. Control of excavated material
- G. Rough grading
- H. Restoration of unpaved surfaces

1.2 REFERENCE STANDARDS

- A. Pennsylvania Department of Transportation:
 - 1. Regulations Governing Occupancy of Highways by Utilities (67 PA Code, Chapter 459)
 - 2. PennDOT Publication 408 Specifications
 - 3. Pennsylvania Test Method, PTM 106 (Soil Moisture-Density)
 - 4. Pennsylvania Test Method, PTM 112 (Soil-Cement Moisture-Density)
 - 5. Pennsylvania Test Method, PTM 402 (Nuclear Density)
 - 6. PennDOT Publication 213, Temporary Traffic Control Guidelines
 - 7. PennDOT Publication 72, Standards for Roadway Construction
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C33: Specifications for Concrete Aggregates
 - 2. ASTM D698: Tests for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, using 5.5 lb (2.49 kg). Rammer and 12-inch (304.8 mm) drop
 - 3. ASTM D2922: Test for Density of Soil and Soil Aggregate in Place by Nuclear Methods

1.3 SUBMITTALS

- A. Submit certification attesting that the composition analysis of pipe bedding and select material stone backfill materials meets specification requirements.
- B. Submit a list of all equipment to be used for compacting, including manufacturer's lift thickness limitations.

1.4 JOB CONDITIONS

- A. Classification of Excavation:

All excavation Work performed is UNCLASSIFIED, and includes excavation and removal of all soil, shale, rock, boulders, fill, and all other materials encountered of whatever nature.

B. Control of Traffic:

1. Employ traffic control measures in accordance with Pennsylvania Department of Transportation Publication 213, "Temporary Traffic Control Guidelines".

C. Protection of Existing Utilities and Structures:

1. Take all precautions and use all facilities required to protect existing utilities and structures. In compliance with Act 287, as amended by Act 121 (2008), advise each Utility at least three (3) working days in advance of intent to excavate, do demolition work or use explosives and give the location of the job site. Request cooperative steps of the utility and suggestions for procedures to avoid damage to its lines.
2. Advise each person in physical control of powered equipment or explosives used in excavation or demolition work of the type and location of utility lines at the job site, the utility assistance to expect, and procedures to follow to prevent damage.
3. Immediately report to the utility and the ENGINEER any break, leak or other damage to the lines or protective coatings made or discovered during the Work and immediately alert the occupants of premises of any emergency created or discovered.
4. Allow free access to utility personnel at all times for purposes of maintenance, repair and inspection.

1.5 QUALITY ASSURANCE

- A. Conduct testing of backfill at locations as authorized by ENGINEER/OWNER.
- B. Testing will be performed by an independent Testing Laboratory as indicated in Section 01400: Quality Assurance.

PART 2 PRODUCTS

2.1 PIPE BEDDING MATERIAL

A. Gravity Sanitary Sewers

1. AASHTO No. 57 crushed stone or gravel aggregate, Table C, Section 703.2, Publication 408 Specifications. Do not use slag or cinders. Bedding depth in accordance with PennDOT RC-30.

B. Pressure Pipe

1. Fine aggregate, Table A, Section 703.1, Publication 408 Specifications. Bedding depth in accordance with PennDOT RC-30.

2.2 BACKFILL MATERIAL

A. Select Material Backfill:

1. Nonplastic Pipes:
 - a. Crushed stone or gravel aggregate conforming to Select Granular Material (2RC), Section 703.3, Publication 408 specifications.

2. Plastic Pipes:
 - a. AASHTO No. 57 crushed stone or gravel aggregate, Table C, Section 703.2, Publication 408 specifications. Do not use slag or cinders.
 3. Work within and along PennDOT Right-of-way
 - a. PennDOT 2A Coarse Aggregate, Table D Section 703.2, Publication 408 Specifications.
- B. Suitable Backfill Material:
1. Pressure Pipe and Gravity Sanitary Sewers
 - a. Roadways and Paved Shoulders
 - (1) From top of pipe bedding material to 12" over top of pipe: Select Backfill Material.
 - (2) From 1 foot above top of pipe to subgrade elevation: Select Backfill Material.
 - b. Other than Roadways and Paved Shoulders
 - (1) From top of pipe bedding material to 12" over top of pipe:
 - (a) Plastic Pipe: Select Backfill Material.
 - (b) Nonplastic Pipe: Select Backfill Material.
 - (2) From 12" above pipe to subgrade elevation:
 - (a) Select Backfill Material.
 2. Work within PennDOT Right-of-way
 - a. From top of pipe bedding material to subgrade elevation: Select Backfill Material

PART 3 EXECUTION

3.1 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Coordinate the Work to ensure the least inconvenience to traffic and maintain traffic in one or more unobstructed lanes unless closing the roadway is authorized.
- B. Maintain access to all streets and private drives.
- C. Provide and maintain signs, flashing warning lights, barricades, markers, and other protective devices as required to conform with construction operations and to keep traffic flowing with minimum restrictions.
- D. Comply with PennDOT Publication 213.

3.2 CUTTING PAVED SURFACES

- A. Where installation of pipelines, miscellaneous structures, and appurtenances necessitate breaking a paved surface, make cuts in a neat uniform fashion forming straight lines parallel with the centerline of the trench. Cut offsets at right angles to the centerline of the trench.
- B. Protect edges of cut pavement during excavation to prevent raveling or breaking; square edges prior to pavement replacement.
- C. The requirement for neat line cuts, in other than state highways, may be waived if the final paving restoration indicates overlay beyond the trench width.

3.3 BLASTING

- A. Blasting will be permitted except in areas where the proximity of structures, underground facilities, or public safety preclude the use of explosives. Nothing in this section shall relieve the CONTRACTOR of his responsibilities for damages, nor shall it result in any responsibility to the OWNER or the ENGINEER precluded in the General Conditions.
- B. Blasting of subsurface rock must be performed under the supervision of a licensed blaster with a minimum of five years of documented experience.
- C. Filling and backfilling and subgrade preparation will be laboratory and field tested to verify compaction requirements.
- D. Testing will be done in accordance with Section 01400 - Quality Control.

3.4 TRENCH EXCAVATION

- A. Depth of Excavation:
 - 1. Gravity Pipelines:
 - a. Excavate trenches to the depth and grade shown on the profile drawings for the invert of the pipe plus that excavation necessary for placement of pipe bedding material.
 - b. Excavation for laterals shall provide a straight uniform grade from the main pipeline or riser stack to the elevation at the right-of-way line, plus that excavation necessary for placement of pipe bedding material.
 - 2. Pressure Pipelines:
 - a. Excavate trenches to the minimum depth necessary and to provide four feet (4') from the top of the pipe to the finished ground elevation, except where specific depths are otherwise shown on the drawings.
 - 3. Where unsuitable bearing material is encountered in the trench bottom, continue excavation until the unsuitable material is removed, solid bearing is obtained or can be established, or concrete cradle can be placed. If no concrete cradle is to be installed, refill the trench to required pipeline grade with pipe bedding material.
 - 4. Where rock is encountered in the trench bottom, remove the rock to the depths as shown on PennDOT RC-30 and backfill to the required pipeline grade with uncompacted bedding material as shown.

5. Where the CONTRACTOR, by error or intent, excavates beyond the minimum required depth, backfill the trench to the required pipeline grade with pipe bedding material.

B. Width of Excavation:

1. Excavate trenches, including laterals, to a width necessary for placement and jointing of the pipe, and for placing and compacting pipe bedding and trench backfill around the pipe, but not less than sixteen inches (16") plus the pipe outside diameter.
2. Shape trench walls completely vertical from trench bottom to at least two feet (2') above the top of the pipe.
3. For pressure pipeline fittings, excavate trenches to a width that will permit placement of concrete thrust blocks. Provide earth surfaces for thrust blocks that are perpendicular to the direction of thrust and are free of loose or soft material.

C. Length of Open Trench:

Do not advance trenching operations more than one hundred feet (100') ahead of completed pipeline.

3.5 SUPPORT OF EXCAVATION

- A. Support excavations with sheathing, shoring, and bracing or a "trench box" as required to safely maintain the trench, and to comply with federal and state laws and codes.
- B. Install adequate excavation supports to prevent ground movement or settlement to adjacent structures, pipelines or utilities. Damage due to settlement because of failure to provide support or through negligence or fault of the CONTRACTOR in any other manner, shall be repaired at the CONTRACTOR's expense.
- C. Withdraw shoring, bracing, and sheathing as backfilling proceeds.

3.6 CONTROL OF EXCAVATED MATERIAL

- A. Keep the ground surface, within a minimum of two feet (2') of both sides of the excavation free of excavated material.
- B. Provide temporary barricades to prevent excavated material from encroaching on private property, walks, gutters, and storm drains.
- C. Maintain accessibility to all fire hydrants, valve pit covers, valve boxes, curb boxes, fire and police call boxes, and other utility controls at all times. Keep gutters clear or provide other satisfactory facilities for street drainage. Do not obstruct natural water courses. Where necessary, provide temporary channels to allow the flow of water either along or across the site of the Work.
- D. In areas where pipelines parallel or cross streams, ensure that no material slides, is washed, or dumped into the stream course. Remove cofferdams immediately upon completion of pipeline construction.

3.7 DEWATERING

- A. Keep excavations dry and free of water. Dispose of precipitation and subsurface water clear of the Work.
- B. Maintain pipe trenches dry until pipe has been jointed, inspected, and backfilled, and concrete work has been completed. Prevent trench water from entering pipelines under construction.
- C. Intercept and divert surface drainage away from excavations. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.
- D. Comply with Federal and State requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.

3.8 THRUST RESTRAINT

- A. Provide pressure pipe with concrete thrust blocking or use restrained joint fittings at all bends, tees, valves, and changes in direction, in accordance with the Standard Details.

3.9 BACKFILLING TRENCHES

- A. After pipe installation and inspection, backfill trenches from trench bottom or from the top of pipe bedding material, whichever is greater, to twelve (12") above the crown of the pipe with specified backfill material hand placed and carefully compacted with hand-operated mechanical tampers in layers of suitable thickness to provide specific compaction around and under the haunches of the pipe. Backfill and compact the remainder of the trench with specified backfill material.
- B. Lift Thickness Limitations:
 - 1. Submit a list of the compaction equipment to be utilized on the project, the recommendations of the equipment manufacturer as to the maximum lift thickness which can be placed, and the method of compaction to be used with this equipment to achieve the required compaction. In no case shall maximum lift thickness placed exceed the maximum limits specified by the manufacturers recommendations. However, if the equipment manufacturer's lift thickness recommendation is followed and the specified compaction is not obtained, the CONTRACTOR shall, at his own expense, remove, replace, and retest as many times as is required to obtain the specified compaction.
 - 2. Lift thickness limitations specified for state highways, shoulders, or embankments govern over the compaction equipment manufacturer's recommendations.
- D. Uncompacted Backfill:
 - 1. Where uncompacted backfill is indicated on the Contract Drawings, backfill the trench from one foot above the pipe to the top of the trench, crowned over the trench to a sufficient height to allow for settlement to grade after consolidated.
- E. Unsuitable Backfill Material:
 - 1. Where the ENGINEER deems backfill material to be unsuitable and rejects all or part thereof due to conditions prevailing at the time of construction, remove the unsuitable materials and replace with Select Material Backfill or suitable foreign backfill material.

3.10 COMPACTION REQUIREMENTS

- A. If tests indicate Work does not meet the specified requirements, it shall be removed, replaced and retested until compliance is achieved.
- B. Maintain optimum moisture content of backfill materials, within the range of two percentage points, plus or minus, to attain required compaction density.
- C. Compact materials to the following percentages of maximum lab density as determined by ASTM A698.
 - 1. Bituminous or concrete roadways, driveways, and parking areas (except within public highway rights-of-way): 95%
 - 2. Bituminous or concrete walkways: 95%
 - 3. Within public highway rights-of-way: per PennDOT 408 Specification
 - 4. Grassed Areas: 85%
 - 5. Landscaped Areas: 80%

3.11 DISPOSAL OF EXCAVATED MATERIAL

- A. Excavated material remaining after completion of backfilling shall remain the property of the CONTRACTOR, and shall be removed from the construction area, and legally disposed of.

3.12 RESTORATION OF SURFACES

- A. Restore unpaved surfaces disturbed by construction to equal the surface condition prior to construction.
- B. Restore grassed areas in accordance with Section 02936, Seeding.
- C. Restore paved surfaces outside the limits of trench excavation disturbed during construction to equal the condition prior to construction, as authorized by the ENGINEER/OWNER.

END OF SECTION

SECTION 02260
EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Installation of shoring and bracing required for construction of direct buried piping, miscellaneous utilities, and to support existing structures.
 - 2. Inspection and acceptance of existing shoring and bracing.
 - 3. Maintenance of shoring and bracing.
 - 4. Removal of shoring and bracing to a minimum of four feet below the surface.
 - 5. Support of existing utilities, manholes, valves, and piping.
 - 6. Monitoring existing structures.
- B. Types of shoring and bracing system include, but are not limited to the following:
 - 1. Steel soldier piles.
 - 2. Timber lagging.
 - 3. Steel sheet piles.
- C. Driving or jetting of sheeting or piles by the use of vibratory equipment impact hammer, or water is prohibited.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02200, "Structure Excavation and Earthwork".

1.4 SUBMITTALS

- A. Prior to starting work, submit for review, calculations and shop drawings showing proposed method of supporting adjacent earth and structures. Include the following:
 - 1. Lists of material to be used, including design mixes.
 - 2. Sequence of operations.
 - 3. Detailed sections clearly illustrating the scope of work.
 - 4. Relationship of piles, lagging, walls, and bracing to new and existing structures.
 - 5. Location of utilities and details of support when required.
 - 6. Procedures and details of testing.

- B. Shop drawings and calculations: Prepared by qualified Licensed Professional Engineers registered in the State of Pennsylvania and bearing their seals and signatures.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of complete projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by excavation support and protection systems.

1.5 QUALITY ASSURANCE

- A. Comply with the Publications of the following agencies to the extent referenced and applicable:
 - 1. ASTM - American Society for Testing and Materials.
 - 2. AISC - American Institute of Steel Construction.
 - 3. OSHA - Occupational Safety and Health Act.
- B. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing excavation support and protection systems similar to those required for this Project and with a record of successful in-service performance.
- C. Professional Engineer Qualifications: A professional engineer licensed in the State of Pennsylvania who is experienced in designing excavation support and protection systems that are similar to those indicated for this Project in material, design, and extent.
- D. Do not begin installation of excavation support and protection system until reviewed by the Engineer.

1.6 JOB CONDITIONS

- A. Before starting work, verify governing dimensions and elevations. Survey condition of adjoining surfaces. Photograph existing conditions to record any prior settlement or cracking of structures, pavements, and other deficiencies. Prepare a list of existing damages, verified by dated photographs and signed by the Engineer.
- B. Survey adjacent structures and improvements, establishing exact elevations at fixed points to act as bench marks. Clearly identify benchmarks and record existing elevations. Locate datum level used to establish benchmark elevations.

1.7 EXISTING UTILITIES

- A. The contract drawings indicate the general location of underground utilities. **All** utility locations and elevations in the vicinity of work shall be verified by the contractor prior to the start of project work. Test pits shall be conducted in areas where conflicts may occur prior to any excavation, heavy equipment loading, or drilling and setting of H-piles is performed to avoid damaging or interfering with these existing utilities.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- A. Design sheeting and bracing using the following criteria:
 - 1. Design shoring and bracing systems using a minimum safety factor of 2.0.
 - 2. Select structural steel members on the basis of AISC specifications.
 - 3. Select structural wood members on the basis of Timber Construction Standards of the American Institute of Timber Construction.
 - 4. Existing buildings valve vaults, manholes or foundations shall not be used for support of sheeting and shoring load. Sheeting and shoring shall be independent of any adjacent structure.
 - 5. All shoring and bracing work shall comply with the applicable publications, codes standards and regulation of OSHA.

2.2 MATERIALS

- A. General: Provide shoring and bracing materials that will support loads imposed. Materials need not be new, but should be in serviceable condition.
- B. Structural Steel - ASTM designation A 36 or ASTM A 572 Grade 50.
- C. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches thick, unless otherwise indicated. Maximum 0.5 inch space between individual pieces.

PART 3 - EXECUTION

3.1 SHORING

- A. The Contractor shall design the sheeting and shoring to minimize disruption to existing utilities.

3.2 BRACING

- A. Provide engineered bracing to support construction activities at the top of the excavation. Bracing shall be designed by an engineer registered in the State of Pennsylvania in accordance with OSHA.
- B. Locate bracing to clear existing and proposed work. If necessary to move a brace, install new bracing prior to removal of original brace.
- C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
- D. Maintain bracing until structural elements are replaced by other bracing or until permanent construction is in place.
- E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.
- F. Repair or replace adjacent work damaged or displaced through the installation or removal of shoring and bracing work.

3.3 PROTECTION OF ADJOINING STRUCTURES

- A. Do not begin any work before review of submittal by Engineer.
- B. Prior to shoring and bracing operations, take and record initial elevation readings of adjacent utilities, footings, pavements, and structures.
- C. Upon completion of shoring and bracing operations take and record elevation readings in same location of initial readings.
- D. Submit three certified copies of all elevation records for review by the Engineer.
- E. If any of the following conditions occur during shoring and bracing operations, stop the work immediately and revise procedures to prevent further damage. Revised procedures will be subject to review by Engineer.
 - 1. New cracking of existing footings, walls, floors, or pavements.
 - 2. Settlement of 0.1 inch relative to adjoining areas.
 - 3. Total settlement of 0.4 inch.
 - 4. Signs of shifting in adjoining facilities or utilities.

3.4 INSTALLATION

- A. Provide all piling, bracing, shoring, or other applicable form of temporary supports required to stabilize and protect from movement all adjacent facilities and utilities. Comply with the requirements of OSHA for all work.
- B. Perform the work in a manner to prevent settlement or shifting of adjacent structures or utilities.
- C. Install piles by means of drilling or boring to eliminate vibration and disturbance to adjacent structure. Jetting, vibratory, or impact hammers, or any other method causing vibration shall not be used. Voids between sheeting and earth shall be filled with lean concrete.
- D. Where tiebacks are used, test each tieback with loads greater than design loads.
- E. The Contractor shall be responsible for any damage caused by or due to failure of sheet piling, shoring, and bracing or other protection methods used.
- F. Maintain sheet piling, shoring, and bracing in place until fill has been placed or permanent construction is in position. Remove shoring, and bracing as required in a manner to avoid disturbance to underlying soils and structures, pavements, facilities and utilities. As a minimum, remove piling, and lagging to 48 inches below existing, and remove walers which interfere with final construction.

3.5 DEWATERING

- A. Provide equipment to remove excess water as required to permit installation of new work in accordance with Section 02200, "Structure Excavation and Earthwork".

END OF SECTION

SECTION 02446

HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Work of this section includes, but is not limited to:
 - 1. Acceptable methods and materials for installing potable water mains by the horizontal directional drilling method.
- B. Related Work Specified Elsewhere:
 - 1. Section 02730: Sanitary Sewer Pipe

1.2 QUALITY ASSURANCE

- A. CONTRACTOR Qualifications:
 - 1. Experience: Actively engaged in horizontal directional drilling for a minimum of 5 years.
 - 2. Field supervisory personnel: Experienced in the performance of the work and tasks as stated herein for a minimum of 5 years.
 - 3. Contractor must demonstrate the successful completion of at least three previous projects of similar size and complexity.
- B. Design Criteria:
 - 1. Submit a proposed plan and profile showing installation locations to accommodate acquired easements, to avoid obstructions, and to properly maintain operation flow velocities
- C. Reference Codes and Specifications:
 - 1. Comply with applicable federal, state and local ordinances, codes, statutes, rules and regulations, and affected jurisdictional bodies.
 - 2. Pennsylvania Department of Transportation Publication 408 Specifications
 - 3. ASTM D3350 Specifications for Polyethylene Plastic Pipe and Fittings
 - 4. AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing ½ inch through 3 inch.
 - 5. AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings 4 inch through 63 inch for Water Distribution.
 - 6. ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

1.3 SUBMITTALS

- A. Submit the following to demonstrate qualifications to perform the work.
 - 1. Presentation of similar experience in the last 5 years including the successful completion of at least three previous projects of similar size and complexity.
 - 2. Include, but not limited to, owner name, address, telephone number, contact person, date and duration of work, location, pipe information, and contents handled by pipeline.
 - 3. Supervisory and field personnel including experience installing via horizontal directional drilling.
 - a. At least one of the field supervisors listed must be at site when HDD operations are in progress.
- B. Submit following:
 - 1. Working drawings and written procedure describing in detail proposed method and entire operation for information only including, but not limited to:
 - a. Size, capacity and arrangement of equipment.
 - b. Detailed drilling schedule specific to this project.
 - c. Location and size of drilling and receiving pits.
 - d. Methods to establish and maintain vertical and horizontal alignment.
 - e. Dewatering and methods of removing spoils material.
 - f. Method of installing detection wire.
 - g. Type, location and method of installing locator station.
 - h. Method of fusion pipe segment and type of equipment.
 - i. Type of cutting head.
 - j. Method of monitoring and controlling line and grade.
 - k. Detection of surface movement.
 - l. Bentonite drilling mud, for information only:
 - 1) Products information, material specifications, and handling procedures.
 - 2) Material safety data sheet and special precautions required.
 - 3) Method of mixing and application.
 - 4) Method of drilling mud recovery and disposal.

1.4 JOB CONDITIONS

- A. Conduct operations so as not to interfere with, interrupt, damage, destroy, or endanger the integrity of surface or subsurface structures or utilities, and landscape in the immediate or adjacent areas.
- B. When drilling under state highways and railroads, comply with applicable right-of-way occupancy permits.
- C. If drilling is obstructed, install line via open cut, as approved by the ENGINEER.

1.5 PROJECT RECORD DOCUMENTS

- A. Record location of pipe runs, connections, manholes, chambers and laterals.

- B. Record location of low pressure sewer every ten feet along alignment via GPS. Locate structures via GPS.
- C. Identify and describe unexpected or unusual variations in subsoil conditions.
- D. Record location and type of service of other underground utilities, where encountered.

1.6 QUALITY ASSURANCE

- A. Source Quality Control: Supplier shall certify all materials are in accordance with project specifications.
- B. Codes: Conform to all local codes and government standards for materials and installation as applicable.
- C. Defective Materials: Reject materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinners or acid solder. Reject materials having cracks, flaws, or other defects whenever identified, before, during, or after installation. Remove all rejected materials promptly from site.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Do not place materials on private property without written permission of the property owner.
- B. During loading, transporting and unloading, exercise care to prevent damage to materials.
- C. Do not drop pipe or fittings. Avoid shock or damage at all times.
- D. Take measures to prevent damage to the exterior surface or internal lining of the pipe.
- E. Pipe may be strung along alignment where approved by the ENGINEER.
- F. Do not stack pipe higher than recommended by the pipe manufacturer.
- G. Store gaskets for mechanical and push-on joints in a cool, dry location out of direct sunlight and not in contact with petroleum products.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe Location

1. Tracer Wire:

- a. Tracer wire to be Copperhead Extra High Strength (EHS), #1245B with High Density Polyethylene (HDPE) jacket with minimum 1150# break load.
- b. Tracer wire shall meet or exceed the following:

Directional Boring Wire Specifications SIZE #12 EHS

Conductor Construction	CCS
Conductor OD	0.0808
Insulation Material	HDPE

Insulation Thickness	.045"
Nominal OD	0.171
Resistance per 1000 feet (Ohms)	5.2954
Weight per 1000 feet (lbs)	22
Breaking Load (tensile) in lbs	1150
Copperhead Part Number 1245EHS	
Spool sizes available 500', 1000', & 2500	

- c. Tracer wire shall be installed with all force mains whether or not telemetry wire is buried with the pipe.
- d. For pipe depths greater than 8', tracer wire shall be placed centerline above pipe at max 8' depth.
- e. Contractor shall schedule a conductivity/locate test upon complete

2. Locator Station.

- a. Tracer Wire shall be brought to the surface by all manholes, valve vaults or at 500' intervals.
- b. Termination box shall be SnakePit Magnetized Tracer Box with Anti Corrosion technology, ease of locate-ability, exterior direct connection point and tamper proof cover.
- c. Cover shall be color coded green for sanitary sewer.

B. Drilling Fluid.

1. BENTONITE

- a. Bentonite shall be provided as specified in API Specifications 13A, Specification for Oil Well Drilling Fluids Material for fresh water drilling fluids. Any modification to the basic drilling fluid involving additives must describe the type of material to be used and be included in Contractor's drilling plan presented to the Owner. The Owner retains the right to sample and monitor the waste drilling mud, cuttings and water.
- b. Bentonite drilling mud compatible with the environment.
- c. Contractor is responsible for the recovery and disposal of drilling mud in accordance with applicable local, state and federal regulations. Such disposal is considered incidental to the work.
- d. Minimize to every extent possible the occasions of inadvertent returns of drilling fluids at locations other than the planned entry and exit points.
- e. Perform immediate cleanup of inadvertent fluid returns at all locations where they occur.

- 2. Waste oil or environmentally non-compatible polymers cannot be part of composition.

PART 3 EXECUTION

3.1 PREPARATION

- A. Prepare the necessary general access earthwork operations as required for the set-up and erection of horizontal drilling equipment at the rig site.
- B. At all times during the working hours, maintain instrumentation in operation that will accurately locate the pilot hole drilling head and which will accurately measure the drilling fluid flow discharge rate and pressure.

- C. Provide equipment to guard against electrocution and an alarm system on drilling equipment capable of detecting electrical current as it approaches electric lines.

3.2 OPERATION

A. General.

1. Determine drilling length and equipment pull strength for type of soil encountered.
2. Provide method to control line and grade.
 - a. Provide and maintain instrumentation that accurately locates pilot hole.
 - b. Drill pilot hole along path following Drawings to these tolerances:
 - 1) Vertical alignment plus or minus 0.5 foot. Vertical path of the pilot hole must not establish new high points not shown on Drawings.
 - 2) Horizontal alignment plus or minus 1.0 foot.
 - c. Include electronic monitoring of the horizontal and vertical drilling head location. Obtain an accuracy range within 1 inch of actual position of the pipeline. Record position readings at a maximum of 10 foot intervals.
 - d. At completion of pilot hole drilling, furnish Engineer tabulations of horizontal and vertical alignment.
3. When water is encountered.
 - a. Provide and maintain a dewatering system of sufficient capacity to remove water.
 - b. Keep excavation free of water until backfill operation is in progress.
 - c. Perform dewatering in such a manner that removal of soils particles are held to a minimum.
 - d. Dewater into a sediment trap.
4. Maintain close observation to detect settlement or displacement of surface and adjacent facilities.
 - a. Notify ENGINEER immediately if settlement or displacement is detected.
 - b. Act to maintain safe conditions and prevent damage.

B. Drilling Operation.

1. Drilling Fluids.
 - a. Maintain drilling fluid in bore hole to increase stability of the surrounding soil and reduce drag on pulled pipe.
 - b. Dispose of drilling fluid and other spoils at location following laws, ordinances, rules, and regulations of local jurisdiction.
 - c. Transport excess fluids and other spoils to the disposal site, at no additional cost to the OWNER.
 - d. Minimize drilling fluid at locations other than entry and exit points. Immediately clean up any drilling fluids that inadvertently surface.
 - e. Provide clean water for drilling, at no cost to the OWNER.
2. Pilot Hole Drilling.

- a. Angle entry hole so that curvature of pilot hole does not exceed allowable bending radius of HDPE pipe.
- b. Be able to make a turn of up to 90 degrees and maintain a curvature not to exceed allowable bending radius of HDPE pipe.
- c. Alignment Adjustment and Restarts.
 - 1) Follow pipeline alignment on Drawings within tolerances specified herein. Before adjustments, notify ENGINEER for approval.
 - 2) Notify ENGINEER when forward motion of operation is stopped by an obstruction.
 - a) Abandon in place with drilling fluid, unless ENGINEER directs otherwise.
 - b) Upon ENGINEER'S approval, attempt a second installation at approved location or excavate at the point of difficulty and install the HDPE pipe by trench method.
 - 3) Withdrawals, abandonments, and restarts are at no additional cost to the OWNER when HDD is provided as an option of installation of pipe.
 - 4) Exercise caution including, but not limited to, locating utilities, drilling downholes (test pits) to observe drill stems or reamer assembly to clear other existing utilities at locations following Drawings.
 - 5) Keep the number of boring pits to a minimum, no closer than following distances, unless otherwise approved by ENGINEER.
 - a) Equipment must be capable of boring a minimum of 250 linear feet in a single bore. Longer bores are allowed.

3.3 INSTALLATION

A. Installing HDPE Pipe.

- 1. Provide a swivel to reaming assembly and pull section of pipe to minimize torsional stress on pull section after drilling pilot hole.
- 2. Hold reaming diameter to 1.5 times the outside diameter of HDPE pipe being installed.
- 3. Protect pull section as it proceeds during pull back so that it moves freely and is not damaged.
- 4. Pull detection wire along with HDPE pipe.
 - a. Install tracer wire.
 - b. Attach to the pulling eye and the crown of sewer pipe with a minimum of two full wraps of duct tape around the pipe. This will allow for a straight, smooth pull of the product pipe as it enters and passes through the borehole toward the drill rig and original entrance hole of the directional bore.
 - c. Install trace wire continuous with each bore. Tape or insulate trace wire to prevent corrosion and maintain integrity of pipe detection.

- 1) Connect ends of tracer wire with appropriate direct bury connectors or wire nuts inside manholes:
 - 2) Provide extra length of tracer wire at each terminus, so tracer wire can be 3 feet out top of structure for connection to detection equipment.
- d. Test each tracer wire for continuity after backfill is completed.
 - 1) If test for continuity is negative, repair or replace at ENGINEER'S direction.
5. When connecting to adjacent pulled or non-pulled section of HDPE pipe, allow pull section of pipe to extend past termination point. Make tie-ins the next day after pullback of HDPE pipe.
6. Test pit pipe installation to verify horizontal and vertical alignment at ENGINEER'S direction.
 - a. One test pit for every 500 feet along length of pipeline.
 - b. ENGINEER may order additional test pit for each test pit that reveals pipeline installation is not in compliance with the Contract Documents at no additional cost to the OWNER.
7. Replace portions of the pipeline not in compliance with the Contract Documents at ENGINEER'S direction and at no additional cost to the OWNER.

3.4 FIELD QUALITY ASSURANCE

- A. Perform field testing of HDPE pipe following Section 02751.

END OF SECTION

SECTION 02575

PAVING AND RESURFACING FOR TRENCH RESTORATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Paving
- B. Permanent Paving
- C. Shoulder Restoration
- D. Curb and Sidewalk Restoration

1.2 REFERENCED STANDARDS

- A. Pennsylvania Department of Transportation:
 - 1. Publication 408 Specifications
 - 2. Publication 27 - Specification for Bituminous Mixtures (Bulletin 27)
 - 3. Publication 37 - Specification for Bituminous Materials (Bulletin 25)
 - 4. Publication 213 - Work Zone Traffic Control

1.3 SUBMITTALS

- A. Submit certification from bituminous and aggregate suppliers attesting that materials conform to PennDOT specifications.

1.4 JOB CONDITIONS

- A. Control of Traffic:
 - 1. Take measures to control traffic during repaving operations. Do not allow traffic on repaved areas until authorized by the ENGINEER/OWNER.
 - 2. Employ traffic control measures in accordance with Publication 213 - "Work Zone Traffic Control".
- B. Restore existing paving outside the limits of the work, that is damaged by the CONTRACTOR'S operations, to its original condition.

PART 2 PRODUCTS

2.1 CONCRETE

- A. See PennDOT Publication 408 Specifications, Section 301.

2.2 BITUMINOUS PAVING MATERIALS AND AGGREGATES

- A. Refer to Publication 408 Specifications. All bituminous materials and aggregates used in

paving and resurfacing are designated in these Specifications by and shall conform to the applicable portions of the Publication 408 Specifications.

PART 3 EXECUTION

3.1 TEMPORARY PAVING

- A. Place temporary paving daily immediately upon completion of trench backfilling.
- B. Shape and compact subgrade material, then place and compact crushed stone base course to the thickness indicated.
- C. Place temporary paving material as indicated. Compact to required minimum thickness with trench roller having minimum 300 pounds per inch-width of compaction roll.
- D. Continuously maintain temporary paving to the satisfaction of the ENGINEER/OWNER. Temporary paving shall remain in place for a minimum of 90 days.
- E. Permanent paving may be placed in lieu of temporary paving. In this case, the CONTRACTOR shall place additional permanent material 90 days after initial placement, to fill in all areas that have settled. All new joints shall be sealed in accordance with Section 3.2.C.

3.2 PERMANENT PAVING

- A. Trim existing paving to remove damaged areas. Cut straight joint lines and right angle offsets.
- B. Remove temporary paving material. Construct permanent base and surface courses to the indicated compacted thicknesses, and in accordance with Publication 408 Specifications.
- C. All joints between new and old material shall be sealed with PG 64-22 (or approved equal), minimum 12" width.
- D. Maintain permanent paving to the satisfaction of the ENGINEER throughout the contract maintenance period.

3.3 SHOULDER RESTORATION

- A. Restore unpaved shoulders as indicated.

3.4 DRIVEWAYS

- A. Trim concrete and bituminous driveway surfaces to remove damaged areas. Saw cut straight joint lines parallel to the centerline of the trench. Cut offsets at right angles to the trench centerline.
- B. Restore existing concrete driveways with a 6" layer of concrete reinforced with 6 x 6 10/10 wire mesh.
- C. Restore existing bituminous driveways as per standard detail.
- D. Restore earth driveways with a compacted 6" depth of No. 2RC stone.
- E. Restore stone or gravel driveways in kind.
- F. Restore brick driveways with like bricks placed on a 4" thick wet sand bed. Place bricks in

like pattern and spacing and bedding.

3.5 CONCRETE CURB AND SIDEWALK REPAIRS

- A. Replace curbs and sidewalks damaged by construction to match existing.
- B. Reconstruct curbs and sidewalks to the first expansion joint on either side of the damaged portion. Install expansion joint material.
- C. Reconstruct sidewalks as per standard detail.

END OF SECTION

SECTION 02580
PAVEMENT MARKINGS (PENNSYLVANIA)

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Application of traffic lines and pavement markings
- B. Application of parking lot lines and markings

1.2 REFERENCES

- A. Pennsylvania Department of Transportation Publication 408, Specifications
 - 1. Section 961 - Cold Plastic Pavement Markings or Legends
 - 2. Section 962 - Painting Traffic Lines and Markings
 - 3. Section 963 - Pavement Marking Removal
 - 4. Section 1103 - Traffic Signing and Marking
- B. Pennsylvania Department of Transportation Publication 68: Regulations - Traffic Signs, Signals and Markings

1.3 SUBMITTALS

- A. Submit catalog cuts, listing PennDOT approval numbers, for all materials, as applicable, under provisions of Section 01300.

1.4 QUALITY CONTROL

- A. Field observation will be performed under provisions of Section 01400.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Paint and glass beads for pavement markings shall be as approved by PennDOT in accordance with Publication 408, Sections 961, 962 and 1103.
- B. All materials shall be supplied by the CONTRACTOR.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that paved surface is ready to receive the work of this Section.

3.2 SURFACE PREPARATION

- A. Satisfactorily clean and dry paved surface. Blow or sweep free of loose dirt and other debris.
- B. Properly locate and place lines and markings.

3.3 APPLICATION

- A. Pavement markings existing in good condition as determined by the ENGINEER and in accordance with the Drawings are not required to be replaced.
- B. Remove any existing markings in conflict with the proposed markings.
- C. Furnish and apply paint and/or plastic pavement markings for traffic lines and markings as indicated.
- D. Satisfactorily remove any line or legend improperly located, then replace it in the proper location.

END OF SECTION

SECTION 02601

MANHOLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Precast Concrete Manholes
- B. Glass Fiber-Reinforced Polyester Manholes
- C. Concrete Manhole Bases
- D. Manhole Steps
- E. Manhole Covers and Frames
- F. Pre-cast Boxes

1.2 REFERENCE STANDARDS

- A. Pennsylvania Department of Transportation Publication 408 Specifications.
- B. American Society for Testing and Materials (ASTM):
 - A48 Specification for Gray Iron Castings
 - C32 Specification for Sewer and Manhole Brick
 - C33 Specification for Concrete Aggregate
 - C139 Specifications for Concrete Masonry Units for Construction of Catch Basins and Manholes
 - C270 Specifications for Mortar for Unit Masonry
 - C443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
 - C478 Specifications for Precast Reinforced Concrete Manhole Sections
 - C579 Standard Test Method for Compressive Strength of Chemical Resistant Grouts, Monolithic Surfacing and Polymer Concrete.
 - C923 Specification for Resilient Connections Between Reinforced Concrete Manhole Structures and Pipes
 - D3753 Specification for Glass Fiber-Reinforced Polyester Manholes
- C. Federal Specifications (FS)
 - FS-SS-S-210 Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints (Type 1 Rope Form)

1.3 SUBMITTALS

- A. Certificates:
 - 1. Submit certification from material suppliers attesting that materials meet or exceed specification requirements.
- B. Shop Drawings:
 - 1. Submit detail shop drawings of manhole sections, and precast bases if used.

2. Submit detail shop drawings of manhole frames and covers, including rubbings of inscription.
3. Submit detail shop drawings of manhole steps.
4. Submit manufacturers' descriptive literature for the pipe to manhole flexible connections.
5. Submit design calculations signed and sealed by Professional Engineer.

PART 2 PRODUCTS

2.1 BASIC MATERIALS

- A. Crushed Stone Subbase: Size 57, Type C, Section 703.2, Publication 408 Specifications.
- B. Manhole Brick: ASTM C32, grade MS, solid
- C. Concrete Masonry Units: ASTM C139.
- D. Masonry Mortar: ASTM C270, Type S
- E. Joint Sealant Compound: FS SS-S-00210, preformed, flexible, self-adhering, cold-applied.
- F. Rubber Gaskets: ASTM C443
- G. Resilient Pipe-to-Manhole Connection: ASTM C923
- H. Concrete for Poured-in-Place Bases or Encasement: Conforming to the requirements of Section 03300.
- I. Coal Tar Epoxy Paint: Koppers Bitumastic 300M
- J. Interior Epoxy coating: Sauereisen SewerGard™ No. 210G
- K. Exterior Epoxy coating: Parsonpoxy FP

2.2 FABRICATED PRODUCTS

- A. Precast Concrete Manhole Sections: ASTM C478
 1. 5.5% $\pm$ 1% air-entrained cement concrete.
 2. Eccentric cone sections; minimum 24" access opening unless otherwise indicated.
 3. Precast riser sections of length to suit.
 4. Precast bases of a design similar to the precast riser sections.
 5. Manholes are to be PA DOT approved, constructed in accordance with Publication 408, Publication 72M and Standards for Roadway Construction RC-39M.

B. Manhole Steps:

1. Material and Type: As identified on the Drawings and specified as follows:
 - a. Aluminum: Alloy 6061-T6, mill finish, drop front design, with embedded portion coated with coal tar epoxy paint.
 - b. Polypropylene Coated Steel: Deformed steel reinforcing bar encapsulated with injection molded polypropylene. Serrated tread and end lugs to prevent feet from slipping off.
2. Spacing: 12 inches on center

C. Manhole Frames and Covers:

1. Domestic cast iron castings: ASTM A48, Class 30 or better; free of bubbles, sand and air holes, and other imperfections
2. Contact surfaces machined and matched
3. Cast cover inscription with pipeline service and OWNER's name at the direction of the ENGINEER and as shown on the details

D. Pipe Opening Seals:

1. Resilient gasket type, cast integrally in precast concrete manhole section
2. Conforming to the requirements specified in ASTM C923

PART 3 EXECUTION

3.1 EXCAVATION

- A. Perform excavation to the line and grade shown on the Contract Drawings and as specified in Section 02225.
- B. Location and depth of manholes as shown on the drawings.

3.2 CONSTRUCTION

- A. Construct watertight manholes of precast concrete sections and of the type shown on the Contract Drawings.
- B. Construct drop connections of the required type as shown on the Drawings.
- C. Install a minimum of 6" of crushed stone subbase.
- D. Provide cast-in-place concrete or precast concrete bases.
 1. Construct cast-in-place bases as shown on the Drawings
 - a. Cast-in-place bases shall be constructed with a special form for a joint to match the manhole cylinder sections.

2. Install precast bases as shown on the Drawings.
 - a. Set the precast base on a crushed stone subbase.
 - b. Provide a sealed, flexible resilient connection between pipe and precast base section.
- E. Form flow channels in manhole bases as shown on the Drawings. Slope channels uniformly from influent invert to effluent invert; Construct bends of the largest possible radius. Form channel sides and invert smooth and uniform; free of cracks, holes or protrusions.
- F. Do not permit pipe to project more than 2" into the manhole.
- G. Seal joints between precast concrete manhole sections with joint sealant compound.
 1. Place joint sealant compound on lower section to be squeezed by the weight of the upper section. Use sufficient sealant compound to provide squeeze-out of material around entire interior and exterior of circumference when joint is completed.
 2. Apply joint sealant to top and bottom of keyway of the lower manhole section.
 3. Where indicated on the drawings, seal manhole sections with a heat-shrinkable wraparound sleeve in accordance with the details and Section 02955
 4. Seal the manhole frame/cone joint with a heat-shrinkable wraparound sleeve in accordance with the details and Section 02955
 5. Seal the exterior Manhole frame/chimney section of manholes to remain exposed with Parsonpoxy FP epoxy coating as per manufacturer's instructions.
- H. When using prefabricated pipe opening seals, fill annular space between pipe and precast concrete manhole section, interior and exterior, with preformed plastic sealing compound. Trowel compound surface smooth and flush with interior face of manhole.
- I. Seal lifting holes with properly designed tapered rubber plugs. Drive plugs into holes from exterior in such a manner as to completely seal opening. Sealing of holes with grout is not permitted. Fill interior of hole with plastic sealing compound. Trowel compound surface smooth and flush with interior face of manhole.
- J. Install manhole sections with steps in proper vertical alignment.
- K. Use precast manhole rings to achieve elevation shown for frame and cover. Do not adjust elevation more than 1 ft. with precast rings.
- L. Install manhole frames and covers.
 1. Set top of frames at finished grade elevation or other elevation shown on the drawing.
 2. Anchor all Manhole Frames.
 3. Anchor manhole covers installed in unpaved areas. Install mortar fillet around the exterior of the manhole frame, and parge precast grade rings if used.
 4. Seal joint between manhole frame and manhole with joint sealant compound.

- 5. Provide heat-shrinkable manhole encapsulation system in accordance with Section 02955
- 6. Seal the exterior Manhole frame/chimney section of manholes to remain exposed with Parsonpoxy FP epoxy coating as per manufacturer's instructions.
- M. Coat entire exterior surface of precast concrete manhole with two coats of coal tar epoxy paint, 7-10 mils dry film thickness each coat.
- N. Where new manholes are to be constructed on existing pipelines, carefully excavate around existing pipeline for placement of the new manhole base. Take all measures necessary to control flow through the existing pipeline and to prevent leakage into the new base. After completion of the manhole, carefully remove the top portion of the existing pipeline.

3.3 BACKFILLING

- A. Backfill only after examination of the manhole by the ENGINEER/OWNER.
- B. Perform backfilling as specified in Section 02225.

3.4 TESTING

- A. Successful passing of tests as specified in Section 02751 is required for acceptance.

END OF SECTION

SECTION 02604
MANHOLE ENCAPSULATION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manhole Encapsulation System.

1.2 RELATED SECTIONS

- A. Section 02601 - Manholes
- B. Section 02730 - Sanitary Sewer Pipe
- C. Section 02751 – Sewer Pipeline and Manhole Testing

1.3 REFERENCES

- A. ASTM D 570 - Water Absorption of Plastics.
- B. ASTM D 638 - Tensile Properties of Plastics.
- C. ASTM D 1000 - Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications.
- D. ASTM D 1002 - Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-To-Metal).
- E. ASTM D 1044 - Resistance of Transparent Plastics to Surface Abrasion.
- F. ASTM D 2240 - Rubber Property - Durometer Hardness.
- G. ASTM D 2671 - Heat-Shrinkable Tubing for Electrical Use.
- H. ASTM E 28 - Softening Point by Ring-and-Ball Apparatus.

1.4 SYSTEM DESCRIPTION

- A. Manhole encapsulation system uses a heat-shrinkable, wraparound sleeve to create a barrier to water infiltration and to protect manhole support structure and frame from ground moisture, preventing corrosion and freeze-thaw damage.
- B. System accommodates ground movement and resists soil stress.

1.5 SUBMITTALS

- A. Comply with Section 01330 - Submittal Procedures.
- B. Product Data: Submit manufacturer's product data.
- C. Manufacturer Qualifications: Submit manufacturer's certification indicating heat-shrink sleeves manufactured in an ISO 9002 registered facility.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Manufacture heat-shrink sleeves in an ISO 9002 registered facility.
2. Capability of producing irradiated and cross-linked polyethylene coating to allow shrinking of coating material in circumferential direction under influence of heat.
3. Capability of providing manufacturer employed field service personnel for site assistance as required.

B. Installer Qualifications:

1. Experienced with installation techniques.
2. Attended a minimum of 1 day of training at manufacturer's facility or on-site with manufacturer's representative.

C. Pre-Installation Meeting: Convene a pre-installation meeting 2 weeks before the start of installation of manhole encapsulation system. Required attendance of parties directly affecting work of this section include the Contractor, Engineer, installer, and manufacturer's representative. Review surface preparation, installation, field quality control, backfilling, protection, and coordination with other work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, batch or lot number, and date of manufacture.
2. Protect individual sleeves to prevent adherence to other sleeves, packing material, and containers.

B. Storage:

1. Store materials in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. Do not store at temperatures above 95°F (35°C) or below -4° F (-20°C).
4. Protect materials and containers from exposure to direct sunlight, rain, snow, dirt, and dust.
5. Store materials off ground or floor in ventilated area.

C. Handling: Protect materials during handling and installation to prevent damage or contamination.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Canusa, Division of Shaw Resource Services Inc., 2408 Timberloch Place, Building C-8 The Woodlands, Texas 77380-1038; Phone: (281) 367-8866. Fax: (281) 367-4304
- B. Canusa-CPS, Division of Shaw Industries Ltd., 25 Bethridge Road, Rexdale, Ontario, Canada M9W 1M7. Phone: (416) 241-0128. Fax: (416) 241-6890.
- C. Approved equal

2.2 MANHOLE ENCAPSULATION SYSTEM

A. Heat-Shrinkable Sleeves:

1. Material: Irradiated and cross-linked polyethylene impermeable backing, coated with protective heat-activated adhesive.
2. Bonding: Bond to primed concrete, metal, and fiberglass surfaces.
3. Compatibility: Compatible with concrete, steel, iron, and fiberglass.
4. Closure: Separate closure seal to secure sleeve in place during installation and seal overlap area.

B. Functional Performance of Heat-Shrinkable Sleeves:

1. Peel Strength, ASTM D 1000: 8.6 pli (15 N/cm).
2. Lap Shear, ASTM D 1002: 1.5 psi (1.0 N/cm²).
3. Water Absorption, ASTM D 570: 0.05 % maximum.
4. Low Temperature Flexibility, ASTM D 2671: -40°F (-40°C).

C. Physical Properties of Heat-Shrinkable Sleeves:

1. System Type: High shrink.
2. Base Size: 24-96 inches (600-2400 mm)
3. Supplied Thickness: 101 mils (2.5 mm).
4. Fully Recovered Thickness: 125 mils (3.2 mm).
5. Shrink Factor: 40%, minimum.

D. Sleeve Adhesive:

1. Softening Point, ASTM E 28: 212° F (100° C).

E. Sleeve Backing:

1. Tensile Strength, ASTM D 638: 2900 psi (20 MPa).
2. Elongation, ASTM D 638: 600%
3. Hardness, ASTM D 2240, Shore D: 46.
4. Abrasion Resistance, ASTM D 1044: 35 mg.

F. Primer: WrapidSeal™ "G" Primer.

1. Use: Primes steel, concrete, and fiberglass surfaces for installation of sleeve.
2. Compatibility: Compatible with common substrates and sleeve adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive manhole encapsulation system. Notify the Engineer if surfaces are not acceptable. Do not begin surface preparation until unacceptable conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Prepare surfaces in accordance with manufacturer's instructions.
- B. Ensure surfaces are clean, dry, and free of frost, surface rust, foreign objects, sharp edges, and projections that could damage manhole encapsulation system.

C. Inspection by Engineer:

1. Advance Notice: Give the Engineer a minimum of 3 days advance notice of start of installation of manhole encapsulation system.
2. Before installation, surfaces to be encapsulated will be inspected by the Engineer.
3. Do not begin installation until defects or deficiencies identified by the Engineer have been corrected.

3.3 INSTALLATION

- A. Install manhole encapsulation system in accordance with manufacturer's instructions.
- B. Install system to create barrier to water infiltration and protect manhole support structure and frame from ground moisture, preventing corrosion and freeze-thaw damage.
- C. Manhole encapsulation system shall not be used on chimney sections of manholes that will remain exposed.

3.4 FIELD QUALITY CONTROL

A. Sleeve Inspection: Visually inspect installed sleeve to ensure:

1. Sleeve is in full contact with substrate, including cone section and manhole frame.
2. No cracks or holes in polyethylene backing.
3. No voids below sleeve.
4. Adhesive has flowed beyond sleeve edges.

B. Site Adhesion Testing: Peel tests.

1. Frequency of Test: 1 in every 100 sleeves.
2. Surface Temperature at Time of Test: $77 \pm 10^{\circ}\text{F}$ ($25 \pm 5^{\circ}\text{C}$), unless environmental conditions will not allow and continuation of test is approved by the Engineer.
3. Peel Rate: 4 inches /minute (100 mm/min).
4. Perform testing using hand peel gauge on 1-inch (25-mm) wide strip.
5. Cut strip and induce initial failure by undercutting and peeling back strip until 2-inch (50-mm) flap is created.
6. Attach clamp to strip and hand peel gauge to clamp and peel back at a 90° angle to surface at specified peel rate.
7. Passing Minimum Peel Strength: 8.6 pli (15 N/cm) with cohesive failure of adhesive.

3.5 BACKFILLING AND PROTECTION

- A. Allow sleeve to cool for a minimum of 2 hours before backfilling manhole.
- B. Prevent damage to sleeve by backfilling with select backfill or material with no sharp stones or large particles, or protect sleeve with extruded polyethylene mesh or other suitable protective shield as approved by the Engineer.
- C. Backfill manhole as specified in Section 02225.

END OF SECTION

SECTION 02640
FIRE HYDRANTS AND VALVES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire Hydrants
- B. Water Valves
- C. Valve Boxes
- D. Insert Valves
- E. Air Release Valves
- F. Blow-offs
- G. Tapping Sleeves and Valves

1.2 REFERENCE STANDARDS

- A. American Water Works Association (AWWA):
 - C500 Gate Valves, 3" through 48", For Water and Other Liquids
 - C502 Dry-Barrel Fire Hydrants
 - C515 Reduced Wall Resilient Seated Gate Valves

1.3 SUBMITTALS

- A. Submit manufacturer's certification attesting that valves, hydrants, and accessories meet or exceed AWWA Standards and specification requirements.
- B. Submit manufacturer's latest published literature including illustrations, installation instructions, maintenance instructions and parts lists.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver handle and store products under provisions of Section 01600.
- B. Prepare valves, hydrants and accessories for shipment according to AWWA Standards and:
 - 1. Seal valve, hydrant and meter ends to prevent entry of foreign matter into product body.
 - 2. Box, crate, completely enclose, and protect products from accumulations of foreign matter.

PART 2 PRODUCTS

2.1 FIRE HYDRANTS

- A. Dry-barrel break-away type conforming to AWWA C502.
 - 1. Bury depth: 4'-6", or as indicated on the drawings.

2. Inlet Connection: 6" mechanical joint.
3. Valve Opening: 5-1/4".
4. Corrosion resistant bolts and nuts.
5. One pumper, two hose nozzles.
 - a. Attach AWWA standard nozzle caps by separate chains.
 - b. Threads – Berks/Reading.
 - c. STORZ Adapter for pumper nozzle w/NST.
6. All internal parts shall be removable without digging.
7. Internal check valve to resist contamination.

2.2 HYDRANT MANUFACTURERS

- A. Darling 5-1/4" B62-B

2.3 GATE VALVES

- A. All gate valves shall have a design pressure of 200 psig for valves 12" in diameter and smaller and 150 psig for 16" and larger.
- B. Resilient Seated
 1. AWWA 515, Ductile Iron
 2. Single disc resilient seated.
 3. Nonrising stem, O-ring stem seal.
 4. Mechanical Joint end.
 5. Worm gear manual actuators, sealed and permanently lubricated. Buried type with 2" square operating nut; stem extension and valve box for buried valves; open counterclockwise unless otherwise indicated.

2.4 VALVE MANUFACTURERS

- A. American Valve and Hydrant
- B. Smith Valve and Hydrant Co.
- C. Mueller Co.
- D. Substitutions under the provisions of Section 01600.

2.5 VALVE BOXES

- A. 12" valves and smaller:
 1. Domestic cast iron, two-piece, screw type.

- B. Valves larger than 12":
 - 1. Domestic cast iron, three-piece, screw type.
 - 2. Round base.

- C. Cast iron lid with the word "WATER" cast in

2.6 INSERT VALVES

- A. Ductile iron, resilient wedge design, 250 psi rating.
- B. Conforms to AWWA C-515 Specifications.
- C. Manufacturers – The Team Insert Valve or approved equal.

2.7 AIR RELEASE VALVES

- A. Cast iron body and cover; stainless steel float, orifice seat, linkage mechanism, mountings and trim. Buna-N orifice valve.
 - 1. Valve orifice designed for maximum venting capacity under normal main pressure.
 - 2. 150 psi minimum rated working pressure; hydrostatically tested to 2 times rated working pressure.

2.8 MANUFACTURERS

- A. Val-Matic Valve and Manufacturing Co.
- B. APCO Valve and Primer Co.
- C. Substitution under provision of Section 01600.

2.9 TAPPING SLEEVES AND VALVES

- A. Inlet ends of tapping valves and sleeves shall have a Class 125 flange for attaching to the sleeve.
- B. Outlet of the valve shall have a mechanical joint end.
- C. Sleeves shall be made in two halves and designed for 150 psi working pressure.

PART 3 EXECUTION

3.1 GENERAL

- A. Determine the exact location and size of valves and hydrants from the Contract Documents. Obtain all necessary clarification and directions from the OWNER or ENGINEER prior to the execution of work.
- B. Perform trench excavation, backfilling and compaction in accordance with Section 02225.
- C. Install water mains and fittings in accordance with Section 02660 and the Drawings.

3.2 FIRE HYDRANTS

- A. Install fire hydrants as shown on the Drawings. Provide support blocking and drainage gravel as shown.
 - 1. Set hydrants plumb with pumper nozzle facing the curb.
 - 2. Set hydrants with nozzles at least 12 inches above the ground and the safety flange not more than 6 inches nor less than 2 inches above grade.
 - 3. Contractor shall provide hydrant barrel extensions as required.
 - 4. Do not block drain hole.
 - 5. Paint hydrants with two coats of Pennsbury - Hydrant Hide. Color to be selected by OWNER/ENGINEER from standard color chart.
 - 6. Furnish one unopened gallon of paint for each fire hydrant to the OWNER on completion of the work.
- B. After hydrostatic testing flush hydrants and check for proper drainage.

3.3 GATE VALVES

- A. Install valves in conjunction with pipe laying. Set valves plumb.
- B. Provide buried valves with valve boxes installed flush with finished grade.
- C. Furnish a minimum of six tee wrenches to the OWNER for valves.

3.4 AIR RELEASE VALVES

- A. Install air release valves at the high points of water mains where shown on the Drawings.
- B. Construct air release valves including valve vault as shown on the Drawings.
- C. Install air release valves in valve vault.
- D. Provide clamp where needed.
- E. Set air release valves plumb.

3.5 BLOW-OFFS

- A. Install a blow-off on the dead ends of all water mains and where shown on the Drawings.
- B. Construct blow-offs as shown on the Drawings.

END OF SECTION

SECTION 02660

WATER MAINS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water Transmission Lines and Fittings
- B. Water Distribution Lines and Fittings

1.2 REFERENCE STANDARDS

- A. American Water Works Association (AWWA):
 - C104 Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water (ANSI A21.4)
 - C110 Ductile Iron Fittings 3-inch through 48-inches (ANSI A21.10)
 - C111 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings (ANSI A21.11)
 - C151 Ductile Iron Pipe for Water or Other Liquids (ANSI A21.51)
 - C50 Resilient Seated Gate Valves
 - C600 Ductile Iron Pipe

1.3 SUBMITTALS

- A. Submit manufacturers' catalog information for each type of pipe, fittings, couplings, adapters, gaskets and assembly of joints for approval of the Engineer. Include manufacturer's recommendations for deflection in pipe joints.
- B. Submit certifications for each type of pipe, fittings, gaskets, lubricants or other joint materials from the manufacturers attesting that each of these meets or exceeds specifications requirements.
- C. Submit shop Drawings for joint assemblies and one sample each type of jointing materials.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, handle and store products under Provisions of Section 01600.
- B. Do not place materials on private property without written permission from the property Owner.
- C. Pipe may be strung along alignment were approved by the ENGINEER.
- D. Do not stack higher than Maximum Stacking Heights shown in AWWA C600 or as recommended by the pipe manufacturer.
- E. Keep interior of pipe and fittings free from dirt or other foreign matter.

- F. Store gaskets for mechanical and push-on joints in cool location out of direct sunlight and not in contact with petroleum products.

PART 2 PRODUCTS

2.1 PIPE, FITTINGS AND JOINTS

A. Ductile Iron Pipe (DIP):

1. Ductile Iron Pipe: AWWA C151

- a. Cement Mortar Lined in accordance with AWWA C104.
- b. Minimum Class 52, unless noted otherwise on the Drawings.
- c. Push-on joint type with rubber gasket conforming to AWWA C111.
- d. Cement lined and coated outside with a bituminous seal coat in accordance with AWWA C104.

2. Ductile Iron Fittings: AWWA C110

- a. Cement Mortar Lined in accordance with AWWA C104.
- b. Pressure Rating: As shown

Ductile iron shall be in accordance with ASTM-A536 with minimum physical qualities of 70,000 psi tensile strength, 50,000 psi yield strength, and five (5%) percent elongation.

Nominal thickness of the fittings shall be equal to Class 54 ductile iron pipe as specified in AWWA C151/ANSI A21.51. Fittings shall have cement-mortar lining and seal coating in accordance with AWWA C104/ANSI A21.4 and shall be mechanical joint in accordance with ANSI/AWWA C111/A21.11. Utilizing restrained joint glands as noted below.

- c. Transition couplings shall be as manufactured by Rockwell or Dresser Company.

3. Joints:

- a. Mechanical or Push-on Joints conforming with AWWA C111 for buried pipe.
- b. Flanged joints conforming with AWWA C110 and AWWA C115 for exposed pipe.
- c. Restrained Joints shall be EBAA Iron Sales, Inc. Megalug type or approved equal for all fittings. Restrained joints shall be U.S. Pipe Field Lok type or approved equal for water piping. (See 3.3G)

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavate trenches as specified in Section 02225. Provide at least 4 ft. of cover from the top of the pipe to the finished grade elevation.

3.2 PIPE BEDDING

- A. Provide bedding for pipelines only as shown on the Drawings and as specified in Section 02225.
- B. Shape recesses for the joints or bell of the pipe by hand. Assure that the pipe is supported on the lower quadrant for the entire length of the barrel.

3.3 PIPE LAYING

- A. Clean and inspect each length of pipe or each fitting with the ENGINEER before lowering it into the trench. Remove all rejected pipe from the site.
- B. Lay pipe to a uniform line and grade with the barrel of the pipe resting solidly throughout its length. Excavate recesses to accommodate joints, fittings, and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- C. Lay each section of pipe in such a manner as to form a close concentric joint with adjoining section and to avoid offsets.
- D. Lubricate pipe and gaskets as recommended by the manufacturer. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement.
- E. Check each pipe installed as to line and grade in place. Correct deviations immediately. Deflection of pipe joints in excess of maximum recommended by manufacturer will be cause for rejection.
- F. Install fittings and valves as pipe laying progresses. Do not support weight of fittings and valves from pipe.
- G. Install Field Lok gaskets in all joints within 40 linear feet of all mechanical joint fittings and within any casing pipe or stream crossing.
- H. When the work is not in progress, and at the end of each work day, securely plug the ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.
- I. Backfill concurrently with pipe laying to hold installed pipe in place. When pipe laying is terminated for any reason, provide at least 2 feet of backfill over all pipe except the last piece laid.

J. Joint Assembly:

1. Push-on Joints:

- a. Clean the inside of the bell and the outside of the spigot. Insert rubber gasket into the bell recess.
- b. Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe, or both.
- c. Insert the spigot end of the pipe into the socket using care to keep the joint from contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket. Mark pipe that is not furnished with a depth mark before assembly to assure that the spigot is fully inserted.

2. Mechanical Joints:

- a. Clean the socket and plain end. Apply a thin film of lubricant. Slip the gland and gasket over the plain end of the pipe. Apply lubricant to gasket.
- b. Insert the plain end of the pipe into the socket and seat the gasket evenly in the socket.
- c. Slide the gland into position, insert bolts, and finger-tighten nuts.
- d. Bring bolts to uniform tightness. Tighten bolts 180-degree apart alternately.
- e. Coat all bolts and nuts with bitumastic paint after installation.

