

8.00 - CONSTRUCTION SPECIFICATIONS **(Public and Private Improvements)**

8.1 GENERAL REQUIREMENTS

Note: Reference Section 1.30 & 1.40 - Submittal Procedures & Plans and Specifications

8.1.1 Payment of Fees:

All capital charges, trunk line and transmission charges, tap fees, permit and inspection fees, and escrow deposits, must be paid prior to the start of any construction.

8.1.2 Insurance:

Certificates in accordance with requirements of Section 1.11 of the design standards "General Requirements" shall be submitted to and approved by the Township prior to the start of construction.

8.1.3 Preconstruction Conference:

A preconstruction conference shall be held prior to the start of construction for all projects. The developer shall make all arrangements and schedule the meeting at least ten (10) days prior to start of work. Those in attendance should include representatives of:

- A. Proprietor
- B. Proprietor's Engineer
- C. Private Utility Companies
- D. Contractors & Subcontractors
- E. Township Fire Chief
- F. Township Representative
- G. Township Engineer or Representative

And: (as applicable)

- H. Livingston County Road Commission
- I. Livingston County Drain Commission
- J. Michigan Department of Transportation

8.1.4 Inspection:

No work on water mains, sanitary and storm sewers, public sidewalks and pavements, and detention/retention basins shall proceed without notification to the Township. The contractor or representative of the proprietor shall notify the Township Zoning Department at least 48 hours prior to start of construction to arrange for inspection.

Any work installed without inspection will not be accepted by the Township and will not be allowed to connect to the system.

8.1.5 Trench Backfill Testing:

All trench density testing shall be provided by the proprietor through their engineer or an independent testing company to verify the compaction requirements to the satisfaction of the Township Engineer. A mechanical analysis of the backfill material shall be furnished to the Township Engineer for approval along with compaction testing results.

8.1.6 Shop Drawings:

Shop drawings shall be furnished to the Township Engineer for all special fabricated structural and mechanical parts of the system as determined by the Engineer. Operation Manuals shall be furnished for all water booster pump stations, sanitary lift stations, and similar installations.

8.1.7 Final Inspections & Acceptance

Prior to acceptance by the Township, final inspections and all necessary tests of the system must be made and witnessed by a Township Inspector. Copies of all test results shall be submitted to the Township Zoning Department. Any tests which fail shall be remade after repairs have been made. Any portions of the work found to be unacceptable shall be repaired or replaced prior to acceptance.

Prior to final acceptance, a one-year maintenance and guarantee bond in the amount equal to the cost of the improvements shall be posted with the Township by the proprietor.

Final acceptance will not be made until all improvements and other construction on the site have been completed.

8.2 WATER MAIN CONSTRUCTION

8.2.1 Pipe Certification and Inspection:

All pipe and fittings delivered to the job shall be accompanied by certification papers showing that the pipe and fittings have been tested in accordance with the applicable specifications and that pipe and fittings meet the specifications for this project. All pipe and fittings will be inspected upon delivery to the job site. No cracked, broken or damaged pipe or fittings will be allowed in this work. Rejected pipe and fittings will be removed immediately from the job site at the contractor's expense.

Each piece of ductile iron pipe shall have its own weight and class designation conspicuously painted or cast on it. All other pipe materials shall have the class designation painted thereon. Where required, other designation marks shall be painted on pipe or fittings to indicate correct location in the pipeline in conformity to a detailed laying schedule.

8.2.2 Handling Pipe, Fittings, or Appurtenances:

All pipes and castings shall be unloaded and distributed along the line of work in such a manner and with such care as will effectually avoid damage to any pipe, fittings, or appurtenances. Dropping the pipe or fittings directly from the truck will not be permitted. Care must also be taken to prevent abrasion of pipe coating. Wherever the coating may be found to have been rubbed off, the part shall be recoated as may be required.

8.2.3 Installation of Pipe:

Installation of the water main shall be made in all respects in accordance with the published installation guide of the pipe manufacturer, except as otherwise specified herein. Whenever the instructions given by the manufacturer are at variance with the provisions specified here in, the laying standards provided herein shall govern.

