
BOOK NO.

ISSUED TO

**BYRON / GAINES UTILITY AUTHORITY
STANDARD CONSTRUCTION REQUIREMENTS**

FOR

**THE BYRON TOWNSHIP AND GAINES CHARTER TOWNSHIP
WATER SUPPLY AND SANITARY SEWER SYSTEM**

JUNE 2009

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June 23, 2009

TO ALL DEVELOPERS, CONSULTING ENGINEERS AND CONTRACTORS:

The Byron / Gaines Utility Authority Standard Construction Requirements, 2009 Edition, were adopted by the Byron / Gaines Utility Authority on June 23, 2009. The purpose of adopting these Standard Construction Requirements is to ensure the use of uniform, adequate and acceptable construction methods and materials. The Byron / Gaines Utility Authority strives at all times to stay up to date regarding construction engineering developments.

These Standard Construction Requirements are to apply to work and materials bid or contracted on or after June 23, 2009.

The cost of this document is thirty (\$30.00) dollars.

Byron Township and Gaines Charter Township also each have an ordinance to administer, regulate, and provide for the connection to and use of the public water and sewer systems. These ordinances provide additional requirements and regulations related to the water and sewer systems. Owners, consulting engineers, contractors, and plumbers are encouraged to review the document ordinances for requirements pertaining to private water services, fire lines, and sanitary sewers.

Dan Van Dyke, Director
Byron / Gaines Utility Authority

EXPLANATION OF THIS DOCUMENT:

The purpose of this document is to provide Developers, Consulting Engineers and Contractors working in the Townships of Byron and Gaines, the general requirements and standard construction requirements required by the Townships for watermain, and sanitary sewer, which, after acceptance by the Township, will become public facilities.

THESE STANDARD CONSTRUCTION REQUIREMENTS SHALL BE INCORPORATED AS PART OF THE CONTRACT DOCUMENTS BY REFERENCE, FOR THE ACQUISITION AND CONSTRUCTION OF THE WATERMAIN AND/OR SANITARY SEWER PROJECTS.

DEFINITIONS

Agreement - The written contract between the Owner and Contractor covering the work to be performed.

Authority – The Byron / Gaines Utility Authority, Kent County, Michigan.

Contractor - The person, partnership, corporation or other legal entity with whom the Owner has entered into an agreement to construct the Work.

Contract Documents - The Agreement, plus any or all of the following additional documents, if they exist: addenda (which pertain to the Contract Documents), contractor's bid (including documentation accompanying the bid and any post bid documentation submitted prior to the notice of award) when attached as an exhibit to the Agreement, the notice to proceed, bonds and insurance certificates, general conditions, supplementary conditions, the specifications and the drawings as the same are more specifically identified in the Agreement, together with all written amendments, change orders, work change directives, field orders, and Owner's Engineer's written interpretations and clarifications. THESE STANDARD CONSTRUCTION REQUIREMENTS SHALL BE INCORPORATED AS PART OF THE CONTRACT DOCUMENTS BY REFERENCE.

Development Contract - A written contract between the Owner and the Township covering various items regarding the Project.

Owner - The person, partnership, corporation or other entity for whom the Work is being constructed and with whom the Contractor has entered into an Agreement.

Owner's Engineer - The Consulting Engineer employed by the Owner for the Project.

Plans - The drawings which show the scope, extent and character of the Work to be furnished and performed by Contractor and which have been approved by the Township and are referred to in the Contract Documents.

Project - The watermain, sanitary sewer, storm sewer or sidewalk construction project which will become a public facility.

Specifications - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

Township – The respective Township (Byron or Gaines) in which work is to be performed, Kent County, Michigan.

Township's Engineer - The respective person, consultant, firm or corporation used by either Byron Township or Gaines Charter Township for engineering purposes.

Work - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. 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 Contract Documents.

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SECTION 1

GENERAL REQUIREMENTS

1.01 AGREEMENT

The Agreement shall incorporate by reference all of these Standard Construction Requirements and shall provide that the Township is a third party beneficiary of the Agreement and that all provisions of the Agreement in favor of the Owner and/or Township may be enforced by the Township. The Agreement shall be submitted to the Township for approval prior to its execution.

The Township shall require a Development Contract between the Developer and the Township. (See Appendix "C")

1.02 STANDARDS/ORDINANCES

All work shall conform to these Standard Construction Requirements and all applicable Township ordinances and rules and regulations.

To the extent applicable, the Township ordinance to administer, regulate, and provide for the connection to and use of the public water and sewer systems, and all rules and regulations adopted there under, are considered part of these Standard Construction Requirements.

The Owner, the Owner's Engineer, and the Contractor shall keep themselves fully informed of and shall at all times comply with all local, state and federal laws, rules and regulations applicable to the Project.

THE PROCEDURE FOR GRANTING OF EXCEPTIONS TO THESE STANDARD CONSTRUCTION REQUIREMENTS IS:

- A. A written request for an exception shall be prepared and filed by the Owner with the Township. This written request for exception shall be prepared by the Owner's Engineer and shall be signed by both the Owner and the Owner's Engineer.
- B. The Township will consider the exception request and consult with the Township Engineer as necessary. The Township will then give a written notice to the Owner stating the Township's decision on the exception request. The Township decision shall be final and binding on the Owner.

1.03 PLAN REVIEW PROCESS

For watermain and sanitary sewer.

- A. The Owner's Engineer shall supply to the Township the Owners name and address. Copies of all correspondence shall be sent to the Owner.

- B. Owner's Engineer shall submit a preliminary site plan for the Project to the Township's Water and Sewer Department concurrent with submittal to the Township Planning Commission for review of any preliminary plat, preliminary planned unit development plan, rezoning request, preliminary site condominium approval request, site plan or any other planning approval document pertaining to the Project. No water or sanitary sewer Project shall be undertaken unless in conformance with the Township Wastewater Collection System and Township Water Supply System Master Plans.
- C. Owner's Engineer shall submit two sets of Plans and Specifications to the Township Water and Sewer Department.
- D. After review of the Plans and Specifications, the Township and the Byron / Gaines Utility Authority will issue a joint review letter to the Owner's Engineer. The review will be valid for two (2) years from the date of its issuance.
- E. Upon receipt of this review letter, any changes required must be made prior to the Township submitting the Plans and Specifications to the Byron / Gaines Utility Authority for construction permits. Total sets of Plans and Specifications required are: six (6) for watermain *or* sanitary sewer, and; ten (10) for *both* water main and sanitary sewer. The Byron / Gaines Utility Authority will forward the plans and specifications to the Michigan Department of Environmental Quality for construction permits. Prior to commencing the Work, a copy of all permits must be submitted to the Township along with one copy of the final approved Plans and Specifications.

The following is a summary of the Byron / Gaines Utility Authority Plans and Specifications submittal process. All reference to Local Unit refers to the Township. The Owner's Engineer should consult directly with the Byron / Gaines Utility Authority as to any questions and/or amendments to the submittal process and copies of all documentation pertinent thereto.

- 1. The Plans and Specifications shall be submitted with a cover letter which shall contain a brief description of the proposed extension or connection, including the name, location and the lengths and sizes of the water mains and sewer lines per street to be constructed. The plans must indicate the project name, the location of the project and a location sketch.
- 2. The plans must be signed and sealed by a licensed professional engineer.
- 3. The Byron / Gaines Utility Authority must have evidence that the proposed Plans have been reviewed and approved by the Township.
- 4. Easements for water and/or sewer lines must be detailed on the Plans. Platted easements must be so noted and all easement areas must be accompanied by the proposed easement document. (See Appendix "B")

5. A general note must be included on the Plans stating that the construction shall be done in accordance with the current “Byron / Gaines Utility Authority Standard Construction Requirements”.
6. The plans must define all areas of construction adjacent to lakes, streams, water courses, or other erosion sensitive locations and reference acceptable control techniques, which must be used to control soil erosion and sedimentation.
7. If this project is within 500 feet of a lake or stream, or if the construction activity is within a 100 year floodplain and/or wetlands (Wetlands as defined by 30301(d) of Part 303 of Act 451, PA 1994) copies of necessary permits or evidence of submittal or a request for determination from the Michigan Department of Environmental Quality - Land and Water Management Division regarding those activities must be submitted. The Plans must define all areas of construction adjacent to ponds, water courses, or other erosion-prone locations and reference acceptable control techniques, which must be used to control soil erosion and sedimentation.
8. For sanitary sewer projects, the permit application for wastewater systems as required by authority of Part 41, Act 451, PA 1994 as amended shall be completed and submitted.
9. The permit applications must define the quantities and locations of the facilities to be constructed (e.g. 800 ft. of 8 inch water line in 120th Avenue from James Street north).

1.04 PERMITS AND APPROVALS

Prior to commencing construction of the Project, the following permits/approvals shall be obtained (if applicable) by the Owner’s Engineer:

- A. Township Water and Sewer Department.
- B. Kent County Road Commission – for all work within County Right-of-Ways and for Soil Erosion Sedimentation Control (Part 91 of PA 451).
- C. Kent County Drain Commissioner - Note: Storm water detention may be required.
- D. Michigan Department of Environmental Quality
 - 1) Watermain construction permits (Act 399).
 - 2) Sanitary sewer construction permit (Part 41 of Act 451).
 - 3) Inland Lakes and Streams (Part 301 of Act 451).
 - 4) Soil Erosion and Sedimentation Control (Part 91 of Act 451).
 - 5) Wetlands (Part 303 of Act 451).

6) Storm Water Discharge (Part 31 of Act 451).

7) Other.

No construction work on the Project shall commence until all of the above referenced permits/approvals which are applicable have been obtained, the Development Contract has been signed, any necessary agreements with the Township have been signed and delivered, all required easements have been signed and delivered to the Township, appropriate evidence that all required insurance is in force has been filed with the Township, the Township has reviewed and approved the Agreement, and the preconstruction conference has been held.

1.05 INDEMNITY/INSURANCE

1.05.01 Indemnity - General

The Contractor shall agree in the Agreement that as a condition of performing the Work, the Contractor agrees to assume all liability for and protect, indemnify and save the Township, the Byron / Gaines Utility Authority, the Kent County Road Commission, the Kent County Drain Commissioner (including Road Commission's, Drain Commissioner's and Township's respective consulting engineers), their agents, consultants, officers, board members and employees, harmless from and against all actions, claims, demands, judgments, losses, expenses of suits or actions and attorney fees for injuries to, or death of, any person or persons and loss or damage to the property of any person, or persons, whomsoever, and the Contractor's agents, contractors, subcontractors, officer and employees, arising in connection with or as a direct or indirect result of entering into and performance of the Work, whether or not due to or arising out of the acts of the Contractor or its agents, contractor, subcontractors, officers and employees, or by or in consequence of any negligence or carelessness in connection with the same or on account of liability of obligation imposed directly or indirectly upon any of the above named indemnified parties by reason of any law of the State of Michigan or the United States, now existing or which shall hereinafter be enacted, imposing any liability or obligations, or providing for compensation to any person or persons on account of or arising from the death of, or injuries to employees. The Contractor shall pay, settle, compromise, and procure the discharge of any and all such claims and all such losses, damages, and expenses. The indemnified parties shall have the option to retain their own attorney or attorneys and the reasonable expense thereof shall be paid by the Contractor.

1.05.02 Insurance Requirements

The Agreement shall provide that prior to commencing work; the Contractor shall file with the Township, the Byron / Gaines Utility Authority, the Kent County Road Commission and the Kent County Drain Commissioner a certificate of insurance acceptable to the Township as proof that the Contractor has secured the types and amounts of insurance required by this subsection for the Project. The Township shall have the right, in its sole discretion and at any time(s), to require the Contractor to file

with the Township certified copies of any policies of insurance required by this subsection.

The Contractor shall provide Owners and Contractors protective insurance coverage for the project in the amount of \$2,000,000.00 (general aggregate and each occurrence) naming the Township, the Byron / Gaines Utility Authority, the Kent County Road Commission, the Kent County Drain Commissioner (including the Drain Commissioner's, the Road Commission's and the Township's respective consulting engineers), of each of the above-named public entities. The named insured's shall include all officers, consultants, agents, employees, and board members.

The certificate or certified policies filed with the Township shall provide for giving the Township 30 days prior written notice of any cancellation, material change in coverage or non-renewal of the insurance.

The furnishing by the Contractor of any insurance policies and/or insurance certificates and their acceptance or approval by the Township shall not release the Contractor from the obligation to provide sufficient insurance coverage as set forth herein and shall not waive liability of the Contractor to provide indemnification as provided above.

1.06 PRE-CONSTRUCTION CONFERENCE

A pre-construction conference shall be held with the Township, the Byron / Gaines Utility Authority, the Kent County Road Commission, the Kent County Drain Commissioner, the Township's Engineer, the utility companies and other agencies affected by the proposed construction. The Township's inspection procedures will be reviewed with regards to watermain, sanitary sewer, and sidewalks.

At the pre-construction meeting, if the Project is for watermain or sanitary sewer, Auto CAD digital drawing files shall be provided to the Township or the drawings may be E-mailed to the Byron / Gaines Utility Authority.

1.07 ASSESSMENTS/CHARGES/FEEES

Water and sewer assessments/charges/fees include, but are not limited to, availability, trunkage, laterals, water services, meters and Plan review and inspection fees (development fees). These assessments/charges/fees will be established by the Township Board by ordinance and resolution. It is the responsibility of the Owner to make inquiry as to the amount of assessments, charges and fees applicable to the Project. Payment terms, if any, shall be as agreed upon in writing with the Township.

See Appendix "A".

1.08 CONNECTIONS/FINAL ACCEPTANCE

Prior to service connections or final approval of the Project by the Township, the following items shall, if applicable to the Project, be submitted to the Township:

- a) Signed Certification and Approval for Water and/or Sanitary Sewer Construction (required form is included as page 1-20).
- b) Executed Bill of Sale (required form is included as page 1-21).
- c) Copies of Michigan Department of Environmental Quality permits.
- d) Final plat showing dedicated easements.
- e) Letter of credit for uncompleted work. See Development Contract (Appendix "C") between Owner and Township.
- f) All easements signed and provided to the Byron / Gaines Utility Authority (to be provided prior to the commencement of construction).

In addition, all testing shall have been completed and all complaints shall have been resolved. Four mil double sided Mylar printed record drawings and Auto Cad Release 14 (or more recent version record drawing files are to be provided within a period of 9 months after the date of approval for connections or final acceptance.

1.09 BUILDING CONNECTIONS

Separate permits will be required for any water services or sewer connections into buildings. See the Township's ordinance to administer, regulate, and provide for the connection to and use of the public water and sewer systems for requirements and regulations pertaining to private water systems, fire lines, sanitary sewer and storm sewer, as well as these Standard Construction Requirements.

1.10 GUARANTEE

The Agreement shall provide that the Contractor shall guarantee the completed Work for one year and shall promptly repair, replace, restore, or rebuild, as the Township may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur (or has occurred) because of such defects during the one-year period, except where other periods of maintenance and guarantee are provided. The one year period shall begin upon the date of certification and approval for water and sewer construction by the Byron and Gaines Utility Authority.

All subcontractors, manufacturer, or supplier warranties and guarantees, expressed or implied, with respect to any material or equipment used in or incorporated as a part of the Work shall be obtained by the Contractor as agent for the Township, and all such warranties and guarantees shall inure to the benefit of the Township without the necessity of separate transfer or assignment thereof; provided that if required by the Township, the Owner and Contractor shall cause such subcontractors, manufacturers, or suppliers to execute such warranties and guarantees in writing to the Township and, further, that the Agreement shall provide that the Contractor will assign all such warranties and guaranties to the Township on request.

1.11 CONTRACTORS AND SUBCONTRACTORS

The Work shall be performed by responsible contractors and subcontractors known to be skilled and regularly engaged in work of similar character and magnitude. The Owner shall receive written approval from the Township of all contractors and subcontractors prior to entering into the Agreement.

1.12 CONTRACTOR RESPONSIBILITIES

1.12.01 General

All of the following Contractor responsibilities shall be incorporated as part of the Agreement.

1.12.02 Safety and Protection

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

The public and all persons on the Work site or who may be affected by the Work; all the Work and materials and equipment to be incorporated therein, whether in storage on or off site; and

other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, driveways, roadways, sidewalks/bike paths, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of construction.

The Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The Contractor shall notify owners of adjacent property and of underground facilities and utility owners when construction of the work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in this paragraph caused, directly or indirectly, in whole or in part, by the Contractor, any subcontractor, supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the Contractor. The Contractors' duties and responsibilities for safety and protection of the Work shall continue until such time as all the Work is completed and accepted.

1.12.03 Safety Representative

The Contractor shall designate a qualified and experienced safety representative at the Work site, whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

1.12.04 Emergencies

In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Owner or the Township, is obligated to act to prevent threatened damage, injury or loss. The Contractor shall give the Owner, the Byron / Gaines Utility Authority, and the Township prompt written notice if the Contractor believes that any significant changes in the Work or variations from the Work have been caused thereby. If the Owner determines that a change in the Work is required because of the action taken by the Contractor in response to such an emergency, with prior written approval of the Township, the Owner may issue a change order or otherwise authorize a change in the Work to account for the consequences of the action taken with respect to the emergency.

1.12.05 Supervision and Superintendence

The Contractor shall supervise, inspect and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor shall be responsible to see that the complete Work complies accurately with the Plans and Specifications.

The Contractor shall keep on the Work at all times during its progress a competent superintendent, who will cooperate fully with the Township at all times, and who shall not be replaced without written notice to the Township. The superintendent will be the Contractor's representative at the site and shall have authority to act on behalf of the Contractor. All communications given to the superintendent shall be as binding as if given to the Contractor.

1.12.06 Labor, Materials and Equipment

The Contractor shall provide competent, suitably qualified personnel to perform the Work. The Contractor shall at all times maintain good discipline and order at the site.

The Contractor shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the Work.

All materials and equipment shall be of good quality and new, except as otherwise provided in the Plans and Specifications. If required by the Township, or the Byron / Gaines Utility Authority, the Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with instructions of the applicable supplier, except as otherwise provided in the Plans and Specifications.

Where existing public water or sanitary sewer system components are being removed as part of a project, the Byron/Gaines Utility Authority reserves the right to retain ownership of the components. If the components are not desired by the Byron/Gaines Utility Authority, the components are to be removed from the site by the contractor.

1.12.07 Construction Records

The Contractor shall provide construction record information and utilize standard record forms as provided by the Township.

1.13 ASBESTOS, PCBs, PETROLEUM, HAZARDOUS WASTE OR RADIOACTIVE MATERIALS:

If, during the course of construction, any asbestos, PCBs, petroleum, hazardous waste or radioactive materials are uncovered or revealed at the Work site which were not shown or indicated on the Plans and Specifications, to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site, the Contractor shall cease operations affecting the find and shall notify the Township and also the Owner in writing, who shall notify the necessary parties. No further disturbance of the materials shall ensue until the Contractor has been notified by the Owner, the Byron / Gaines Utility Authority, and the Township that the Contractor may proceed.

1.14 PAYMENT

Payment shall be made by the Owner to the Contractor. The Township, unless it is the owner, shall not have any liability to the Contractor for amounts due the Contractor under the Agreement, or for any part of the cost of the Project. The method of payment (lump sum, unit prices, etc.) is between the Owner and the Contractor.

1.15 COST SHARING

All cost sharing agreements (if any) between the Township and Owner shall be in writing and shall be signed and delivered prior to the start of construction.

1.16 WORK SITE

The Contractor shall confine its work to the public rights-of-way, easements and Owner's property. Any other area required for equipment or material storage or for construction operation shall be the Contractor's responsibility.

1.17 ACCESS

The Byron / Gaines Utility Authority, the Township, and its representatives shall be allowed access to all parts of the Work at all times and shall be furnished such information and assistance by the Contractor as may be required to make a complete and detailed inspection.

1.18 CONSTRUCTION OBSERVERS

Authority and Duties of Township Construction Observers:

Township construction observers shall not supervise, direct, or have control of the Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto. Township construction observers are not authorized to revoke, alter, enlarge or relax any of the Specifications nor to change the Plans in any particular. Township construction observers are not authorized to increase or decrease any Agreement item nor to add new items to the Agreement. Township construction observers will inform the Township and the Byron / Gaines Utility Authority as to the progress of the Work and the quality of the completed Work, and the quality of the materials being used. In no instance shall any action or omission on the part of the Township construction observers relieve the Contractor of the responsibility for completing the Work in accordance with the Agreement.

The Township shall make an observation of the completed Work, or such portions thereof which are eligible for acceptance, upon notification by the Contractor that the Work is complete or substantially complete. If the completed Work is not acceptable to the Township at the time of such observation, the Township shall inform the Owner and the Contractor orally or in writing as to the particular defects to be remedied.

Observation may be done by the Byron / Gaines Utility Authority, its representative, or the Township's Engineer. Observation will consist of daily viewing of watermain and sanitary sewer installation, testing of watermain and sanitary sewer and gathering of construction record information of all items related to watermain and sanitary sewer construction, including laterals and water services.

All construction staking, compaction testing, major field changes and pay estimates will be the responsibility of Owner's Engineer.

The Owner's Engineer shall periodically review the work for conformance to the Plans and Specifications and these Standard Construction Requirements. The Owner's Engineer shall complete, sign and submit to the Township the Engineer's Certificate contained on page 1-20.

The Township must accept the Work prior to placing watermain, sanitary sewer, or sidewalk in service.

1.19 DEFECTIVE MATERIALS AND WORK

All materials, which do not meet the requirements of the Specifications at the times they are to be used, shall be rejected, unless otherwise authorized as acceptable by the Byron / Gaines Utility Authority and Township in writing.

All completed Work that is found to be defective before the final acceptance of the completed Work, shall be corrected and replaced immediately in conformance with the Specifications.

1.20 SCHEDULING

The Contractor shall file a construction schedule with the Township, the Byron / Gaines Utility Authority, and the Kent County Road Commission and shall receive approval in writing prior to commencing construction.

The Contractor shall give 48 hours notice to the Byron/Gaines Utility Authority and the Township construction observers prior to commencing water or sanitary sewer work.

Certain projects may require street closings. The Contractor shall coordinate its work with the Kent County Road Commission and the Township and shall take all necessary precautions required by the Road Commission to minimize traffic interference.

All traffic control that may be necessary for a project must be approved by the Kent County Road Commission.

The Contractor's emergency telephone number shall be filed with the Byron / Gaines Utility Authority and the Township.

1.21 MAINTENANCE OF TRAFFIC

When working within the limits of existing streets, the Contractor shall accommodate vehicular traffic in road rights-of-way as provided in the Specifications. Access to fire hydrants, water and gas valves shall be maintained at all times during construction.

Where streets are partially obstructed, the Contractor shall place and maintain temporary driveways, ramps, etc., which, in the opinion of the Kent County Road Commission, the Byron / Gaines Utility Authority, and/or the Township, are necessary to accommodate the public.

The Contractor shall inform the local police, schools, ambulance services and fire department in advance of its program of street obstruction and detours. Detouring and construction signage shall be in accordance with MDOT Standards for Uniform Traffic Control and in accordance with the directions of the Kent County Road Commission.

1.22 LIMITATION ON OPERATIONS

When working within the limits of existing streets, the Contractor shall at all times conduct its work so that there is a minimum of inconvenience to the residents and traveling public within the Project area. Unless otherwise approved by Byron Township or Gaines Charter Township, hours of operation are limited to 7:00 am to 7:00 pm on Mondays through Fridays, and 7:00 am to 1:00 pm on Saturdays. No work shall be performed on Sundays or legal holidays.

1.23 PROTECTION OF WORK

The Contractor shall protect the Work until it is accepted by the Township in writing. Any part of the completed Work that is damaged prior to acceptance by the Township shall be replaced at the Contractor's expense.

1.24 DUST CONTROL

All haul roads, detour roads and other public and private roads (including backfilled trenches), driveways and parking lots used by the Contractor must be maintained in a dust free condition. The control of the dust shall be accomplished by the application of dust control materials and methods of application as approved and/or sweeping shall be applied as often as is necessary to control the dust or if directed to do so by the Township (within 12 hours after notifications).

Cost of providing dust control shall be considered incidental to the Project price and shall not be charged back to the Township or the Byron / Gaines Utility Authority.

1.25 MATERIAL HAUL ROADS

Any spillage on public roadways used as haul routes shall be cleaned daily.

Gravel roads shall only be used by the Contractor when permission is given to the Contractor in writing by the Kent County Road Commission and only if the Contractor assumes responsibility of maintenance, dust control and restoration of the gravel roads to the satisfaction of the Kent County Road Commission.

1.26 COLOR AUDIO-VIDEO TAPING

The entire Project area involving existing streets may be video taped by the Kent County Road Commission. Other Project areas may be video taped by the inspectors. These tapes will be available to the Contractor, Owner, Byron Gaines Utility Authority, and the Township during construction of the project.

1.27 MAIL BOXES

The Contractor shall temporarily relocate mail boxes interfering with construction so that mail service is not interrupted. Mail boxes shall be replaced in a condition and location equal to that prior to construction or as required by the U.S. Postal Service. All mail boxes shall be replaced with a turn out of six (6") inches of MDOT 23A gravel.

1.28 TREES/CLEARING AND GRUBBING

Trees marked "REMOVE" on the Plans shall be taken down and removed from the right-of-way or easement in a manner that does not endanger the adjoining property or persons, or traffic using the right-of-way. The wood shall become the property of the adjoining property owner when in an existing right-of-way, or the property owner who granted the easement. If the adjoining property owner or property owner does not want the wood, it shall become the property of the Contractor. Burning or burying will not be permitted unless first approved in writing by the Township.

Existing stumps and stumps of trees which are removed shall not be ground down but shall be completely removed

Because of the special concern for preservation of trees in the Township, only those trees, which have been indicated for removal on the Plans, may be removed. All other trees are to be preserved unless written permission for removal is obtained from the Township and the property owner. Selective pruning of trees will be permitted to allow operation of the Contractor's equipment.

Tree branches and roots shall be pruned neatly and the scars shall be covered with an approved tree dressing.

1.29 DEWATERING

Where dewatering is required, the Contractor shall limit the dewatering operation to the minimum time and depth required for construction. The Contractor will be required to furnish and maintain temporary water service to property owners whose wells may be affected by the dewatering operations. The Contractor shall also be responsible for any necessary repairs to existing wells required to place them back in operation after construction is completed. If the Contractor does not provide temporary water in a timely manner, the Township will cause temporary water to be provided and the Contractor shall promptly reimburse the Township for all of its expenses.

1.30 USE OF SLAG

No slag shall be permitted for use as backfill for any utility construction.

1.31 EXISTING UTILITIES

Various utilities and underground structures are shown on the Plans. There is no guarantee that the location shown for existing utilities and underground structures on the Plans is accurate, nor that additional underground utilities or structures may not be encountered.

The Contractor shall notify MISS DIG and the utility companies for utility locations before starting any open cut or tunnel construction or before drilling holes for construction purposes. The Contractor shall cooperate with the utility companies in any repair, relocation or other work to be performed on the utility caused by the construction of the Project.

The Contractor shall be fully responsible for the location, protection, relocation, replacement, etc. for all existing underground utilities, which may reasonably be expected in any area, regardless of whether or not such utilities are shown on the Plans. Items in this category shall include, but not necessarily be limited to: watermains and services, gas mains and services, storm sewer and catch basin leads, telephone, electric, and cable TV wire, etc. Such work shall be considered incidental to the major items of construction unless otherwise noted on the Plans.

A. Water Mains

It shall be the responsibility of the Contractor to uncover such mains for a reasonable distance ahead of his construction operation to permit field adjustments where such might be made in grade, location or alignment of the proposed sewer and watermain and/or appurtenances.

An existing watermain, including water services, shall be raised to pass over the sewer (where the elevation of the watermain conflicts with the elevation of the

sewer), provided a minimum cover of five feet is maintained on the watermain. The existing watermain may be lowered where the elevation of the watermain conflicts with the elevation of the sewer. The raising or lowering of existing watermain shall be accomplished by using vertical bends properly anchored. A sand cushion shall be provided between the watermain and the sewer. The Contractor shall notify the Byron / Gaines Utility Authority and the Township before any work on existing watermain is begun. The Byron / Gaines Utility Authority shall approve the configuration of the bends and thickness of the sand cushion. (A minimum of 18" is recommended.)

B. Sewers (Sanitary, Storm, Culverts, and Under Drains)

All existing sewers crossing or parallel to proposed sewers and watermain (even if not shown on the Plans) shall be saved or re-laid by the Contractor if damaged during construction, unless otherwise indicated on the Plans.

Existing manholes, catch basins and inlets shall be saved and protected unless otherwise indicated on the plans to be removed. Catch basins and inlets shall be reconstructed if damaged during construction. Costs for rebuilding, removing and/or repairing existing sewer, manholes, catch basins, inlets, house leads, headwalls, etc. shall be considered incidental unless otherwise noted on the construction Plans or in the Specifications.

C. Electric Services

Consumers Energy operates electrical systems in the Townships.

D. Gas

D.T.E. Energy Company (previously Michcon) provides natural gas service in the Townships.

E. Telephone

AT&T (previously Ameritech) provides telephone service in the Townships.

F. Cablevision

Comcast (previously AT&T Broadband) provides cable T.V. service in the Townships.

G. MISS DIG

The Township and other local units of government, Byron / Gaines Utility Authority, Consumers Energy, D.T.E. Energy Company, AT&T, and Comcast, are members of a utility communication system called "MISS DIG" that provides service to participating units of government and utilities. The Contractor shall contract "MISS DIG" not less than 72 hours before starting construction for assistance in locating utilities or for any work to be done on utilities. The toll free phone number is (800) 482-7171.

H. Utilities

The Contractor shall notify other units of government and the utility companies of the Contractor's schedule and obtain any necessary permits from them. These units of government and companies include the Township, the Byron / Gaines Utility Authority, Consumers Energy, D.T.E. Energy Company, AT&T, and Comcast.

The Contractor shall pay for any charges by the units of government and utility companies for permits, inspections, or similar charges required to construct the Project as shown on the Plans.

I. Water and Sewer

The Townships and the Byron / Gaines Utility Authority operate and maintain the water and sewer systems in the Township.

1.32 UTILITY POLES

When necessary, the Contractor shall shore and brace utility poles that interfere with construction. Shoring and bracing shall be such that sinking or excessive tilting does not take place. All relocation or removing and replacing of power poles, light poles and telephone poles shall be done in accordance with the pole owner's standards and all expenses shall be paid for by the Contractor. All arrangements for pole relocations shall be completed by the Contractor with the pole owner at least 72 hours prior to need for relocations.

1.33 TELEPHONE

An emergency telephone system (listing of number) shall be set up and given to the Township and the Byron / Gaines Utility Authority so that the Contractor may be immediately notified of any unsafe conditions or emergencies encountered during times that the Contractor is not working on the Project.

The Contractor shall provide a local number and a local employee so that the Contractor may be contacted at any time (including weekends and holidays) 24 hours a day.

1.34 EXISTING PRIVATE FACILITIES

Existing wells, septic tank, tile field, lawn sprinklers or other facilities which are not on the Owner's property which are disturbed or damaged by the Contractor, shall be repaired and restored to working condition before the end of that working day. Under no circumstances will such interruptions be extended overnight. The Contractor shall take necessary precautions not to allow any discharge from the above to enter any lake, stream or canal along the line of work. Costs for repairs or temporary service caused by the Contractor shall be at the Contractor's expense.

All precautions necessary shall be taken to insure no damage occurs to homes, including basements.

1.35 CASTING ADJUSTMENTS

Casting adjustments (manholes, watermain valves, gas valves, etc.) required in order to meet the new/restored grade shall be made by the Contractor.

1.36 MATERIAL TESTING

The Byron / Gaines Utility Authority reserves the right to sample and test any of the materials required for the proposed construction, either before or after delivery to the Project and to reject any material represented by any sample which fails to comply with the minimum requirements specified.

The Contractor shall furnish all materials reasonably required by the Byron / Gaines Utility Authority and the Township for sample testing and analysis necessary for the testing of materials as required by the Specifications.

If any pipe fails to meet the specified requirements, all pipe represented by the sample shall be rejected unless the Contractor can demonstrate through additional tests, at the Contractor's expense, that the remainder of the pipe is satisfactory.