3. Coupled Joints: In accordance with manufacturer's recommendations.

3.4 CUTTING

- A. Cut pipe without damaging pipe or lining.
- B. Grind cut ends and rough edges smooth. Bevel end for push-on joints.

3.5 DEFLECTION

- A. When it is necessary to deflect water mains from a straight alignment horizontally or vertically, do not exceed limits set by manufacturer.

3.6 THRUST RESTRAINT

- A. Provide all valves, tees, bends, caps, and plugs with concrete thrust blocks as indicated on the Drawings or restrained pipe joints.

Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks to contain the resultant force and so pipe and fitting joints will be accessible for repair.

- B. Furnish and install, tie rods, clamps, set screw retainer glands, or restrained joints as indicated on the Drawings. Protect metal restrained joint components against corrosion by

applying a bituminous coating, encasing the entire assembly with an 8-mil thick polyethylene wrap in accordance with AWWA C105, or by concrete mortar encasement of metal area.

- C. Provide a minimum of forty feet (40') of restrained pipe on each side of a restrained valve or fitting.

3.7 CAST-IN-PLACE CONCRETE CONSTRUCTION

All concrete shall be in accordance with Section 03303 and Drawings.

3.8 SPECIAL CONDITIONS

A. Connections

1. Wherever an existing water main is to be cut and closed, or extended or connected to the proposed new lines, construct connections as shown on the Drawings.
2. For connecting pipe of different materials, use transition fittings as recommended by the manufacturer and approved by the ENGINEER.

B. Stream Crossings:

1. Install water mains crossing streams as shown on the Drawing.

C. Highway and Railroad Crossings:

1. Install water mains crossing highways and railroads as shown on Contract Drawings. Comply with Railroad Company, Pennsylvania Department of Transportation, and municipal permits included in the Contract Specifications.
2. When casing pipe is indicated, install it as specified in Section 2150 - Boring, Jacking, Tunneling.

D. Bridge or Aerial Crossings:

1. For above the ground water mains attached to a bridge or other structural supports, furnish and install all supports, hangers and fastenings as shown on the Drawings.
2. Provide insulation and jacket and heat tracing as shown.

D. Wall Sleeves:

1. Provide pipes passing through concrete or masonry construction with sleeve or wall pipe fittings of type and size indicated.
2. Provide sleeves two pipe sizes larger than the water mains, unless otherwise specified or shown.

3.9 COMPLETION

- A. Test and disinfect water mains as specified in Section 02675.

3.10 INTERRUPTION OF WATER SERVICE

During the course of the WORK, it may be necessary or advantageous to temporarily interrupt service to a customer or group of customers. If the CONTRACTOR wishes to interrupt service, approval of the ENGINEER/OWNER shall be obtained at least forty-eight (48) hours prior to such interruption of service; and it shall be the responsibility of the CONTRACTOR to notify all customers, whose service will be interrupted, at least twenty-four (24) hours prior to such interruption of service. In all instances, the duration of interruption of service shall be kept to a minimum.

END OF SECTION

SECTION 02661

WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tapping water mains by installation of corporation stops or other suitable fittings or couplings.
- B. Connection of service pipe and fittings up to curb stops and meter boxes.
- C. Installation of meter setting equipment.

1.2 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI):
 - B16.3 Malleable-Iron Screwed Fittings, 150 and 300 lb.
- B. American Society for Testing and Materials (ASTM):
 - A120 Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses
 - B43 Specification for Seamless Red Brass Pipe, Standard Sizes
 - B62 Specification for Composition Bronze or Ounce metal Castings
 - B88 Specification for Seamless Copper Water tube

1.3 SUBMITTALS

- A. Manufacturer's catalog for each size and type of Corporation Stop, Curb Stop, Curb Box, Meter Setting and pipe, fitting or coupling.
- B. Certificate for pipe, pipe fittings, joints, joint gaskets and lubricants and base materials from each manufacturer attesting that each of these meets or exceeds specification requirements.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle and protect products under provision at Section 01600.

PART 2 PRODUCTS

2.1 PIPE OR TUBING AND FITTINGS

- B. Copper Water Tubing:
 - 1. ASTM B88, Type K, Seamless, heavy wall, soft temper

2. Fittings: Compression Type only.

2.2 CONNECTIONS

A. General:

1. Provide pipe joints and coupling materials suitable in size, design and material of pipe and service fittings with which it is used.
2. The CONTRACTOR shall have available coupling and service line adapters of all types and sizes needed to connect to the property owner's water service.

B. Screwed Joints:

1. Use sharp cut threads of standard gauge and length. After threading, ream all pipe ends to the size of bore and clean out all chips. Sufficient quantity of select pipe dope or graphite and oil shall be used for lubrication of assembly.

2.3 TAPPING ACCESSORIES

A. 1" through 2" Services

1. Service saddles
 - a. Ductile iron body, stainless steel bales and straps, single or double strap, blue shopcoat enamel coating.
 - b. Acceptable Manufacturers
 - i. Smith-Blair, Inc. No. 315 or No. 317.
 - ii. Substitutions in accordance with Section 01600.

B. 3" and larger services

1. Tapping Sleeves:
 - a. Mechanical Joint, or as indicated on the drawings
 - b. 200 psi working pressure
 - c. Outlet Flange: ANSI B16.1, Class 125
2. Tapping Valves:
 - a. Ductile iron body and bonnet, bronze mounted conforming to AWWA C509
 - b. Resilient seated
 - c. Non-rising stem, o-ring stem seals
 - d. 250 psi working pressure

2.4 CORPORATION STOP ASSEMBLY

A. Corporation Stops:

1. Manufacturers: Mueller, Ford.
2. Brass or Red Brass alloy body conforming to ASTM B62.
3. Inlet end threaded for tapping according to AWWA C800.
3. Outlet end suitable for service pipe specified.
4. Shall comply with Section 1417 of the Safe Drinking Water Act (SDA) for low lead brass requirements.

B. Service Clamps:

1. Galvanized Iron or Bronze body.
2. Neoprene, O-ring gasket.
3. Single or Double Straps with matching hardware.

2.5 CURB STOP ASSEMBLY

A. Curb Stops:

1. Manufacturers: Mueller, Ford.
2. Brass or Red Brass alloy body conforming to ASTM B62
3. Plug Type Valve
4. Positive Pressure Sealing
5. Shall comply with Section 1417 of the Safe Drinking Water Act (SDA) for low lead brass requirements.

B. Curb Boxes and Covers:

1. Manufacturers: Mueller, Ford.
2. Cast Iron body, Extension Type or Buffalo Type
3. Minneapolis or Arch Pattern Base
4. Provide optional foot piece for stability.
5. Lid with inscription "WATER", with Pentagon Plug

2.6 METER SETTING EQUIPMENT

A. Meter Yokes, Copper or Iron

- B. Inlet and Outlet Horizontal/Vertical setting with matching couplings, fittings and stops.

PART 3 EXECUTION

3.1 PREPARATION

- A. Establish location of curb stops and meter boxes for each service connection.
- B. Excavate trench to the line and grade shown on the Contract Drawings. Jack or bore service lines underneath paved highways where approved by the ENGINEER.

3.2 TAPPING WATER MAINS

- A. Each connection for different kinds of water mains shall be tapped using suitable materials, equipment and methods approved by the ENGINEER/OWNER. Service connections shall include a corporation stop, curb stop and box with interconnecting service tubing.
- B. Screw Corporation Stops directly into a tapped and threaded iron main at 10 or 2 o'clock positions on the main's circumference. Place a double wrap of 3 mil Teflon tape on each corporation stop. Locate corporation stops at least 12" apart longitudinally and staggered.
- C. Use proper seals or other devices to ensure that no leaks are left in the water mains at the points of tapping. Do not backfill and cover the service connection until approved by the ENGINEER/OWNER.

3.3 SERVICE LINE AND FITTINGS

- A. Use bends to connect the service pipe or tubing to the tapping fitting or corporation stops to provide flexibility to counteract the effects of settlement or expansion/contraction in the line.
- B. Lay each section of the service line in a manner to form a tight joint with the adjoining section. Avoid offsets, kinks or awkward bends to ensure a smooth flow line.
- C. Clean and inspect each pipe and part of the fitting before installing and assemble to provide a flexible joint. Use joints or lubricants recommended by the manufacturer and as approved by the ENGINEER.
- D. Install service fittings and appurtenances on suitable brick or concrete supports. Do not use earth, rocks, wood or other organic materials as supports.
- E. Prevent displacement of pipes and fittings at the time of placing concrete for thrust blocks or for any structures and until initial setting of concrete is assured.
- F. Operate each corporation and curb stop before and after installation.
- G. When the work is not in progress and at the end of each work day, securely plug the ends of pipe and fittings to prevent any dirt or foreign substances from entering the lines.
- H. Provide concrete thrust blocking or restrained joints at all bends, tees and changes in direction.
- I. Provide all pipes passing through concrete or masonry construction with wall sleeves of the type and size indicated.

- J. Test and disinfect mains and service lines as specified in Section 02675.

END OF SECTION

SECTION 02675

TESTING AND DISINFECTING WATER MAINS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing Water Main Pipeline:
 - 1. Hydrostatic pressure testing
 - 2. Leakage testing
- B. Disinfecting:
 - 1. Bacteriological testing

1.2 QUALITY ASSURANCE

- A. Bacteriological testing shall be performed by a testing laboratory engaged and paid for by the CONTRACTOR and approved by the ENGINEER/OWNER.
- B. No test will be accepted until the results are below the specified maximum limits.
- C. The CONTRACTOR shall, at his own expense, determine and correct the sources of leakage and retest until successful test results are achieved.

1.3 REFERENCE STANDARDS

- A. American Water Works Association (AWWA):
 - C600 Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances, Section 4
 - C651 Standard for Disinfecting Water Mains

1.4 SUBMITTALS

- A. Submit a testing sequence schedule including a list of testing equipment to be used.
- B. Submit, prior to starting testing, certification attesting that the pressure gauges to be used have been calibrated and are accurate to the degree specified.
- C. Submit disinfection report containing the following information:
 - 1. Type and form of disinfectant used
 - 2. Date and time of disinfectant injection start and time of completion
 - 3. Test locations
 - 4. Initial and 24-hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
 - 5. Date and time of flushing start and completion
 - 6. Disinfectant residual in ppm after flushing for each outlet tested
 - 7. Method of disposal for finished chlorine station.

- D. Submit bacteriological report containing the following information:
1. Date issued, project name, and testing laboratory name, address, and telephone number
 2. Time and date of water sample collection
 3. Name of person collecting samples
 4. Test locations
 5. Initial and 24-hour disinfectant residuals in ppm for each outlet tested
 6. Coliform bacteria test results for each outlet tested. Attach a copy of laboratory test results
 7. Certification that water conforms, or fails to conform, to bacteriological standards of Pennsylvania DEP.

PART 2 PRODUCTS

2.1 HYDROSTATIC TEST EQUIPMENT

Hydro pump
Pressure hose
Test connections
Water meter
Pressure gauge, calibrated to 0.1 lbs/sq. in.
Pressure relief valve

2.2 DISINFECTING CHEMICALS

- A. Liquid chlorine, calcium hypochlorite, or sodium hypochlorite conforming to AWWA Standards B300 and B301.

PART 3 EXECUTION

3.1 PREPARATION

- A. Backfill trenches in accordance with Section 02225.
- B. Provide the water line under test with reaction thrust blocking. Hydrostatic testing shall not begin until at least seven (7) days after the concrete thrust blocking is placed.
- C. Provide pumps, piping, tanks, connections, polyurethane plugs, and appurtenances at no additional expense to the OWNER. The OWNER will provide the necessary water.

3.2 TESTING WATER LINES

- A. Hydrostatic Testing:
1. Test each newly installed section of water line by hydrostatic test procedure in accordance with the recommended practice established by AWWA, Standard C600, Section 4.
 2. Conduct pressure tests for a period of not less than thirty (30) minutes at a pressure of not less than 1.5 times the working pressure based upon the elevation of the lowest point in line under test corrected to the elevation of the test gauge, or 150 psi, whichever is more. Obtain test pressure from the ENGINEER.
 3. Slowly fill the section to be tested with water, expelling air from the pipeline at the high points. Install corporation stops at high points if necessary. After all air is

expelled, close air vents and corporation stops and raise the pressure to the specified test pressure. Maintain the test pressure for four hours for covered pipes or one hour for exposed pipes.

B. LEAKAGE TESTS

1. A leakage test shall be conducted concurrently with the pressure test. The CONTRACTOR will furnish laboratory calibrated test gauge and measuring device, and all necessary assistance to conduct the test.
 - a. Leakage Definition: Leakage is defined as the quantity of water that must be supplied into the newly laid pipe, and any section thereof, to maintain pressure within five (5) psi of leakage test pressure after the pipe has been filled with water and the air expelled.
 - b. Permitted Leakage: No pipe installed will be accepted until the leakage is less than ten (10) gallons per day per inch of pipe diameter per mile of pipe.
 - (1) The ENGINEER will record both the make-up water and pressure at one-half hour intervals during the test period.
 - (2) Should any test of pipe disclose leakage greater than that specified, the CONTRACTOR shall, at his own expense, locate, repair and replace the defective joints, pipe, or fittings until the leakage is within the specified allowance.
3. Common Requirements:
 - a. ENGINEER Presence: The ENGINEER shall monitor the pressure and leakage tests. The CONTRACTOR shall notify the ENGINEER of the test day at least forty-eight (48) hours in advance.
 - b. The ENGINEER shall be present during the operating of valves required to fill main for pressure and leakage tests.
 - c. If test fails to meet test requirements, the CONTRACTOR shall pay for all additional engineering personnel testing time.
 - d. Hydrants: When hydrants are in the test section, the test shall be made against the closed hydrant.
 - e. Acceptance: Observation of successful testing of water mains or services by the ENGINEER does not constitute acceptance of the system or any portion thereof. Upon completion of any determined portion of a total system, and successful testing thereof, the ENGINEER may recommend final acceptance by the Owner.

3.3 DISINFECTION

A. General:

1. After completion of satisfactory pressure and leakage testing, disinfect the water pipelines in accordance with the recommended practice established in AWWA Standard C651. Conduct water line disinfection in the following steps:
 - a. Preliminary flushing
 - b. Chlorine application
 - c. Final flushing
 - d. Bacteriologic tests

- B. During construction, place calcium hypochlorite granules at the upstream end of the first section of pipe, at the upstream end of each branch main, and at five hundred foot (500') intervals. Refer to AWWA C651 for quantity of granule to be used.

WARNING: This procedure must not be used on solvent welded plastic pipe or in screwed joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

C. Preliminary Flushing:

1. Prior to disinfection, except when the tablet method is used, fill the line to eliminate air pockets and flush the line at a rate of flow of 2.5 feet per second (fps) to remove particulates. Refer to AWWA C651 for rate of flow to produce 2.5 fps in pipe of various sizes.
2. Dispose of flushing water.

D. Chlorine Form:

1. The chlorine form to be applied to the system shall be either chlorine gas solution, calcium hypochlorite or sodium hypochlorite. The ENGINEER's written approval of the chlorine form to be used is required.

E. Chlorine Application:

1. Continuous Feed Method:

- a. The continuous feed method consists of completely filling the main to remove air pockets, flushing to remove particulates, and filling the main with potable water chlorinated so that after a 24-hour holding period in the main there will be a free chlorine residual of not less than ten (10) mg/l.
- b. Feed water and chlorine to the line at a constant rate such that the water will have not less than twenty-five (25) mg/l free chlorine. Chlorine application shall not cease until the entire line is filled with heavily chlorinated water.
- c. During chlorine application, take precautionary measures to prevent the concentrated treatment solution from flowing back into the existing distribution system and/or supply source.

2. Tablet Method:

- a. The tablet method consists of placing calcium hypochlorite granules and tablets in the water main as it is being installed and then filling the main with potable water when installation is completed.

NOTE: Since the preliminary flushing step must be eliminated, this method may be used only when scrupulous cleanliness has been exercised and only with approval of the ENGINEER. It shall not be used if trench water or foreign material has entered the main, or if the water temperature is below 41° F.

- b. During construction, place sufficient number of five (5) g calcium hypochlorite tablets in each section of pipe, in hydrants, hydrant branches, and other appurtenances to obtain a minimum of twenty-five (25) mg/l available chlorine. Attach tablets to the crown of pipe sections with adhesive. Apply adhesive only to the broad side of the tablet next to the pipe surface. Refer to AWWA C651 for the proper number of five (5) g calcium hypochlorite tablets required.
- c. When pipeline installation is completed, fill the main with water at a maximum velocity of one foot per second. This water shall remain in the pipe for at least twenty-four (24) hours. Manipulate valves so that the chlorine solution does not flow back into the line supplying the water.

3. During the twenty-four (24) hour treatment, operate all valves, curb stops, and hydrants in the section treated.
4. At the completion of the twenty-four (24) hour treatment, the treated water in all portions of the main shall have a residual of not less than ten (10) mg/l free chlorine.
5. Repeat the disinfection process until the minimum available chlorine is present at the end of the treatment sequence. The tablet method cannot be used in these subsequent disinfections. No additional compensation will be provided the CONTRACTOR for repeat treatment or testing.

F. Final Flushing:

1. Flush the heavily chlorinated water from the system under treatment until the chlorine concentration in the water leaving the system is no higher than that generally prevailing in the system or is acceptable for domestic use.
2. Comply with Federal, State and local laws when discharging the flushed chlorine solution

G. Bacteriological Testing:

1. After final flushing is completed and before the water main is placed in service, test the line for bacteriologic quality. Perform two (2) tests twenty-four (24) hours apart.
2. Collect a minimum of one (1) sample at the end of each line for each test, and one (1) sample of the incoming water from the existing water system for comparison.
3. Collect samples in sterile bottles treated with sodium thiosulfate.

4. Sampling tap shall consist of corporation stop installed in the main with copper tube gooseneck assembly. No hose or fire hydrant shall be used to collect samples.
5. Provide bacteriological test reports to the OWNER and the ENGINEER. Failure to meet State health standard requirements will be cause for the CONTRACTOR to rechlorinate and retest the system.

END OF SECTION

SECTION 02730
SANITARY SEWER PIPE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sanitary sewer gravity pipelines
- B. Sanitary sewer pressure pipelines
- C. Laterals/service connections

1.2 REFERENCE STANDARDS

- A. ANSI A21.4 Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings.
- B. ANSI A21.11 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
- C. ANSI A21.51 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for water or other liquids
- D. ASTM A53 Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless
- E. ASTM A74 Specification for Cast Iron Soil Pipe and Fittings
- F. ASTM A746-09 Specification for Ductile Iron Gravity Sewer Pipe
- G. ASTM C14 Specification for Concrete Sewer, Storm Drain and Culvert Pipe
- H. ASTM C76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- I. ASTM C443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets
- J. ASTM C564 Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
- K. ASTM D1785 Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- L. ASTM D2241 Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe for (SDR-PR)
- M. ASTM D2321 Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe
- N. ASTM D2464 Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- O. ASTM D2466 Specification for Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
- P. ASTM D2729 Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

Q.	ASTM D2751	Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
R.	ASTM D2737	Specification for Polyethylene (PE) Plastic Tubing
S.	ASTM D2751	Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
T.	ASTM D2855	Standard Practice for Making Solvent Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
U.		
V.	ASTM D3033	Specification for Type PSP Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
W.	ASTM D3034	Specification for Type PMS Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
X.	ASTM D3139	Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
Y.	ASTM D3212	Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
Z.	ASTM D3350	Specifications for Polyethylene Plastic Pipe and Fittings
AA.	ASTM F477	Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
BB.	ASTM F679	Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
CC.	ASTM F789	Specification for type PS-46 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings
DD.	Fed Spec	HH-P-117 - Packing, Jute, Twisted
EE.	AWWA C301	Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids
FF.	AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 Inch through 12 Inch for water and other liquids.
GG.	AWWA C901	Polyethylene (PE) Pressure Pipe and Tubing, ½ in (13 mm) through 3 in (76 mm)
HH.	AWWA C905	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 Inch through 48 Inch for water and other liquids.
II.	AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 in through 63 inch

1.3 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe prior to subsequent backfill operations.

1.4 SUBMITTALS

- A. Manufacturer's Certificates: Certify that pipe, pipe fittings, joints, gaskets, lubricants and accessories meet or exceed specification requirements.
- B. Manufacturer's catalog cut for each size and type of curb stop, curb box, check valve and pipe, fitting or coupling.
- C. Butt fusion equipment manufacturer's literature. Equipment shall contain mechanisms to prevent excessive pressure during the fusion process.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01700.
- B. Record location of pipe runs, connections, manholes, cleanout, chambers, laterals and invert elevations.
- C. Identify and describe unexpected or unusual variations in subsoil conditions.
- D. Record location and type of service of other underground utilities, where encountered.

1.6 QUALITY ASSURANCE

- A. Source Quality Control: Supplier shall certify all materials are in accordance with project specifications.
- B. Codes: Conform to all local codes and government standards for materials and installation as applicable.
- C. Defective Materials: Reject materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinners or acid solder. Reject materials having cracks, flaws, or other defects whenever identified, before, during, or after installation. Remove all rejected materials promptly from site.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, handle and store products under provisions of Section 01600.
- B. Do not place materials on private property without written permission of the property owner.
- C. During loading, transporting and unloading, exercise care to prevent damage to materials.
- D. Do not drop pipe or fittings. Avoid shock or damage at all times.
- E. Take measures to prevent damage to the exterior surface or internal lining of the pipe.
- F. Pipe may be strung along alignment where approved by the ENGINEER/OWNER.
- G. Do not stack pipe higher than recommended by the pipe manufacturer.
- H. Store gaskets for mechanical and push-on joints in a cool, dry location out of direct sunlight and not in contact with petroleum products.

PART 2 PRODUCTS

2.1 GENERAL

- A. Pipe thickness and classifications listed are minimum regardless of installation conditions. Pipe thickness and classification must be increased as required by actual trench load conditions.

2.2 DUCTILE IRON PIPE

- A. Pipe: ANSI A21.51, minimum thickness Class 50, with push-on type joints with rubber gaskets. For stream crossings, minimum thickness is Class 54. For Railway crossings, minimum thickness is Class 56.
- B. Fittings: Ductile iron, mechanical joint type complying with ANSI A21.10.
- C. Coating: all ductile iron pipe and fittings shall be coated outside only with a bituminous seal coat in accordance with ANSI A21.51. Provide 8 mil polyethylene encasement at direction of Engineer in areas of corrosive soil or cathodic protection.
- D. Rubber gaskets, Lubricants, Glands, Bolts and nuts: ANSI A21.11
- E. Field Lok gaskets are required at all stream crossings, borings, and railway crossings.
- F. Lining (Inside)
 - 1. Pipe: Protecto 401 Ceramic Epoxy Lining 40 mils nominal dry film thickness or approved equal.
 - 2. Bell Sockets and Spigot Ends: 6 mils nominal, 10 mils maximum Protecto Joint Compound on bell interior and spigot exterior up to 6 inches back from end of the spigot end, or approved equal.

2.3 POLYVINYLCHLORIDE (PVC) SEWER PIPE

- A. Gravity Sewer Pipe and Fittings;
 - 1. Pipe 15" diameter and smaller: ASTM D3033 or ASTM D3034, SDR-35 or Type PS-46, ASTM F789.
 - 2. Pipe 18" to 27" diameter: ASTM F679.
 - 3. Joints: Push-on type, integral bell with elastomeric gasket, ASTM D3212 and ASTM F477.
- B. Pressure Sewer Pipe and Fittings;
 - 1. Pressure-Rated Pipe:
 - a. AWWA C900, PVC pressure rated pipe SDR-21 (200 psi) with cast iron equivalent O.D. and integral bell and gaskets ASTM D2241 and ASTM F477.
 - 2. Joints: Push-on type, flexible elastomeric seal ASTM D3139, material ASTM

F477. Use thrust blocking or approved equivalent restraint for all changes in alignment, valves, tees, caps and plugs.

3. Fittings: Mechanical joint-type, conforming to ANSI A21.10 and A21.11, coat inside and out with bituminous seal coat.
4. Appurtenances
 - a. Cleanouts: Schedule 80 PVC pipe, fittings, couplings and transition gaskets. Installed as shown on the drawings. Threaded brass pipe plug with raised operating nut.
 - b. Air Release Valves: Installed to prevent air binding. Assembly includes manhole or concrete vault air release valve, tapping saddle, shutoff valve, piping, fittings, couplings and transition gaskets.

2.4 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

- A. Dimension Ratio DR11, iron pipe size, pipe diameter as noted on the drawings with corresponding operating pressure of 160 psi, unless noted otherwise.
- B. Pipe shall be PPI PE 3408/ASTM PE 3608 high density polyethylene pipe meeting the requirements of ASTM D3350 listed and approved for potable water in accordance with NSF 61. Pipe shall be color coded for sanitary sewer with three equally spaced pairs of longitudinal green color stripes extruded into the pipe outside diameter. The pipe shall be capable of withstanding pulling pressures/loads.
- C. The pulling head shall be a special fabrication designed to withstand the continuous tensile pull stresses with intermittent sudden occasional surges. The design and fabrication of the pull head shall be the sole responsibility of the Contractor and his pipe installer.
- D. Acceptable manufacturers include Plexco, Driscopipe, CSR PolyPipe or approved equal.
- E. Fittings and Valves:
 - a. Butt fusion HDPE fittings shall be PE 3408/3608 in accordance with ASTM D3350 approved for potable water and manufactured in accordance with ASTM 3261 and ASTM F1055 with ends suitable for butt fusion unless otherwise specified. The fittings shall meet the requirement of AWWA C906.
 - b. Fittings shall be suitable for pressure conduits with a nominal burst value of 3.5 times the working pressure rating of the fitting.
 - c. Mechanical joint adapters shall be PE 3408/3608 as determined by ASTM 3350. Mechanical joint adapters shall be manufactured in accordance with ASTM 3261 Adapters shall have a pressure rating equal to the pipe unless otherwise noted.
 - d. Class 350 DIP mechanical fittings allowed. Contractor to supply joint restraint at all fittings and valves using EBAA Iron HDPE Joint Restraint, Series 2000PV, or approved equal. Joint restraint to include stainless steel internal pipe stiffener.
- F. Service connection
 - a. HDPE butt fused tee, as noted above.
- G. Joining
 - a. Butt Fusion

- 1) Sections of polyethylene pipe shall be joined by the butt fusion process into continuous lengths at the job site.
 - 2) The joining method shall be the heat fusion method and shall be performed in strict accordance with pipe manufacturer's recommendations.
 - 3) The heat fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer.
 - 4) The butt fusion joining will produce a joint with weld strength equal to or greater than the tensile strength of the pipe itself.
 - 5) No threaded or solvent welded/glued HOPE joints permitted.
- b. Mechanical Joint Couplings: Suitable for joining HOPE to DIP fittings and valves.
- 1) Use where the butt fusion method cannot be used, at the direction of the Engineer.
 - 2) Use suitably sized HDPE mechanical joint adapter with ductile iron back up ring.
 - a) Size stiffeners for size and OR of HDPE pipe being joined.
 - b) Supply a feature that prevents stiffener from sliding completely into pipe.
 - c) Size stiffeners for length of mechanical coupling and not to extend outside of body of mechanical coupling.
 - d) Mark stiffener with pipe diameter and DR.
 - e) Stiffeners to be stainless steel.
 - 3) Use seal and restraint type coupling. Requirements for type of couplings are specified herein:
 - a) Seal and restraint type mechanical couplings: restrain HDPE pipe at mechanical couplings using EBAA Iron HDPE Joint Restraint with stiffener or approved equal.
 - b) Size stiffeners for size and DR of HDPE pipe being joined.
 - c) Supply a feature that prevents stiffener from sliding completely into pipe.
 - d) Size stiffeners for length of mechanical coupling and not to extend outside of body of mechanical coupling.
 - e) Mark stiffener with pipe diameter and DR.
 - f) Stiffeners to be stainless steel.

2.5 AIR RELEASE VALVES

- A. Reinforced nylon body and cover; stainless steel spring, stem and washer, orifice seat, linkage mechanism, mountings and trim.
 - 1. Valve orifice designed for maximum venting capacity under normal main pressure.
 - 2. 150 psi minimum rated working pressure; hydrostatically tested 2 times rated working pressure.
- B. Manufacturers
 - 1. A.R.I. Flow Control Accessories, or approved equal.
 - 2. Substitution under provision of Section 01600.

2.6 STEEL CASING PIPE

- A. Pipe: ASTM A53; 35,000 psi minimum yield strength, asphalt coated.
 - 1. Wall thickness as indicated on the drawings.
- B. Joints: Electric resistance welded.

PART 3 EXECUTION

3.1 PREPARATION

- A. Gravity Pipe
 - 1. Perform trench excavation to the line and grade indicated on the Contract Drawings as specified in Section 02225.
 - 2. Unless otherwise indicated on the drawings, provide for a minimum cover of 4-feet above the top of piping laid in trenches.
 - 3. Provide pipe as specified in Section 02225 for all [gravity sewer pipe and for all PVC and ABS pipe.] Place aggregate in a manner to avoid segregation and compact to the maximum practical density so that the pipe can be laid to the required tolerances.
- B. Pressure Sewer
 - 1. Prepare horizontal direction drill access pits to the line and grade indicated on the Contract Drawings as specified in Section 02225.
- C. Perform trench excavation to the line and grade indicated on the Contract Drawings as specified in Section 02225.
- D. Unless otherwise indicated on the drawings, provide for a minimum cover of 4-feet above the top of piping laid in trenches.
- E. Provide pipe bedding as specified in Section 02225 for all sewer pipe. Place aggregate in a manner to avoid segregation, and compact to the maximum practical density so that the pipe can be laid to the required tolerances.

3.2 LAYING PIPE IN TRENCHES

- A. Give ample notice to the ENGINEER/OWNER in advance of pipe laying operations. Provide cut sheet (25 ft. maximum interval) for each manhole run.
- B. Maintain no less than three batter boards set at 25' maximum interval, or their equivalent between adjoining manholes during pipe laying operations, or use laser alignment instruments.
- C. Inspect each length of pipe before lowering into trench. Defects are cause for rejection. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe.
- D. Lay pipe proceeding up-grade with the bell or groove pointing upstream.
- E. Lay pipe to a true uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- F. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow lines.
- G. Clean and inspect each section of pipe before joining. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. Use lubricant recommended by the pipe manufacturer. If fitting resistance is encountered or if the pipe cannot be fully inserted into the bell, disassemble joint, inspect for damage, reclean joint components, and reassemble joint.
- H. Assemble joints in accordance with recommendations of the manufacturer.
- I. Disassemble and remake improperly assembled joints using a new gasket.
- J. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed grade as shown on the contract drawings, or deflection of pipe joints, will be cause for rejection.
- K. Place sufficient compacted backfill on each section of pipe, as it is laid, to hold firmly in place.
- L. Clean interior of the pipe as work progresses. Where cleaning after laying is difficult because of small pipe size, use a suitable swab or drag in the pipe and pull forward past each joint immediately after the jointing has been completed.
- M. Keep trenches and excavations free of water during construction.
- N. Under no condition shall pipe be laid in water or on subgrade containing frost, and no pipe shall be laid when trench conditions are unsuitable for such work. In all cases, water shall be kept out of the trench until concrete cradles or supports, where used, have hardened.
- O. There shall be no walking or working on the completed pipelines, except as may be necessary in tamping or backfilling, until the trench has been backfilled to a height of at least one (1) foot over the top of the pipe.

- P. Any pipe that has its grade or joint disturbed after laying shall be taken up and relaid. Any section of pipe already laid and found to be defective shall be taken up and replaced with new pipe without expense to the OWNER.
- Q. When the work is not in progress, and at the end of each work day, securely plug open ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.
- R. When it is necessary to deflect pressure sewer mains from a straight alignment horizontally or vertically, do not exceed the limits as recommended by the manufacturer.
- S. Pressure sewer pipe
 - a. When it is necessary to deflect pressure sewer mains from a straight alignment horizontally or vertically, do not exceed the limits as recommended by the manufacturer.
 - b. Placement.
 - 1) Clean each pipe and fitting of foreign substances before placing in trench and keep clean during jointing process.
 - i. Should foreign substances, harmful materials, or damaged pipe be observed in previously installed pipe, cease work until foreign material is removed or damaged pipe is removed and replaced.
 - 2) Close open ends of pipe and fittings with a watertight seal during periods when work is not in progress.
 - 3) Provide thrust blocks at bends, tees, caps, and plugs following Standard Details.
 - c. Install via Horizontal Directional Drilling, see Section 02446.
 - d. Install detectable warning tape and/or Tracer Wire following Standard Details and Section 02446.

3.3 WYE BRANCHES AND TEES

- A. Install wye branches or pipe tees at locations designated by the ENGINEER concurrent with pipe laying operations. Use standard fittings of the same material and joint type as the pipeline into which they are installed.
- B. For taps into an existing pipeline, use a saddle wye or tee with stainless steel clamps or core drill pipe and install watertight resilient boot. Mount saddles with solvent cement or gasket and secure with metal bands. Layout holes with a template and cut holes with a mechanical hole cutter.
- C. Cut joints shall be encased in concrete for a distance of twelve inches in each direction to a minimum thickness of 6 inches.

3.4. FITTINGS AND VALVES

- A. Install fittings and valves following Drawings.
 - 1. Inspect and operate valves to ensure proper working order prior to installation.

2. Set fittings and valves and join pipe as specified previously herein.
 3. Install modified cast-iron valve boxes at service valve assemblies and other valve locations following Standard Details.
- B. Installation: Set valve boxes at right angles to pipe, centered and plumb over valve operating nut with box cover flush with finished grade or otherwise as directed.
1. Support box to maintain nut in position for operation with extended tee wrench operator.
 2. Backfill and compact under and around valve boxes to ensure no vertical loads are transmitted to valves or pipe.
 3. Set pipe and fittings in arch openings of lower box section so that no part of box bears on pipe, fittings, and valves.
 4. Where valve box is located within new subdivision or in area where surface is scheduled to be improved, provide marker stake consisting of a piece of 2 inch by 4 inch lumber a minimum of 5 feet long adjunct to valve box with approximately 3 feet extended above ground.
 - a. Paint entire length of marker stake green.

3.5 LATERALS

- A. Construct laterals from the wye branch to a terminal point as designated and as shown on the Drawings.
- B. Where the depth of the main pipeline warrants, construct riser type laterals from the wye branch as shown on the Drawings. The determination as to the type of riser, slope, and depth of lateral pipe at the termination point will be made by the ENGINEER in the field.
- C. Install an approved watertight plug, braced to withstand pipeline test pressure thrust, at the termination of the lateral. Install testing port per standard detail and connect to the existing sanitary sewer lateral as shown on the Drawings.
- D. Submit to the ENGINEER, on a monthly basis, all as-built information which shall include: manhole run, station, length from centerline of sewer, invert elevation at the termination point of lateral and the address or property owner's name for whom the lateral is provided.
- E. Wherever a stone, brick or concrete sidewalk or curb exists, service connections, which are plugged at the curb, shall be evidenced by a cut mark in the form of an arrow. Wherever there are no sidewalks or curbs, service connections which are plugged at the curb or property line, shall be evidenced by a metal or treated wooden marker placed across the end of the pipe, and not less than six inches (6") below the pipe, and extending vertically to twenty-four (24") inches above the finished grade. The top one (1) foot of the marker shall be painted a bright color with durable paint acceptable to the ENGINEER.
- F. Unless otherwise directed, service connections will be brought to the curb or property line at such an elevation that a pipe can be laid, on a grade of one-quarter (1/4) inch per foot, below the level of the cellar floor for the entire length of the building; but the depths to inverts of service connections at curb or property lines shall not be less than four (4) feet, unless otherwise allowed by the ENGINEER.

- G. Excavation for service connections shall be opened for the entire length of each service connection before any pipe is laid. If rock is encountered in a service connection excavation within ten (10) feet of any building, it must be removed by drilling and wedging or by a method acceptable to the ENGINEER.
- H. When there are no existing buildings, connections will be terminated at the curb line at such depths and at such locations as the ENGINEER may direct.

3.6 CAST-IN-PLACE CONCRETE CONSTRUCTION

- A. All concrete construction shall be in accordance with Section 03301 and as shown on the Drawings.

3.7 CRADLES AND ENCASEMENT

- A. Provide concrete cradles and encasement for pipeline where indicated on the Contract Drawings, or as directed by the ENGINEER, and as shown on the Drawings.

3.8 THRUST RESTRAINT

- A. Provide thrust blocking or restrained joints for pressure pipeline at all bends, tees, and changes in direction.

3.9 CARRIER PIPE IN CASINGS

- A. Applicable to casing pipe installed in open cut trenches. For installation by boring, jacking, or tunneling - see Section 02150.
- B. Provisions regarding pipe laying specified above also apply to carrier pipe installed in casings. Field Lock pipe gaskets, or approved equal, shall be utilized to join all carrier pipes within the casing pipe.
- C. Excavate trench to the additional depth and width necessary to accommodate the casing pipe and to maintain the line and grade of the carrier as indicated on the Contract Drawings.
- D. Minimum inside diameter of the casing pipe: As shown on the Drawings.
- E. Support pipeline within casing so that no external loads are transmitted to the carrier pipe. Provide casing spacers for pipe support per manufacturer's directions.
- F. Close ends of casing.

3.10 STREAM CROSSING

- A. Construct sanitary sewer pipeline stream crossings as shown on the Drawings.

3.11 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of pipe laying by the ENGINEER.
- B. Backfill trenches as specified below and in accordance with Section 02225.

3.12 TESTING

- A. Successful passing of tests as specified in Section 02751 is required for payment.

3.13 DETECTION TAPE

- B. Whenever a nonmetallic main is installed, a detection tape, as manufactured by Joseph G. Pollard Co., Inc., No. P-802; Allen Systems, Inc.; or approved equal, shall be installed above the main and twelve (12) to eighteen (18) inches below finished grade along the entire trench length. Payment for the detection tape shall be included in the unit price for installation of the pipe.

3.14 TRACER WIRE

- A. Whenever a nonmetallic pressure main is installed tracer wire shall be installed according to Section 02446. Payment for tape shall be included in the PROPOSAL.

END OF SECTION

SECTION 02751

SEWER PIPELINE AND MANHOLE TESTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Visual Test
- B. Testing Gravity Sewer Pipelines:
 - 1. Low-pressure air test
 - 2. Infiltration test
 - 3. Exfiltration test
- C. Testing Pressure Pipelines;
 - 1. Hydrostatic leakage test
- D. Deflection Testing of Pipe
- E. Vacuum Testing of Manholes

1.2 QUALITY ASSURANCE

- A. No test will be accepted until the results are below the specified maximum limits.
- B. The CONTRACTOR shall, at his own expense, determine and correct the causes of test failure and retest until successful test results are achieved.

1.3 SUBMITTALS

- A. Testing procedures
- B. List of test equipment
- C. Testing sequence schedule
- D. Provisions for disposal of flushing and test water
- E. Certificate of test gauge calibration
- F. Deflection mandrel drawings and calculations

1.4 JOB CONDITIONS

- A. Do not allow personnel in manholes during pressure testing.
- B. Provide relief valves set at 10 psig to avoid accidentally over-pressurizing gravity sewer line during low pressure air testing.

PART 2 PRODUCTS

2.1 AIR TEST EQUIPMENT

- A. Air compressor
- B. Air supply line
- C. Pressure relief valve
- D. Pressure regulator
- E. Shut-off valve
- F. Pressure gauge, calibrated to 0.1 lbs/sq. in.
- G. Plugs
- H. Stop watch

2.2 INFILTRATION TEST EQUIPMENT

- A. Weirs

2.3 HYDROSTATIC TEST EQUIPMENT

- A. Hydro pump
- B. Pressure hose
- C. Water meter
- D. Test connections
- E. Pressure gauge, calibrated to 0.1 lbs/sq. in.
- F. Pressure relief valve

2.4 DEFLECTION TEST EQUIPMENT

- A. Go, No-Go mandrels
- B. Pull/retrieval ropes

2.5 MANHOLE VACUUM TESTING EQUIPMENT

- A. Vacuum pump
- B. Vacuum line
- C. Vacuum plate
- D. Shut off valve
- E. Vacuum gauge, calibrated to 0.1 inches of mercury plugs
- F. Stopwatch

PART 3 EXECUTION

3.1 PREPARATION

- A. Install, backfill, plug and support all piping including connections.

- B. Flush pipeline to remove debris. Collect and dispose of flushing water and debris.
- C. Clean pipelines by propelling a snug fitting rubber ball through the pipeline with water from the upstream manhole to the downstream manhole. Investigate and correct any stoppage of the cleaning ball. Collect and dispose of cleaning water and debris.

3.2 VISUAL TESTING

- A. Lamp gravity pipeline in the presence of the ENGINEER.
- B. Assist the ENGINEER in the lamping operation by shining a light at one end of each pipeline section between manholes. The ENGINEER will observe the light at the other end.
- C. In order to be accepted, each pipeline section must show a good light circle, with at least 80 percent of the true circle showing. Pipeline that has not been installed with uniform line and grade will be rejected. Remove and re-lay rejected pipeline sections. Re-clean and lamp until pipeline section achieves a uniform line and grade to the satisfaction of the ENGINEER. Closed circuit television inspection may be required by the Engineer to determine the exact nature of any alignment problems with the pipeline.

3.3 TESTING GRAVITY SEWER PIPELINES

- A. Low Pressure Air Test:
 - 1. Test each newly installed section of gravity sewer line between manholes.
 - 2. Slowly introduce air pressure to approximately 4.0 psig. If ground water is present, determine its elevation above the spring line of the pipe by means of a piezometric tube. For every foot of groundwater above the spring line of the pipe, increase the starting air test pressure reading by 0.43 psig. Do not increase pressure above 10 psig.
 - 3. Allow pressure to stabilize for at least five minutes. Adjust pressure to 3.5 psig or the increased test pressure as determined above if groundwater is present and start the test.
 - 4. Test:
 - a. Determine the test duration for a sewer section with a single pipe size from the table below:

Low Pressure Air Test - Test Times

<u>Nominal Pipe Size</u>	<u>T (Time) Min/100 Ft.</u>	<u>Nominal Pipe Size</u>	<u>T (Time) Min/100 Ft.</u>
3	.2	18	2.4
4	.3	21	3.0
6	.7	24	3.6
8	1.2	27	4.2
10	1.5	30	4.8
12	1.8	33	5.4
15	2.1	36	6.0

- b. Record the drop in pressure during the test period. If the air pressure has dropped more than 1.0 psig during the test period, the line is presumed to

have failed. If the 1.0 psig air pressure drop has not occurred during the test period, the test shall be discontinued and the line will be accepted.

- c. If the line fails, determine the source of the air leakage, make corrections and retest. The CONTRACTOR has the option to test the section in incremental stages until the leaks are isolated. After the leaks are repaired, retest the entire section between manholes.

5. Pipe over 36" diameter shall be subjected to a visual interior inspection.

B. Infiltration Test:

1. Use only when gravity pipeline is submerged in groundwater. Obtain prior approval of the ENGINEER.
2. Maximum Allowable Infiltration: 100-gallons per inch of pipe diameter per mile per day including allowances for leakage from manholes.
3. Test:
 - a. Plug the upstream end of the pipe section and any opening exiting from the structure in which the infiltration water will be collected.
 - b. Test for six (6) hours
 - c. Pipe section will be accepted if infiltration water collected in the downstream structure does not exceed specified limit.

C. Exfiltration Test:

1. The ENGINEER may direct that gravity flow sewer systems be tested for leakage by an exfiltration test in addition to other tests.
2. Maximum Allowable Exfiltration: One hundred (100) gallons per inch of diameter per mile of pipe per day, including allowances for leakage from manholes.
3. Test:
 - a. Plug the downstream end of the pipe section and all other pipe openings, except the opening which will be used to establish the test head.
 - b. fill the pipe section with water, making sure all air is expelled from the pipe.
 - c. Fill pipe so that the minimum head of water over the top of any portion of the pipe is two feet.
 - d. Test for six (6) hours.
 - e. Pipe section will be accepted if leakage does not exceed specified limit.
4. When the difference in sewer elevations between the upper and lower manholes exceeds ten (10) feet, the CONTRACTOR will be allowed additional exfiltration, as may be determined by the ENGINEER.

3.4 TESTING PRESSURE SEWER PIPELINES

- A. Sewer force mains shall be tested for leakage by means of a hydrostatic pressure test. After the pipe has been laid and partially backfilled between joints, each section of pipe between valves or temporary plugs shall be tested as follows:
1. Test each newly laid pressure pipeline, including any valved section thereof, hydrostatically at 1.5 times the working pressure of the pipeline based on the elevation of the lowest point in the pipeline corrected to the elevation of the test gauge, but in no case less than 150 psi. Obtain test pressure from the ENGINEER.
 2. Slowly fill the section to be tested with water, expelling air from the pipeline at the high points. Install corporation stops at high points if necessary. After all air is expelled, close air vents and corporation stops and raise the pressure to the specified test pressure.
 3. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
 4. After visible deficiencies are corrected, continue testing at the same test pressure for an additional two hours to determine the leakage rate. Maintain pressure within plus or minus 5.0 psi of test pressure. Leakage is defined as the quantity of water supplied to the pipeline necessary to maintain test pressure during the period of the test.
 5. Compute the maximum allowable leakage by the following formula:
$$L = S \times D \times (P)^{0.5} / 133,200$$

Where: L = allowable leakage in gallons
S = length of pipe tested in feet
D = nominal diameter of the pipe in inches
P = average test pressure in psig

If the line under test contains sections of various diameters, the allowable leakage shall be the sum of the computed leakage for each size.
 6. If the test of the pipe indicates leakage greater than that allowed, locate the source of the leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of the amount of leakage.

3.5 DEFLECTION TESTING OF SEWER PIPE

- A. Perform vertical ring deflection testing on all portions of sewer piping, in the presence of the ENGINEER, after backfilling has been in place for at least 30 days but not longer than 12 months.
- B. The maximum allowable deflection for installed sewer pipe shall be limited to 5% of the original vertical internal diameter.
- C. Perform deflection testing with a deflectometer, calibrated television, or a properly sized "Go, No-Go" mandrel. The mandrel(s) shall be constructed at the CONTRACTOR's expense and subject to the approval of the ENGINEER.

- D. Pipe exceeding the allowable deflection shall be located, excavated, replaced, and retested.

3.6 LEAKAGE TESTS FOR WATER MAINS

- A. Whenever the WORK is parallel to a water main, and the water line has been exposed in the course of construction, tests of the main shall be made, at the expense of the CONTRACTOR, upon completion of the WORK along each section of water main between line valves, to determine if any leakage has been caused by the operation of the CONTRACTOR.
- B. In the event that leakage is shown by the test, the CONTRACTOR shall have the leak repaired.
- C. The test shall be a hydrostatic pressure test as outlined in Part 3.4 or other test as required by the OWNER of the water line.

3.7 VACUUM TESTING OF MANHOLES

- A. Perform vacuum testing of all manholes, in the presence of the ENGINEER, after manholes and frames have been installed to final grade.
- B. Perform test as follows:
 - 1. The testing shall be done after assembly of the manholes.
 - 2. All lift holes shall be plugged with a non-shrinking mortar.
 - 3. The CONTRACTOR shall plug the pipe openings, taking care to securely brace the plugs and pipe.
 - 4. With the vacuum tester set in place, draw a vacuum to 10 inches of mercury (hg) and close valve.
- C. Test:
 - 1. The test shall pass if the vacuum remains at 10" Hg or drops to no lower than 9" Hg. Over a period of the one minute.
 - 2. If the manhole fails the test, determine the source of the vacuum leak, make repairs and retest. Manholes shall be retested at the sole expense of the CONTRACTOR.

3.8 COST OF TESTING

- A. Closed circuit television inspection of pipelines, if requested by the ENGINEER, shall be solely at the CONTRACTOR'S cost.

END OF SECTION

SECTION 02923
LANDSCAPE GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Final grade topsoil for finish landscaping.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Topsoil: On site stockpiled material approved by the ENGINEER or imported material free of stones, sticks and other debris, capable of sustaining vigorous plant growth with a pH value between 5.4 and 7.0.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify building and trench backfilling has been inspected.
- B. Verify substrate base has been contoured and compacted.

3.2 SUBSTRATE PREPARATION

- A. Eliminate uneven areas and low spots.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove subsoil contaminated with petroleum products.
- C. Scarify subgrade to depth of 3-inches where topsoil is scheduled. Scarify in areas where equipment is used for hauling and spreading topsoil and has compacted subsoil.

3.3 PLACING TOPSOIL

- A. Place topsoil in areas where seeding, sodding, and planting is required, to indicated thickness. Place topsoil during dry weather.
- B. Fine grade topsoil eliminating rough or low areas. Maintain profiles and contour of subgrade.
- C. Remove roots, weeds, rocks and foreign material while spreading.
- D. Manually spread topsoil close to trees, plants, buildings, and other structures in order to prevent damage.
- E. Lightly compact placed topsoil.
- F. Remove surplus subsoil and topsoil from site.
- G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.4 TOLERANCES

- A. Top of Topsoil: Plus or minus 1/2 inch.

3.5 PROTECTION

- A. Protect landscaping and other features remaining as final work.
- B. Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

3.6 SCHEDULES

- A. Provide compacted topsoil thickness as noted below in areas to receive the following treatment:
 - 1. Seeded Grass: 6 inches.
 - 2. Sod: 4 inches.
 - 3. Shrub Beds: 18 inches.
 - 4. Flower Beds: 12 inches.
 - 5. Planter Boxes: To within 3 inches of box rim.

END OF SECTION

SECTION 02936

SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Seeding, hydroseeding, mulching and fertilizing
- B. Maintenance

1.2 REFERENCES

- A. FS O-F-241 - Fertilizers, Mixed, Commercial
- B. PennDOT Publication 408, Specifications

1.3 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.5 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.7 SUBMITTALS

- A. For hydroseeding, submit mix formulation. Match seed mixture to local conditions.
- B. Provide catalog cuts and manufacturer's instructions for erosion control matting.

1.8 MAINTENANCE SERVICE

- A. The CONTRACTOR shall maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

- B. The CONTRACTOR shall replace topsoil at all eroded areas and/or washouts and shall reseed with the same seed mix, or shall place sod of the same seed mix.
- C. The CONTRACTOR shall be responsible for replacing all failures which occur within one year of final completion.

PART 2 PRODUCTS

2.1 SEED

- A. All seed used shall be labeled in accordance with the U.S. Department of Agricultural Rules and Regulations under the Federal Seed Act in effect at the time of purchase, which shall be later than the date of this Contract. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. Seed shall not be more than two (2) years old and shall be retested for germination rate no more than ninety (90) days prior to use.
- B. Inert matter shall not exceed 15%. Blue Tag Certified Seed shall be supplied wherever possible.

2.2 SEED MIXTURE

	<u>% by Weight</u>	<u>Purity</u>	<u>Min. % Germination</u>	<u>Max. % Weed Seed</u>
A. Lawn Seed (PennDOT Formula B)				
Kentucky Bluegrass (4 or more varieties - none greater than 25% of total Bluegrass component)	50	98	80	0.20
Pennfine Perennial Ryegrass	20	98	90	0.15
Creeping Red Fescue	30	98	85	0.15
B. Slope areas steeper than 3 horizontal to 1 vertical which will not be moved (PennDOT Formula C)				
Crown Vetch	45	99	70	0.10
Annual Ryegrass	55	98	90	0.15
	<u>% by Weight</u>	<u>Purity</u>	<u>Min. % Germination</u>	<u>Max. % Weed Seed</u>
C. Special Areas - swales, pond embankments, levees, diversion channels, and occasional water flow areas (PennDOT Formula D).				
Kentucky 31 Tall Fescue	70	98	85	0.25
Creeping Red Fescue	30	98	85	0.15

D.	Temporary Seeding (PennDOT Formula E)				
	Annual Ryegrass	100	98	90	0.15
E.	Temporary Seeding				
	Winter Rye	100	95	80	0.15

2.3 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- B. Pulverized agricultural limestone.
- C. Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with fifty percent (50%) of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the following proportions: Nitrogen ten percent (10%), phosphoric acid ten percent (10%), soluble potash ten percent (10%).
- D. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
- E. Erosion Control Matting: Of the type indicated on the Drawings, in accordance with the manufacturer's specifications.
- F. Herbicide: In accordance with Publication 408, Section 804.2(d).
- G. Stakes: Softwood lumber, chisel pointed.
- H. String: Inorganic fiber.
- I. Edging: Plastic or wood of the indicated species.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section.

3.2 FERTILIZING

- A. Apply pulverized agricultural limestone at a rate of 6 tons per acre.
- B. Apply fertilizer in accordance with manufacturer's instructions.
- C. Apply after smooth raking of topsoil and prior to roller compaction.
- D. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- E. Mix fertilizer and limestone thoroughly into upper four inches of topsoil.
- F. Lightly water to aid the dissipation of fertilizer.

3.3 SEEDING

- A. Apply seed at the rates listed below, evenly in two intersecting directions. Rake in lightly.

Formula B	2.5 lbs per 1,000 sq. ft.
Formula C	1.0 lbs per 1,000 sq. ft.
Formula D	2.5 lbs per 1,000 sq. ft.
Formula E	1.2 lbs per 1,000 sq. ft.
Winter Rye	4 lbs per 1,000 sq. ft.

- B. Do not seed areas in excess of that which can be mulched on same day.

- C. Planting Season:

Formula B	March 1 to June 1 and August 1 to October 15
Formula C	Ryegrass portion March 1 to October 15; Crown Vetch portion November 1 to August 31
Formula D	March 1 to June 1 and August 1 to October 15
Formula E	March 1 to August 15
Winter Rye	August 16 to October 15

- D. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- E. Roll seeded area with roller not exceeding 65 lbs. per foot width.
- F. Immediately following seeding and compacting, apply mulch at a rate of 3 tons per acre. Maintain clear of shrubs and trees.
- G. Apply water with a fine spray immediately after each area has been mulched. Saturate to four inches of soil.

3.4 HYDROSEEDING

- A. Apply seeded slurry with a hydraulic seeder to match seed rates specified in Section 3.3A, evenly in two intersecting directions.
- B. Inoculate Crown Vetch at 5 times the manufacturer's rate.
- C. If fertilizer is applied with inoculant, the mixture shall not remain in a slurry for more than one hour.
- D. Mulch as specified in Section 3.3F., or apply wood cellulose fiber, at a rate of 900 lbs. per acre, as part of the slurry.

3.5 TEMPORARY SEEDING

- A. Temporary seeding shall be done in areas where no active work will be performed for 20 days or more. Any disturbed area on which activity has ceased for more than 20 days must be seeded and mulched immediately.
- B. During nongermminating periods, ONLY mulch should be applied at the recommended rates.
- C. Disturbed areas which are not at finished grade and which will be redisturbed within one (1) year may be seeded and mulched with a temporary seed mixture.

- D. Disturbed areas which are either at finished grade or will not be disturbed again within one (1) year shall be seeded with the indicated permanent seed mixture and mulched.
- E. Temporary Seeding Steps:
 - 1. Apply agricultural limestone or hydrated lime at a rate of one ton per acre.
 - 2. Apply fertilizer at the application rate of 50-50-50 (N-P₂O₅-K₂O) pounds per acre.
 - 3. Work the limestone and fertilizer into the soil to depth of three inches.
 - 4. Apply mulch at a rate of three tons per acre.

3.6 SEED PROTECTION

- A. Identify seeded areas with stakes and string around area periphery.
- B. Mulch shall be kept moist and anchored either mechanically, or with cutback asphalt or polymer tackifier, as required to prevent it from blowing away.
- C. Cover seeded areas with erosion control matting where indicated. Install matting in accordance with manufacturer's specifications and instructions.
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- E. Apply herbicides in accordance with Publication 408, Section 804.3(h).

3.7 MAINTENANCE

- A. Mow grass at regular intervals prior to final completion to maintain a maximum height of four inches in lawn areas. Do not cut more than 1/3 of grass blade at any one mowing.
- B. Neatly trim edges and hand clip where necessary, in lawn areas.
- C. Immediately remove clippings after mowing and trimming.
- D. Water to prevent grass and soil from drying out.
- E. Roll surface to remove minor depressions or irregularities.
- F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- G. Immediately reseed and mulch areas which show bare spots.
- H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

SECTION 02938

SODDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fertilizing
- B. Sod installation
- C. Maintenance

1.2 REFERENCES

- A. ASPA (American Sod Producers Association) - Guideline Specifications to Sodding.
- B. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.3 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4 QUALITY ASSURANCE

- A. Sod: Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
- B. Submit sod certification for grass species and location of sod source.

1.5 QUALIFICATIONS

- A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience.
- B. Installer: Company approved by the sod producer.

1.6 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition. Provide copies of labels and material safety data for all pesticides.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Deliver sod on pallets. Protect exposed roots from dehydration.
- C. Do not deliver more sod than can be laid within 24 hours.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Sod: TPI defined field grown standard grade; cultivated grass sod; type indicated below; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft.
 - 1. Kentucky Bluegrass Blend Grass Type: 100 percent.
- B. Starter Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the following proportions; nitrogen 18 percent, phosphoric acid 24 percent, soluble potash 12 percent. Follow-up with maintenance fertilizer 30 days after installation. Fertilizer proportions - 18-24-12, 50% sulphur coated urea apply at 4 lbs./1000 S.F., 174 lbs/acre.
- C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

2.2 ACCESSORIES

- A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.
- B. Wire Mesh: Interwoven hexagonal metal wire mesh of 24 inch size.
- C. Edging: [Galvanized steel] [Plastic] [Wood of common Southern Pine species.
- D. Herbicide: For area preparation - nonselective "Round-up". For area maintenance - selective - Minimum 32% 2,4-D; 16% MCPP; 2% DRAMBA.

2.3 HARVESTING SOD

- A. Machine cut sod and load on pallets in accordance with ASPA Guidelines.
- B. Cut sod in area not exceeding 1 sq. yd. with minimum 1/2 inch and maximum 1 inch topsoil base.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this section.

3.2 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply prior to smooth raking of topsoil. Mix thoroughly into upper 2-inches of topsoil.
- C. Apply fertilizer no more than 48 hours before laying sod.
- D. Lightly water sod to aid the dissipation of fertilizer.

3.3 LAYING SOD

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately after delivery to site to prevent deterioration.
- C. Lay sod tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
- D. Lay smooth. Align with adjoining grass areas.
- E. Place top elevation of sod 1/2 inch below adjoining edging.
- F. On slopes 6 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.
- G. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.
- H. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding 100 lbs.

3.4 MAINTENANCE

- A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming.
- D. Water to prevent grass and soil from drying out.
- E. Roll surface to remove irregularities.
- F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- G. Immediately replace sod to areas which show deterioration or bare spots.
- H. Protect sodded area with warning signs during maintenance period.
- I. Maintain sodded areas immediately after placement until grass is well-established and exhibits a vigorous growing condition for two cuttings.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Form work, complete with shoring, bracing and anchorage.
- B. Cast-in-place concrete tanks, foundations, and slabs.
- C. Reinforcing steel, welded wire fabric, supports, spacers and accessories.
- D. Waterstops, preformed construction joints, preformed joint filler, bonding agent and accessories.
- E. Equipment pads, light pole bases, flag pole bases.
- F. Surface Finishes.
- G. Floor toppings and hardeners.
- H. Concrete Curing.

1.2 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Maintain copy of ACI 301 on site.
- C. Obtain materials from same source throughout the Work.
- D. Conform to ACI 305 R when concreting during hot weather.
- E. Conform to ACI 306.1 when concreting during cold weather.

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable building code for area where project is located.

1.4 TESTS

- A. Testing and analysis of concrete will be performed under provisions of Section 01400.
- B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of work.
- C. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.
- D. Tests of cement and aggregates will be performed to ensure conformance with requirements stated herein.

- E. Four concrete test cylinders will be taken for every 50 or less cu yds of each class of concrete placed each day.
- F. Four additional test cylinders will be taken during cold weather and cured on site under same conditions as concrete they represent.
- G. A minimum of one slump test will be taken for each set of test cylinders taken.

1.5 SUBMITTALS

- A. Submit shop drawings of reinforcing steel under provisions of Section 01300.
- B. Indicate reinforcement sizes, spacings and locations of reinforcing steel, and wire fabric, bending and cutting schedules, splicing, and supporting and spacing devices. Bar lists and computer printouts will not be reviewed. Only fully drawn and detailed placement drawings are acceptable.
- C. Submit proposed concrete mix design for each class of concrete along with sufficient data to document the proportioning of the proposed concrete mix in accordance with ACI 301.
- D. Submit proposed curing methods for hot and cold weather.
- E. Submit product data under provisions of Section 01300.
- F. Provide product data for specified products.
- G. Submit manufacturers' instructions under provisions of Section 01300.

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS (ACI 301 4.2)

- A. Cement: ASTM C150, moderate - Type II; grey color.
- B. Fine and Coarse Aggregates: ASTM C33, subject to limitations of ACI 301 4.2.
- C. Water: Clean and not detrimental to concrete.
- D. Fibrous Reinforcement: Add 1.5 pounds per cubic yard of 100% virgin polypropylene, fibrillated fibers as manufactured by Fibermesh Co., W. R. Grace, Forta Corporation, or an approved equal. Fibers shall be added to the mix in accordance with the manufacturers printed instructions.
- E. Ready-Mixed Concrete: Mix and deliver concrete in accordance with ASTM C94.