Proper tools, including pipe pullers, special cutters, spacing yokes, machining tools, test caps, ring feeler gages, etc., shall be provided at the site of the work for installation of the pipe.

8.2.4 Service Lead Installation:

In general, open cutting of existing hard surfaced pavements for installation of water service leads will not be allowed. Service leads may be bored, drilled or jacked (under MDOT Standard Specification, Section 5.11.09, latest edition); jetting of water or air will not be allowed. Casings may be required where probable damage to the roadbed or the service lead exists due to soil conditions.

A. Installation Without Casing

In soils of a stable nature boring will be recommended providing that the diameter of the auger head does not exceed the diameter of the service lead by more than one inch. The service lead pipe will be pushed or pulled through after the hole has been augured. The ends of the pipe shall be examined after installation to determine whether it has been damaged during installation. In the event that the pipe is damaged, it must be replaced by the contractor. All voids created by this process must be grouted.

B. Installation With Casing

In unstable soils, as determined by the Engineer, the combination of boring and jacking simultaneously is acceptable providing the cutting edge of the auger does not advance ahead of the casing. The diameter of the casing shall not exceed the diameter of the service lead by more than one inch.

C. Boring Installation

All requirements of the governing road authority regarding boring and jacking under streets shall be met. Reference Section 8.5 - Specifications Pertaining to Excavation and Backfill - for more information.

D. Open Cut

Prior to pavement construction or reconstruction, services may be installed by open cut method. (See details)

8.2.5 Water Main Insulation:

Where shown on the Drawings or directed by the Engineer, the contractor shall provide insulation over an existing or proposed water main.

The insulation shall be 2 inches thick located as shown on the Drawings. The insulation shall be rigid thermal type plastic foam board manufactured for this purpose. Insulation shall have a minimum compressive strength of 25 psi and a maximum water absorption of 0.1% by volume meeting Federal Specification HH-1-524B, Type II, Class B. Adhesives shall be as recommended by the manufacturer of the board. Samples shall be submitted in duplicate a minimum of one week prior to starting this phase of the work.

8.2.6 Preparation of Trench Bottom and Backfilling:

The contractor shall provide a competent person during all excavation activities and adhere to 40 CFR excavation safety regulations. Failure of the contractor to provide a safe working environment for the workers on-site may result in the Township suspending all construction activities until a safe working environment is provided.

A. Trench bottom preparation and backfill shall be as follows:

The trench width shall be a minimum of 18". Trench depths shall be as shown on the plans and generally shall provide not less than 5.5 feet of cover from the top of the water main to the final surface grade above such mains. The bottom of trench shall be excavated neatly to required grade and filled 6" with MDOT Class II granular material thoroughly compacted before the pipe is laid (see details). The bedding shall be dug out at each bell end of the pipe to conform to the shape of the bell. Blocking under the pipe is strictly prohibited. After the pipe has been laid, backfill shall be continued to a level 12" above the top of the pipe barrel and compacted to 95% maximum density.

Backfill shall be placed in horizontal layers not more than 6" in depth, and each layer shall be thoroughly compacted to 95% maximum density, using mechanical tampers or other

approved means, before the following layer is placed. In the event suitable earth is not available from the trench excavation, bank sand shall be furnished from off the site of the work and placed and compacted as specified. The remaining backfill shall be completed with approved excavated material free of cobbles, vegetation, frozen material or other deleterious or foreign material. Backfill shall be thoroughly compacted to prevent settlement, and prior to acceptance of the work, the contractor shall refill any trenches which have settled.

Trenches under road surfaces, pavement, sidewalk, curb, driveway or where the edge of the trench is within 1 to 1 influence of pavement shall be full depth back-filled with MDOT Class II granular material. The material shall be placed in 6" layers. Each layer shall be compacted by the use of suitable compaction equipment to at least 95% of modified proctor density method before the succeeding layer is started. Maximum unit weight will be determined by the current Method of Test for the Compaction and Density of Soil, AASHTO Designation: T-99, or by the Cone Density Method developed by the Michigan Department of Transportation, as required.