As a minimum requirement, the following shall be submitted to the Byron / Gaines Utility Authority by the Contractor (at no extra cost to the Owner).

A. Pipe: Certified test reports for strength from the manufacturer.

B. Material list: Valves, pipe, hydrants, etc. by type and manufacturer.

1.37 BONDS

The Township may require performance bonds for all of the Work or, as a minimum, for that portion of the Work within existing rights of way. (Bonds will be required when the Township is the Owner.)

1.38 FUNDING

Prior to the Contractor starting work, the Owner shall submit in writing to the Township documentation that the Owner has available sufficient funds to complete the Project.

1.39 AUTHORITY OF THE TOWNSHIP AND THEIR AUTHORIZED REPRESENTATIVES

The Byron / Gaines Utility Authority, the Township, and their authorized representatives have the authority to verify that the Project is being constructed in accordance with the Plans and Specifications, the Standard Construction Requirements, the Township's Rules and Regulations and the Development Agreement.

1.40 DISPUTES

All disputes between the Owner and Contractor shall be reviewed and resolved in a timely manner.

1.41 SUSPENSION OF WORK AND TERMINATION

The Township reserves the right to suspend the Work until all disputes between the Owner and Contractor are resolved.

**1.42 CONTRACT AMENDMENTS/CHANGE ORDERS/NOTIFICATION/
CONCURRENCE**

When necessary, the Owner or the Owner's Engineer will prepare for the Township's prior written approval Agreement amendments and change orders.

1.43 SITE CLEANLINESS

The Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land areas identified in and permitted by the Plans and Specifications and other land and areas permitted by law, rights-of-way, permits and easements, and shall not unreasonably encumber the Work premises with construction equipment or other materials or equipment. The Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the Work.

1.44 SUBSURFACE CONDITIONS

Any utilities shown on the Plans are located according to the latest available information. The Contractor shall make a conscientious effort and shall provide reasonable assistance to the Byron / Gaines Utility Authority, the Township, and their representatives as may be required to verify the locations and/or elevations of all existing utilities, which may be affected by the proposed construction.

At points where the Contractor's operations are near the properties of railroad, telephone and power companies, or are near existing underground utilities, damage to which might result in considerable expense, loss or inconvenience, work shall not be commenced until all arrangements necessary for the protection thereof have been made.

The Contractor shall protect, shore, brace, support and maintain all utilities affected by his operations. The Contractor shall be responsible for all damage to utility properties or facilities and shall make his own arrangements satisfactory to the Owner, with the agency or authority having jurisdiction thereover, concerning repair or replacement or payment of costs incurred with said damage.

In the event of interruption to water or other utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the Byron / Gaines Utility Authority or other utility owner and shall cooperate with the Byron / Gaines Utility Authority and/or such owner in the restoration of service. If water service or other essential service is interrupted, repair work shall be continuous until the service is restored. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the Township Fire Department.

1.45 WASTEWATER PUMPING STATIONS

All wastewater pumping stations to be operated by the Byron / Gaines Utility Authority will be designed by the Township's Engineer. However, if individual (private) pump

stations (grinder pumps) are required and approved by the Township, they can be designed by the Owner's Engineer provided they discharge into a public gravity sewer.

1.46 FIRE PROTECTION SYSTEMS/FIRE HYDRANTS

The Township shall review/approve all fire protection systems except where an exception is authorized as is provided in the Water Rules and Regulations. All fire hydrants shall be on a public watermain operated by the Township or the Byron / Gaines Utility Authority. Easements will be required when the watermain and/or fire hydrants are on private property.

1.47 MASTER PLANS

The Township's watermain and wastewater collection system master plans shall be followed by the Owner's Engineer in the design of the Project. It is recommended that prior to any design being completed, that a meeting be scheduled with the Township to review these master plans.

1.48 ROOF DRAINS/FOOTING DRAINS/SUMP PUMP DISCHARGES

All buildings and other structures shall provide for positive points of discharge for roof drains, footing drains and sump pumps.

Sump pump discharges will not be permitted in the sanitary sewer.

1.49 EASEMENTS

All easements to be granted to the Townships will be on forms as provided by the Townships. All easements must be delivered to the Byron / Gaines Utility Authority prior to the commencement of construction.

See Appendix B for standard utility line easement forms and standard sidewalk easement forms.

1.50 RECORD PLANS

Record plans printed on mylar sheets shall be provided to the Byron / Gaines Utility Authority by the owner. A set of the record plans printed on bond shall also be provided to the Township, the Kent County Road Commission, and the Township's Engineer. The record plans shall show all measurements and witnesses provided to the Owner's engineer by the Township inspectors. The Owner shall be responsible to obtain surveyed rim and invert elevations for all sanitary sewer manholes and placing this information on the record plans.

1.51 EXCEPTIONS

Exceptions to these Standard Construction Requirements may be granted in writing by the Township Water and Sewer Administrator. Exceptions shall only be granted when applied for in writing and in circumstances where compliance with the Standard Construction Requirements is impossible or would cause extreme hardship. All requests for exceptions shall be in writing and signed by the Owner. The exception request shall include all relevant supporting documentation and information, including information supplied by the Owner's Engineer. The burden of proof shall be on the Owner to provide convincing proof that the exception is necessary because it is

impossible to comply with the Standard Construction requirements or compliance will cause extreme hardship. Additional cost alone is not justification for the granting of an exception. If granted, the exception shall be granted in writing by the Township. The decision of the Township shall be final.



Byron - Gaines Utility Authority

1381 84th Street SE
Byron Center, MI 49315

Phone: (616) 971-0002
Fax: (616) 554-3655

CERTIFICATION AND APPROVAL FOR WATER AND/OR SANITARY SEWER CONSTRUCTION

Project Name: _____

Township of _____ Section _____ County Kent, State of Michigan

I hereby certify that _____ has designed and overseen
(Engineering Firm)

construction of the above named project on behalf of the owner/developer. The construction plans were designed in accordance with the Byron-Gaines Utility Authority Standard Construction Requirements and the proposed construction materials meet approved specifications.

Exception(s): _____

Signature: _____ Date: _____

Printed Name: _____
(Project Engineer)

I hereby certify that the work has been installed and completed for the above named project, that all construction materials meet the approved specifications, and that all required testing was performed and passed, in accordance with the Byron-Gaines Utility Authority Standard Construction Requirements for the Byron-Gaines Water Supply and Sanitary Sewer Systems.

Exception(s): _____

Construction Observation Firm: _____

Signature: _____ Date: _____

Printed Name: _____
(Construction Observation Supervisor)

Based on the signed certifications above, connection of services to the () Watermain & Sanitary Sewer
() Watermain Only () Sanitary Sewer Only; is hereby authorized.

Signature: _____ Date: _____

Printed Name: _____
(Authority Manager)

WARRANTY

BILL OF SALE

_____, whose address is _____
_____, (hereinafter referred to as "Seller") for and in consideration of One (\$1.00) Dollar
and other good and valuable consideration, does hereby grant, dedicate, transfer, and deliver to
BYRON TOWNSHIP, whose address is 8085 Byron Center Avenue, S.W., Byron Center, MI 49315
and GAINES CHARTER TOWNSHIP, whose address is 8555 Kalamazoo Avenue, S.E., Caledonia,
MI 49316, (hereinafter referred to as the "Townships") _____

(the "Improvement").

Seller hereby warrants and certifies to the Townships that the Improvement has been acquired,
constructed and completed in accordance with the Plans and Specifications of _____
_____ for the Improvement previously approved by the Townships, with only those change
orders approved in writing by the Townships, and that no claim, action, or liability exists with
respect to the Improvement and its construction and installation.

Seller further warrants and represents to the Townships that it is the lawful owner of the
Improvement, and that the Improvement is free of all liens and encumbrances of any kind. Seller
further represents that it has the authority to transfer the Improvement and that Seller will warrant
and defend the Townships against all claims asserted by any entity or person arising out of the
installation, construction and completion of the Improvement. Seller also warrants that the
Improvement is free from defects in materials and workmanship. All warranties and guarantees
pertaining to the Improvement are hereby assigned and transferred to the Townships.

Dated: _____, 200____.

Witnessed By:

_____ By: _____

Its: _____

_____ By: _____

Its: _____

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SECTION 2

SPECIFICATIONS FOR EXCAVATING, TRENCHING, AND BACKFILLING FOR UTILITIES

2.01 DESCRIPTION OF WORK

The work shall consist of furnishing all materials, equipment, and labor for excavating, trenching, and backfilling for utilities. The work also shall include the necessary clearing, sheeting and shoring, boring and jacking, dewatering, pipe embedment, and other appurtenant work.

2.02 CLEARING, BRUSHING AND TREE REMOVAL

2.02.01 General

The contractor shall perform all clearing, brushing, and tree removal required for the proposed construction. Where indicated on the plans for a specific area, that area shall be completely cleared in accordance with Section 201 of the current MDOT Standard Specifications. Clearing and brushing shall be confined to the limits of the right-of-way, easements, and project site unless otherwise directed and shall be kept to a practicable minimum.

Trees marked "Remove" on the plans shall be taken down and removed from the right-of-way in a manner that does not endanger the adjoining property or persons or traffic using the right-of-way. Existing stumps and stumps of trees which are removed shall not be ground down but shall be completely removed.

Selective pruning of trees will be permitted to allow operation of the Contractor's equipment. Trees shall be pruned neatly, and the scars from pruning or other damage by the contractor's equipment shall be covered with a preservative.

2.02.02 Preservation of Trees

Because of the special concern for preservation of trees, all trees six (6") inches in diameter and larger, measured at a point 4 1/2' above the ground line at the base of the tree, which are to be removed have been marked on the plans. All other trees are to be preserved unless written permission for removal is obtained from the Owner and the Township. Where tunneling is necessary to preserve a tree, it shall be incidental to the construction. Trees that may have to be tunneled may or may not be specified on the plans. Where tunneling is necessary, excavation may have to be done by hand to prevent damage to the tree or to its roots. When tunneling or excavating close to a tree to be preserved, every effort shall be made to preserve the main roots.

2.02.03 Disposal of Debris

All trees, brush, and stumps from clearing and brushing operations shall be disposed of by the Contractor by hauling from the site, or other suitable means approved by the Township. The Contractor shall obtain the necessary burning permits and shall comply with the safety regulations required.

2.03 **REMOVAL OF SURFACE IMPROVEMENTS**

Surface improvements such as sidewalks, improved lawns, drives, curb and gutter, and all types of pavement shall be removed just prior to excavating or trenching operations. All improvements shall be cut at the expected trench width prior to excavating using suitable equipment, which does not damage the improvement outside of the trench area.

Concrete and bituminous pavement and drives shall be cut with a pavement cutting saw. The depth of the cut shall be the full depth of the pavement. Pavement crushers or breakers of any type are prohibited unless specifically authorized by the Township. Pavement, which is removed, shall not become mixed with backfill material. Power equipment may be used for pavement removal, provided that damage is not caused to improvements which are to remain.

2.04 **EXISTING UNDERGROUND UTILITIES AND STRUCTURES**

2.04.01 Location

The Contractor shall notify the owners of all underground utilities before starting any work. House sewer connections, water and gas services, and other utility lines may not be indicated on the plans. However, the Contractor shall make every effort to locate all underground utilities from information obtained from the utility owner or by prospecting in advance of trench excavation.

2.04.02 Replacement

Certain underground utilities, such as sewers, may require removal and subsequent replacement in lieu of supporting or bracing during the proposed construction, or the Contractor may elect this option when temporary provisions to maintain essential services have been previously approved by the Township.

Unless otherwise specified, any utilities removed during the proposed construction shall be replaced by the Contractor. Materials and installation shall be equal to or better than original construction in every way. Salvaged materials may be reused when they are in good condition, and a satisfactory installation can be accomplished in the judgment of the Township.

2.04.03 Relocation

Should any pipe or other existing utility require raising or lowering or moving to another location because of interference with the pipe or structure being constructed under these specifications, such changes, which in the opinion of the Township are necessary, shall be made by the Contractor unless otherwise specified.

2.04.04 Reconnection

Where lateral services, house connections, or other pipe lines require reconnection to the proposed utility, as is the case when an existing utility is being reconstructed, the Contractor shall make these connections as specified or as shown on the plans.

2.04.05 Utilities to be Abandoned

When pipes, conduits, sewers, or other structures are removed from the trench leaving dead ends in the ground, such ends shall be fully plugged or sealed with brick and mortar by the Contractor. Abandoned structures such as manholes or chambers shall be entirely removed unless otherwise specified or shown on the plans.

All materials from abandoned utilities which can be readily salvaged shall be removed from the excavation by the Contractor. All salvageable materials remain the property of the Owner.

2.05 EXCAVATING AND TRENCHING

2.05.01 General

Excavating and trenching operations shall at all times be conducted in a safe, orderly manner using methods and equipment designed and suited to the intended use by personnel experienced in the work being performed.

None of the requirements or provisions specified herein or shown on the plans shall nullify or restrict any safety provisions required by any regulation or law governing the protection and/or safety of persons or property.

2.05.02 Width of Trench

The width of the trench shall be ample to permit the pipe to be laid and joined properly and the pipe embedment material and backfill to be placed and compacted as specified. Trenches shall be of sufficient extra width when required as will permit the convenient placing of trench supports, sheeting, and bracing.

2.05.02.01 Width of Trench for Rigid Pipe

In order to limit excessive loads on rigid pipe, the maximum width of trench for pipe 36 inches and larger in diameter shall not be more than twice the nominal diameter; for

smaller sizes of pipe, the maximum width of trench shall be not more than three (3) feet greater than the nominal diameter of the pipe, except as otherwise specified or directed. The above limiting restrictions on trench width apply from outside bottom of pipe to outside top of pipe.

Where the width of trench within these limits exceeds the maximum limit specified, the Contractor shall install a heavier class of pipe or use other means to provide additional load-carrying capacity. Any changes in class of pipe or other variation shall be approved in writing by the Township before the work progresses.

2.05.02.02 Width of Trench for Flexible Pipe

Unless otherwise specified or approved by the Township, a minimum trench width of at least 18 inches on each side of the pipe for placement of select embedment material will be required.

2.05.03 Excavating to Grade

The trench shall be excavated to a depth required for the proper installation of the pipe and placing of the pipe embedment material as specified.

Any part of the bottom of the trench excavated below the specified subgrade shall be refilled with approved materials compacted to 95% of maximum unit weight in accordance with MDOT procedures. If additional excavation is required to correct unstable foundation conditions, the Contractor shall notify the Owner and agree on the cost prior to commencing work.

2.05.04 Sheeting, Shoring, Bracing, and Shelving

2.05.04.01 General

The Contractor shall brace or slope back the sides of all excavations in accordance with current MIOSHA and OSHA regulations. The Contractor shall be responsible for compliance to such regulations and for the design, installation, and maintenance of all excavation safety measures.

2.05.05 Rock Excavation

2.05.05.01 General

Wherever the word rock is used in these specifications, it shall mean boulders, solid ledge rock, and other minerals geologically placed and of a hardness when first exposed of three (3) or greater in scales of mineral hardness, which in the opinion of the Engineer requires continuous use of drilling and blasting or special power equipment for its removal.

Soft disintegrated rock which can be removed with a power-operated excavator or with hand tools and loose, shaken, or previously blasted rock and broken stone in rock fillings shall not be classified as rock.

2.05.05.02 Blasting

Where blasting is necessary, the Contractor shall obtain the required permits and licenses at his own expense. This work shall be done with due regard to the safety of workmen, other people, and public and private property. The method of covering blasts, amounts of charges used, and the general procedure for doing this work shall conform to the standard practice and shall meet all requirements of local ordinances and other regulations and shall be subject to the approval of the Township.

2.05.05.03 Clearance

Rock shall be removed to provide a clearance for all pipes, appurtenances, or structures of at least six (6) inches below, and a minimum of six (6) inches on each side of the pipe, appurtenance, or structure.

The specified minimum clearances are the minimum clear distance which will be permitted between any part of the pipe or appurtenances being laid and any part, point, or projection of the rock.

2.05.06 Dewatering

The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water, including water or sewage from exposed sewers or watermains, from all excavations and trenches, or other parts of the work. Each excavation shall be kept dry during the preparation of the subgrade and continually thereafter until the structure to be built or the installation of the pipe line is completed to such extent that no damage from hydrostatic pressure, flotation, or other cause will result.

Where work is in soil containing an excessive amount of water, the Contractor shall provide, install, and maintain suitable well points or wells connected to manifolds or reliable pumping equipment, or other suitable dewatering methods, and shall so operate the dewatering system to insure proper construction of the work. If the Contractor elects to use a trench underdrain or similar dewatering system, he shall receive prior approval of the Township as to location and installation methods for this type of system. The Contractor shall make every effort to prevent sand, sediment, or debris from entering any existing pipe line or conduit which he may use for drainage purposes. The repair or cleaning of drainage structures made necessary by the Contractor's operations shall be performed by and at the expense of the Contractor.

Arrangements for discharge of ground water into any public storm sewer shall be previously approved by the Township and/or Kent County Drain Commission and/or Kent County Road Commission.

2.06 BORING AND JACKING

2.06.01 General

Where so specified on the drawings, railroad tracks, streets, or other obstructions to be crossed by utilities shall be bored and/or jacked as hereinafter specified. These specifications describe the general method of conducting the boring and jacking operations and set forth minimum conditions. The location and details of the proposed installation will be shown on the Plans.

Unless otherwise specified, the Contractor shall be responsible for obtaining any permits required for the work under the right-of-way, or other facility to be crossed, and shall carry out the details of his work in a manner that will fully meet the requirements of the authority having jurisdiction over the facility affected. No interruption of traffic will be permitted, and the Contractor shall take all precautions to that effect.

2.06.02 Casing Method

When the casing method is specified, a casing pipe shall be jacked into place and a carrier pipe shall then be installed in the casing pipe. The casing pipe shall be jacked into place by approved methods that will provide accurate alignment and grade and that will allow the carrier pipe to be installed within the casing at the specified alignment and grade.

The carrier pipe shall be joined together to form a continuous run through the casing. It shall be supported on wooden or plastic shoes or blocks which shall be securely fastened to each piece of pipe. The carrier pipe shall then be drawn or shoved through the casing. Junction with pipes of other materials at each end shall be made as shown on the Plans. After the pipe has been inspected and accepted, the annular space between the pipe and the casing shall be filled with materials approved by the Township, such as peastone, or flowable fill. After the casing has been filled, the ends of the casing shall be sealed as shown on the plans or in the specifications.

2.06.03 Jacking Pipe Method/Directional Bore

When specified or indicated on the Plans, the pipe to be jacked shall also be utilized as the carrier pipe. The pipe shall be jacked into place by approved methods that will provide accurate alignment and grade. Excavation shall be performed ahead of the pipe by working inside the pipe or shall be performed by boring with approved equipment suitable for the intended use.

2.07 SUBGRADE

The subgrade for pipe and/or structures shall be firm, dense, and thoroughly compacted and consolidated, free from mud and muck, and sufficiently stable to remain firm and intact under the feet of the workmen.

2.07.01 Unstable Foundation

When the soil beneath the normal pipe embedment area is soft or unstable, even with adequate dewatering, or in the opinion of the Township cannot support the pipe or utility, further depth shall be excavated and refilled to the proposed grade with approved materials compacted in twelve (12) inch layers as specified in Section 2.08.05, or other approved means shall be employed to assure a firm foundation for the utility. The volume of unstable foundation removed and replaced with approved materials for which payment will be allowed shall be determined in cubic yards unless otherwise specified on the plan or in the proposal. Said volume to be computed by assuming that the cross section area of the unstable foundation takes the form of a trapezoid as shown on the Standard Detail for Unstable Soil Removal for Utility.

2.07.02 Special Foundations

Where the subgrade at the bottom of the excavation consists of soil which is unstable or yielding to such a degree that, in the opinion of the Township, it cannot properly support the pipe or structure, the Contractor shall construct such additional foundation or reinforcement of the subgrade as may be specified, such as timber piling, geotextiles, or other means as approved by the Township to provide a proper foundation.

2.08 PIPE EMBEDMENT

2.08.01 General

Pipe embedment shall include the furnishing and placing of approved materials as specified or as directed from four (4) inches under the outside bottom of the pipe to twelve (12) inches over the outside top of the pipe. Various classes of pipe embedment may be specified or shown on the Plans or Standard details in which case the limits of the various types will also be specified.

2.08.02 Flexible Pipe Embedment

Flexible pipe is any pipe having a pipe stiffness of less than 200 psi. as defined under the requirements of ASTM Designation D-2412 (this includes all plastic pipe except Composite (Truss) pipe, and may include corrugated metal pipe, ductile iron pipe, and steel pipe, depending on pipe diameter and wall thickness).

Pipe embedment for flexible pipe shall be Class B. For pipes less than fifteen (15) inches in diameter, bedding material meeting the requirements of the current MDOT Standard Specifications for granular materials Class II, modified to 100% passing a 1" sieve shall be used. If stone is used for bedding, it shall be placed at least up to the spring line of the pipe and shall not exceed 1 ½" diameter. For pipes fifteen (15) inches in diameter and larger, bedding material meeting the requirements of the current MDOT Standard Specifications for granular materials Class I, modified to 100% passing a 1" sieve shall be used.

2.08.03 Class B Pipe Embedment

Unless otherwise specified or shown on the Plans, all pipe embedment shall be Class B pipe embedment as shown on the Standard details. When the soil in the bottom of the trench at pipe subgrade meets all the requirements for Granular Material Class II as specified in the current MDOT Standard Specifications Section 902.12 and in the opinion of the Township will provide suitable bedding for the pipe, such soil may be utilized as bedding material and prepared to receive the pipe as specified without undercutting and subsequent replacement.

2.08.04 Special Pipe Embedment

Various types of special pipe embedment may be specified or shown on the Plans in locations where special conditions require their use.

The Contractor shall perform all the work of constructing special pipe embedment where specified.

2.08.05 Placing Pipe Embedment Material

Pipe embedment material shall be placed in the bottom of the trench and shaped by hand to provide a firm and uniform bearing for the barrel of the pipe with additional shaping to accommodate the bells on bell and spigot pipe.

After each pipe has been graded, aligned, and placed in final position on the bedding material and jointing is complete, additional embedment material shall be carefully placed and compacted under and around each side of the pipe and over the pipe until it is completely covered by 12 inches of embedment material. Said material shall be distributed along both sides of the pipe uniformly and simultaneously to prevent lateral displacement of the pipe. All granular embedment material shall be compacted to 95% of maximum unit weight in accordance with MDOT procedures.

All of the work of placing pipe embedment shall be considered an integral part of installing the pipe and shall be completed immediately after the pipe is laid to the correct alignment and grade.

2.09 **BACKFILLING ABOVE PIPE EMBEDMENT**

2.09.01 General

All backfill material shall be free from cinders, pavement, ashes, refuse, sod, organic material, boulders, or rocks larger than six (6) inches in diameter, frozen material or other material which in the opinion of the Township is unsuitable. The soil excavated from the trenches shall be used for backfilling when it is classified as suitable by the Township and the Kent County Road Commission. If all or a portion of the excavated material is classified unsuitable for backfilling, the Contractor shall remove and dispose of the unsuitable material and shall furnish and place granular material meeting

the requirements of Section 902.12 of the current MDOT Specifications for Granular Material Class II.

All backfilling and compaction shall be performed by the Contractor using methods and equipment approved by the Township.

2.09.02 Trenches Requiring Compacted Granular Backfill

Trenches and excavations in the following locations shall be backfilled with approved granular material meeting the requirements of the current MDOT Standard Specifications for Granular Material Class II:

- a. Improved areas, including drives, sidewalks, parking areas, around structures, etc.
- b. Within the limits of the roadway (within a 1 on 1 slope beginning two (2) feet from the edge of pavement or back of curb towards the right-of-way line).
- c. Within the limits of future improvements (shown on Plans).
- d. Within limits specified on Plans.
- e. All sanitary sewer lateral trenches.

All backfill within these areas shall be placed in layers not exceeding twelve (12) inches thick, and shall be compacted to 95% of maximum unit weight in accordance with MDOT procedures. Tests for compaction will be made by the Owner or other representative designated by the Owner at no cost to the Township. When tests indicate a density which is less than that required, the methods or equipment being used shall be modified to obtain the density specified, and the section in question shall be recompacted until the required density is obtained. The cost of retesting shall be borne by the Contractor. Density testing shall be in accordance with Kent County Road Commission requirements.

2.09.03 Trenches Not Requiring Compacted Granular Backfill

Where not otherwise specified or directed, backfilling above the pipe embedment shall be made with material which is originally excavated, which is suitable. Backfill materials shall be consolidated by mechanical equipment working longitudinally in the trench, or by other approved methods, so as to be free of large voids with any excess material mounded over the trench or removed as directed by the Township. The trench shall be graded to a reasonable uniformity and left in a neat condition.

2.10 DISPOSAL OF EXCESS EXCAVATION

All excavated material in excess of that needed for backfill or that material classified as unsuitable by the Township, shall be disposed of by the Contractor and shall be incidental to the major items of work. However, the Township reserves the right to direct the Contractor to haul all or a portion of the material not required for backfilling

to an area designated by the Township which is not more than 1,000 feet outside the project and which is reasonably accessible.

2.11 LIMITATIONS ON OPERATIONS

The Contractor shall at all times conduct his work so that there is a minimum of inconvenience to the residents and businesses in the vicinity of the project. To this end, he shall complete his backfill and remove all debris and unsuitable backfill to a point as close to the actual pipe installation as is practical and keep the area where the pipe construction and backfill has been completed in a neat condition. Open excavations shall be protected by signs, lights, barricades, and/or fences at all times when work is not actually taking place at that excavation. The placement of excavated earth along the line of the trench shall be controlled by the use made of the street or right-of-way by the public and shall always be confined to approved limits.

Not more than 300 consecutive feet of street shall be closed at one time, and vehicular traffic through any street shall not be stopped for a period longer than two weeks without the written permission of the Township. Not more than one cross street shall be closed to vehicular traffic at the same time except by permission of the Township.

2.12 SOIL EROSION AND SEDIMENTATION CONTROL

The Contractor shall conduct his operations in such a manner that all soil is confined within the project limits and prevented from entering storm sewers, water courses, rivers, lakes, reservoirs, or wetlands.

The Contractor shall place a filter or barrier composed of straw, stone or other approved material around all catch basins or other inlets to the storm sewer or drainage courses to prevent sedimentation in these structures. After the construction operations are completed, the Contractor shall remove these filters and clean all the sediment and debris from the catch basins, ditches, or other storm sewer structures.

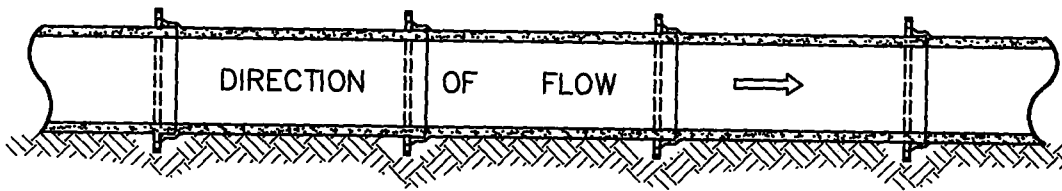
Soil erosion and sedimentation control measures if indicated on the plans are considered as minimum requirements and are not to be considered as complete and all-inclusive. Additional control measures as may be required due to circumstances or conditions at the time of construction or as directed by the Kent County Road Commission, or the designated Soil Erosion Control agency, shall be placed as required to insure conformance with the Part 91 of PA 451 of 1994. Deviations from or additions to the erosion control measures shown on the plan shall be subject to the approval of the Township or enforcing agency.

The cost of this work and other control measures which may be required or directed by the Township shall be incidental to the cost of the project unless specific items have been provided in the proposal.

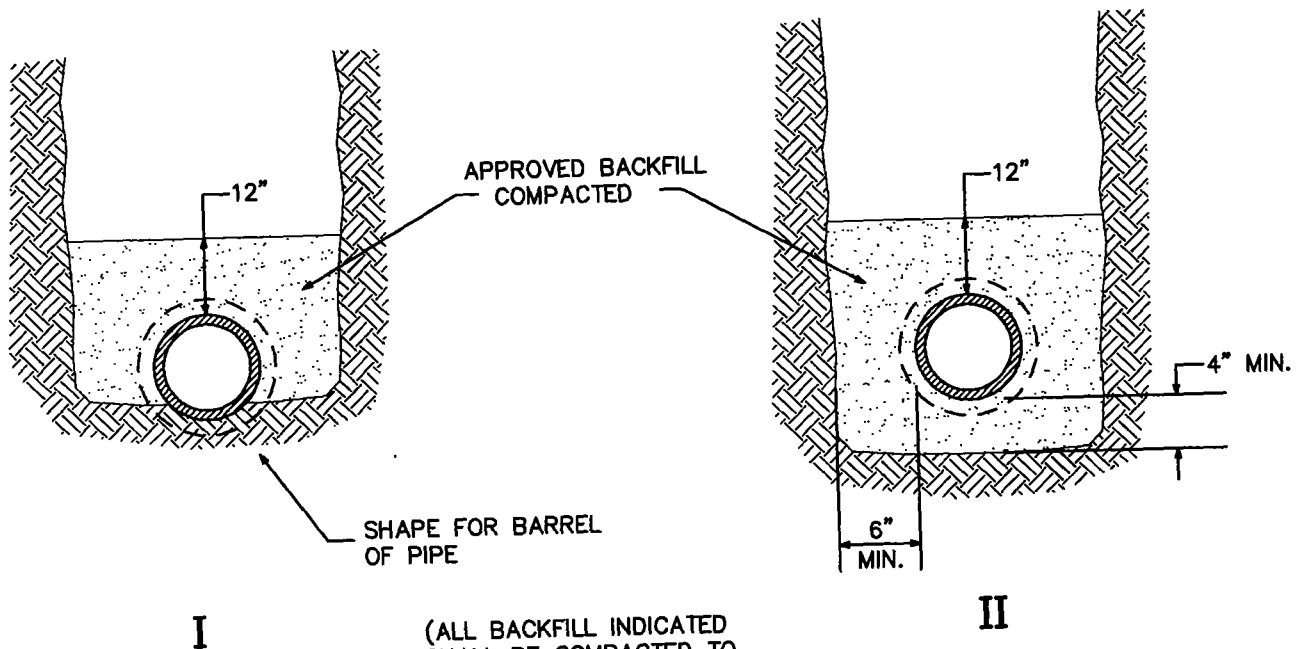
2.13**STREAM CROSSINGS**

The rules and regulations concerning Inland Lakes and Streams Part 301 of Act 451, shall govern all stream and river crossings. Three (3) feet of cover to top of pipe (depth below firm bottom) shall be required.





EXCAVATION FOR BELLS



(ALL BACKFILL INDICATED
SHALL BE COMPACTED TO
95% OF MAX. DENSITY IN
ACCORDANCE WITH
M.D.O.T. PROCEDURES)

NOTE:

1. METHOD I SHALL BE USED IN AREAS OF UNCONSOLIDATED SOILS. (SAND, GRAVEL, & ETC.)
2. METHOD II SHALL BE USED IN AREAS OF CONSOLIDATED SOILS. (CLAY, HARDPAN, ROCK, & ETC.)

CLASS B PIPE EMBEDMENT

6/09

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SECTION 3

SPECIFICATIONS FOR SURFACE RESTORATION

3.01 GENERAL

All areas within existing rights-of-way and adjacent areas disturbed by construction operations shall be restored to the original condition thereof as determined by the Township using information from plans, surveys, and photographs or video tapes when available.

3.02 GRADING

All existing streets, walks, and other improved surfaces disturbed by construction operations shall be replaced to uniform lines and grades established by the Owners Engineer. The finish grade line will be established within three (3) inches of the existing ground profile shown on the plans unless a proposed grade is shown which indicates otherwise.

The Contractor shall perform all grading, compacting, shaping, and related work required to prepare the subgrade to the satisfaction of the Township. The cost for preparing the subgrade as specified herein shall be incidental to the cost of the project, and no specific payment will be made therefore.