2.2 ADMIXTURES (ACI 301 4.2)

- A. Add an air-entraining agent conforming to ASTM C260 to obtain a total air content as required by Table 4.2.2.4 of ACI 301, except that a minimum total air content of four percent (4%) by volume shall be provided in all mix designs, unless noted otherwise.
- B. A water reducing admixture conforming to ASTM C494 - Type A shall be used in all mix designs. The quantity to be added, the controlling temperature and the method of mixing shall conform with the manufacturers written recommendations.
- C. Pozzolans conforming to ASTM C618 Type F may be substituted for up to 25 percent of the cementitious material if mix designs with proven results can be provided to the ENGINEER.
- D. Use of additional admixtures must be approved in writing by the ENGINEER.
- E. No calcium chloride or other chloride containing admixture will be permitted.

2.3 CONCRETE MIX (ACI 301 4.1)

- A. Provide concrete mix in accordance with ASTM C94 and the following characteristics:

1.	Compressive Strength (7 day)	2800 psi
	Compressive Strength (28 day)	4000 psi
	Maximum Water-Cement ratio	0.44
	Minimum Cementitious Materials Content	564 lb/cy
	Air Content	6% $\pm$ 1
	Slump	2" to 3"

- 2. Admixtures should be added as indicated in Item 2.2 above.

2.4 REINFORCING STEEL (ACI 301 3.2)

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade billet steel deformed bars.
- B. Welded Steel Wire Fabric: Plain type, ASTM A185, in flat sheets.
- C. Finish
 - 1. All reinforcing shall be uncoated.

2.5 JOINT FILLERS AND SEALANTS

- A. All premolded expansion joint filler shall be asphalt impregnated fiberboard conforming to ASTM D1751, and as manufactured by Masonite Building & Industrial Products Group, or an approved equal. Thickness and sizes shall be as shown on the Drawings. The CONTRACTOR shall submit manufacturer's data on type of joint filler to be used.
- B. Joint Sealant: As specified on the drawings.

2.6 WATERSTOPS

- A. Waterstops shall be of the type and size as indicated on the Drawings and shall be provided in the joints of all pits, tanks, troughs and foundation walls which are intended to be watertight.
- B. Type I - serrated waterstop with center bulb 3/16 inch thick PVC, as manufactured by W. R. Grace & Co., W. R. Meadows, Inc. or Greenstreak, Inc.

- C. Type IA - serrated type waterstop with expandable center bulb 3/16 inch thick PVC. DUO-PVC Type No. 6180-D as manufactured by W. R. Meadows, Inc. or Greenstreak, Inc. capable of providing a moving joint.
- D. Type II Waterstop - Preformed plastic waterstop meeting all the requirements of Federal Specification SS-S-210A such as Synko-Flex Waterstop, and shall be suitable for the location and hydrostatic pressure involved.
- E. Type III Waterstop - Preformed mineral colloid strips, 3/4-inch thick, moisture expanding.
- F. Waterstops used in joints designated as thermal or expansion joints shall be capable of accommodating movement. These waterstops must also be compatible with adjacent waterstops.

2.7 ACCESSORIES

- A. Bonding Agent: two component modified epoxy resin; such as Sikadur Hi-mod as manufactured by Sika Chemical Corporation; Fresh Concrete Bonder #2 as manufactured by E-poxy Industries or an approved equal.
- B. Vapor Retarder: 6 mil thick, reinforced plastic film, type recommended for below grade application.
- C. Nonshrink Grout: Premixed compound with nonmetallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 4,000 psi.
- D. Dovetail Anchor Slots: Minimum 16 gage thick galvanized steel; foam filled; release tapes; sealed slots; bent tab anchors.
- E. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete shall be nontoxic and suitable for contact with potable water.
- F. Nonmetallic Hardener: Silica type premixed dry powder type such as Silica Floor Hardener by Admixtures, Inc. or equal.
- G. Chairs, bolsters, bar supports, spacers, and tie wire for support of reinforcement during concrete placement. Use special chairs, bolsters, bar supports and spacers adjacent to weather exposed concrete (plastic coated steel). Where epoxy coated reinforcement is required, provide epoxy coated bar supports and tie wires.
- H. Form Covering Material: Submit manufacturers instructions, test data and design information on the form covering material.

PART 3 EXECUTION

3.1 GENERAL

- A. Install concrete work in accordance with ACI 301 except as amended by this Section.
- B. Verify site conditions under provisions of Section 01039.
- C. Verify requirements for concrete cover over reinforcement.
- D. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 FORM WORK (ACI 301 2.3)

- A. Verify lines, levels and measurements before proceeding with form work.
- B. Obtain ENGINEER'S review for use of earth forms. When using earth forms, hand-trim sides and bottoms, and remove loose dirt prior to placing concrete.
- C. Erect form work, shoring, and bracing to achieve design requirements in accordance with requirements of ACI 301.
- D. Chamfer external corners of beams, joints, columns and walls, except where masonry overhangs concrete.
- E. Construct form work to maintain the tolerances as listed in ACI 301.
- F. Apply form release agent on form work in accordance with manufacturer's recommendations. Apply prior to placing reinforcing steel, anchoring devices and embedded parts. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent.

Release agents should be suitable for contact with potable water for water storage or treatment tanks. Furnish manufacturers certification.

3.3 INSERTS, EMBEDDED ITEMS AND OPENINGS

- A. Locate and cast in place all slots, sleeves, openings, recesses, chases, bolts, anchors or other inserts required by other trades. Sizes and locations of all inserts shall be coordinated with other trades and certified equipment drawings.
- B. Install all waterstops as shown on the Drawings. Waterstops shall be continuous, with heat sealed joints and shall be firmly anchored and wired to the reinforcing steel prior to placing concrete.
- C. Provide temporary ports or openings in form work where required to facilitate cleaning and inspection and placing of concrete. Locate openings at bottom of forms to allow flushing water to drain. Close temporary ports or openings with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

3.4 REINFORCING STEEL (ACI 301 3.3)

- A. Place, support, and secure reinforcement against displacement. Do not deviate from required position.
- B. No welding of reinforcing steel will be permitted unless approved in writing by the ENGINEER.
- C. Do not displace or damage vapor barrier.
- D. Conform to ACI 318 for concrete cover over reinforcement.
- E. No reinforcing steel embedded in hardened concrete shall be bent unless approved in writing by the ENGINEER.
- F. The CONTRACTOR shall notify the ENGINEER after all reinforcing steel and accessories have been set and at least 24 hours prior to pouring concrete so that all reinforcing can be inspected and approved.
- G. Reinforcing bars shall not be field cut unless approved by the ENGINEER.
- H. If approved, field cuts shall be treated with an approved repair material.
- I. All areas where the reinforcement coating is damaged during shipping, handling or placing shall be repaired using an approved repair compound.

3.5 CONSTRUCTION JOINTS (ACI 301 5.3)

- A. Construction joints shall be located as shown on the Drawings; any additional joints or relocation of joints must be approved in writing by the ENGINEER prior to construction. All construction joints shall be doweled, keyed, and water stopped as shown on the Drawings.
- B. Prior to placing the new concrete against the existing concrete in a construction joint, the existing concrete shall be thoroughly cleaned of all dirt, debris, laitance and loose mortar, and then thoroughly wetted.

3.6 CONTROL OF MIXING WATER (ACI 301 4.3)

- A. No additional water shall be added to the concrete after it arrives at the job site unless authorized by the ENGINEER or his authorized representative. If additional water is added, additional cement must be added to maintain the original water-cement ratio specified herein.

3.7 PLACING CONCRETE

- A. Notify ENGINEER minimum 24 hours prior to commencement of concreting operations.
- B. Place concrete in accordance with ACI 301.
- C. Ensure reinforcement, inserts, embedded parts, and formed expansion and contraction joints are not disturbed during concrete placement.
- D. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.
- E. Place floor slabs on fill in checkerboard pattern indicated on Drawings.

- F. Saw cut control joints at an optimum time after finishing. Use 3/16 inch thick blade, cutting 1/3 into depth of slab thickness.
- G. Apply concrete hardener on floor surfaces as scheduled. Apply in accordance with manufacturer's printed instructions, under supervision of manufacturer's representative.
- H. Separate exterior slabs on fill from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/2-inch of finished slab surface.
- I. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify ENGINEER upon discovery.
- J. Provide pads for all equipment. Pads shall project 3" beyond all sides of the equipment and be 4" high unless indicated otherwise on the Drawings.

3.8 TOLERANCES

- A. Place floor slabs to meet 10-ft. straightedge flatness criteria of ACI 117. Pitch to drains 1/4 inch per foot nominal, unless noted otherwise on the Drawings.

3.9 REMOVAL OF FORMS (ACI 301 2.3)

- A. Do not remove forms, shores and bracing until concrete has gained sufficient strength to carry its own weight, construction loads, and design loads which are liable to be imposed upon it. Verify strength of concrete by compressive test results.
- B. No reshoring of concrete will be permitted unless authorized in writing by the ENGINEER.

3.10 EXISTING WORK

- A. Where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack with nonshrinking grout.
- B. Prepare previously placed concrete by cleaning with steel brush and apply bonding agent in accordance with manufacturer's instructions.

3.11 REPAIR OF SURFACE DEFECTS (ACI 301 5.3)

- A. Allow ENGINEER to inspect concrete surfaces immediately upon removal of forms.
- B. Modify or replace concrete not conforming to required lines, detail, elevations and tolerances.
- C. Repair or replace concrete not properly placed resulting in excessive honeycombing and other defects. Do not patch, repair or replace exposed architectural concrete except upon express direction of ENGINEER.
- D. If strength tests fail to meet the requirements of ACI 301, the OWNER/ENGINEER may require in-place and/or core tests in accordance with ACI 301, Section 1.6. Cost of all additional testing shall be paid by the CONTRACTOR.

3.12 SCHEDULE OF FORMED SURFACES

- A. Smooth form surface finish at all concealed wall surfaces that will not receive paint or other finish.

- B. Smooth rubbed finish at all exposed wall surfaces, and all surfaces to receive paint or other subsequent finish.
- C. Surfaces to receive "concrete waterproofing" shall be prepared in accordance with the requirements of specification Section 07146.
- D. Surfaces shall be finished within 48 hours of placing concrete.
- E. If CONTRACTOR fails to finish exposed surfaces within specified time frame, concrete shall be coated with one coat of "Thoroseal" as manufactured by Degussa Construction Chemicals. Surface preparation and application shall be in accordance with manufacturer's instructions.

3.13 SCHEDULE OF FLOOR SLAB FINISHES

- A. Trowel finish at all interior slabs and tank bottoms.
- B. Broom or belt finish at all sidewalks.

3.14 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.
- B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.15 CURING AND PROTECTION (ACI 301, 5.3)

- A. Protect finished work under provisions of Section 01600.
- B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete, at least 7 days, except for high early strength which requires 3 days.
- D. Hot weather curing and cold weather curing procedures must be submitted by the CONTRACTOR for approval.

3.16 TEST FOR WATERTIGHTNESS

All concrete tanks designed to hold water, sewage or some other liquid shall be tested for watertightness as follows. All visible cracks, holes or defects shall be cut out and patched to the satisfaction of the ENGINEER prior to starting the test procedure. After the concrete tanks have been constructed and properly cured, for a length of time to be determined by the ENGINEER, and prior to any backfilling around the structures, the CONTRACTOR shall fill the tanks to the levels as indicated on the Drawings. The water shall not be removed for a minimum of 48 hours unless otherwise instructed by the ENGINEER. The ENGINEER will check for evidence of leakage, and any areas which show evidence of leakage will be repaired at the direction of the ENGINEER. For the purposes of this Specification, watertightness shall be defined as the absence of any damp or wet areas with discernible flow. If repairs are necessary, the tank must be drained, the repairs made and test repeated, at no additional cost to the OWNER, until satisfactory completion of the test.

All leakage tests and required repairs shall be included in the scope of work and no extras will be allowed for this Work.

The method and materials for repairs shall be approved by the ENGINEER prior to the start of any repair work. All leaks and defective areas shall be cut or chipped and patched. No feathered edges or surface patches will be allowed.

END OF SECTION

SECTION 03301

CRYSTALLINE CONCRETE WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. This section covers the requirements for waterproofing of all concrete structures which are intended to hold liquid.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM).
 - 1. Chemical resistance C 267-77
 - 2. Crack sealing C 856-88
 - 3. Compressive strength C 39 BS 1881
 - 4. Freeze thaw C 666
- B. Army Corp. of Engineers CRD C48-73
- C. NSF 61 Approved for potable water.

1.3 SYSTEM DESCRIPTION

- A. The concrete waterproofing shall be of the cementitious crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete.
- B. The design shall include the use of the crystalline waterproofing repair materials that generate a non-soluble crystalline formation in the concrete.

1.4 STORAGE, DELIVERY AND HANDLING

- A. Store manufacturer's sealed and labeled material containers in dry, protected environment off the ground.

1.5 SCHEDULING

- A. Coordinate with Section 03300 Cast-In-Place Concrete.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Standard for performance based on Xypex Chemical Corporation, Richmond, B.C., Canada. As Distributed by Watertite Inc. 717-469-0058, fax 717-469-0334.
- B. Equivalent materials as approved by the engineer 10 days prior to acceptance of bids.

2.2 MATERIALS

- A. Xypex Concentrate Admix C-1000 Xypex, Patch n' Plug.

- B. For new Horizontal surface Xypex DS-1 may be used. Application rate 1.75 pounds per square yard, included as part of the concrete placement and finishing. For best results no air entrainment required. Curing compounds must meet ASTM C-309.

2.3 MIXES

- A. Recommended dosage rate for Concentrate C-1000 is 2% of weight of cement. NOTE: 3% for applications exposed to a constant pH of 3 or 11 or occasionally outside these limits.

PART 3 APPLICATION

3.1 MATERIALS PREPARATION-ADMIX

- A. For Dry Batch plants the Xypex Admix can evenly be distributed on a plant conveyor belt carrying the rock and sand or placed into the weight hopper.

For Central Mix plants 15 gallons of water per 60 lb. pail should be placed into the truck prior to adding the dry powder Admix and mixed into slurry. After this has been completed, the balance of the materials are then added to the truck and mixed.
- B. Blend total concrete mix using normal practices to ensure formation of homogeneous mixture.

3.2 APPLICATION

- A. Placement of concrete shall be in accordance with the Section 03300.
- B. Retardation of set may occur when using Concentrate Admix. The amount of retardation will depend upon the concrete mix design and the dosage rate of the Admix.
- C. Concrete that contains Xypex Concentrate Admix C-1000 must be cured as per "Standard for Curing Concrete" (ACI 308) Curing compounds must meet ASTM C309.
- D. Normal backfilling procedures may be used after concrete has cured for at least seven (7) days.
- E. Tie holes and defects should be filled with Xypex Patch n' Plug. This work should be done as soon as possible to achieve maximum benefit. (48 hours)

END OF SECTION

SECTION 03303
CONCRETE FOR UTILITY CONSTRUCTION

PART 1 GENERAL

1.1 DESCRIPTION

A. The Work of this Section includes, but is not limited to:

1. Cast-in-place concrete construction
2. Reaction and support blocking
3. Cradles and encasements

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation: Publication 408 Specifications
2. American Society for Testing and Materials (ASTM):

C31 Making and Curing Concrete Test Specimens in the Field
C39 Test for Compressive Strength of Cylindrical Concrete Specimens
C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C172 Sampling Fresh Concrete

1.3 SUBMITTALS

A. Certificates:

1. Submit certification from the concrete producer attesting that the cement concrete conforms to Section 704, Publication 408 Specifications for the class of concrete being used.
2. Submit certified results of compressive strength tests performed by an independent testing laboratory.

B. Shop Drawings:

1. Submit detailed shop drawings of reinforcing steel.

PART 2 PRODUCTS

2.1 CONCRETE

A. Ready-mixed, conforming to Section 704, Publication 408 Specifications:

1. Requirements for State approved batch plants, design computations and plant inspection shall not apply. The acceptability of concrete will be based on conformance with the Concrete Criteria specified below and the results of the specified tests.

B. Concrete Criteria:

All concrete shall be PennDOT Class A. No on-site mixing of concrete is allowed.

2.2 REINFORCEMENT STEEL

A. Reinforcement Bars:

1. New billet-steel conforming to Section 709.1, Publication 408 Specifications.
2. Deformed, Grade 60.

B. Steel Wire Fabric:

1. Conforming to Section 709.3, Publication 408 Specifications.

PART 3 EXECUTION

3.1 CONSTRUCTION

- A. Comply with Section 1001, Publication 408 Specifications for construction requirements including formwork, curing, protection and finishing of concrete.
- B. Excavate and shape trench bottoms and sides to accommodate thrust block forms, encasement, manhole bases, inlets and vaults.
- C. Support pipe, valves and fittings at the required elevation with brick or concrete block. Do not use earth, rock, wood, or organic material as supports.
- D. Construct manhole bases, reaction and support blocking, cradles, encasements, and miscellaneous mass concrete.
- E. Construct cast-in-place vaults, inlets, endwalls, curbs, sidewalks and miscellaneous reinforced structures.
- F. Provide spacers, chairs, bolsters, ties and other devices for properly placing, spacing, supporting and fastening reinforcement in place.
- G. Place concrete utilizing all possible care to prevent displacement of pipe or fittings. Return displaced pipe or fittings to line and grade immediately.
- H. Ensure tie rods, nuts, bolts and flanges are free and clear of concrete.
- I. Do not backfill structures until concrete has achieved its initial set, forms are removed, and concrete work is inspected by the ENGINEER.
- J. Perform backfilling and compaction as specified.

3.2 FIELD TESTS OF CONCRETE DURING CONSTRUCTION

The OWNER reserves the right to perform the following tests. All testing laboratory costs will be paid by the OWNER except as noted in Item B. The CONTRACTOR will provide the necessary labor and materials to make cylinders.

- A. Test each 50 cubic yards or fraction thereof of each class of concrete for compressive

strength. Retain an independent testing laboratory to test cylinders.

1. Sample concrete in accordance with ASTM C172.
 2. Prepare and cure two test cylinders in accordance with ASTM C31.
 3. Test cylinders in accordance with ASTM C39.
- B. If test cylinders fail to meet strength requirements, the ENGINEER may require additional core tests in accordance with ASTM C42 at the expense of the CONTRACTOR.

END OF SECTION

SECTION 03603
NON-SHRINK GROUT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Non-shrink cementitious grout.
 - 2. Grouting of dowels, base plates, equipment, machinery, and elsewhere as noted on the drawings.

1.2 REFERENCES

- A. American Society of Testing and Materials:
 - 1. ASTM C191 - Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
 - 2. ASTM C307 - Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
 - 3. ASTM C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 4. ASTM C579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacing and Polymer Concretes.
 - 5. ASTM C827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
- B. U. S. Army Corps of Engineers Concrete Research Division (CRD):
 - 1. CRD C621 - Non-Shrink Grout.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit product data on grout.
- C. Manufacturer's Installation Instructions: Submit manufacturer's instructions for mixing, handling, surface preparation and placing non-shrink type grouts.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver grout in manufacturer's unopened containers with proper labels intact.
- C. Store grout in a dry shelter, protect from moisture.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements: Environmental conditions affecting products on site.

- B. Observe manufacturer's requirements for minimum and maximum air temperatures.

PART 2 PRODUCTS

2.1 NON-SHRINK CEMENTITIOUS GROUT

- A. Manufacturers:
1. Sika Corporation.
 2. L & M Construction Chemicals, Inc.
 3. Substitutions: Section 01600 - Product Requirements.
- B. Non-shrink Cementitious Grout: Pre-mixed ready for use formulation requiring only addition of water; non-shrink, non-corrosive, non-metallic, non-gas forming, no chlorides.
- C. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with CRD-C621, for Type D non-shrink grout:

Property	Test	Time	Result
Setting Time	ASTM C191	Initial	2 hours (Approx)
		Final	3 hours (Approx)
Expansion			0.10% - 0.4% Maximum
Compressive Strength	CRD-C621	1 day	4,000 psi
		7 days	7,000 psi
		28 days	10,000 psi to 10,800 psi

2.2 FORMWORK

- A. Refer to the drawings for formwork requirements.

2.3 CURING

- A. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or with use of wet burlap method.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify areas to receive grout.

3.2 PREPARATION

- A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.

- B. Rough concrete lightly, but not enough to interfere with placement of grout.
- C. Remove foreign materials from metal surfaces in contact with grout.
- D. Align, level and maintain final positioning of components to be grouted.
- E. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

3.3 INSTALLATION - FORMWORK

- A. Construct leakproof forms anchored and shored to withstand grout pressures.
- B. Install formwork with clearances to permit proper placement of grout.

3.4 MIXING

- A. Mix and prepare non-shrink cementitious grout in accordance with manufacturer's instructions.
 - 1. Capable of developing minimum compressive strength of 2400 psi in 48 hours and 7000 psi in 28 days.
- B. Mix grout components in proximity to work area and transport mixture quickly and in manner not permitting segregation of materials.

3.5 PLACING GROUT

- A. Place grout material quickly and continuously.
- B. Do not use pneumatic-pressure or dry-packing methods.
- C. Apply grout from one side only to avoid entrapping air.
- D. Do not vibrate placed grout mixture, or permit placement when area is being vibrated by nearby equipment.
- E. Thoroughly compact final installation and eliminate air pockets.
- F. Do not remove leveling shims for at least 48 hours after grout has been placed.

3.6 CURING

- A. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. After grout has attained its initial set, keep damp for minimum of 3 days.

END OF SECTION

SECTION 11261

DUPLEX SUBMERSIBLE SEWAGE PUMP STATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submersible wet pit centrifugal pumps including automatic discharge connection fitting
- B. Guide rails for removing pumps from tanks
- C. Pump lifting chain
- D. Wet well and valve chamber
- E. Manufacturers's control panel
- F. Portable hoist

1.2 RELATED SECTIONS

- A. Section 02575 - Paving and Resurfacing
- B. Section 02601 - Manholes
- C. Section 02730 - Sanitary Sewer Pipe
- D. Section 02751 - Pipeline Testing
- E. Section 02923 - Landscape Grading
- F. Section 02936 - Seeding
- G. Section 03300 - Cast-In-Place Concrete
- H. Section 03301 - Precast Concrete

1.3 QUALITY ASSURANCE

- A. Equipment manufacturer shall have a minimum of ten (10) years experience in the design and manufacture of submersible pump station of the type specified.
- B. If requested by the ENGINEER, the equipment manufacturer shall furnish a listing of not less than twenty-five (25) plants where equipment of the type specified is installed and operating. Each installation shall identify plant size, type of equipment installed, date of installation, name of engineer, name of owner, contract person, and phone number.
- C. Obtain pumping equipment, motors, pump controls, pump enclosures, and appurtenances from one supplier whose responsibility it shall be to ensure that the pumping equipment is properly coordinated and operated in accordance with these specifications. All pumps and motors shall be from the same manufacturer.
- D. Upon request from the ENGINEER, the pump station manufacturer shall demonstrate proof of financial responsibility with respect to performance and delivery date.
- E. Upon request from the ENGINEER, the pump station manufacturer shall demonstrate proof or evidence of facilities, equipment, and skills required to produce the equipment specified herein.

- F. Corrosion Protection. All materials that are, or that may be exposed to wastewater contact, or that are exposed to wastewater environment shall have inherent corrosion protection; i.e., cast iron, fiberglass, stainless steel, PVC, etc. Any steel surfaces shall be suitably protected against corrosion. All fasteners shall be stainless steel.

1.4 SUBMITTALS

- A. In accordance with the requirements of Section 01300, submit complete shop drawings and manufacturer's data covering installation instructions, dimensions, weight, detailed specifications, materials, parts, devices, and any and all information required to verify compliance with these specifications.
- B. Prior to delivery, submit for approval certified copies of factory run pump performance tests at least ten (10) days before shipment to the project site. Submittal shall include test log, description of test setup, test procedure, and certified performance curve.
- C. Submit complete information on corrosion protection coatings applied by the manufacturer.
- D. Submit complete wiring diagrams for all components to be furnished.
- E. In accordance with the requirements of Section 01700, submit complete operation and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment and materials to the site in an undamaged condition. Schedule delivery so that wet well and valve chamber can be placed immediately in final position in excavation. Exercise care when off-loading equipment to prevent damage.
- B. Store equipment which could be damaged by moisture in a covered, well-ventilated, moisture-free environment.
- C. Store equipment which could be damaged by low temperature in a heated enclosure.

1.6 WARRANTY

- A. Provide manufacturer's warranty, in writing, under provisions of Section 01700.

1.7 DESIGN REQUIREMENTS

- A. Design pump system for handling raw, unscreened sewage and wastewater.
- B. Design system for continuous operation at full nameplate load with pump and motor fully submerged, partially submerged, or totally nonsubmerged.
- C. Design pump system for continuous submergence, without leakage, under a minimum water head of 65 feet.
- D. Design entire system to be explosionproof under Class I, Division 1, Group D conditions as defined by NEC.

- E. Motors shall be of sufficient size to operate without overload under all possible conditions of loading through the entire range of the pump characteristic curve.

1.8 PERFORMANCE REQUIREMENTS

A. Pump Station Number 1

1. Liquid to be pumped: Raw wastewater
2. Temperature range of liquid: 32° F to 80° F
3. Capacity at design point: _____ gpm
4. Total head (H) at design point: _____ feet
5. Minimum efficiency at design point: _____ %
6. Shutoff head: __ ft.
7. Maximum bhp at any point in the operating range: _____ hp
8. Discharge size: _____ inches
9. Solids handling capacity: _____ inches
10. Maximum rotative speed: _____ rpm
11. Power supply: __ volts, _____-phase, _____ Hz

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fairbanks-Morse Pump Corporation (Kansas City, KS)
- B. Barnes Pumps, Inc. (Mansfield OH)
- C. Aurora/Hydromatic Pumps, Inc. (Ashland OH)
- D. Substitutions: Allowed under provisions of Section 01600

2.2 MATERIALS

A. Pumps:

1. Motor and bearing housing: Cast Iron, ASTM A48, Class 30
2. Casing/volute: Cast iron, ASTM A48, Class 30
3. Impeller: Cast iron, ASTM A48, Class 30
4. Shaft: 416 stainless steel
5. Seals: stainless steel metallic and Buna-N components
Upper seal: carbon/Ni-resist
Lower seal: carbon/ceramic
6. Nuts, bolts, washers, and other fastening devices: Type 304 or 316 stainless steel

B. Guide rails: Stainless steel

C. Lifting chain: Galvanized steel

- D. Anchor Bolts: Stainless steel in accordance with ASTM F593, alloy group 1, 2, or 3, condition SH, including compatible nuts.

2.3 MANUFACTURED UNITS

A. Impeller:

1. Bladeless (single vane)
2. Pump out vanes on upper side to reduce pressure in seal area
3. Statically and dynamically balanced

B. Casing/volute:

1. Single volute type, circular design
2. Internally finished to provide smooth, unobstructed flow in volute

C. Shaft: Sized to deliver maximum torque developed by motor

D. Bearings:

1. Outboard thrust bearing consisting of ball bearing with minimum L_{10} life of 40,000 hours
2. Inboard radial bearing may be either ball or sleeve bearing
3. Permanently lubricated

E. Seals: Double mechanical seal operating in oil bath, with all seal faces and springs immersed in oil

F. Motor

1. UL listed for Class I, Division 1, Group D hazardous areas
2. Squirrel cage induction motor, 1.15 service factor
3. Class F insulation
4. Capable of sustaining a minimum of 10 starts per hour.
5. Equip with thermal switches embedded in stator to protect motor from overheating
6. Equip with moisture-sensing device to prevent damage to motor in case of seal failure

G. Discharge Connection

1. Design to permit gravity coupling to discharge piping
2. Design to permit connection to flanged ductile iron discharge pipe

H. Electrical Cables

1. Power cord: Required length of SO cable
2. Temperature and moisture sensor cord: Required length of 14/4 SO cable

2.4 WET WELL AND VALVE CHAMBER

- A. Precast reinforced concrete wet well and valve chamber meeting the following requirements:
 1. Precast Manhole Sections - ASTM C478, latest revision.
 2. Precast concrete chambers - ASTM C857, ASTM C858, latest revision.
 3. Joint seals - "B/C Rubber Caulking Compound", Nervaseal TS
- B. Diameter and Depth: As shown on the Drawings.
- C. Equip with:
 1. Reinforced concrete cover
 2. NEMA 7 junction box
 3. Aluminum access hatch as specified below:
 - a. 1/4" thick, one-piece extruded aluminum frame with mill finish, incorporating concrete anchors for embedment in precast top slab. Bituminous coating applied to frame where embedded in concrete.
 - b. 1/4" thick, aluminum diamond plate door panels, designed to withstand 300 psf live load. Automatic hold open arm and release handle. Tamperproof stainless steel hinges and attaching hardware. Noncorrosive locking bar and handle. Door swings 90 degrees open, and closes flush with frame. Hinged stainless steel hasp to receive padlock. Stainless steel hardware throughout to meet corrosive conditions.
 - c. Two door unit shall combine pump access and trash basket access doors in a one-piece frame structure.
 - d. Ten-year guarantee against defects in materials and/or workmanship.
 - e. Halliday Products, Series T1R, T2R.
 4. Aluminum access ladder with safety extension as specified below:
 - a. Aluminum flat bar rails minimum 3/8" x 2-1/2", 16" wide; 1-3/8" diameter slip resistant rungs spaced at 12" o.c., welded to rails. Mount to floor and access hatch; provide additional standoffs to prevent movement or bowing when manned. Halliday Products Series L1B.
 - b. Two inch (2") square aluminum tube with 1-5/8" aluminum safety post; positive locking mechanism when extended for use; 37" extension, and fully retractable to allow closure of access hatch. Halliday Products L1E.
 5. Hopper bottom constructed from lean concrete (2,500 psi min.) as specified in Section 03300

6. Antiflotation collar
7. Watertight seals for pipe penetrations as shown on the Drawings
8. Discharge elbow mounted on wet well floor with stainless steel anchor bolts and designed to permit gravity coupling to pump discharge
9. Ductile iron discharge pipe and fittings
10. Resilient seat gate valves as specified below:
 - a. Flanged, iron body, 125 pound standard, outside screw and yoke, bronze mounted with resilient-seated wedge conforming to AWWA C 509, handwheel operator, counterclockwise to open..
 - b. Resilient seat of Styrene Butadiene SBR or Urethane Rubber bonded to cast iron wedge. "O-ring" type stem seals. Exterior to be asphalt varnish or epoxy coated; interior ferrous metal parts to be epoxy coated, AWWA C 550.
 - c. Buried valves shall be nonrising (NRS) stem type. All valves shall open counterclockwise. Buried valves shall be furnished with a 2-inch square operating nut, valve box, and extension rod to within six inches (6") of finished grade. Provide one tee handle per pump station.
 - d. Kennedy, American Darling, DeZurick or approved substitute.
11. Swing check valve as specified below:
 - a. Flanged, iron body, bronze mounted, full opening swing type check, with bolted cover, stainless steel hinge and malleable iron clapper arm. Cast iron disc with bronze seat ring.
 - b. Minimum working pressure of 150 psi.
 - c. Valves 10 inch and larger furnished with outside lever and spring.
 - d. Valves less than 10 inch furnished with outside lever and adjustable weight.
 - e. Mueller, Clow, M & H Valve, or approved substitution.
 - f. Acceptable alternate: Val-Matic Swing Flex Series 500 with backflow actuator.
12. Valve boxes as specified below:
 - a. Provide two-piece, screw type Buffalo style adjustable roadway-type valve box constructed of cast iron. Valve boxes shall have a 5-1/4" shaft. All parts of the box shall be of gray iron, free from cold shuts and blow holes and shall be painted with black bituminous paint.
 - b. Box shall have a plug lid fitting into a recessed seat. The lid shall have the

word "SEWER" cast in the lid.

- c. Valve boxes shall be set at the surface of grade and shall have an adjustable range up to 6-inches above grade.
- d. Tyler, Clow, or approved substitute.
- 13. Two-inch (2") diameter Schedule 40 pipe, stainless steel guide rails for removal of pumps, including support brackets.
- 14. Pump control system with mercury float switches.
- 15. 1,000 pound capacity stainless steel portable pump lifting hoist; Halliday Products H1000, or equal. Hoist anchors to be located in wet well cover and valve chamber cover.
- 16. Trash basket and rails as specified below:
 - a. 0.080" aluminum perforated screen basket, 2" holes on 3" centers, aluminum tracking angles built into basket frame.
 - b. Extruded aluminum guide rails sized to facilitate easy operation of the basket, aluminum basket stop, standoff at 7" minimum, coordinate with access hatch.
 - c. Halliday Products, Series B1A.

2.5 PUMP CONTROL SYSTEM

A. Consists of the following major components:

- 1. Duplex pump control panel
- 2. Four (4) float switches
- 3. Power cable and float cable from control panel to wet well
- 4. Cable supports and junction boxes, as required

B. Control Panel

- 1. Enclosure:
 - a. Mount in NEMA 4X station control panel with clear acrylic window
 - b. Equip with NEMA 3R gasketed door
- 2. Equip with:
 - a. Manual disconnect with three-pole adjustable overload protection and instantaneous magnetic trip; one per pump
 - b. Magnetic starter, rated for pump horsepower; one per pump
 - c. Hand/Off/Auto selector switch; one per pump
 - d. Automatic pump alternator

- e. Control circuit fuse or circuit breaker
- f. Klaxon motor protection switch to shut down pump motor if high temperature occurs; one per pump
- g. Yellow seal failure light mounted on door; one per pump
- h. Green running light mounted on door; one per pump
- i. Red high level alarm light
- j. Transformer to provide 24-volt control circuit for float switches
- k. Contacts as follows:
 - (1) One NO and one NC unpowered contact from seal failure alarm wired to terminals for autodialer connection; one per pump.
 - (2) One NO and one NC unpowered contact from high level alarm wired to terminals for autodialer connection; one per pump.
- l. Elapsed time meter; one per pump
- m. Lightning arrestor, mounted inside pump panel
- n. Intrinsically safe circuits for:
 - (1) Float system
 - (2) High level alarm float
- o. 120 volt, 15 amp duplex receptacle and 15 amp fuse in receptacle feed

C. Float Switches

- 1. Provide four (4) float switches, with required cable and mounting hardware, for mounting in pump station wet well.
- 2. Float switch functions (top to bottom):
 - a. Energize high level alarm circuit at elevation shown on Drawings
 - b. Start lag pump at elevation shown on Drawings
 - c. Start lead pump at elevation shown on Drawings
 - d. Stop both pumps at elevation shown on Drawings

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install pump systems in accordance with manufacturers' instructions.

- B. Support guide rails to prevent movement or bowing when pump is lifted or lowered.
- C. Embed hoist anchors (capable of supporting 1,000 pound portable hoist) in concrete wet well cover and valve chamber cover.

3.2 FIELD TESTING

- A. Slide pumps up and down on guide rails to check for free movement and proper coupling to discharge piping.
- B. Run each pump for a minimum of 30 minutes to check for the proper operation and absence of vibration. Verify proper operation of control system floats and pump alternator.

END OF SECTION

SECTION 11307

RESIDENTIAL GRINDER PUMP SEWAGE SYSTEM Semi-Positive Displacement Grinder Pump System

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: The Manufacturer shall furnish complete factory-built and tested Grinder Pump Station(s), consisting of semi-positive displacement type grinder pump(s) suitably mounted in a basin constructed of high density polyethylene (HDPE) or Fiberglass Reinforced Polyester Resin with dimensions and capacities as show on the Design Drawings, NEMA 6P electrical quick disconnect (EQD), pump removal system, stainless steel discharge assembly/shut-off valve, anti-siphon valve/check valve, each assembled in the basin, electrical alarm panel and all necessary internal wiring and controls. Component type grinder pump systems that require field assembly will not be acceptable due to the potential problems that can occur during field assembly. All components and materials shall be in accordance with section 2.0 of this Product Specification. For ease of serviceability, all pump, motor/grinder units shall be of like type and horsepower throughout the system.
- B. Value Engineering: Components shall be evaluated by function and fit with packaged residential grinder pump station(s) performance requirements. Non-metallic components shall be furnished to prevent corrosion.
- C. Related Sections
 - 1. Section 02730 - Sanitary Sewer Pipe
 - 2. Section 02751 - Sewer Pipeline and Manhole Testing

1.2 REFERENCE STANDARDS

- A. Underwriters Laboratories, Inc. (UL) - 778, Motor Operated Water Pumps
- B. American National Standards Institute ANSI/Instrument Society of America (ISA) - ANSI/ISA S82.01, Safety Requirements for Electrical Equipment for Control Use
- C. Intertek Testing Services (ITS) - ETL Residential Grinder Pump Sewage System Listing
- D. Intertek Testing Services (ITS) - -C Residential Grinder Pump Sewage System Listing
- E. American Association of State Highway and Transportation Officials (AASHTO) - Standard Specifications for Highway Bridges, Fifteenth Edition, 1992.
- F. National Electrical Manufacturers Association (NEMA Standard 250-1991) - NEMA 4X, Intended for indoor or outdoor use to provide a degree of protection against windblown dust and rain, splashing water and hose-directed water (1000 psi)
- G. National Electrical Manufacturers Association (NEMA Standard 250-1991) - NEMA 6, Intended for indoor or outdoor use to provide a degree of protection against the entry of liquid during occasional temporary submergence (1 hour) at a limited depth (6 feet/3 psi)
- H. National Electrical Manufacturers Association (NEMA Standard 250-1991) - NEMA 6P, Intended for indoor or outdoor use to provide a degree of protection against the entry of liquid during prolonged submergence (24 hours) at a limited depth (6 feet/3 psi)
- I. Occupational Safety and Health Association (OSHA) -29 CFR 1910.146, Permit Required Confined Space Entry
- J. International Electrotechnical Commission (IEC 529) - IP 67, Intended for indoor or outdoor use to provide a degree of protection against the entry of liquid during occasional temporary submergence (1 hour) at a limited depth (6 feet/3 psi)
- K. International Electrotechnical Commission (IEC 529) - IP 68, Intended for indoor or outdoor use to provide a degree of protection against the entry of liquid during prolonged submergence (24 hour) at a limited depth (265 feet/100 psi)

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. The pumps shall be capable of delivering, 11 GPM against a rated total dynamic head of 92 feet (40 PSIG), and 7.8 GPM against a rated total dynamic head of 181 feet (75 PSIG). The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor(s). Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

1.4 SUBMITTALS

- A. Submittals: Prior to fabrication, manufacturer shall furnish shop drawings detailing the equipment to be furnished including dimensional data and materials of construction for approval by the Engineer. This submittal shall contain, but not be limited to detailed specifications, including pump, motor, impeller, grinder assembly, lift out assembly, check valve, shut off valve, piping, level controls, basin, electrical control panel, electrical junction boxes, alarm facilities, pump performance curves, collection tank structural calculations, collection tank flotation calculations, drawings of the major components of the system and complete parts list. Any deviations from the specification shall be noted in the submittal.

1.5 MANUFACTURER QUALITY ASSURANCE

A. Qualifications

1. The equipment furnished shall be produced by a company experiences in the design and manufacture of grinder pumps. Manufacturer shall have a minimum of twenty-five years experience in the design and manufacture of grinder pump systems for use in low pressure sewer projects. A project is defined as an installation of 150 or more pumps discharging to a common force main.
2. Submit statement of qualifications with bid submission.

B. Regulatory Requirements

Residential Grinder Pump Sewage System(s) shall be furnished to meet state and local requirements.

C. Certifications

Certified test results shall be supplied by Manufacturer upon request showing Residential Grinder Pump Sewage System(s) operation parameters.

The manufacturer shall submit a certificate of compliance for Underwriters Laboratories approval for the complete package.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading: Manufacturer shall provide a complete Residential Grinder Pump Sewage System(s) on skid(s) or pallet(s) ready to install. Do not drop or impact the basin. If basin must be moved, be sure that ground traversed is smooth and free of rocks, debris, etc. When lifting basin, only a pliable strap or rope should contact basin. Do not use chains or steel cables.
- B. Storage and Protection: Store Residential Grinder Pump Sewage System(s) away from sun and weather exposure until installation.

1.7 WARRANTY

- A. The grinder pump MANUFACTURER shall provide a part(s) and labor warranty on the complete station and accessories, including, but not limited to, the panel for a period of 24 after notice of OWNER'S acceptance, but no greater than 27 months after receipt of shipment. Any manufacturing defects found during the warranty period will be reported to the MANUFACTURER by the OWNER and will be corrected by the MANUFACTURER at no cost to the OWNER.
- B. WARRANTY PERFORMANCE CERTIFICATION: As a bid certification requirement, each bidder shall provide with their bid schedule a Warranty Performance Certification statement executed by the most senior executive officer of the grinder pump MANUFACTURER, which certifies a minimum of a 24-month warranty. They must further detail any exclusions from the warranty or additional cost items required to maintain the equipment in warrantable condition, including all associated labor and shipping fees, and certify that the MANUFACTURER will bear all costs to correct any original equipment deficiency for the effective period of the warranty. All preventive maintenance type requirements shall be included in this form as exclusions. These requirements include, but are not limited to, unjamming of grinder mechanism, periodic motor maintenance, and periodic cleaning of liquid level controls. A Warranty Performance Certification form is included with the bid schedule and must be completed and submitted as part of the bid package. Bids with incomplete forms or missing forms will be considered nonresponsive.
- C. Service Center

The grinder pump manufacturer shall be required to maintain an authorized warranty and repair service center within seventy-five (75) mile radius of the project site. The service center shall be equipped with twenty-four (24) hour on call service, full time grinder pump service technician, be equipped with full rebuilding and testing facilities complete with pump test loop to load test repaired pumps under clear water working conditions. Service center shall stock at a minimum three (3) of the specified grinder pumps, and two (2) of the specified control panels.
- D. Operation and Maintenance Instructions

The Manufacturer shall submit two (2) copies of a draft Operations and Maintenance Manual to the Engineer for review. Upon acceptance by the Engineer, the Manufacturer shall supply five (5) copies of Operation and Maintenance Manuals to the OWNER, and one copy of the same to the ENGINEER and PROPERTY OWNER. Manual shall be neatly bound in three ring binders. All pages and exhibits shall have reinforcements or be printed on heavy duty paper stock to reduce page tear out. The maximum exhibit size shall be 11 inches by 17 inches.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. e/One Corporation
- B. F. E. Myers Pump Co. (Pentair Inc.)
- C. Approved equal

2.2 EXISTING PRODUCTS

- A. Sewer mains shall be of materials specified by Engineer in Section 02730 - Sanitary Sewer Pipe. Residential Grinder Pump Sewage System(s) materials shall be compatible with existing materials to maintain water tightness.

2.3 MATERIALS

- A. All components shall be constructed of corrosion resistant materials with proven history in residential sewage service. Painted or galvanized steel components exposed to pumped media shall not be allowed.

2.4 MANUFACTURED UNIT

- A. Manufacturer shall provide factory built and tested Residential Grinder Pump Sewage System(s) completely assembled with grinder pump suspended in a polyethylene collection tank, tool-free pump removal system, shut-off valve with integral extension handle, and check valve assemblies within collection tank, and all necessary internal wiring, piping, and controls.

2.5 COMPONENTS

A. Grinder Pump

1. The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanical seal. Double radial O-ring seals are required at all casting joints to minimize corrosion and create a protective barrier. All pump castings shall be cast iron, fully epoxy coated to 8-10 mil Nominal dry thickness, wet applied. The rotor shall be through-hardened, highly polished, 300 series stainless steel. The stator shall be a synthetic elastomer. This material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance.

B. Grinder Assembly

1. The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. The grinder will be a one-piece, forged 440c stainless steel cutter wheel of the rotating type with hardened cutter teeth (Rockwell 55-58c) for abrasion resistance. A stationary quench hardened and ground shredding ring shall be provided. The shredding ring will have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque.
2. This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to minimize clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

- a. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.
 - b. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm.
 3. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, wipes, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.
- C. Electric Motor:
 1. As a maximum, the motor shall be a 2 HP, 1750 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, type with Class F installation, low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. The motor shall be press-fit into the casting for better heat transfer and longer winding life. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished grinding capability. The wet portion of the motor armature must be 300 Series stainless.
- D. Mechanical Seal:
 1. The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped.
- E. Collection Tank
 1. High Density Polyethylene Construction
 - a. The tank shall be a wet well/dry well design made of high density polyethylene, with a grade selected to provide the necessary environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.
 - b. The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. The tank capacities shall be as shown on the design drawings.

- c. The Drywell access way shall be an integral extension of the wet well assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The access way design and construction shall enable field adjustment of the station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.
- d. The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations will be acceptable.
- e. All discharge piping shall be constructed of 304 stainless steel. The discharge shall terminate outside the access way bulkhead with a stainless steel, 1-1/4" Female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 235 psi WOG. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.
- f. The access way shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with access way penetrations warranted by the manufacturer to be watertight. The EQD will be supplied with fifty (50) feet of useable Electrical Supply Cable (ESC) outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer. Field assembly of the ESC into the basin is not acceptable because of potential workmanship issues. The EQD shall require no tools for connecting, seal against water before the electrical connection is made, and include radial seals to assure a watertight seal regardless of tightening torque. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. A junction box shall not be permitted in the access way due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required. The access way shall also include an integral 2-inch vent to prevent sewage gases from accumulating in the tank.

2. Hard Piped Assembly

- a. Discharge piping shall be 1-1/4" stainless steel hard piped as indicated on the plans. Piping shall connect to a 1-1/4" stainless steel discharge flange, factory located on the basin at the height shown in the plans. Base Elbows and Guide rail systems shall not be considered equal or allowed.
- b. Pump shall rest on basin floor mounted to a stainless steel base
- c. An adequate length stainless steel chain shall be supplied for removing the pump. The chain shall be of sufficient length and strength to effectively support the weight of the pump assembly during removal or installation.

3. Inlet Flange

- a. A one-piece, flexible basin inlet fitting for 4" SCH 40 plastic pipe shall be shipped loose for field installation.

4. Junction Box

- a. A U.L. listed, NEMA Type 6 submersible rated junction box shall be provided. Junction box shall be formed from corrosion resistant, flame retardant thermoplastic. The enclosure shall be of adequate thickness and properly reinforced to provide good mechanical strength. The junction box shall have a fully gasketed, hinged cover that is held in place by four (4) stainless steel screws. The hinged cover shall prevent dropping the cover into the basin during service.
- b. An adequate number of sealing-type cord grips shall be supplied for incoming pump and level control cords. The cord grips shall be made of non-corrosive material such as PVC or nylon, and shall make an effective seal around the wire jacket.
- c. The junction box shall have a PVC solvent weld socket with an integral 2" NPT pipe for attaching basin conduit hub. The hub shall be made of a corrosion resistant material and shall be of adequate size
- d. The incoming wires shall be sealed by external means, (supplied by others), so that condensation from the conduit or groundwater will not enter the enclosure. The interior of the enclosure shall be of adequate size to accommodate the wires and connections for pump and level control operation.
- e. The wires (supplied by others) running between the control panel and the junction box shall be color-coded and fastened to the pump and level controls by means of adequately sized and insulated twist lock or crimp connectors.

F. CHECK VALVE:

1. The pump discharge shall be equipped with a factory installed, gravity operated, ball-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open. Moving parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back pressure. The valve body shall be an injection molded part made of an engineered thermoplastic resin. The working pressure of the valve shall be at least 235 psi. Ball type check valves are unacceptable due to their limited sealing capacity in slurry applications.

G. ANTI-SIPHON VALVE:

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

diameter shall be no less than 60% of the inside diameter of the pump discharge piping.

H. CONTROLS:

1. Pressure Switch Level Control

- a. Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The air column shall be integrally molded from a thermoplastic elastomer suitable for use in wastewater and with excellent impact resistance. The air column shall have only a single connection between the water level being monitored and the pressure switch. Any connections are to be sealed radially with redundant O-rings. The level detection device shall have no moving parts in direct contact with the wastewater and shall be integral to the pump core assembly in a single, readily-exchanged unit. Depressing the push to run button must operate the pump even with the level sensor housing removed from the pump.
- b. All fasteners throughout the assembly shall be 300 Series stainless steel. High-level sensing will be accomplished in the manner detailed above by a separate air column sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices and their tendency to malfunction because of incorrect wiring, tangling, grease buildup, and mechanical cord fatigue. To assure reliable operation of the pressure switches, each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes. Tube or piping runs outside of the station tank or into tank-mounted junction boxes providing pressure switch equalization will not be permitted due to their susceptibility to condensation, kinking, pinching, and insect infestation. The grinder pump will be furnished with a 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a factory installed NEMA 6P EQD half attached to it.

2. Electrical Power/Control Cord

- a. The motor power cord shall be 14 GA., 3 lead SJOW water resistant and CSA/U.L. approved or as recommended by the manufacturer.
- b. The power cable entry into the cord cap assembly shall first be made with a rubber compression washer and compression nut. Each individual lead shall be stripped down to bare wire, at staggered intervals, and each strand shall be individually separated. A heat shrink tube filled with epoxy shall seal the outer cable jacket and the individual leads to prevent water contamination to gain entry even in the event of wicking or capillary attraction.
- c. All cords between pump and alarm panel shall be fifty (50) feet in length.

I. ALARM PANEL:

1. Each grinder pump station shall include a NEMA 4X, UL-listed alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic polyester to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel.
2. The alarm panel shall contain one suitably sized, double-pole circuit breaker for the pump power circuit including over current and short circuit protection and one 15-amp single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.
3. The alarm panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high level alarm capability. The alarm sequence is to be as follows when the pump and alarm breakers are on:
 - a. When liquid level in the sewage wet-well rises above the alarm level, audible and visual alarms are activated, the contacts on the alarm activate.
 - b. The audible alarm may be silenced by means of the externally mounted, push-to-silence button.
 - c. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.
4. The pump shall include controls to shut the pump down for the following unacceptable operating conditions:
 - a. Brownout conditions with the electrical supply.
 - b. System over-pressure condition such as a closed valve.
 - c. Run dry operation of the pump.
5. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating. The audible alarm shall be externally mounted on the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).
6. The entire alarm panel, as manufactured and including any of the following options, shall be listed by Underwriters Laboratories, Inc.

2.6 SAFETY

- A. The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled

and wired grinder pump station shall be listed by Underwriters Laboratories, Inc. to be safe and appropriate for the intended use.

- B. The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the seal of NSF International.

PART 3 EXECUTION

3.1 CERTIFIED SERVICE PROGRAM:

- A. The grinder pump MANUFACTURER shall provide a program implemented by the MANUFACTURER'S personnel as described in this specification to certify the service company as an authorized serviced center. As evidence of this, the MANUFACTURER shall provide, when requested, sufficient evidence that they have maintained their own service department for a minimum of 30 years and currently employ a minimum of three employees specifically in the service department.

As part of this program, the MANUFACTURER shall evaluate the service technicians as well as the service organization annually. The service company will be authorized by the MANUFACTURER to make independent warranty judgments. The areas covered by the program shall include, as a minimum:

1. Pump Population Information — The service company will maintain a detailed database for the grinder pumps in the territory that tracks serial numbers by address.
2. Inventory Management — The service company must maintain an appropriate level of inventory (pumps, tanks, panels, service parts, etc.) including regular inventory review and proper inventory labeling. Service technicians will also maintain appropriate parts inventory and spare core(s) on service vehicles.
3. Service Personnel Certification — Service technicians will maintain their level-specific certification annually. The certifications are given in field troubleshooting, repair, and training.
4. Service Documentation and Records — Start up sheets, service call records, and customer feedback will be recorded and available by the service company.
5. Shop Organization — The service company will keep its service shop organized and pumps will be tagged with site information at all times. The shop will have all required equipment, a test tank, and cleaning tools necessary to service pumps properly.

- B. INSTALLATION BY PROPERTY OWNER:

1. Earth excavation and backfill are specified under Earthwork for Utilities, but are also to be done as a part of the work under this section, including any necessary sheeting and bracing.
2. The PROPERTY OWNER shall be responsible for handling ground water to provide a firm, dry subgrade for the structure, and shall guard against flotation or other damage resulting from general water or flooding.

3. The grinder pump stations shall not be set into the excavation until the installation procedures and excavation have been approved by the PROPERTY OWNER.
4. Remove packing material. User's instructions MUST be given to the PROPERTY OWNER. Hardware supplied with the unit, if required, will be used at installation. The basin will be supplied with a standard 4" inlet grommet (4.50" OD) for connecting the incoming sewer line. Appropriate inlet piping must be used. The basin may not be dropped, rolled or laid on its side for any reason.
5. Installation shall be accomplished so that 1" to 4" of access way, below the bottom of the lid, extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the excavated hole must be large enough to allow for the concrete anchor.
6. A 6" inch (minimum) layer of naturally rounded aggregate, clean and free flowing, with particle size of not less than 1/8" or more than 3/4" shall be used as bedding material under each unit.
7. A concrete anti-flotation collar, as detailed on the drawings, and sized according to the manufacturer's instructions, shall be required and shall be pre-cast to the grinder pump or poured in place. Each grinder pump station with its pre-cast anti-flotation collar shall have a minimum of three lifting eyes for loading and unloading purposes.
8. If the concrete is poured in place, the unit shall be leveled, and filled with water, to the bottom of the inlet, to help prevent the unit from shifting while the concrete is being poured. The concrete must be manually vibrated to ensure there are no voids. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8" sleeve is required over the inlet prior to the concrete being poured.
9. The PROPERTY OWNER will provide and install a 4-foot piece of 4-inch SCH 40 PVC pipe with water tight cap, to stub-out the inlet for the property owners' installation contractor, as depicted on the contract drawings.
10. The electrical enclosure shall be furnished, installed and wired to the grinder pump station. An alarm device is required on every installation, there shall be NO EXCEPTIONS. It will be the responsibility of the developer to determine the optimum location for the Alarm Panel.
11. Mount the alarm device in a conspicuous location, as per national and local codes. The alarm panel will be connected to the grinder pump station by a length of 6 conductor 12 gauge type TC cable as shown on the design drawings. The power and alarm circuits must be on separate power circuits. The grinder pump stations will be provided with 65', 50' of useable, electrical supply cable to connect the station to the alarm panel.

C. **BACKFILL REQUIREMENTS:** Proper backfill is essential to the long-term reliability of any underground structure. Several methods of backfill are available to produce favorable results with different native soil conditions. The most highly recommended method of backfilling is to surround the unit to grade using Class I or Class II backfill material as defined in ASTM 2321. Class 1A and Class 1B are recommended where frost heave is a concern, Class 1B is a better choice when the native soil is sand or if a high, fluctuating

water table is expected. Class 1, angular crushed stone offers an added benefit in that it doesn't need to be compacted.

Class II, naturally rounded stone, may require more compactive effort, or tamping, to achieve the proper density. If the native soil condition consists of clean compactable soil, with less than 12 percent fines, free of ice, rocks, roots and organic material, it may be an acceptable backfill. Soil must be compacted in lifts not to exceed one foot to reach a final Proctor Density of between 85 percent and 90 percent. Heavy, non-compactable clays and silts are *not* suitable backfill for this or any underground structure such as inlet or discharge lines.

If you are unsure of the consistency of the native soil, it is recommended that a geotechnical evaluation of the material is obtained before specifying backfill.

Another option is the use of a flowable fill (i.e., low slump concrete). This is particularly attractive when installing grinder pump stations in augured holes where tight clearances make it difficult to assure proper backfilling and compaction with dry materials. Flowable fills should not be dropped more than 4 feet from the discharge to the bottom of the hole to avoid separation of the constituent materials.

Backfill of clean native earth, free of rocks, roots, and foreign objects shall be thoroughly compacted in lifts not exceeding 12" to a final Proctor Density of not less than 85 percent. Improper backfilling may result in damaged access ways. The grinder pump station shall be installed at a minimum depth from grade to the top of the 1 1/4" discharge line, to assure maximum frost protection. The finish grade line shall be 1" to 4" below the bottom of the lid, and final grade shall slope away from the grinder pump station.

- D. START-UP AND FIELD TESTING: The MANUFACTURER shall provide the services of authorized service technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct the OWNER and PROPERTY OWNER in the operation and maintenance of the equipment before the stations are accepted by the PROPERTY OWNER.

All equipment and materials necessary to perform testing shall be the responsibility of the INSTALLING CONTRACTOR. This includes, as a minimum, a portable generator and power cable (if temporary power is required), water in each basin (filled to a depth sufficient to verify the high level alarm is operating), and opening of all valves in the system. These steps shall be completed prior to the qualified factory trained technician(s) arrival on site.

The services of a trained factory-authorized technician shall be provided at a rate of 2 hours for every grinder pump station supplied.

The Property Owner, upon completion of the installation of the grinder pump, hydrostatic testing of low pressure service lateral and low pressure air test of the gravity service lateral shall schedule start-up testing of the grinder pump station. The authorized factory technician shall have two (2) business days to schedule the start-up services. The authorized factory technician(s) will perform the following test on each station

1. Make certain the discharge shut-off valve in the station is fully open.
2. Turn ON the alarm power circuit and verify the alarm is functioning properly.
3. Turn ON the pump power circuit. Initiate the pump operation to verify automatic "on/off" controls are operative. The pump should immediately turn ON.
4. Consult the Manufacturer's Service Manual for detailed start-up procedures.

Upon completion of the start-up and testing, the MANUFACTURER shall submit to the ENGINEER the start-up authorization form describing the results of the tests performed for each grinder pump station. Final acceptance of the system will not occur until authorization forms have been received for each pump station installed and any installation deficiencies corrected.

END OF SECTION

PART 6

STANDARD DETAILS

SEWER STANDARD DETAILS

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

CONNECTION TO EXISTING SEWER



SSM

RMS

08/12

S-01

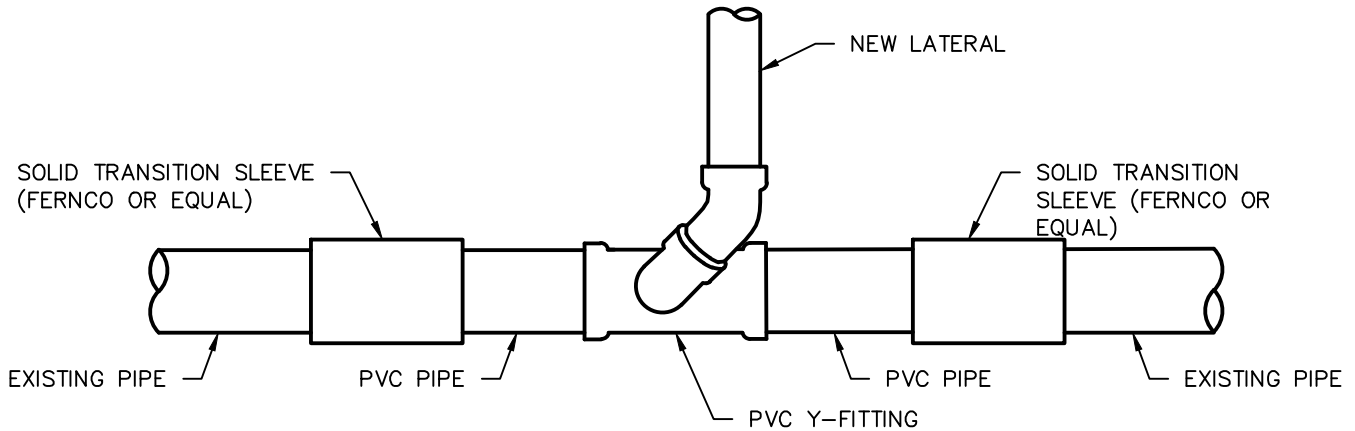
CONSULTING ENGINEERS

APP'D.

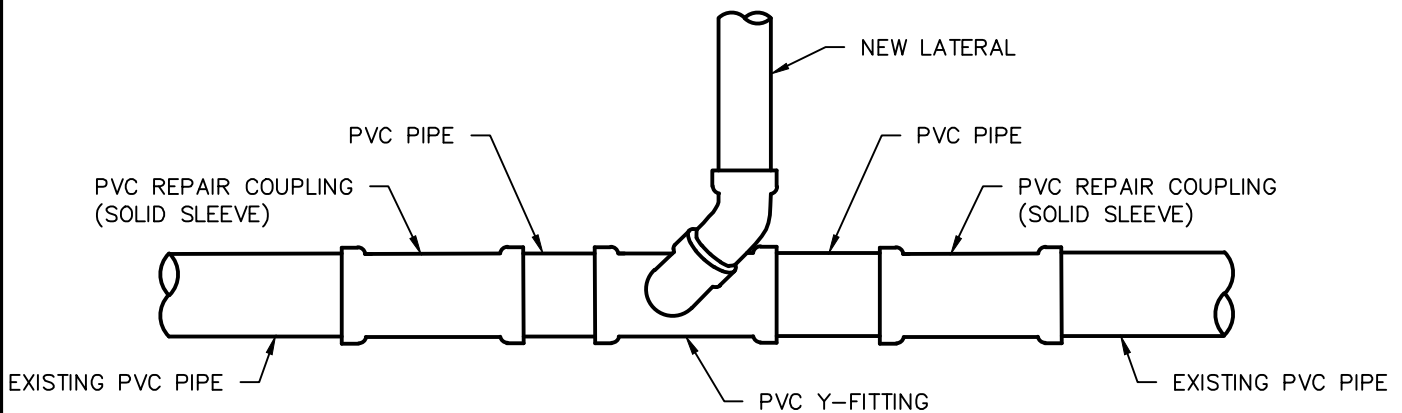
DATE

DRAWING NUMBER

REV.