Except at pipe joints and service connections, backfill to an elevation at least 6" above the top of the pipe shall be placed in advance of the hydrostatic test. In no case will the test requirements be relaxed because the trench may have been backfilled.

8.2.7 Defective Pipe and Fittings:

No pipe or fitting that is known to be defective shall be laid in the work. Any piece found to be defective after it has been laid shall be removed by the contractor, at his expense, and replaced by a sound and perfect piece. If the major part of a defective pipe is sound, the good end may be cut off and used. Every such cut shall be square, beveled, and ground smooth. The cut surfaces of ductile iron pipe shall be painted with 2 coats of approved asphaltum metal protective paint.

8.2.8 Laying Pipe:

Pipe shall be carefully laid to line and grade and shall have bearing over its entire length except at joints where the joint hole shall be of such size as to give adequate room for working. Pipe shall be laid with a minimum cover as shown on the drawing. Immediately before laying, each section of pipe or fitting shall be thoroughly cleaned inside of all debris, dirt or other accumulated foreign material. It shall be inspected for damage to the coating or pipe material and repairs made where required or removed from the job site if deemed irreparable by the engineer. Care shall be taken to keep the interior of already laid pipe clean and free from dirt and other foreign material. Bulkheads or other means shall be used at the open end of the previously laid pipe for this purpose.

After a length of pipe is placed in the trench, the spigot shall be centered in the bell of the adjacent pipe, the pipe shoved into proper position in the collar or bell and brought into true alignment, and there secured with earth, carefully tamped under and on each side of the pipe.

8.2.9 Joint Restraint and Thrust Blocks:

A. Joint Restraint

All pipe deflections over 11-1/4 degrees and all tees and crosses shall be restrained, tied or harnessed in a manner acceptable to the engineer. The restraint shall be applied to joints each way from deflection or tee an adequate distance to resist the axial thrust of the test pressure. Details of all proposed joint restraint, showing type and locations, shall be submitted to the engineer for approval.

B. Thrust Blocks

Unless approval of the Township Engineer is granted, thrust blocks are not acceptable.

8.2.10 Service Connections and Taps:

Water mains shall be tapped for corporation cocks where shown on the drawings or required for testing and sterilization of the completed water mains.

8.2.11 Service Lead, Corporation Stop, Curb Valve, and Curb Box:

A. Service Lead Pipe

Except as modified in the Standards of Design, service lead shall be 1 inch to 2 inch ASTM B-88 type K annealed seamless copper water tube. Fittings shall be flared or compression type.

B. Corporation Stops

Corporation Stops shall be as specified in the standards of design. The following table lists the maximum size tap and corporation stop allowed for the respective water main diameters. Corporation sizes exceeding these maximums shall utilize a Bruner or stainless steel with dual straps.

PIPE SIZE (Inches)	TAP SIZE (Inches)
4	¼
6	1
8	1¼
10	1 ½
12	2
14	2
16	2 ½
18	2 ½
20	3
24	4

C. Curb Valves

Shall be open left, with a stop and extension for short key.

D. Curb Box

Shall be ductile iron, slip type adjustment, with cover marked "WATER"

8.2.12 Fittings, Valves, Hydrants and Adapters:

Valves, fittings and hydrants shall be installed using the current standards for joints being used for the project. Wherever adapters are required to properly connect proposed water main with existing pipe of other material or manufacture, the nominal I.D. of the adapters shall be of the same size as the nominal diameter of the pipe connected thereto. Adapters shall also be furnished and used as required by the manufacturer for connection to fittings. Special machined faced parts shall be provided where required to connect to existing mains.

8.2.13 Setting Hydrants:

At points indicated in the drawings, a hydrant assembly shall be installed consisting of a hydrant, 6" gate valve, an adjustable cast iron valve box, and all pipes necessary for a complete job. Valves shall be located 3 feet from hydrant, as shown on typical setting detail on the standard drawings.