3.03 ROADWAY EARTHWORK AND SUBBASE

A. Roadway Earthwork

Unless otherwise specified or shown on the Plans, roadway earthwork shall conform to the Section 205 of the current MDOT Standard Specifications. Roadway Embankment unless otherwise specified, shall be suitable granular material salvaged from the project or contractor furnished borrow. The material shall be granular material Class II or III as specified in the current MDOT Standard Specifications.

B. Subbase

Unless otherwise specified or shown on the Plans, subbase shall conform to Section 301 of the current MDOT Standard Specifications. A minimum of Class II 15" sand subbase is required on local residential roads and 18" sand subbase is required on industrial, commercial, primary and major arterial roads.

3.04

ROADWAY REPLACEMENT SPECIFICATIONS

A. Replacement for Crossing Existing Streets

330# square yard (165#/s.y. MDOT 3C, 165#/s.y. MDOT 4C, 2 lifts with bond coat) with 8" MDOT 22A gravel base. The gravel shall be placed upon completion of the utility installation. In clay areas a twelve (12) inch sand sub-base is also required.

B. Requirements for Open Cut Streets

- 1) Absolutely no open cut of pavement will be allowed without proper notification and required permits written.
- 2) Pavement shall be cut back so that patch is six (6) inches wider than trench opening.
- 3) Edges of existing blacktop will be saw cut perpendicular to centerline.
- 4) Local and subdivision streets will be blacktop based within 24 hours.
 - a) 22A gravel base four (4) feet wider than the bituminous pavement.
 - b) Construction signs must remain until the top course is placed.
- 5) Primary and arterial streets will be blacktop based the same day of construction.
 - a) 22A gravel base, ten (10) feet wider than bituminous pavement.
 - b) Construction signs will be erected and will remain until cleanup is completed.

All work within existing rights-of-way requires that the Contractor obtain a permit from the Kent County Road Commission.

Deviations from this policy will only be considered when it can be demonstrated there would be no adverse effect on the traveling public. In this case the Contractor will provide maintenance at adequate intervals guaranteeing a smooth crossing. Should this become deficient in any way the bituminous patch will be ordered in immediately.

3.05

CONSTRUCTION OF BITUMINOUS STREETS

Bituminous streets shall be constructed in accordance with the typical section shown on the plans. All work shall be in accordance with the Kent County Road Commission Standards.

3.05.01 Materials

Aggregate base for bituminous streets shall meet the requirements of 22A in Section 902 of the current MDOT Standard Specifications. Bituminous mixtures for base, leveling, and surface courses shall be as specified, and shall conform to the requirements of Section 501 of the current MDOT Standard Specifications. Materials for prime coat and bond coat shall be as specified in Section 502 of the current MDOT Standard Specifications.

3.05.02 Construction Methods

Aggregate base for bituminous streets shall be placed in accordance with Section 302 of the current MDOT Standard Specifications.

Bituminous mixtures shall be placed in accordance with the applicable portions of Section 501 of the current MDOT Standard Specifications. For placement of valley gutters, pavers shall be equipped with an extension to the vibrating screed adjustable to fit the typical section shown on the plans.

The Contractor shall not place the aggregate base course until the subgrade has been approved by the Kent County Road Commission. The Contractor shall not place the first bituminous course and each successive bituminous course until the underlying aggregate or bituminous course has been approved by the Kent County Road Commission.

**3.06 REPLACEMENT OF CONCRETE AND BITUMINOUS IMPROVEMENTS
(other than roadways)**

The Contractor shall replace all concrete sidewalks, drives, curb and gutter, and pavement removed during the installation of the utility or damaged by the Contractor.

3.06.01 Materials

Concrete sidewalks and driveways shall conform to 1996 MDOT Specifications Section 803. Concrete is to be six sack limestone mix and shall be air entrained.

3.06.02 Construction Methods

The thickness of the concrete shall be the same as the concrete adjacent to the trench but shall not be less than four (4) inches. The alignment and grade and the contour and finish of the surface shall be the same as the concrete adjacent to the trench unless otherwise directed by the Township.

Pavements, walks, and drives shall be sawed at the edges of the trench or removed to existing joints. The depth of the saw cut shall not be less than the full depth of the concrete.

The forms and joints and the methods of placing, curing, and protection shall be consistent with standard practice and shall meet all the requirements of the current MDOT Standard Specifications for the various items.

3.06.03 Bituminous Driveway and Sidewalk Replacement

Bituminous driveway and sidewalk replacement shall be replaced at a thickness equal to the existing at the trench but not less than one and one-half (1 ½) inches of MDOT 13A bituminous base and one (1) inch of MDOT 36A bituminous top over six (6) inches of MDOT 22A gravel compacted in place.

3.06.04 Gravel Driveway Replacement

Gravel driveways disturbed during construction shall be replaced with six (6) inches of MDOT 22A compacted in place.

3.07 TURF RESTORATION

All areas of established turf shall be replaced as nearly as possible to their original condition.

3.07.01 Topsoil

Topsoil shall be placed four (4) inches in depth over all areas disturbed by the Contractor's operations. The subgrade shall be graded to conform to the adjacent contours prior to placement of the topsoil and shall be approved by the Township prior to placing topsoil. The topsoil shall then be placed in accordance with Section 816 of the current MDOT Standard Specifications.

Existing topsoil, where available and suitable, shall be stripped, salvaged, and used for replacement. The soil shall consist of natural loam topsoil and shall be of uniform quality, free from hard clods, stones, and all other undesirable material. The soil shall contain not less than three (3%) percent organic matter. The acidity range shall be between PH 5.0 and PH 8.0. New topsoil will be required where the existing topsoil does not meet the above specifications.

3.07.02 Fertilizer

After the topsoil has been placed, it shall be fertilized with a good grade of chemical fertilizer at the rate of two (2) pounds of available nitrogen per 1,000 square feet. Fertilizer shall be applied just before the placing of the seed to retain its full benefit before unfavorable weather can cause deterioration.

3.07.03 Seeding

All lawn areas to be seeded shall be seeded with Class A seed. Other areas disturbed by the Contractor's operations shall be seeded with Roadside seed. Seed mixtures,

application rates, and methods shall be in accordance with Section 816 of the current MDOT Specifications.

Seasonal limitations on seeding in Section 816 of the MDOT Standard Specifications are waived. The Contractor shall repeat the seeding procedure as often as necessary to produce a close stand of weed-free grass.

3.07.04 Mulching

All seeded areas shall be mulched immediately following the seeding. Mulching shall be applied to all newly seeded areas at a rate of two (2) tons per acre in accordance with the requirements of Section 816 of the current MDOT Standard Specifications.

3.07.05 Hydro Application

All fertilizing, seeding and mulching shall be applied by an approved Hydro seeding and mulching process unless separate applications as heretofore described are approved by the Township. Separate loose straw mulch is prohibited on residential lawn areas.

3.07.06 Sod

Sod shall be placed only where required by the Township or as noted on the plans or specifications.

All sod shall be nursery grown, conforming to MDOT requirements for Class A. Sod shall be approved by the Township prior to placing and shall be placed in accordance with the requirements of Section 816 of the current MDOT Specifications. The base on which the sod is to be laid shall consist of a minimum of four (4) inches of topsoil placed and fertilized in the same manner required for seeding.

3.08 TREE/BUSH REPLACEMENT

Replacement trees and bushes shall be the size and type specified in the Proposal. Transplanting replacement trees/bushes shall be in accordance with Michigan Department of Transportation Specifications 815 "Landscaping". The Contractor shall replace transplanted trees/bushes that are not in a vigorous growing condition one year after transplanting. Unless otherwise noted, tree/bush replacement is a pay item unless unnecessarily removed by the Contractor through carelessness.

3.09 SEWER LATERALS/WATER SERVICE TRENCH RESTORATION

Sewer lateral and water service trench restoration shall be repaired and replaced as often as necessary until settlement has stopped.

3.10 SCHEDULING OF RESTORATION WORK

Initial restoration (rough grading, temporary aggregate if necessary, removal of excess excavated material and debris) shall be done each day to the extent necessary to allow the movement of local traffic and permit access to all properties for emergency vehicles. Maintenance of streets, drives, sidewalks, etc. shall be the responsibility of the Contractor (including dust control, grading, stabilization, etc.) until the restoration is complete and has been accepted by the Township.

Restoration of each street or section of utility line shall follow the construction in a timely fashion so as to minimize inconvenience to the adjacent property owners and the general public. The manner in which this restoration is done by the Contractor will be a determining factor in the approval by the Owners Engineer of staking requests and partial payment requests.

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Existing topsoil, where available and suitable, shall be stripped, salvaged, and used for replacement. The soil shall consist of natural loam topsoil and shall be of uniform quality, free from hard clods, stones, and all other undesirable material. The soil shall contain not less than three (3%) percent organic matter. The acidity range shall be between PH 5.0 and PH 8.0. New topsoil will be required where the existing topsoil does not meet the above specifications.

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3.07.03 Seeding

All lawn areas to be seeded shall be seeded with Class A seed. Other areas disturbed by the Contractor's operations shall be seeded with Roadside seed. Seed mixtures,

application rates, and methods shall be in accordance with Section 816 of the current MDOT Specifications.

Seasonal limitations on seeding in Section 816 of the MDOT Standard Specifications are waived. The Contractor shall repeat the seeding procedure as often as necessary to produce a close stand of weed-free grass.

3.07.04 Mulching

All seeded areas shall be mulched immediately following the seeding. Mulching shall be applied to all newly seeded areas at a rate of two (2) tons per acre in accordance with the requirements of Section 816 of the current MDOT Standard Specifications.

3.07.05 Hydro Application

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3.07.06 Sod

Sod shall be placed only where required by the Township or as noted on the plans or specifications.

All sod shall be nursery grown, conforming to MDOT requirements for Class A. Sod shall be approved by the Township prior to placing and shall be placed in accordance with the requirements of Section 816 of the current MDOT Specifications. The base on which the sod is to be laid shall consist of a minimum of four (4) inches of topsoil placed and fertilized in the same manner required for seeding.

3.08 TREE/BUSH REPLACEMENT

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Restoration of each street or section of utility line shall follow the construction in a timely fashion so as to minimize inconvenience to the adjacent property owners and the general public. The manner in which this restoration is done by the Contractor will be a determining factor in the approval by the Owners Engineer of staking requests and partial payment requests.

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SECTION 4

SPECIFICATIONS FOR WATERMAINS AND WATER SERVICES

4.01 DESCRIPTION OF WORK

The work shall consist of furnishing and installing watermain of the specified size or sizes at the depths shown on the plans or specified herein, and furnishing all fittings and joint material, labor, materials, tools, and equipment for receiving, unloading, transporting, laying, testing, and disinfecting of water pipe and fittings. The Contractor shall furnish all hydrants, valves, valve boxes and other necessary accessories to complete the pipe work as shown on the plans and specified herein.

4.02 MATERIALS

All materials furnished by the Contractor shall conform to the specifications which follow. Where reference specifications are mentioned the current edition or latest issue shall be used.

4.02.01 Pipe

4.02.01.01 Ductile Iron Pipe

Ductile iron pipe shall conform to the requirements of AWWA C-151 (ANSI A21.51). Ductile iron pipe shall be Class 53 unless otherwise specified. Eight (8) inch is the minimum diameter for mainline pipe.

4.02.01.02 Fittings

All fittings shall be ductile iron in accordance with AWWA C-153 (ANSI A21.53). Fittings twenty four (24) inches in diameter and smaller shall have a minimum pressure rating of 350 psi., fittings larger than twenty four (24) inches in diameter shall have a minimum pressure rating of 250 psi. Fittings shall have either cement mortar lining with seal coat in accordance with AWWA C-104 (ANSI A21.4) or fusion bonded epoxy coating in accordance with AWWA C-116 (ANSI A21.6). Lining shall have NSF61 approval for use with potable water. All watermain fittings must be produced in the United States of America.

4.02.01.03 Joints

Unless otherwise specified, all pipe joints shall be rubber gasket joints conforming to the requirements of AWWA C-111 (ANSI A21.11) for bolted mechanical joints or push-on joints. Joints on fittings shall be bolted mechanical joints. (See 4.10.04 for brass wedging requirements)

4.02.01.04 Cement Lining

All pipe shall have a cement mortar lining with seal coat conforming to the requirements of AWWA C-104 (ANSI A21.4). Seal coat shall have NSF61 approval for use with potable water.

4.02.01.05 Polyethylene Wrap

When laying pipe in corrosive type soils as determined by the Byron / Gaines Utility Authority, the pipe shall be encased in a seamless polyethylene tube, in accordance with AWWA C-105 (ANSI A21.5) 8 mills minimum thickness. The ends of adjacent sections of polyethylene tubing shall be overlapped a minimum of one (1) foot, and the joint taped or otherwise secured to prevent displacement during backfill operations.

4.02.02 Valves

4.02.02.01 Resilient Wedge Gate Valves

All valves 4"-16" shall be resilient wedge gate valves. All watermain valves must be produced in the United States of America.

Valves shall be Traverse City Iron Works, East Jordan Iron Works, Clow Corporation R/W Resilient Wedge, Waterous Resilient wedge, U.S. Pipe Metroseal 250, American AVK Company Series 25, or equal (Resilient Wedge valves shall conform to AWWA C-509 or C515-99). Valves will open right or clockwise.

Valves shall have a 250 p.s.i. design pressure rating and a test pressure of 500 p.s.i. A certification of manufacturer and testing shall be provided on request. Valve body and bonnet shall be totally encapsulated with an epoxy coating.

Gate shall be ductile iron and shall be totally encapsulated in rubber. This rubber coating shall be permanently bonded to the ductile iron wedge casting and shall meet A.S.T.M. D429 tests for rubber to metal bonding.

Valve stem shall be made of high strength manganese bronze.

Stem seal shall have two O-ring seals in the seal plate which shall be replaceable with the valve in the full open position at rated working pressure.

4.02.02.02 Tapping Sleeves

Tapping sleeves shall be stainless steel, Ford FAST, Smith-Blair 662, Romac Industries SST or Power Seal Model 3480, with coated carbon steel or ductile iron flange, or approved equal.

4.02.02.03 Butterfly Valves

All valves larger than 16" shall be Butterfly Valves.

All butterfly valves shall conform to AWWA C-504, Standard for Rubber Seated Butterfly Valves. Valves shall be Class 150-B and shall have a "short body" form. Valves suitable for buried service will be acceptable without a manhole. Valves shall be constructed of material suitable for handling water. Shaft seals shall be replaceable without removing the valve shaft. Valves shall be equipped with totally enclosed worm gear operators conforming to AWWA C-504. All valves shall be Henry Pratt Company "Groundhog", or approved equal. Valves will open right or clockwise. All watermain valves must be produced in the United States of America.

4.02.03 Hydrants

Fire hydrants shall conform to AWWA C-502, Standard for Dry Barrel Fire Hydrants. The six (6) inch mechanical joint inlet shall be located five feet six inches (5'6") below the ground bury line of the hydrant. Hydrants shall be installed so that the ground bury line of the hydrant is placed at the finished grade at the hydrant. The center of the pumper nozzle is to be a minimum distance of eighteen (18) inches above the ground bury line. Access culverts (where required) shall be installed. Joint materials shall conform to those previously specified under ductile iron joints.

The hydrant shall have a 5 ¼" valve opening. The operating nut and nozzle caps shall have a 1 ¾" square by 1" thick section for the wrench. The nozzle caps shall have a suitable rubber-like gasket. The hydrants shall open right or clockwise. Hydrants shall be furnished with a breakable stem and flange. The pumper connection shall be four (4) inches with E.J.I.W. #2 threads (Grand Rapids thread standard), and there shall be two, two and one-half (2 1/2) inch nozzles with national standard male hose coupling threads. The hydrants shall be East Jordan Iron Works 5BR -250 D with liner, Waterous Pacer, or approved equal.

All hydrants must be produced in the United States of America.

All Hydrants shall be factory painted fire – engine red enamel.

Hydrants shall be located at all highpoints of the watermain and so that all points of buildings served by the watermain project are within 250 feet of a hydrant.

4.02.04 Valve Boxes

Valve boxes shall be cast iron screw type, three sectional, adjustable with round bases, with an overall length sufficient to permit the tops to be set flush with the established pavement or ground surface. The box shall be provided with a cast iron lid or cover and marked with the word "WATER". The valve boxes shall be designed to withstand heavy traffic. Valve Boxes shall be EJIW 8560-D4 or Tyler 6860 with 5" minimum inside diameter. Valve boxes shall be placed on a concrete ring as shown on the Valve & Box Foundation detail.

4.02.05 Stainless Steel

Stainless steel components shall meet the specifications of A.S.T.M. type 304.

4.03 WATER SERVICES

Connection to the water supply system and use of the water supply system is governed by the Township ordinance to administer, regulate, and provide for the connection to and use of the water and sewer system. See this Ordinance for regulations governing use of the water supply system and penalties for violation of the Ordinance. Application forms and permits for connection are available at the Township office. These forms will provide for payment of the connection fees at the time request is made for service.

Meter and service sizes must be approved by the Township as suitable for the proposed application.

The Byron / Gaines Utility Authority or an authorized representative must inspect all water services in dry conditions under pressure prior to backfill. Temperatures must be above freezing. Inspections can be scheduled by calling the Byron / Gaines Utility Authority a minimum of 24 hours prior to the time an inspection is needed. Inspection times are scheduled on a first come basis. A permit number and building street address are required to schedule an inspection.

Outside of public rights-of-way and easements the customer shall construct, own and maintain the water line at his expense in its entirety.

Water services in the Townships are to be installed in accordance with the following specifications:

4.03.01 Materials

4.03.01.01 Curb Boxes

Curb Boxes shall be Tyler Series 6500, Model 95E (5'-6" bury exactly) or an approved equal having a minimum diameter of 2-1/2" and a brass bolt to connect the lid. The lids of all boxes shall be marked with the word "Water" or the letter "W". (No rods are required) The curb box shall be centered over the curb cock (normally to be set on the property line or easement line) and must be plumb after backfilling. The tops of curb boxes are to be left 6" above finish grade. Stakes for finish grade at the curb stop must be provided if requested.

4.03.01.02 Curb Stops

Curb stops shall be Ball Valves: Ford B22 or B44 Series, McDonald Model No. 6100 or Mueller Series 300 Model B-25204 or Model P25209, with flared or compression fittings, or approved equal. The curb stop shall normally be set on the property line or easement line. The curb stop shall be installed on an approved curb box foot piece,

block, or brick support so that the valve can be operated normally after backfilling. The service shall be sealed shut using a brass union, w/ copper disc and plug.

4.03.01.03 Corporation Stops

Corporation stops shall be Ball Valves: Ford FB600 or FB 1000, McDonald Model 4701B, or Mueller Series 300 Model B-25000 or Model P-25008, with flared or compression fittings or approved equal.

4.03.01.04 Valve Boxes and Valves

Valve boxes and Valves shall meet the requirements of 4.02.04 and 4.02.02.01. Valves for services shall normally be set on the property line or easement line.

4.03.01.05 Copper to Copper Connections

Copper to copper connections shall be Mueller No. 15404 or 15403, Ford C22 or C44 Series, McDonald Model No. 4758, or Hays No. 5615, with flared or compression fittings, or approved equal.

Within public right-of-way and public watermain easements copper to copper connections will not be allowed between a corporation stop and curb stop unless lengths of copper between the corporation stop and curb stop exceeds 100' for 1" diameter copper tubing or 60' for 1 ½" and 2" diameter copper tubing.

Copper to copper connections may not be placed under the influence of pavement.

4.03.01.06 Public Water Service Pipe (within public utility easements and right-of-way)

Water service pipe two inches and smaller in diameter (1" minimum diameter) shall be Type K, annealed, seamless copper tubing in accordance with the current ASTM specification B88. All fittings and joints to be drip free at time of inspection.

Pipe 4" and larger shall be cement lined Ductile Iron Class 53 pipe. All materials, inspections, pressure testing, and bacteria sampling must be provided in accordance with the watermain mainline specifications for ductile iron pipe.

4.03.01.07 Private Service Line Pipe (outside of public utility easements and right-of-way)

All private Service Line pipe, unless otherwise specified, shall be of the materials specified in Paragraph 4.03.01.06.

4.03.02 Installation

4.03.02.01 Tapping

Locations for taps will be determined by the Byron / Gaines Utility Authority and / or the Township. For new developments this will be at the center of the lot. All water services will be installed perpendicular to the watermain and outside of paved areas unless special circumstances warrant the Byron / Gaines Utility Authority and /or the Township to authorize differently.

Tapping of the mains for copper water services shall be made under pressure with a tapping machine similar to Hays No. B-1, or Mueller B-100. For services 1 ½" services and larger, saddles are to be used for connecting the water service to the main. Drilling through service clamps, saddles or welded couplings shall be performed with a machine similar to Mueller D-5. The tap shall be installed 45 degrees above the horizontal axis of the pipe, and flow arrow shall point away from the main. The contractor shall keep and accurate record of measurements from the nearest valve or hydrant to each corporation or other connection to the main.

Tapping of the mains for ductile iron water services shall be made under pressure in accordance with the watermain mainline specifications.

4.03.02.02 Pavement Crossing

Service lines shall be jacked or bored across pavements. No pavement shall be cut or removed without permission by the Township and the Road Commission in which the service is located.

4.03.02.03 Cover

All services shall be installed with a minimum earth cover of five (5) feet. In no case shall the maximum earth cover exceed seven (7) feet.

4.03.02.04 Curb Box Locations

Curb Boxes shall be located on the right-of-way line or on the utility easement limit.

4.03.02.05 Surface Restoration

Restoration required for the installation of the water service is the responsibility of the water service contractor.

4.03.02.06 Dewatering

All taps must be made in a dry trench.

4.03.02.07 Polywrap/Coating Repairs

All disturbed polywrap/coatings shall be repaired/replaced to provide the required protection to the mainline watermain.

4.03.03 Meters

A. Installation:

All meters must be installed at the expense of the customer.

All meters must be located at the point of the water service entrance into the building.

New Meters must be installed 18" above the finish floor and be placed horizontally and according to the manufacturer's specifications.

Valves must be installed immediately upstream and downstream of each meter.

Meters may not be installed in pits. On a case by case basis, the Byron and Gaines Utility Authority may allow the placement of meters in meter boxes.

Meter by-pass piping and valves are prohibited, except as provided for in this section. A commercial or industrial customer may submit a written request to install water meter by-pass piping and valves. The request shall explain why installation of water meter by-pass piping is necessary. The Township Water and Sewer Advisory Committee may approve water meter by-pass piping if it determines, in its discretion, that it is necessary for the protection of equipment and public health. In some cases a gap in the by-pass piping will be required. The Township and/or Byron Gaines Utility Authority will maintain in inventory various spool pieces which may be inserted into the gap while necessary repairs are made to the Water Meter or associated plumbing.

B. Accessibility:

All meters must be placed in a location readily accessible to Township and Byron / Gaines Utility Authority personnel.

Crawl space installations must be approved by the Township prior to service installation.

When more than one meter is installed in a building for metering of tenant spaces, piping and meter configurations must be approved prior to installation and separate shut-offs, accessible to the Township, must be provided.

Customers must provide a chaseway (access way) for installation of the remote wire from the water meter to the outside of the building as necessary.

C. Protection:

Meters and equipment must be protected from freezing and other damaging elements.

D. Fittings:

All pipe and fittings prior to metering must be Class 53 cement-lined Ductile Iron, copper or brass.

The Water Department typically will elect to furnish meter horns and/or meter bars and inside fittings for installation by the property owner or his plumber, the cost of which will be included with the connection fees. Byron / Gaines Utility Authority personnel will install the meter and remote reader to the outside of the structure with a wire running to the meter as necessary.

E. Ownership:

All meters shall remain the property of the Township.

All meters shall be furnished by the Township, the cost of which will be passed on to the customer and included in the connection fees.

4.04 INSPECTION

4.04.01 Shop Inspection

All materials furnished by the Contractor are subject, at the discretion of the Township to inspection and approval at the Manufacturer's plant. All inspection in the plant of the manufacturer of materials furnished by the Contractor shall be made at the expense of the Township. If the materials are defective, the Contractor shall pay for costs for replacing the defective materials and for inspection, both for installation and visit at the manufacturer's plant.

4.04.02 Field Inspection

All pipe and accessories shall be laid, joined, and tested under pressure for defects and leakage in the manner specified herein and in the presence of, and as approved by the Township.

4.04.03 Disposition of Defective Material

All material found during the progress of the work to have cracks, flaws, or other defects shall be rejected by the Township. All defective materials furnished by the Contractor shall be promptly removed by him from the site.

4.05 RESPONSIBILITY FOR MATERIAL

4.05.01 Responsibility for Material Furnished by Contractor

The Contractor shall be responsible for all material furnished by him and shall replace at his own expense all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all material and labor required for the replacement of installed material discovered prior to the final acceptance of the work.

4.05.02 Responsibility for Safe Storage

The Contractor shall be responsible for the safe storage of material furnished by or to him, and accepted by him, and intended for the work, until it has been incorporated in the completed project. The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

4.05.03 Replacement of Damaged Material

Any material that becomes damaged after acceptance by the Contractor shall be replaced by the Contractor at his own expense.

4.06 HANDLING OF MATERIAL

The Contractor shall use care and proper equipment during the unloading and distribution of watermain materials on the job site to insure the materials are not damaged.

Pipe and/or fittings shall not be rolled or skidded off the truck beds against previously unloaded materials.

4.07 ALIGNMENT AND GRADE

4.07.01 General

The watermain shall be laid and maintained to the required lines and grades with fittings, valves, and hydrants at the required locations and all valve and hydrant stems plumb.

4.07.02 Deviations Occasioned by Other Structures

Whenever obstructions not shown on the plans are encountered during the progress of the work and interfere to such an extent that an alteration in the plans is required, the Township shall have the authority to change the plans and order a deviation from the line and grade or arrange with the Owners of the structures for the removal, relocation, or reconstruction of the obstructions. If the change in plans results in a change in the

amount of work by the Contractor, such altered work shall be done by a written field order.

4.07.03 Depth of Pipe

All pipe shall be laid with the top of the pipe a minimum depth of five (5) feet below established street centerline grade, and with a minimum cover of five (5) feet below existing grade at the watermain, unless specified otherwise. watermain eight (8) inches and larger shall be laid to a specified grade. Generally watermain eight (8) inches and larger shall have a depth of 5 feet 9 inches below proposed centerline of the street or the existing ground to centerline pipe unless specified on the plans or approved by the Byron / Gaines Authority. Maximum depth of cover to be nine (9) feet.

4.07.04 Grade Stakes

Grade stakes for the watermain will be required at a minimum of every 100 feet and at all fittings, valves, and deflection points.

4.08 LAYING

4.08.01 Lowering of Watermain Material into Trench

Proper implements, tools, and facilities shall be provided and used by the Contractor for the safe and expedient completion of the work. All pipe fittings, valves, and hydrants shall be carefully lowered into the trench by means of suitable tools or equipment, in such a manner as to prevent damage to watermain material and protective coatings and linings. Under no circumstances shall watermain materials be dropped or dumped into the trench.

If damage occurs to any pipe, fittings, valves, hydrants, or watermain accessories in handling, the damage shall be immediately brought to the Township's attention. The Township shall prescribe corrective repairs or rejection of the damaged items.

4.08.02 Inspection before Installation

All pipe and fittings shall be carefully examined for cracks and other defects while suspended above the trench immediately before installation in final position. Spigot ends shall be examined with particular care as this area is the most vulnerable to damage from handling. Defective pipe or fittings shall be laid aside for inspection by the Township, who will prescribe corrective repairs or rejection.

4.08.03 Cleaning of Pipe and Fittings

All lumps, blisters, and excess coating shall be removed from the bell and spigot end of each pipe, and the outside of the spigot and the inside of the bell shall be wire brushed and wiped clean and dry and free from oil and grease before the pipe is laid.

4.08.04 Laying of Pipe

All dirt or other foreign material shall be removed from the inside of the pipe before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after laying. No tools or other articles shall be stored in the pipe at any time.

As each length of pipe is placed in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Precautions shall be taken to prevent dirt from entering the joint space.

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

• 4.08.05 Cutting of Pipe and Connections to Existing Watermains

The Byron / Gaines Utility Authority shall be notified in writing prior to any valves being operated on the portion of water supply system operated by the Township. No such valves shall be operated by the Contractor unless authorized in writing by the Byron / Gaines Utility Authority.

The Contractor shall cut the pipe in a straight and uniform manner, at right angles to the axis of the pipe, wherever necessary for placing valves, fittings, or closure pieces without damage to the pipe, and without extra cost to the Owner. The cut ends of the pipe shall be beveled before assembly of the joint.

The method of cutting pipe shall be subject to the approval of the Township.

Connection to existing mains shall be done at a time when it will least interfere with normal use of the main. The Contractor shall be responsible for draining water from the closed off section of the existing main so that the connection can be made.

The Contractor shall uncover existing mains at points of connection sufficiently in advance of making the connection to allow verification of the dimensions of the existing main and shall make any revisions required to the fitting, or obtain special adaptors required for the connection. Existing pipe lines shall be adequately supported during the connection operation and prior to placement of backfill.

The Contractor shall be responsible for preventing contamination of existing watermains while the connection is made. He shall be responsible for any damage caused by his operations to existing mains to which the connections are being made.

4.08.06 Bell Ends to Face Direction of Laying

Pipe shall be laid with bell ends facing in the direction of laying, unless directed otherwise by the Township. Where pipe is laid on a grade of 10 percent or greater, the laying shall start at the bottom and shall proceed upward with the bell ends of the pipe upgrade.

4.08.07 Ductile/Cast Iron Sleeves

In connecting ductile/cast iron pipe together with a ductile iron sleeve, the space between adjoining ductile/cast iron pipes shall not exceed one (1) inch. Where the space between adjoining ductile/cast iron pipe exceeds one (1) inch, a spacer shall be placed to fill the space. The spacer shall be a piece of ductile iron pipe of the same diameter and class as the adjoining pipe, and shall be cut straight and uniform and be free of defects and damage.

4.09 JOINING OF MECHANICAL - JOINT PIPE

4.09.01 General Requirements

The general requirements in Section 4.04 - 4.08 inclusive shall apply, except that where the terms "bell" and "spigot" are there used, they shall be considered to refer to the bell and spigot ends of the lengths of mechanical-joint pipe.

4.09.02 Cleaning and Assembly of Joint

The last eight (8) inches outside of the spigot and inside of the bell of mechanical- joint pipe shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter from the joint and then coated with a lubricant. The gasket lubricant shall be non-toxic, tasteless, and odorless, and shall be as supplied or recommended by the pipe manufacturer and approved by the Township. The Mega-lug restraint shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket, or bell, end. The rubber gasket shall be coated with lubricant and placed on the spigot end with the thick edge toward the Mega-lug.

4.09.03 Bolting of Joint

The entire section of the pipe shall be pushed forward to seat the spigot end in the bell. The gasket shall then be pressed into place within the bell; care shall be taken to locate the gasket evenly around the entire joint. The Mega-lug restraint shall be moved along the pipe into position for bolting, all of the bolts inserted, and the nuts screwed up tightly with the fingers. All nuts shall be tightened with a suitable (preferably torque-limiting) wrench. The torque for various sizes of bolts shall be as follows:

<u>Size</u> Inches	<u>Range of Torque</u> Foot - Pounds
5/8	45 - 60
3/4	75 - 90
1	100 - 120
1-1/4	120 - 150

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland. When tightening bolts it is essential that the Mega-lug be brought up toward the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This may be done by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, and last, the remaining bolts. Repeat this cycle until all bolts are within the above range or torques. If effective sealing is not attained at the maximum torque indicated above, the joint should be disassembled and reassembled after thorough cleaning. Over stressing of bolts to compensate for poor installation practice is not allowed.

4.09.04 Permissible Deflection in Mechanical-Joint Pipe

Whenever it is desirable to deflect mechanical-joint pipe in order to form a long-radius curve, the amount of deflection shall not exceed the maximum limits shown in Table 1.