CONNECTION TO EXISTING D.I., C.I., A/C OR RCP PIPE



CONNECTION TO EXISTING PVC PIPE

CONNECTION TO EXISTING SEWER

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

SADDLE CONNECTION TO EXISTING SEWER



SSM

RMS

08/12

S-02

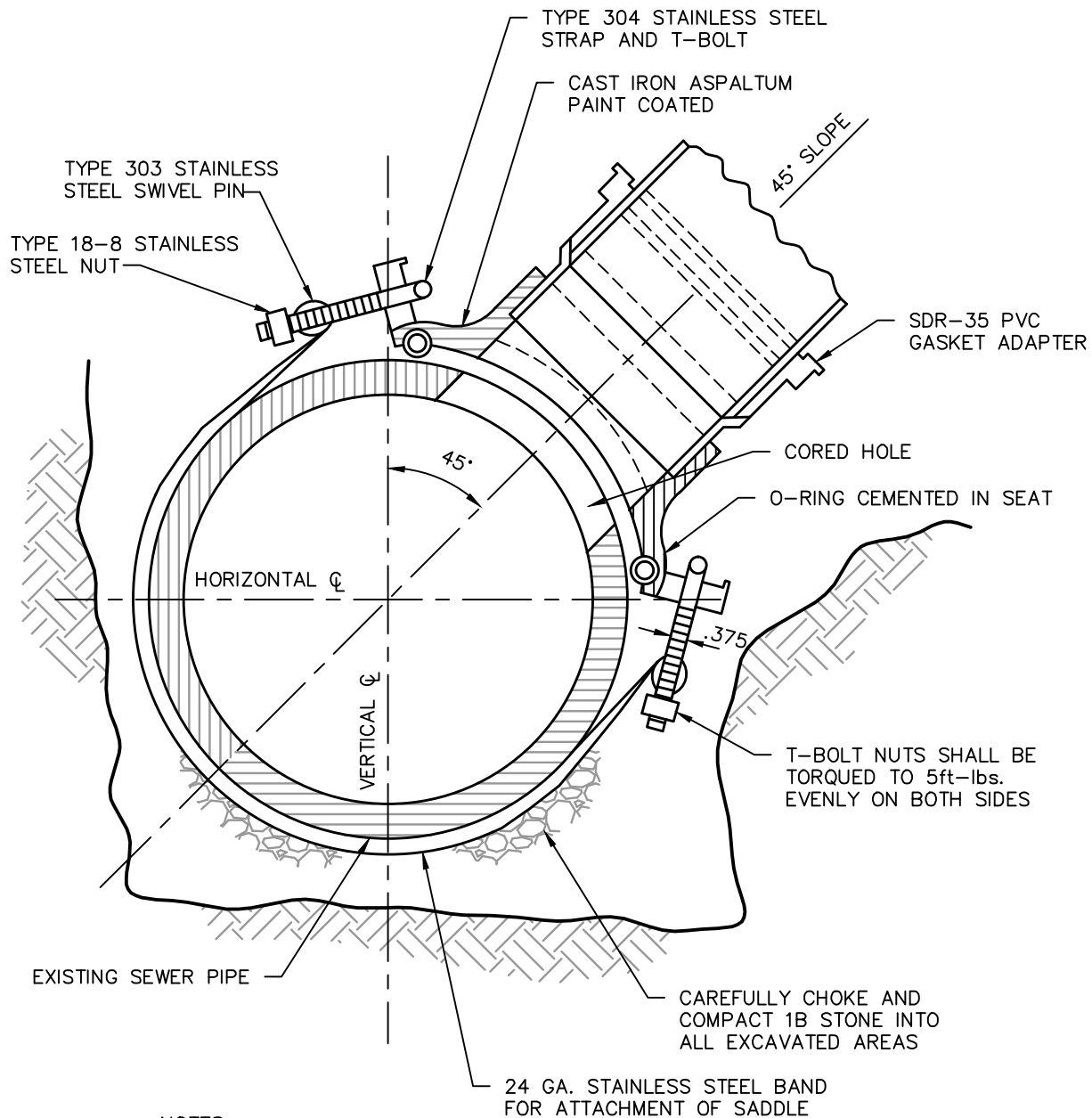
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. PIPE SADDLE SHALL BE STYLE CB AS MANUFACTURED BY ROMAC INDUSTRIES, INC. GENERAL ENGINEERING CO. OR APPROVED EQUAL. FOR PVC SEWER PIPE, SADDLE MAY BE GPK INDUSTRIES SADDLE WYE OR APPROVED EQUAL.
2. THE OPENING IN THE EXISTING SEWER PIPE OVER WHICH THE PIPE SADDLE WILL BE INSTALLED SHALL BE CORED OR CUT (NOT BROKEN) TO THE SIZE OF THE SADDLE OUTLET WITHOUT OVERCUTTING BEYOND THE SEAL DIAMETER.

SADDLE CONNECTION TO EXISTING SEWER

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

WYE CONNECTION TO EXISTING SEWER



SSM

RMS

08/12

S-03

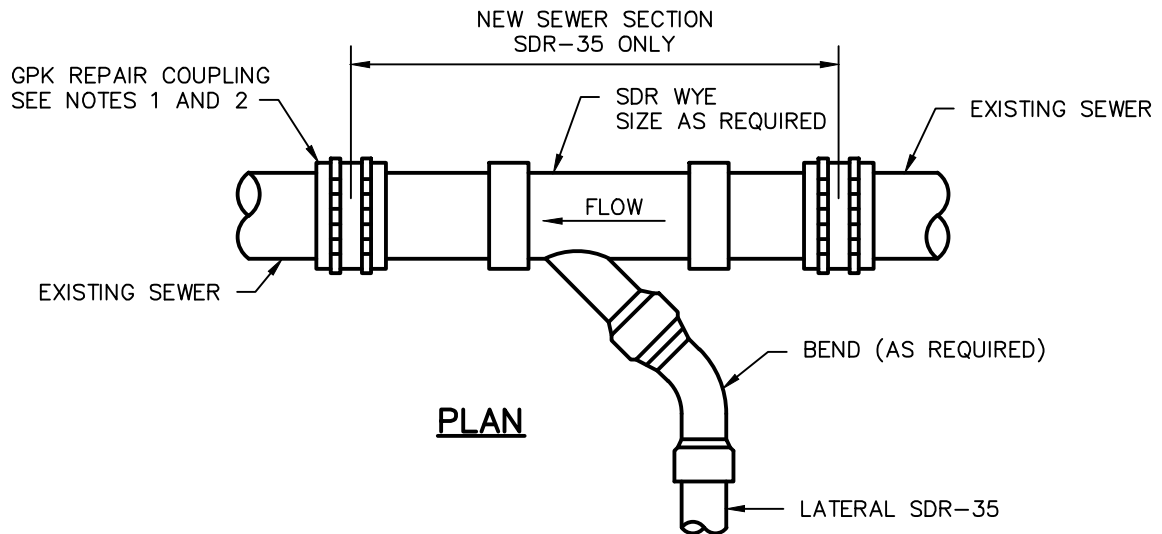
CONSULTING ENGINEERS

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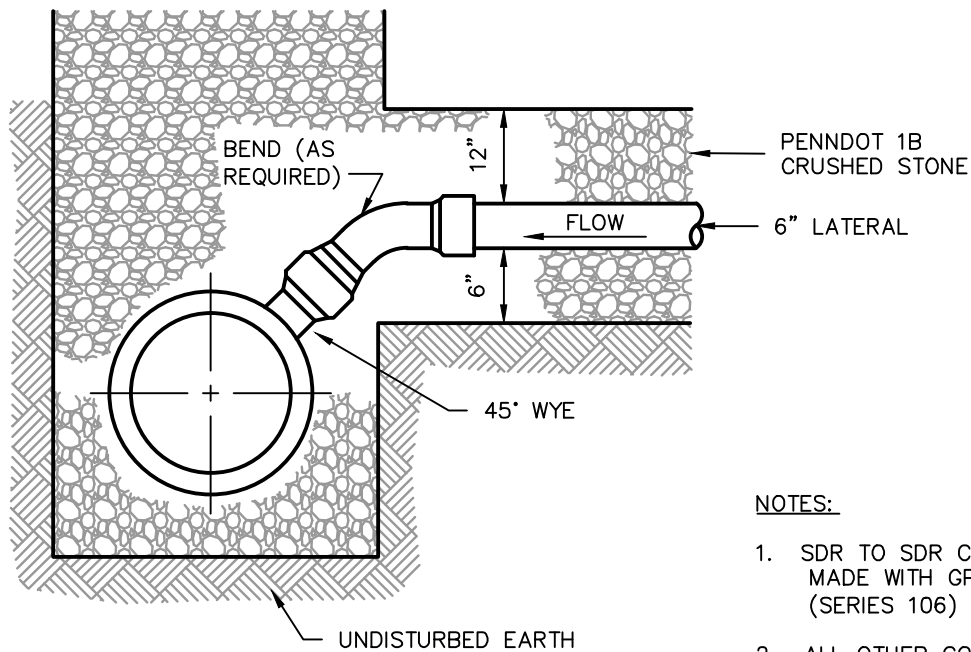
DATE

DRAWING NUMBER

REV.



PLAN



SECTION

NOTES:

1. SDR TO SDR CONNECTION TO BE MADE WITH GPK REPAIR COUPLING (SERIES 106) OR APPROVED EQUAL.
2. ALL OTHER CONNECTIONS TO BE MADE WITH FERNCO COUPLING WITH STAINLESS STEEL STRAPS, STAINLESS STEEL SHEAR RING, AND PVC BUSHING WHEN REQUIRED.
3. ALL LATERAL CONNECTIONS WILL BE MADE BETWEEN 10 O'CLOCK AND 2 O'CLOCK.

WYE CONNECTION TO EXISTING SEWER

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TYPICAL SERVICE LATERAL



RMS

08/12

S-04

CONNECTION TO D.I.P. MAIN

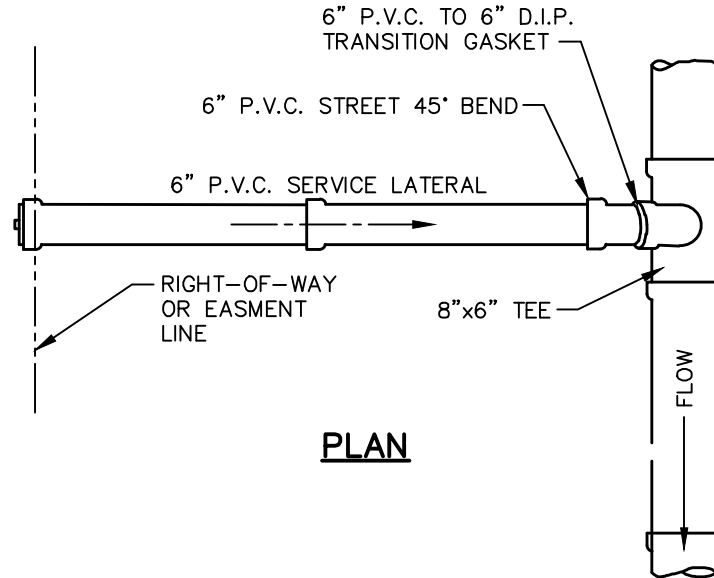
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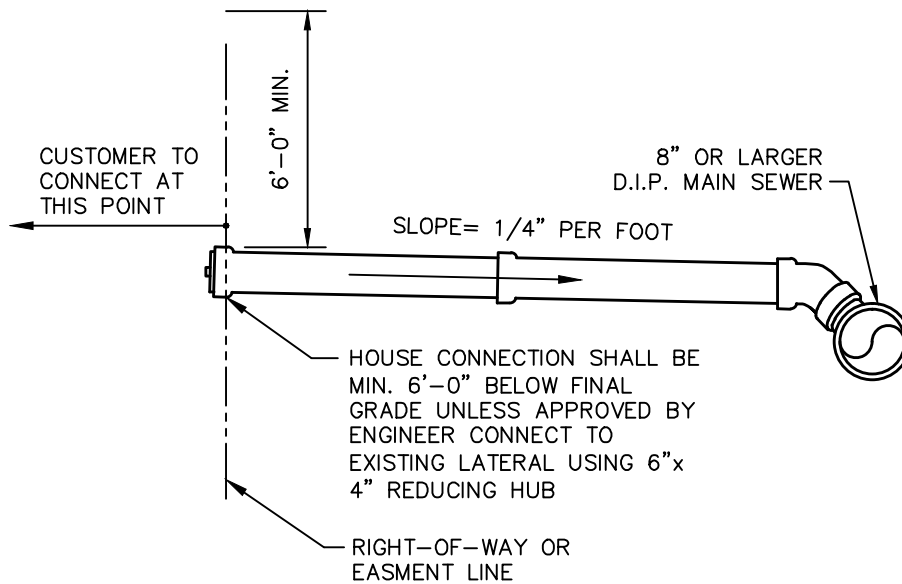
DATE

DRAWING NUMBER

REV.



PLAN



ELEVATION

D.I.P. MAIN
TYPICAL SERVICE LATERAL CONNECTION

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TYPICAL SERVICE LATERAL



RMS

08/12

S-05

CONNECTION TO P.V.C. MAIN

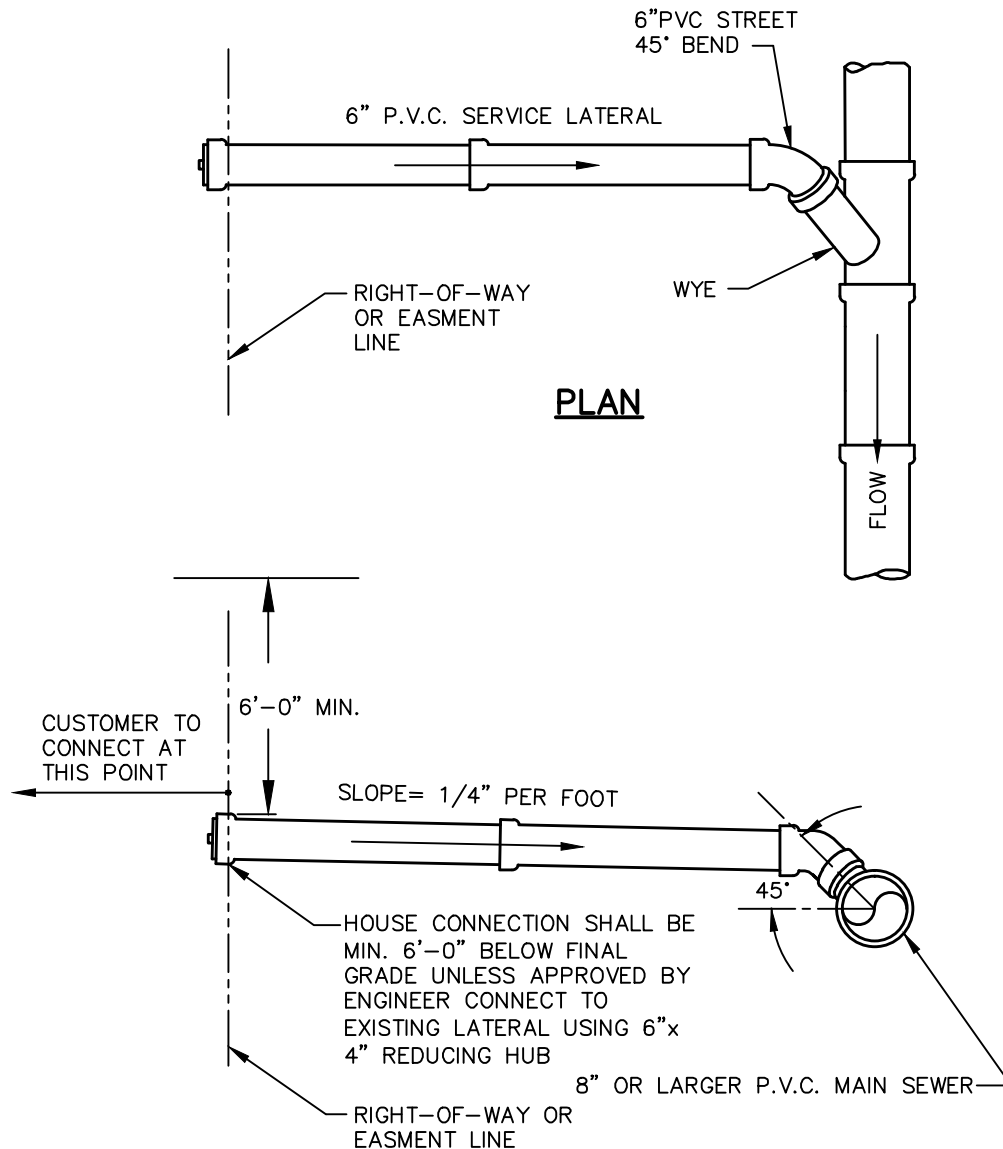
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



ELEVATION

P.V.C. MAIN TYPICAL SERVICE LATERAL CONNECTION

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TYPICAL STANDPIPE



RMS

08/12

S-06

SINGLE SERVICE LATERAL RISER

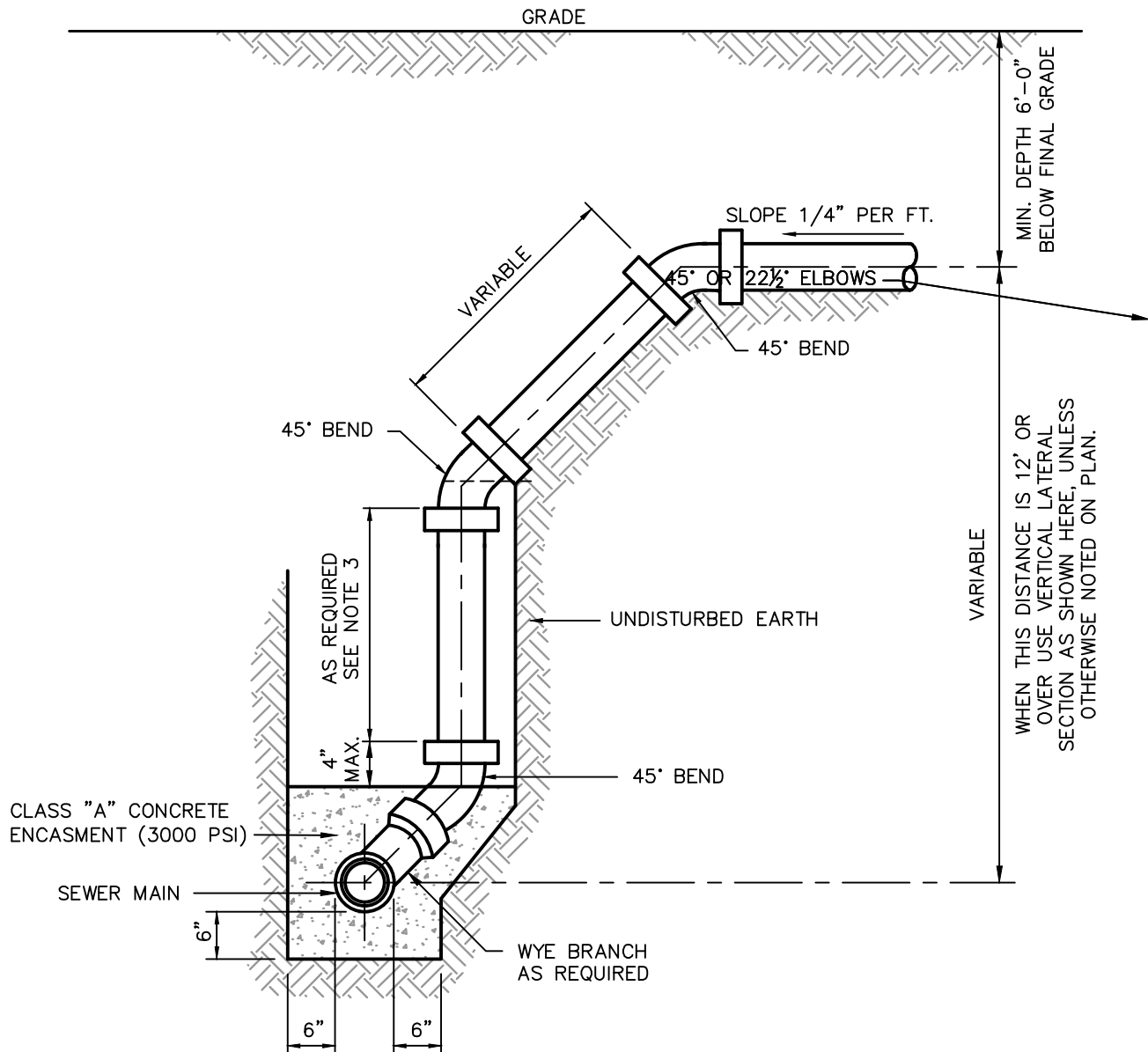
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. IN NO CASE SHALL A LATERAL CONNECT TO THE SEWER MAIN DIRECTLY ON TOP OF THE PIPE.
2. THE VERTICAL PIPE SHALL BE BRACED WHILE BACKFILLING TRENCH.
3. THE VERTICAL SECTION OF THE LATERAL RISER SHALL NOT BE USED WHEN THE HEIGHT OF THE RISER FROM THE ϵ OF THE SEWER MAIN TO ϵ OF END OF LATERAL IS LESS THAN 6 FEET, UNLESS APPROVED BY THE ENGINEER.
4. CONCRETE ENCASMENT SHALL EXTEND ALONG SEWER MAIN 2 FEET BEYOND END OF WYE BRANCH FITTING (BOTH ENDS).

TYPICAL STANDPIPE SINGLE SERVICE LATERAL RISER DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TYPICAL STANDPIPE



SSM

RMS

08/12

S-07

MULTIPLE SERVICE LATERAL RISER

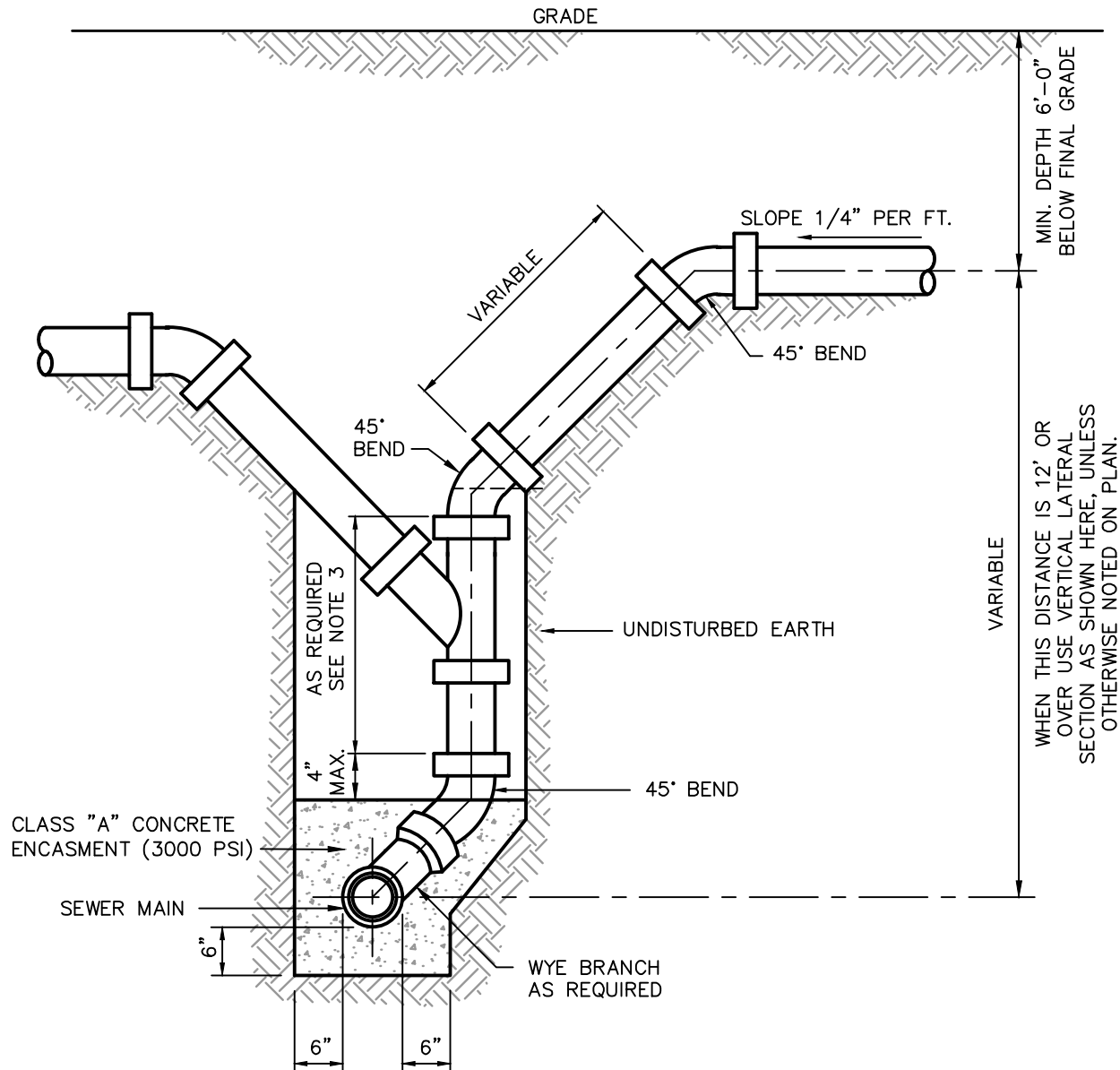
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. IN NO CASE SHALL A LATERAL CONNECT TO THE SEWER MAIN DIRECTLY ON TOP OF THE PIPE.
2. THE VERTICAL PIPE SHALL BE BRACED WHILE BACKFILLING TRENCH.
3. THE VERTICAL SECTION OF THE LATERAL RISER SHALL NOT BE USED WHEN THE HEIGHT OF THE RISER FROM THE ϵ OF THE SEWER MAIN TO ϵ OF END OF LATERAL IS LESS THAN 6 FEET, UNLESS APPROVED BY THE ENGINEER.
4. CONCRETE ENCASMENT SHALL EXTEND ALONG SEWER MAIN 2 FEET BEYOND END OF WYE BRANCH FITTING (BOTH ENDS).

TYPICAL STANDPIPE MULTIPLE SERVICE LATERAL RISER DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TRENCH PLUG DETAIL



SSM

RMS

08/12

S-08

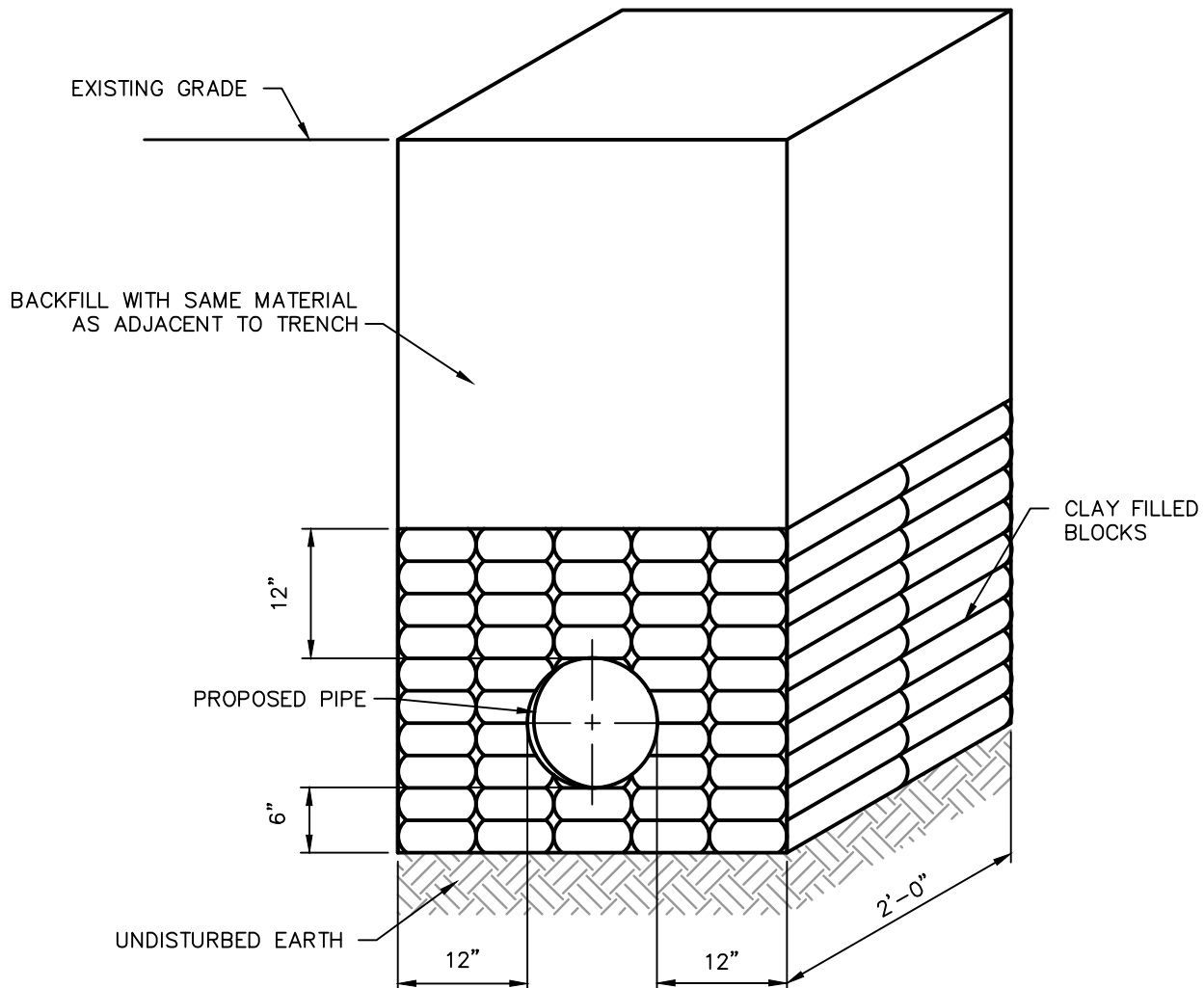
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



TRENCH PLUG DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TYPICAL BUILDING SEWER



CLC

07/14

S-09

RESIDENTIAL

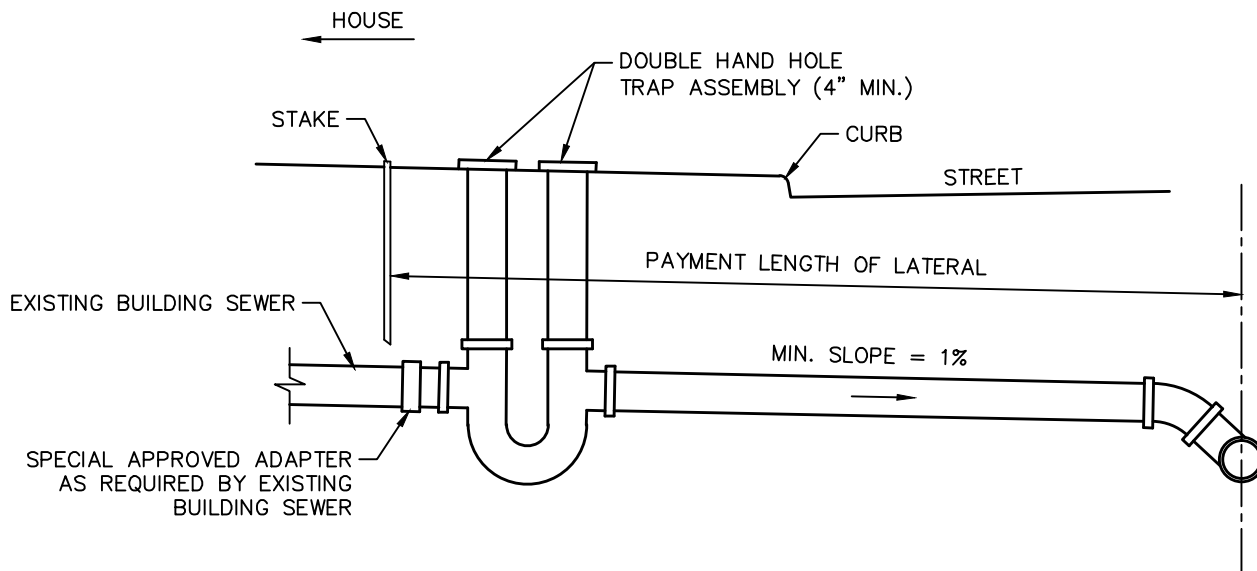
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



TYPICAL SERVICE LATERAL CONNECTION

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TYPICAL BUILDING SEWER



RMS

08/12

S-11

COMMERCIAL OR INDUSTRIAL

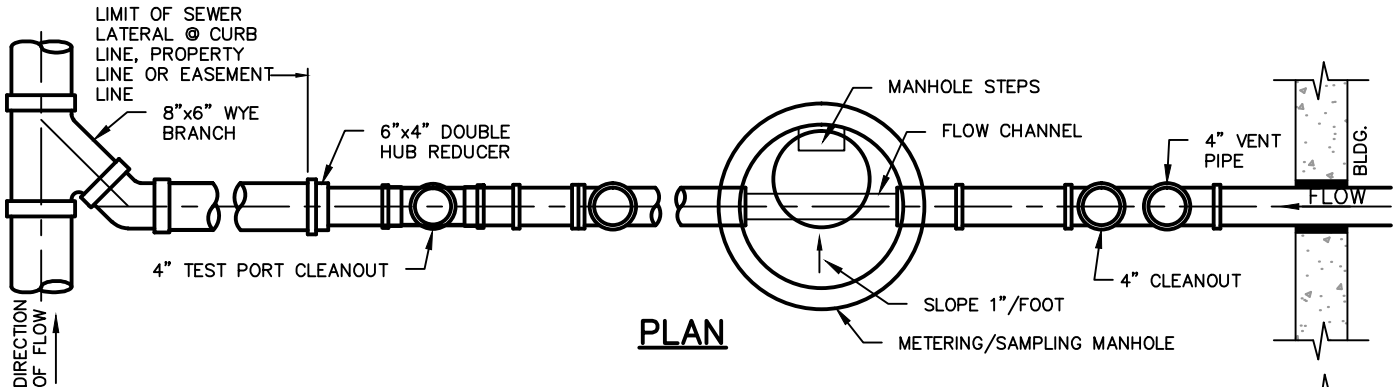
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APP'D.

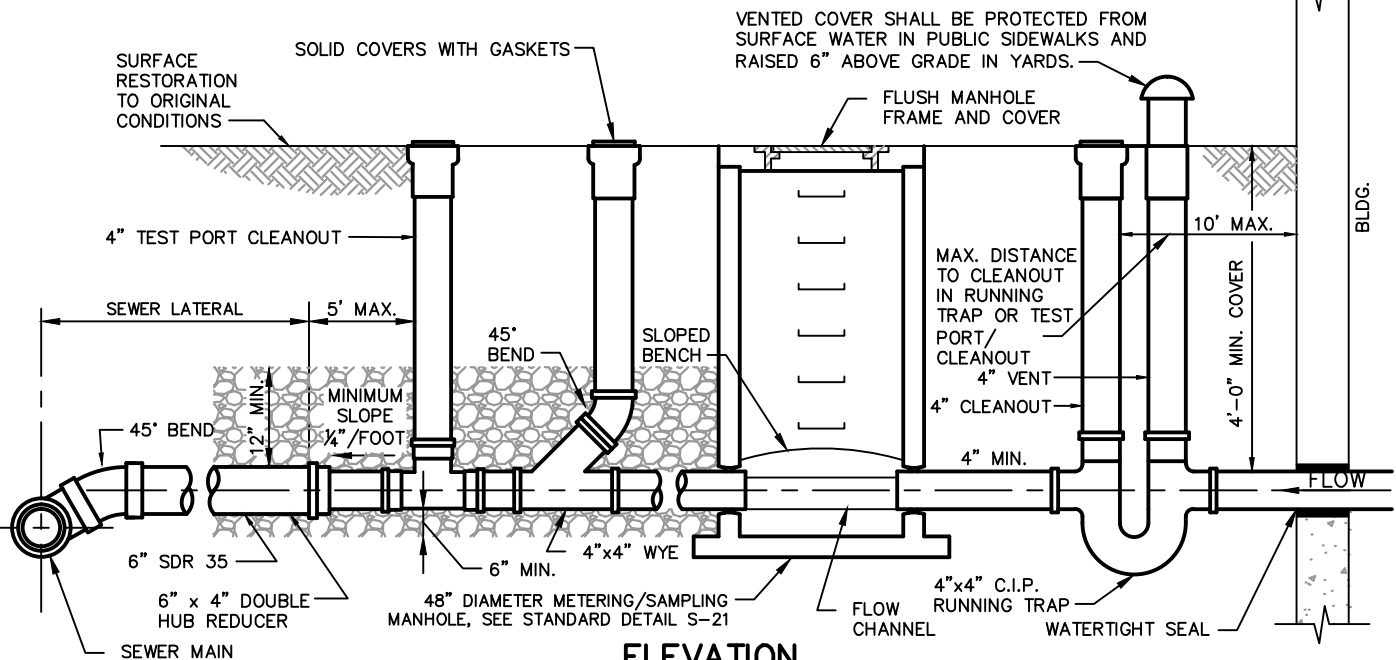
DATE

DRAWING NUMBER

REV.



PLAN



ELEVATION

NOTES:

1. CONSTRUCTION SHALL COMPLY WITH THE ICC INTERNATIONAL BUILDING CODE AND THIS DRAWING, AS A MINIMUM.
2. CLEANOUTS SHALL BE INSTALLED NOT MORE THAN 50' APART IN HORIZONTAL DRAINAGE LINES OF 4" DIA. OR LESS, NOT MORE THAN 100' APART FOR LARGER DIA. PIPES, AT ALL CHANGES OF DIRECTION, AND AT THE PROPERTY LINE OR CURB LINE, AS SHOWN IN THE ABOVE DETAIL.
3. ON-LOT SEWAGE DISPOSAL SYSTEM SHALL BE ABANDONED IN A MANNER APPROVED BY THE MUNICIPALITY.
4. TESTING SHALL INCLUDE EITHER AN AIR TEST OF THE BUILDING SEWER AND CLEANOUTS AT 5 PSIG AIR PRESSURE FOR 15 MINUTES OR A HYDROSTATIC EXFILTRATION TEST AT 10' HEAD OF WATER MINIMUM, FOR 6 HOURS.
5. VENTS WILL NOT BE PERMITTED IN PAVED AREAS.
6. CLEANOUTS AND TEST PORTS, IF PLACED WITHIN PAVED AREAS, SHALL BE PROTECTED FROM VEHICULAR DAMAGE BY LOCATING IN CAST IRON OR DUCTILE IRON VALVE BOX AND COVER MARKED "SEWER".
7. IT IS THE PROPERTY OWNERS RESPONSIBILITY TO MAINTAIN ACCESS TO TEST PORTS. ALL COSTS RELATED TO GAINING ACCESS SHALL BE THE RESPONSIBILITY OF THE PROPERTY OWNER.
8. PROVIDE STONE BEDDING AS SHOWN ABOVE.
9. PROPERTY OWNER SHALL BE RESPONSIBLE FOR SEALING THE BUILDING SEWER PENETRATION THROUGH THE BUILDING WALL. THE MUNICIPALITY SHALL NOT BE RESPONSIBLE FOR ANY GROUND WATER ENTERING INTO THE BUILDING.

BUILDING SEWER PIPE

SHALL CONFORM TO ONE OF THE STANDARDS LISTED BELOW

MATERIAL	STANDARD
CAST-IRON PIPE	ASTM A 74; CISPI 301; ASTM A 888
POLYVINYL CHLORIDE (PVC) PLASTIC PIPE (TYPE DWV, SDR26, SDR35, SDR41, PS50 OR PS100)	ASTM D2665; ASTM D3034; CSA CAN/CSA-B182.2; CSA CAN/CSA-B182.4; ASTM D1784; ASTM D1785; ASTM D2729

TYPICAL BUILDING SEWER COMMERCIAL OR INDUSTRIAL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

GRADE ADJUSTMENT



SSM

RMS

08/12

S-12

CONSULTING ENGINEERS

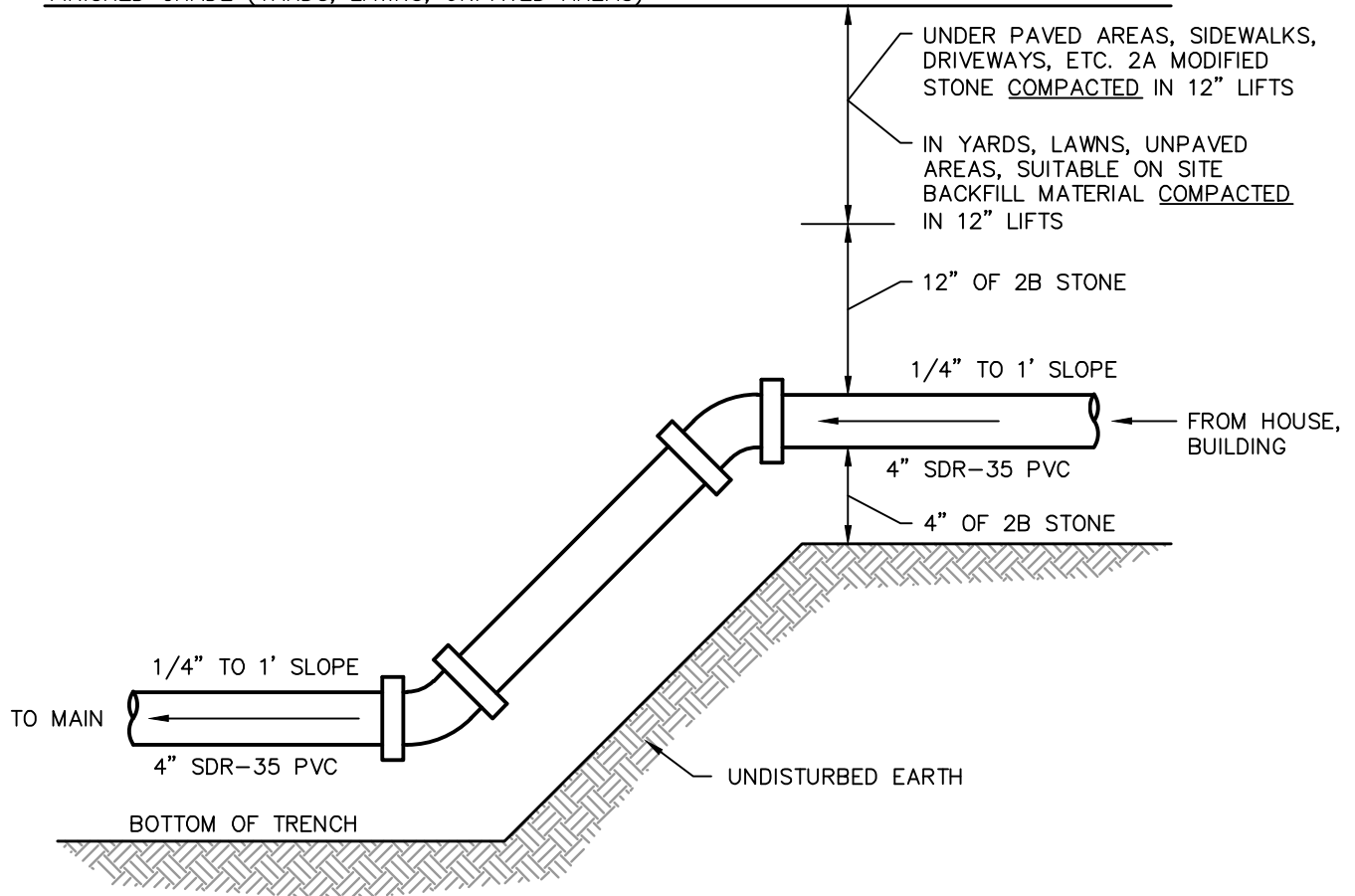
APP'D.

DATE

DRAWING NUMBER

REV.

SUBBASE (PAVED AREAS, SIDEWALKS, DRIVEWAYS, ETC.)
FINISHED GRADE (YARDS, LAWNS, UNPAVED AREAS)



GRADE ADJUSTMENT DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

CLEANOUT FRAME & COVER IN PAVED AREA



SSM

RMS

08/12

S-13

CONSULTING ENGINEERS

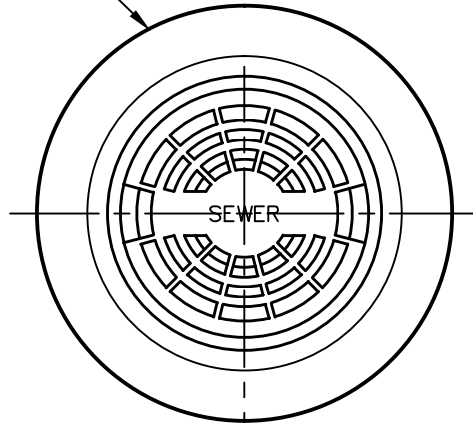
APP'D.

DATE

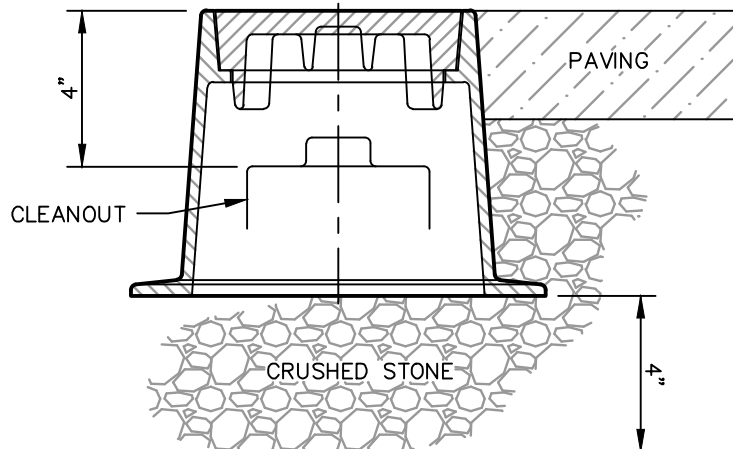
DRAWING NUMBER

REV.

FRAME AND COVER AS
MANUFACTURED BY
EAST JORDAN IRON
WORKS OR GENECO.
FRAME AND COVER
SHALL BE SIZED FOR A
6" CLEANOUT MIN.



PLAN



SECTION

CLEANOUT FRAME & COVER IN PAVED AREA

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

STANDARD MANHOLE SECTION



SSM

RMS

08/12

S-14

PRECAST BASE

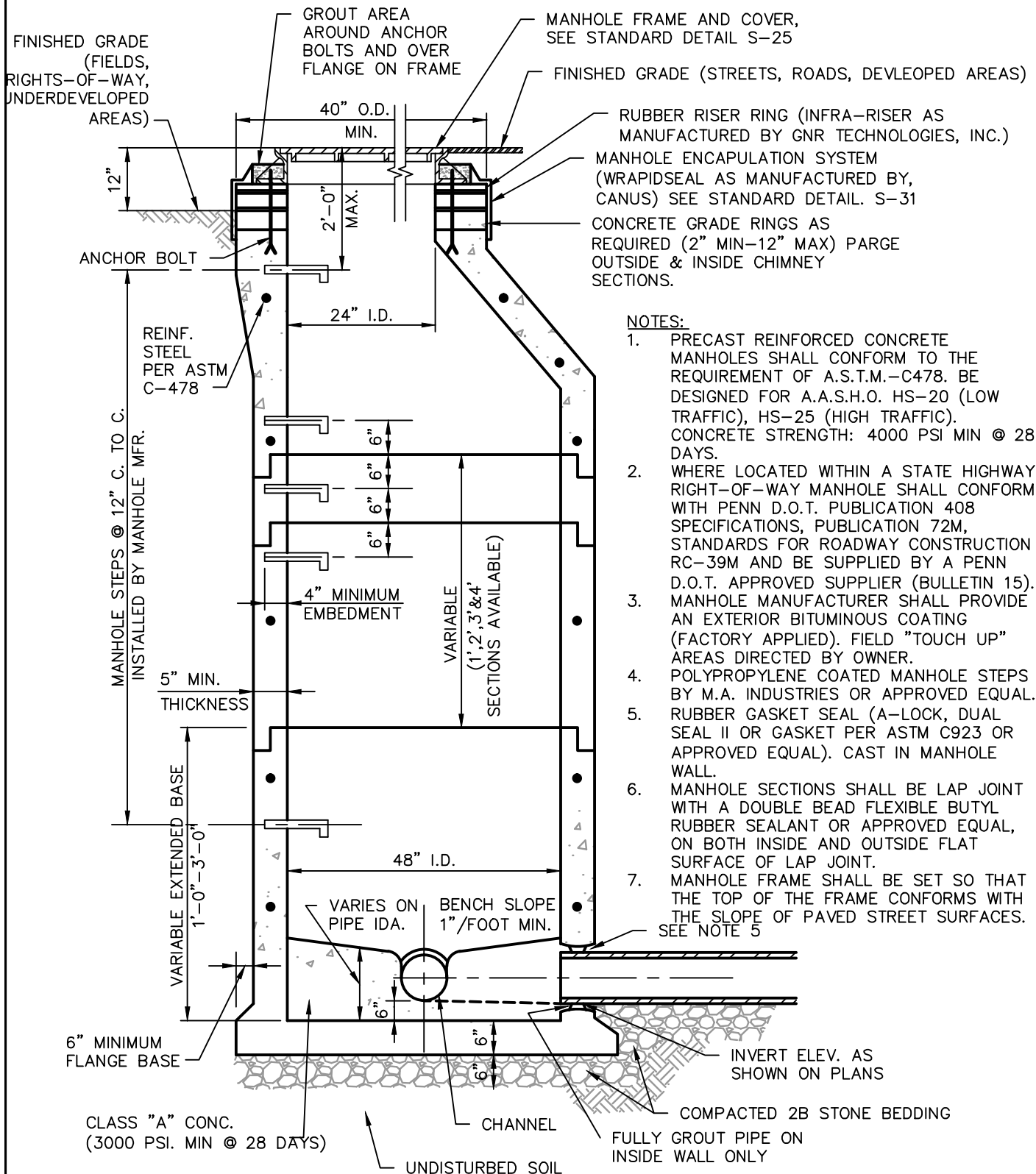
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. PRECAST REINFORCED CONCRETE MANHOLES SHALL CONFORM TO THE REQUIREMENT OF A.S.T.M.-C478. BE DESIGNED FOR A.A.S.H.O. HS-20 (LOW TRAFFIC), HS-25 (HIGH TRAFFIC). CONCRETE STRENGTH: 4000 PSI MIN @ 28 DAYS.
2. WHERE LOCATED WITHIN A STATE HIGHWAY RIGHT-OF-WAY MANHOLE SHALL CONFORM WITH PENN D.O.T. PUBLICATION 408 SPECIFICATIONS, PUBLICATION 72M, STANDARDS FOR ROADWAY CONSTRUCTION RC-39M AND BE SUPPLIED BY A PENN D.O.T. APPROVED SUPPLIER (BULLETIN 15).
3. MANHOLE MANUFACTURER SHALL PROVIDE AN EXTERIOR BITUMINOUS COATING (FACTORY APPLIED). FIELD "TOUCH UP" AREAS DIRECTED BY OWNER.
4. POLYPROPYLENE COATED MANHOLE STEPS BY M.A. INDUSTRIES OR APPROVED EQUAL.
5. RUBBER GASKET SEAL (A-LOCK, DUAL SEAL II OR GASKET PER ASTM C923 OR APPROVED EQUAL). CAST IN MANHOLE WALL.
6. MANHOLE SECTIONS SHALL BE LAP JOINT WITH A DOUBLE BEAD FLEXIBLE BUTYL RUBBER SEALANT OR APPROVED EQUAL, ON BOTH INSIDE AND OUTSIDE FLAT SURFACE OF LAP JOINT.
7. MANHOLE FRAME SHALL BE SET SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED STREET SURFACES. SEE NOTE 5

STANDARD MANHOLE SECTION PRECAST BASE

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

DROP MANHOLE SECTION



RMS

08/12

S-15

FOR NEW MANHOLE

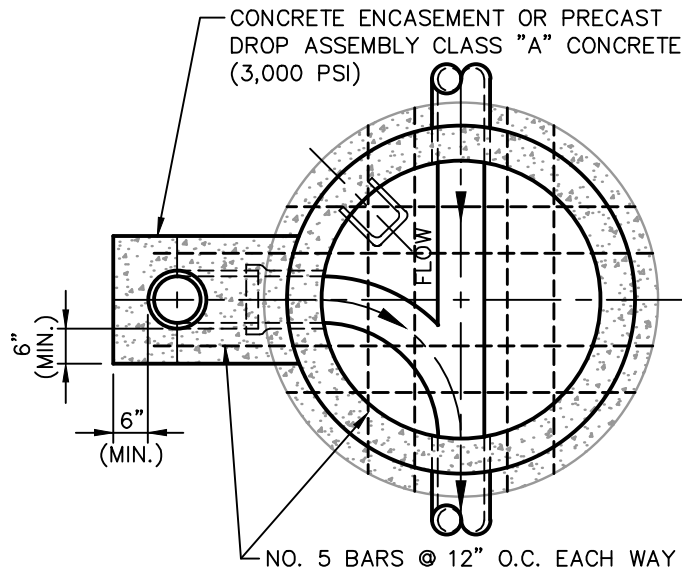
CONSULTING ENGINEERS

APP'D.

DATE

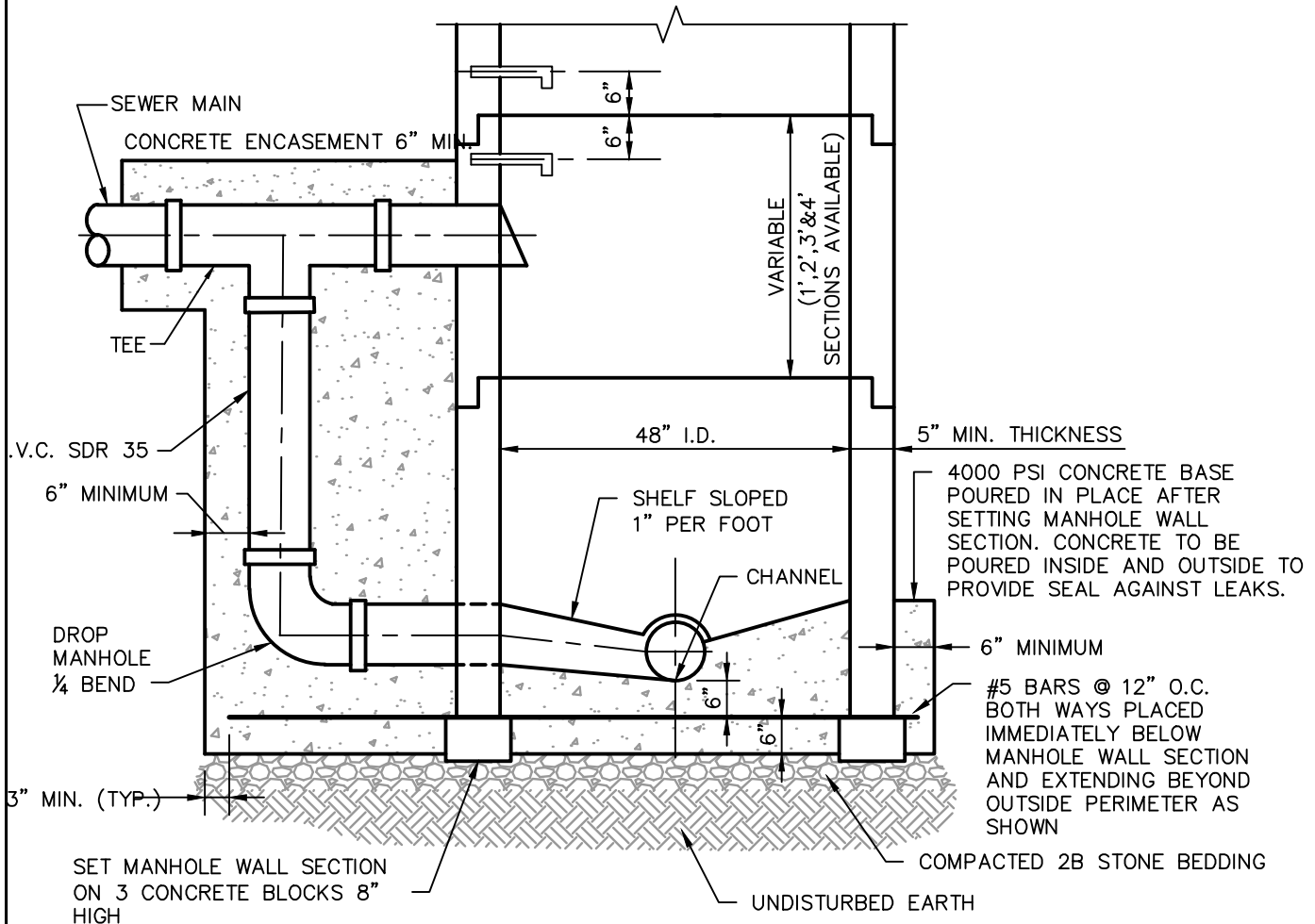
DRAWING NUMBER

REV.



NOTES:

1. DROP CONNECTIONS SHALL BE INSTALLED WHEN THE PIPE INVERTS IN ARE 2'-0" OR MORE ABOVE THE INVERT OUT OF THE MANHOLE.
2. ALL APPLICABLE PROVISIONS OF STANDARD MANHOLE DETAIL DRAWING S-21A APPLY TO DROP MANHOLES.
3. FOUNDATION FOR DROP SECTION SHALL BE POURED MONOLITHICALLY WITH MANHOLE BASE.



DROP MANHOLE SECTION FOR NEW MANHOLE

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

DROP MANHOLE SECTION



SSM

RMS

08/12

S-16

FOR EXISTING MANHOLE

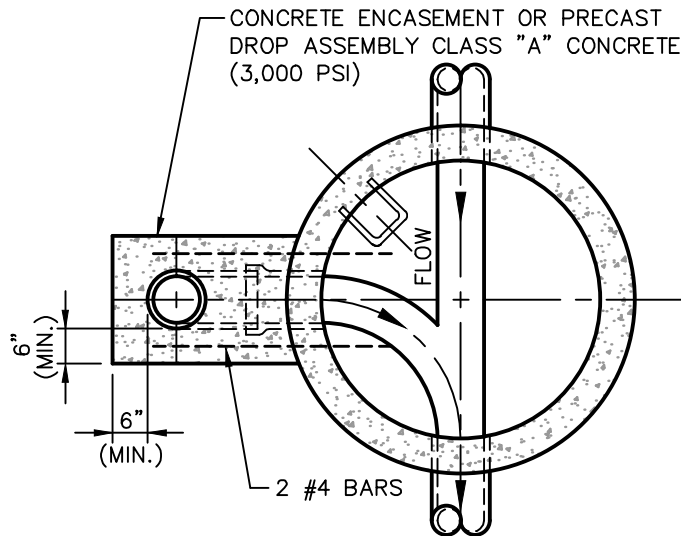
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APP'D.

DATE

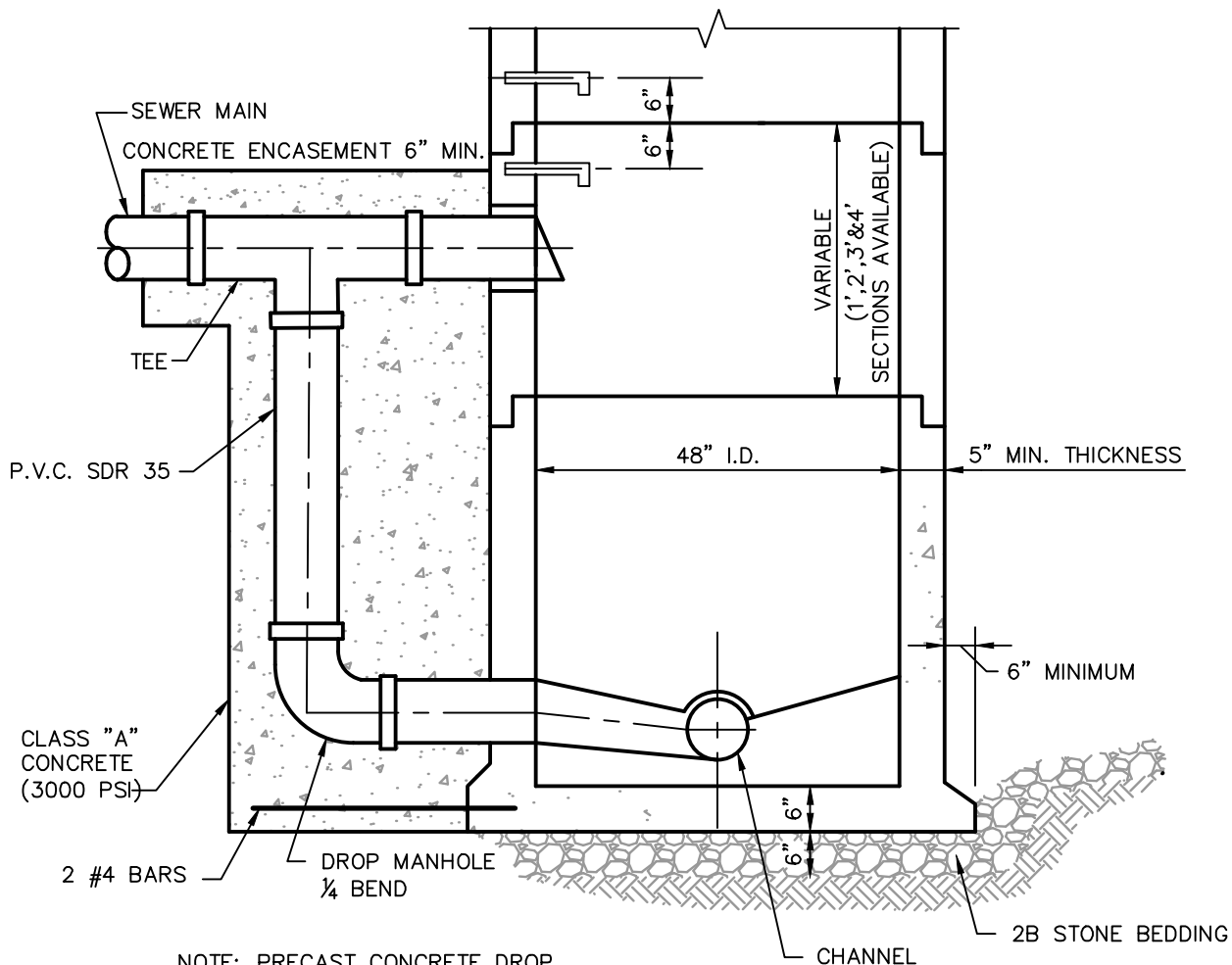
DRAWING NUMBER

REV.