Each hydrant shall be set truly plumb and held firmly braced in this position. Connection of the hydrant to the branch shall be made by means of mechanical joints, as herein specified under jointing. All joints between the hydrant and the main shall be restrained by the same means as used for water main as specified under Joint Restraint.

If hydrants are furnished with drain outlets, the outlets shall be permanently capped or plugged.

After hydrant has been set, an additional 1-foot depth of gravel shall be spread and compacted around the hydrant and valve. When this has been done, the remaining backfill shall be placed and compacted, taking care at all times to avoid jarring the hydrant.

After hydrants have been set and tested, the part above ground shall be painted with two coats of first quality metal protective paint. Color will be the Township's standard red. (See Details)

8.2.14 Hydrant Flushing:

Each hydrant assembly shall be flushed by the contractor for a minimum of 10 minutes. During this period the 6-inch auxiliary hydrant valve shall be closed and opened. The contractor shall furnish the necessary hoses for disposal of water. A testing schedule and method of disposing of flushing water shall be submitted to the Township for approval. The contractor shall coordinate the testing schedule with the Township Inspector.

8.2.15 Connections to Existing Mains:

Where shown on the plans, connection of existing mains to new mains will be done only after the new mains are shown to be sterile by results of the bacteriological analysis. (See Spec. 8.2.18, Hydrostatic Testing)

8.2.16 Flushing of Water Mains:

Prior to disinfection, the newly constructed water mains shall be thoroughly flushed to remove all accumulated debris which may have entered the line during the construction. Flushing may include the use of a "poly pig", or approved equal equipment, to remove the accumulated deposits. The frequency of running the "poly pig" through the water mains shall be determined by the debris discharging from the effluent. Several passes with the "poly pig" through the newly constructed system may be required before the main is acceptable. Procedures for the use of the "poly pig", or approved equal equipment, shall be per the manufacturer's specifications.

8.2.17 Sterilization of Mains:

After pressure testing and before hydrostatic testing, all new pipe lines shall be flushed until the water runs clear. After flushing, liquid chlorine shall be added to the water in the amount of 80 ppm (parts per million). This will require the addition of the following quantities of liquid chlorine: (Chlorine tablets or powder are not approvable)

PIPE SIZE (Inches)	POUNDS OF LIQUID CHLORINE (100%) PER 100 FT. LENGTH OF PIPE
4	0.043
6	0.098
8	0.174
10	0.272
12	0.392
14	0.532
16	0.695
18	0.880
20	1.096
24	1.563
30	2.445

After the main, or section thereof, has been filled with chlorinated water, a minimum contact period of 24 hours will be required with an average chlorine level of 50 ppm, after which the main shall be flushed with water from the distribution system until the chlorine residual of the water in the main is 0.5 ppm. The main shall then be allowed to stand for a 24-hour period. At the end of this period, two samples shall be drawn from the main at a minimum of two different locations on two successive days, (after 24 hours and after 48 hours) for an independent bacteriological analysis. If these analyses show the presence of harmful bacteria, the contractor shall repeat the sterilization process until such time as the mains are shown to be sterile by the results of the bacteriological analyses. The Township Inspector shall be present for all testing and sampling procedures.

The contractor shall furnish the chlorine and all necessary equipment for its application. The contractor shall make suitable arrangements with the Township and the independent laboratory for bacteriological analyses. The contractor shall dispose of high residual chlorine water by a method approved by the engineer. As soon as test results are available they shall be sent directly to the Township.

8.2.18 Hydrostatic Testing of Water Mains:

Prior to and during the hydrostatic test, the new main is not to be connected to the existing water system, except as specified herein. Temporary blow-offs, caps or plugs shall be provided at the ends of the new main.

No testing may be performed against a closed valve. After chlorination and subsequent flushing, a sample of the water must show, by test of the laboratory, safe bacteriological results. The contractor shall, in the event of an unsatisfactory hydrostatic test, cut the new main, install caps or plugs, pressure test, and rechlorinate without additional cost or charge.