TABLE 1

PERMISSIBLE DEFLECTIONS IN MECHANICAL - JOINT PIPE

Size of Pipe Inches	Max. Permissible Deflection Per Length - Inches				Approx. Radius of Curve Produced By Succession of Joints – Feet			
	12'	16'	18'	20'	12'	16'	18'	20'
3	21	28	31	35	85	110	125	140
4	21	28	31	35	85	110	125	140
6	18	24	27	30	100	130	145	160
8	13	18	20	22	130	170	195	220
10	13	18	20	22	130	170	195	220
12	13	18	20	22	130	170	195	220
14	9	12	13.5	15	190	250	285	320
16	9	12	13.5	15	190	250	285	320
18	7.5	10	11	12	230	300	340	380
20	7.5	10	11	12	230	300	340	380
24	6	8	9	10	300	400	450	500
30	6	8	9	10	300	400	450	500
36	5	7	8	9	330	440	500	550
42	5	6	7.5	8	340	450	510	570
48	5	6	7.5	8	340	450	510	570

4.10 JOINING OF PUSH-ON JOINT PIPE

4.10.01 General Requirements

The general requirements in Section 4.04 - 4.08 inclusive shall apply except that, where the terms "bell" and "spigot" are there used, they shall be considered to refer to the bell and spigot ends of the lengths of push-on joint pipe.

4.10.02 Cleaning and Assembly of Joint

The inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter. The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the bell socket.

The thin film of gasket lubricant shall be applied to either the inside surface of the gasket or the spigot end of the pipe or both.

Gasket lubricant shall be non-toxic, tasteless, and odorless and shall be as supplied or recommended by the pipe manufacturer and approved by the Township.

The spigot end of the pipe shall be centered in the bell and forced or pushed home. Smaller sizes of pipe can be pushed or forced into place by hand; larger sizes will require the use of mechanical assistance.

The condition of the trench bottom must be such that correct location and position of the pipe to be joined is in a straight line assuring a joint of maximum tightness and permanent seal.

4.10.03 Permissible Deflection in Push-On Joint Pipe

Whenever it is desirable to deflect push-on joint pipe, in order to form a long radius curve, the amount of deflection shall not exceed the maximum limits shown in Table 2, unless recommended by the pipe manufacturer and approved by the Township.

TABLE 2

PERMISSIBLE DEFLECTIONS IN PUSH-ON JOINT PIPE

Size of Pipe Inches	Max. Permissible Deflection Per Length - Inches				Approx. Radius of Curve Produced By Succession of Joints - Feet			
	12'	16'	18'	20'	12'	16'	18'	20'
3	12	16.5	19	21	140	185	205	230
4	12	16.5	19	21	140	185	205	230
6	12	16.5	19	21	140	185	205	230
8	12	16.5	19	21	140	185	205	230
10	12	16.5	19	21	140	185	205	230
12	12	16.5	19	21	140	185	205	230
14	7.5	10	11	12	230	305	340	380
16	7.5	10	11	12	230	305	340	380
18	7.5	10	11	12	230	305	340	380
20	7.5	10	11	12	230	305	340	380
24	7.5	10	11	12	230	305	340	380
30	7.5	10	11	12	230	305	340	380
36	7.5	10	11	12	230	305	340	380
42	5	6.5	7.5	8	340	460	510	570
48	5	6.5	7.5	8	340	460	510	570

4.10.04 Brass Wedges

A minimum of two (2) Brass wedges are required for all push on joints.

4.11 SETTING OF VALVES AND FITTINGS

4.11.01 General Requirements

Valves, fittings, plugs, and caps shall be set and joined to pipe in the manner specified above for cleaning, laying and joining pipe.

4.11.02 Location of Valves

Valves in watermains shall, where possible, be located as shown on plans unless otherwise directed by the Township.

4.11.03 Valve Boxes

A valve box shall be provided for every valve. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished grade or such other level as may be directed. Valve boxes are to be left 6" above finish grade.

4.11.04 Dead Ends

All dead ends on new mains shall be closed with ductile iron plugs or caps; or where required by the Byron / Gaines Utility Authority, a hydrant will be placed at dead ends. Brass plugs will be required to plug tapped holes in ductile iron watermain plugs or caps that have been tapped for temporary standpipes.

4.12 SETTING OF HYDRANTS

4.12.01 Location

Hydrants shall be located as shown or as directed so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians. Maximum spacing between hydrants shall be five hundred (500) feet. Hydrants shall be located at all highpoints of the watermain and so that all points of buildings served by the watermain project are within 250 feet of a hydrant.

When placed behind the curb, unless otherwise directed, the hydrant barrel shall be set so that no portion of the pumper or hose nozzle cap will be less than two (2) feet from the face of the curb.

When set in the lawn space between the curb and the sidewalk, or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within six (6) inches of the sidewalk.

4.12.02 Position

All hydrants shall stand plumb and shall have their nozzles parallel with, or at right angles to, the curb, with the pumper nozzle facing the curb. The ground bury line of

the Hydrants shall be set to the established grade at the hydrant, with the center of nozzles a minimum of eighteen (18") inches above the ground at the hydrant, unless otherwise directed by the Township and/or Byron / Gaines Utility Authority.

4.12.03 Connection to Main

Each hydrant shall be connected to the main with a six (6) inch ductile iron branch controlled by an independent 6 inch gate valve, unless otherwise specified. All hydrant gate valves shall be open at the time of testing and remain open thereafter. The cost of the branch pipe shall be incidental to cost of installing the hydrant.

4.12.04 Hydrant Drainage

All hydrant drains and weep holes shall be left unplugged, except at the direction of the engineer in areas where there is a high ground water table or unsuitable or contaminated soils. One half cubic yards of pea gravel must be placed below the weep hole as shown on the hydrant detail.

4.12.05 Pumping of Hydrants

All hydrants shall be pumped completely dry as necessary when the watermain is placed in service.

4.12.06 Hydrant Signs

A Hydrant sign indicating the section number, hydrant number, and size of watermain to the hydrant shall be placed for all hydrant installations. The hydrant signs shall be purchased from Byron and Gaines Utility Authority at a cost of \$50.00 per sign. The Byron and Gaines Utility Authority will be responsible for placement of the signs.

4.13 ANCHORAGE

4.13.01 Restrained Joint Pipe

The use of restrained joint pipe shall be first approved by the Township. If approved, all ductile iron restrained joint pipe shall be Clow Corporation "Super-Lock"; American Ductile Iron Pipe "Lok-Ring Joint" or Flex-Ring Joint; Griffen Pipe Products Co. "Snap-Lok"; U.S. Pipe "TR Flex" or approved equal. All components of the restrained joint shall be as manufactured, supplied, or recommended by the manufacturer of the restrained joint pipe system actually installed. The Township will first encourage the use of EBAA Iron Sales Megalug or approved equal to restrain pipe.

4.13.02 Joint Restraining Glands

Joint restraining glands shall be Megalug as manufactured by EBAA Iron Sales, Inc. or approved equal.

4.13.03 Mechanical Joint Anchoring Fittings ("Swivel" Fittings)

Mechanical joint anchoring fittings shall be as manufactured by Clow Corporation, Tyler Corporation, or approved equal.

4.13.04 Anchorage for Hydrants

All hydrants shall be restrained to the hydrant lateral valve, and the hydrant lateral valve shall be restrained to the main using an approved joint restraint system consisting of joint restraining glands (Megalug), Mechanical Joint Anchoring Fittings, or approved equal.

4.13.05 Anchorage for Plugs, Caps, Tees, Bends and Valves

Unless otherwise specified or approved by the Township, movement of all plugs, caps, tees, bends, and valves shall be prevented by use of restrained joint pipe or joint Megalugs as manufactured by EBAA Iron Sales.

When joints are to be restrained with mechanical devices as noted above, all joints shall be restrained for a minimum distance from the fitting as required in the following table. All joints of watermain in casings are to be restrained.

Approval of restraining method and distances by the Engineer shall not relieve the contractor from their responsibility for the adequacy and limits of restraint.

PIPE RESTRAINT LENGTH REQUIRED, FEET

Pipe Diameter	Tees, 90° Bends	45° Bends	22-1/2° Bends	11-1/4° Bends	Dead Ends	Reducers (one size)	**
4"	23	9	5	2	57		
6"	32	13	6	3	82	43	63
8"	41	17	8	4	104	43	55
12"	58	24	12	6	149	80	120
16"	74	31	15	7	192	82	110
20"	89	37	18	9	233	82	104
24"	104	43	21	10	272	82	99
30"	123	51	25	12	328	115	148
36"	141	58	28	14	379	115	140

**If straight run of pipe on small side of reducer exceeds this value, then no restrained joints are necessary.

NOTE: The length of restrained joint pipe required as shown in the table above is based on trench backfill being compacted to 95% of maximum unit weight in

accordance with MDOT procedures. If the pipe is wrapped in polyethylene, a greater length of restrained pipe will be required as specified, shown on the Plans, or directed by the Township. A multiplier of 1.43 shall be used if the pipe is installed with polyethylene wrap.

All joints lying within the above minimum distances from the fitting must be restrained as noted herein.

Tees: Tees shall be restrained in the branch direction as required in the table above. Also, to augment the above, in the straight through direction, the minimum length of the first pipe on either side of the tee shall be ten (10) feet. In those cases where a valve is placed within 10 feet of the tee, the valve shall be restrained to the tee as noted below, and the next pipe shall be a minimum length of ten (10) feet.

Plugs/Caps: All dead ends on watermains shall be plugged or capped with standard plugs or caps. The watermain, including the plug or cap shall be restrained back from the plug or cap as required in the table above.

Bends: Bends shall be restrained in both directions as required in the table above.

Valves: Valves used in conjunction with restrained joint pipe shall be restrained in accordance with the recommendations of the manufacturer of the restrained joint pipe. All valves at crosses or tees shall be restrained to the tee by use of restrained joint pipe or joint restraining glands as specified above. Hydrant valves may be restrained using mechanical joint anchoring fittings.

4.13.06 Reaction Backing (Thrust Blocks)

Reaction backing (thrust blocks) shall be used only at locations indicated on the Plans and approved by the Township.

Minimum Bearing Area against an undisturbed trench wall, in square feet, for sand is indicated in the table below.

REACTION BACKING

Pipe Size	Tees, Plugs, Wyes, 45° Els	Hydrants, 90° Els	Wyes, 22-1/2° Els or Less
6"	3	3	1
8"	4	6	2
10"	7	9	3
12"	9	11	3
16"	13	20	6
20"	20	28	8
24"	28	40	11

Other Soil Conditions

Cement Sand or Hardpan	-	multiply above by 0.5
Gravel	-	multiply above by 0.7
Hard Dry Clay	-	multiply above by 0.7
Soft Clay	-	multiply above by 2.0

Muck - secure all fittings with restrained joint pipe or joint restraining glands, with concrete reaction backing the same as listed for sand conditions.

4.14 HYDROSTATIC TEST

4.14.01 Procedure

All tests will be made by the Contractor using his own equipment, operators, and supervision, in the presence of the Township or his duly authorized representative. The length of the section to be tested shall be as approved by the Byron / Gaines Utility Authority and/or the Township. The test shall not be against an existing valve, unless written permission is obtained from the water system operator. In no case shall a test be made against an existing valve that is found to be leaking or otherwise defective.

4.14.02 Air Removal before Test

Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied.

4.14.03 Leakage Test

A leakage test shall be conducted in the presence of the Township after the pressure test has been satisfactorily completed. The Contractor shall furnish the pump, pipe, connections, gages and all other necessary apparatus, and shall furnish the necessary assistance to conduct the test. The duration of the test shall be two (2) hours, and during the test the main shall be subjected to a pressure of 150 psi.

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain the specified leakage test pressure after the air in the pipeline has been expelled, and the pipe has been filled with water. When several valved sections are tested as one test, the maximum allowable leakage will be equivalent to the calculated smallest value of the maximum allowable leakage for any valved section. No pipe installation will be accepted if the leakage is greater than that determined by the formula:

$$L = \frac{SD\sqrt{P}}{133,200}$$

Where:

L = Allowable leakage in gallons per hour

S = Length of pipe tested, in feet

D = Nominal diameter of the pipe, in inches

P = Average test pressure during the leakage test, in pounds per square inch gage.

When testing lengths of watermain greater than 1,000 feet, the maximum allowable leakage will be the amount calculated for 1,000 feet.

This formula is based on allowable leakage of 11.65 gallons per day, per mile of pipe, per inch of nominal diameter at 150 psi.

The Township shall be furnished a written report of the results of the leakage test that identifies the specific length of pipe tested, the pressure, the duration of the test, and the amount of leakage. The report shall be signed by the Contractor and the Byron / Gaines Utility Authority or the Township or their designated representatives.

4.14.04 Variation from Permissible Leakage

If any test of pipe laid discloses leakage greater than that specified above, or if visible leaks are present, the Contractor shall at his own expense locate and repair the leaks until the leakage is within the specified allowance.

4.14.05 Time for Making Test

The pipe may be subject to hydrostatic pressure and inspected and tested for leakage at any convenient time after the trench has been partially backfilled. Where any section of the main is provided with concrete reaction backing, the hydrostatic pressure test shall not be made until at least five (5) days have elapsed after the concrete reaction backing was installed. If high-early-strength cement is used in the concrete reaction backing, the hydrostatic pressure test will not be made until at least two (2) days have elapsed.

4.15 **CLEANING AND DISINFECTION**

Cleaning and disinfection of watermain shall be in accordance with AWWA standard C651 – 99.

4.15.01 Flushing Watermain

The watermain and services three (3) inches in diameter and larger shall be flushed by providing taps in sufficient size or number to provide a velocity as required by AWWA Standard C651. For watermains twelve (12) inches in diameter and larger, minimum four (4) inch diameter standpipes are to be provided. Hydrants may be used providing the requirements listed below are met.

4.15.01.01 Procedure

Byron/Gaines Utility Authority personnel are to be present prior to and during chlorination. The Contractor shall submit to the Byron / Gaines Utility Authority or the Township or their designated representative, a procedure schedule outlining the method he proposes to use for flushing watermains. Mains shall be flushed at a maximum of 1/4-mile intervals.

4.15.01.02 Time for Flushing

Flushing may be done prior to pressure testing or following pressure testing but, in any case, prior to chlorination of the watermain.

4.15.02 Chlorination

All newly-laid lines shall be chlorinated. Byron/Gaines Utility Authority personnel are to be present prior to and during chlorination. The Contractor shall furnish all necessary equipment and materials and shall furnish all necessary assistance for effective disinfection of the watermains. Chlorination shall be accomplished by using the following general procedure.

4.15.02.01 Procedure

After the watermain has been pressure tested and flushed, the Contractor shall pump a chlorine solution into the watermain in such a manner and at such strength that the residual free chlorine shall be 50 to 100 ppm.

The amount of chlorine required for each 100 feet of pipe of various diameters to produce 50 ppm chlorine solution is as follows:

<u>Pipe Sizes (Inches)</u>	<u>100 Percent Chlorine (lb.)</u>	<u>16% Bleach (gal.)</u>
6	.061	.046
8	.108	.081
10	.170	.128
12	.240	.180
16	.436	.313
24	.980	.737
30	1.463	1.100

4.15.02.02 High Test Calcium Hypochlorite

("HTH", Perchlören", Pittchlor"). Prepare a ten-thousand-parts-per-million solution in water and pump at a constant rate into the watermain while bleeding off the water at the extreme end. The bleed rate will determine the feed rate of the chlorine in order to arrive at a 50 to 100 ppm solution in the watermain.

4.15.02.03 Liquid Chlorine

Liquid Chlorine may be applied to the watermain much the same way as the hypochlorite solution listed above. The rate of application will have to be adjusted for the degree of concentration of the liquid chlorine.

4.15.02.04 Point of Application

The chlorinating agent shall be applied at the supply end of the line through a corporation cock or a valved stand pipe. The water for injecting the chlorine into the new main may be taken from the pressure side of the isolation valve or by utilizing a pressure pump.

Care shall be exercised to prevent any of the strong chlorine solution from entering existing watermains.

4.15.02.05 Retention Period

The chlorinated water shall be retained in the new watermain for a period not to exceed 24 hours nor less than 16 hours in the event 50 parts per million is used. In cases where a shorter retention period is necessary, a stronger solution may be used and the retention period reduced accordingly. For these stronger solutions the approval of the Byron / Gaines Utility Authority or the Township must be secured in writing as to the length of retention time in relationship to chlorine strength.

While the chlorine solution is in the line, the Contractor shall operate valves and hydrants in the chlorinated section to insure the complete disinfection thereof.

4.15.02.06 Flushing and Testing

The chlorinated water shall be flushed from the main at the end of the retention time so that the entire line is clear of any residual chlorine. A sample shall be taken from the line by the Township, the Byron Gaines Utility Authority, or their designated representative, (through a corporation stop or a valved stand pipe, or fire hydrant) after the line is flushed, and delivered for bacteriological analysis. In the event that the water does not pass this bacteriological test, the chlorination procedure outlined above shall be repeated until the quality of water is substantially the same as that being delivered from the existing distribution system. The test procedure shall be repeated until two (2) consecutive safe results are obtained at each location as required by the

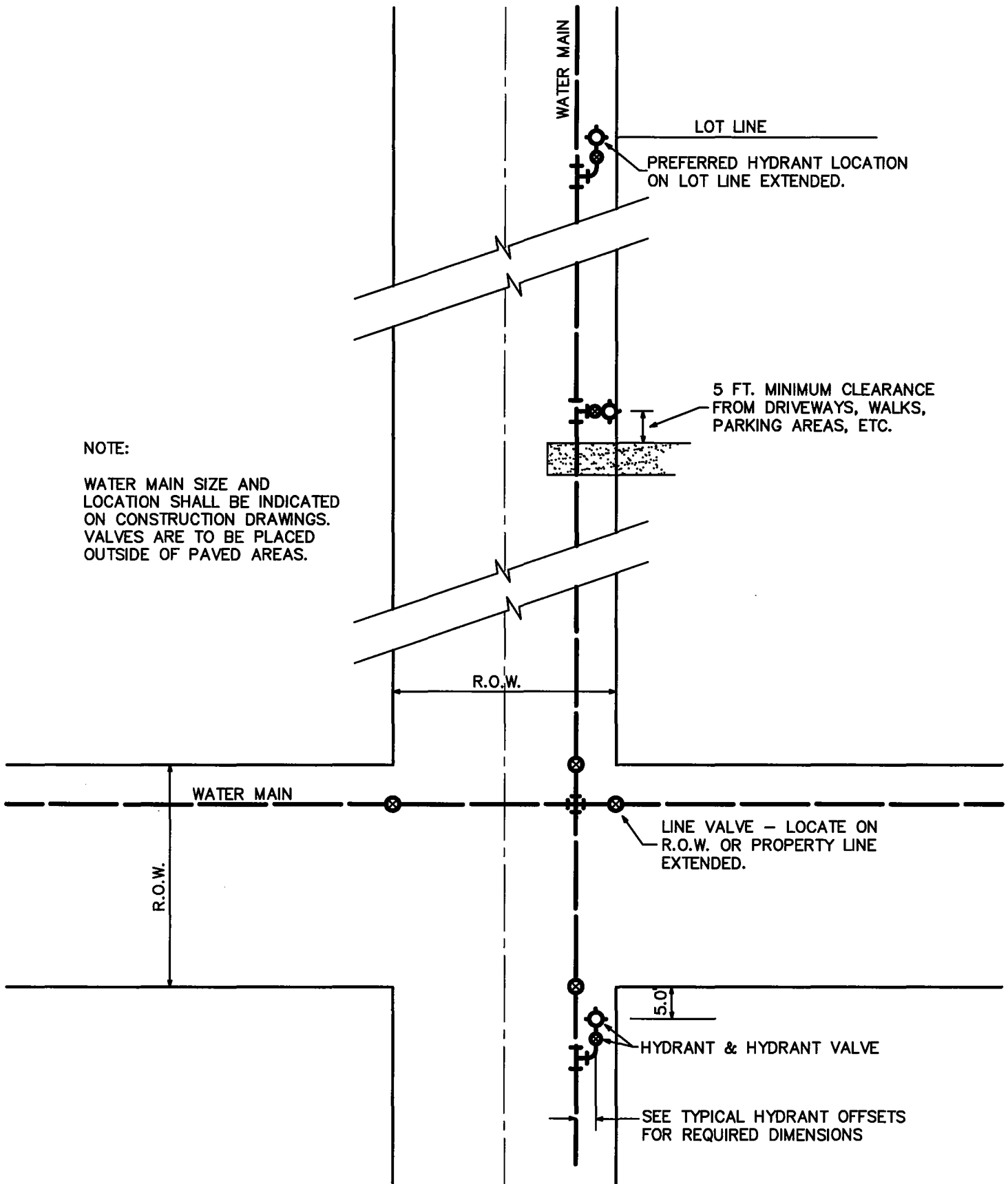
Michigan Department Environmental Quality. The two samples shall be taken 24 hours apart. Flushing of the main shall not occur between the two samples.

4.16 DEAD ENDS/LOOPING

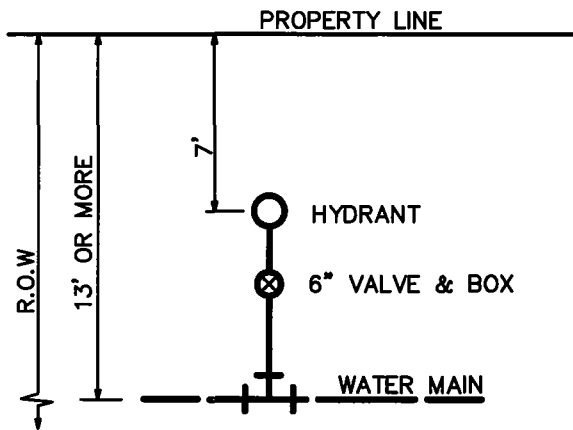
Generally the Township will not permit dead end watermain and will require looping.

4.17 SHUT DOWNS OF EXISTING WATERMAINS FOR CONNECTION

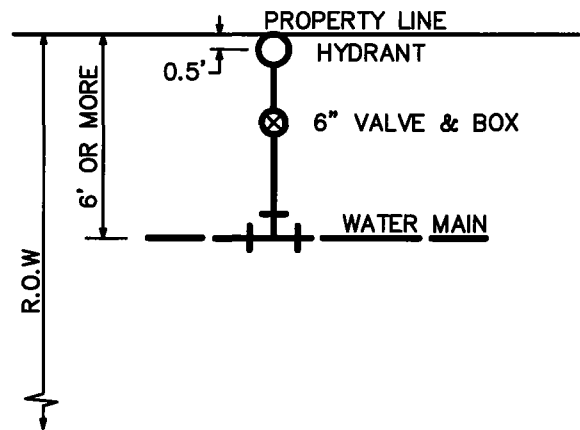
1. Shut downs of existing watermain can only be made when approved by and coordinated with the Byron / Gaines Utility Authority.
2. Notice to water customers affected by the shut down shall be given by the Byron Gaines Utility Authority unless otherwise directed.
3. The duration of the shut down shall be minimized. All necessary labor, equipment and materials must be present before work proceeds.
4. The Byron / Gaines Utility Authority shall be present, perform the shut down and inspect the connection.