NOTES:

1. DROP CONNECTIONS SHALL BE INSTALLED WHEN THE PIPE INVERTS IN ARE 2'-0" OR MORE ABOVE THE INVERT OUT OF THE MANHOLE.
2. ALL APPLICABLE PROVISIONS OF STANDARD MANHOLE DETAIL DRAWING S-21A APPLY TO DROP MANHOLES.
3. FOR NEW MANHOLES, FOUNDATION FOR DROP SECTION SHALL BE POURED MONOLITHICALLY WITH MANHOLE BASE.
4. THIS CONFIGURATION IS ALLOWED ONLY FOR A NEW SEWER CONNECTION TO AN EXISTING SEWER MANHOLE.



NOTE: PRECAST CONCRETE DROP ASSEMBLIES MAY ALSO BE USED.

DROP MANHOLE SECTION FOR EXISTING MANHOLE

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

DROP MANHOLE SECTION



RMS

08/12

S-17

USING PRECAST DROP COLLARS

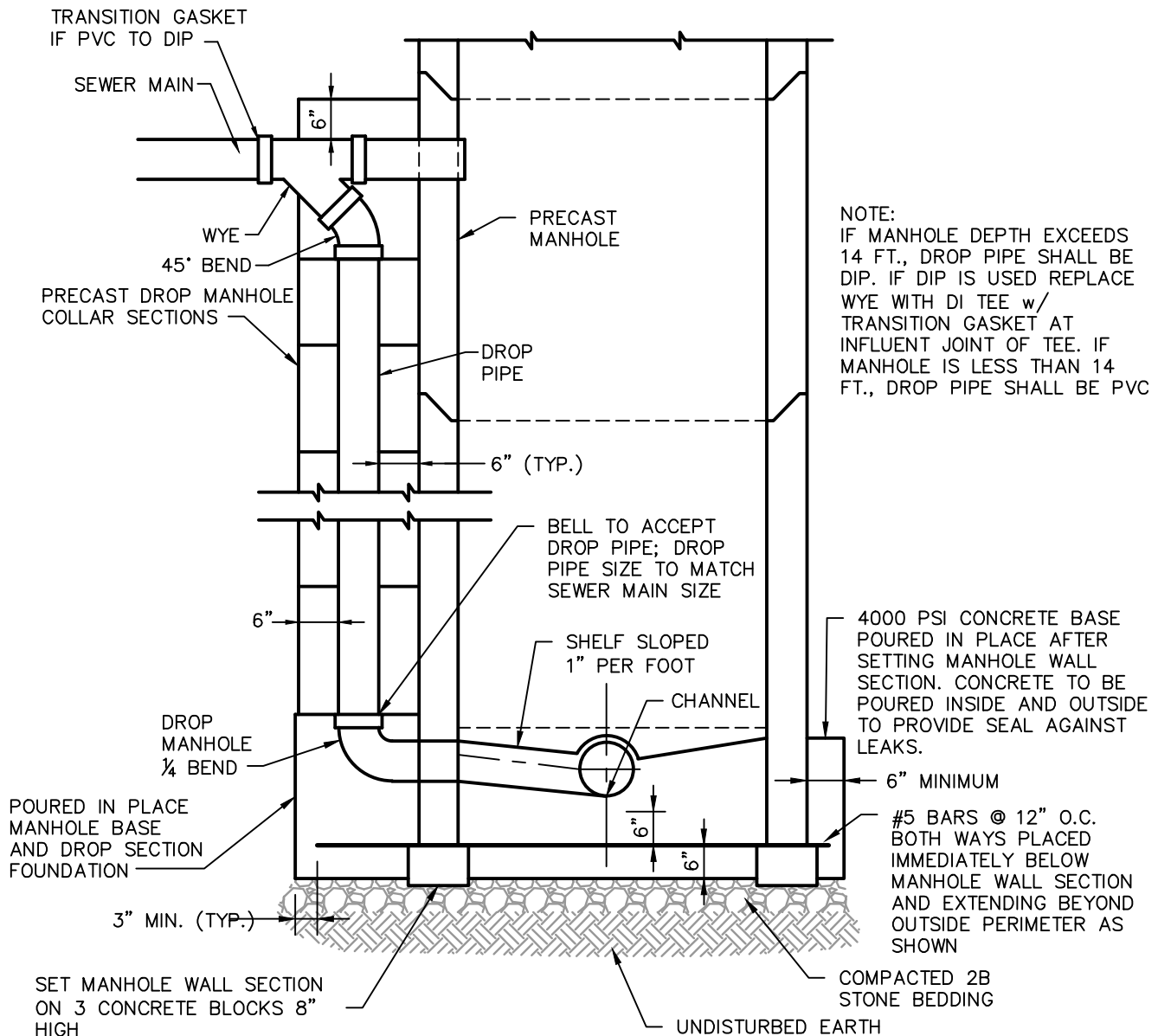
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. DROP CONNECTIONS SHALL BE INSTALLED WHEN THE PIPE INVERTS IN ARE 2'-0" OR MORE ABOVE THE INVERT OUT OF THE MANHOLE.
2. ALL APPLICABLE PROVISIONS OF STANDARD MANHOLE DETAIL S-14 APPLY TO DROP MANHOLES.
3. FOUNDATION FOR DROP SECTION SHALL BE POURED MONOLITHICALLY WITH MANHOLE BASE.

DROP MANHOLE SECTION USING PRECAST DROP COLLARS

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

U-SHAPED COLLAR DETAIL



RMS

08/12

S-18

FOR DROP MANHOLES

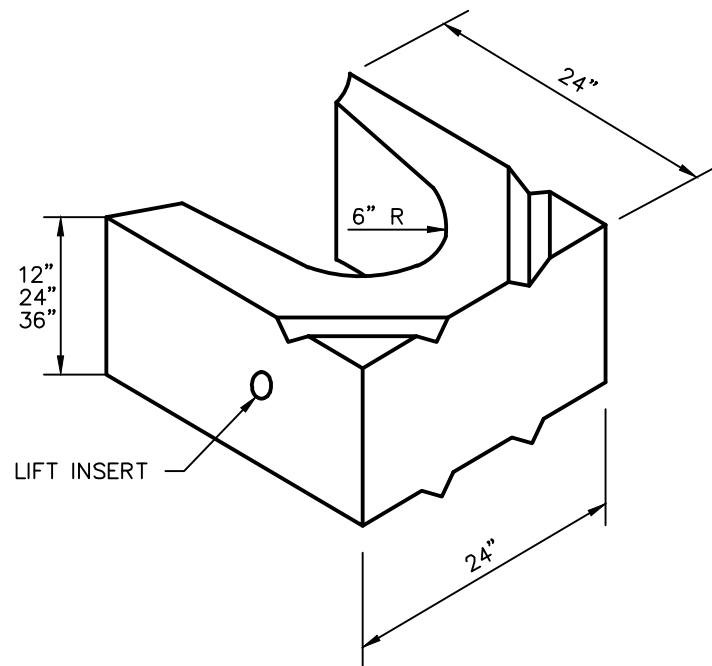
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APP'D.

DATE

DRAWING NUMBER

REV.



U-SHAPED COLLAR DETAIL FOR DROP MANHOLES

NO SCALE

MUHLENBERG TOWNSHIP AUTHORITY

RMS

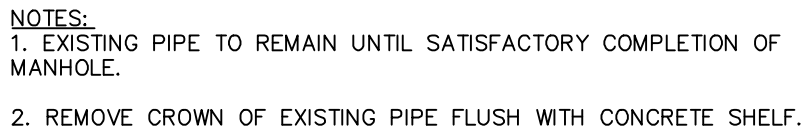
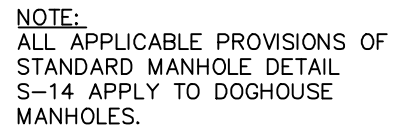
S-19

APP'D.

DATE _____

DRAWING NUMBER

REV. |



DOGHOUSE MANHOLE SECTION

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

STANDARD METERING/SAMPLING



RMS

08/12

S-21

MANHOLE DETAIL

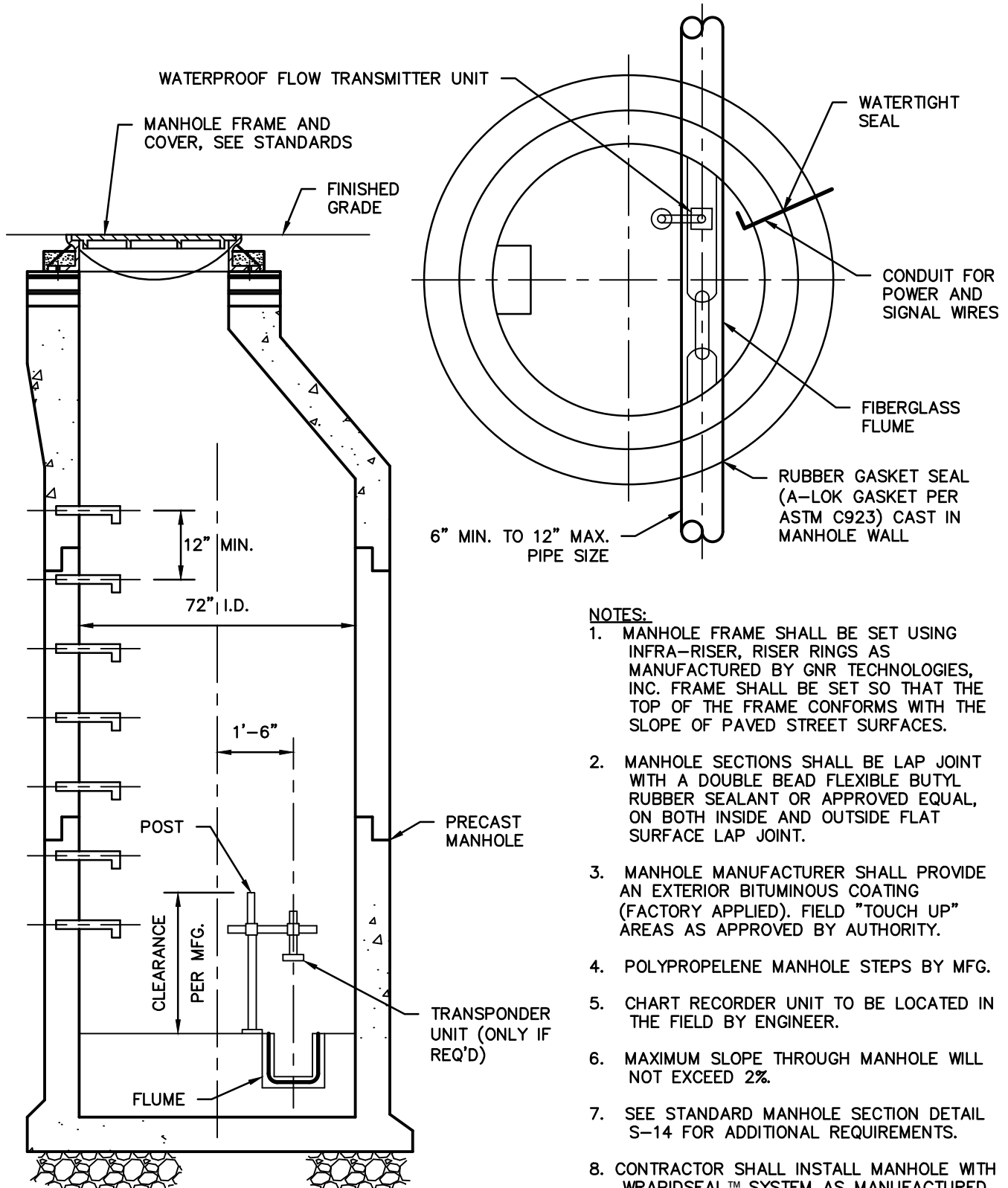
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. MANHOLE FRAME SHALL BE SET USING INFRA-RISER, RISER RINGS AS MANUFACTURED BY GNR TECHNOLOGIES, INC. FRAME SHALL BE SET SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED STREET SURFACES.
2. MANHOLE SECTIONS SHALL BE LAP JOINT WITH A DOUBLE BEAD FLEXIBLE BUTYL RUBBER SEALANT OR APPROVED EQUAL, ON BOTH INSIDE AND OUTSIDE FLAT SURFACE LAP JOINT.
3. MANHOLE MANUFACTURER SHALL PROVIDE AN EXTERIOR BITUMINOUS COATING (FACTORY APPLIED). FIELD "TOUCH UP" AREAS AS APPROVED BY AUTHORITY.
4. POLYPROPELENE MANHOLE STEPS BY MFG.
5. CHART RECORDER UNIT TO BE LOCATED IN THE FIELD BY ENGINEER.
6. MAXIMUM SLOPE THROUGH MANHOLE WILL NOT EXCEED 2%.
7. SEE STANDARD MANHOLE SECTION DETAIL S-14 FOR ADDITIONAL REQUIREMENTS.
8. CONTRACTOR SHALL INSTALL MANHOLE WITH WRAPIDSEAL™ SYSTEM AS MANUFACTURED BY CANUSA.

STANDARD METERING/SAMPLING MANHOLE DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

POURED-IN-PLACE



RMS

08/12

S-22

MANHOLE BASE

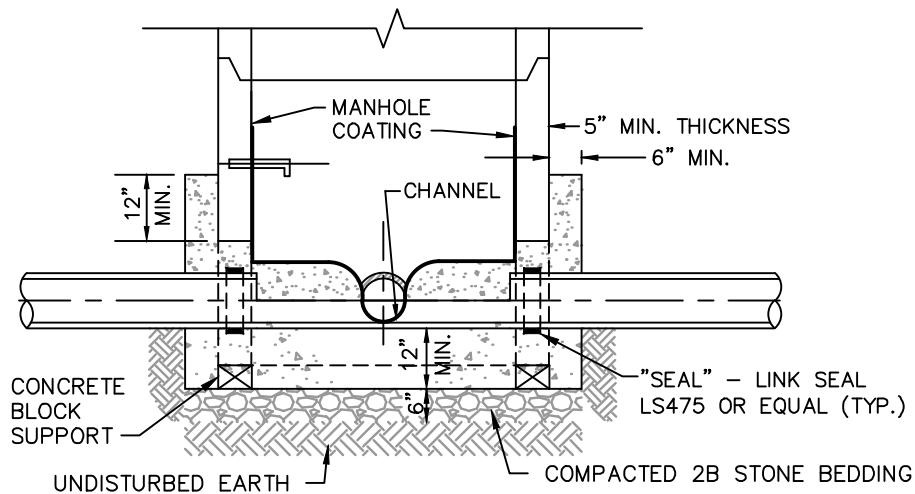
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. ALL APPLICABLE PROVISIONS OF STANDARD DETAIL DRAWING S-21A APPLY TO MANHOLES WITH POURED-IN-PLACE BASES.
2. CONTRACTOR SHALL CLEAN P.V.C. PIPE AND INSTALL LINK SEAL.
3. BOTTOM WALL SECTION OF MANHOLE TO BE SUPPORTED BY 3 CONCRETE BLOCKS WHILE POURING CONCRETE FOR MANHOLE BASE.
4. APPLY WELDCRETE BONDING AGENT PRIOR TO POURING CONCRETE ENCASEMENT.
5. CONCRETE ENCASEMENT SHALL EXTEND 12" ABOVE THE TOP OF THE HIGHEST OPENING IN THE BOTTOM WALL SECTION OF THE MANHOLE.
6. COAT THE INTERIOR OF THE MANHOLES TO A POINT 18" ABOVE THE TOP OF THE HIGHEST PIPE ENTRANCE. COATING SHALL COVER THE WALLS, BENCH, CHANNEL AND PIPE PROTRUSION. COATING SHALL BE PARSONPOXY FP AS MANUFACTURED BY PARSON ENVIRONMENTAL PROD. CO., OR EQUAL

POURED IN PLACE MANHOLE BASE

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

MANHOLE JOINT DETAIL



SSM

RMS

08/12

S-23

CONSULTING ENGINEERS

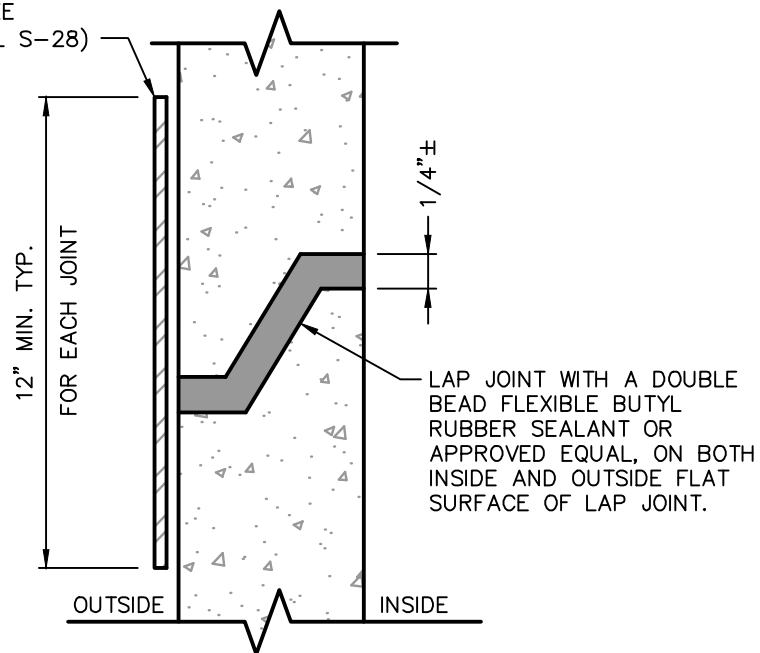
APP'D.

DATE

DRAWING NUMBER

REV.

WRAPIDSEAL™ (SEE
STANDARD DETAIL S-28)



MANHOLE JOINT DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

MANHOLE GRADE RING DETAIL

**SSM**

RMS

08/12

S-24

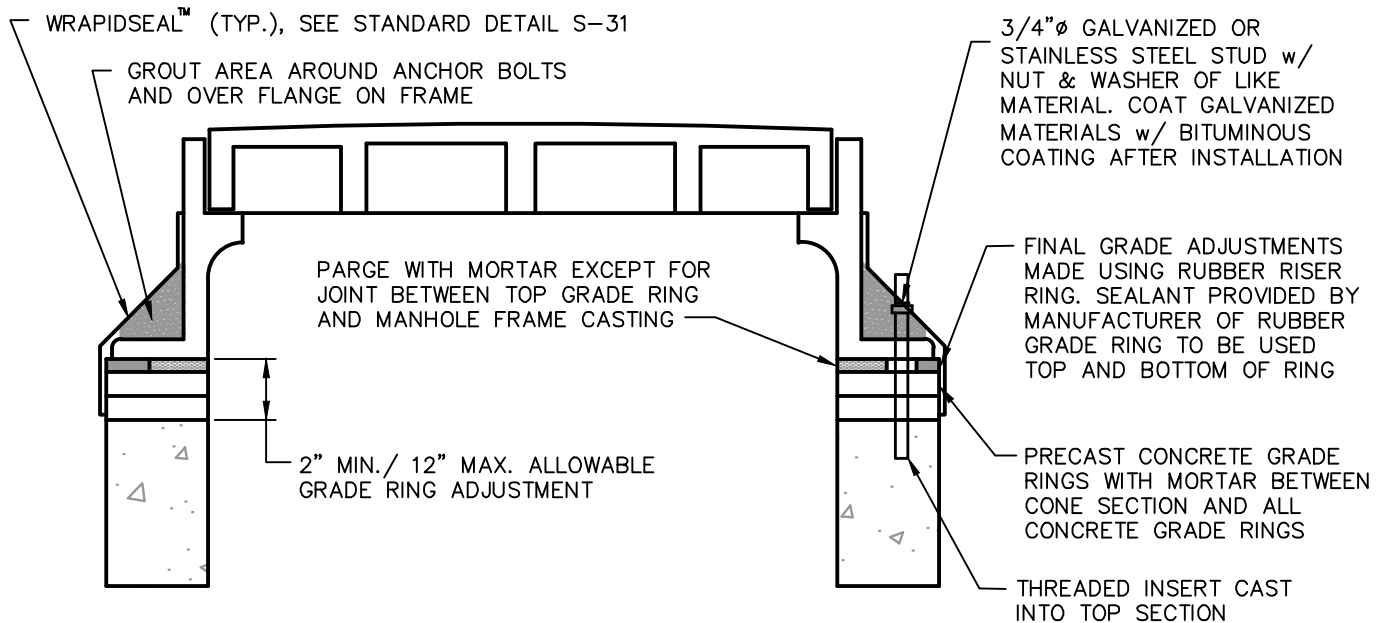
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. GRADE ADJUSTMENTS TO BE MADE USING RUBBER RISER RINGS (INFRA-RISER AS MANUFACTURED BY GNR TECHNOLOGIES) AND CONCRETE GRADE RINGS.
2. MINIMUM ADJUSTMENT BY GRADE RINGS IS 2", MAXIMUM IS 12".
3. WHERE ADJUSTMENT IS GREATER THAN 2", CONCRETE GRADE RINGS ARE TO BE USED TO WITHIN 2" OF THE FINAL GRADE. THE REMAINING VERTICAL ADJUSTMENT SHALL BE MADE UP WITH THE RUBBER GRADE RING.
4. ALL NON-SHRINK CONCRETE GROUT SHALL BE TROWELED SMOOTH.
5. CONCRETE SURFACES SHALL BE CLEAN AND DRY PRIOR TO PARGING.
6. FRAME SHALL BE SET SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED SURFACES. FOR UNPAVED AREAS, FRAME TO HAVE 18" HEIGHT FROM EXISTING GRADE. GRADE RINGS ARE NOT REQUIRED IN UNPAVED AREAS.

MANHOLE GRADE RING DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

STANDARD MANHOLE



SSM

RMS

08/12

S-25

FRAME AND COVER INSTALLATION

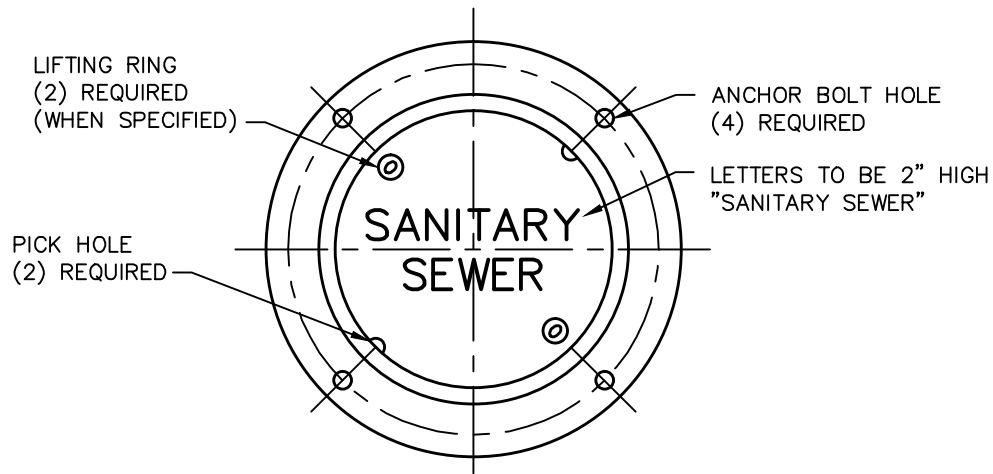
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APP'D.

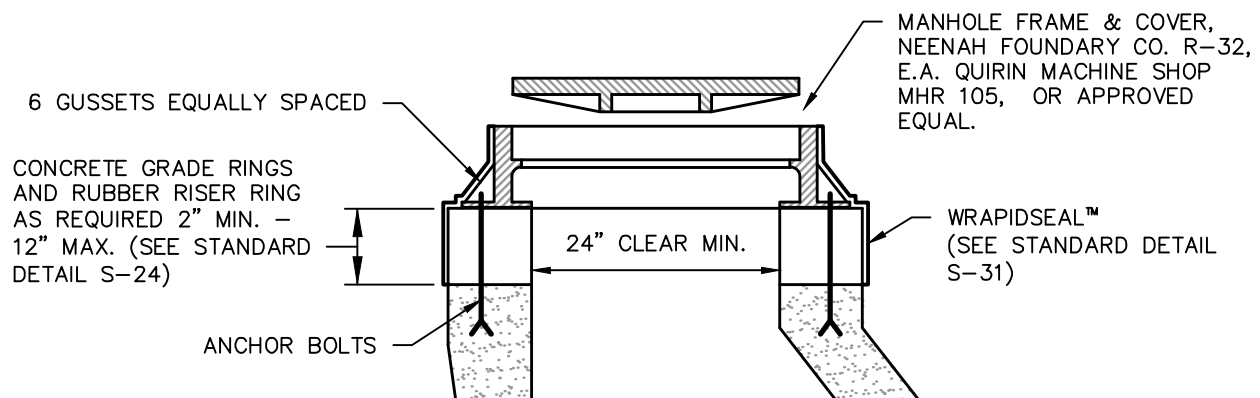
DATE

DRAWING NUMBER

REV.



PLAN



SECTION

NOTES:

1. CAST IRON SHALL HAVE MINIMUM TENSILE STRENGTH OF 30,000 LBS. PER SQUARE INCH AND BE DESIGNED FOR HS-20 TRAFFIC LOADING.
2. REQUEST BOLT DOWN LID MODEL FROM MANUFACTURER WHEN SPECIFIED. (STAINLESS STEEL BOLTS (4)).
3. SIZE AND POSITION OF LETTERS TO BE CONFIRMED BY CLIENT.
4. PROVIDE (2) LIFTING RINGS WHEN SPECIFIED.
5. PROVIDE (2) CONCEALED WATERTIGHT PICK HOLES.
6. PROVIDE WATERPROOF NEOPRENE SEALING GASKET.
7. PROVIDE FOUR 1" DIAMETER ANCHOR BOLT HOLES.
8. MARKER POSTS SHALL BE INSTALLED TO MARK MANHOLE LOCATIONS IN OPEN FIELD INSTALLATIONS.

STANDARD MANHOLE FRAME & COVER INSTALLATION

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

WATERTIGHT MANHOLE FRAME AND COVER



RMS

08/12

S-26

INSTALLATION – BOLT DOWN COVER

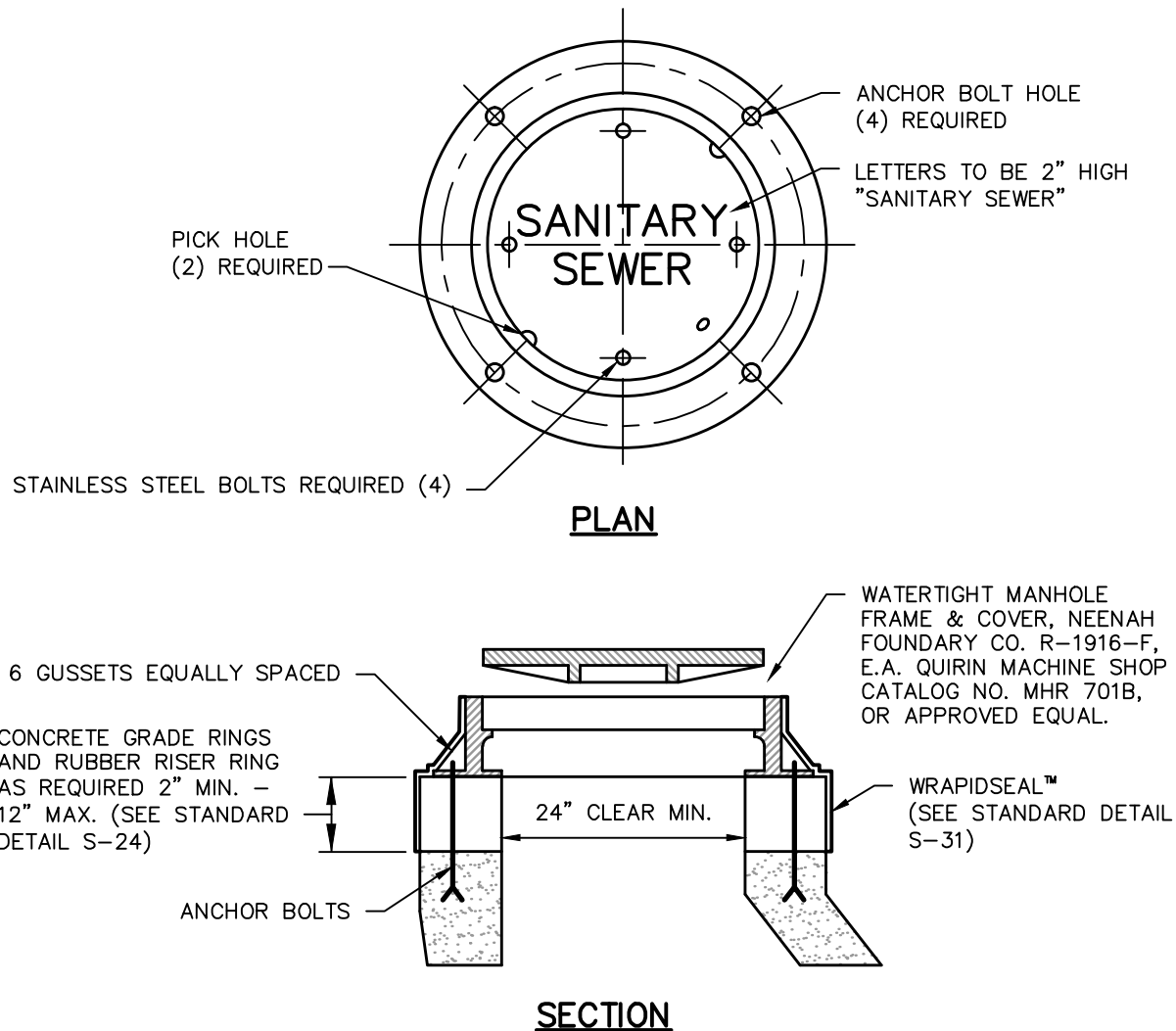
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. CAST IRON SHALL HAVE MINIMUM TENSILE STRENGTH OF 30,000 LBS. PER SQUARE INCH AND BE DESIGNED FOR HS-20 TRAFFIC LOADING.
2. PROVIDE BOLT DOWN USING FOUR (4) STAINLESS STEEL BOLTS.
3. FRAME AND COVER SHALL BE SUITABLE FOR LOW PRESSURE APPLICATIONS UP TO 20 PSI.
4. SIZE AND POSITION OF LETTERS TO BE CONFIRMED BY CLIENT.
5. PROVIDE (2) CONCEALED WATERTIGHT PICK HOLES.
6. PROVIDE WATERPROOF NEOPRENE SEALING GASKET.
7. PROVIDE FOUR 1" DIAMETER ANCHOR BOLT HOLES.
8. MARKER POSTS SHALL BE INSTALLED TO MARK MANHOLE LOCATIONS IN OPEN FIELD INSTALLATIONS.

WATERTIGHT MANHOLE FRAME & COVER INSTALLATION – BOLT DOWN COVER

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

WATERTIGHT MANHOLE FRAME & COVER



SSM

RMS

08/12

S-27

INSTALLATION – INNER SEALING LID

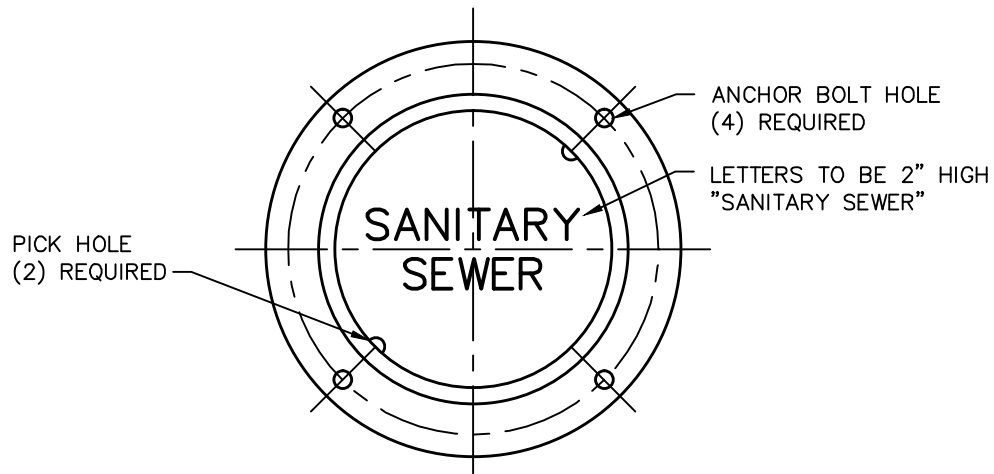
CONSULTING ENGINEERS

APP'D.

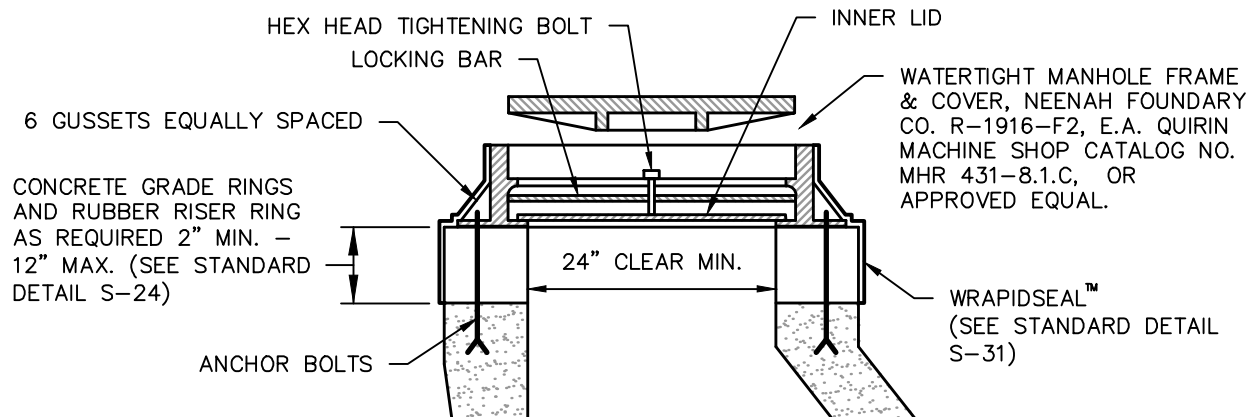
DATE

DRAWING NUMBER

REV.



PLAN



SECTION

NOTES:

1. CAST IRON SHALL HAVE MINIMUM TENSILE STRENGTH OF 30,000 LBS. PER SQUARE INCH AND BE DESIGNED FOR HS-20 TRAFFIC LOADING.
2. PROVIDE INNER LID WITH FLAT NEOPRENE SEALING GASKET AND LIFT RINGS (2). PROVIDE LOCKING BAR WITH HEX HEAD TIGHTENING BOLT.
3. SIZE AND POSITION OF LETTERS TO BE CONFIRMED BY CLIENT.
4. PROVIDE (2) CONCEALED WATERTIGHT PICK HOLES.
5. PROVIDE WATERPROOF NEOPRENE SEALING GASKET ON COVER.
6. PROVIDE FOUR 1" DIAMETER ANCHOR BOLT HOLES..

WATERTIGHT MANHOLE FRAME & COVER INSTALLATION – INNER SEALING LID

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

MANHOLE ANCHOR BOLT DETAIL



RMS

08/12

S-28

STAINLESS STEEL

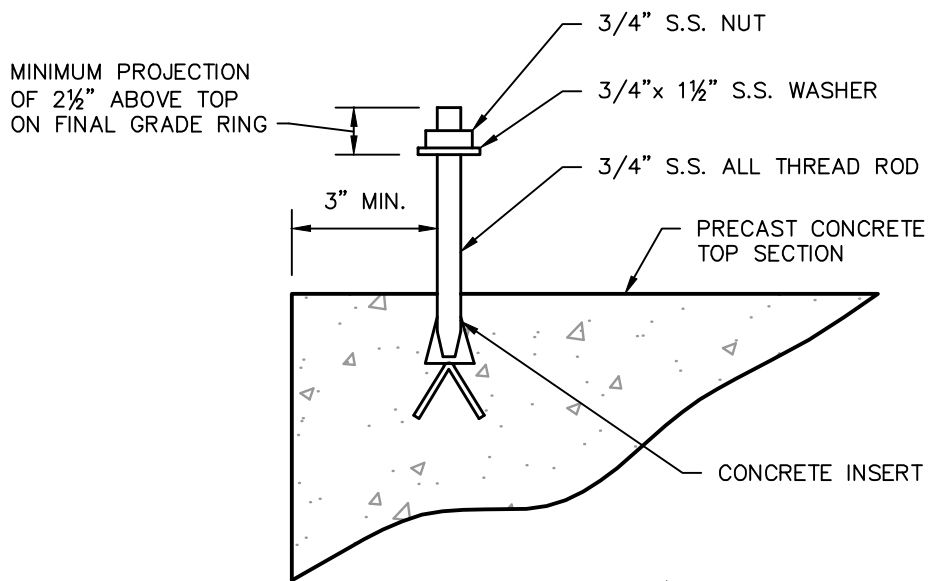
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTE: 4 REQ'D PER MANHOLE

MANHOLE ANCHOR BOLT DETAIL
STAINLESS STEEL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

MANHOLE ANCHOR BOLT DETAIL



RMS

08/12

S-29

GALVANIZED

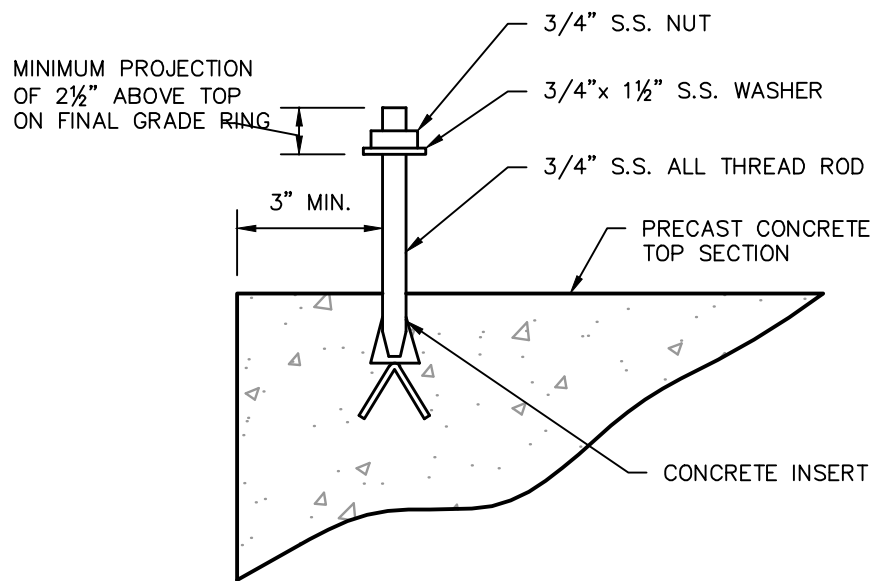
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTE:

4 REQ'D PER MANHOLE, COAT ALL EXPOSED
HARDWARE WITH BITUMINOUS COATING AFTER
INSTALLATION.

MANHOLE ANCHOR BOLT DETAIL
GALVANIZED

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

MANHOLE WALL PENETRATION SEAL



SSM

RMS

08/12

S-30

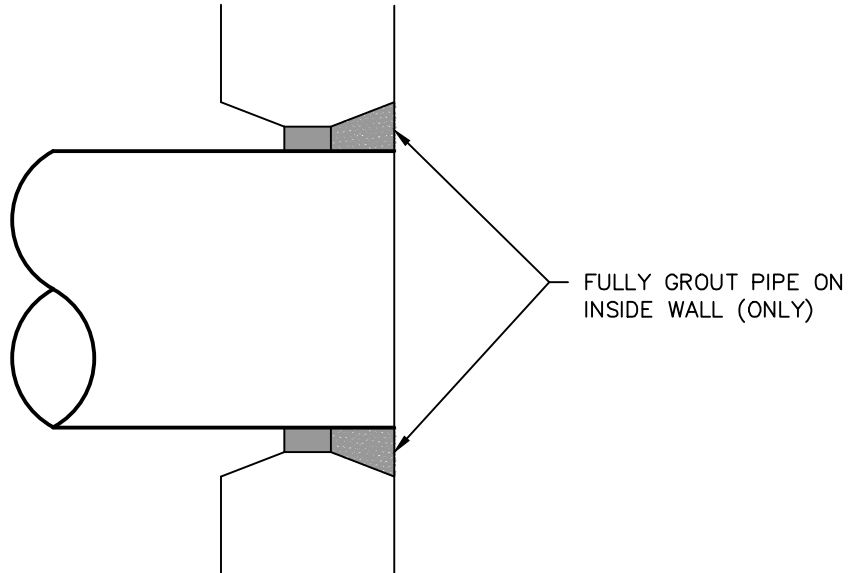
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APP'D.

DATE

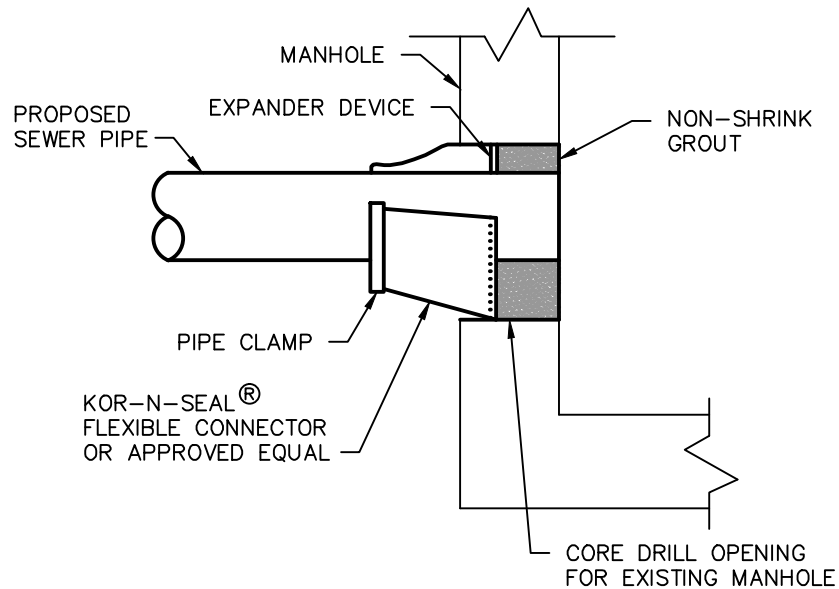
DRAWING NUMBER

REV.



A-LOK GASKET PER ASTM RUBBER GASKET SPECS. C923 OR EQUAL CAST INTEGRALLY IN MANHOLE WALL AND LOCATED AS REQUIRED.

NEW MANHOLE



CORE DRILL EXISTING MANHOLE

MANHOLE WALL PENETRATION SEAL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

HEAT SHRINKABLE MANHOLE SEAL



SSM

RMS

08/12

S-31

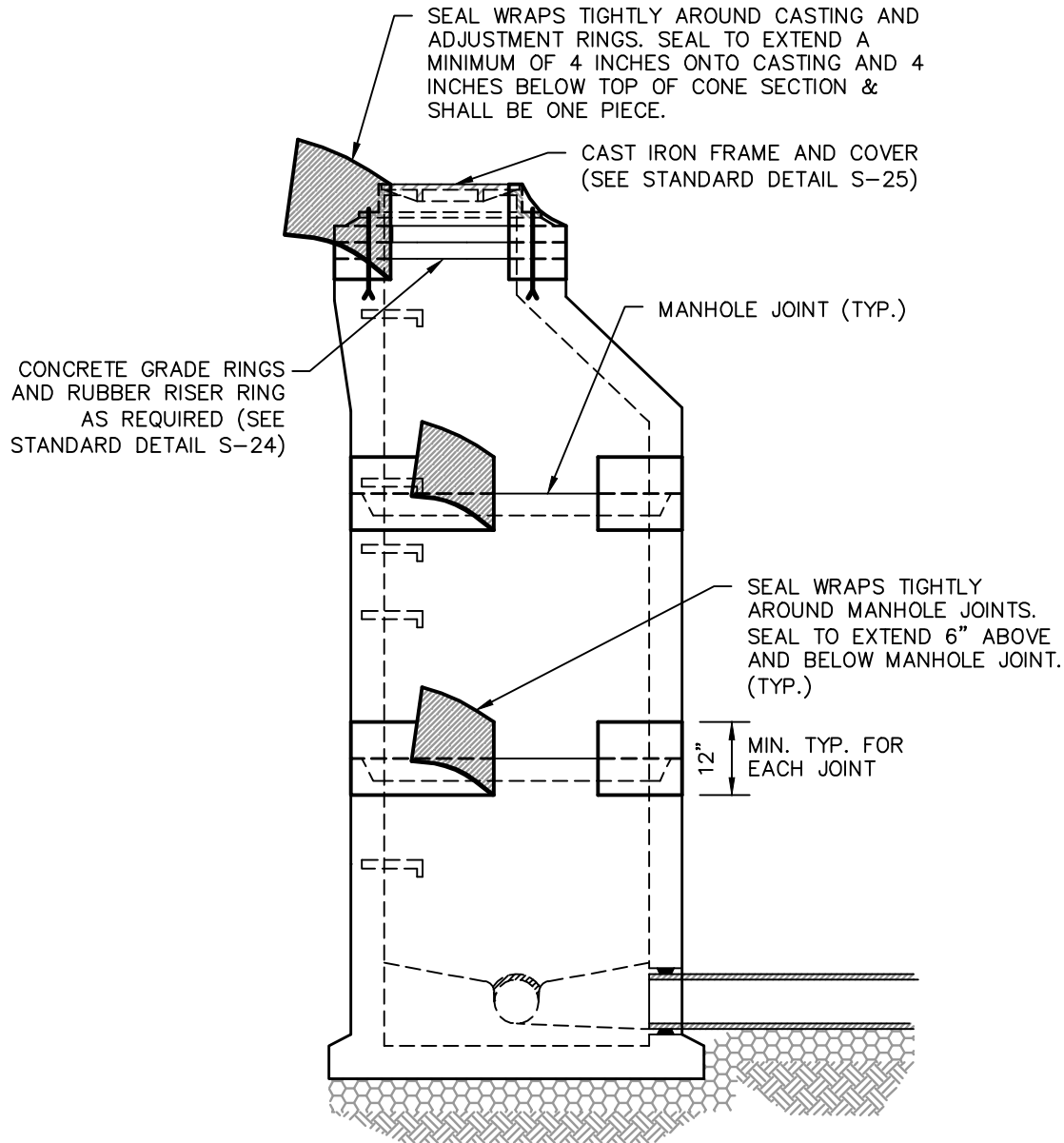
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. MANHOLE SEAL TO BE WRAPIDSEAL MANUFACTURED BY CANUSA-CPS OR APPROVED EQUAL.
2. MANHOLE JOINT SEALS INSTALLED AS DIRECTED BY THE ENGINEER AND ON ALL JOINTS 10' OR MORE BELOW FINISHED GRADE.

HEAT SHRINKABLE MANHOLE SEAL

NO SCALE

MUHLENBERG TOWNSHIP AUTHORITY

08/12

CONSULTING ENGINEERS

DATE _____

DRAWING NUMBER

REV.

[illegible]

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

FLOW METERING MANHOLE



RMS

08/12

S-33

PIPE SIZE 6" TO 12"

CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.

WATERPROOF FLOW SENSOR
TRANSMITTER UNIT
LOCATE PER MANUFACTURER

MANHOLE FRAME
AND COVER 30"
DIA.

MANHOLE STEPS

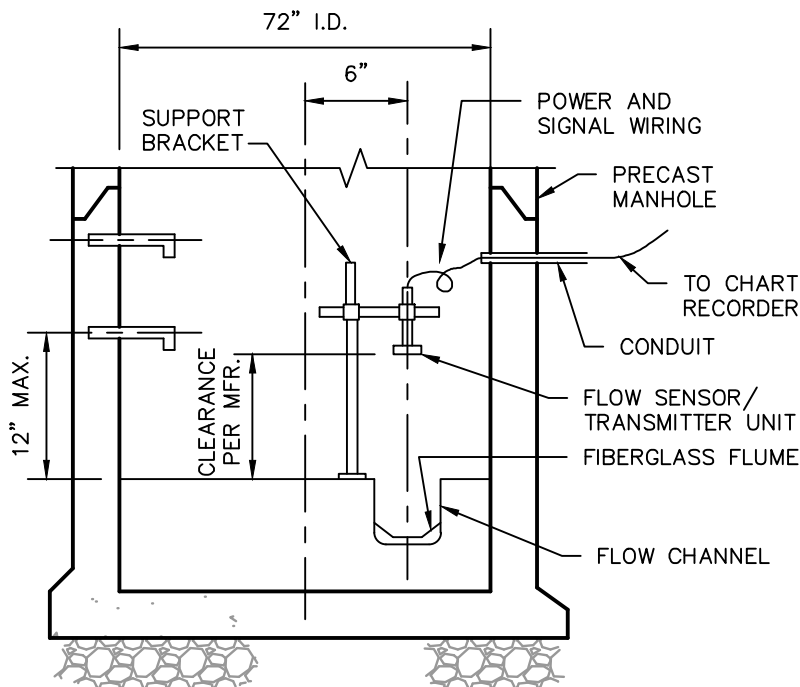
6" MIN. TO 12" MAX. PIPE SIZE

WATERTIGHT
SEAL

CONDUIT FOR POWER
AND SIGNAL WIRES TO
CHART RECORDER 30"
MIN. BELOW GRADE.

FIBERGLASS FLUME

RUBBER GASKET SEAL
(A-LOK GASKET PER
ASTM C923) CAST IN
MANHOLE WALL



NOTES:

1. SEE STANDARD MANHOLE SECTION DETAIL S-14 OR G-16 FOR ADDITIONAL REQUIREMENTS.
2. MAXIMUM SLOPE THROUGH MANHOLE SHALL NOT EXCEED 2%.
3. FIBERGLASS METERING FLUME, PALMER BOWLUS OR APPROVED EQUAL, INSTALLED PER MFR.
4. WATERPROOF FLOW SENSOR/TRANSMITTER UNIT INSTALLED PER MFR. PROVIDE ADJUSTABLE SUPPORT BRACKET, APPROVED BY MFR., FOR FLOW SENSOR/TRANSMITTER UNIT.
5. CHART RECORDER UNIT TO BE LOCATED IN THE FIELD. LOCATION TO BE APPROVED BY ENGINEER.

STANDARD FLOW METERING MANHOLE DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

RESIDENTIAL GRINDER PUMP DETAIL



SSM

RMS

08/12

S-34

SIDE VIEWS

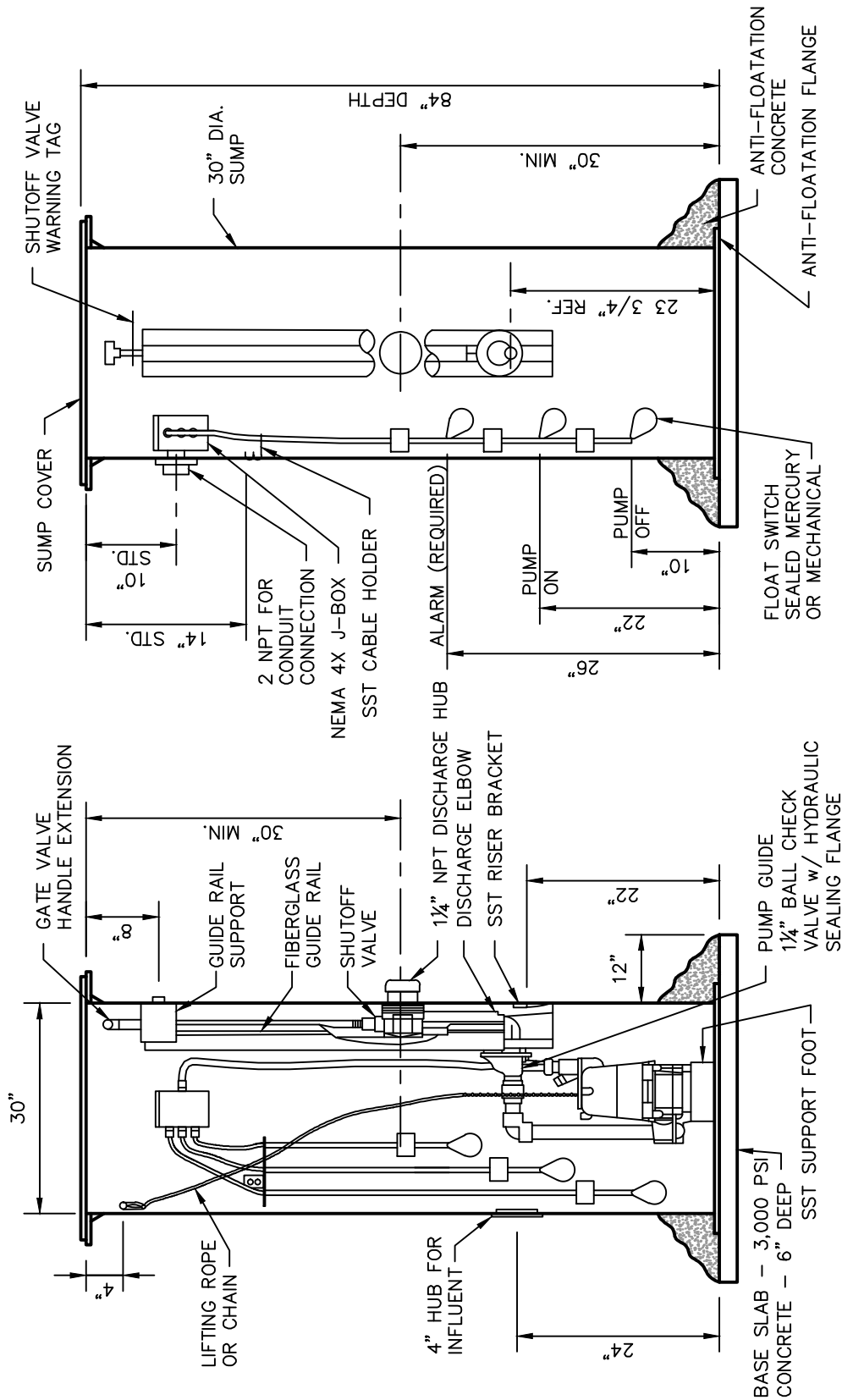
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



- NOTES:
1. DETAILS MAY VARY BY PUMP MANUFACTURER.
 2. PROVIDE 2.5 CUBIC FEET OF CONCRETE PER VERTICAL FOOT OF TANK.

RESIDENTIAL GRINDER PUMP

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

RESIDENTIAL GRINDER PUMP DETAIL



RMS

08/12

S-35

PLAN VIEW AND EQUIPMENT NOTES

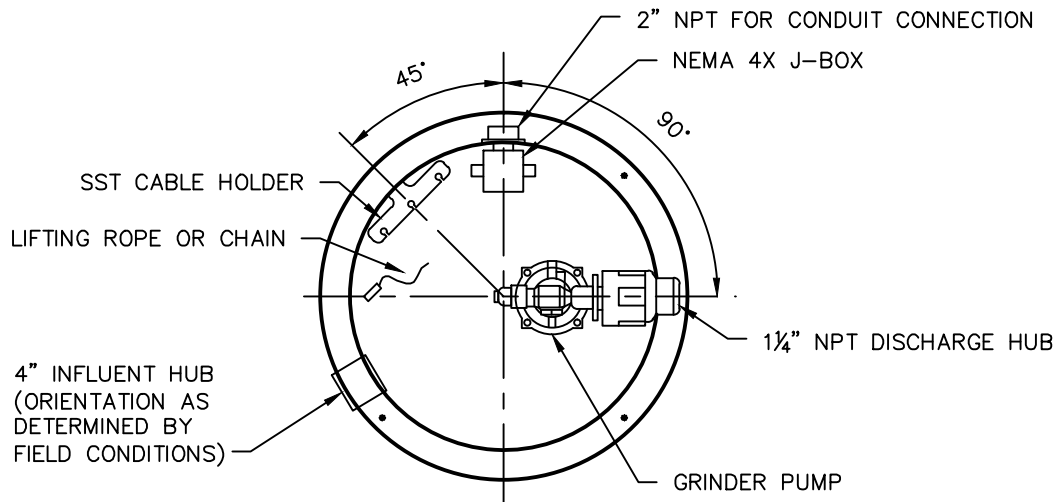
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



PLAN VIEW

30" DIA. SUMP
(ORIENTATION NOT
DEPICTED BY SIDE VIEWS)

RESIDENTIAL GRINDER PUMP NOTES:

1. EACH LOT SHALL BE EQUIPPED WITH A HYDROMATIC TRST SYSTEM WITH 30" DIAMETER FIBERGLASS SUMP, WALL MOUNTED J-BOX. GRINDER PUMPS SHALL BE HYDROMATIC PUMPS INC., ULTRA GRIND HPG200, 3500 RPM, 4.25" DIA. IMPELLER, 1 1/4", DISCHARGE, SIMPLEX PUMP SYSTEMS COMPLETE FROM HYDROMATIC OR APPROVED EQUAL.
2. CONTROL PANELS SHALL BE REMOTE MOUNTED ON EACH HOME. EACH PANEL SHALL BE EQUIPPED WITH AN AUDIBLE AND VISUAL HIGH LEVEL ALARM, NEMA 4X FIBERGLASS ENCLOSURE, ELAPSED TIME METER, AND SEAL LEAK DETECTION.
3. THE CONTRACTOR SHALL PROVIDE SPARE GRINDER SEWAGE PUMPS TO THE MUNICIPALITY FOR USE AS EMERGENCY REPLACEMENT SHOULD A HOMEOWNER'S PUMP MALFUNCTION. THE NUMBER OF SPARE PUMPS WILL BE DETERMINED BY THE NUMBER OF GRINDER PUMPS INSTALLED. THE SPECIFICATION FOR INSTALLATION OF THE GRINDER PUMP AND FORCE MAIN SHALL BE AVAILABLE WITH THE PLAN SET DURING CONSTRUCTION ON SITE.
4. TANKS SHALL INCLUDE 1 1/4" FEMALE NPT DISCHARGE FITTING(S) AND A 2" FEMALE NPT CONDUIT FITTING. A 4" NEOPRENE INFLUENT GROMMET TYPE CONNECTION SHALL BE PROVIDED FOR MOUNTING IN THE FIELD. GROMMET SHALL BE SUITABLE FOR 4" SDR-35 INFLUENT PIPE.

RESIDENTIAL GRINDER PUMP

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

L.P. SEWER LATERAL CONNECTION



RMS

08/12

S-36

TO MAIN (WET TAP)

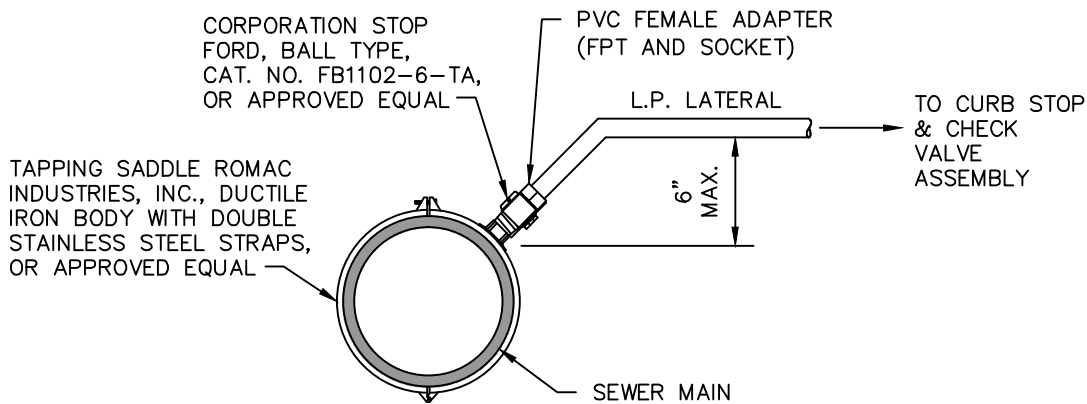
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. USE NECESSARY BENDS/FITTINGS TO MAINTAIN MINIMUM DEPTHS AND CLEARANCES AS INDICATED ON THE DESIGN PLANS AND OR STANDARD DETAILS. USE COMBINATIONS OF 45° BENDS AND OTHER FITTINGS RATHER THAN 90° BENDS.
2. SOLVENT CEMENTED JOINT PIPE SHALL BE PLACED IN TRENCH IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS OR AS DIRECTED BY THE DESIGN ENGINEER.
3. TAPPING SADDLE SHOULD BE USED ON EXISTING PRESSURE SEWER MAINS GREATER THAN 3 INCH.
4. REFER TO DRAWINGS FOR SIZES AND LOCATION AT MAIN LINE PRESSURE SEWER AND PRESSURE SEWER HOUSE CONNECTION.
5. PIPE BEDDING AND BACKFILL SHALL BE IN ACCORDANCE WITH PIPE BEDDING DETAIL/
6. SUPPORT PIPE, SADDLE, CORPORATION STOP AND TAPPING MACHINE AS REQUIRED TO PREVENT DAMAGE TO PIPE.