The contractor shall furnish all necessary personnel, temporary timber bracing, plugs, test pumps and all other necessary apparatus for conducting the test.

Before applying test pressure, all air shall be expelled from the pipe. If necessary to accomplish this ³/₄ inch minimum corporation taps shall be made at points of highest elevation in ductile iron pipe, and such corporations subsequently removed and plugged, prior to the test, with tight threaded brass plugs.

Test pressure shall be maintained at 150 pounds per square inch by pumping potable water into the pipe for a period of at least 1 hour for pipe sizes 6 inches and under, 2 hours for pipe sizes 8 inches and above, and in all cases long enough to permit assurance of a satisfactory test. Leakage, as measured by the quantity of water pumped into the pipe to maintain 150 psi pressure during the test, shall not exceed the rate of 50 gallons per inch diameter of main, per mile of pipe, in 24 hours.

Unless otherwise directed, each joint in the section of main being tested shall be carefully examined while the main is subjected to full test pressures, and any joint showing visible leakage shall be repaired as necessary to produce a tight joint. Any faulty pipe, fittings, gate valves, or other accessories disclosed by testing shall be replaced with sound material, and tests shall be repeated as often as necessary until specified requirements have been met.

In the event the contractor backfills the trench before the main is tested, and difficulty is experienced in obtaining a satisfactory hydrostatic test, the joints shall progressively be exposed and repaired in such a manner as to provide protection to the pipe. Under no circumstances will the test requirements be waived or reduced because the trench is backfilled.

8.2.19 Painting:

All iron pipe, valves, bolts, and any other portions of the water main exposed inside manholes or other structures shall receive 2 coats of Inertol No. 49, Tape coat TC Mastic, or approved equal material. If necessary, heat shall be provided to maintain good drying conditions. All items to be painted shall be dry and clean before application of paint. Any rust or scale shall be removed by wire brushing or scraping prior to painting, if required.

8.2.20 Pipe Placed in Casings:

Pipes shall be placed in casing pipe in the locations shown on the drawings. Under this work the contractor shall place the carrier pipe, fill the annular space between the casing and carrier pipe, place bulkheads, and complete all backfilling.

For road crossings all void spaces between the casing pipe and the carrier pipe shall be filled with sand meeting the requirements of M.D.O.T. Standard Specifications for natural sand 2NS. Sand shall be placed by flushing or other methods approved by the engineer. The contractor shall furnish to the Engineer information on the quantity of sand placed.

For railroad crossings, all void spaces shall be cement grouted.

The annular space at the ends of the casing pipe shall be bulk-headed with a minimum of 8" thick solid masonry with a 1/2-inch fiberboard cushion between the masonry and carrier pipe.

All necessary skidding materials required to protect the carrier pipe shall be furnished.

8.2.21 Stream Crossings:

Stream crossings shall be made with a freely deflecting locked joint pipe. Pipe shall be either ductile iron with bell ball type joints or reinforced concrete pressure pipe with bell bolt type of joints. Pipe shall be of same class and grade as called for on the plans.

Bell joint river crossing pipe may be installed by pulling or floating across the river. Bell bolt joint pipe must be laid on grade by coffer-damming the trench.

The trench shall be backfilled with clean washed stone.

8.3 OPEN CUT SEWERS

8.3.1 General:

Sewers shall be considered channels or conduits between the extreme ends of the project including branch lines.

All labor, tools, equipment and materials necessary to excavate for, lay, join, backfill, and finish the sewer shall be considered as part of the sewer construction.

Unless otherwise allowed under certain specifications for a particular type of sewer or unless permitted by the Engineer, construction shall begin at the outlet end of the sewer and proceed upgrade.