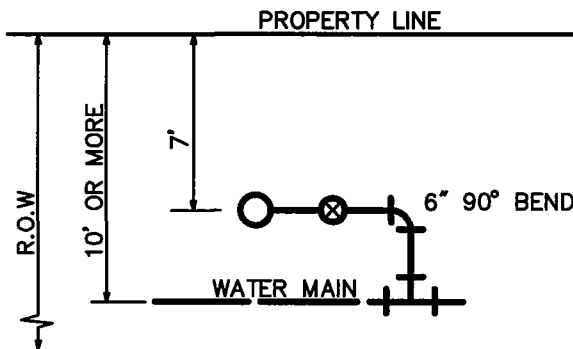
VALVE & HYDRANT LOCATIONS



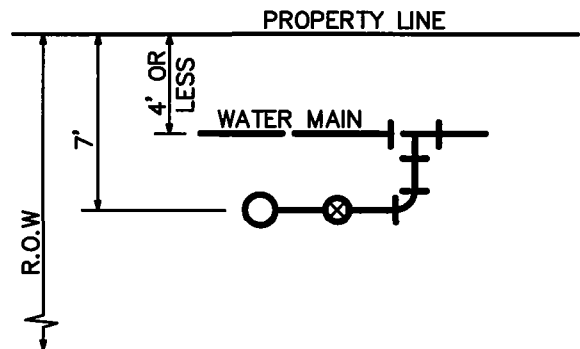
A. WATER MAIN MORE THAN 13' FROM P
HYDRANT LOCATED AT 7' FROM P



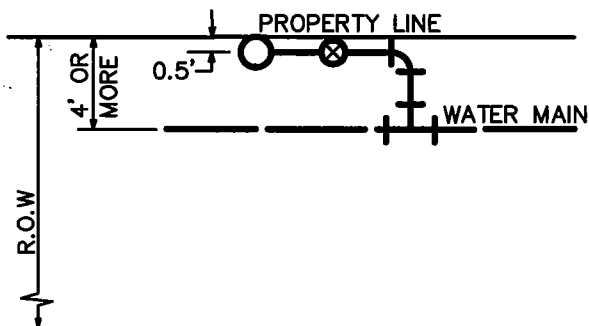
B. WATER MAIN MORE THAN 6' FROM P
HYDRANT LOCATED AT 0.5' FROM P



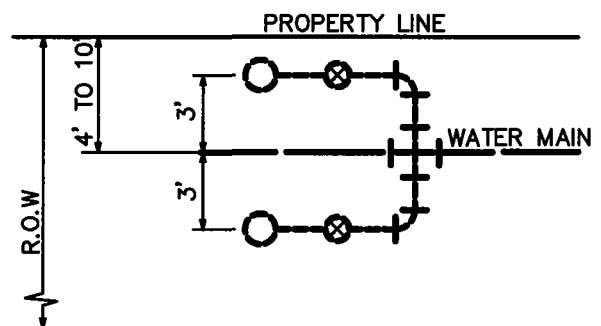
C. WATER MAIN MORE THAN 10' FROM P
HYDRANT LOCATED AT 7' FROM P



D. WATER MAIN MORE THAN 4' FROM P
HYDRANT LOCATED AT 7' FROM P

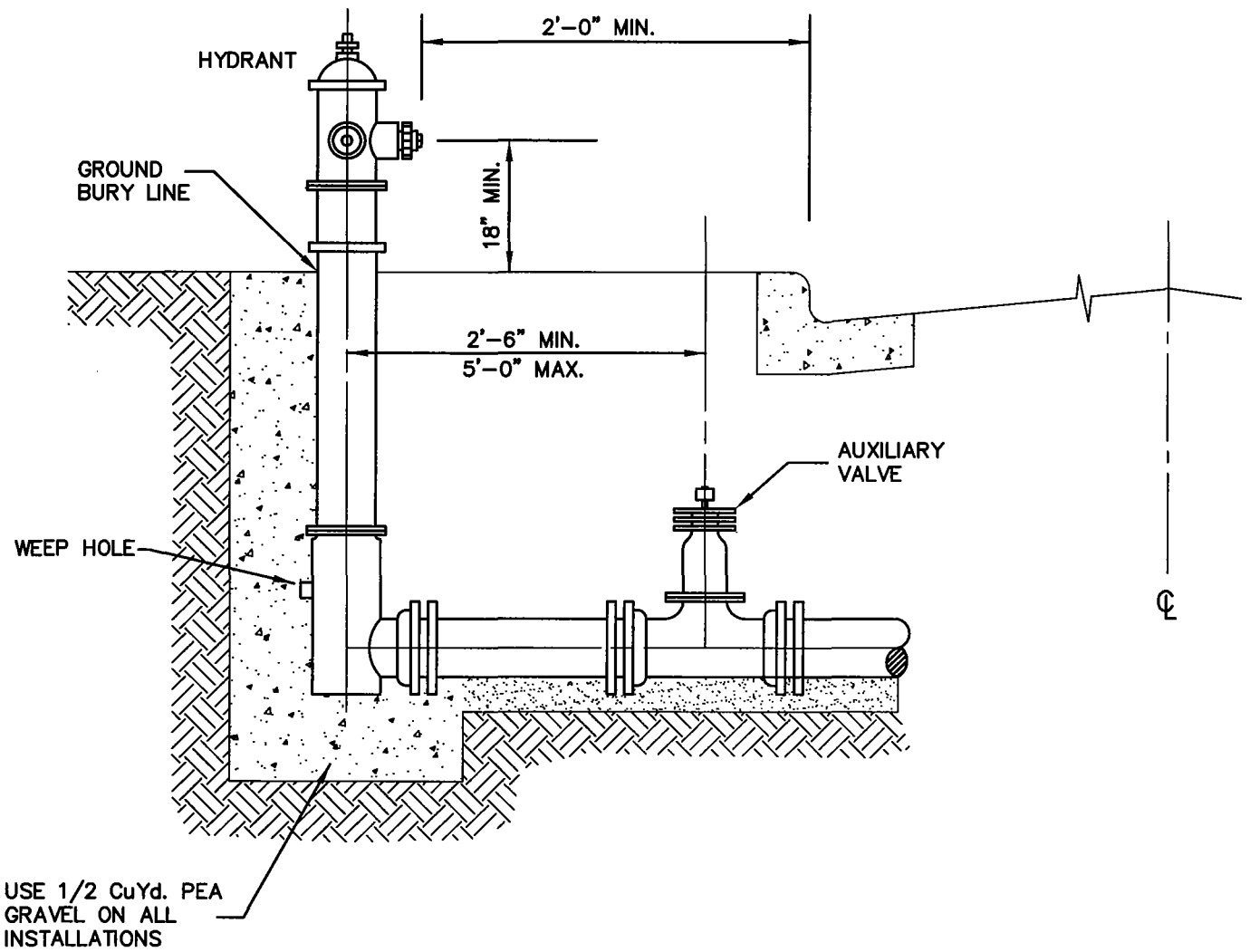


E. WATER MAIN MORE THAN 4' FROM P
HYDRANT LOCATED AT 0.5' FROM P

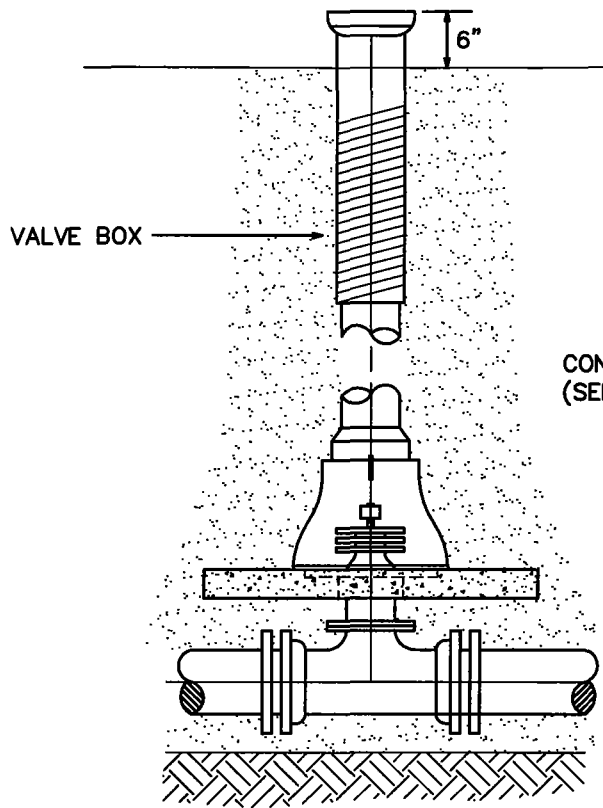


F. WATER MAIN BETWEEN 4' & 10' FROM P
HYDRANT LOCATED AT 3' FROM W.M.

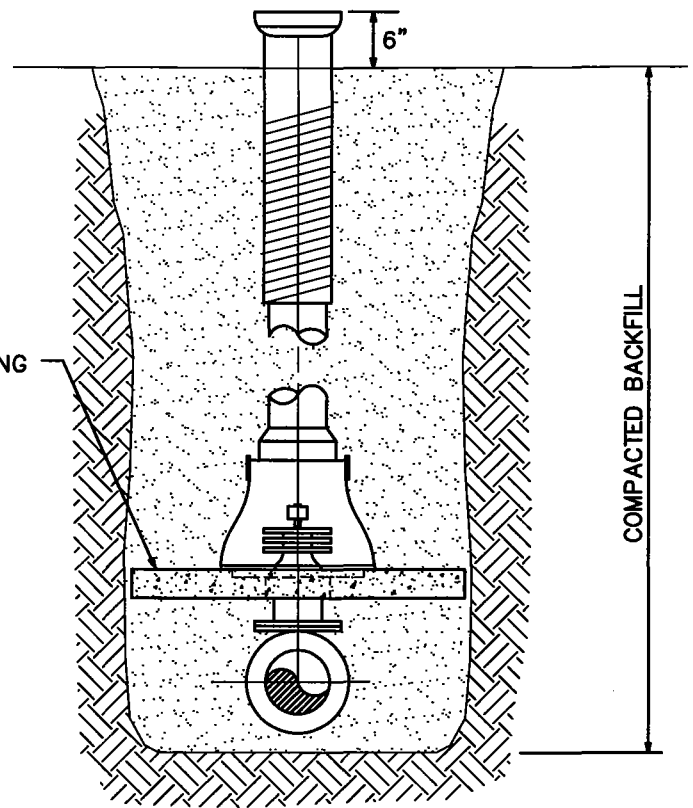
HYDRANT OFFSETS



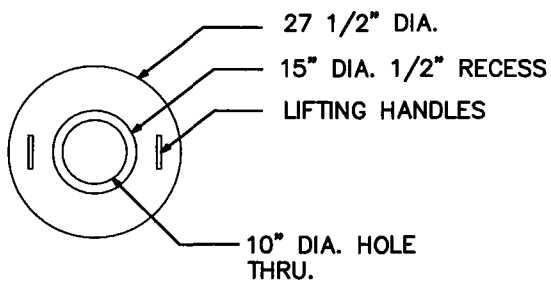
HYDRANT DETAIL



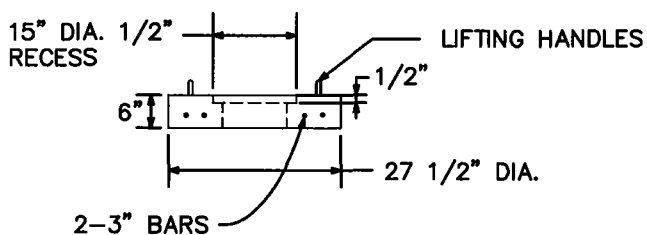
SIDE VIEW



FRONT VIEW

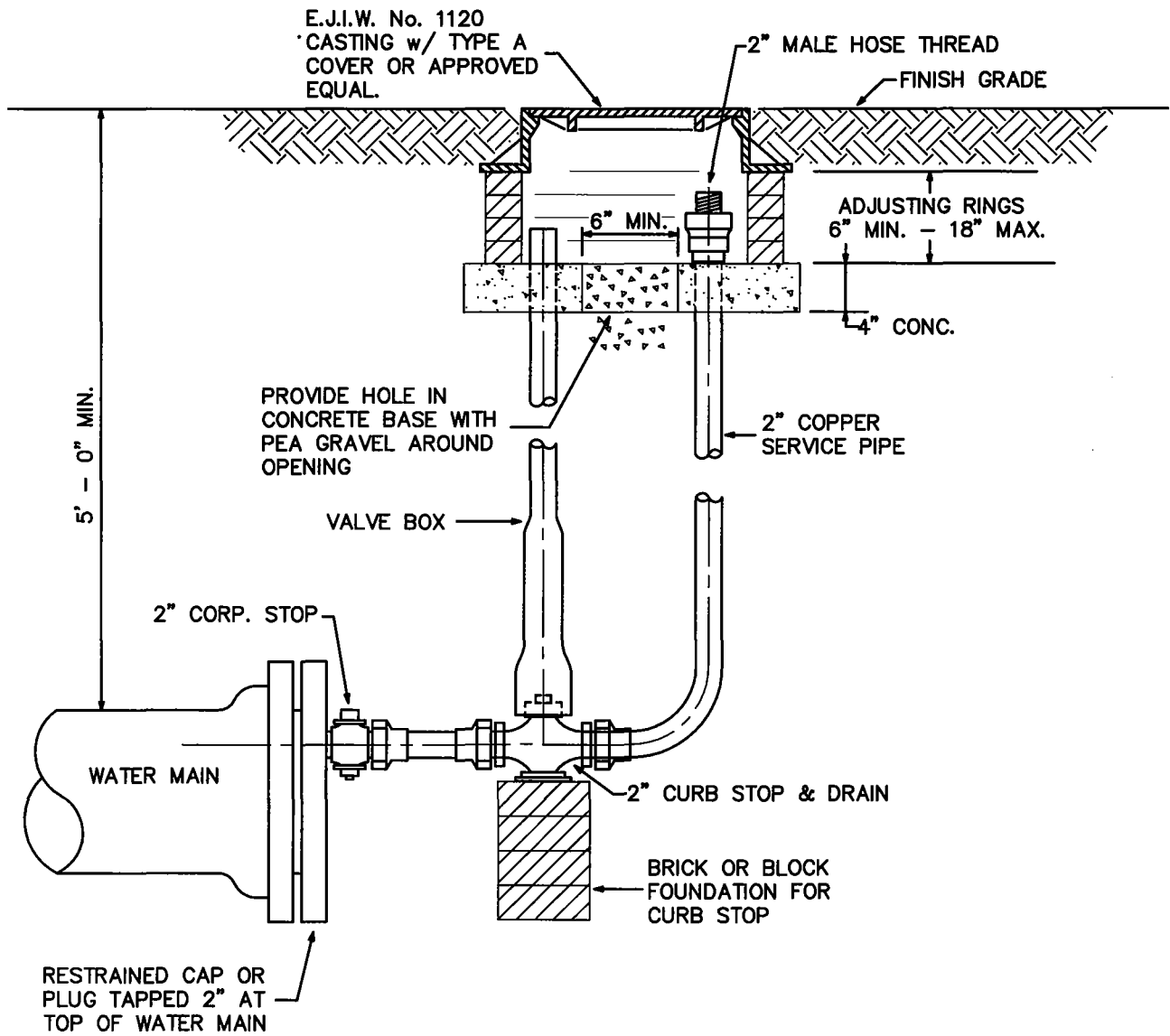


NOTE:
VALVE BOX AND SUPPORTS SHALL
NOT BE IN CONTACT WITH VALVE
OR PIPE. MAINTAIN MINIMUM
2" CLEARANCE

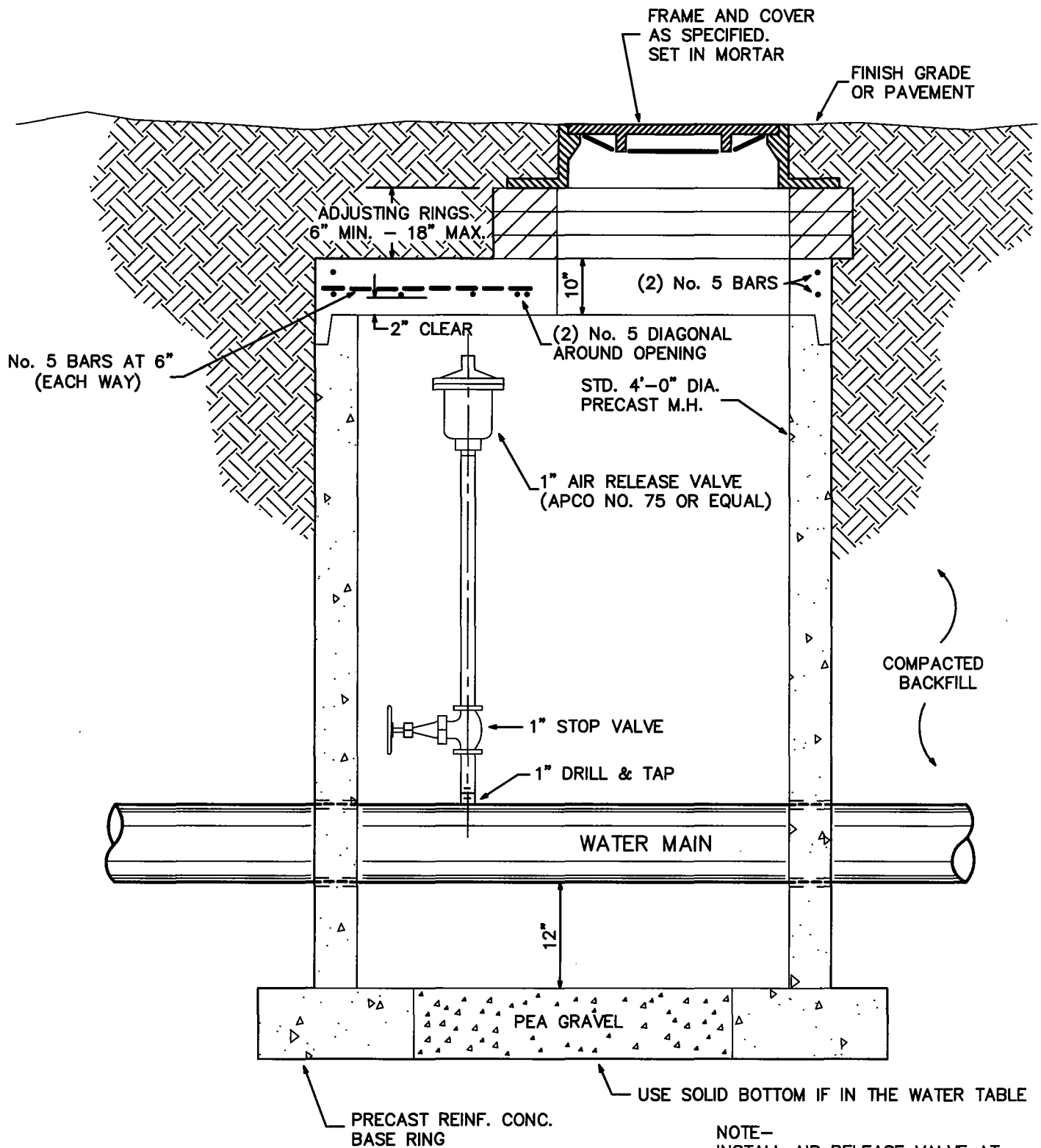


CONCRETE VALVE BOX BASE

VALVE & BOX FOUNDATION

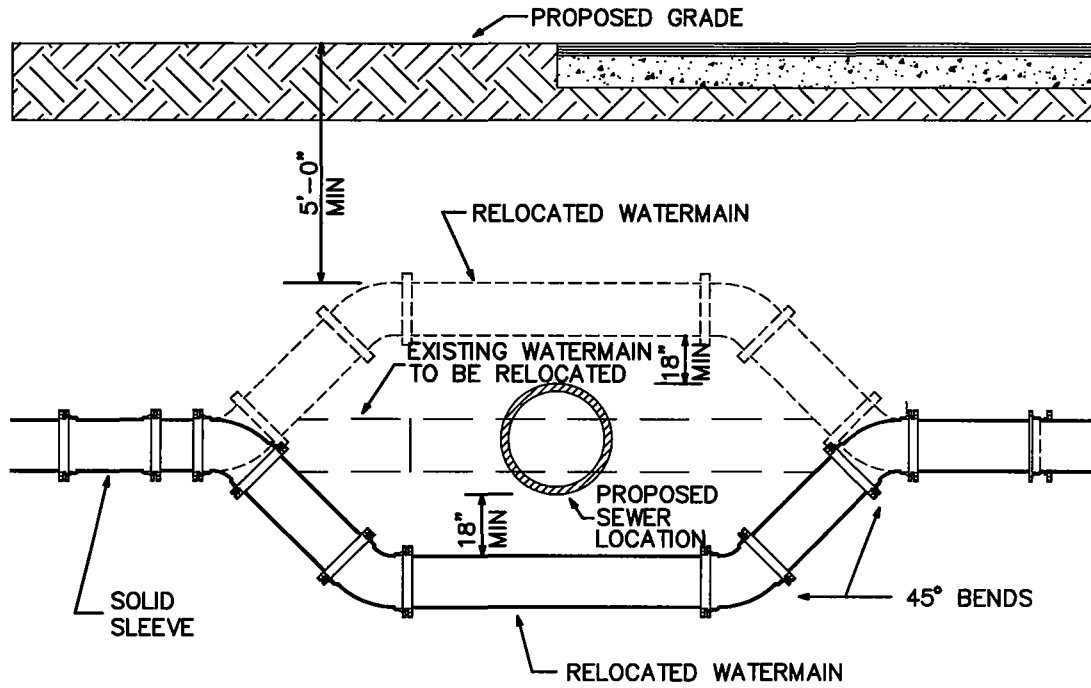


BLOW OFF DETAIL



NOTE—
INSTALL AIR RELEASE VALVE AT
THE VERY HIGHEST ELEVATION
OF THE WATER MAIN.

STANDARD AIR RELEASE VALVE — MANHOLE



NOTE:

WHEN THE MINIMUM CLEARANCE AND COVER CAN BE OBTAINED, THE WATERMAIN IS TO BE RELOCATED ABOVE THE SEWER.

WATERMAIN RELOCATION DETAIL

SECTION 6 CONTENTS

SPECIFICATIONS FOR SANITARY SEWER

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Sanitary Sewer Laterals	6.06
Manhole Construction	6.07
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SECTION 6

SPECIFICATIONS FOR SANITARY SEWER

6.01 DESCRIPTION OF WORK

The work shall consist of installing sanitary sewer pipe of the specified size or sizes in a trench and shall include the construction of manholes, lateral connections to the abutting property and other appurtenant work. Excavating, trenching and backfilling shall be as specified in Section 2.

6.02 MATERIALS

All materials furnished by the contractor shall conform to the specifications which follow. Where reference specifications are used, they shall be considered as referring to the current edition or latest issue. Certified test reports for strength from the manufacturer shall be submitted to the Township when the pipe is delivered to the site.

6.02.01 Sewer Pipe

All sewer pipe shall be of the materials and strengths shown on the Plans and as specified. Only one type of pipe material is to be placed from manhole to manhole.

6.02.01.01 Polyvinyl Chloride (PVC) Composite (Truss) Pipe

Polyvinyl Chloride (PVC) Composite (Truss) Pipe shall conform to the requirements of ASTM Designation D-2680 with elastomeric gasket seal joints as specified in current ASTM specification D-3212.

Couplings and fittings shall be as supplied or recommended by the pipe fitting manufacturer.

6.02.01.02 Polyvinyl Chloride (PVC) Solid-Wall Pipe

Polyvinyl chloride (PVC) solid-wall pipe shall conform to the requirements of ASTM Designation D-3034, with a standard dimension ratio of 26 (SDR-26).

Joints for (PVC) solid wall pipe shall be elastomeric gasket seal as specified in current ASTM specification D-3212.

6.02.02 Cement Mortar

Cement mortar shall be non-shrink grout mixed in accordance with manufacturer's recommendations.

The sand and cement shall be mixed dry in a clean tight box until a mixture of uniform color is produced, after which water shall be added until the required consistency is obtained. Mortar shall be mixed only in such quantities as needed for immediate use. The retempering of mortar will not be permitted.

6.02.02.01 Cement

Air Entraining Portland Cement shall conform to the requirements for Type 1A of the current specifications for Air Entraining Portland Cement, ASTM Designation C-175.

6.02.02.02 Masonry Sand

Masonry Sand shall conform to the requirements of "Natural Sand, 2 MS" of the current standard specifications of MDOT.

6.02.02.03 Water

Water for mixing mortar shall be obtained from the public water supply unless otherwise approved by the Township.

6.02.03 Manhole Materials

6.02.03.01 Adjusting Rings

Adjusting rings are to be precast grade adjusting rings conforming to the requirements of ASTM Designation C-478 or up to 3" of GNR Technologies "Infra Riser" rubber casting adjustment rings may be installed in accordance with manufacturer's recommendations.

6.02.03.02 Precast Units

Unless otherwise specified, all manholes shall be precast. Manhole bases shall be integrally cast into the riser section.

Precast reinforced concrete manhole risers and precast reinforced concrete manhole cone sections shall conform to the requirements for reinforced concrete manhole risers and tops, ASTM C-478.

Joints for precast sections shall be premium rubber O-ring seals. All exterior joints of manholes will be sealed with a flexible Butyl rubber based tape (12" wide) centered over the manhole joint. Joints must be clean before applying, and primer used according to manufactures recommendations. Exterior of the Manhole will be waterproofed with an asphalt or tar coating.

6.02.03.03 Castings

Castings shall meet the requirements specified in the current Michigan Department of Transportation Standard Specifications Section 908. Manhole covers and rings and similar combinations of castings shall be machined to provide an even bearing.

Unless otherwise specified, manhole castings shall be East Jordan No. 1040 with Type A solid cover, or approved equal. Where indicated on the plans, water-tight or bolt down manhole covers shall be East Jordan No. 1040 WT, with Type A solid cover, or approved equal. Grouting shall be as shown on the standard manhole details.

6.02.03.04 Steel Reinforcement

Steel Reinforcement shall conform to the requirements for steel reinforcement of the current MDOT Standard Specifications.

6.02.03.05 Flexible Manhole Connectors (Rubber Boots)

Flexible manhole connectors (also called rubber boots) shall be "Kor-N-Seal" by National Pollution Control Systems, Inc., "P.S.X." or "Press Wedge II" by Press Seal Gasket Corporation, "Lock Joint Flexible Manhole Sleeve" by Inter Place Corporation, "A-lok" by A-lok Products, Inc., or approved equal. Flexible manhole connectors shall conform to the requirements of ASTM Designation C-923, Resilient Connectors.

6.02.03.06 Manhole Steps

Unless otherwise specified, manhole steps shall be plastic coated steel steps conforming to the requirements of ASTM Designation C-478, or approved equal, spaced at 16" center to center.

6.02.03.07 Stainless Steel

Stainless steel components shall meet the specifications of A.S.T.M. type 304.

6.02.03.08 Manhole, Ring, and Casting Sealing System

Where a manhole, ring, and casting sealing system is specified on the plans, full GNR Technologies "Infra Riser" rubber ring casting adjustment, or CANUSA "Wrapid Seal" heat shrink casting and ring protection, or "Cretex" external casting and ring protection are to be installed in accordance with manufacturer specifications.

6.03 INSPECTION OF MATERIALS BY CONTRACTOR

It shall be the responsibility of the Contractor to inspect all materials for cracks, flaws or other defects before they are incorporated into the work. Any materials found to be defective or damaged, shall be promptly removed from the job site.

6.04 LAYING PIPE

6.04.01 Alignment and Grade

6.04.01.01 Laser Alignment

The Contractor shall use the laser beam method of maintaining line and grade for sewer construction, unless otherwise approved by the Township. The Contractor shall submit evidence to the Township that a qualified operator will handle the laser beam equipment during the course of construction.

The Owners Engineer shall place line and grade stakes at each manhole, or more often, as determined by the Township. The Contractor shall check the line and grade at every point at which a stake has been placed.

6.04.02 Handling

Pipe shall be protected during unloading and handling against impacts, shocks and free fall. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

Pipe shall be carefully lowered into the trench in such a way as to avoid danger to the workers or damage to the pipe.

6.04.03 Direction of Laying

Excavation of trenches and laying of pipe shall begin at the outlet for the sewer and proceed upgrade with the individual pipe being laid with the spigot end downstream.

6.04.04 Placing

The pipe shall be placed on the prepared sub-grade and held firmly in place during subsequent pipe jointing and embedment operations. Successive pipes shall be carefully positioned so that when laid, they form a sewer with a uniform invert true to line and grade.

Sufficient pressure shall be applied by an approved method to each pipe as it is laid to insure that the spigot is completely home in the bell. Care shall be exercised to prevent joints from opening as successive lengths of pipe are place. The Contractor shall take the necessary precautions when using a trench box to prevent joint separation when the box is pulled ahead.

6.04.05 Cleaning Sewer

Prior to visual inspection, the interior of the sewer shall be cleaned of all jointing material, dirt and debris as the work progresses.

In small sewers where cleaning after laying may be difficult, a swab or drag may be required in the pipe line to satisfactorily complete this work.

The Contractor shall place and maintain a plug in the downstream end of the newly constructed sewer to minimize dirt and debris from entering the existing system. The plug shall be maintained by the Contractor until the newly constructed sewer has been accepted by the Township.

Where plugs are required in existing sanitary sewer manholes, they shall not be removed until authorization is received in writing from the Byron / Gaines Utility Authority. These plugs shall be provided and installed by the Contractor at the start of the project.

6.04.06 Channel Protection

Channel protection is required for any live manholes within which work will be performed. Channel protection is to consist of ¾" plywood cut to match the inside diameter of the manhole. Two 2" x 4" boards are to be nailed across the plywood for support. Geotextile fabric is to be placed on top of the plywood to collect debris. The contractor is to remove the channel protection upon completion of work.

6.05 **PIPE JOINTS**

Pipe joints shall be made in strict accordance with the pipe manufacturer's recommendations unless otherwise specified herein. All lubricants, gaskets, and other materials required to make the joints shall be supplied or recommended by the pipe manufacturer and approved by the Township.

Pipe layers shall be fully qualified and experienced in the work being performed and shall check each joint after it is completed to see that no part of the joint material is left on the inside of the pipe and that the joint is properly made.

6.06 **SANITARY SEWER LATERALS**

Connection to the sanitary sewer collection system and use of the sanitary sewer system is governed by the Township ordinance to administer, regulate, and provide for the connection to and use of the water and sewer system. See this ordinance for regulations governing use of the water supply system and penalties for violation of the Ordinance. Application forms and permits for connection are available at the Township Office. These forms will provide for payment of an inspection fee, assessments, and charges at the time request is made for service.

The Byron / Gaines Utility Authority or an authorized representative must inspect all lateral construction prior to backfill. Inspections can be scheduled by calling the Byron / Gaines Utility Authority by a minimum of 24 hours prior to the time of inspection is

needed. Inspections times are scheduled on a first come basis. A permit number and building street address is required to schedule an inspection.

Outside of public rights-of-way and easements the customer shall construct, own and maintain the sewer lateral at his expense in its entirety.

Sewer laterals in the Townships are to be installed in accordance with the following specifications:

6.06.01 Location of Wyes and Tees

The approximate locations of wyes or tees are shown on the plans. These locations may be adjusted where necessary to best serve the various properties. Exact locations will be determined by the Township before the wyes or tees are installed.

The Contractor shall keep an accurate record of measurements from the nearest downstream manhole to each wye or tee which is installed. These measurements shall be recorded on the record plans to be furnished by the Contractor.

Laterals shall be connected to manholes only where approved by the Township Engineer.

6.06.02 Length

All sanitary sewer laterals shall normally be laid at right angles to the sanitary sewer mainline. Along existing streets, laterals shall extend to the street right-of-way (property line) unless otherwise directed. Along streets for new developments, laterals shall extend to the edge of easements for private utilities.

The Contractor shall measure and record the horizontal length of the lateral from the main line sewer to the end of the lateral and provide this information to the Township.

6.06.03 Grade

It is intended that the ends of laterals at property lines will be deep enough to service the lowest floor of all existing buildings by gravity flow.

The minimum grade on the lateral shall be two (2%) percent (1/4 in/ft.). Where minimum depths as specified herein cannot be obtained, minimum grades may be reduced to one (1%) percent (1/8 in/ft.).

Where the elevation of the end of the lateral to serve an existing structure is not shown on the plans it shall be set at three (3) feet below basement grade for standard houses (eleven (11) feet below first floor) or four (4) feet below basement grade for houses with walkout basements (twelve (12) feet below first floor) where the set-back is fifty (50) feet or less.

In other cases the lateral may be set at two (2) feet below the basement elevation for standard houses (three (3) feet for walkouts) plus an additional depth of two (2%) percent multiplied by the set-back distance to the structure.

6.06.04 Risers

Where the sanitary sewer is more than twelve (12) feet deep, a main line riser shall be constructed in accordance with the standard details or as shown on the plan. Backfill shall be carefully placed and compacted around the riser in an approved manner which will not damage the sewer or riser.

Property line risers shall be constructed on all laterals. Property line risers shall be constructed at the end of the lateral. The property line riser shall consist of a six (6) inch sewer lateral pipe extended upward to a minimum of one (1) foot above the normal groundwater table, or to a depth of not less than four (4) feet below grade at the end, whichever is higher. (See detail on page 18)

6.06.05 Markers and Measurements

After installation of the service lateral, but prior to backfilling, the Contractor shall provide and install a 2" x 2" wood marker for each service. The wood markers shall be set vertically from the end of the lateral to twelve (12) inches above finish surface elevations. Also, a 1/2" diameter by 3' long iron stake shall be placed vertically and adjacent to the wood marker with six (6) inches of cover. The Contractor shall assist the Inspector in locating the end of each lateral, and in recording the location by measuring to the nearest downstream manhole. Also, the Contractor shall provide the Inspector the depth of the lateral and property line riser relative to the street centerline elevation.

6.06.06 Materials

6.06.06.01 Wyes and Tees

Wyes and Tees may be cast fittings of the same material and joints as the main sewer, or may be an approved fabricated special fitting which provides a suitable connection for the lateral to the main sewer.

Details of special fittings and/or adaptors for connection laterals of a material different than the main sewer shall be approved by the Byron/Gaines Utility Authority before they are manufactured and installed.

Wye and Tees will be required as follows:

6" Wyes on main sewer of 8" or 10" diameter

6" Wyes or Tees on main sewer of 12" in diameter or larger.

6.06.06.02 Plugs and Stoppers

Plugs or stoppers for plugging the ends of laterals or risers which are not extended shall make a water tight seal and shall be solvent welded or glued.

6.06.06.03 Public Sewer Lateral Pipe (within public utility easements and right-of-way)

All Public Sewer Lateral Pipe, unless otherwise specified, shall be of any materials specified in Paragraph 6.02.01. All fittings to be heavy wall solvent weld or glued fittings or elastomeric gasket seal as specified in ASTM specification D-3212.

6.06.06.04 Private Building Sewer Pipe (outside of public utility easements and right-of-way)

All Private Building Sewer Pipe, unless otherwise specified, shall be of any of the following:

1. PVC solid wall pipe, ASTM D-3034, with a standard dimension ratio of 26 (SDR-26) with solvent weld or glued joints for 4" diameter pipe, or with elastomeric gasket seal joints as specified in current ASTM specification D-3212 or solvent weld or glued joints for pipe 6" in diameter or larger.
2. PVC solid wall pipe, ASTM D-2665, Schedule 40 with solvent weld or glued joints for 4" diameter pipe, or for pipe 6" or larger in diameter with elastomeric gasket seal joints as specified in current ASTM specification D-3212 or solvent weld or glued joints.
3. PVC solid wall pipe, ASTM F-891, Schedule 40 with solvent weld or glued joints for 4" diameter pipe, or for pipe 6" or larger in diameter with elastomeric gasket seal joints as specified in current ASTM specification D-3212 or solvent weld or glued joints.
4. Cast iron no hub soil pipe and fittings, ASTM A-74.
5. All fittings for building sewers shall be solvent weld or glued joints.

6.06.07 Size and Grade of Private Building Sewers

Four (4) inch minimum size for single and two-family residential laid at a minimum grade of 1/8 inch per foot from the lateral (stub) at the property line to the building.

Lateral sizes must be approved by the Township as suitable for the proposed application.

PLEASE NOTE: A grade of 1/4 inch per foot is recommended.

6.06.08 Private Building Sewer Cleanouts

1. A four (4) inch cleanout shall be placed within five (5) feet of the building. (A four (4) inch cleanout located just within the basement wall shall be sufficient)
2. Four (4) inch cleanouts shall be placed at all bends totaling greater than 45 degrees and at every one hundred (100) feet.

6.06.09 Adapters

Adaptors for size changes and/or types of pipe shall be approved by the Township. (Fernco adaptors by Hamilton/Kent or equal)

6.06.10 Inspection manholes

Inspection manholes may be required by the Township to monitor flows of industrial and/or commercial users before entering the public sewer system. (Manholes to be ASTM C-478 or equal)

6.06.11 Grease Interceptors or Oil and Sand Separators

Grease Interceptors or Oil and Sand Separators may be required by the Township in accordance with the Township ordinance to administer, regulate, and provide for the connection to and use of the water and sewer system.

6.06.11.01 Grease Interceptors

Where required, outdoor grease interceptors shall conform to the following:

- A. The grease interceptor must be an approved precast concrete structure (two pieces). The tank dimensions must be comparable to those listed on the figure on page 6-19.
- B. All booted openings must be PSX Boot Press-seal Gasket, NPC Kor-n-seal, or approved equal.
- C. Exterior wrap strip must be 12" EZ-WRAP (or approved equal).
- D. All chambers of grease interceptor (3 total) must be easily accessible.
- E. 2' diameter grade risers must be precast concrete.
- F. The top section of the tank must have a H20 loaded rating in traffic areas.
- G. Minimum size on inbound and outbound pipes is 4".
- H. The grease interceptor must be installed per Manufacturer's recommendation.

- I. An inspection of the installation of the grease interceptor must be scheduled with the Byron-Gaines Utility Authority with at least 24 hours notice.

6.06.11.02 Oil and Sand Separators

Where required, outdoor Oil and Sand Separators shall conform to the following:

- A. The oil separator must be an approved precast concrete structure (two piece). The tank dimensions must be comparable to those listed on the figure on page 6-20.
- B. All booted openings must be PSX Boot Press-seal Gasket, NPC Kor-n-seal, or approved equal.
- C. Exterior wrap strip must be 12" EZ-WRAP (or approved equal).
- D. 20" diameter openings of oil separator (2 total) must be easily accessible.
- E. 2' diameter grade risers must be precast concrete.
- F. The top section of the tank must have a H20 loaded rating in traffic areas.
- G. Minimum size on inbound and outbound pipes is 4".
- H. The interior walls of the tank must be coated with an approved epoxy coating.
- I. All larger size oil separators must be approved by the Byron-Gaines Utility Authority. Specification sheets must be submitted to the Authority prior to installation of the oil separator.
- J. The oil separator must be installed per Manufacturer's recommendation.
- I. An inspection of the installation of the oil separator must be scheduled with the Byron-Gaines Utility Authority with at least 24 hours notice.

6.07 **MANHOLE CONSTRUCTION**

Manholes shall be constructed in accordance with the standard details and as specified herein.

Precast bases shall be installed on the subbase in such a way as to provide a uniform bearing under the manhole base.

Stubs shall be provided in manholes for future connections as shown on the plans or as directed by the Township. All such stubs shall be sealed with standard watertight, removable plugs.

All openings in manholes for the purpose of receiving pipes (including openings for future pipes) shall be fitted with a flexible type connector. Flexible connectors shall be factory installed. Openings for future connections shall be sealed by an approved prefabricated cap or plug. Bituminous waterproofing shall be applied to the outer surface of all manholes at the rate of one (1) gallon per 100 square feet.

Flow channels through Manholes are to be the same height and width as the pipe size.

6.08 CUT-INS

When cutting into an existing manhole, the opening shall be no larger than is necessary to admit the new sewer. The opening shall be made by a concrete drilling or coring machine, and shall have a mechanically compressed flexible joint connection installed. All broken or surplus material falling inside the structure shall be removed.

Flow channels and/or drop connections shall be constructed as specified or as directed to accommodate the sewer being cut-in. Pipe inverts higher than 6 feet from the primary flow channel will require a drop connection to within 6" from the primary flow channel.

6.09 ACCEPTANCE TESTS

6.09.01 Alignment and Grade

Each section of sewer may be checked by the Township for alignment and grade using lights and mirrors, television inspection, or other similar means. The Contractor shall assist the Township in the performance of these tests when necessary.

The Contractor shall be responsible to maintain plugs in existing manholes to prevent any water, debris, etc. from entering the existing sewer. These plugs shall remain in place until the new sewer system is accepted by the Township.

6.09.02 Leakage Tests

The completed sewer shall be free from leaks either by infiltration or exfiltration. Manholes and sewer lines will be visually inspected for leakage.

The Contractor shall provide all necessary labor, equipment and supervision to perform infiltration, exfiltration and air tests in accordance with the requirements of the Township. All sewer shall be subjected to an air test unless otherwise specified below.