LOW PRESSURE SEWER LATERAL CONNECTION TO MAIN (WET TAP)

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

L.P. SEWER CURB STOP/CHECK VALVE



RMS

08/12

S-37

INSTALLATION DETAIL

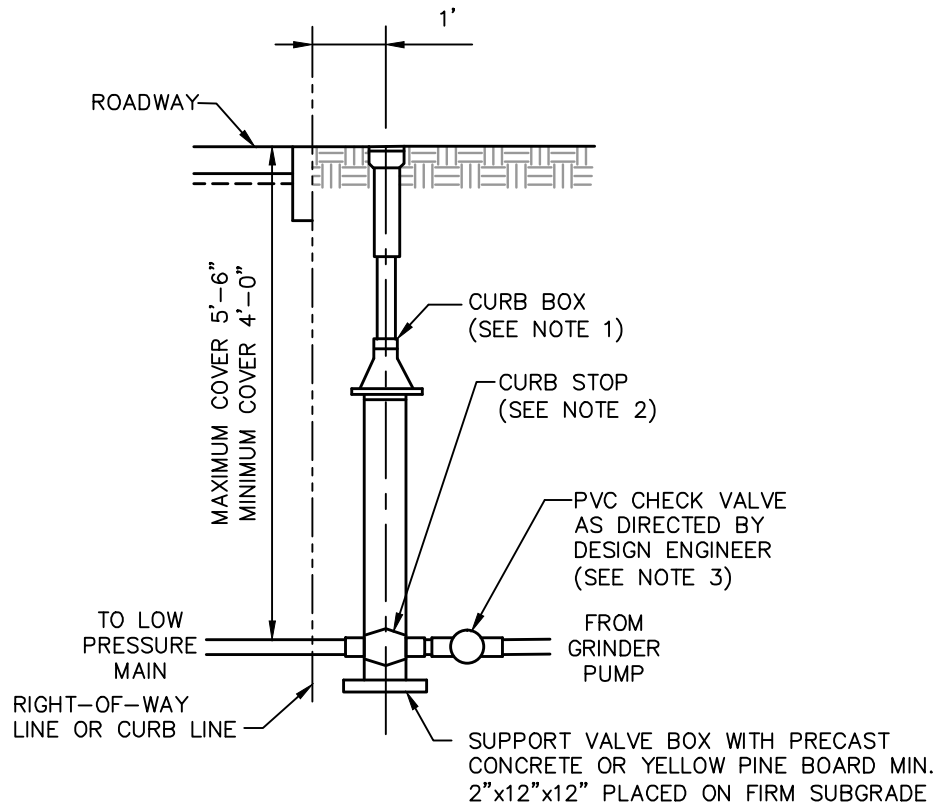
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. CURB BOX WITH STATIONARY ROD: FORD METER BOX CO. SERIES EA-2, MUELLER CO. CAT. NO. H-10334, OR APPROVED EQUAL.
2. CURB STOP: TRUE UNION PVC BALL VALVE WITH SOCKET END CONNECTIONS AND 2" SQUARE OPERATING NUT, ASAHI-AMERICA TYPE 21 OR APPROVED EQUAL.
3. CHECK VALVE: TRUE UNION PVC BALL CHECK VALVE WITH SOCKET END CONNECTIONS, ASAHI-AMERICA OR APPROVED EQUAL.
4. UNLESS OTHERWISE NOTED ALL PVC PIPE SHALL HAVE SOLVENT CEMENT JOINTS AND HDPE SHALL HAVE BUTT FUSED JOINT.
5. ALL FITTINGS SHALL BE BLOCKED OR ANCHORED UNLESS OTHERWISE NOTED.

LOW PRESSURE SEWER CURB STOP/CHECK VALVE INSTALLATION DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

LOW PRESSURE SEWER



RMS

08/12

S-38

CLEANOUT MANHOLE - IN-LINE

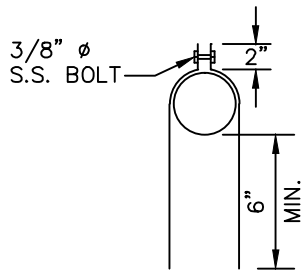
CONSULTING ENGINEERS

APP'D.

DATE

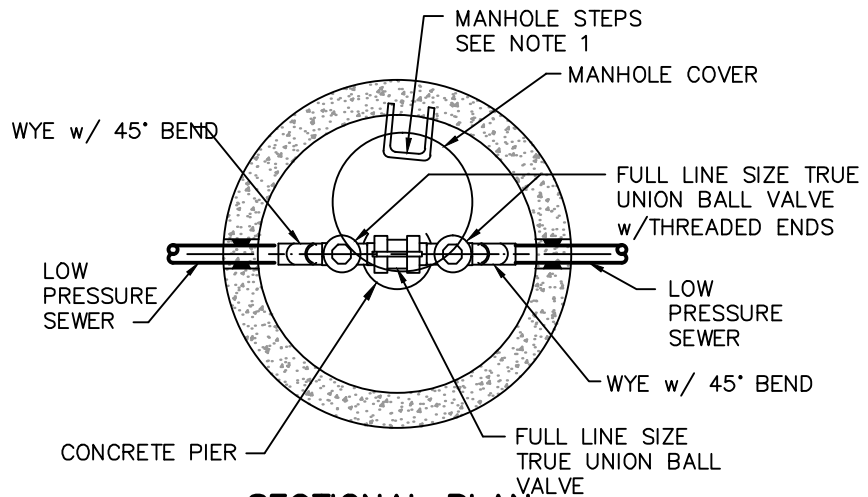
DRAWING NUMBER

REV.



304 S.S. PIPE STRAP DETAIL

NOTE:
SEE PLAN & PROFILE
DWG. FOR LINE SIZES.



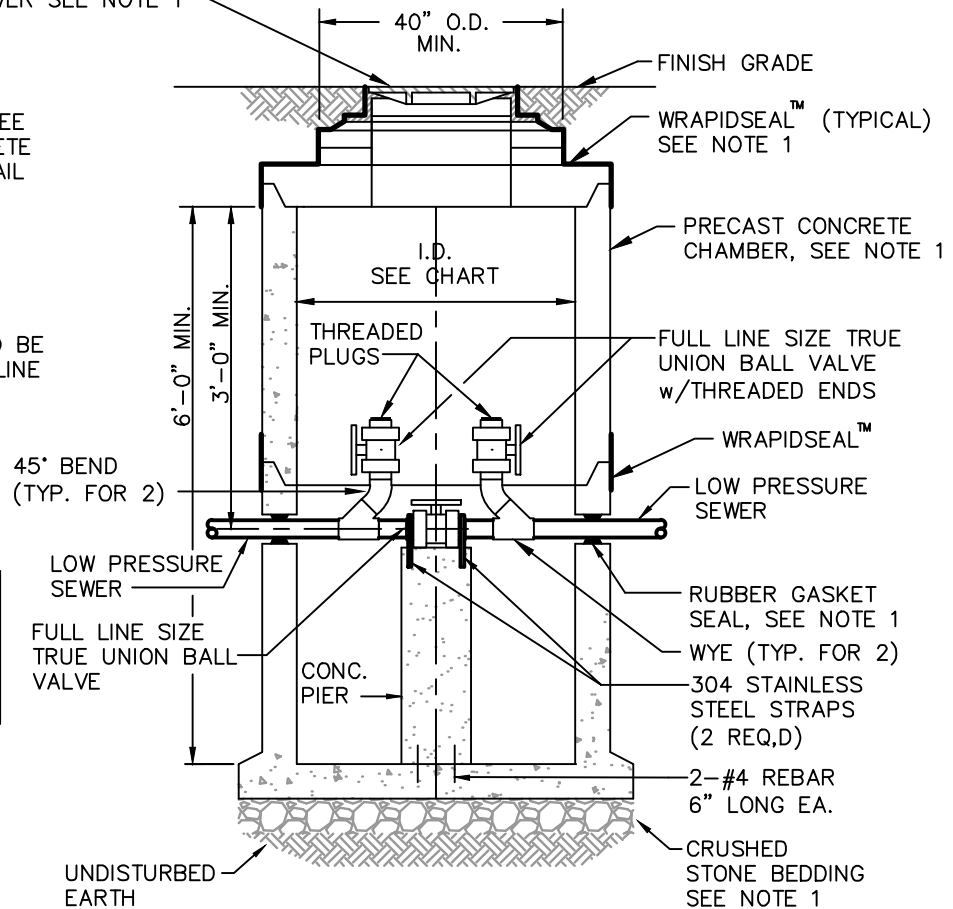
SECTIONAL PLAN

STANDARD MANHOLE FRAME &
COVER SEE NOTE 1

NOTES:

1. FOR CHAMBER DETAILS, SEE TYPICAL PRECAST CONCRETE CHAMBER STANDARD DETAIL G-16.
2. ALL PVC JOINTS TO BE SOLVENT WELDED UNLESS NOTED OTHERWISE.
3. ALL PVC BALL VALVES TO BE TRUE UNION WITH FULL LINE SIZE BORE.

PIPE SIZE	MANHOLE I.D.
2 1/2" or less	60"
3"	60"
4"	72"



LOW PRESSURE SEWER IN-LINE CLEANOUT MANHOLE 4" AND UNDER

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

LOW PRESSURE SEWER



RMS

08/12

S-39

CLEANOUT MANHOLE - 90° BEND

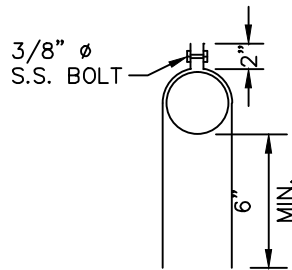
CONSULTING ENGINEERS

APP'D.

DATE

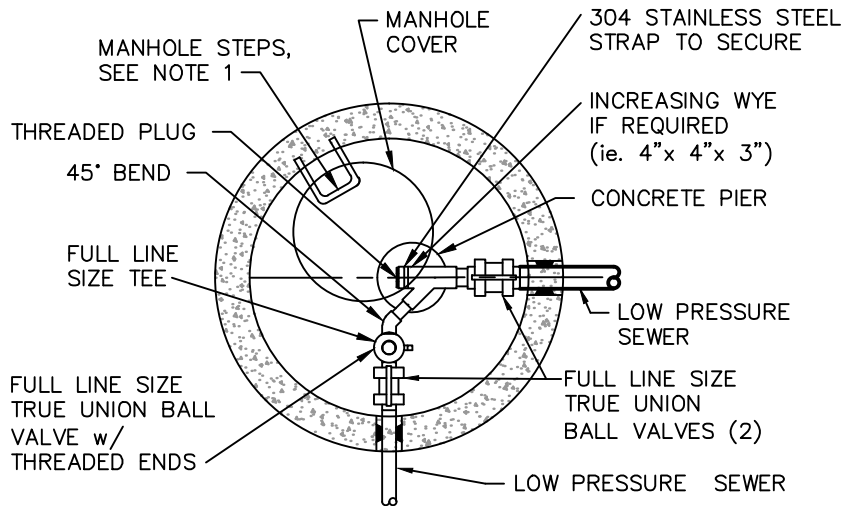
DRAWING NUMBER

REV.



304 S.S. PIPE STRAP DETAIL

NOTE:
SEE PLAN & PROFILE
DWG. FOR LINE SIZES.



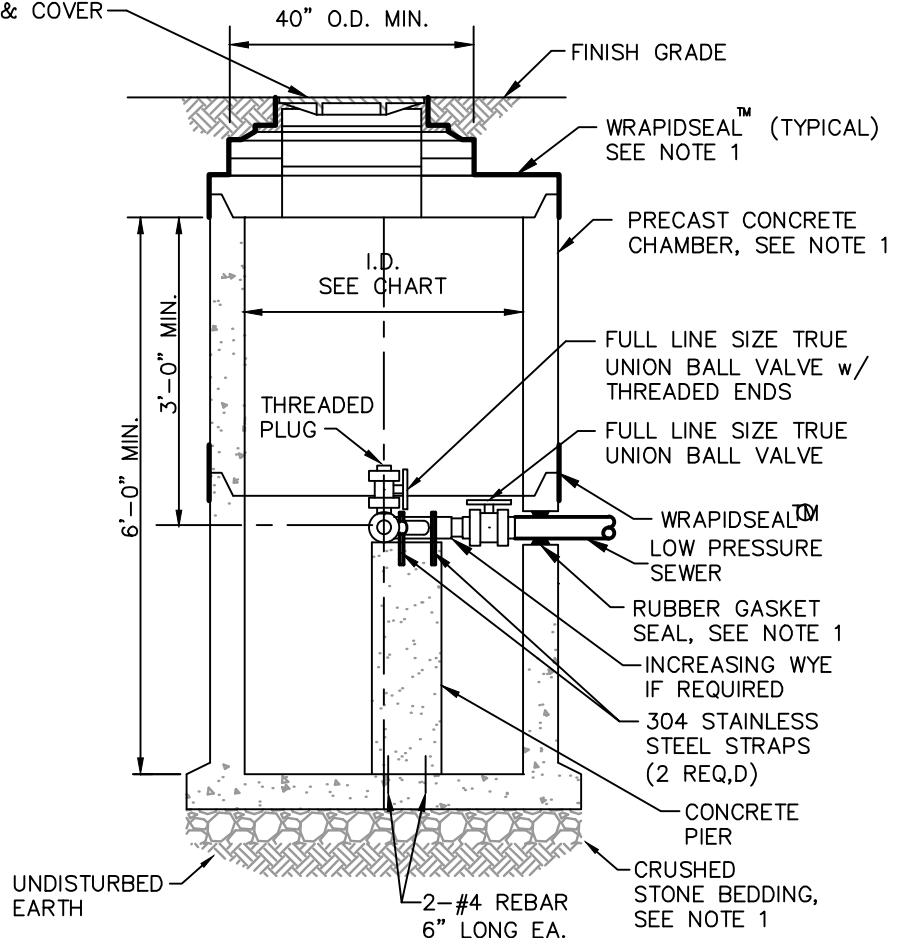
SECTIONAL PLAN

STANDARD MANHOLE FRAME & COVER
SEE NOTE 1

NOTES:

1. FOR CHAMBER DETAILS, SEE TYPICAL PRECAST CONCRETE CHAMBER STANDARD DETAIL G-16.
2. ALL PVC JOINTS TO BE SOLVENT WELDED UNLESS NOTED OTHERWISE.
3. ALL PVC BALL VALVES TO BE TRUE UNION WITH FULL LINE SIZE BORE.

PIPE SIZE	MANHOLE I.D.
2 1/2" or less	60"
3"	60"
4"	72"



LOW PRESSURE SEWER 90° BEND CLEANOUT MANHOLE 4" AND UNDER

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

LOW PRESSURE SEWER



RMS

08/12

S-40

CLEANOUT MANHOLE - 90° TEE

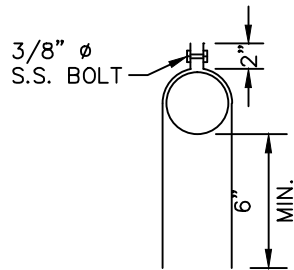
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APP'D.

DATE

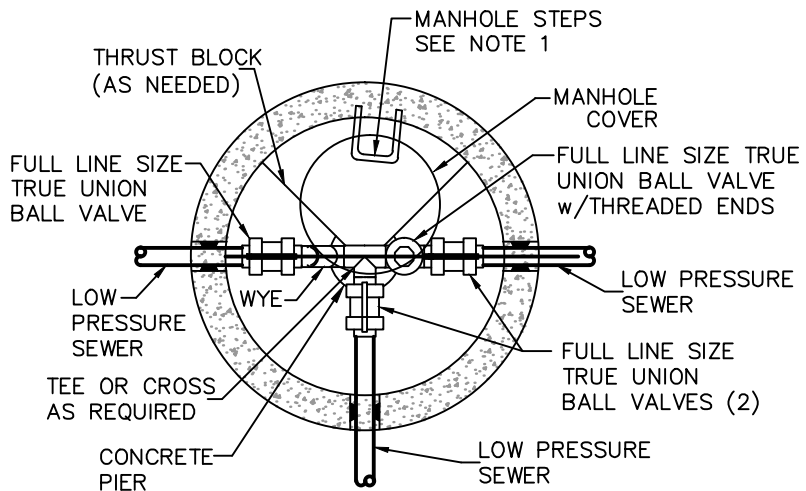
DRAWING NUMBER

REV.



304 S.S. PIPE STRAP DETAIL

NOTE:
SEE PLAN & PROFILE
DWG. FOR LINE SIZES.



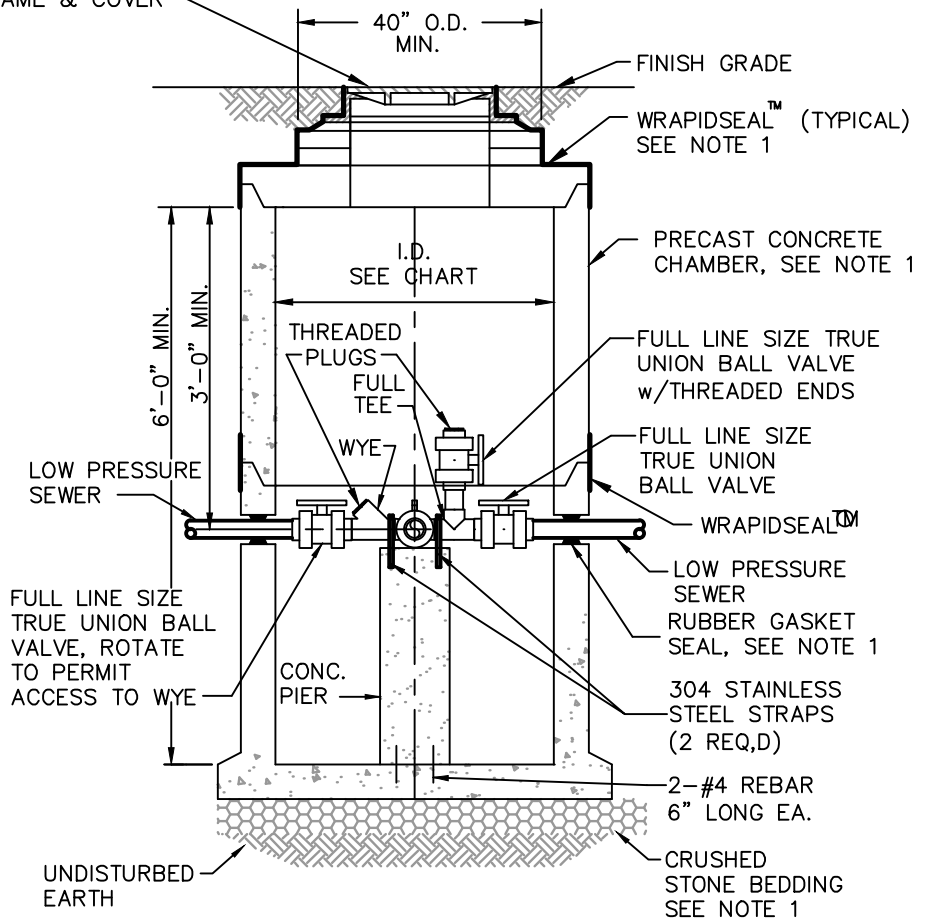
SECTIONAL PLAN

STANDARD MANHOLE FRAME & COVER
SEE NOTE 1

NOTES:

1. FOR CHAMBER DETAILS, SEE TYPICAL PRECAST CONCRETE CHAMBER STANDARD DETAIL G-16.
2. ALL PVC JOINTS TO BE SOLVENT WELDED UNLESS NOTED OTHERWISE.
3. ALL PVC BALL VALVES TO BE TRUE UNION WITH FULL LINE SIZE BORE.

PIPE SIZE	MANHOLE I.D.
2 1/2" or less	60"
3"	60"
4"	72"



LOW PRESSURE SEWER TEE CLEANOUT MANHOLE 4" AND UNDER

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

LOW PRESSURE SEWER



RMS

08/12

S-41

CLEANOUT MANHOLE – DEAD END

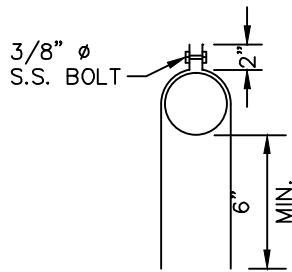
CONSULTING ENGINEERS

APP'D.

DATE

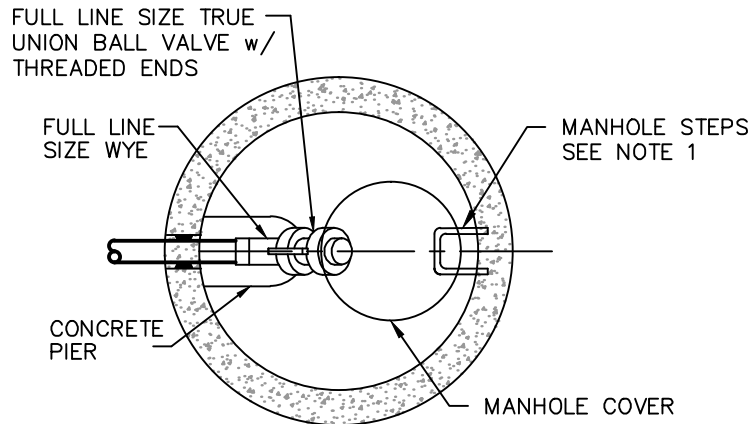
DRAWING NUMBER

REV.



304 S.S. PIPE STRAP DETAIL

NOTE:
SEE PLAN & PROFILE
DWG. FOR LINE SIZES.



SECTIONAL PLAN

STANDARD MANHOLE FRAME & COVER
SEE STANDARD DETAIL

NOTES:

1. FOR CHAMBER DETAILS, SEE TYPICAL PRECAST CONCRETE CHAMBER STANDARD DETAIL.
2. ALL PVC JOINTS TO BE SOLVENT WELDED UNLESS NOTED OTHERWISE.
3. ALL PVC BALL VALVES TO BE TRUE UNION WITH FULL LINE SIZE BORE.

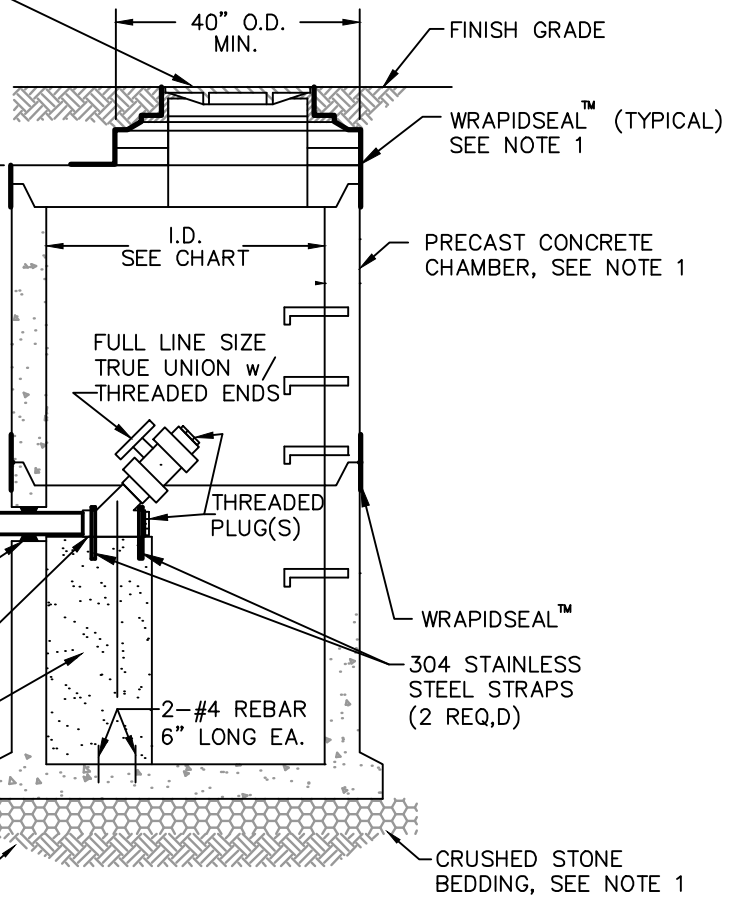
PIPE SIZE	MANHOLE I.D.
2 1/2" or less	60"
3"	60"
4"	72"

LOW PRESSURE SEWER

RUBBER GASKET SEAL, SEE NOTE 1

FULL LINE SIZE WYE

CONCRETE PIER



LOW PRESSURE SEWER DEAD END CLEANOUT MANHOLE 4" AND UNDER

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

FORCE MAIN OR LOW PRESSURE SEWER



RMS

08/12

S-42

CONNECTION TO MANHOLE

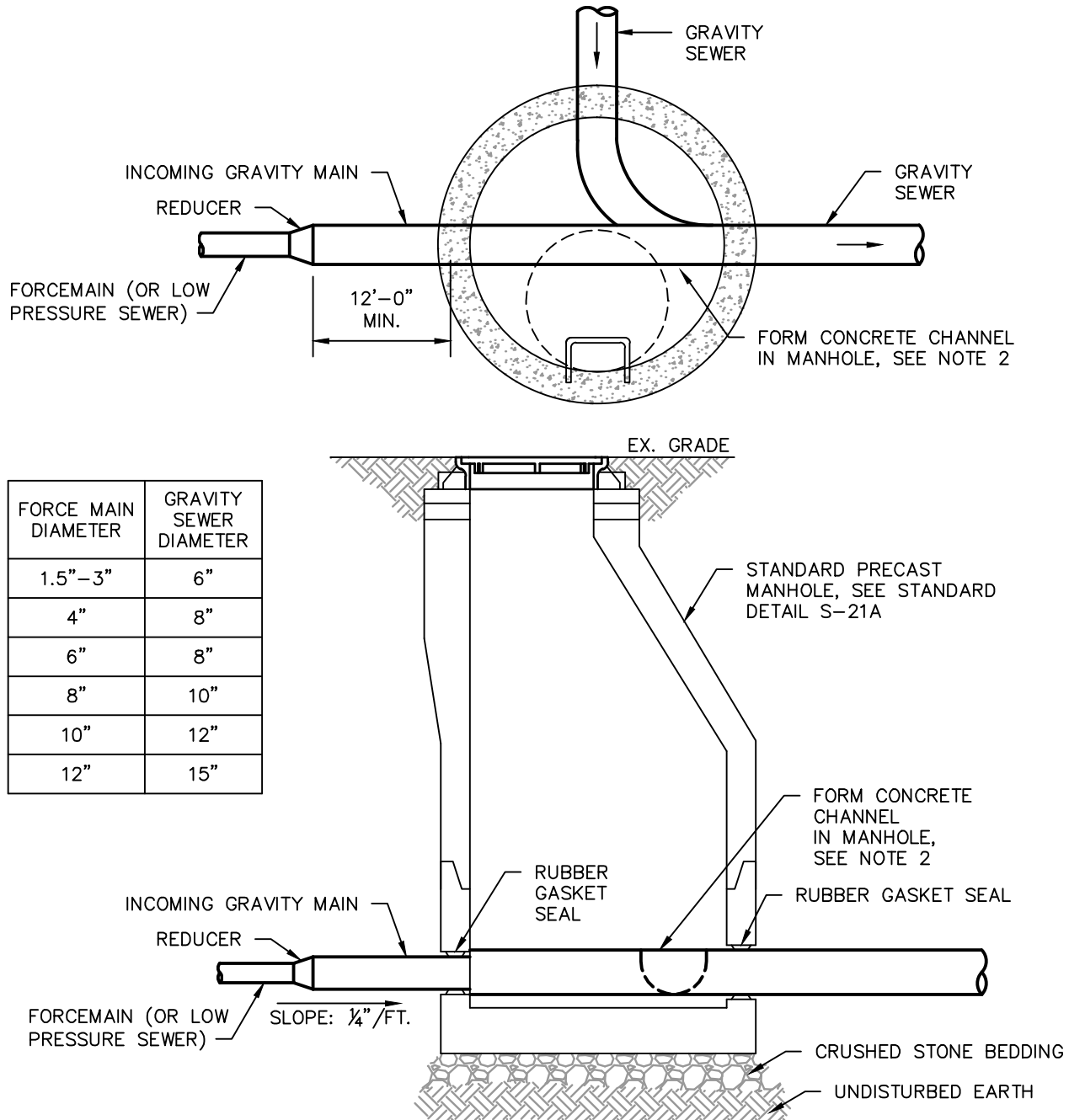
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. PROVIDE PRECAST OPENING WITH A-LOK SEAL PIPE GASKET (OR EQUAL) FOR ALL PIPE PENETRATIONS.
2. PROVIDE SMOOTH FLOW CHANNEL IN MANHOLE FROM FORCE MAIN DISCHARGE TO OUTLET PIPE WITH SLOPED BENCH (1"/FT.) FROM OUTSIDE EDGE OF MANHOLE TO CHANNEL. CHANGES IN SIZE, GRADE AND DIRECTION TO BE MADE SMOOTHLY AND EVENLY WITH AS LARGE A RADIUS AS POSSIBLE.

FORCE MAIN OR LOW PRESSURE SEWER CONNECTION TO MANHOLE

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

LOW PRESSURE SEWER INSIDE DROP



SSM

RMS

08/12

S-43

CONNECTION MANHOLE

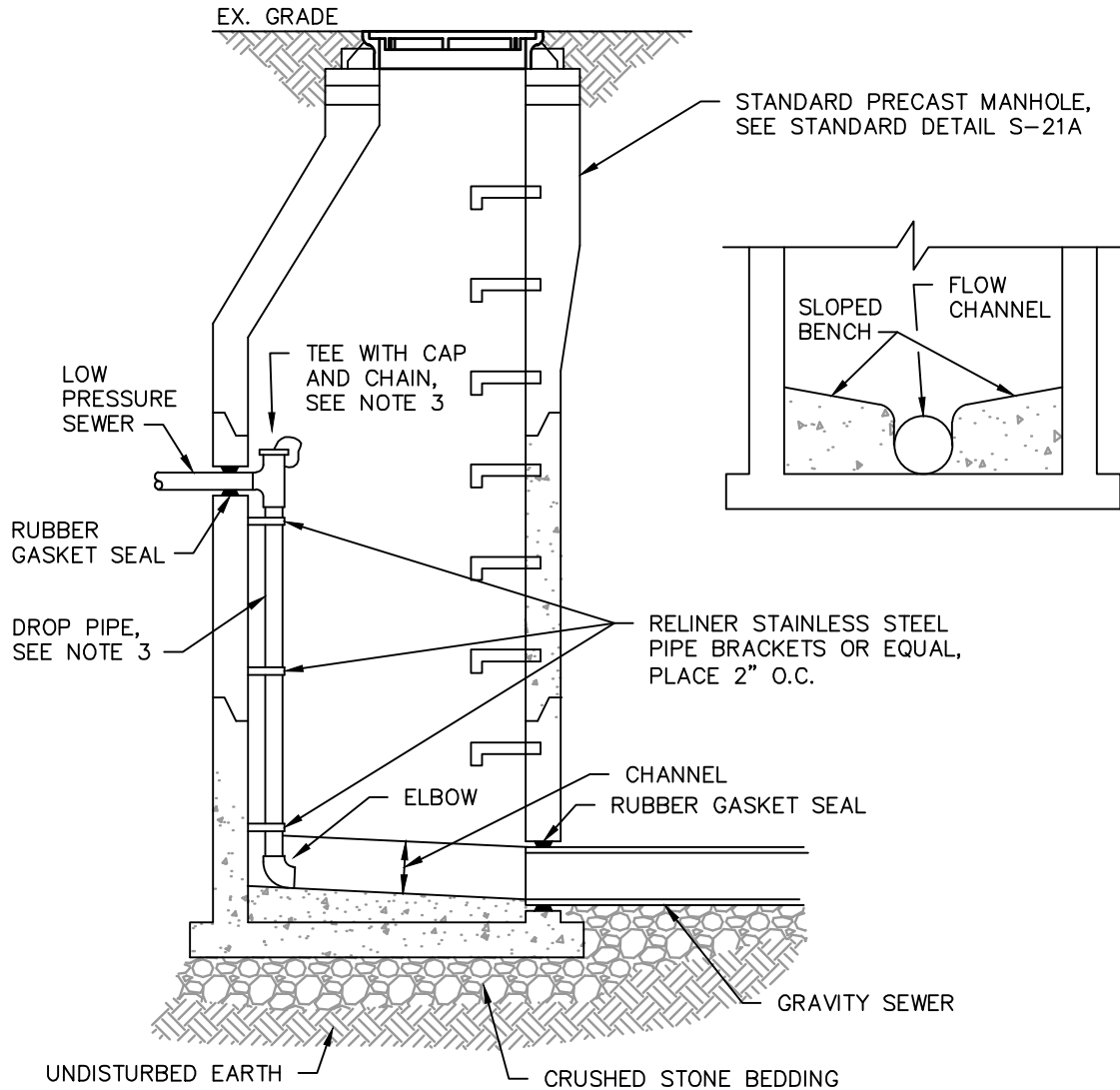
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. PROVIDE PRECAST OPENING WITH A-LOK SEAL PIPE GASKET (OR EQUAL) FOR ALL PIPE PENETRATIONS.
2. PROVIDE SMOOTH FLOW CHANNEL IN MANHOLE FROM FORCE MAIN DISCHARGE TO OUTLET PIPE WITH SLOPED BENCH (1"/FT.) FROM OUTSIDE EDGE OF MANHOLE TO CHANNEL. CHANGES IN SIZE, GRADE AND DIRECTION TO BE MADE SMOOTHLY AND EVENLY WITH AS LARGE A RADIUS AS POSSIBLE.
3. INCREASE SIZE OF TEE AND PIPING INSIDE MANHOLE A MINIMUM OF ONE PIPE DIAMETER OVER THE DIAMETER OF THE INCOMING LOW PRESSURE SEWER.

LOW PRESSURE SEWER INSIDE DROP CONNECTION MANHOLE

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

COMBINATION AIR RELEASE/AIR & VACUUM



RMS

08/12

S-44

VALVE CHAMBER – LOW PRESSURE SEWER

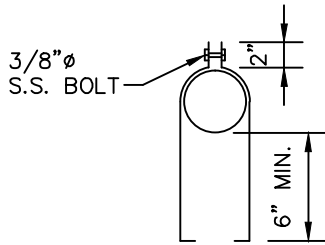
CONSULTING ENGINEERS

APP'D.

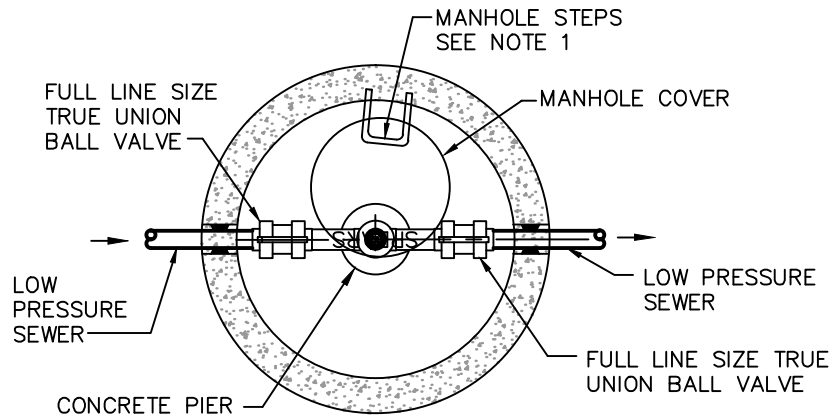
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REV.

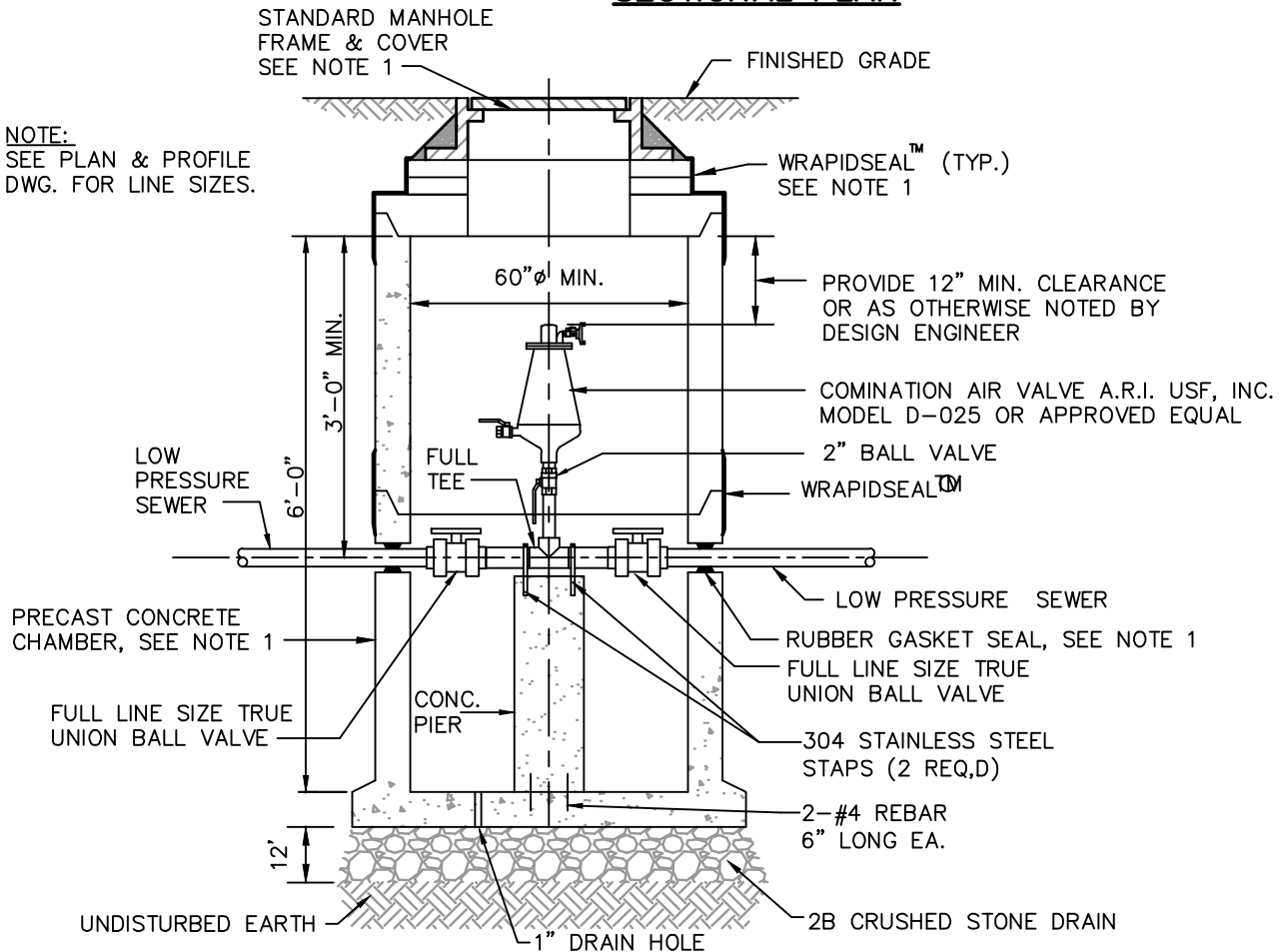


**304 S.S. PIPE STRAP
DETAIL**



SECTIONAL PLAN

NOTE:
SEE PLAN & PROFILE
DWG. FOR LINE SIZES.



NOTES:

1. FOR CHAMBER DETAILS, SEE TYPICAL PRECAST CONCRETE CHAMBER STANDARD DETAIL G-16.
2. PIPE SIZE 3" OR LESS.
3. ALL P.V.C. JOINTS TO BE SOLVENT WELDED UNLESS NOTED OTHERWISE.
4. ALL PVC BALL VALVES TO BE TRUE UNION. WITH FULL LINE SIZE BORE.

**LOW PRESSURE SEWER COMBINATION
AIR RELEASE/VACUUM VALVE CHAMBER**

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

COMBINATION AIR RELEASE/AIR & VACUUM



RMS

08/12

S-45

VALVE CHAMBER – SANITARY FORCE MAIN

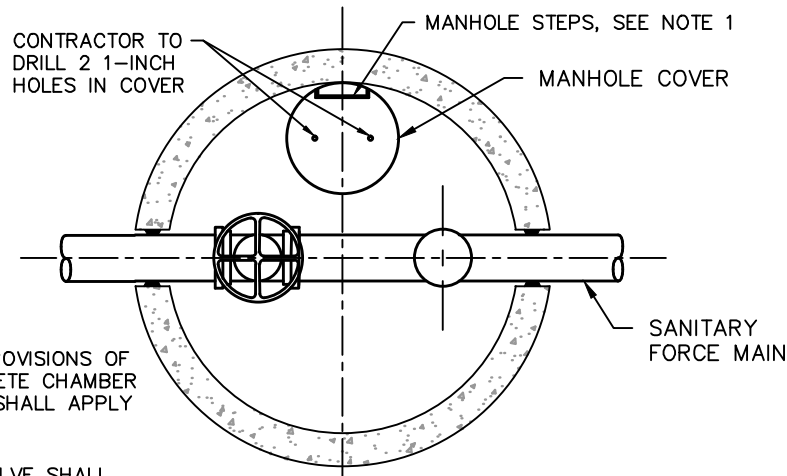
CONSULTING ENGINEERS

APP'D.

DATE

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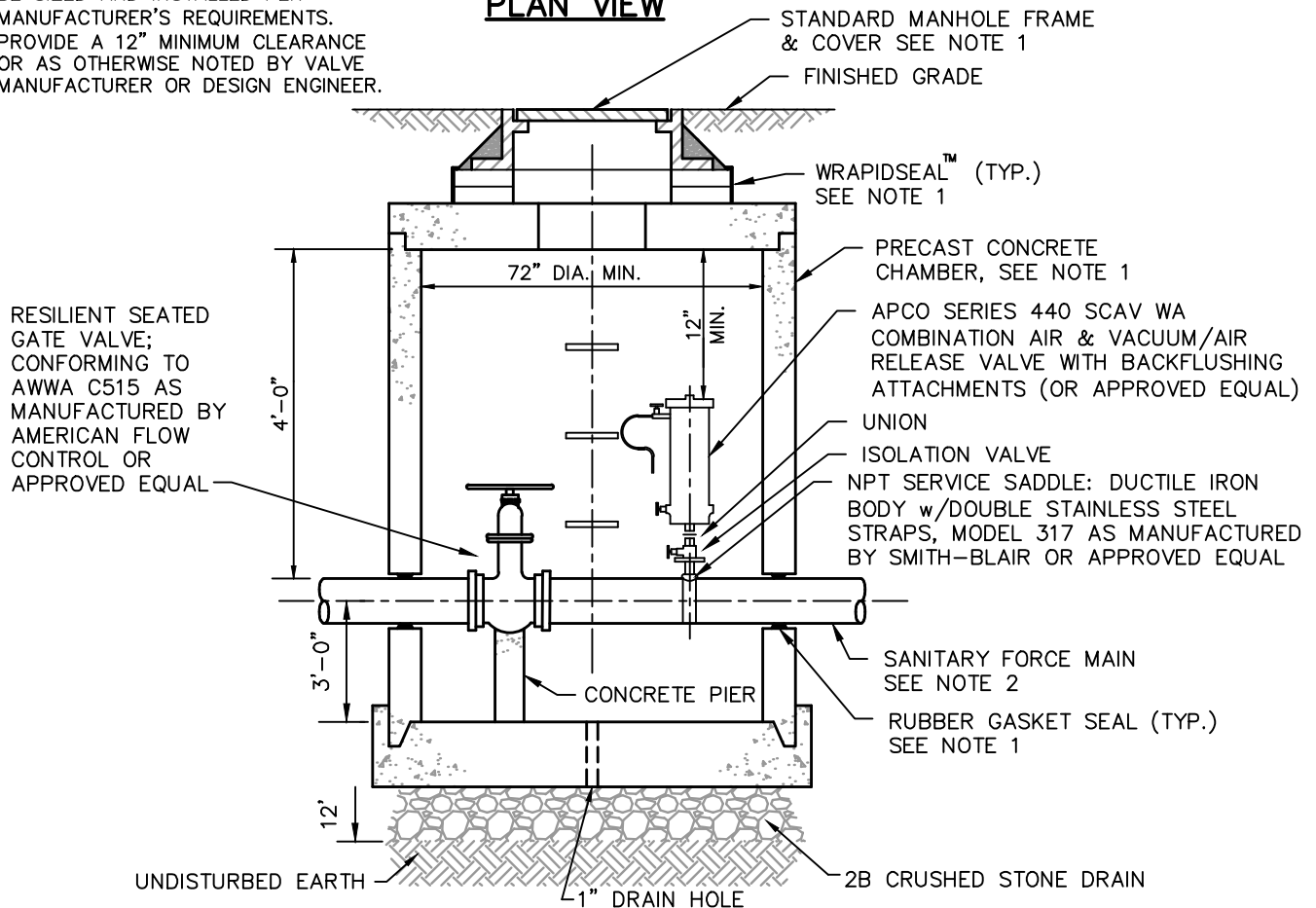
REV.



PLAN VIEW

NOTES:

1. ALL NON-CONFLICTING PROVISIONS OF TYPICAL PRECAST CONCRETE CHAMBER STANDARD DETAIL G-16 SHALL APPLY TO THIS DRAWING.
2. PIPE SIZES 4" THRU 12".
3. AIR RELEASE/VACUUM VALVE SHALL BE SIZED AND INSTALLED PER MANUFACTURER'S REQUIREMENTS.
4. PROVIDE A 12" MINIMUM CLEARANCE OR AS OTHERWISE NOTED BY VALVE MANUFACTURER OR DESIGN ENGINEER.



SECTION VIEW

COMBINATION AIR RELEASE/AIR VACUUM VALVE CHAMBER – SANITARY FORCE MAIN

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

SEWAGE PUMP STATION



RMS

08/12

S-46

SUBMERSIBLE

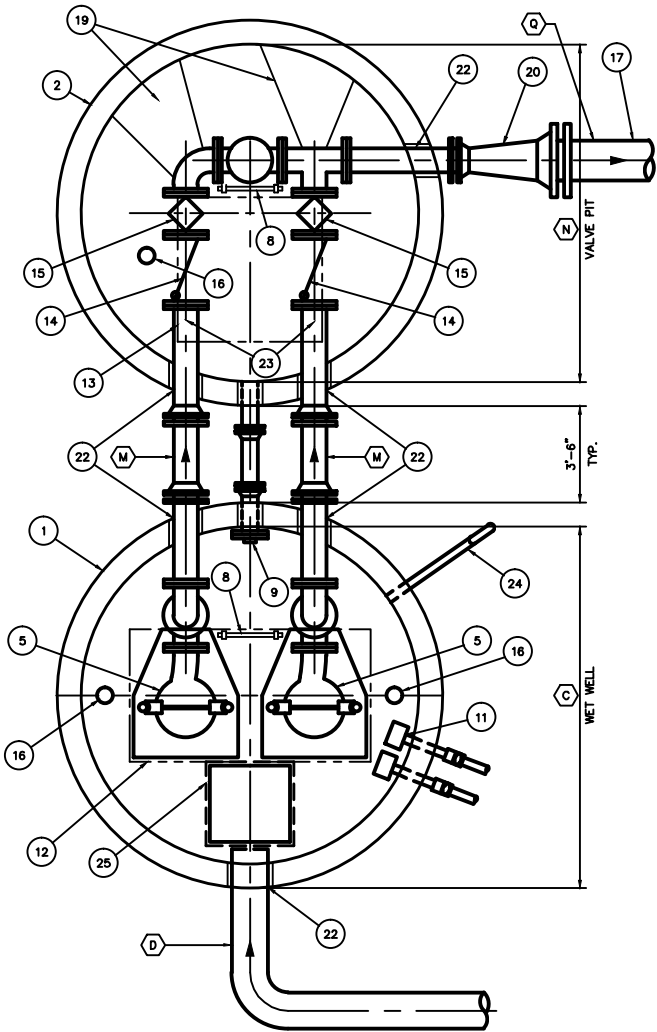
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



SECTIONAL PLAN OF PUMP STATION
NO SCALE

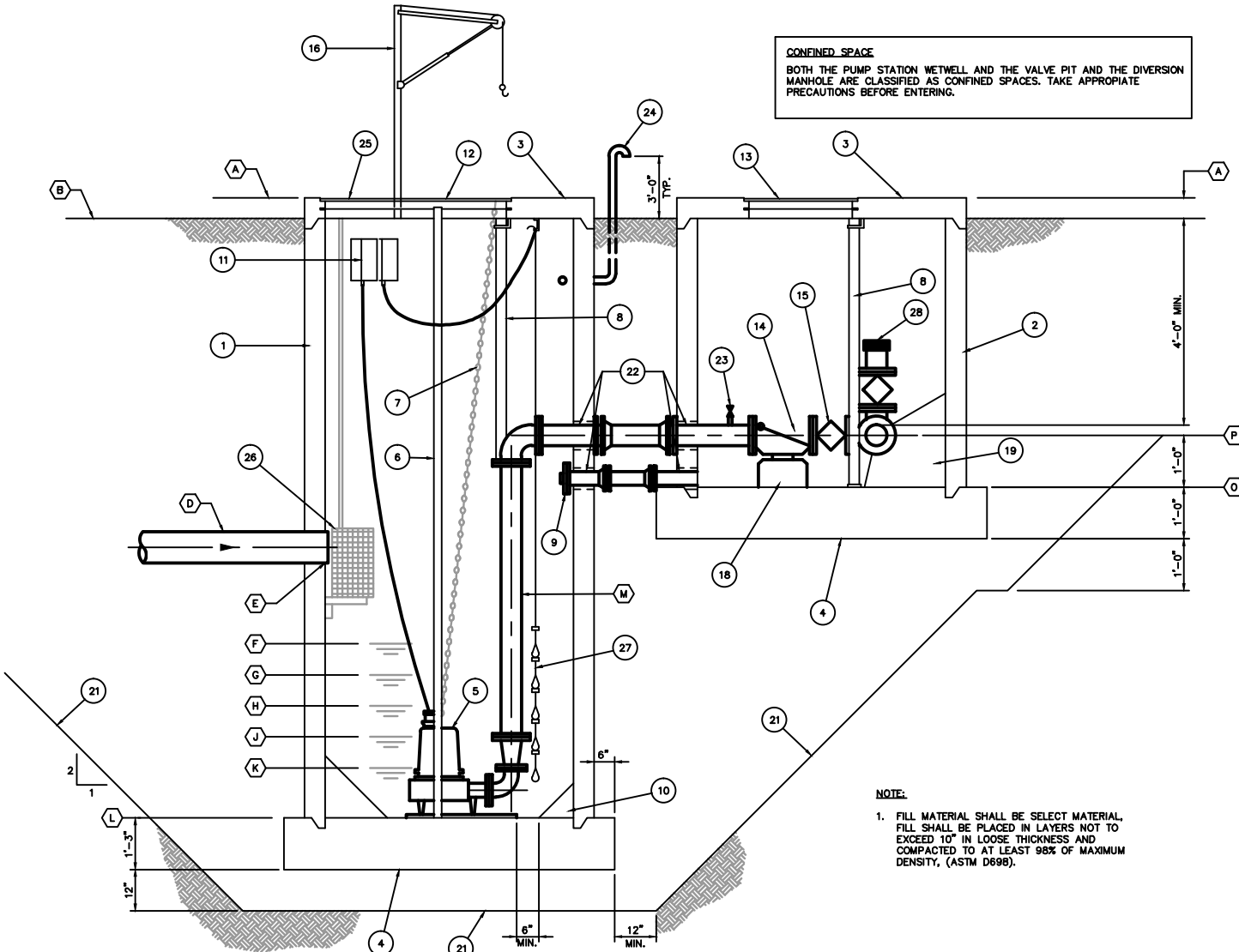
100 YEAR FLOOD ELEVATION

DESIGN SCHEDULE

PUMP STATION 1

PUMP STATION 2

- (A) TOP ELEVATION
- (B) FINISHED GRADE
- (C) MIN. INSIDE DIAMETER OF WET WELL
- (D) INFLUENT LINE SIZE
- (E) INVERT IN
- (F) HIGH WATER ALARM ELEVATION
- (G) LAG PUMP ON ELEVATION
- (H) LAG PUMP OFF ELEVATION
- (J) LEAD PUMP ON ELEVATION
- (K) LEAD PUMP OFF ELEVATION
- (L) WET WELL INVERT
- (M) DISCHARGE SIZE
- (N) MIN. INSIDE DIAMETER OF VALVE PIT
- (O) VALVE PIT INVERT
- (Q) ELEVATION OF FORCE MAIN
- (R) FORCE MAIN SIZE



CONFINED SPACE
BOTH THE PUMP STATION WETWELL AND THE VALVE PIT AND THE DIVERSION
MANHOLE ARE CLASSIFIED AS CONFINED SPACES. TAKE APPROPRIATE
PRECAUTIONS BEFORE ENTERING.

NOTE:
1. FILL MATERIAL SHALL BE SELECT MATERIAL.
FILL SHALL BE PLACED IN LAYERS NOT TO
EXCEED 10" IN LOOSE THICKNESS AND
COMPACTED TO AT LEAST 98% OF MAXIMUM
DENSITY, (ASTM D698).

CROSS-SECTION OF PUMP STATION
NO SCALE

- (1) PRECAST CONCRETE WET WELL (SQUARE ALSO ACCEPTABLE)
- (2) PRECAST CONCRETE VALVE PIT (SQUARE ALSO ACCEPTABLE)
- (3) PRECAST CONCRETE TOP
- (4) CONCRETE FOUNDATION SLAB w/ #5 AT 12" E.W.
- (5) SUBMERSIBLE PUMP
- (6) STAINLESS STEEL PUMP GUIDE RAIL WITH INTERMEDIATE SUPPORTS
- (7) STAINLESS STEEL LIFTING CHAIN
- (8) HEAVY-DUTY STAINLESS STEEL OR FIBERGLASS LADDER w/ RUNGS AT 12" O.C. w/ RETRACTABLE 1" O.D. EXTENSION TUBES FOR HANDRAILS
- (9) 4" FLAP VALVE & DRAIN
- (10) CONCRETE FILL

KEY NOTES

- (11) PUMP ELECTRICAL SERVICE w/ PUMP POWER CABLE & LEVEL CONTROL WIRES.
- (12) DOUBLE LEAF ALUMINUM HATCH w/ FLUSH TYPE HANDLE & LOCK. SIZE AS REQUIRED FOR PUMP REMOVAL BY HALLIDAY, BILCO OR APPROVED EQUAL.
- (13) 2'-6" SQ. ALUMINUM HATCH w/ FLUSH TYPE HANDLE & LOCK BY HALLIDAY, BILCO OR APPROVED EQUAL.
- (14) CHECK VALVE
- (15) PLUG VALVE
- (16) PROVIDE PORTABLE HOIST w/ 3 FLOOR MOUNTED LINED STAINLESS STEEL MOUNTING BRACKETS.
- (17) FORCE MAIN
- (18) CONC. PIPE SUPPORT AT EACH CHECK VALVE
- (19) CONC. REACTION BLOCKING TO BE CONSTRUCTED ALLOWING ENOUGH CLEARANCE FOR BOLT REMOVAL FROM PIPE FLANGE

- (20) REDUCER IF REQUIRED OR 4'-0" SECTION OF PIPE
- (21) UNDISTURBED EARTH
- (22) PIPE OPENING SEAL
- (23) 3/4" TAP & BALL VALVE
- (24) 4" DUCTILE IRON VENT
- (25) SINGLE LEAF 304 S.S. HATCH w/ FLUSH TYPE HANDLE & LOCK 24" x 30" MIN. SIZE
- (26) REMOVABLE TRASH BASKET BY HALLIDAY OR APPROVED EQUAL, 3/4" MAX. SIZE OPENINGS.
- (27) PRESSURE TRANSDUCER OR FLOAT SWITCHES AND CABLES w/ HOLDER.
- (28) BLIND FLANGE w/ 4" PLUG VALVE, DIP NIPPLE AND THREADED CAP.

WATER STANDARD DETAILS

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

GATE VALVE DETAIL



SSM

RMS

08/12

W-01

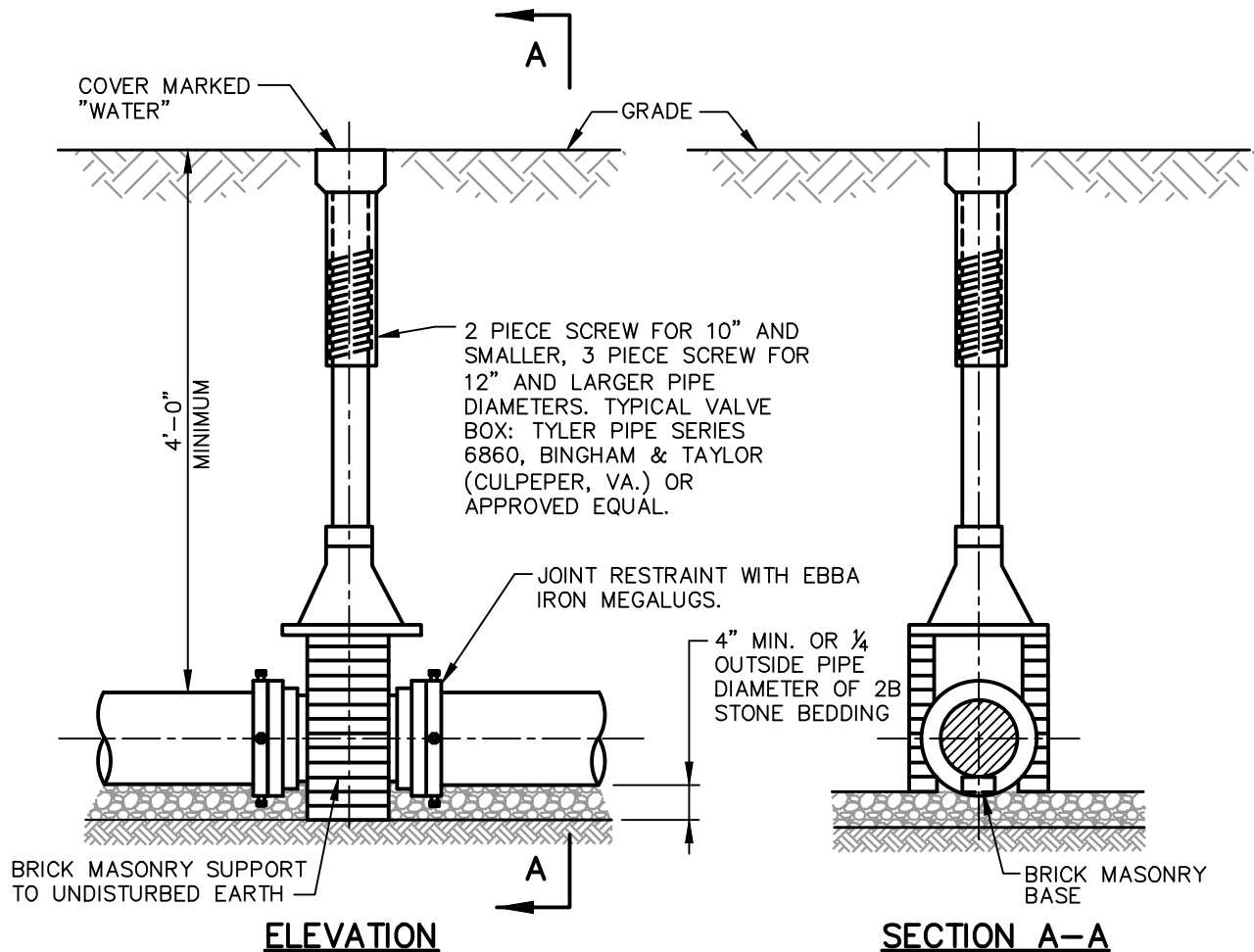
CONSULTING ENGINEERS

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DATE

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REV.



NOTES:

1. ALL VALVES SHALL CONFORM TO AWWA C515 FOR RESILIENT SEATED GATE VALVES AS MANUFACTURED BY AMERICAN FLOW CONTROL OR APPROVED EQUAL..
2. VALVE BOX BASES TO BE:
No. 4 DOME - VALVES 4" AND SMALLER
No. 6 ROUND - 6" AND 8" VALVES
No. 160 OVAL - 10" TO 24" VALVES
3. MECHANICAL JOINTS WITH JOINT RESTRAINT FOR ALL VALVES AND FITTINGS. PROVIDE FIELD LOCK GASKETS 60 LF IN AND OUT OF ALL VALVES AND FITTINGS.