Handling, storage, installation, and the making of joints shall strictly follow the manufacturer's recommendations. Plastic and rubber materials affected by ultraviolet rays including all PVC products shall be protected from direct sunlight. Material handling during cold weather shall take into account increased brittleness of plastic materials. Pipe which is warped or bowed due to temperature variations such that the deviation from straightness is greater than one inch shall not be installed.

8.3.2 Sewer Pipe:

Sewer pipe shall be of approved type and class as designated by the Township specifications set forth in section 4.2 for locations or uses shown or noted on the contract drawings. Any deviation from type or class of pipe shown on the drawings will not be permitted, except upon receipt of written approval of the Engineer.

Pipe joints shall be of the approved type and/or brand called for on the contract drawings. They shall be made in strict accordance with the manufacturer's recommendations utilizing the recommended lubricant. Wood blocks or other approved materials shall be used to protect the pipe and fitting ends from pry bars, chains, etc. with particular care taken with plastic materials. Pipe shall be pushed closed to the "home" position and if joints do not remain tightly closed, the pipes shall be replaced.

Full lengths of pipe shall be used whenever feasible. Cutting of pipe, where required, shall be done only using methods as recommended by the manufacturer, utilizing tools and equipment as required to provide a neat, perpendicular cut without damage to the pipe or coatings. All burrs shall be removed. Spigot ends of cut pipe shall be beveled similar to factory beveling. If field cutting or coring of pipes exposes any bare metal surface, the surface shall be covered with an epoxy coating.

8.3.3 Cement Mortar Pointing:

All pipe joints on sewers 36" diameter and larger shall be pointed on the inside with approved non-shrink cement mortar composed of one (1) part cement and two (2) parts sand. On bituminous mastic joints the compound shall be removed to a depth of 3/4 of an inch from the inside of the joint and pointed as described above.

Note: Rubber gasket joints do not require pointing.

8.3.4 Excavation:

All Excavation activities shall adhere to 40 CFR safety regulations.

Excavation shall include clearing of the site of work and removal and disposal of all materials necessary to be removed in the construction of all the work.

Excavation shall be of sufficient width and depth to provide adequate room and protection for construction and installation of the work to the lines, grades, and dimensions called for on the plans. The width of a trench from the invert to a height 12" above the top of the sewer barrel shall not be greater than 12" plus the outside diameter of the sewer barrel. In the case of 4" thru 12" sewers the width of the trench may be 24 inches.

If maximum trench width, as specified above, is exceeded, unless otherwise shown on the drawings, the contractor shall install, at his own expense, such concrete cradling or other bedding as approved by the Engineer, to support the added load of the backfill.

Where, through the contractor's construction procedure, or because of poor existing ground conditions, it is impossible to maintain alignment and grade properly, the contractor shall, at his own expense, excavate below grade and replace with large size aggregate or slag. This is recorded in order to insure that the pipe, when laid, will maintain the correct alignment and grade.

Excavated materials shall be temporarily stored along the trench in a manner that will not cause damage to trees, shrubs, fences or other property. Also, they shall not endanger the bank of the trench by imposing too great a load thereon.

Excavation for structures shall be extended sufficiently beyond the limits of the structure to provide ample room for form construction and other construction methods to be followed, whenever necessary, generally, on a 1 to 1 slope or using adequate bracing and shoring.

Open cut excavations for shafts or other structures shall be adequately braced and/or sheeted to prevent caving or squeezing of the soil. Tunnels shall be sheeted and/or braced as necessary to enable the work to be prosecuted with safety to the men, the work, and neighboring structures.

All excavations shall be completely dewatered prior to construction of the sewer or other structures and adequate provisions shall be made to prevent water from flowing through or over newly placed concrete or block work. Drainage shall be carried to sumps from which the water may be pumped. Prior to discharge, adequate filtering capabilities shall be utilized.

8.3.5 Test of Pipe:

Contractor shall have tests of pipe and strength made by an independent testing laboratory. Tests of up to 4 lengths of sewer pipe per 100 lengths may be required to show compliance with the specifications. All pipe delivered to the job site shall be accompanied by manufacturer's certificate of compliance to the specifications.