Leakage testing of the sewer shall be performed after all watermain, water services, and storm sewer proposed in the vicinity of the sanitary sewer has been installed. This requirement may be waived by the Byron and Gaines Utility Authority in cases where the natural ground water table is above the grade of the sanitary sewer and dewatering is in place.

All sewer which is submerged by ground water to an average depth of greater than seven (7) feet above the crown of the sewer at the time of the test shall be subjected to an infiltration test.

The air test shall be performed on each section of pipe between manholes after laterals are installed. The section of pipe being tested shall be sealed at each manhole using inflatable plugs or other approved devices. All plugs shall be adequately braced.

Pressure gauges are to have a range of 0-15 p.s.i.g. with increments of 0.10 p.s.i.g. and accuracy of +/- 0.04 p.s.i.g.

Where the expected water table level, as determined by the soil borings, is above the sewer elevation, the pressure testing limits for dry trench condition shall be as follows:

1. Where the expected water table level is zero (0) feet to seven (7) feet above the pipe, the test pressure limits will be 3.5 to 2.5 psig.
2. Where the expected water table level is over seven (7) feet above the pipe, the test pressure limits will be 4.5 to 3.5 psig.

In a wet trench condition where the water table has risen above the pipe to a depth of less than seven (7) feet above the crown of the pipe prior to testing, the air testing limits shall be determined by adding to the original 3.5 psig. an additional 0.43 psig. for each foot the water table is above the crown of the pipe, or as determined in the dry trench condition, whichever is greater. Maximum test pressure shall be 6.0 psig.

The air pressure in the section under test shall be raised to an initial pressure of 0.5 psig. above the beginning test pressure and allowed to stabilize for a minimum of five (5) minutes. Air shall be added during this stabilization period as required to maintain the pressure at or above the beginning test pressure.

The rate of air loss shall be determined by measuring the time interval required for the internal pressure to decrease 1.0 psig. within the limits previously specified.

Minimum time interval for a satisfactory test shall be in accordance with the table following this section.

In the event the Township determines that the results of the air test are inconclusive because of visible infiltration, unsatisfactory or incomplete record, or improper application of testing methods or equipment, or other similar reasons, the Township may require either an exfiltration test or an infiltration test for the section or sections of sewer involved.

The allowable leakage as measured by either an infiltration test or an exfiltration test shall not exceed 50 gallons per day per inch of diameter per mile of sewer.

Sewers shall be tested for exfiltration by isolating a section or sections of the sewers between manholes by means of an approved temporary type of water-tight bulkhead. the isolated section of sewer shall then be filled with water to a level which is two and one-half (2-1/2) feet above the existing water-table but not less than two and one-half (2-1/2) feet above the crown of the sewer pipe at the high end of the isolated section under the test. The length of the section shall be such that, where possible, the water level at its lower end will not be more than five (5) feet above the crown of the pipe except as may be required by a high water table.

The length of time and the exfiltration test period shall be at the discretion of the Township. Determination of the amount of exfiltration shall be made by measurement of the loss of volume of water in the manholes. The amount of exfiltration over a 24 hour period will then be calculated from the measured loss of volume and time period.

On any section of sewer that the Township shall deem impractical to test by means of the exfiltration test specified above, as may be the case when local connections are involved, a suitable infiltration test will be required.

6.09.03 Pipe Deflection Tests (Flexible Pipe Only)

Flexible pipe is any pipe having a pipe stiffness of less than 200 psi as defined under the requirements of ASTM Designation D-2412.

The completed installation of flexible pipe shall at no point have out-of-round deflections in the main sewer pipe greater than five (5%) percent of the pipe's base original inside diameter (see chart for mandrel sizes below). Go/no go gauging tests, using an approved pointed mandrel with nine (9) points, shall be performed by the Contractor in the presence of the Township, or his authorized representative after the trench is backfilled, and before the surface restoration is begun. Pipe with deflections greater than five (5%) percent shall be re-laid by the Contractor at no additional expense to the Owner. Vibratory re-rounding of failed sections is prohibited. More than one person, mechanical means, or leverage will not be allowed to force the mandrel through test sections.

The pipe shall have been in place a minimum of 30 days prior to the mandrel test. When sanitary sewer is installed within a paved street, the street shall be paved prior to the mandrel testing when required by the Kent County Road Commission or the Township.

MANDREL TEST SIZES (SDR -26)

<u>Pipe Diameter</u>	<u>Mandrel Diameter</u>	<u>Test Measurement</u>
8"	7.11"	6.91"
10"	8.87"	8.60"
12"	10.54"	10.22"
15"	12.90"	12.51"
18"	15.76"	15.28"

21"	18.57"	18.01"
24"	20.87"	20.24"

The test measurement is the height of the mandrel as it rests with two fins on a flat surface.

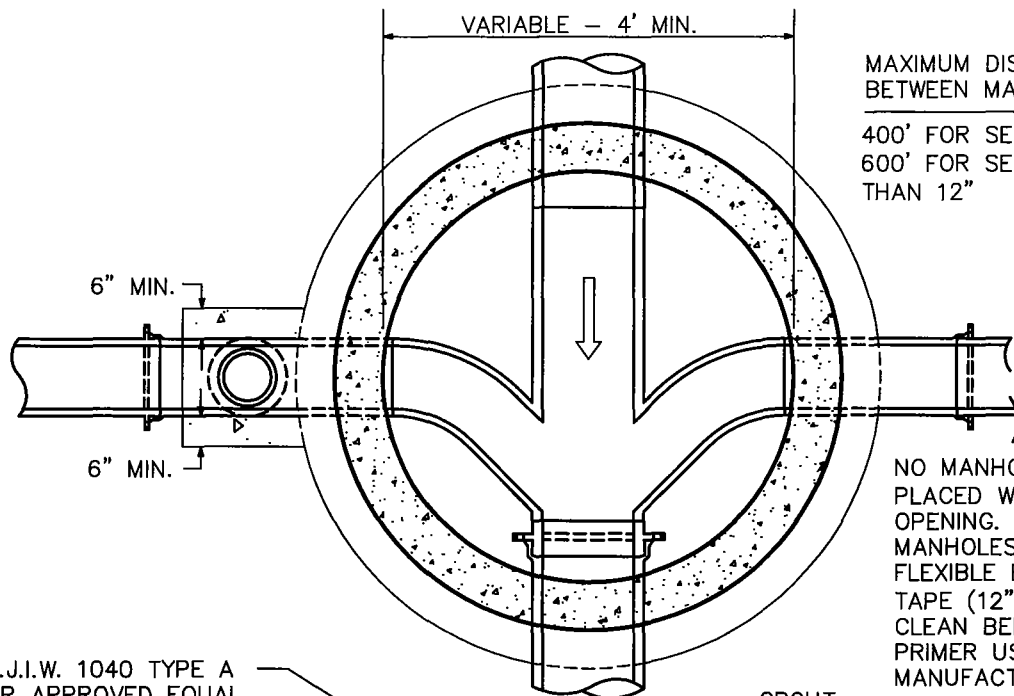
REQUIRED AIR TESTING TIMES FOR SANITARY SEWER
TABLE 1 – PVC and TRUSS

Pipe Diameter, in.	Minimum Time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

Note: Table to be used for determining testing time for one length of pipe and its respective diameter.

When simultaneously testing two lengths of pipe of varying diameter, the table shall be used to determine the time required for each individual length of pipe and its respective diameter, and the times shall be added together.

Total Testing Time = Time for Length and Diameter of Pipe 1 + Time for Length and Diameter of Pipe 2.



MAXIMUM DISTANCE
BETWEEN MANHOLES:

400' FOR SEWER 12" & LESS
600' FOR SEWERS LARGER
THAN 12"

NO MANHOLE JOINTS ARE TO BE
PLACED W/IN 12" OF A PIPE
OPENING. ALL EXTERIOR JOINTS OF
MANHOLES WILL BE SEALED WITH A
FLEXIBLE BUTYL RUBBER BASED
TAPE (12" WIDE). JOINTS MUST BE
CLEAN BEFORE APPLYING AND
PRIMER USED ACCORDING TO
MANUFACTURERS RECCOMENDATIONS.

E.J.I.W. 1040 TYPE A
OR APPROVED EQUAL
USE 1040 WT WHERE
SPECIFIED.

VARIES

ADJUSTING RINGS
6" MIN. - 15" MAX.

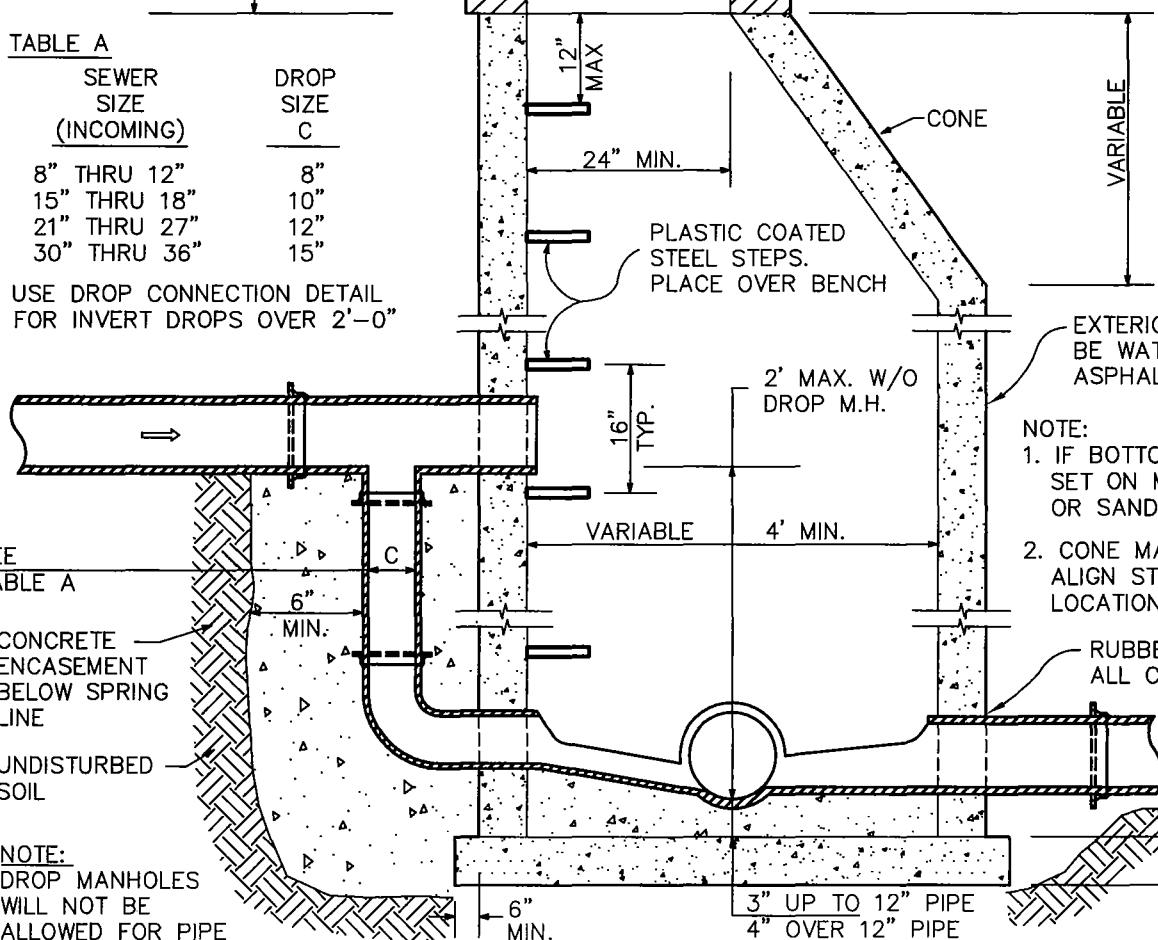
TABLE A

SEWER SIZE (INCOMING)	DROP SIZE C
8" THRU 12"	8"
15" THRU 18"	10"
21" THRU 27"	12"
30" THRU 36"	15"

* USE DROP CONNECTION DETAIL
FOR INVERT DROPS OVER 2'-0"

GROUT
FINISH GRADE
SET FRAME IN
SOFT MORTAR BED

HOLES FOR LIFTING
PINS MAY NOT
PROTRUDE THROUGH
MANHOLE WALLS.



SEE
TABLE A

CONCRETE
ENCASEMENT
BELOW SPRING
LINE

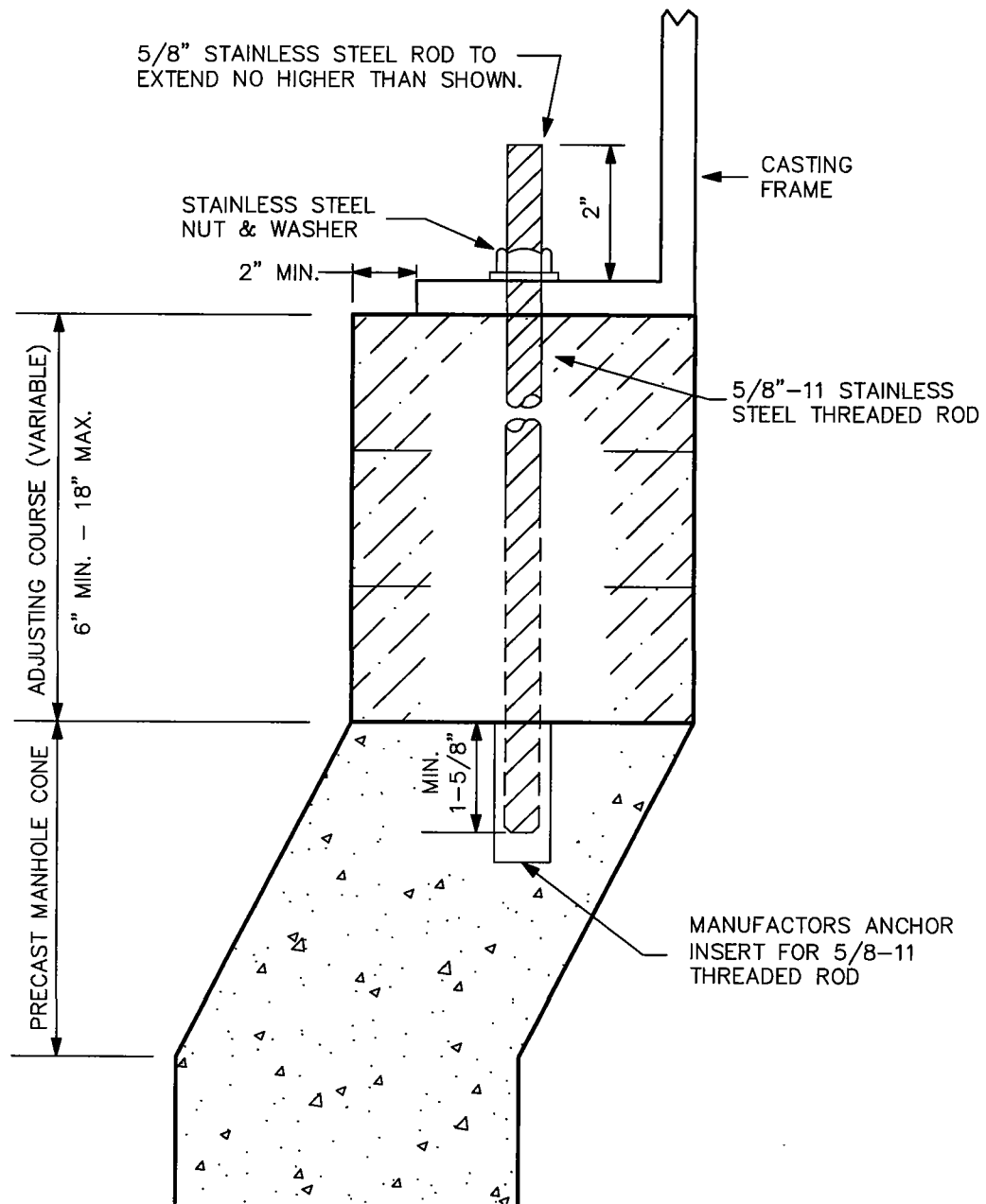
UNDISTURBED
SOIL

NOTE:
DROP MANHOLES
WILL NOT BE
ALLOWED FOR PIPE
INVERT DIFFERENCES
OF LESS THAN 6'.

STANDARD SANITARY SEWER MANHOLE (PRECAST CONCRETE)

6/09

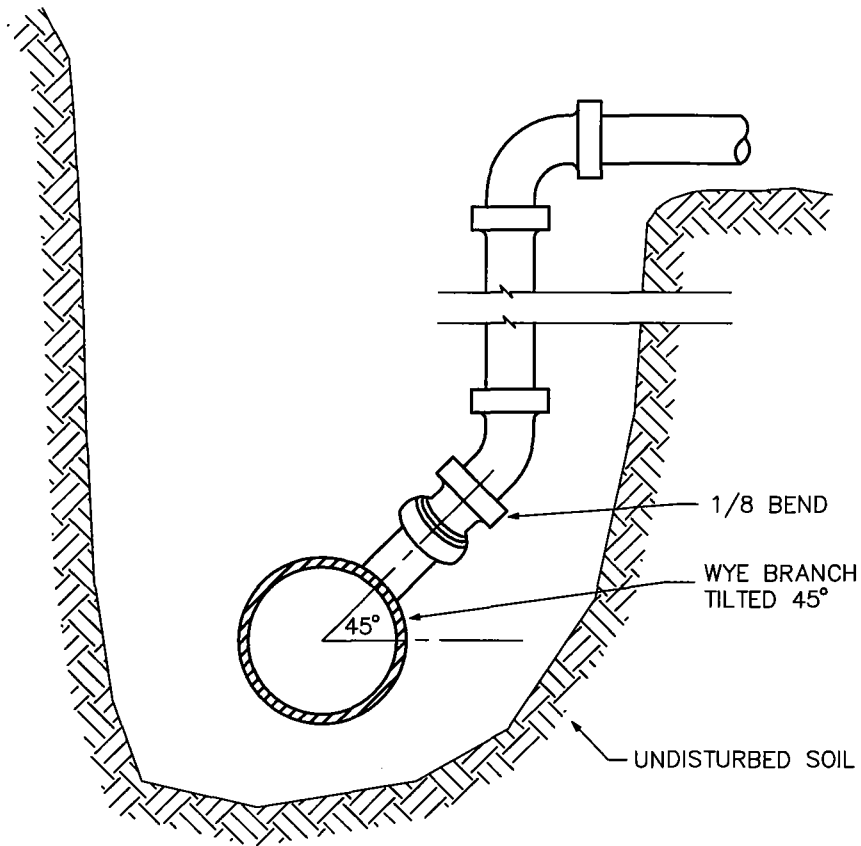
T: \SPECS\DWG\SANMH1.DWG



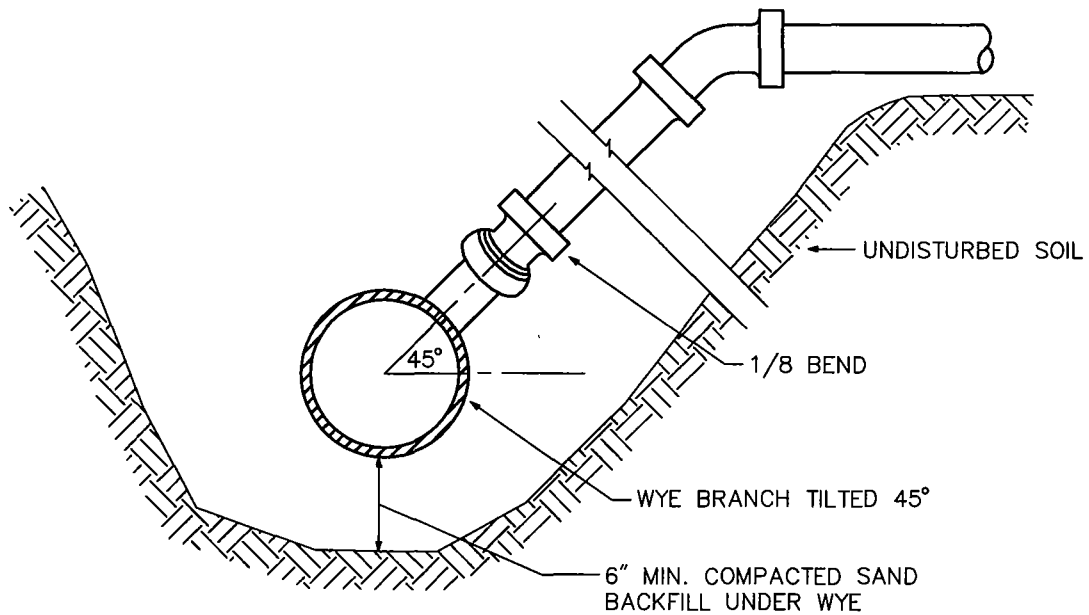
NOTE: FOR ALL PRESSURE TIGHT
CASTING (4 PER COVER)

ANCHOR DETAIL

SEE PLANS OR SPECS FOR
SIZE AND DEPTH OF LATERAL



VERTICAL TRENCH

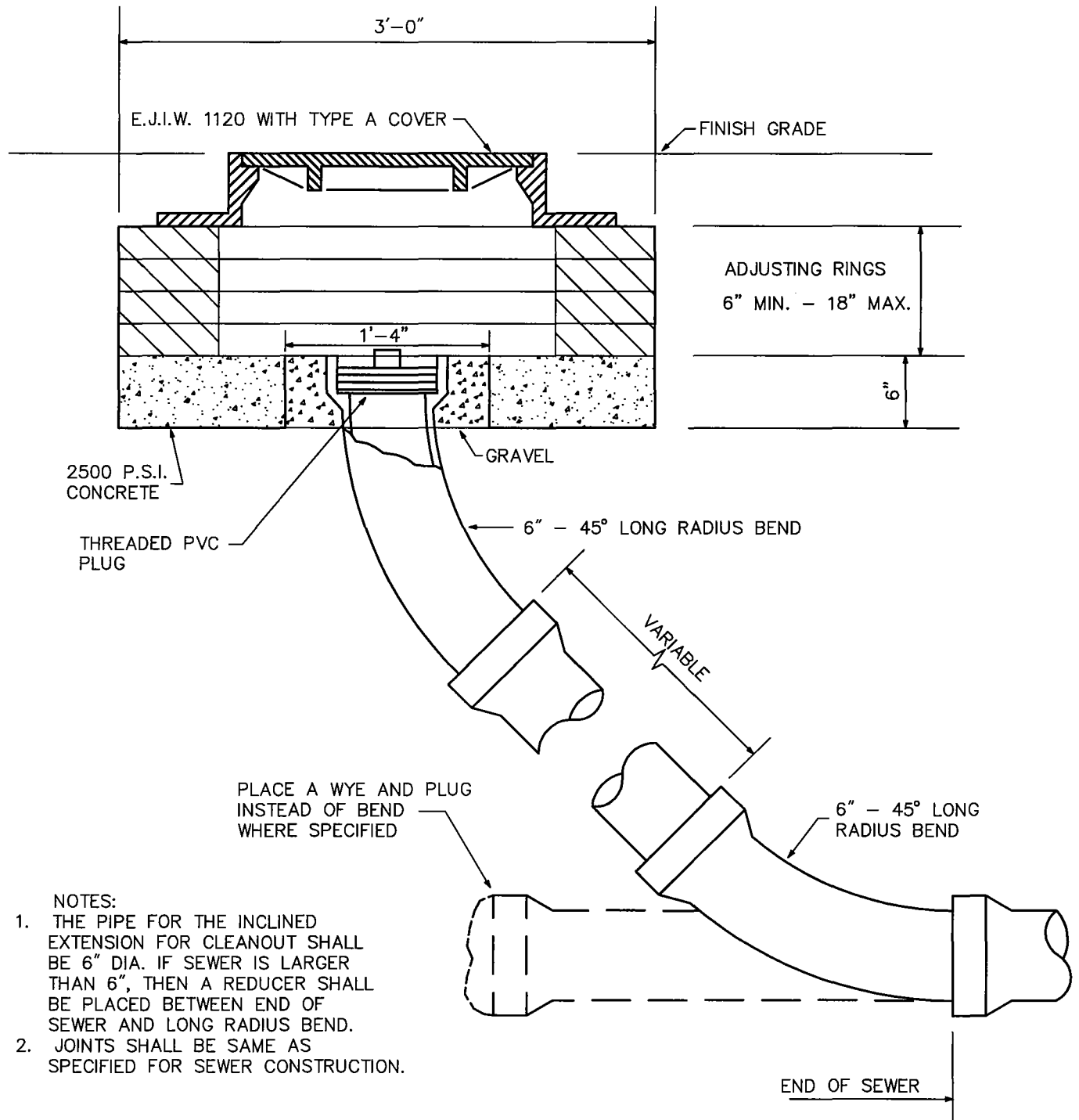


SLOPING TRENCH

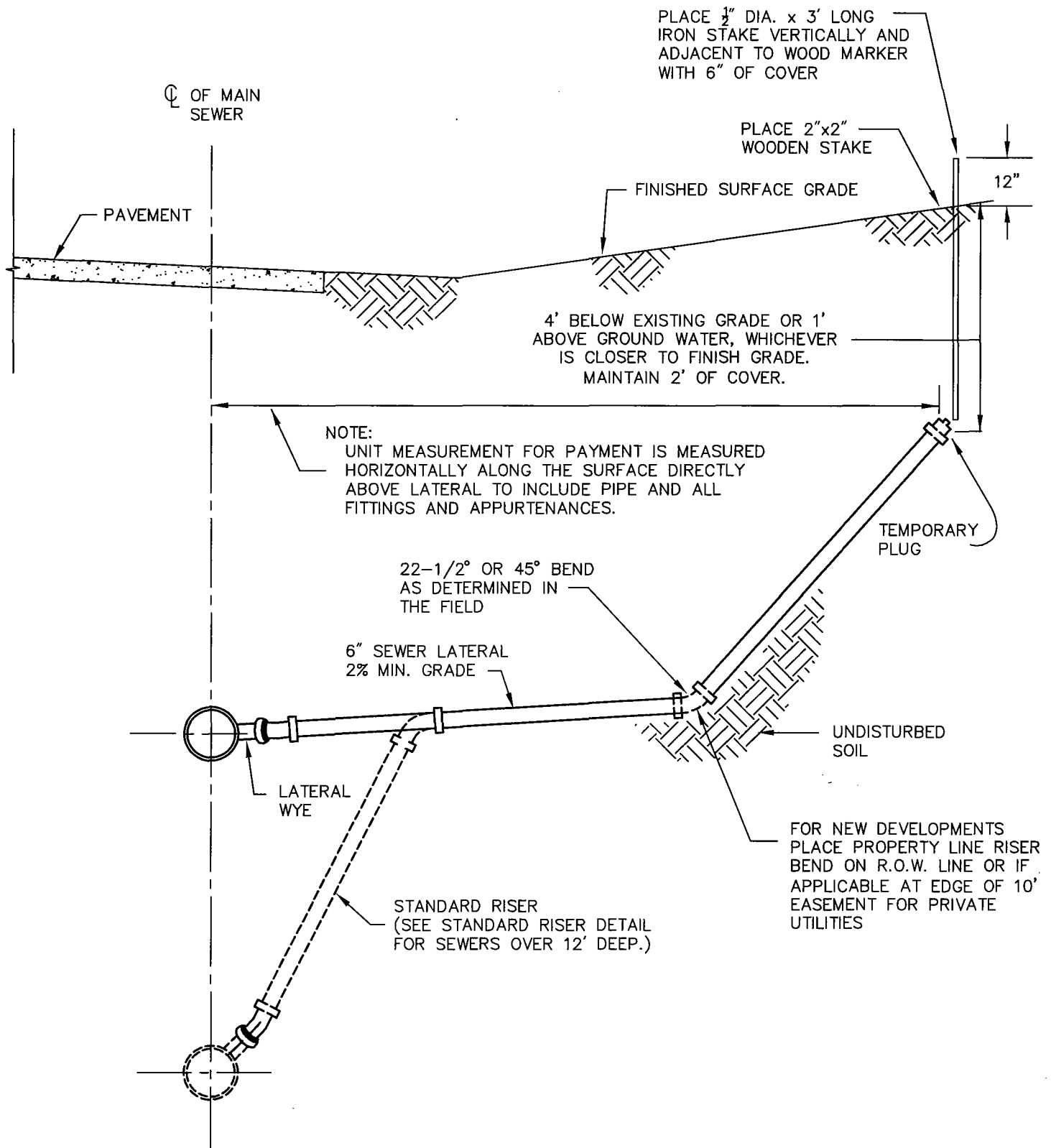
STANDARD RISER DETAILS FOR SEWERS OVER 12' DEEP