GATE VALVE DETAIL

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

CUT-IN VALVE DETAIL



SSM

RMS

08/12

W-02

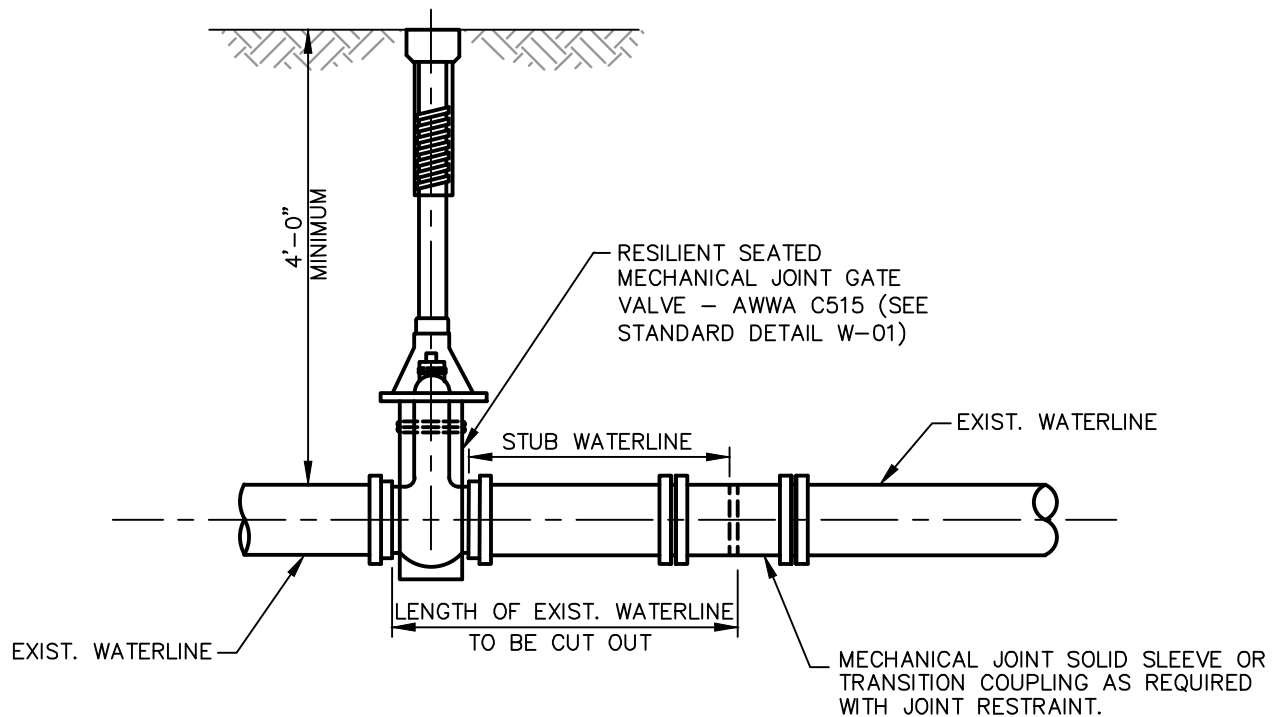
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTE:
MECHANICAL JOINTS WITH JOINT RESTRAINT
REQUIRED FOR ALL VALVES AND FITTINGS.

CUT-IN VALVE DETAIL

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

STANDARD WATER SERVICE



RMS

08/12

W-03

CONNECTION FOR - 3/4" & 1"

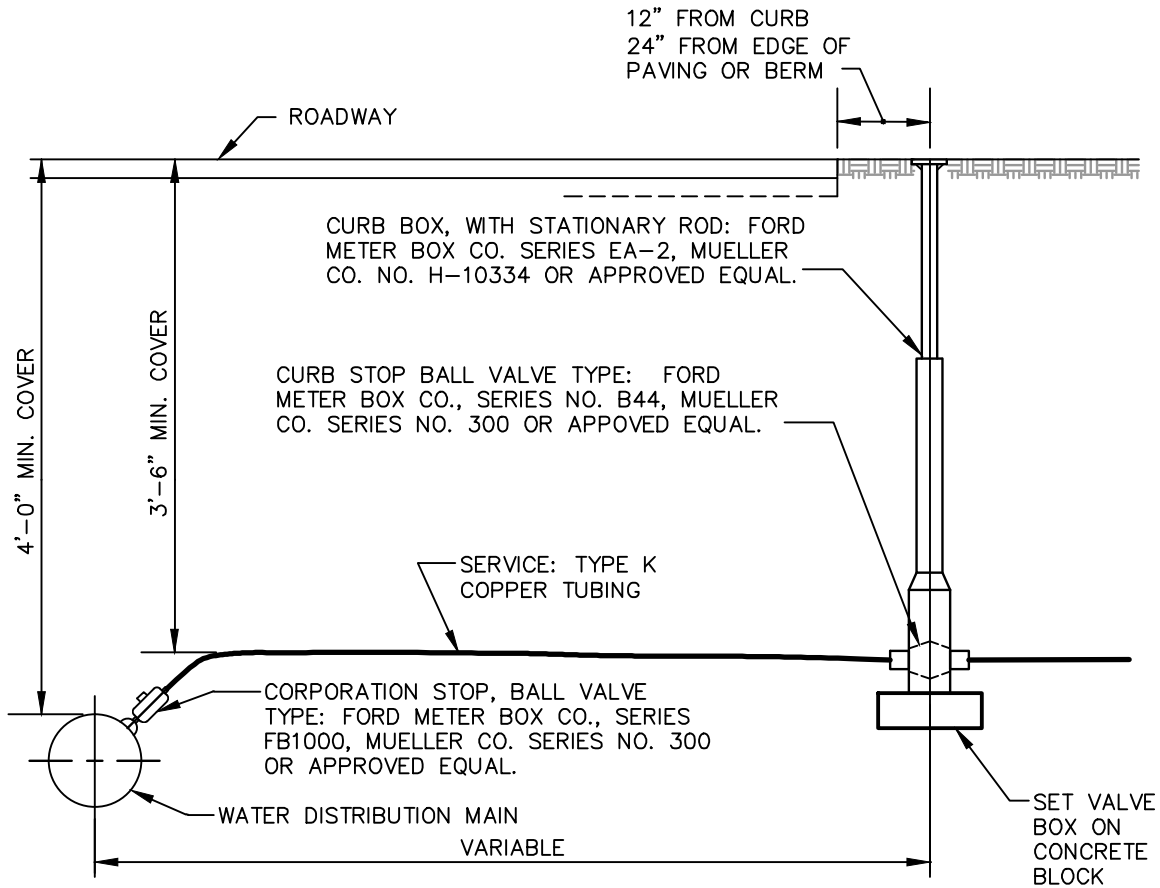
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



ELEVATION

STANDARD WATER SERVICE CONNECTION

(3/4" AND 1")

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TYPICAL WATER SERVICE CONNECTION



SSM

RMS

08/12

W-04

WITH OUTSIDE METER BOX

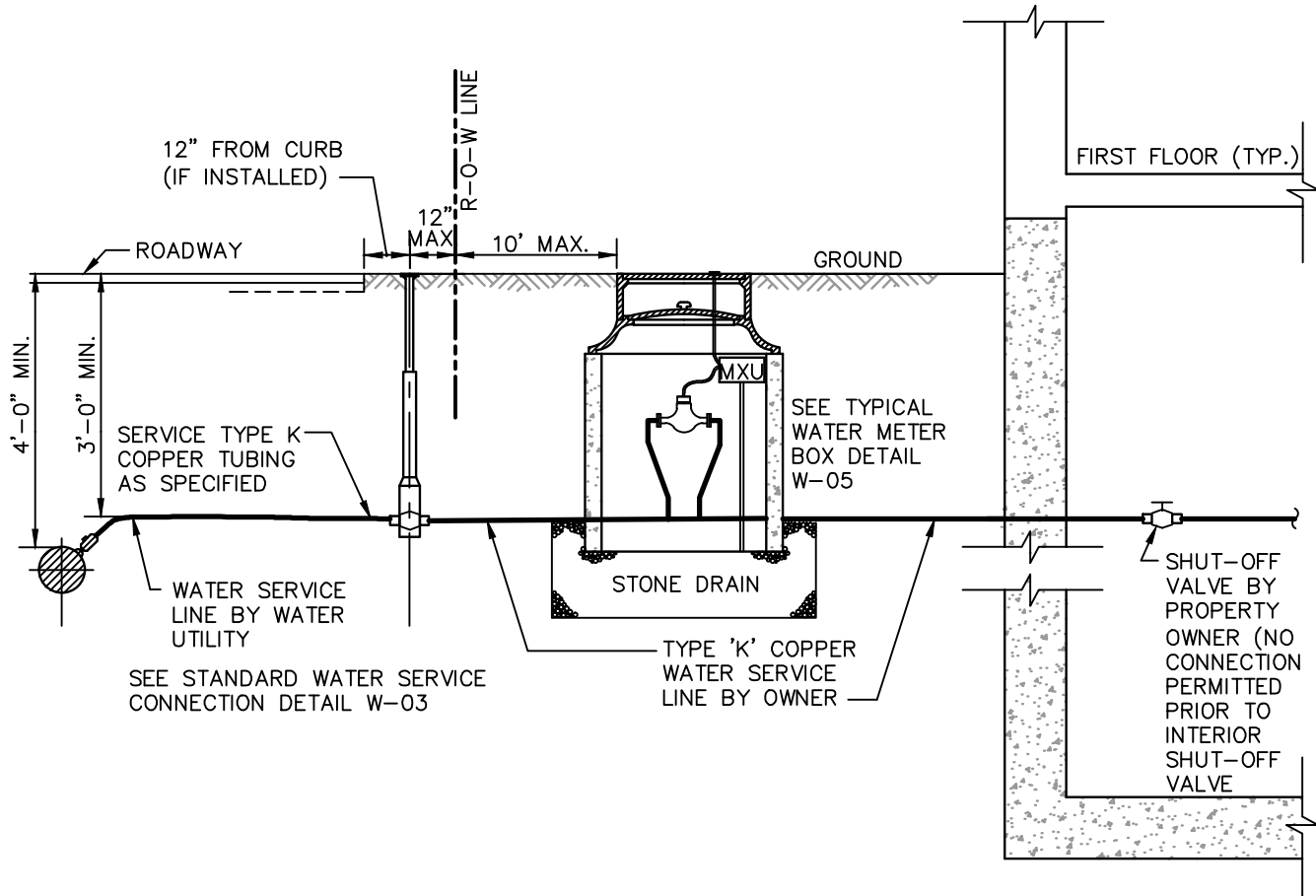
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



TYPICAL WATER SERVICE CONNECTION WITH OUTSIDE METER BOX

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TYPICAL WATER METER BOX DETAIL



SSM

RMS

08/12

W-05

5/8", 3/4" & 1" METERS

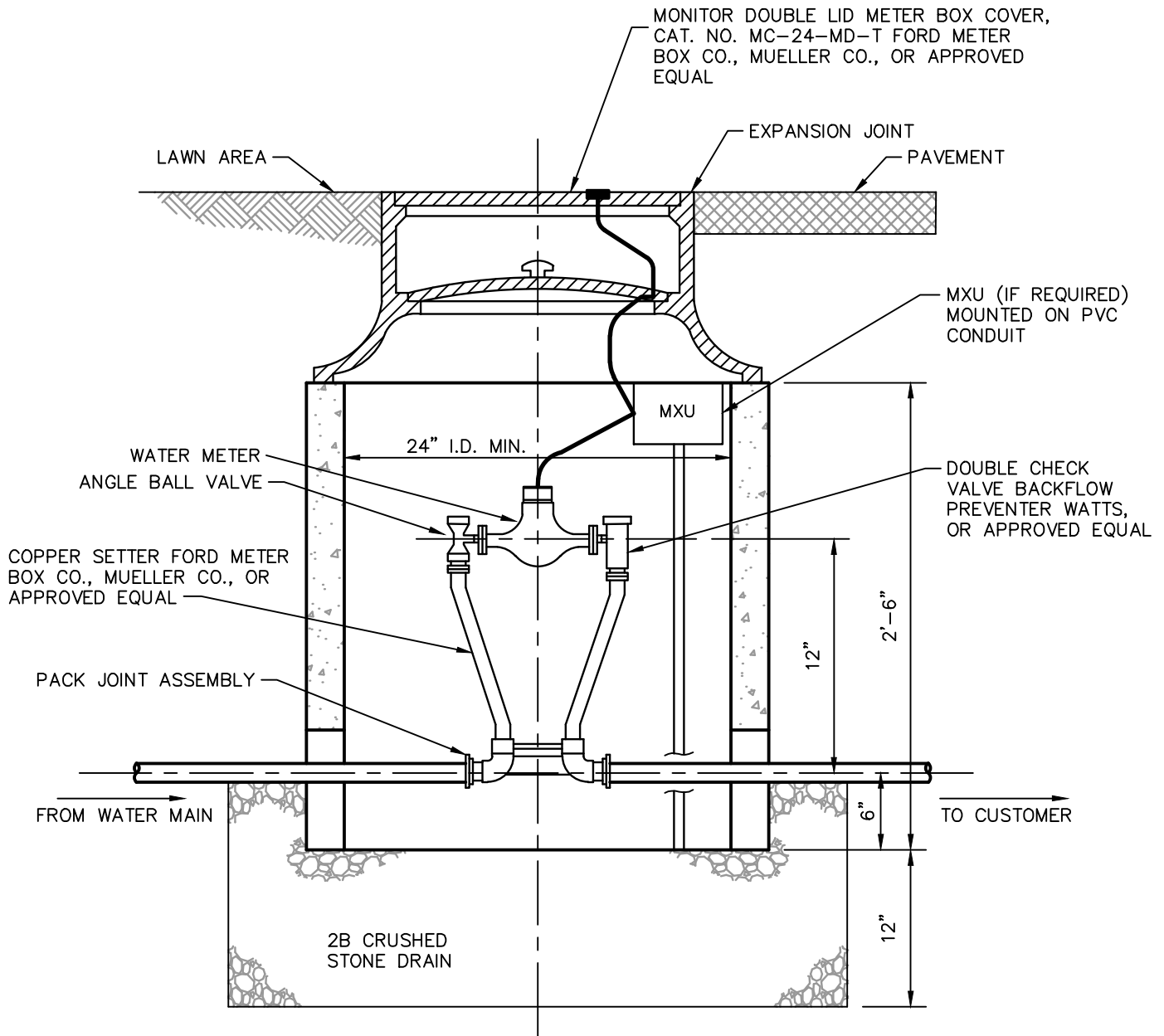
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



TYPICAL WATER METER BOX DETAIL

(5/8", 5/8"x3/4", 3/4" AND 1" METERS)
NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TYPICAL WATER METER BOX DETAIL



SSM

RMS

08/12

W-06

1 1/2" & 2" METERS

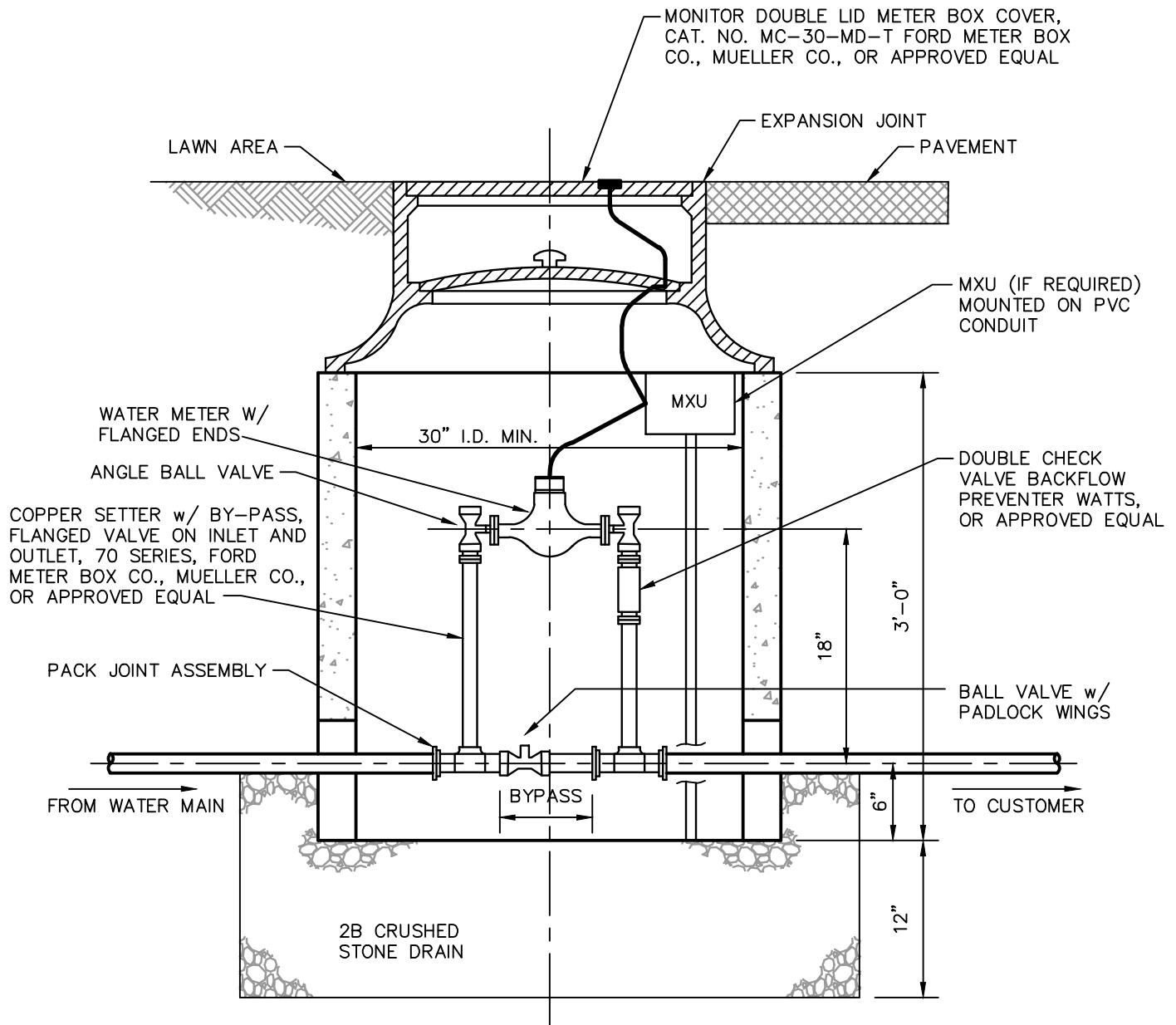
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



TYPICAL WATER METER BOX DETAIL

(1 1/2" AND 2" METERS)
NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

INSIDE WATER METER INSTALLATION



SSM

RMS

08/12

W-07

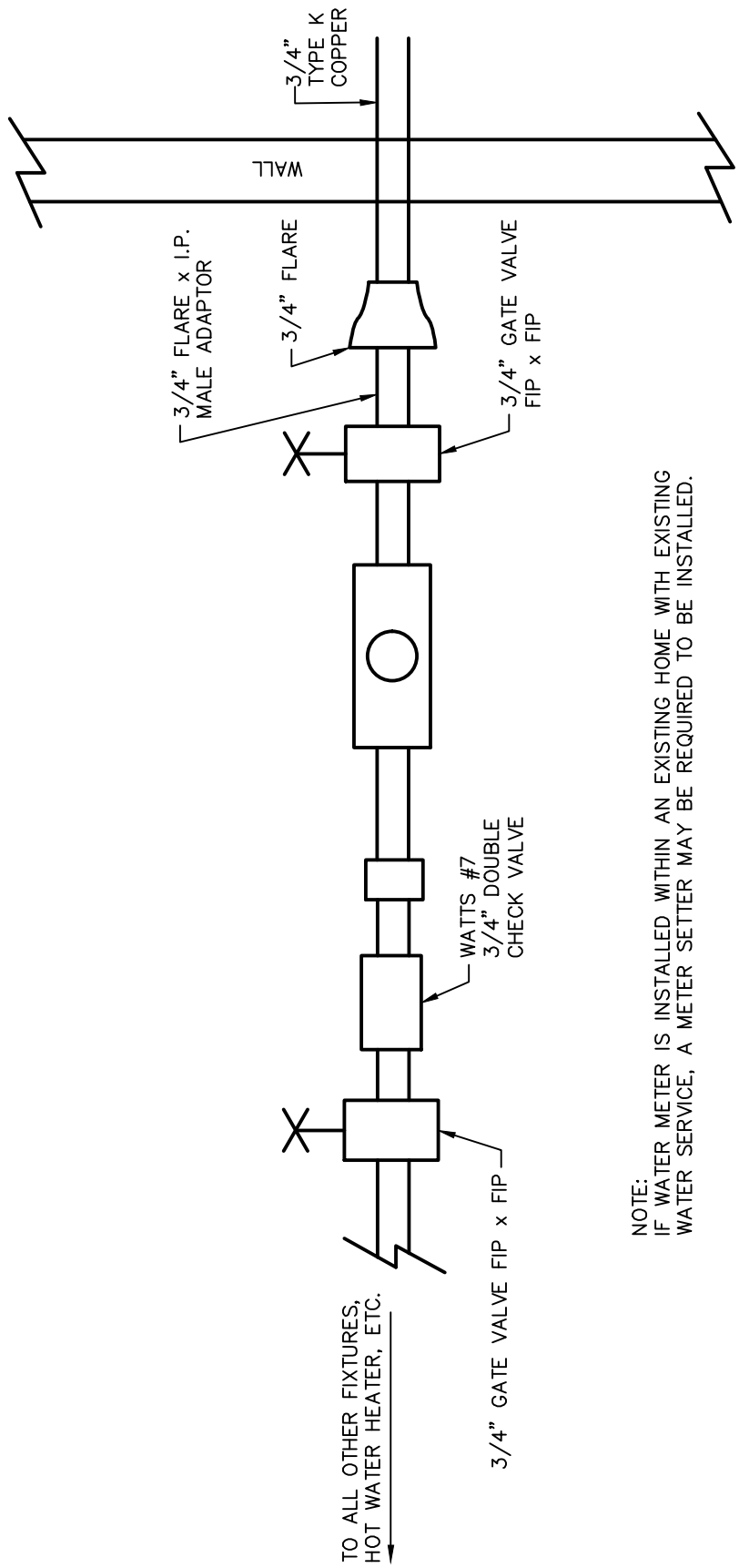
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTE:
IF WATER METER IS INSTALLED WITHIN AN EXISTING HOME WITH EXISTING
WATER SERVICE, A METER SETTER MAY BE REQUIRED TO BE INSTALLED.

INSIDE WATER METER INSTALLATION DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

TYPICAL WATER METER



RMS

08/12

W-08

HORIZONTAL SETTING DETAIL

CONSULTING ENGINEERS

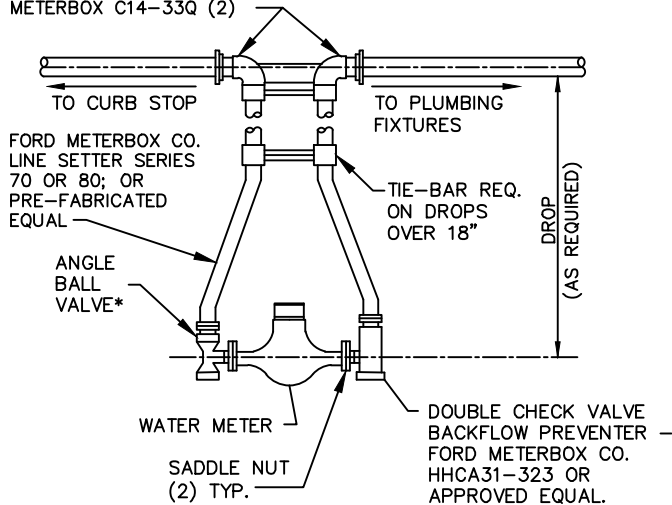
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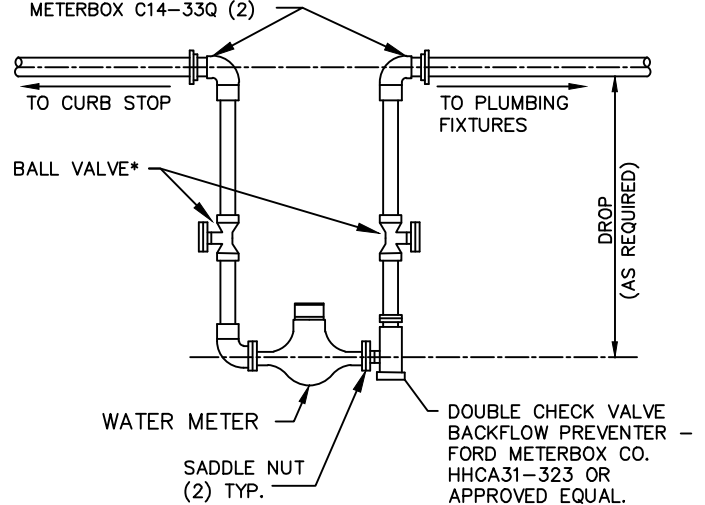
REV.

PACK JOINT ASSEMBLY
AND/OR SERVICE LINE
ADAPTOR BY FORD
METERBOX C14-33Q (2)

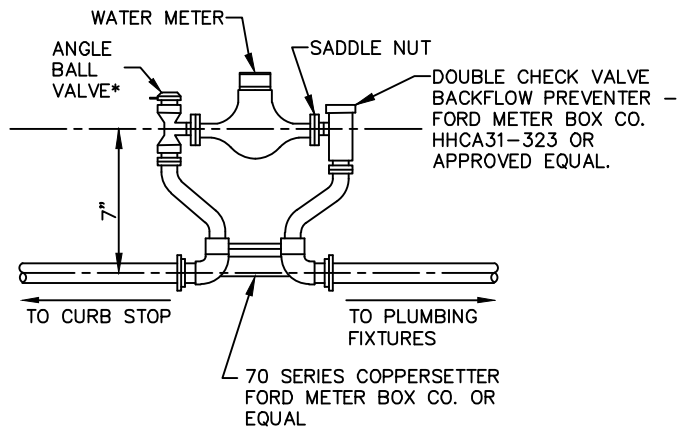


DROP

PACK JOINT ASSEMBLY
AND/OR SERVICE LINE
ADAPTOR BY FORD
METERBOX C14-33Q (2)



DROP w/o METER SETTER



RISER

*ONLY ONE VALVE REQUIRED IF
THERE IS AN EXISTING OPERABLE
HOUSE STOP.

NOTES:

1. MUELLER SETTINGS AS MANUFACTURED BY MUELLER CO. ARE CONSIDERED AN APPROVED EQUAL.
2. NO CONNECTIONS PERMITTED BETWEEN CURB STOP AND METER SETTINGS. METER TO BE SET AS CLOSE AS PRACTICABLE TO WATER LINE ENTRANCE INTO BUILDING.
3. PIPE TO BE ANCHORED TO PROVIDE SUFFICIENT SUPPORT FOR METER WHERE NECESSARY.
4. CENTERLINE OF METER SHALL NOT BE MORE THAN 48" OR LESS THAN 18" ABOVE THE FLOOR.

TYPICAL WATER METER HORIZONTAL SETTING DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

DUAL SERVICE WITH



CLC

08/14

W-09

DOUBLE LID PIT SETTER

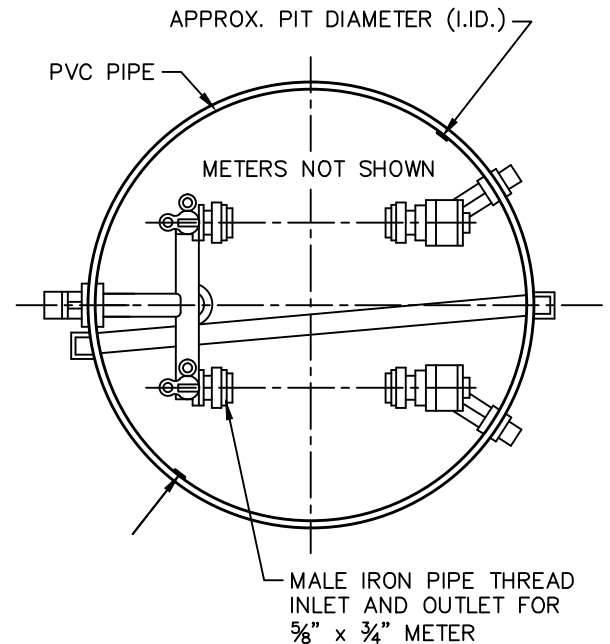
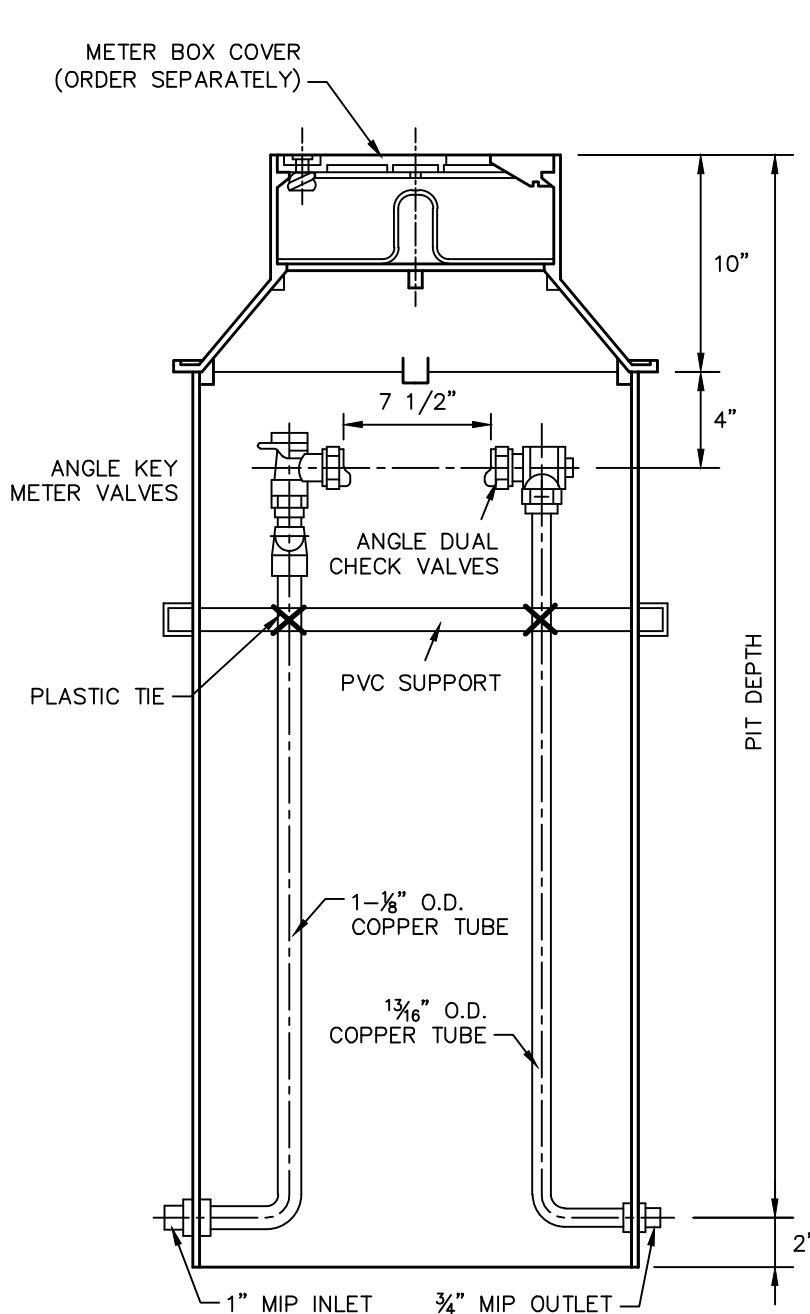
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. METER TO BE PROVIDED BY MUHLENBERG TOWNSHIP AUTHORITY.
2. DUAL SERVICE WITH DOUBLE LID COVER-ANGLE KEY METER VALVES INLET BY ANGLE DUAL CHECK VALVES OUTLET.
3. PLASTIC PITSETTER AS MANUFACTURED BY FORD METER BOX COMPANY PDDVHH-288-XX-XX-NL STYLE.
4. ALL BRASS THAT COMES INTO CONTACT WITH POTABLE WATER MUST CONFORM TO AWWA STANDARD C800.
5. LEAD FREE SOLDER MUST BE UTILIZED WHEN ASSEMBLING THE PIPING AND APPURTENANCES.
6. SERVICE LINES MUST BE A MINIMUM OF 2" FROM THE PIT WALL TO PREVENT FROST.

PIT DIAMETER AND DEPTH	CATALOG NUMBER
20"x36"	PDDVHH-288-20-36-NL
20"x48"	PDDVHH-288-20-48-NL
20"x60"	PDDVHH-288-20-60-NL
20"x72"	PDDVHH-288-20-72-NL

NOTE: "D" STANDS FOR DOUBLE LID COVER

DUAL SERVICE WITH DOUBLE LID PIT SETTER

FOR RESIDENTIAL & FIRE WATER SERVICE
NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

FIRE HYDRANT DETAIL



DAJ

07/20

W-11

1

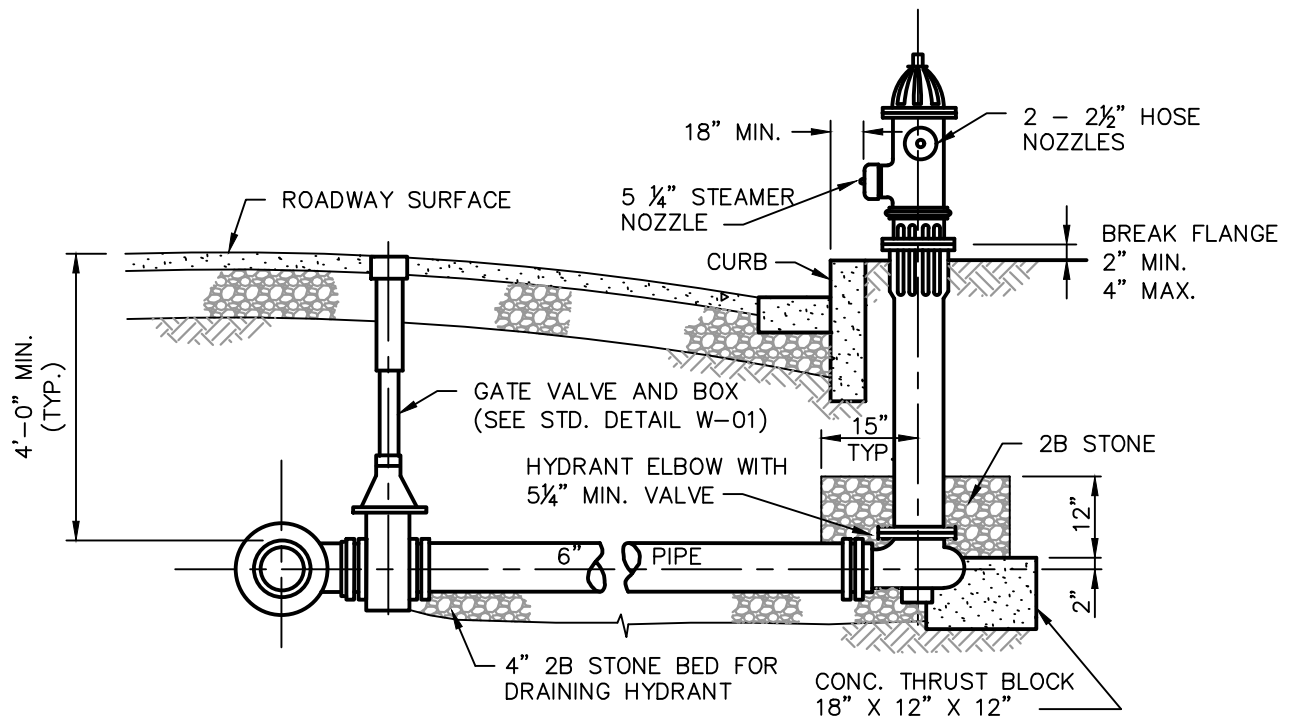
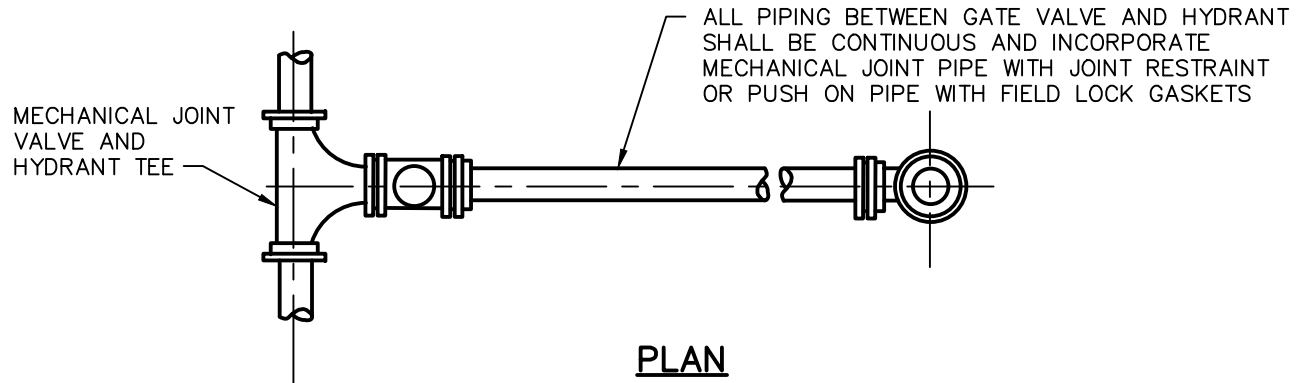
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. GATE VALVE - 6" RESILIENT SEAT GATE VALVE, CONFORMING TO AWWA C515, AS MANUFACTURED BY AMERICAN FLOW CONTROL, U.S. PIPE, KENNEDY, OR APPROVED EQUAL.
2. FIRE HYDRANT - CONFORMING TO AWWA C502, AS MANUFACTURED BY AMERICAN DARLING B-62-B5, WITH 5" STORTZ CONNECTION.
3. NOZZLE THREADS AND ADAPTERS SHALL COMPLY WITH MUNICIPAL AND FIRE DEPARTMENT REGULATIONS.
4. THE FIRE HYDRANT DRAIN MUST BE EXPOSED TO THE GRAVEL DRAIN.

FIRE HYDRANT DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

UTILITY WATER HYDRANT



RMS

08/12

W-12

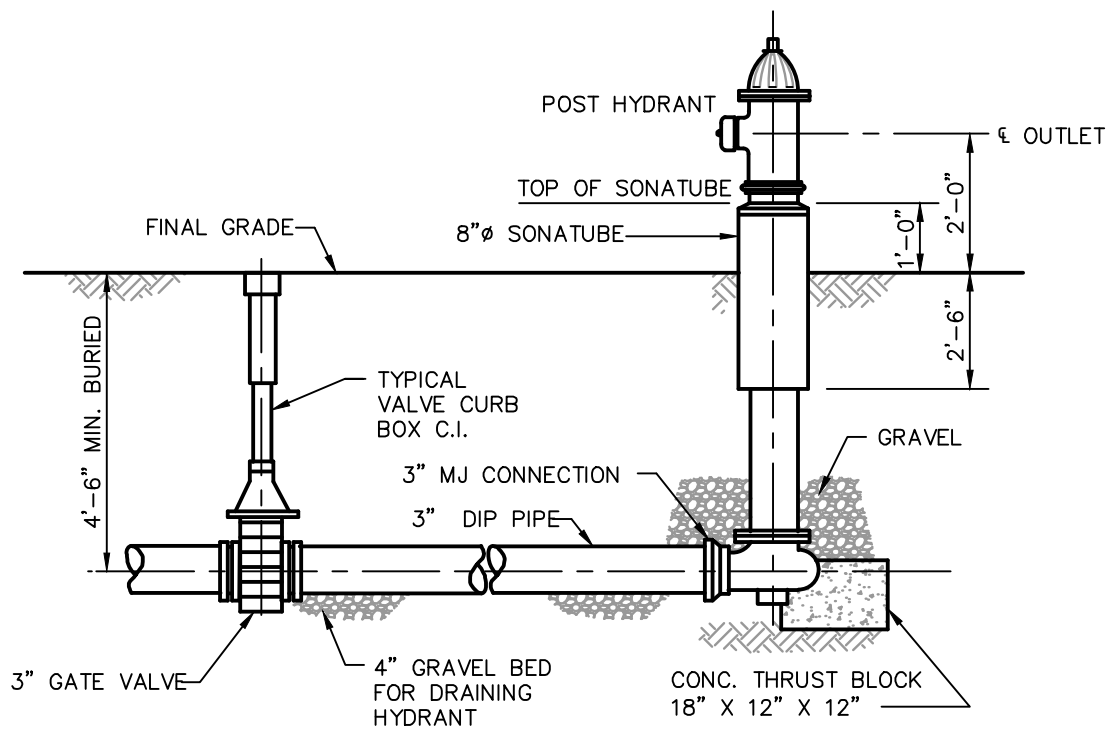
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



UTILITY WATER HYDRANT

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

IN-LINE BLOW-OFF DETAIL



SSM

RMS

08/12

W-13

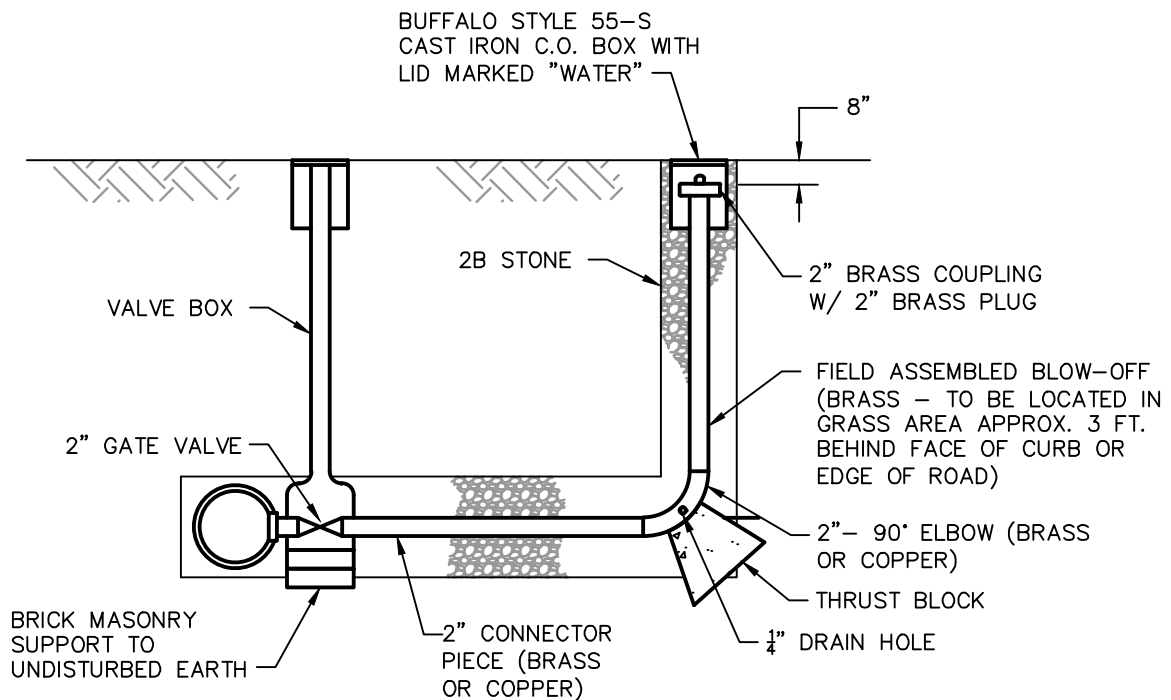
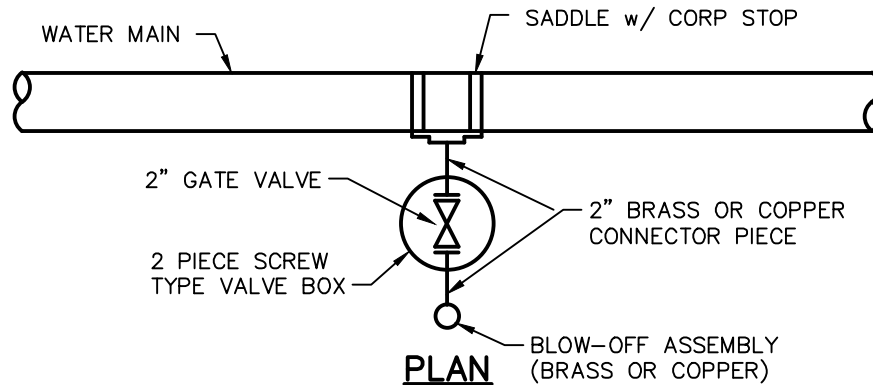
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTE:
IF COPPER IS USED-NO SWEAT JOINTS.
BRASS FITTINGS MUST BE USED.

ELEVATION

IN-LINE BLOW-OFF DETAIL

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

END OF LINE BLOW-OFF DETAIL



SSM

RMS

08/12

W-14

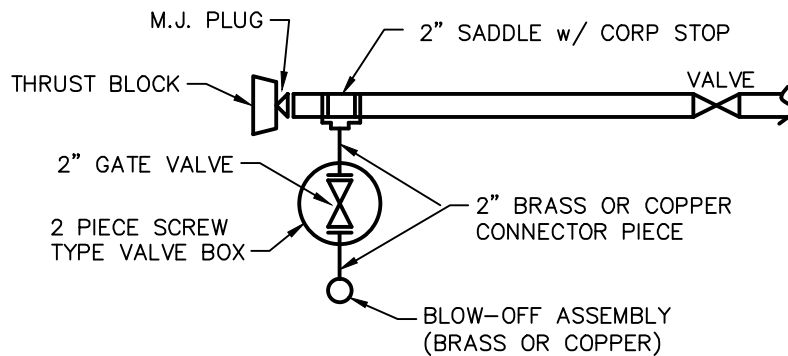
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APP'D.

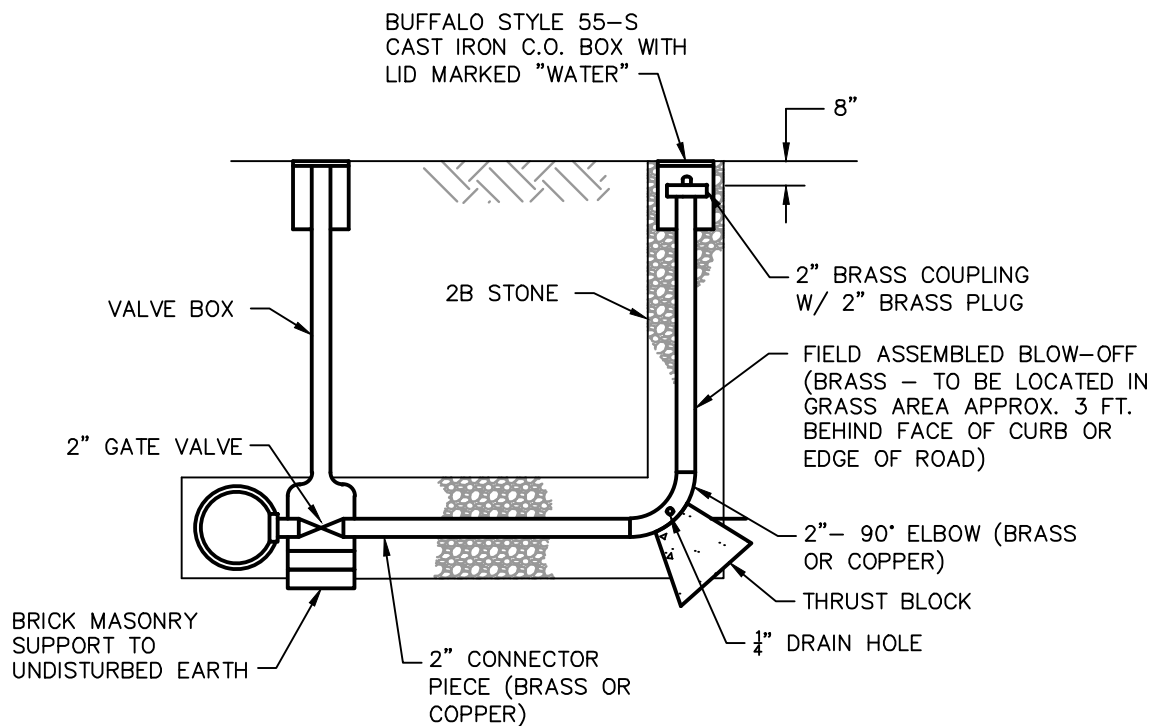
DATE

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PLAN



NOTE:
IF COPPER IS USED—NO SWEAT JOINTS.
BRASS FITTINGS MUST BE USED.

ELEVATION

END OF LINE BLOW-OFF DETAIL

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

AIR AND VACUUM VALVE CHAMBER



RMS

08/12

W-15

INSTALLATION DETAIL

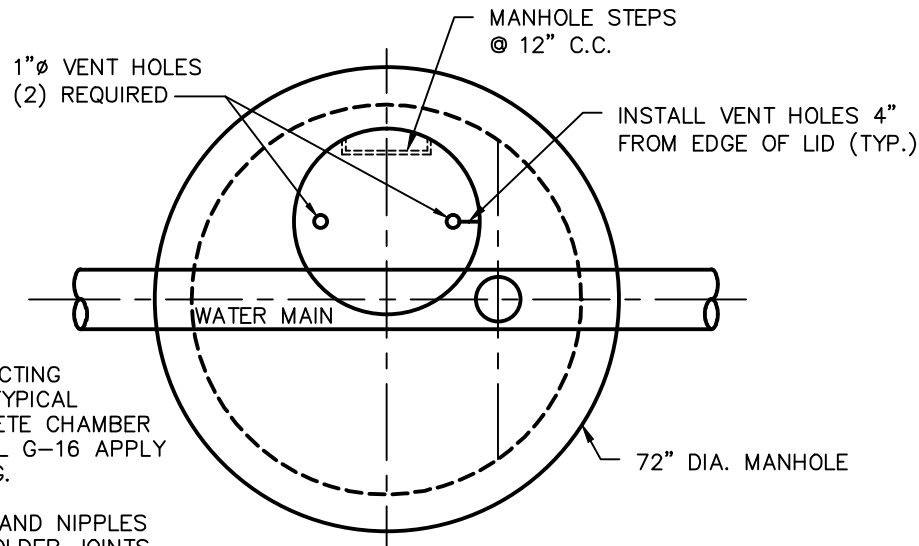
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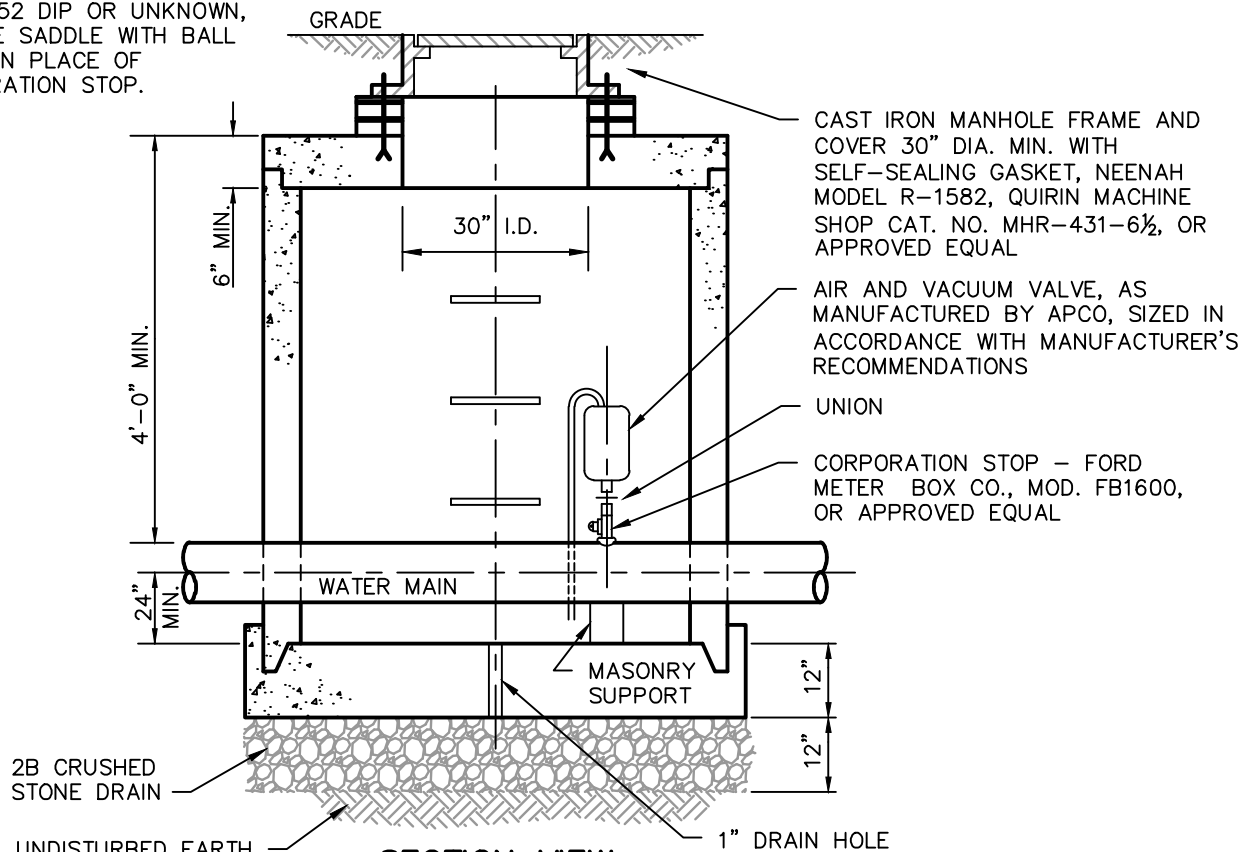
REV.



PLAN VIEW

NOTES:

1. ALL NON-CONFLICTING PROVISIONS OF TYPICAL PRECAST CONCRETE CHAMBER STANDARD DETAIL G-16 APPLY TO THIS DRAWING.
2. BRASS FITTINGS AND NIPPLES REQUIRED. NO SOLDER JOINTS ALLOWED.
3. IF WATER MAIN IS LESS THAN CLASS 52 DIP OR UNKNOWN, PROVIDE SADDLE WITH BALL VALVE IN PLACE OF CORPORATION STOP.



SECTION VIEW

AIR & VACUUM VALVE INSTALLATION DETAIL

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

AIR RELEASE VALVE CHAMBER



SSM

RMS

08/12

W-16

WATER MAIN INSTALLATION

CONSULTING ENGINEERS

APP'D.

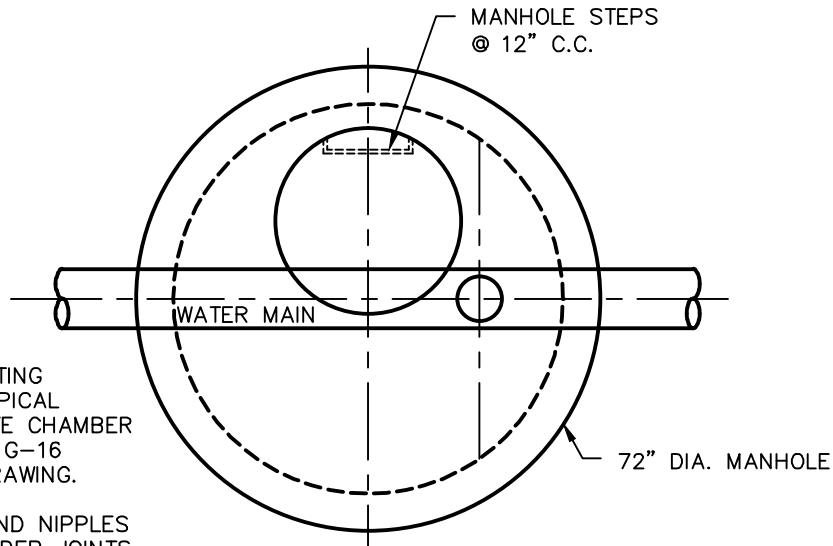
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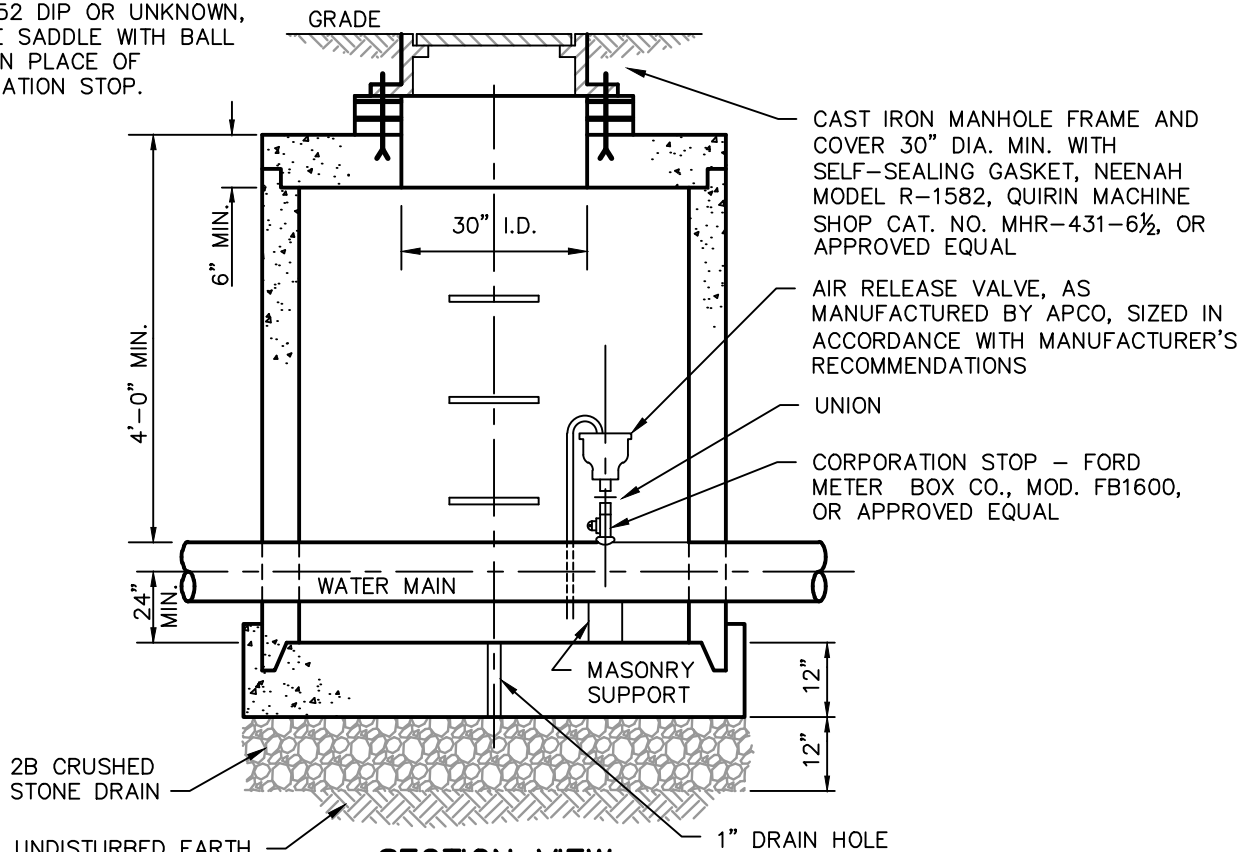
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NOTES:

1. ALL NON-CONFLICTING PROVISIONS OF TYPICAL PRECAST CONCRETE CHAMBER STANDARD DETAIL G-16 APPLY TO THIS DRAWING.
2. BRASS FITTINGS AND NIPPLES REQUIRED. NO SOLDER JOINTS ALLOWED.
3. IF WATER MAIN IS LESS THAN CLASS 52 DIP OR UNKNOWN, PROVIDE SADDLE WITH BALL VALVE IN PLACE OF CORPORATION STOP.



PLAN VIEW



SECTION VIEW

AIR RELEASE VALVE INSTALLATION DETAIL

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

COMBINATION AIR AND VACUUM/AIR RELEASE



RMS

08/12

W-17

VALVE CHAMBER WATER MAIN INSTALLATION

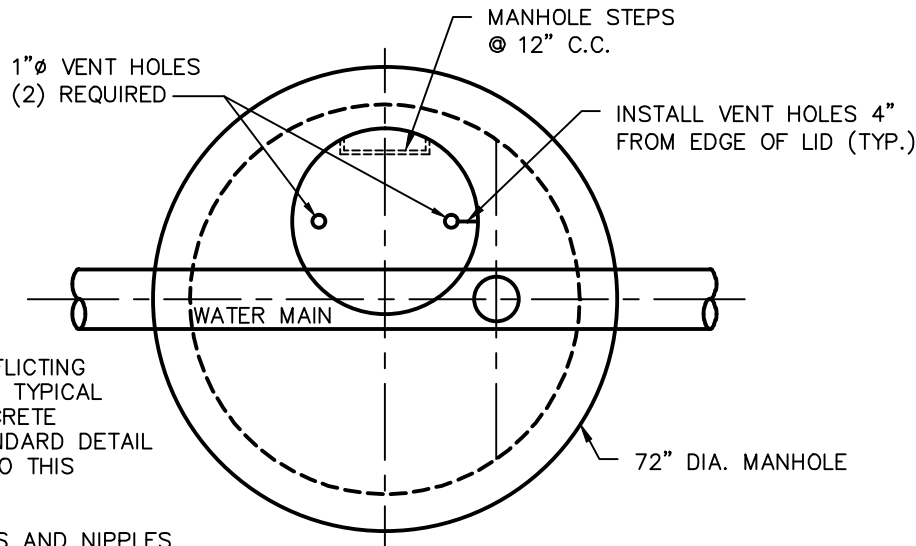
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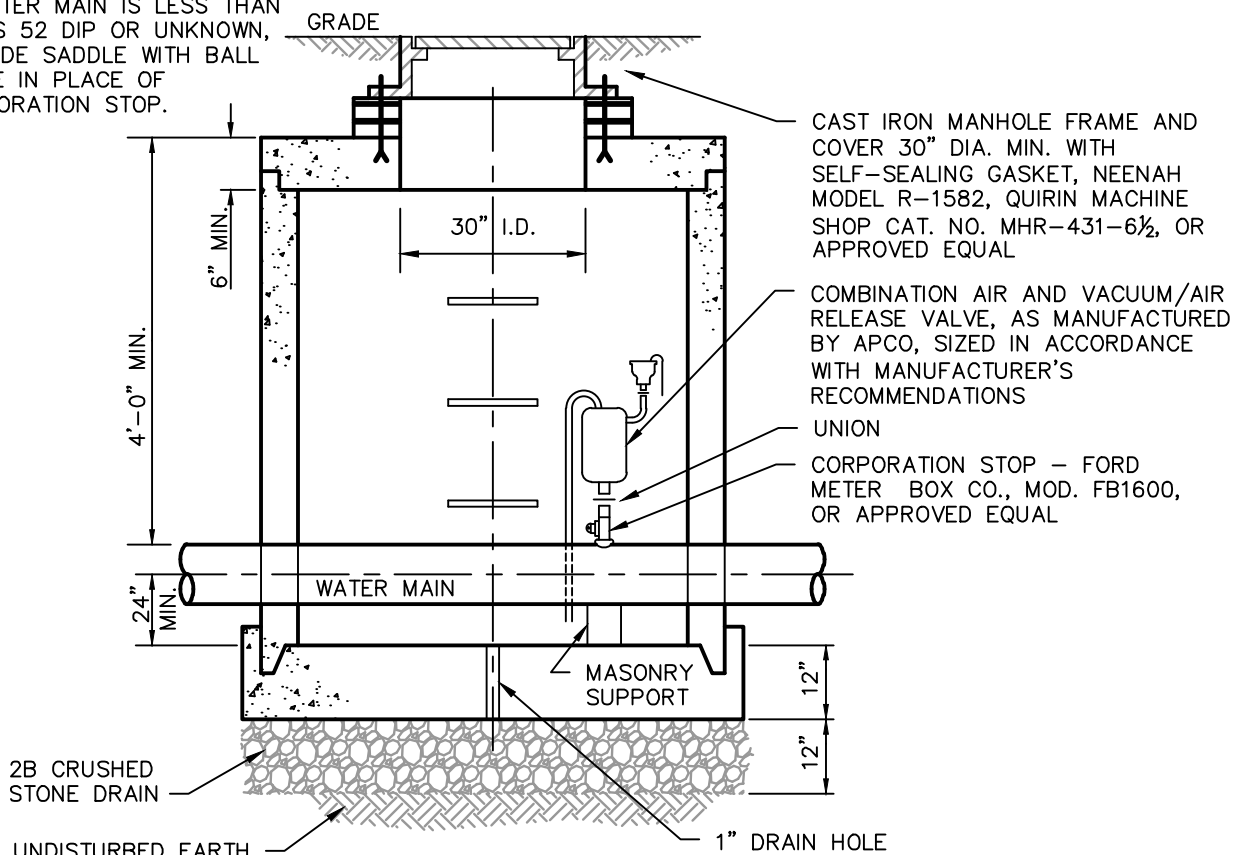
REV.