The contractor shall submit shop drawings or data sheets for all manhole castings, pipe to manhole connections, valves and backfill materials.

8.3.6 Laying Pipe:

All pipes shall be laid to the line and grade called for on the plans. Each pipe as laid shall be checked by the contractor with a laser or other device to insure that this result is obtained. The finished work shall be straight and shall be sighted through between manholes.

Each pipe shall be inspected for defects prior to being lowered into the trench and the inside of the pipe and the outside of the spigot shall be cleaned of any dirt or foreign matter. Whenever any pipe section, fitting or appurtenance is found to be unsuitable for installation due to

specification non-conformance, poor workmanship, damage, or any other reason, it shall be removed from the construction site during that working day by the contractor at his own expense. Any material not so removed shall be painted or otherwise marked to prevent its subsequent use.

Construction shall begin at the outlet end and proceed upgrade with spigot ends pointing in direction of flow. Pipes shall be laid on a 4"-6" compact sand cushion, which shall be carefully prepared so that the entire bottom half of pipe will bear against the cushion. If, through carelessness or other reasons, the subgrade has been disturbed so that refilling is necessary to bring pipe to grade, such refilling shall be done with sand, gravel, or stone, thoroughly compacted in place. Bell holes shall be excavated so that the full length of the barrel will bear uniformly on the subgrade.

Pipes shall be centered in bells or grooves and pushed tight together to form a smooth and continuous invert. After laying of pipe, care shall be taken so as not to disturb its line and grade. Any pipe found off grade or out of line shall be re-laid properly by the contractor.

Where pipe is laid in wet trenches or trenches with running sand, contractor shall provide and use mechanical means for pulling the pipe home in making up the joint and holding the pipe joints tight until completion of the line. Mechanical means shall consist of a cinch cable, a cable placed inside the pipe with a suitable blocking winch, jack, or come-along for pulling the pipe home and holding pipe in position.

Mechanical means shall be used for pulling home all rubber gasketed pipe regardless of trench conditions where manual means will not result in pushing and holding the pipe home.

If maximum trench width specified under "Excavation" is exceeded, unless otherwise shown on the drawings, contractor shall install, at his own expense, such concrete cradling or other bedding as approved by the engineer to support the added load of the backfill.

8.3.7 Backfilling:

Backfilling of sewer trenches shall follow closely behind the laying and joining of sewer pipe, but only after the completed section has been inspected and approved by the Inspector. Concrete sewers constructed monolithically in the trench shall be backfilled only after concrete has attained sufficient strength to sustain all the loads that may be imposed by backfilling operations.

All open trenches shall be backfilled at the end of each working day unless prior approval has been obtained for special site conditions.

Sewer pipe shall be laid on a minimum 4" to 6" thick sand cushion and backfilled with porous sand tamped in 6" layers to a height of one foot above the top of pipe. Particular care shall be taken to completely fill all voids under and around the pipe. The remainder of trench shall be backfilled with approved excavated trench material (excluding blue or gray clay) or sand, free from large stones and lumps, and shall be placed in 12" layers which shall be thoroughly compacted in a manner that will prevent subsequent settlement. Backfill material shall be deposited in the trench with care so as not to disturb the sewer and to equalize pressure on the sewer.

Where called for on the plans, special concrete cradle or other special bedding materials shall be used to the depths specified and the remainder of the trench backfilled as described above.

Trenches under proposed and/or existing road surfaces, pavement, curb, driveways and sidewalk and where the trench is within a 1 to 1 slope of the pavement shall be full depth backfilled with

sand meeting the requirements of "Granular Material, Class II", MDOT Specification 8.02.05. Material shall be placed by the "Controlled Density Method, MDOT Specification 2.08.11(d), or by other approved means.

Attention is directed to the requirement that backfilling and all restoration of improvements in streets, roads or highways will be subject to regulation and inspection by the public authority having jurisdiction in each case, and that all such work must be made satisfactory to such authority.