6/09

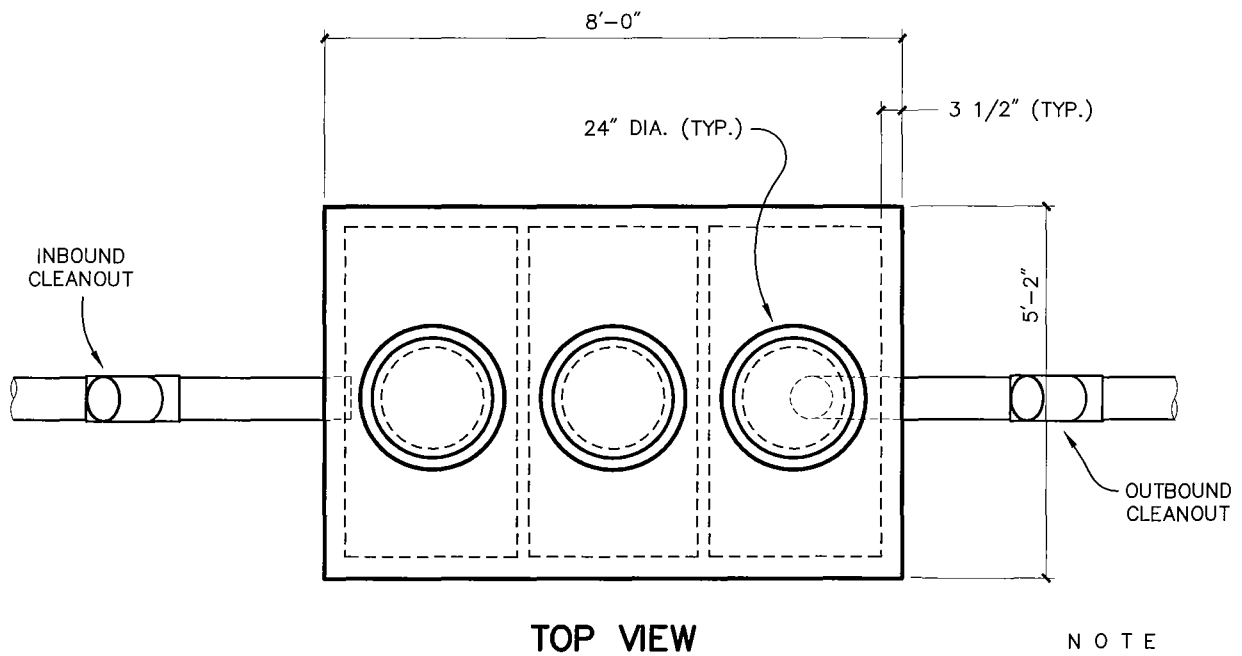
T: \SPECS\DWG\STDRISER.DWG



SEWER CLEANOUT

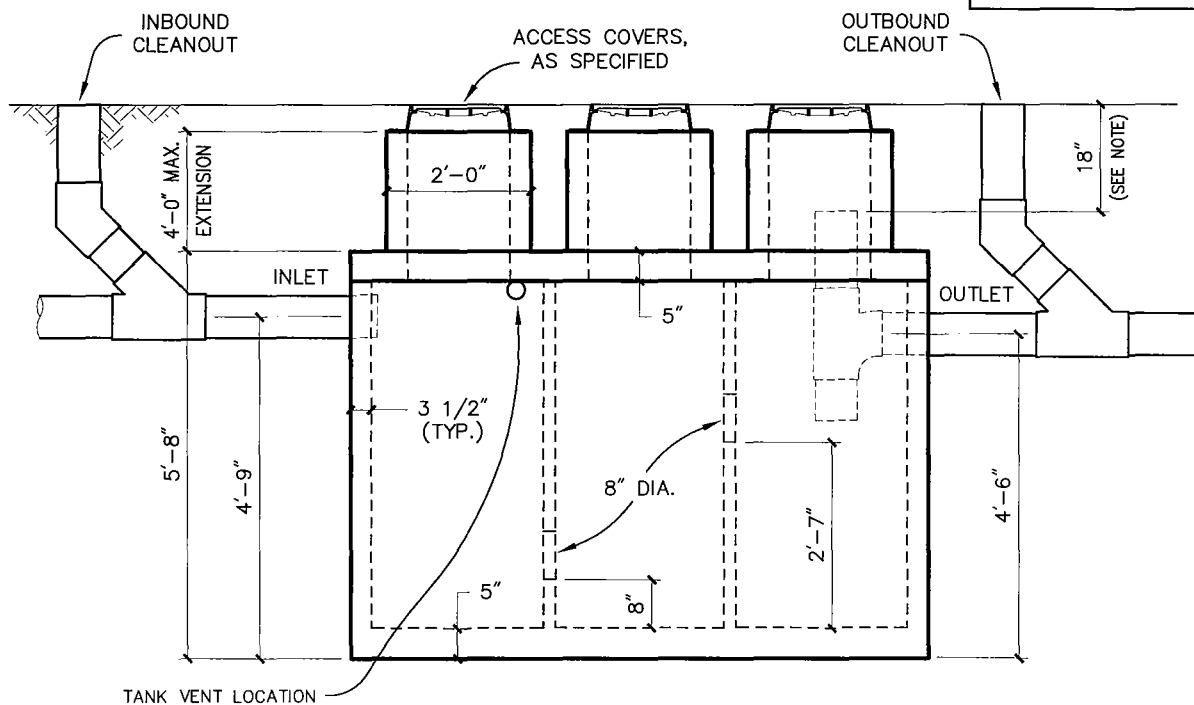


LATERAL AND PROPERTY LINE RISER DETAIL



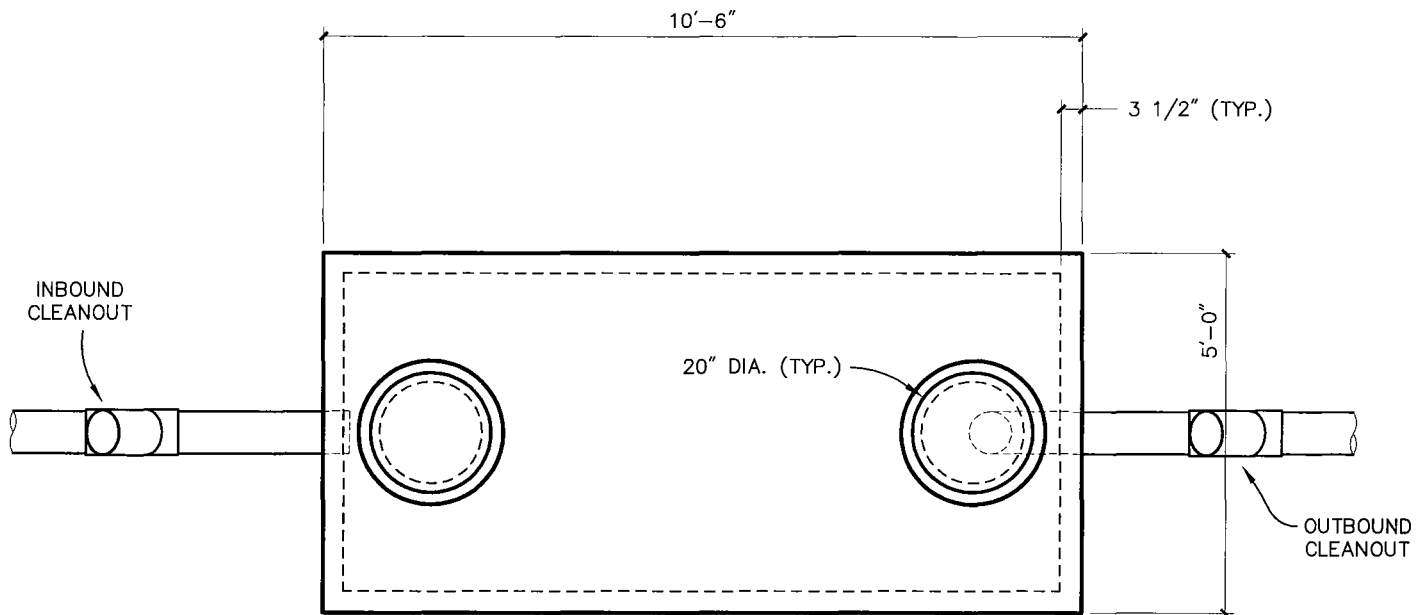
NOTE

DROP LEG ASSEMBLY RISER MUST BE BROUGHT UP TO WITHIN 18" OF GRADE ELEVATION

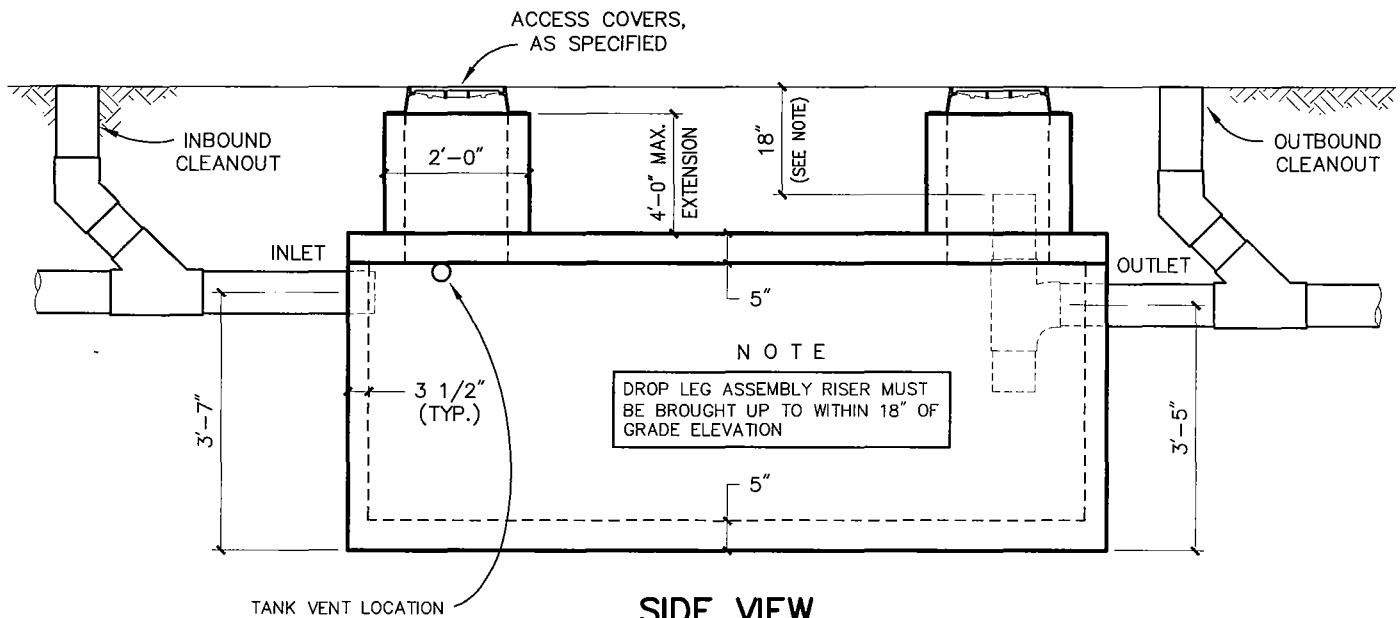


- ACCESS COVERS MUST BE RATED FOR ANTICIPATED TRAFFIC LOAD.
- SEAL BETWEEN TANK AND EXTENSIONS MUST BE WATER TIGHT.
- THE TANK JOINT MUST BE GASKETED AND WRAPPED WITH 12" EZ-WRAP.
- THE TANK MUST HAVE A VENT ABOVE ALL TANK INVERTS AND MUST BE MADE WATER TIGHT.
- INBOUND AND OUTBOUND PIPES MUST HAVE BOOTED SEAL AT TANK OPENING.
- 18" MINIMUM LENGTH ON OUTBOUND DROPLEG
- A SANITARY TEE MUST BE INCLUDED ON THE DROPLEG ASSEMBLY.

1,000 GALLON OUTDOOR GREASE INTERCEPTER



TOP VIEW



SIDE VIEW

- ACCESS COVERS MUST BE RATED FOR ANTICIPATED TRAFFIC LOAD.
- SEAL BETWEEN TANK AND EXTENSIONS MUST BE WATER TIGHT.
- THE TANK JOINT MUST BE GASKETED AND WRAPPED WITH 12" EZ-WRAP.
- THE TANK MUST HAVE A VENT ABOVE ALL TANK INVERTS AND MUST BE MADE WATER TIGHT.
- INBOUND AND OUTBOUND PIPES MUST HAVE BOOTED SEAL AT TANK OPENING.
- 18" MINIMUM LENGTH ON OUTBOUND DROPLEG
- A SANITARY TEE MUST BE INCLUDED ON THE DROPLEG ASSEMBLY.

1,000 GALLON OUTDOOR OIL & SAND SEPARATOR

(SHALLOW)

SECTION 7 CONTENTS

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SECTION 7

SPECIFICATIONS FOR PUMP STATIONS AND FORCE MAINS

7.01 DESCRIPTION OF WORK

7.01.01 PUMP STATIONS DESCRIPTION OF WORK

All pump stations will be designed by the Township's Engineering Consultant.

7.01.02 FORCEMAIN DESCRIPTION OF WORK

The work shall consist of furnishing and installing force main of the specified size or sizes at the depths shown on the plans or specified herein, and furnishing all fittings and joint material, labor, materials, tools, and equipment for receiving, unloading, transporting, laying, and testing of force main pipe and fittings. Contractor shall furnish all necessary accessories to complete the pipe work as shown on the plans and specified herein.

7.02 MATERIALS

All materials furnished by the Contractor shall conform to the specifications which follow. Where reference specifications are mentioned the current edition or latest issue shall be used.

7.02.01 Ductile Iron Pipe

7.02.01.01 Pipe

Ductile iron pipe shall conform to the requirements of AWWA C-151 (ANSI A21.51). Ductile iron pipe shall be Class 53 unless otherwise specified. Brass wedges are required for all push on joints.

7.02.01.02 Fittings

All fittings shall be ductile iron in accordance with AWWA C-153 (ANSI A21.53). Fittings sixteen (16) inches in diameter and smaller shall have a minimum pressure rating of 350 psi., fittings larger than sixteen (16) inches in diameter shall have a minimum pressure rating of 250 psi.

7.02.01.03 Joints

Unless otherwise specified, all pipe joints shall be rubber gasket joints conforming to the requirements of AWWA C-111 (ANSI A21.11) for bolted mechanical joints or push-on joints. Joints on fittings shall be bolted mechanical joints.

7.02.01.04 Cement Lining

All pipe and fittings shall have a cement mortar lining conforming to the requirements of AWWA C-104 (ANSI A21.4).

7.02.02 Plastic Wrap for Pipe

Where indicated on the Plans, or in the specifications, the pipe shall be encased in a seamless polyethylene tube, in accordance with AWWA C-105 (ANSI A21.5). The ends of adjacent sections of polyethylene tubing shall be overlapped a minimum of one (1) foot, and the joint taped or otherwise secured to prevent displacement during backfill operations.

7.03 **HANDLING OF MATERIAL**

The Contractor shall use care and proper equipment during the unloading and distribution of force main materials on the job site to insure the materials are not damaged.

Pipe and/or fittings shall not be rolled or skidded off the truck beds against previously unloaded materials.

7.04 **ALIGNMENT AND GRADE**

7.04.01 General

The force main shall be laid and maintained to the required lines and grades with fittings at the required locations.

7.04.02 Deviations Occasioned by Other Structures

Whenever obstructions not shown on the plans are encountered during the progress of the work and interfere to such an extent that an alteration in the plans is required, the Township shall have the authority to change the plans and order a deviation from the line and grade or arrange with the Owners of the structures for the removal, relocation, or reconstruction of the obstructions.

7.04.03 Depth of Pipe

All pipe shall be laid with the top of the pipe a minimum depth of five (5) feet below established street centerline grade, and with a minimum cover of five (5) feet below existing grade at the force main, unless specified otherwise.

7.05 LAYING

7.05.01 Lowering of Force Main Material into Trench

Proper implements, tools, and facilities shall be provided and used by the Contractor for the safe and expedient completion of the work. All pipe and fittings shall be carefully lowered into the trench by means of suitable tools or equipment, in such a manner as to prevent damage to force main material and protective coatings and linings. Under no circumstances shall force main materials be dropped or dumped into the trench.

If damage occurs to any pipe or fittings in handling, the damage shall be immediately brought to the Township's attention. The Township shall prescribe corrective repairs or rejection of the damaged items.

7.05.02 Inspection before Installation

All pipe and fittings shall be carefully examined for cracks and other defects while suspended above the trench immediately before installation in final position. Spigot ends shall be examined with particular care as this area is the most vulnerable to damage from handling. Defective pipe or fittings shall be laid aside for inspection by the Township, who will prescribe corrective repairs or rejection.

7.05.03 Cleaning of Pipe and Fittings

All lumps, blisters, and excess coating shall be removed from the bell and spigot ends of each pipe, and the outside of the spigot and the inside of the bell shall be wire brushed and wiped clean and dry and free from oil and grease before the pipe is laid.

7.05.04 Laying of Pipe

All dirt or other foreign material shall be removed from the inside of the pipe before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after laying. No tools or other articles shall be stored in the pipe at any time.

As each length of pipe is placed in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Precautions shall be taken to prevent dirt from entering the joint space.

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

7.05.05 Bell Ends to Face Direction of Laying

Pipe shall be laid with bell ends facing in the direction of laying, unless directed otherwise by the Township. Where pipe is laid on a grade of ten (10%) percent or greater, the laying shall start at the bottom and shall proceed upward with the bell ends of the pipe upgrade.

7.05.06 Cutting of Pipe and Connections to Existing Forcemains

The Contractor shall cut the pipe in a straight and uniform manner, at right angles to the axis of the pipe, wherever necessary for placing fittings, or closure pieces without damage to the pipe, and without extra cost to the Owner. The cut ends of the pipe shall be beveled before assembly of the joint.

The method of cutting pipe shall be subject to the approval of the Township.

7.06 JOINING OF MECHANICAL - JOINT PIPE

7.06.01 General Requirements

The general requirements in Sections 7.04 - 7.05 inclusive shall apply except that, where the terms "bell" and "spigot" are there used, they shall be considered to refer to the bell and spigot ends of the lengths of mechanical-joint pipe.

7.06.02 Cleaning and Assembly of Joint

The last eight (8) inches outside of the spigot and inside of the bell of mechanical joint pipe shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter from the joint and then coated with a lubricant as supplied or recommended by the pipe manufacturer and approved by the Township. The retaining gland (Mega-lug) shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket, or bell, end. The rubber gasket shall be coated with lubricant and placed on the spigot end with the thick edge toward the gland.

7.06.03 Bolting of Joint

The entire section of the pipe shall be pushed forward to seat the spigot end in the bell. The gasket shall then be pressed into place within the bell; care shall be taken to locate the gasket evenly around the entire joint. The retaining gland (Mega-lug) shall be moved along the pipe into position for bolting, all of the bolts inserted, and the nuts screwed up tightly with the fingers. All nuts shall be tightened with a suitable (preferably torque-limiting) wrench. The torque for various sizes of bolts shall be as follows:

<u>Size</u> Inches	<u>Range of Torque</u> Foot - Pounds
5/8	45 - 60

3/4	75 - 90
1	100 - 120
1-1/4	120 - 150

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland. When tightening bolts, it is essential that the gland be brought up toward the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This may be done by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, and last, the remaining bolts. Repeat this cycle until all bolts are within the above range or torques. If effective sealing is not attained at the maximum torque indicated above, the joint should be disassembled and reassembled after thorough cleaning. Over stressing of bolts to compensate for poor installation practice is not allowed.

7.06.04 Permissible Deflection in Mechanical-Joint Pipe

Whenever it is desirable to deflect mechanical-joint pipe in order to form a long-radius curve, the amount of deflection shall not exceed the maximum limits shown in Table 1.

TABLE 1

PERMISSIBLE DEFLECTIONS IN MECHANICAL - JOINT PIPE

Size of Pipe Inches	Max. Permissible Deflection Per Length - Inches				Approx. Radius of Curve Produced By Succession of Joints - Feet			
	12'	16'	18'	20'	12'	16'	18'	20'
3	21	28	31	35	85	110	125	140
4	21	28	31	35	85	110	125	140
6	18	24	27	30	100	130	145	160
8	13	18	20	22	130	170	195	220
10	13	18	20	22	130	170	195	220
12	13	18	20	22	130	170	195	220
14	9	12	13.5	15	190	250	285	320
16	9	12	13.5	15	190	250	285	320
18	7.5	10	11	12	230	300	340	380
20	7.5	10	11	12	230	300	340	380
24	6	8	9	10	300	400	450	500
30	6	8	9	10	300	400	450	500
36	5	7	8	9	330	440	500	550
42	5	6	7.5	8	340	450	510	570
48	5	6	7.5	8	340	450	510	570

7.07 JOINING OF PUSH-ON JOINT PIPE

7.07.01 General Requirements

The general requirements in Sections 6.04 - 6.05 inclusive shall apply except that, where the terms "bell" and "spigot" are there used, they shall be considered to refer to the bell and spigot ends of the lengths of push-on joint pipe.

7.07.02 Cleaning and Assembly of Joint

The inside of the bell and the outside of the spigot end shall be thoroughly cleaned or remove oil, grit, excess coating, and other foreign matter. The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the bell socket.

A thin film of gasket lubricant shall be applied to either the inside surface of the gasket or the spigot end of the pipe or both. Gasket lubricant shall be as supplied or recommended by the pipe manufacturer and approved by the Township.

The spigot end of the pipe shall be centered in the bell and forced or pushed home. Smaller sizes of pipe can be pushed or forced into place by hand; larger sizes will require the use of mechanical assistance.

7.07.03 Permissible Deflection in Push-On Joint Pipe

Whenever it is desirable to deflect push-on joint pipe, in order to form a long radius curve, the amount of deflection shall not exceed the maximum limits shown in Table 2, unless recommended by the pipe manufacturer and approved by the Township.

7.07.04 Brass Wedges

All push-on joints shall have brass wedges.

TABLE 2

PERMISSIBLE DEFLECTIONS IN PUSH-ON JOINT PIPE

Size of Pipe Inches	Max. Permissible Deflection Per Length - Inches				Approx. Radius of Curve Produced By Succession of Joints - Feet			
	12'	16'	18'	20'	12'	16'	18'	20'
3	12	16.5	19	21	140	185	205	230
4	12	16.5	19	21	140	185	205	230
6	12	16.5	19	21	140	185	205	230
8	12	16.5	19	21	140	185	205	230
10	12	16.5	19	21	140	185	205	230
12	12	16.5	19	21	140	185	205	230
14	7.5	10	11	12	230	305	340	380
16	7.5	10	11	12	230	305	340	380
18	7.5	10	11	12	230	305	340	380
20	7.5	10	11	12	230	305	340	380
24	7.5	10	11	12	230	305	340	380
30	7.5	10	11	12	230	305	340	380
36	7.5	10	11	12	230	305	340	380
42	5	6.5	7.5	8	340	460	510	570
48	5	6.5	7.5	8	340	460	510	570

7.08 ANCHORAGE

7.08.01 Anchorage for Plugs, Caps, Tees, Bends and Valves

Unless otherwise specified or approved by the Township, movement of all plugs, caps, tees, and bends shall be prevented by use of restrained joint pipe or joint restraining glands (i.e. Mega-lugs). The Township will first encourage the use of EBAA Iron Sales Megalug or approved equal to restrain the pipe.

When joints are to be restrained with mechanical devices as noted above, all joints shall be restrained for a minimum distance from the fitting as required in the following table.

PIPE RESTRAINT LENGTH REQUIRED, FEET

Pipe Diameter	Tees, 90° Bends	45° Bends	22-1/2° Bends	11-1/4° Bends	Dead Ends	Reducers (one size)	**
4"	23	9	5	2	57		
6"	32	13	6	3	82	43	63
8"	41	17	8	4	104	43	55
12"	58	24	12	6	149	80	120
16"	74	31	15	7	192	82	110
20"	89	37	18	9	233	82	104
24"	104	43	21	10	272	82	99
30"	123	51	25	12	328	115	148
36"	141	58	28	14	379	115	140

**If the straight run of pipe on the small side of the reducer exceeds this value, then no restrained joints are necessary.

NOTE: The length of restrained joint pipe required as shown in the table above is based on trench backfill being compacted to ninety five (95%) percent of maximum unit weight in accordance with MDOT procedures. If the pipe is wrapped in polyethylene, a greater length of restrained pipe will be required as specified, shown on the Plans, or directed by the Township. A multiplier of 1.43 shall be used if the pipe is installed with polyethylene wrap.

All joints lying within the above minimum distances from the fitting must be restrained as noted herein.

Tees: Tees shall be restrained in the branch direction as required in the table above. Also, to augment the above, in the straight through direction, the minimum length of the first pipe on either side of the tee shall be ten (10) feet.

Bends: Bends shall be restrained in both directions as required in the table above.

7.08.02 Reaction Backing (Thrust Blocks)

Reaction backing (thrust blocks) shall be used only at locations indicated on the Plans, or approved by the Township.

Reaction backing shall be concrete of a mix not leaner than one (1) part cement to two and one-half (2-1/2) parts sand and five (5) parts stone, and having a compressive strength of not less than 2,000 psi after twenty eight (28) days. Backing shall be placed between solid ground and the fitting to be anchored. The area of bearing on the pipe and on the ground in each instance shall be that shown in the table below or

directed by the Township. The backing shall, unless otherwise shown or directed, be so placed that the pipe and fitting joints will be accessible for repair.

REACTION BACKING

Minimum Bearing Area against undisturbed trench wall, in square feet, for sand is indicated in the table below. Details of placement are shown in Standard Details.

Pipe Size	Tees, Plugs, Wyes,		Wyes, 22-1/2° Els or Less
	45° Els	90° Els	
6"	3	3	1
8"	4	6	2
10"	7	9	3
12"	9	11	3
16"	13	20	6
20"	20	28	8
24"	28	40	11

Other Soil Conditions

Cement Sand or Hardpan	-	multiply above by 0.5
Gravel	-	multiply above by 0.7
Hard Dry Clay	-	multiply above by 0.7
Soft Clay	-	multiply above by 2.0

Muck - secure all fittings with restrained joint pipe or joint restraining glands, with concrete reaction backing the same as listed for sand conditions.

7.09 CLEAN OUTS

Single and double clean outs shall be constructed as shown on the standard detail. All pipe and fittings for the clean out shall be ductile iron. Unless otherwise specified, manhole castings shall be East Jordan No. 1120 with Type A solid cover or approved equal.

7.10 AIR RELIEF VALVES

7.10.01 Air Relief Valve

Air relief valve shall be APCO 400 WA sewage valve, Crispin, Valmatic #48BW, or equal, with two (2) inch inlet and five-sixteenths (5/16) inch orifice. Riser and fittings to be brass; gate valve to be iron pipe gate valve. Location of air relief valve shall be shown on the construction plans.

7.10.02 Air Relief Valve Manhole

Air relief manholes shall be constructed in accordance with the Standard Details and as specified herein.

Precast bases shall be installed on the subbase in such a way as to provide a uniform bearing under the manhole base.

Precast manholes with integral bottom may be used; however, any changes to the structure due to minor field adjustments in alignment and grade required to meet construction conditions, shall be made by the Contractor.

7.11 HYDROSTATIC TEST

7.11.01 Procedure

All tests will be made by the Contractor using his own equipment, operators, and supervision, in the presence of the Township or its duly authorized representative. The length of the section to be tested shall be as approved by the Township, or as shown on the plans.

7.11.02 Air Removal before Test

Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with potable water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure of 150 psi applied.

7.11.03 Leakage Test

A leakage test shall be conducted in the presence of the Township after the pressure test has been satisfactorily completed. The Contractor shall furnish the pump, pipe, connections, gages and all other necessary apparatus, and shall furnish the necessary assistance to conduct the test. The duration of each leakage test shall be one (1) hour and during the test the main shall be subjected to a pressure of 150 psi. When several valved sections are tested as one test, the maximum allowable leakage will be equivalent to the calculated smallest value of the maximum allowable leakage for any valved section. No pipe installation will be accepted if the leakage is greater than that determined by the formula:

$$L = \frac{SD\sqrt{P}}{66,600}$$

Where:

L = Allowable leakage in gallons per hour

S = Length of pipe tested, in feet

D = Nominal diameter of the pipe, in inches

P = Average test pressure during the leakage test, in pounds per square inch gage.

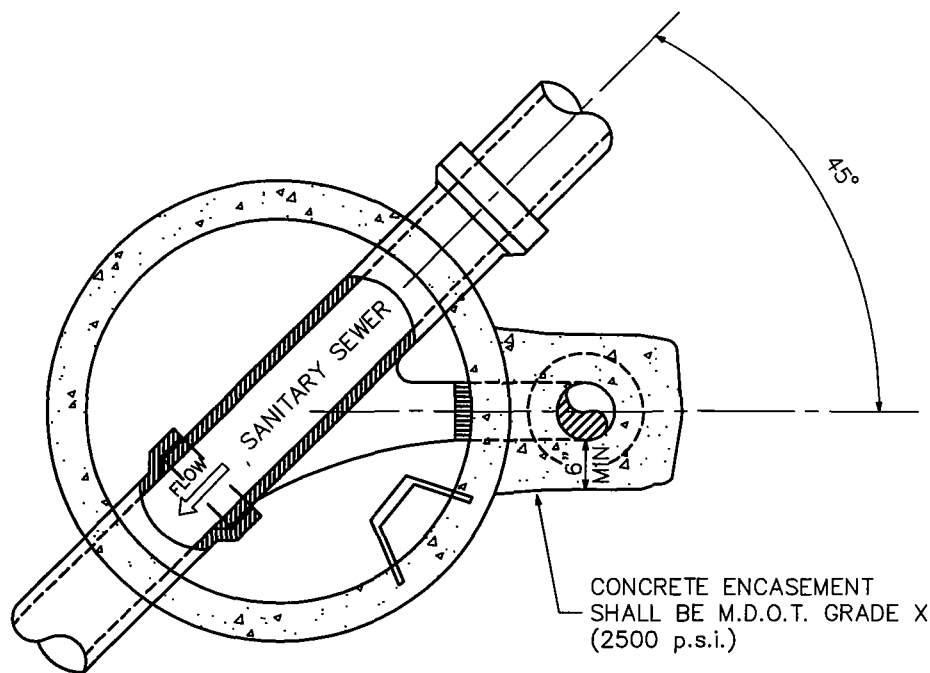
This formula is based on allowable leakage of 23.30 gallons per day, per mile of pipe, per inch of nominal diameter at 150 psi. The Township shall be furnished a written report of the results of the leakage test that identifies the specific length of pipe tested, the pressure, the duration of the test, and the amount of leakage. The report shall be signed by the Contractor and the Township.

7.11.04 Variation from Permissible Leakage

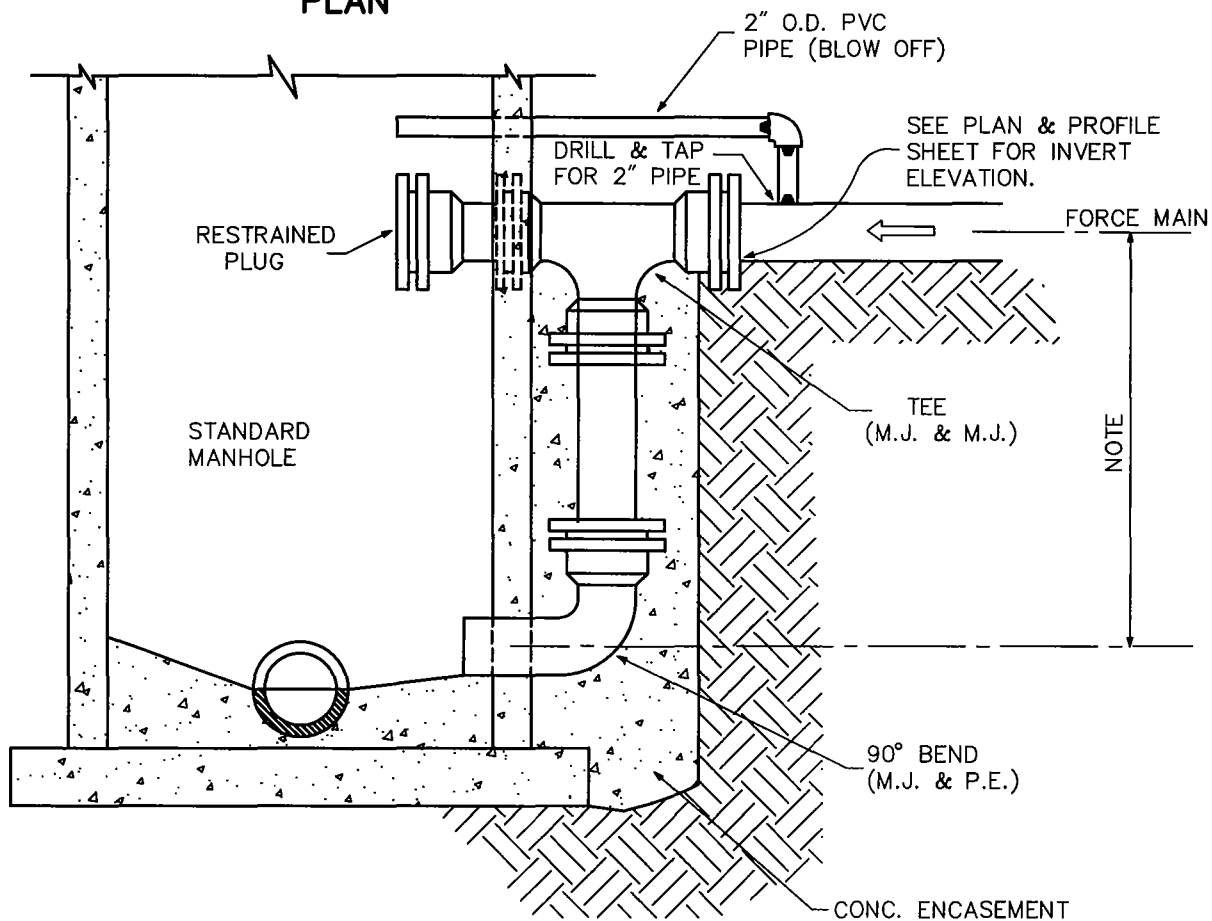
If any test of pipe laid discloses leakage greater than that specified above, the Contractor shall at his own expense locate and repair the leaks until the leakage is within the specified allowance.

7.11.05 Time for Making Test

The pipe may be subject to hydrostatic pressure and inspected and tested for leakage at any convenient time after the trench has been partially backfilled. Where any section of the main is provided with concrete reaction backing, the hydrostatic pressure test shall not be made until at least five (5) days have elapsed after the concrete reaction backing was installed. If high-early-strength cement is used in the concrete reaction backing, the hydrostatic pressure test will not be made until at least two (2) days have elapse.