PLAN VIEW

NOTES:

1. ALL NON-CONFLICTING PROVISIONS OF TYPICAL PRECAST CONCRETE CHAMBER STANDARD DETAIL G-16 APPLY TO THIS DRAWING.
2. BRASS FITTINGS AND NIPPLES REQUIRED. NO SOLDER JOINTS ALLOWED.
3. IF WATER MAIN IS LESS THAN CLASS 52 DIP OR UNKNOWN, PROVIDE SADDLE WITH BALL VALVE IN PLACE OF CORPORATION STOP.



SECTION VIEW

COMBINATION AIR & VACUUM/AIR RELEASE VALVE INSTALLATION DETAIL

NOT TO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

FIRE FLOW METER CHAMBER



RMS

08/12

W-18

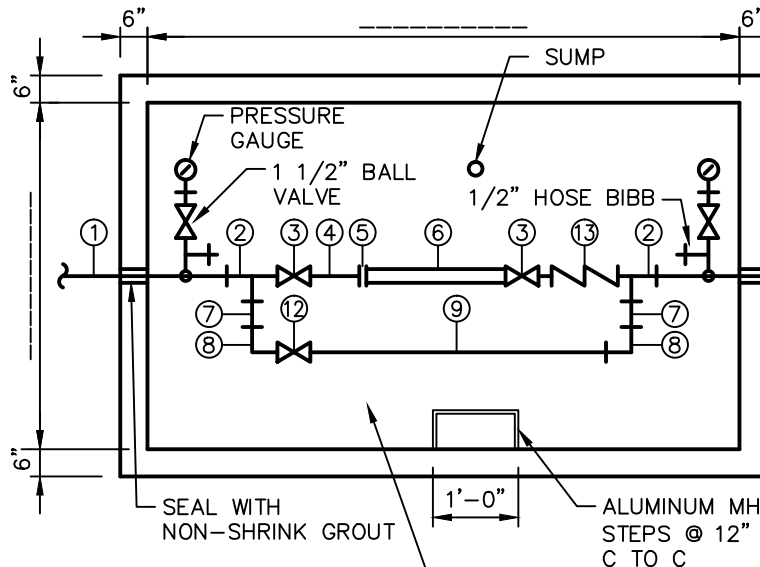
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



ALUMINUM HATCH ABOVE

NOTE:

___" PIPE STAND (4 REQ'D)

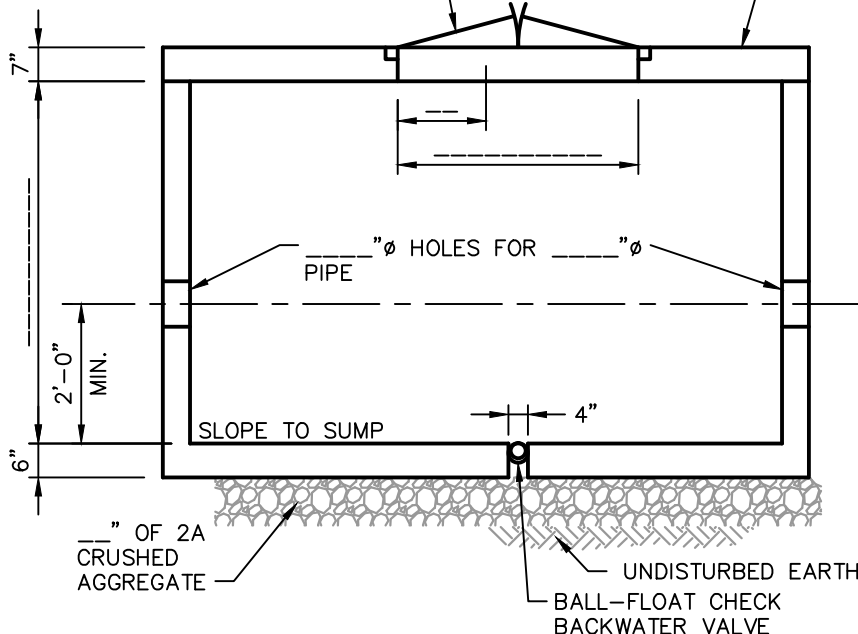
___" PIPE STAND (1 REQ'D)

SUMP PUMP w/ 1 1/2" PVC PIPING THRU ROOF

PLAN VIEW

___" x ___" DOUBLE LEAF
ALUMINUM HATCH w/ LOCKING DEVICE
RATED FOR H2O TRAFFIC LOADING

PRE-CAST
CONCRETE
VAULT FOR
AASHTO
LOADINGS



SECTION VIEW

FIRE FLOW METER CHAMBER

NO SCALE

NOTES:

1. PRECAST REINFORCED CONCRETE SHALL CONFORM TO THE REQUIREMENT OF A.S.T.M.-C478. BE DESIGNED FOR A.A.S.H.O. HS-20 (LOW TRAFFIC), HS-25 (HIGH TRAFFIC). CONCRETE STRENGTH: 4000 PSI MIN @ 28 DAYS.
2. WHERE LOCATED WITHIN A STATE HIGHWAY RIGHT-OF-WAY MANHOLE SHALL CONFORM WITH PENN D.O.T. PUBLICATION 408 SPECIFICATIONS, PUBLICATION 72M, STANDARDS FOR ROADWAY CONSTRUCTION RC-39M AND BE SUPPLIED BY A PENN D.O.T. APPROVED SUPPLIER (BULLETIN 15).
3. POLYPROPYLENE COATED STEPS BY M.A. INDUSTRIES OR APPROVED EQUAL.
4. RUBBER GASKET SEAL (A-LOCK, DUEL SEAL 1 OR GASKET PER ASTM C923 OR APPROVED EQUAL). CAST IN WALL.
5. SECTIONS SHALL BE LAP JOINT WITH A DOUBLE BEAD FLEXIBLE BUTYL RUBBER SEALANT OR APPROVED EQUAL, ON BOTH INSIDE AND OUTSIDE FLAT SURFACE OF LAP JOINT.
6. SIZES OF METER CHAMBER AND HATCHES MAY VARY DEPENDING ON THE SIZE OF THE SERVICE NEEDED. FILL IN BLANKS WITH APPROPRIATE SIZES ONCE SIZE OF WATER SERVICE IS DETERMINED.

METER PIT MATERIAL LIST

- ① ___" DIP x PE ___'-0"
- ② ___"x ___"x ___" TEE
- ③ ___" OS&Y GATE VALVE
- ④ ___" DIP x PE ___"
- ⑤ ___" COUPLING ADAPTER
- ⑥ ___" SENSUS C2 METER
- ⑦ ___" DIP x ___"
- ⑧ ___" 90° BEND
- ⑨ ___" DIP x ___"
- ⑩ ___" DIP
- ⑪ ___" WATER SERVICE TO BE CONFIRMED BY SPRINKLER DESIGN
- ⑫ ___" OS&Y GATE VALVE
- ⑬ ___" WATTS 709 DOUBLE CHECK BACKFLOW OR EQUAL VALVE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

FIRE FLOW BACKFLOW PREVENTER CHAMBER



SSM

RMS

08/12

W-19

CONSULTING ENGINEERS

APP'D.

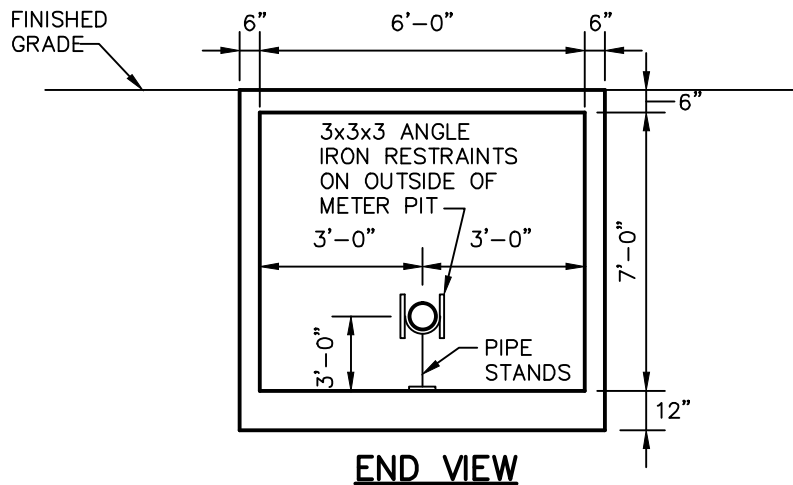
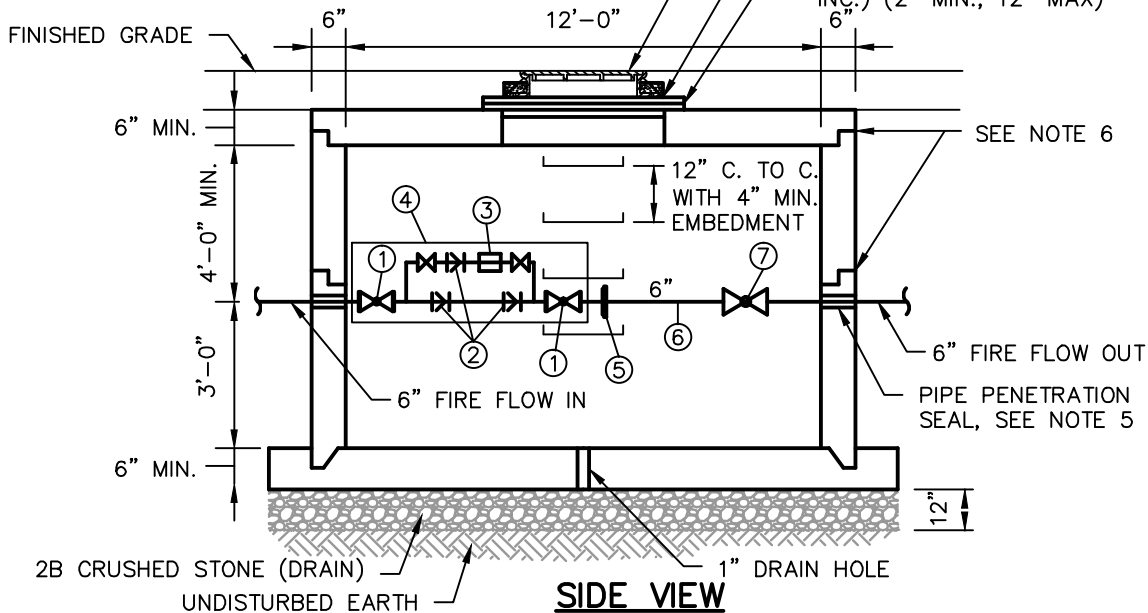
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DRAWING NUMBER

REV.

MANHOLE FRAME AND COVER - 30" DIA. MIN., INCLUDING SELF-SEALING GASKET, NEENAH FOUNDRY CO., CAT. NO. R-1582, QUIRIN MACHINE SHOP, CAT. NO. MHR-531-6½ OR APPROVED EQUAL

DOUBLE MASTIC UNDER CASTING CONCRETE GRADE RINGS AND RUBBER RISER RINGS (INFRA-RISER AS MANUFACTURED BY GNR TECHNOLOGIES, INC.) (2" MIN., 12" MAX)



METER PIT MATERIAL LIST

- ① 6" GATE VALVE (OS&Y)
- ② U.L. APPROVED DETECTOR CHECK VALVE
- ③ BY-PASS FLOW METER
- ④ 6" WATTS 709 DCDA (w/BYPASS METER)
- ⑤ 6" SMITH BLAIR #912 ADAPTOR
- ⑥ 6"x 3'-0" DUCTILE FLANGE, PIECE
- ⑦ 6" RESILIENT SEAT GATE VALVE

NOTES:

1. PRECAST REINFORCED CONCRETE CHAMBER SHALL CONFORM TO THE REQUIREMENT OF A.S.T.M.-C478. BE DESIGNED FOR A.A.S.H.O. HS-20 (LOW TRAFFIC), HS-25 (HIGH TRAFFIC). CONCRETE STRENGTH: 4000 PSI MIN @ 28 DAYS.
2. WHERE LOCATED WITHIN A STATE HIGHWAY RIGHT-OF-WAY CHAMBER SHALL CONFORM WITH PENN D.O.T. PUBLICATION 408 SPECIFICATIONS, PUBLICATION 72M, STANDARDS FOR ROADWAY CONSTRUCTION RC-39M AND BE SUPPLIED BY A PENN D.O.T. APPROVED SUPPLIER (BULLETIN 15).
3. CHAMBER MANUFACTURER SHALL PROVIDE AN EXTERIOR BITUMINOUS COATING (FACTORY APPLIED). FIELD "TOUCH UP" AREAS DIRECTED BY OWNER.
4. POLYPROPYLENE COATED CHAMBER STEPS BY M.A. INDUSTRIES OR APPROVED EQUAL.
5. RUBBER GASKET SEAL (A-LOCK, DUEL SEAL 1 OR GASKET PER ASTM C923 OR APPROVED EQUAL). CAST IN CHAMBER WALL.
6. CHAMBER SECTIONS SHALL BE LAP JOINT WITH A DOUBLE BEAD FLEXIBLE BUTYL RUBBER SEALANT OR APPROVED EQUAL, ON BOTH INSIDE AND OUTSIDE FLAT SURFACE OF LAP JOINT.
7. CHAMBER FRAME SHALL BE SET SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED STREET SURFACES.

FIRE FLOW BACKFLOW PREVENTOR CHAMBER

NO SCALE

GENERAL STANDARD DETAILS

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

CRUSHED STONE BEDDING



RMS

08/12

G-01

FOR RIGID PIPE

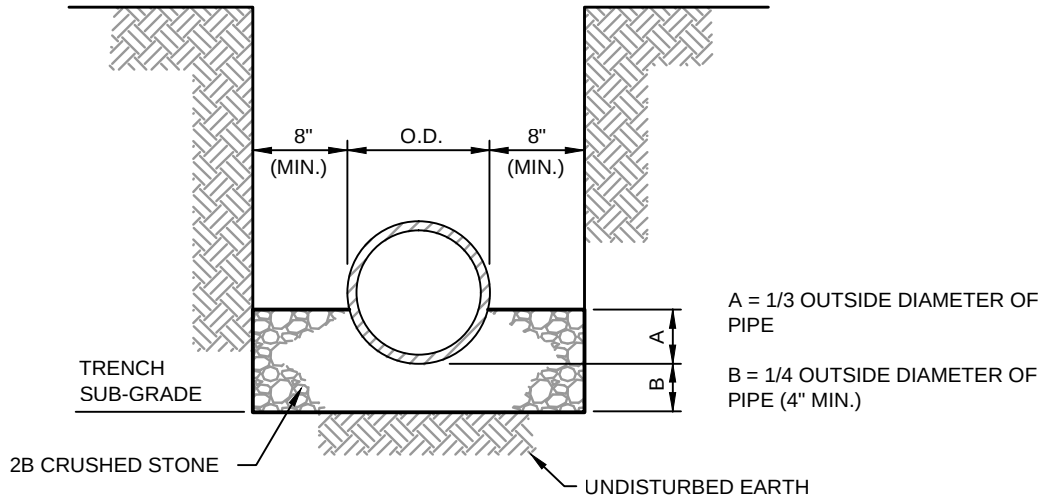
CONSULTING ENGINEERS

APP'D.

DATE

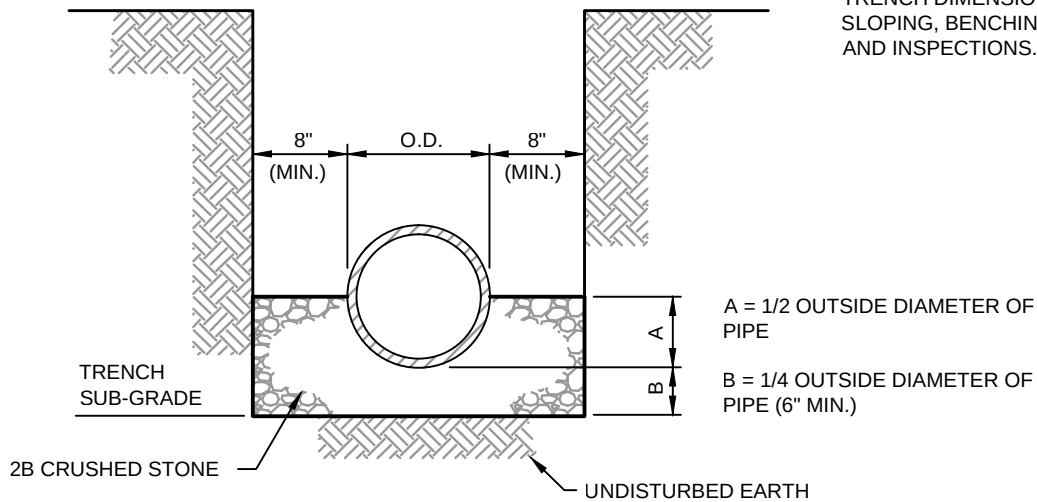
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REV.



WATER MAINS AND FORCE MAINS

NOTE:
CONTRACTOR TO COMPLY WITH CURRENT OSHA STANDARD 29 CFR 1926 FOR TRENCH DIMENSIONS, SLOPING, BENCHING, SHORING AND INSPECTIONS.



GRAVITY SANITARY SEWERS AND STORM SEWERS

CRUSHED STONE BEDDING FOR D.I.P. AND OTHER RIGID PIPE

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

CRUSHED STONE BEDDING



RMS

08/12

G-02

FOR FLEXIBLE PIPE

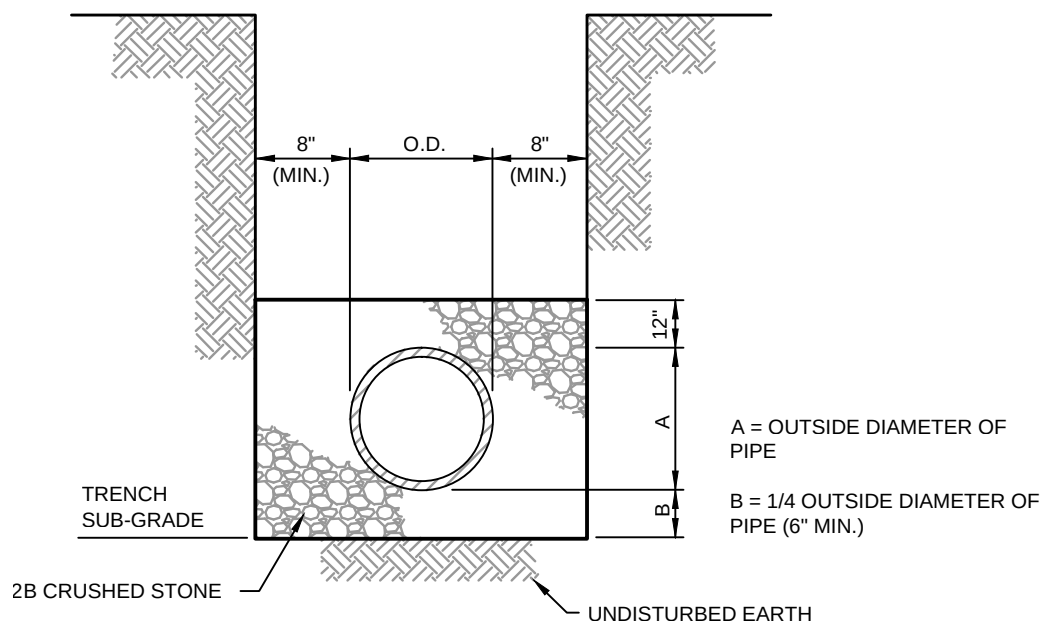
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTE:

CONTRACTOR TO COMPLY WITH CURRENT OSHA STANDARD 29 CFR 1926 FOR TRENCH DIMENSIONS, SLOPING, BENCHING, SHORING AND INSPECTIONS.

CRUSHED STONE BEDDING FOR PVC AND OTHER FLEXIBLE PIPE

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

CONCRETE ENCASEMENT FOR PIPE



RMS

08/12

G-03

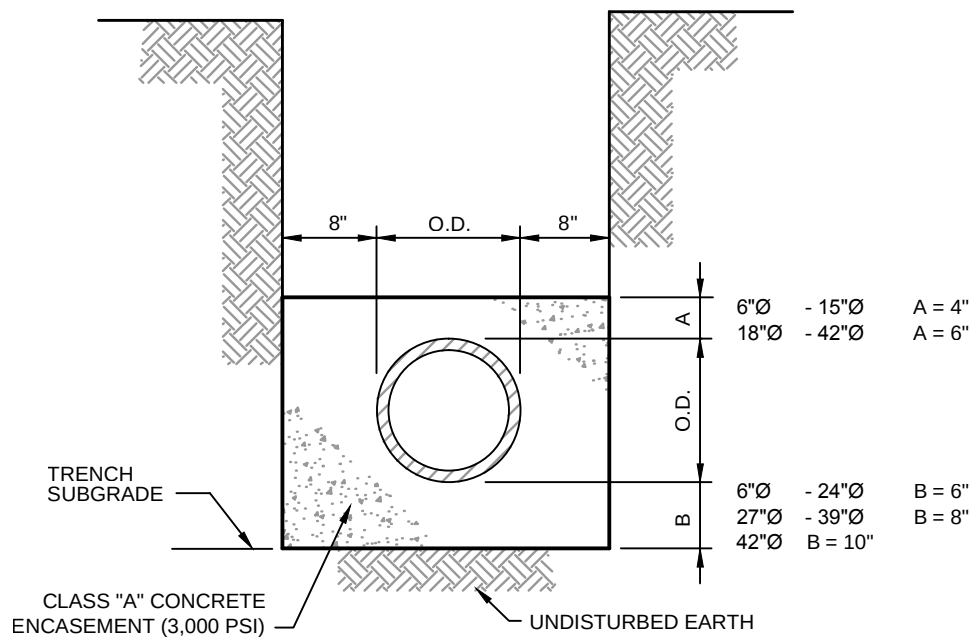
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTE:
CONTRACTOR TO COMPLY WITH CURRENT OSHA
STANDARD 29 CFR 1926 FOR TRENCH DIMENSIONS,
SLOPING, BENCHING, SHORING AND INSPECTIONS.

TYPICAL CONCRETE ENCASEMENT DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

THRUST BLOCKING FOR HORIZONTAL & VERTICAL



RMS

08/12

G-04

DOWNWARD THRUSTS

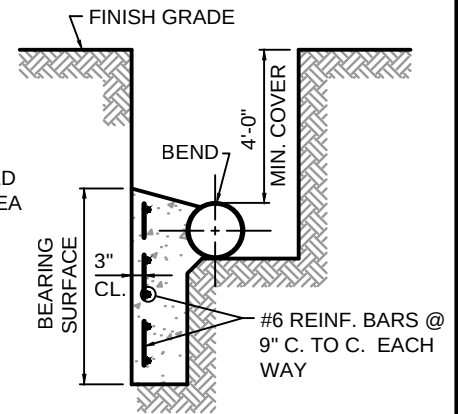
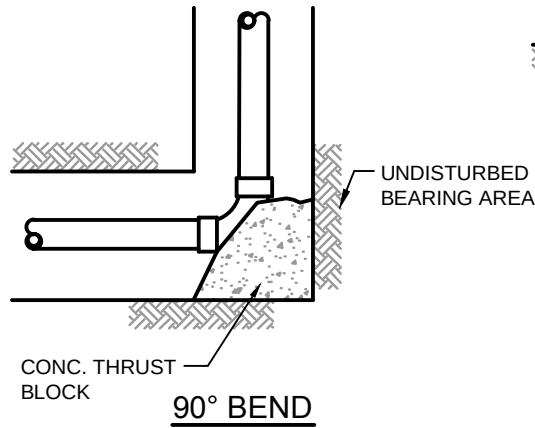
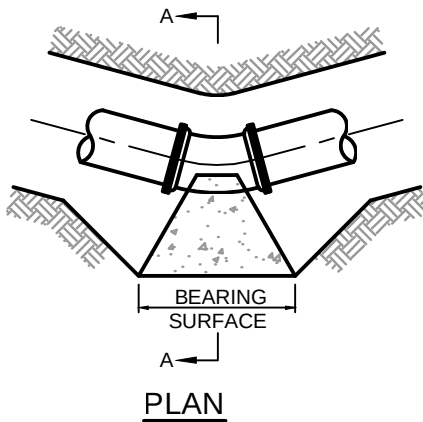
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



ADDITIONAL BEARING AS REQUIRED

NOTES:

1. ALL CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3300 PSI.
2. ALL REINFORCING STEEL SHALL BE DEFORMED BARS.
3. NO COUPLING OR JOINTS SHALL BE COVERED WITH CONCRETE.
4. REINFORCING BAR STRAPS TO BE SHAPED TO PIPE CURVATURE.
5. ALL EXPOSED STEEL TO BE COATED WITH CARBOLINE BITUMASTIC 50 APPLIED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS WITH A MINIMUM DRY FILM THICKNESS OF 30 MILS.
6. THRUST BLOCKING FOR TEES SHALL HAVE THE SAME BEARING AREA AS 90° BENDS OF THE PIPE SIZE OF THE OUTLET. DEAD ENDS SHALL HAVE THE SAME BEARING AREA AS 90° BENDS.

BEARING AREA REQUIRED, SQUARE FEET

TYPE OF BEARING MATERIAL AND ALLOWABLE LOADS, PSF	4" AND LESS DEGREE BEND				6" AND 8" DEGREE BEND				10" AND 12" DEGREE BEND			
	11¼°	22½°	45°	90°	11¼°	22½°	45°	90°	11¼°	22½°	45°	90°
LOOSE SAND OR MEDIUM CLAY - 2,000	1.0	2.0	2.7	4.0	1.5	3.0	6.0	10.0	3.0	6.2	12.0	22.0
PACKED GRAVEL AND SAND - 4,000	1.0	1.0	1.5	2.0	1.0	1.5	3.0	5.0	1.5	3.1	6.0	11.0
ROCK - 10,000	1.0	1.0	1.0	1.0	1.0	1.0	1.2	2.0	1.0	1.3	2.4	4.4

BEARING AREA REQUIRED, SQUARE FEET

TYPE OF BEARING MATERIAL AND ALLOWABLE LOADS	14" AND 16" DEGREE BEND OR DEFLECTION				18" AND 20" DEGREE BEND OR DEFLECTION			
	11¼°	22½°	45°	90°	11¼°	22½°	45°	90°
LOOSE SAND OR MEDIUM CLAY - 2,000	6.0	12.0	22.5	40.0	9.5	19.0	37.0	67.0
PACKED GRAVEL AND SAND - 4,000	3.0	6.0	11.3	20.0	4.8	9.5	18.5	33.5
ROCK - 10,000	1.2	2.4	4.5	8.0	2.0	3.8	7.4	13.5

THRUST BLOCKING FOR HORIZONTAL AND VERTICAL DOWNWARD THRUSTS UP TO 150 PSI WORKING PRESSURE

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

THRUST BLOCKING



RMS

08/12

G-05

FOR VERTICAL UPWARD THRUSTS

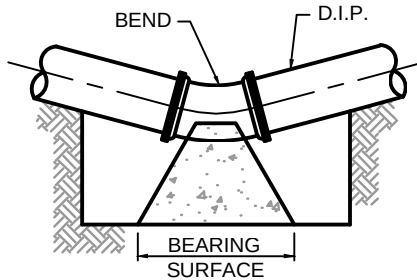
CONSULTING ENGINEERS

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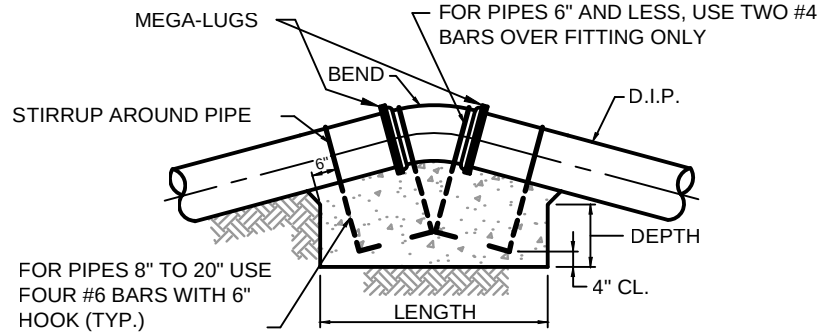
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REV.



**TYPICAL SECTION
VERTICAL THRUST DOWNWARD**



**VERTICAL THRUST UPWARD
UP TO 150 PSI WORKING PRESSURE**

NOTES:

1. ALL CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3300 PSI.
2. ALL REINFORCING STEEL SHALL BE DEFORMED BARS.
3. NO COUPLING OR JOINTS SHALL BE COVERED WITH CONCRETE.
4. REINFORCING BAR STRAPS TO BE SHAPED TO PIPE CURVATURE.
5. ALL EXPOSED STEEL TO BE COATED WITH CARBOLINE BITUMASTIC 50 APPLIED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS WITH A MINIMUM DRY FILM THICKNESS OF 30 MILS.

PIPE SIZES	DIMENSIONS OF CONCRETE BLOCKING								
	LENGTH			WIDTH			DEPTH		
	11¼°	22½°	45°	11¼°	22½°	45°	11¼°	22½°	45°
4" AND SMALLER	2.0'	4.0'	4.0'	1.5'	3.0'	3.0'	1.0'	2.0'	3.0'
6" AND 8"	3.0'	4.0'	6.0'	3.0'	3.0'	3.0'	2.0'	3.0'	4.0'
10" AND 12"	4.5'	6.0'	8.0'	3.0'	3.0'	4.0'	3.0'	4.5'	5.0'
14" AND 16"	6.0'	8.0'	11.0'	3.5'	3.5'	5.0'	3.5'	5.0'	5.0'
18" AND 20"	7.0'	9.0'	13.0'	4.0'	5.0'	5.5'	4.0'	5.0'	6.0'

SCHEDULE OF DIMENSIONS FOR CONCRETE BLOCKING OF VERTICAL BENDS WITH AN UPWARD THRUST BASED ON A WORKING PRESSURE OF 150 P.S.I.

THRUST BLOCKING FOR VERTICAL UPWARD THRUSTS TO 150 PSI WORKING PRESSURE

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

GRASSED AREA BACKFILLING AND RESTORATION



RMS

08/12

G-06

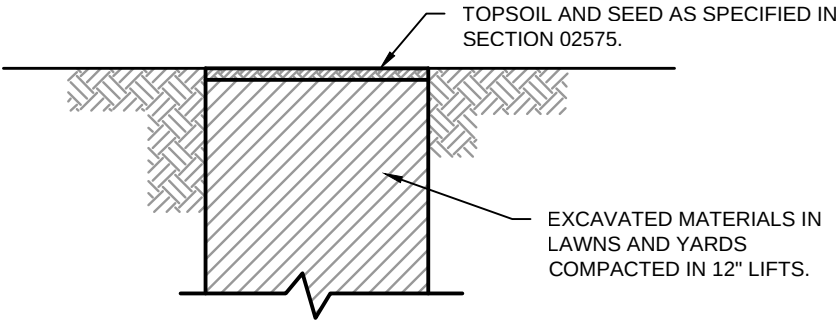
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



GRASSED AREA BACKFILLING
AND RESTORATION DETAIL
NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

MUNICIPAL STREET TEMPORARY RESTORATION



SSM

RMS

08/12

G-07

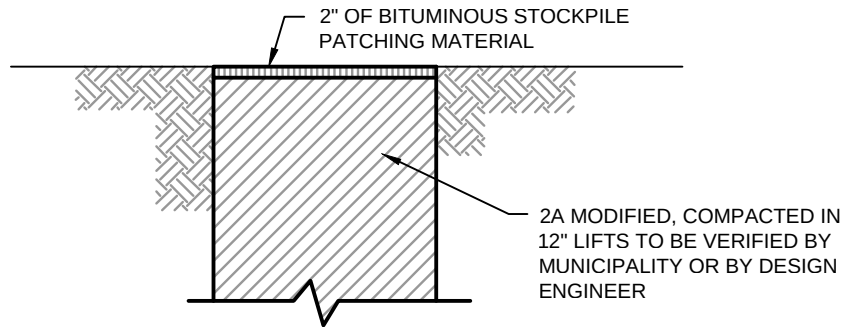
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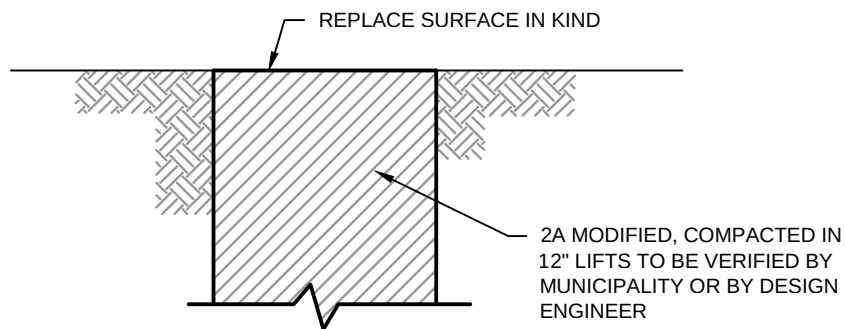
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REV.



PAVED STREET TEMPORARY RESTORATION

NO SCALE



UNPAVED STREET OR SHOULDER TEMPORARY AND PERMANENT RESTORATION

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

MUNICIPAL STREET PERMANENT RESTORATION



RMS

08/12

G-08

BITUMINOUS AND CONCRETE PAVING

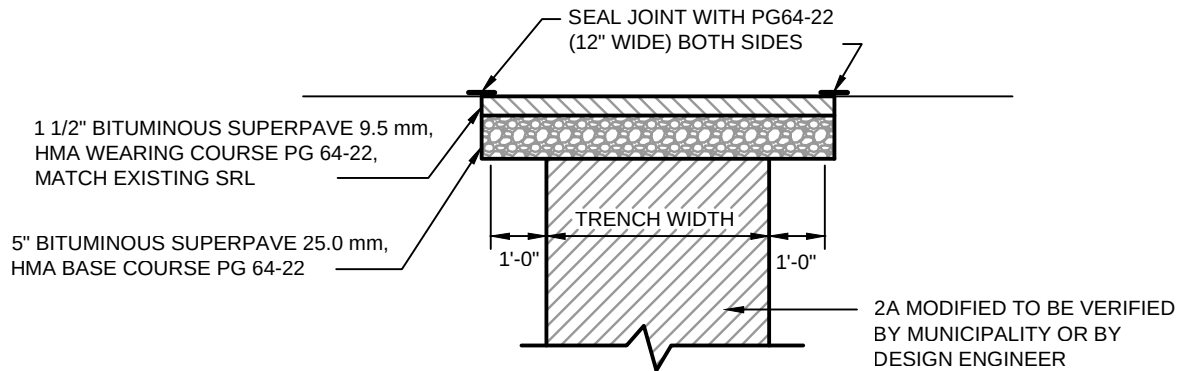
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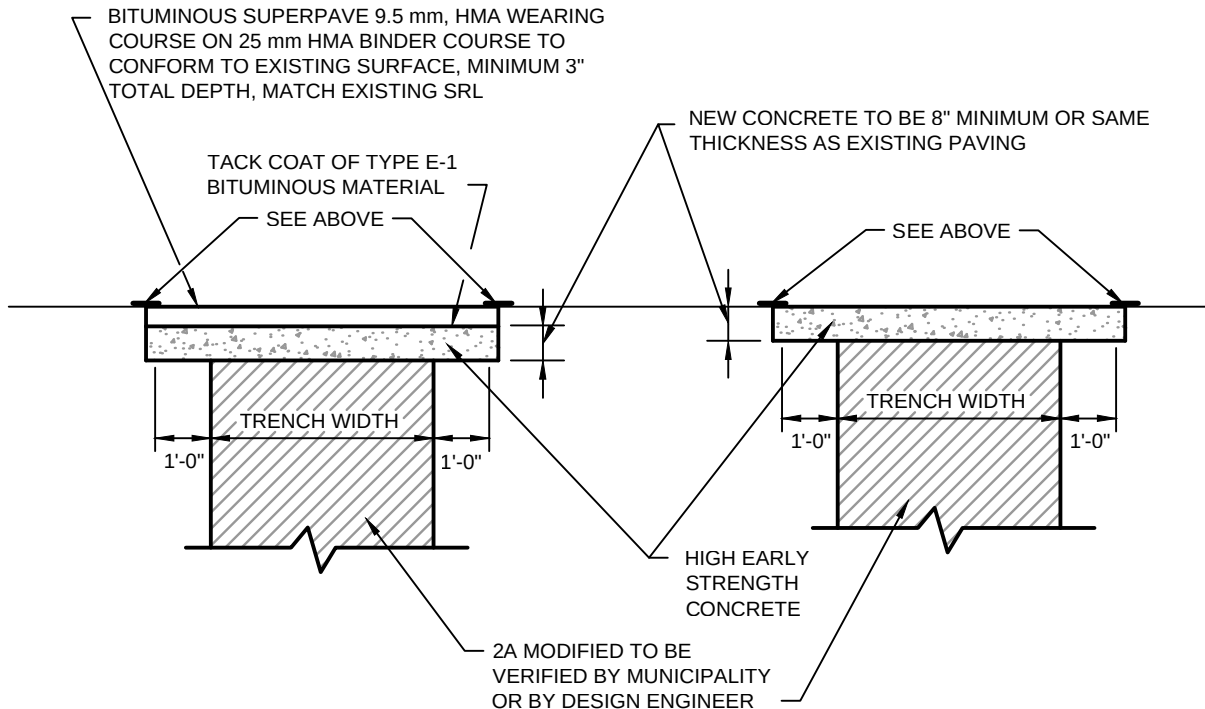
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REV.



BITUMINOUS PAVING - PERMANENT RESTORATION

NO SCALE



CONCRETE BASE WITH BITUMINOUS WEARING SURFACE

FULL DEPTH CONCRETE PAVEMENT RESTORATION

CONCRETE PAVING - PERMANENT RESTORATION

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

PA-DOT ROADS



RMS

08/12

G-09

FLEXIBLE PAVEMENT RESTORATION

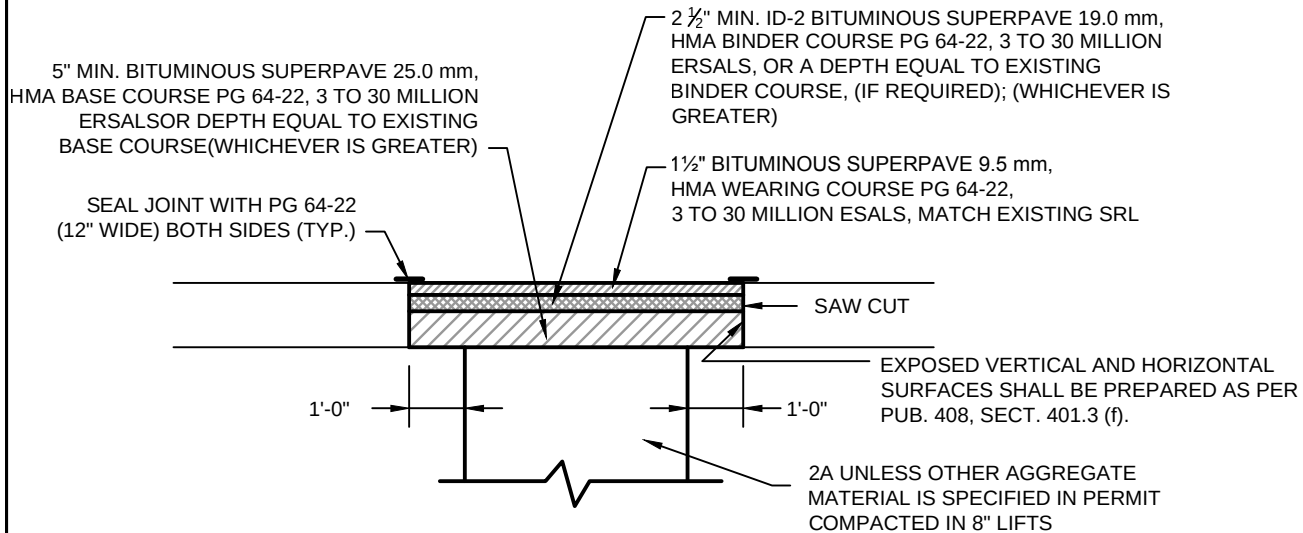
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DATE

DRAWING NUMBER

REV.



PA-DOT ROADS - FLEXIBLE PAVEMENT RESTORATION

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

PA-DOT ROADS



RMS

08/12

G-10

RIGID PAVEMENT RESTORATION

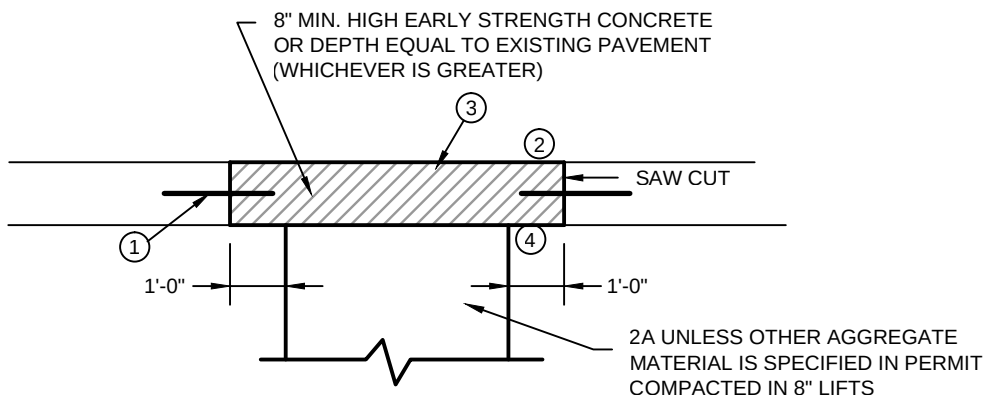
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DATE

DRAWING NUMBER

REV.



- ① ON REINFORCED CONCRETE PAVEMENT, PLACE REINFORCING STEEL, TIE BOLTS, AND LOAD TRANSFER DEVICES AS PER R.C. 26.
- ② SURFACE TEXTURE AS PER PUBLICATION 408, SECTION 501.3(K).
- ③ FOR LIMITS OF CONCRETE REPLACEMENT SEE DEPT. REG. 459, SECTION 459.8(1)(4).
- ④ CUT BACK IS NOT REQUIRED BEYOND A TRANSVERSE OR LONGITUDINAL JOINT OR CURB.

PA-DOT ROADS - RIGID PAVEMENT RESTORATION

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

PA-DOT ROADS TEMPORARY AND



SSM

RMS

08/12

G-11

PERMANENT SHOULDER RESTORATION

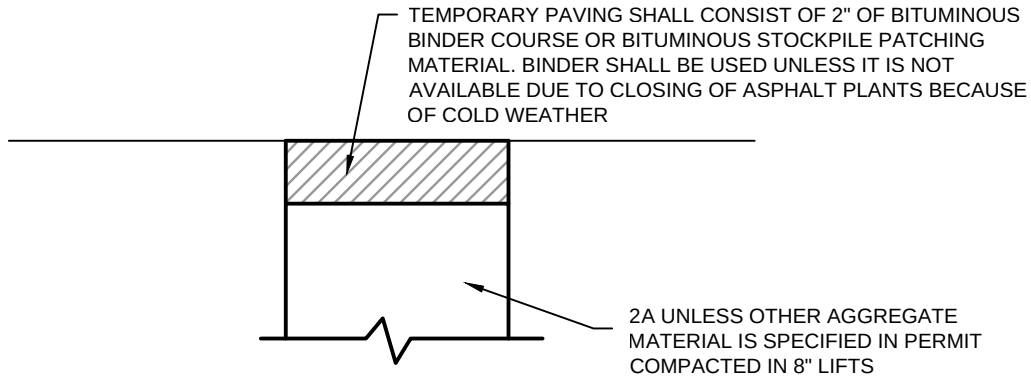
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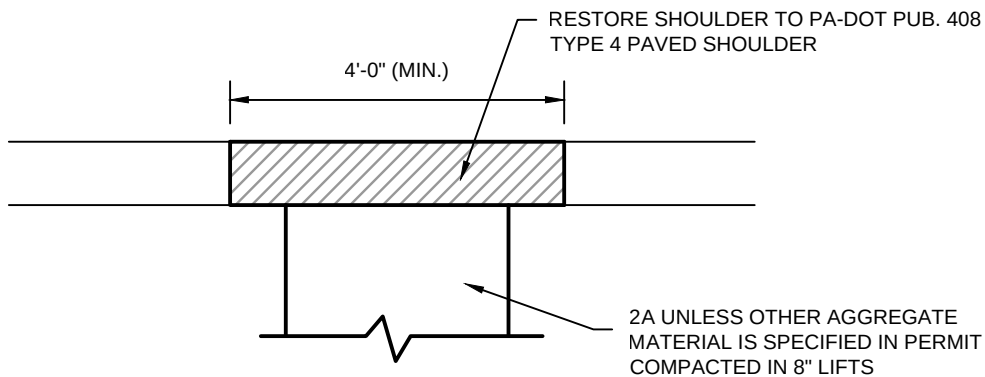
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REV.



PA-DOT ROADS - TEMPORARY RESTORATION

NO SCALE



PA-DOT ROADS - PERMANENT RESTORATION

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

CONCRETE CURB REPLACEMENT



RMS

08/12

G-12

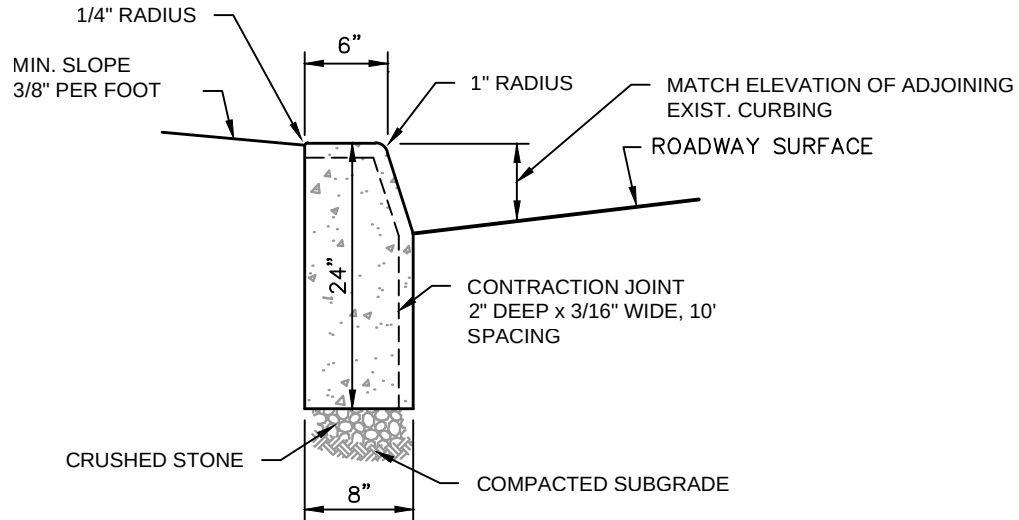
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. ALL CURB SHALL BE CONSTRUCTED ON A 4" MINIMUM DEPTH $\frac{3}{4}$ " CLEAN CRUSHED STONE BASE (AASHTO NO. 57 OR PennDOT NO. 2B)
2. ALL CEMENT CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 PSI.
3. ALL EXPANSION JOINTS SHALL BE A $\frac{1}{2}$ " THICK PREMOLDED, NON-EXTRUDING, RESILIENT BITUMINOUS JOINT FILLER PLACES AT 10' SPACING.
4. EXPANSION JOINTS SHALL BE PLACED BETWEEN THE CURB AND SIDEWALK IF THEY ABUT EACH OTHER.

CURB REPLACEMENT DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

CONCRETE SIDEWALK REPLACEMENT



RMS

08/12

G-13

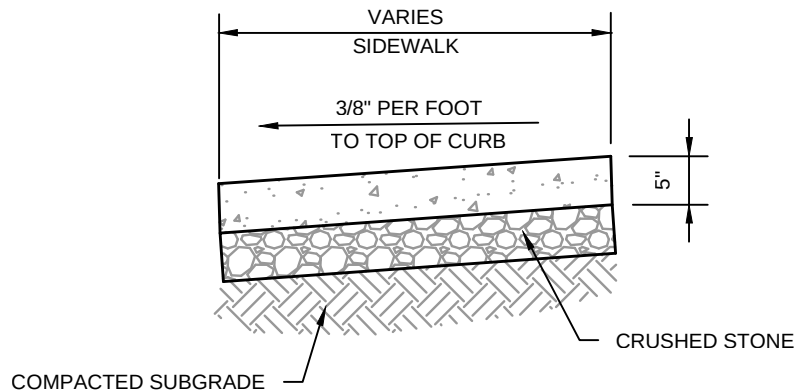
CONSULTING ENGINEERS

APP'D.

DATE

DRAWING NUMBER

REV.



NOTES:

1. ALL CURB SHALL BE CONSTRUCTED ON A 4" MINIMUM DEPTH $\frac{3}{4}$ " CLEAN CRUSHED STONE BASE (AASHTO NO. 57 OR PennDOT NO. 2B)
2. ALL CEMENT CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 PSI.
3. ALL EXPANSION JOINTS SHALL BE A $\frac{1}{2}$ " THICK PREMOLDED, NON-EXTRUDING, RESILIENT BITUMINOUS JOINT FILLER.
4. SCORED CONTRACTION JOINTS OR EXPANSION JOINTS SHALL BE PROVIDED AT 5' INTERVALS IN SIDEWALK. EXPANSION JOINTS SHALL BE PLACED BETWEEN THE CURB AND SIDEWALK IF THEY ABUT EACH OTHER.

SIDEWALK REPLACEMENT DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

REINFORCED CONCRETE SLOPE ANCHORS



RMS

08/12

G-14

FOR UTILITY LINES

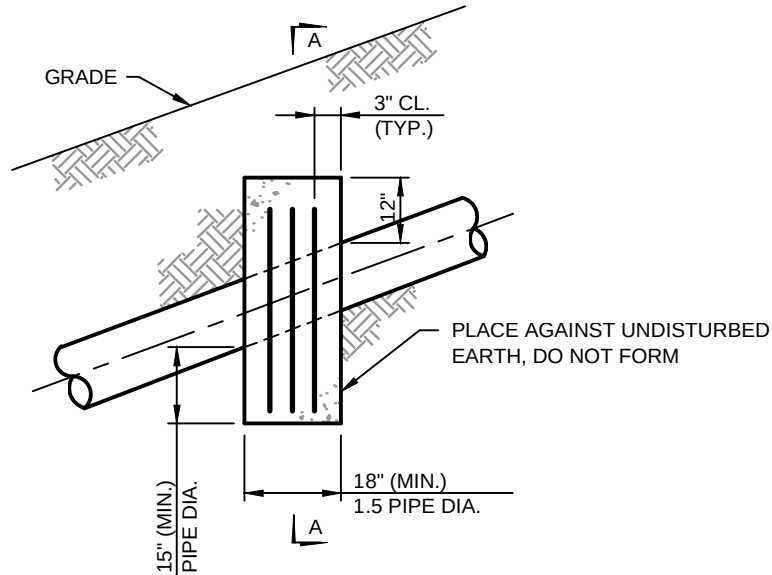
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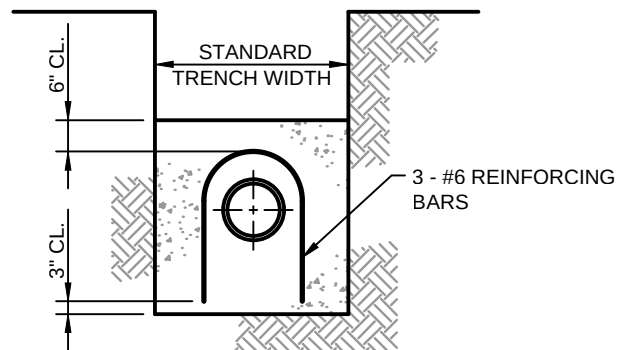
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ELEVATION



SECTION A-A

MAXIMUM SPACING	
36' C/C	20% TO 35% SLOPES
24' C/C	35% TO 50% SLOPES
16' C/C	50% OR GREATER SLOPES

REINFORCED CONCRETE SLOPE ANCHORS

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

REINFORCED CONCRETE STRAP ANCHORS



RMS

08/12

G-15

FOR UTILITY LINES

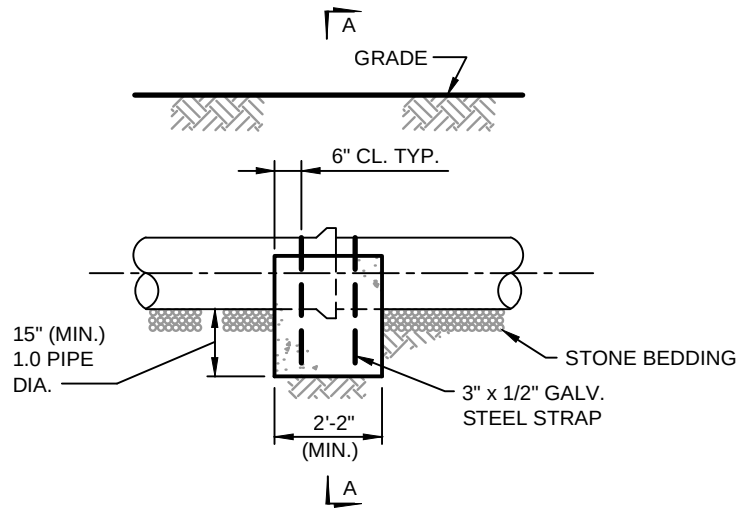
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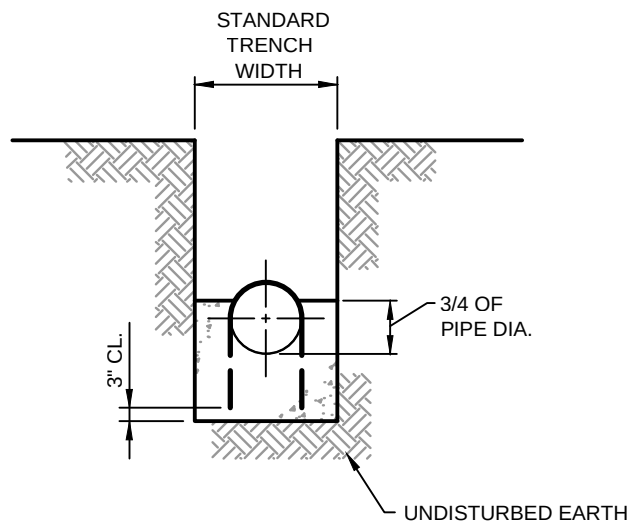
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ELEVATION



SECTION A-A

NOTE:

1. ANCHOR SPACING SHALL BE AT EACH JOINT
ALONG PIPE WHERE COVER IS LESS THAN
THREE FEET (3').

STRAP ANCHOR DETAIL

NO SCALE

STANDARD DETAIL

MUHLENBERG TOWNSHIP AUTHORITY

CARRIER PIPE AND CASING CONDUIT



RMS

08/12

G-16

INSTALLATION DETAILS

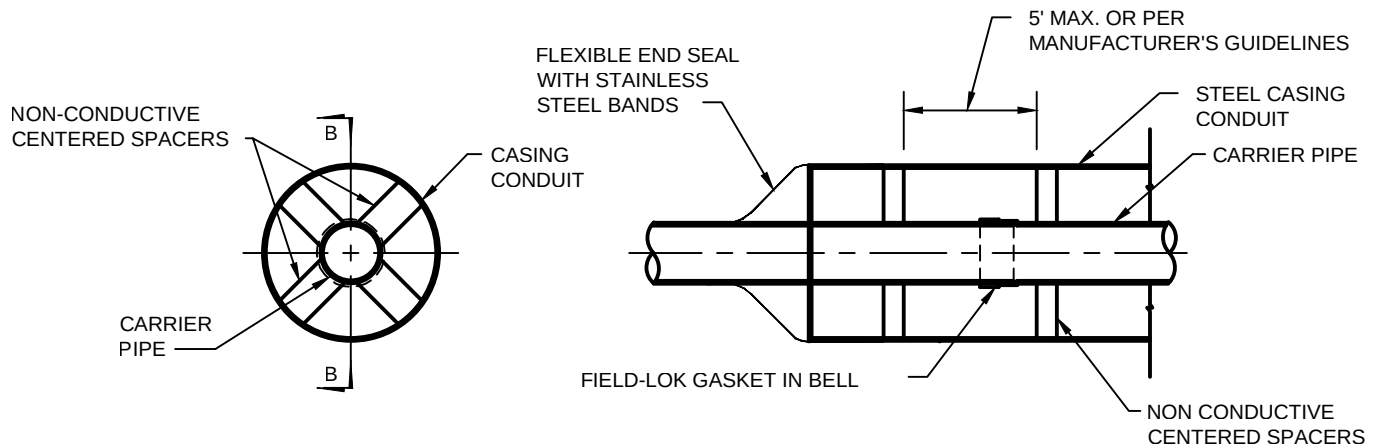
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DATE

DRAWING NUMBER

REV.



END SECTION

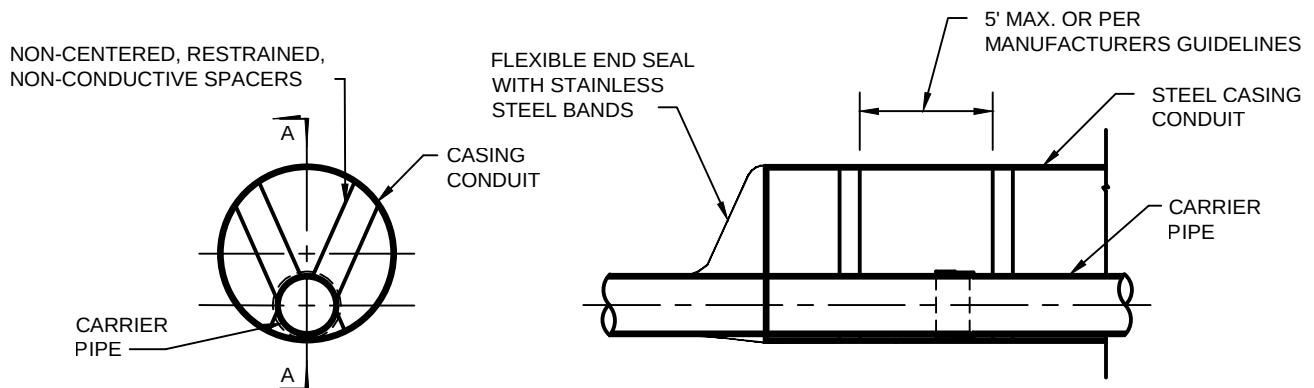
SECTION B-B

NOTES:

1. FOR CASING CONDUIT REQUIREMENTS, SEE SPECIFICATIONS.
2. CONTRACTOR MAY USE SAND FILL AND BRICK AND GROUT END SEAL IF APPROVED.

CARRIER PIPE AND CASING CONDUIT INSTALLATION DETAIL - WATER OR FORCE MAIN

NO SCALE



END SECTION

SECTION A-A

NOTES:

1. FOR CASING CONDUIT REQUIREMENTS, SEE SPECIFICATIONS.
2. CONTRACTOR MAY USE SAND FILL AND BRICK AND GROUT END SEAL IF APPROVED.

CARRIER PIPE AND CASING CONDUIT INSTALLATION DETAIL - GRAVITY SEWER

NO SCALE