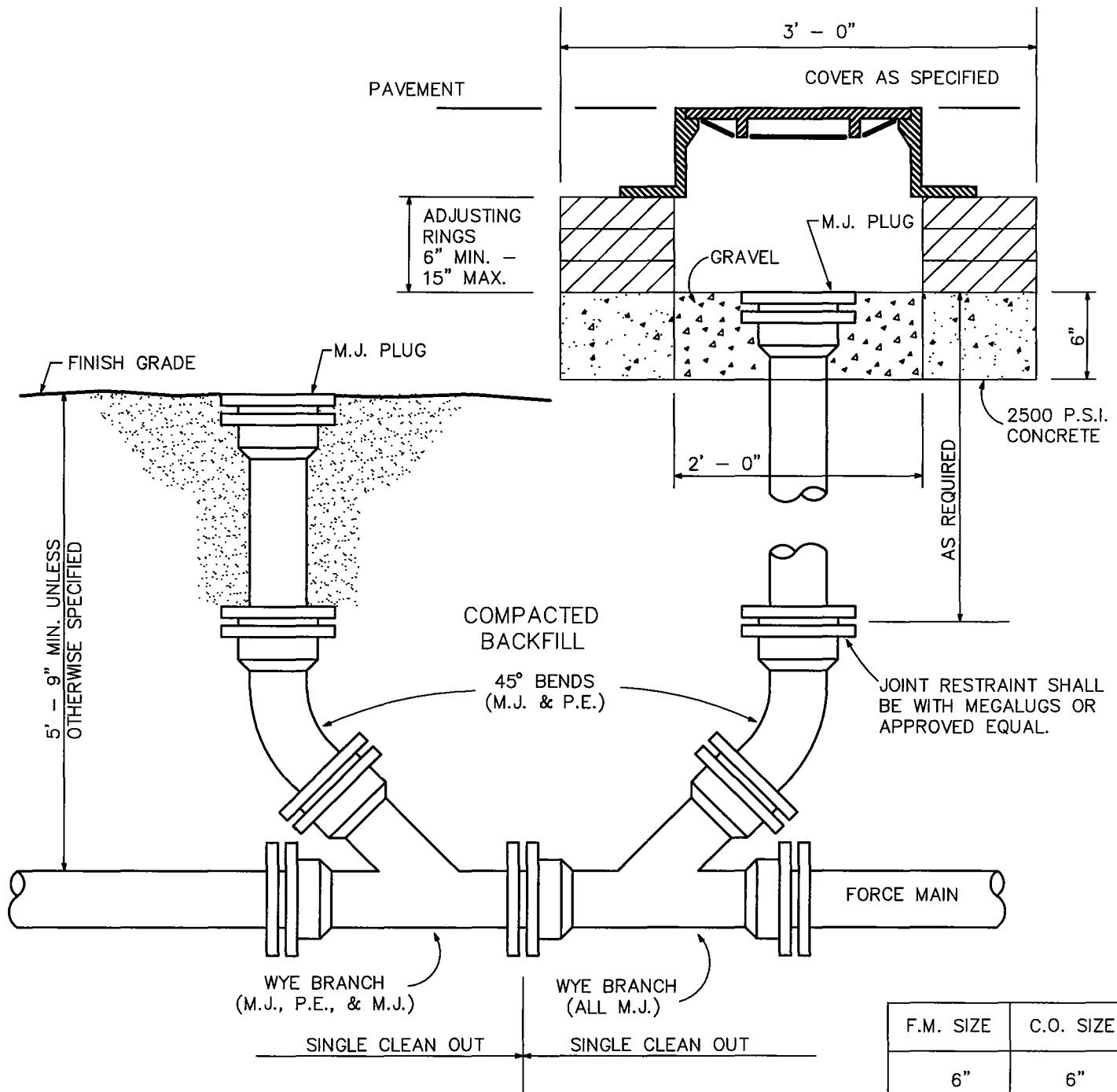
PLAN



NOTE -
FORCE MAIN DROP CONNECTION REQUIRED
FOR DROPS IN EXCESS 6"

SECTION

STANDARD FORCE MAIN DROP CONNECTION



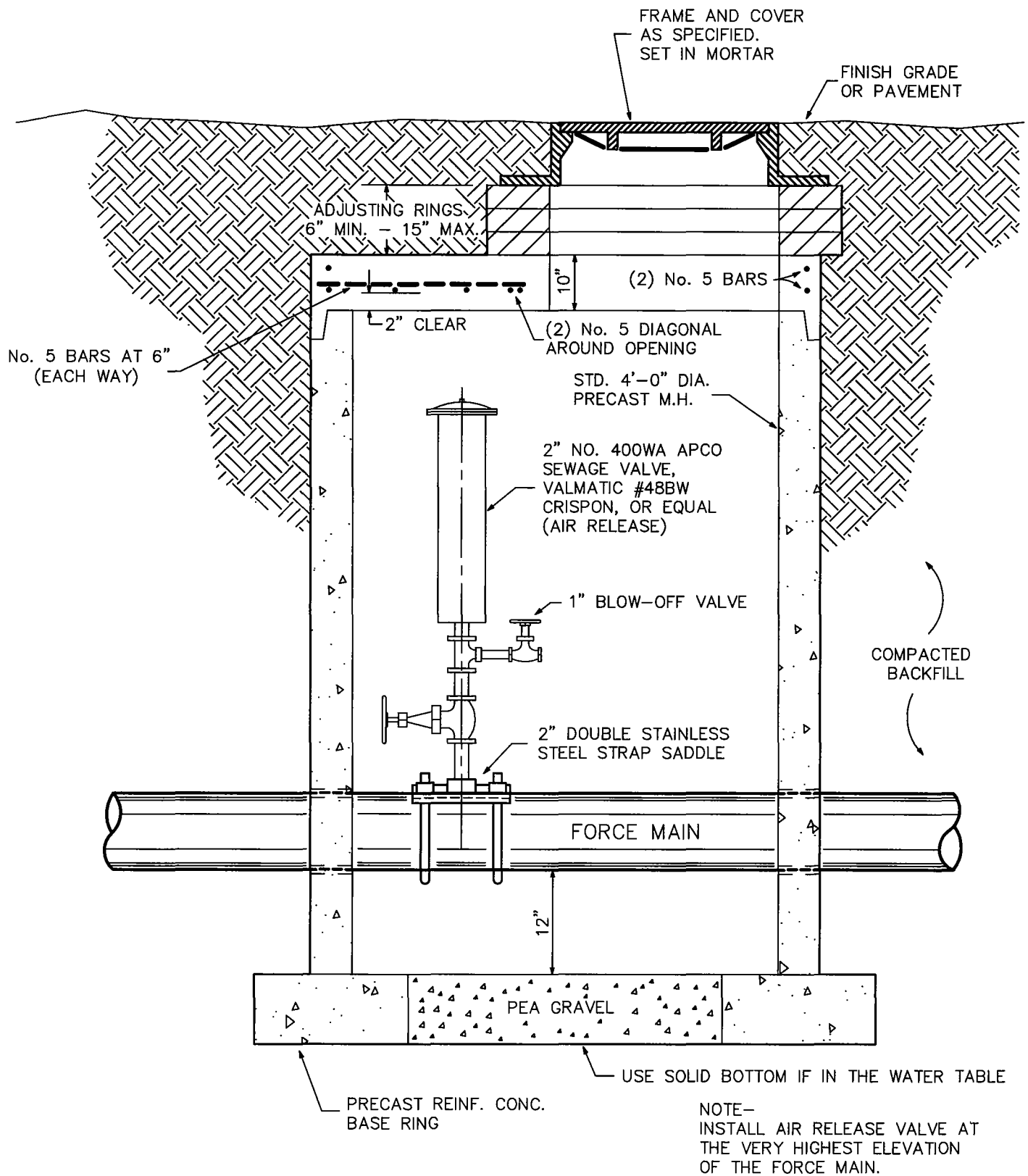
NOTE: ALL MATERIALS IN CLEAN OUT ASSEMBLY SHALL BE DUCTILE IRON.

F.M. SIZE	C.O. SIZE
6"	6"
8"	6"
10"	8"
12"	8"
16"	12"
OVER 16"	12"

STANDARD DOUBLE CLEAN OUT IN FORCE MAIN

6/09

T: \SPECS\DWG\DOUBCO.DWG



STANDARD AIR RELEASE VALVE - MANHOLE

APPENDIX “A”

CHARGES / FEES

Charges and fees for availability, trunkage, laterals, services, and inspection shall be paid in accordance with the respective Township’s ordinance to administer, regulate and provide for the connection to and use of the public water and sewer systems, and to provide for the setting and collection of rates and charges for the use of the water and sewer systems.

APPENDIX "B"

Public Utilities Easement
Parcel No.

EASEMENT AGREEMENT

KNOW ALL MEN BY THESE PRESENTS, that _____

whose address is _____ (the "OWNER") a
(corporation) (partnership) (limited liability company) formed under the laws of the State of _____, and the TOWNSHIP OF BYRON and the CHARTER TOWNSHIP OF GAINES
whose respective addresses are 8085 BYRON CENTER AVENUE SW, BYRON CENTER, MI 49315 and 8555 KALAMAZOO AVENUE, SE, CALEDONIA, MI 49316, (the "GRANTEE"),
agree as follows:

The Owner is the owner of real property as described below and Owner wishes to construct certain utilities in accordance with plans and specifications furnished by Owner and approved by Grantee which shall become public utilities upon their construction and acceptance by Grantee, and Owner desires to convey all right, title and interest to the utilities constructed by Owner, as well as grant an easement to Grantee regarding such utilities and such future utilities as Grantee may construct within such easement.

The Owner, for and in consideration of the sum of One Dollar (\$1.00), receipt of which is acknowledged, does hereby convey, grant and release to the GRANTEE, its successors and assigns, a permanent easement and right-of-way in which to build, install, construct, inspect, operate, maintain, repair and replace public service or utility components consisting of water mains, sanitary sewer lines, force mains, drains, storm sewers, other public service or utility facilities, or any combination thereof, and other related improvements necessary to provide such public services (the "Improvements") over, across, under, and through the following parcels of land situated in the TOWNSHIP of _____ in the County of Kent, State of Michigan, known as the parent parcel, and described as:

SEE ATTACHED EXHIBIT A

(the "Property"), together with the right of ingress and egress to, from and over said lands.

The easement located on the Property shall consist of a Permanent Easement as more specifically described below.

SEE ATTACHED EXHIBIT A

The Grantee may remove pavement, fences, shrubs, trees, or other surface or subsurface landscaping or improvements if required for its exercise of the easement rights. This conveyance includes a release of any and all claims to damages arising from or incidental to the exercise of any of the rights granted herein, except that the Grantee will restore the surface of the Property to its original condition as near as may be reasonable for any activities Grantee conducts on the surface of the Property. Such restoration shall include grading, seeding and repair of roadway, driveway, walkway and parking areas (paved and unpaved) but shall not include replacement of trees, shrubs, fences, or other landscaping or improvements.

The Owner shall not place, or permit to be placed, trees, major shrubbery, fences, buildings, structures or other construction of any kind or nature upon, over or under the above-described Permanent Easement without the prior written consent of the Grantee.

The Owner hereby agrees to save and hold Grantee harmless from any and all claims, debts, causes of action or judgments for any damage to property and/or injury to any person which may arise out of any construction within or use of easement areas by the Owner, its agents, employees, representatives, contractors, successors or assigns.

The Owner and its successors or assigns agree that if any buildings or other structures are constructed by it, its successors or assigns, near or adjacent to said Permanent Easement, and because of the construction of such buildings and other structures, it should become necessary to structurally support, shore, brace or otherwise provide for the stability of such buildings, surface or subsurface structures so that the Grantee may perform the work of constructing, maintaining, replacing and repairing the facilities installed within the easement, the Owner shall assume such expense for support, shoring and bracing; provided, however, that the Grantee shall consult with the Owner, its successors and assigns before performing the work with respect to alternative methods of construction, repair, improvement, maintenance or replacement. The Owner and the Grantee shall confer promptly and shall avoid jeopardizing the health, welfare and safety of the public by unnecessary delays in consultation.

The Owner reserves the right to grant to others additional easement rights, in the easement hereby being granted, for the installation and maintenance of gas, electric power, telephone structures and lines; said right being subject to approval by the Grantee as to location and size of the proposed easement and utilities. Said approval by the Grantee shall not be unreasonably withheld. All such additional easements shall be subject to the prior rights of the Grantee and additional expenses incurred in the construction maintenance, repair or replacing of the facilities owned by the Grantee resulting from these additional easements and the presence of gas, electric or telephone structures and lines, shall be assumed by the owners of the structures or lines causing such extra expense.

This Agreement shall be binding on and for the benefit of the parties hereto, their heirs, representatives, successors and assigns. The rights granted in this Agreement may be assigned by Grantee in whole or in part.

Executed this _____ day of _____, 20____.

WITNESSES:

OWNER:

By: _____

Its: _____

STATE OF MICHIGAN)
) ss
COUNTY OF _____)

The foregoing instrument was acknowledged before me this _____ day of _____,
20____, by _____ on behalf of _____.

Notary Public

County, _____
My commission expires: _____

Prepared By:

After Recording Return To: Mr. Dan Van Dyke, Director
Byron Gaines Utility Authority
1381 – 84th Street SE
Byron Center, MI 49315

**EXHIBIT A
TO EASEMENT AGREEMENT**

PARCEL NO.

PROPERTY DESCRIPTION:

PERMANENT EASEMENT:

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APPENDIX "C"

**WATER AND/OR SEWER
DEVELOPMENT CONTRACT
CONTRACT FACE PAGES**

I. PARTIES

A. DEVELOPER (the "Developer"):

X

Name

X

Address

X

Type of legal entity, i.e. corporation, partnership, limited liability
Company, individual, etc.

**B. TOWNSHIP OF _____ (the "Township"),
whose address is:**

II. DESCRIPTION OF DEVELOPER'S DEVELOPMENT (the "Development").

**III. DESCRIPTION OF WATER AND/OR SEWER
EXTENSIONS/IMPROVEMENTS TO BE CONSTRUCTED BY DEVELOPER IN
ACCORDANCE WITH THIS DEVELOPMENT CONTRACT (the "Project").**

See Attached Construction Plans

Note: A map showing the location of the Development and the Project, which separately identifies the water and/or sewer extensions/improvements, must be attached to this Development Contract.

IV. **PROJECT COMPLETION DATE** (the “Completion Date”): _____

V. **IRREVOCABLE LETTER OF CREDIT**

A. Required prior to commencement of construction:

YES _____ NO _____

B. Amount of letter of credit: \$ _____

VI. **WATER AVAILABILITY FEE**

A. Basis of Water Availability: _____

B. Amount of Water Availability Fee: \$ _____

C. Payment Terms: _____

VII. **WATER TRUNKAGE FEE**

A. Basis of Water Trunkage Fee: _____

B. Amount of Water Trunkage Fee: \$ _____

C. Payment Terms: _____

VIII. WATERMAIN PAYBACK ARRANGEMENTS

- A. Basis of Payback Arrangements for Watermain: _____

- B. Maximum Amount of Watermain Payback Payments to the Developer:
\$ _____
- C. Payment Terms: _____

- D. Expiration Date of Payback Arrangements: _____
- E. The Developer acknowledges that the obligation of the Township to make payback payments is contingent upon future events (i.e., water and/or sewer connections) which are not within the control of the Township and therefore the Developer further acknowledges that the amount and frequency of payback payments is not guaranteed by the Township.

IX. PAYMENT TO THE DEVELOPER FOR OVERSIZING WATERMAIN

- A. Basis of Oversizing Payment for Watermain: _____

- B. Amount of Oversizing Payment to the Developer: \$ _____
- C. Payment Terms: _____

Note: The payment for oversizing may be funded jointly by the Township of Byron and the Charter Township of Gaines in accordance with a separate cost sharing agreement between the Townships.

X. SEWER AVAILABILITY FEE

- A. Basis of Sewer Availability Fee: _____

- B. Amount of Sewer Availability Fee: \$ _____
- C. Payment Terms: _____

XI. SEWER TRUNKAGE FEE

- A. Basis of Sewer Trunkage Fee: _____

- B. Amount of Sewer Trunkage Fee: \$ _____
- C. Payment Terms: _____

XII. SANITARY SEWER PAYBACK ARRANGEMENTS

- A. Basis of Payback Arrangements for Sanitary Sewer: _____

B. Maximum Amount of Sanitary Sewer Payback Payments to the Developer:
\$ _____

C. Payment Terms: _____

D. Expiration Date of Payback Arrangements: _____

E. The Developer acknowledges that the obligation of the Township to make payback payments is contingent upon future events (i.e., water and/or sewer connections) which are not within the control of the Township and therefore the Developer further acknowledges that the amount and frequency of payback payments is not guaranteed by the Township.

XIII. PAYMENT TO THE DEVELOPER FOR OVERSIZING SANITARY SEWER

A. Basis of Oversizing Payment for Sanitary Sewer: _____

B. Amount of Oversizing Payment to the Developer: \$ _____

C. Payment Terms: _____

Note: The payment for oversizing may be funded jointly by the Township of Byron and the Charter Township of Gaines in accordance with a separate cost sharing agreement between the Townships.

XIV. PAYMENT OF PROJECT COSTS

Subject to oversizing payments as summarized above, if any, the Developer shall pay all costs of the Project, including without limitation all costs related to construction of the public water main and/or public sewer main, water services, sewer laterals and related improvements and appurtenances, the cost of acquiring necessary interests in land and right of ways, engineering, restoration and replacement, the cost of connecting the Project to the existing water or sewer system, the cost of connecting the Development to the Project and the Permit, Plan Review and Construction Inspection Costs identified in XV below.

XV. PERMIT, PLAN REVIEW, AND CONSTRUCTION INSPECTION COSTS:

In addition to the payment of Project costs and applicable availability fees, trunkage fees and all other rates, charges and costs imposed by applicable Township ordinance, the Developer shall reimburse the Township for costs of (a) sanitary sewer and watermain construction permit submittals, (b) Township Engineer and staff review of plans, and (c) construction inspection performed by the Township or the Township's duly authorized representatives.

XVI. MISCELLANEOUS

XVII. AGREEMENT OF THE PARTIES:

In consideration of the mutual covenants and agreements contained in the attached Contract Terms, the parties mutually agree that the Developer will acquire and construct the Project at Developer's sole expense, that after completion of the Project ownership of the Project shall be transferred by the Developer to the Township in accordance with the Contract Terms, and that all aspects of the acquisition, construction, completion, and transfer of the Project shall be governed by the Contract Terms, attached hereto.

IN WITNESS WHEREOF, the parties have executed this Contract.

Witnesses:

DEVELOPER:

(1) _____

By: _____

Its: _____

(2) _____

By: _____

Its: _____

Dated: _____, 20__

Witnesses:

TOWNSHIP OF _____:

(1) _____

By: _____

Its: Supervisor

(2) _____

By: _____

Its: Clerk

Dated: _____, 20__

WATER AND/OR SEWER DEVELOPMENT CONTRACT

CONTRACT TERMS

Section 1. **PRECONSTRUCTION MATTERS.** Before commencing construction of the Project, the Developer shall complete all of the following:

(a) Obtain all necessary permits for the installation and construction of the Project from all state and county agencies having jurisdiction and all necessary permission to work in the public right-of-way from the Township, County Road Commission, Michigan Department of Transportation, and other public bodies.

(b) Submit to the Township for approval detailed plans and specifications for the Project prepared by a professional engineer licensed in Michigan. The plans and specifications are to be provided in a format acceptable to the Township. Construction of the Project shall not commence unless and until the Township reviews and approves these plans and specifications in writing. As part of the approval of the plans and specifications, the Township Engineer shall determine the location of the public water main or public sewer, and approve the construction methods and materials used in the construction, including in the case of a public water main extension, the installation of fire hydrant markers. The extension shall cover the entire road or public right of way frontage of the Development to be served by the extension. If the Township requests changes in the plans and specifications for the Project, the Developer agrees to make such changes as shall be requested by the Township provided, however, the Township shall not withhold its approval of the plans and specifications unreasonably and, further, that if Township requirements with respect to the plans and specifications are in conflict with those of the state or any county agency having jurisdiction, the requirements of the state or county agency shall control. The fact that the Township may require higher quality materials or better construction practices than a state or county agency shall not be deemed a conflict and Township requirements shall control. The plans and specifications shall provide for complete restoration to original condition of all paved street surfaces and bicycle paths as well as replacement of all driveways and landscaping disturbed or damaged in the course of the construction of the Project;

(c) Submit to the Township the names of the proposed general contractor and all subcontractors who will be constructing and completing the Project on behalf of the Developer. Construction of the Project shall not commence unless and until the Township has approved in writing the Developer's general contractor and all subcontractors, such approval not to be withheld unreasonably. On request, the Developer shall submit to the Township such additional information concerning the Developer's proposed contractors as the Township shall reasonably request;

(d) Submit to the Township a copy of a proposed written contract between the Developer and its general contractor. The Developer may remove from this contract price information. This contract shall not be signed until approved in writing by the Township. A copy of the final signed contract shall be provided to the Township. This contract shall contain

the following provisions: “The construction project to be completed pursuant to this contract shall be completed in all respects in accordance with the current Byron / Gaines Utility Authority Standard Construction Requirements (together, the “Specifications”), and all terms and provisions of this contract and all plans and specifications and other documentation incorporated by reference in this contract or applicable to the construction project provided for in this contract shall be subordinate to the provisions of the Specifications. The Township of Byron shall be deemed to be a third party beneficiary of this construction contract and all provisions of the construction contract in favor of the owner and/or the Township of Byron may be enforced by the Township of Byron, however, the Township of Byron shall not be obligated to enforce any such provisions;” and

(e) Transfer, in consideration of this Development Contract, to the Charter Township of Gaines and the Township of Byron, jointly (together, the “Townships”), all easements required to construct the Project. All easements shall be in such form and substance as shall be required by the Township. All easements shall be perpetual and shall be at least as wide as required by the Township but no less than twenty (20) feet in width in any event. The Developer shall provide to the Township such proof of title and other title documentation as the Township shall reasonably require in order to verify that the Township is receiving good title to all easements being transferred to the Township by the Developer.

Section 2. **PROJECT CONSTRUCTION.** The Developer shall cause the Project to be constructed in accordance with the approved plans and specifications in a good and workmanlike manner and so as to meet all quality standards and tests which would apply and be conducted if the Township itself constructed and acquired the Project. During construction of the Project, the Township shall have the right, at the cost of the Developer, to undertake with Township employees or third party contractors such inspection of the Project as the Township shall deem appropriate. No change order shall be issued with respect to the approved plans and specifications without prior written approval of the Township, such approval not to be withheld unreasonably.

Section 3. **DEWATERING.** If the Project requires dewatering, the Developer agrees that the Developer alone, at the Developer’s sole cost, is responsible for any negative impact caused by Project dewatering including, but without limitation, the drying of lakes, streams, or ponds or the quantity, quality and taste of the well water supply of any lands. No Project shall be transferred to the Township, and the Township will not approve any Project or accept ownership thereof, unless and until the Township is satisfied that all negative impact to well water supplies, or bodies of water, caused by the Project have been fully and satisfactorily corrected. The Township may require written documentation from the owner of lands whose well water supply, or body of water, has been affected by Project dewatering that such land owner is satisfied with his/her/their well water supply, or body of water, if the lands have not been connected to the public water system. In the event of a disagreement between the Township and the Developer as to whether a particular well or body of water has been adversely affected by the Project, the Township’s engineer shall make a written determination and this determination shall be final and binding on the Township and the Developer.

Section 4. **COMPLETION OF THE PROJECT.** The Project shall be completed and made available to the Township for final inspection and approval no later than the Completion Date. Upon completion of the Project and after final inspection and written approval by the Township, such approval not to be withheld unreasonably, the Project shall be transferred by the Developer, in consideration of this Development Contract, to the Charter Township of Gaines and the Township of Byron, jointly, (together the "Townships") pursuant to the Townships standard form Warranty Bill of Sale.

The Township shall not be obligated to approve the Project or accept ownership thereof unless and until the Township is satisfied the Project has been constructed in accordance with the approved plans and specifications and in a good and workmanlike manner and, further, that the Project meets all quality standards and tests which would apply and be conducted if the Township itself acquired and constructed the Project. In addition, the Township shall not be obligated to approve the Project and accept ownership thereof unless and until all of the restoration has been fully completed.

Prior to approval of the Project and acceptance of ownership thereof, the Township shall receive from the Developer such waivers of lien, affidavits and other documentation as the Township shall reasonably deem necessary to be assured that all contractor(s) and all pipe, equipment and other suppliers in connection with the Project have been paid in full and that there are no liens or other unpaid obligations outstanding with respect to the Project.

The Township also reserves the right to require, prior to approval of the Township and acceptance of ownership thereof and at the cost of the Developer, a written opinion from the Developer's consulting engineer that the Project has been constructed and completed in accordance with the approved plans and specifications.

If the Contract Face Pages require that the Developer provide an irrevocable letter of credit prior to commencement of construction in order to guarantee completion of the Project by the Completion Date, this irrevocable letter of credit shall be issued by a bank having an office in Kent County in favor of the Township in the amount shown on the Contract Face Pages. The letter of credit to be provided shall be in such form and with such provisions as the Township shall reasonably require.

The Project shall not be connected to the Township's sewer and/or water systems unless and until the Township has completed its final inspection and approved the Project in writing. If the Developer desires to connect the Project to the water and/or sewer systems in advance of this final inspection and written approval, the Developer shall provide to the Township an irrevocable letter of credit issued by a bank having an office in Kent County in favor of the Township in such amount as the Township shall reasonably determine is necessary to pay all costs and expenses related to completing the Project. The letter of credit to be provided shall be in such form and with such provisions as the Township shall reasonably require.

No portion of the Development shall be connected to the Project until the Project has been approved by the Township and the ownership of the Project has been dedicated and conveyed jointly to the Charter Township of Gaines and the Township of Byron in the manner provided by these Contract Terms.

The Developer shall cooperate with the Township at all times, whether before or after the conveyance of the Project to the Township, and to the fullest extent with all Project contract and warranty claims deemed necessary by the Township to be made or filed against the Developer's contractor.

If the Project is not completed by the Completion Date, the Township shall have the right to complete the Project at the Developer's expense and to pay the full cost of such completion by making a draw or draws against the Developer's letter of credit. The Developer shall reimburse the Township for all costs incurred in completing the Project including, but without limitation, engineering, third party contractors and the charges of Township personnel necessary to supervise the completion of the Project. To the extent the Township costs to complete the Project are not fully paid by a draw or draws on a letter of credit, the Developer shall pay such amounts to the Township on demand. Amounts not paid on demand shall bear interest at a rate of 1% per month or fraction of a month that the amount remains unpaid.

Section 5. **INSURANCE.** Beginning as and when construction of the Project is commenced, and continuing at all times while the Project or any part thereof is under construction, the Developer and/or its contractor(s) shall continuously carry and maintain the same insurance coverage which is routinely required by the Township with respect to the construction of its own water and sewer projects. The Charter Township of Gaines, the Township of Byron and their respective Township Board members, officers, agents, employees and Township engineers (together, the "Additional Insureds") shall all be named as additional insured under such insurance, and such insurance shall also provide that it is the primary source of coverage for all such parties named as additional insureds with respect to the Project and the acts of omission of the Developer and its contractor(s) related thereto.

Certificates evidencing the acquisition of all insurance required by this section and that such insurance is in full force and effect shall be deposited with the Township before construction of the Project is commenced. The Developer shall furnish, or cause to be furnished, upon request of the Township, certified copies of all policies required pursuant to this section as well as all amendments and renewals. All insurance policies required pursuant to this section shall contain a provision that they are non-cancelable and not subject to material modification by the insurer except upon 30 days' prior written notice to the Township. At least 30 days prior to the expiration or cancellation of any such insurance policy, there shall be furnished to the Township evidence satisfactory to it that the policy has been renewed or replaced by another policy. Construction of the Project shall not commence unless and until the Township has approved the insurance required to be provided by the Developer and its contractor(s) pursuant to this section in writing, such approval not be withheld unreasonably.

With respect to the Project, the Developer agrees to indemnify the Townships and all of the other Additional Insureds named in the first paragraph of this section, from and against any and all claims, costs, actions, causes of action, liability, judgments, losses, or expenses (including reasonable attorney's fees and other expense of defense) resulting from or caused by the acts or omissions of Developer or its contractor(s) in acquiring, constructing and completing the Project or with respect to the legal title to the Project, including all necessary easements, rights of way and interests in land required for the Project.

Section 6. **CONNECTION CHARGES/RATES.** The Developer shall pay all availability fees and trunkage fees in the amounts and in the manner set forth on the Contract Face Pages. The Developer shall pay all rates and charges imposed by the Township pursuant to the applicable rate ordinance or rate resolution with respect to the Project on such terms and provisions as are provided in that rate ordinance or rate resolution. The Township shall be entitled to establish such water rates and/or sewer usage rates as the Township deems appropriate. The Developer will reimburse the Township for the costs of sanitary sewer and watermain construction permit submittals, Township Engineer and staff review of plans, and construction inspection performed by the Township or the Township's duly authorized representative. The fact the Developer has installed the Project at its expense shall not excuse the Developer or any party owning or utilizing lands and premises within the Development served by the Project or any part thereof from being obligated to pay water and sewer rates and charges or any other charges levied by the Township generally against water and/or sanitary sewer customers.

Section 7. **TOWNSHIPS' UTILIZATION OF THE PROJECT.** As and when the Project has been transferred to the Townships pursuant to the Warranty Bill of Sale referred to in Section 4 above, the Project shall become part of the Townships' water and/or sewer system, as the case may be, and may be utilized by the Townships in such manner as the Townships utilize other portions of their water and sewer systems. Without limiting the generality of the preceding sentence, the Townships may connect other water and/or sewer customers to the Project and may also connect water and/or sewer extensions to the Project and connect additional customers to those extensions, all without any obligation to make any payment or reimbursement to the Developer on account of the Developer having constructed the Project at the Developer's expense, unless there is a written agreement to the contrary set forth in the Contract Face Pages or otherwise.

Section 8. **ZONING AND OTHER APPROVALS.** Approval and execution of this Development Contract by the Township does not constitute or imply that the Developer has received or will receive from the Township or any other applicable governmental entity any or all land use, zoning and/or any other approvals from the Township which are required for or applicable to the Development under applicable Township ordinance or law and the Township makes no guarantee to the Developer that any of such approvals will be granted by the Township. The Developer at Developer's sole risk and expense is required to obtain from the Township or other applicable governmental entity all such applicable land use, zoning and/or other approvals for the Development before proceeding with the construction of the Project.

Section 9. **THIRD PARTY BENEFICIARY.** In consideration of the joint ownership by the Townships of the sanitary sewer and water systems located in the Township, the Charter Township of Gaines shall be a third-party beneficiary of this Development Contract and entitled to enforce the terms hereof in accordance with applicable law.

Section 10. **DEFINED TERMS.** All capitalized terms not otherwise defined in these Contract Terms shall have the meanings assigned thereto in the Contract Face Pages.

Section 11. **MISCELLANEOUS.** Neither this Contract nor any rights under it may be assigned nor may any duty be delegated without the prior written consent of the non-assigning

or non-delegating party. Any attempt to assign or delegate rights or duties without prior written consent shall be void. This Contract shall inure to the benefit of and be binding upon the parties hereto and their respective successors and permitted assigns.

All notices and other documents to be served and transmitted hereunder shall be in writing and addressed to the respective parties hereto at the addresses stated on the Contract Face Pages or such other address or addresses as shall be specified by the parties hereto from time to time and may be served or transmitted in person or by ordinary or certified mail properly addressed with sufficient postage. This is an integrated contract. It contains the full understanding of the parties and supersedes all other understandings, agreements or conditions, written or oral, regarding the subject matter of this Contract. This Contract has been executed in the State of Michigan and shall be governed by Michigan law, except as to matters pertaining to choice of law. The waiver by any party hereto of a breach or violation of any provision of this Contract shall not be a waiver of any subsequent breach of the same or any other provision of this Contract. If any section or provision of this Contract is unenforceable for any reason, the unenforceability thereof shall not impair the remainder of this Contract, which shall remain in full force and effect. It is contemplated that this Contract will be executed in multiple counterparts, all of which together shall be deemed to be one contract. The captions in this Contract are for convenience only and shall not be considered as part of this Contract or in any way to amplify or modify the terms and provisions hereof. This Contract shall be enforceable only by the parties hereto and their successors in interest by virtue of an assignment which is not prohibited under the terms of this Contract and, with the exception of specified third party beneficiaries, no other person shall have the right to enforce any of the provisions contained herein. No amendment, modification or waiver shall be effective unless in writing and signed by both parties. All rights and remedies set forth in this Contract are cumulative and are in addition to any other legal or equitable rights and remedies.

[END OF CONTRACT TERMS]