In the event that any inconsistencies exist between the appropriate public authority's backfill requirements and the requirements herein provided, the more rigid shall govern. Trenches to be constructed in established lawn areas shall be compacted so as to permit restoration with sod shortly after completion of the backfilling without appreciable settlement.

No backfill shall be placed around manhole walls until 48 hours after the cement grout coat has been applied to the outside walls, nor shall backfill be placed around and over the top of concrete structures until the concrete has attained sufficient strength to sustain all the loads imposed by the backfilling operations.

8.3.8 Connections to Live Sewers:

When connections are made with sewers carrying sewage or water, special care must be taken to keep the pipe intact and that no part of the work is built underwater; a flume or dam must be installed and pumping maintained if necessary and the new work kept dry until completed and any concrete or mortar has set.

8.3.9 Sewer and Drainage Structures:

Manholes, catch basins, inlets and special structures shall be constructed at the locations shown on the plans and shall be of the size and type called for on the plans. Manholes and catch basins shall be constructed to conform to the Township specifications and standard detailed drawings.

8.3.10 Sanitary Manholes:

Sanitary manholes shall be constructed of precast reinforced concrete risers and tops in conformance with the standard detailed drawings and specifications. The manhole bottom riser section may have the base slab poured monolithically with the riser.

Wherever existing manholes or sewer pipe are to be tapped, drill holes at 4" center to center around the periphery of opening, to create a plane of weakness joint, before breaking section out.

Joints on precast risers and tops shall be modified grooved tongue with rubber gaskets. Joints around penetrations in manholes shall be flexible rubber joints such as Press Wedge II, Res-Seal, Kor-N-Seal, Link-Seal, or other approved equal. All openings for pipe shall be fabricated at the time of manufacture.

8.3.11 Drop Manhole Connections:

Drop manhole connections shall be constructed on sanitary manholes in conformance with the standard detail drawings whenever a sewer enters a manhole at an elevation of 24" or more above the invert of the outlet sewer pipe.

8.3.12 Sanitary Test Manhole:

The first manhole upstream from point of connection to existing sanitary sewer system shall have an 18" deep sump which shall be filled with concrete and channeled upon successful completion of infiltration testing.

The outlet pipe from this manhole shall be plugged with a water-proof stopper to prevent discharge to the existing system until acceptance of the system by the Township. The requirement to provide a sump may be waived by the Engineer where testing is to be done by either low pressure air testing or exfiltration testing.

8.3.13 Storm Drainage Structures:

Storm sewer manholes, catch basins, and inlets shall be constructed of precast reinforced concrete, concrete radial manhole block, brick, poured-in-place reinforced concrete, or combinations of the above. Storm sewer structures shall conform to the standard detail drawings and specifications.

Joints on precast reinforced concrete risers and tops may be either cold applied bituminous mastic or modified grooved tongue with rubber gasket.

The entire outside surface of all concrete block and brick masonry portion of drainage structures shall be plaster coated with a minimum of 1/2" thick mortar.

All catch basins and inlets shall have 2-foot deep sumps unless otherwise approved by the Township.

8.3.14 Construction Methods for Sewer and Drainage Structures:

Construction methods for the sewer and drainage structures shall conform to MDOT Spec.5.14.03 thru 5.14.07, inclusive, except as herein provided.

Precast reinforced concrete units shall be such that no more than 33% of the circumference, measured on the inside face, shall be deleted on any horizontal plane for sewer pipe openings. There shall be no less than 12" of residual concrete measured on any horizontal plane between pipe openings.

With the exception of drainage structures having sumps, the bottom of structures shall be channeled to provide for smooth flow through the manhole. Channels shall be formed using 2500 psi concrete, or on straight through manhole, pipe may be laid through the manhole, the top half broken out and the voids around the lower half of the pipe filled with concrete. (See Standard Detail)

8.3.15 Final Grade Adjustments:

Final grade adjustments of existing and proposed structures shall be considered as incidental to the site construction.

A. Sanitary Sewers

The final grade adjustments for man holes shall be made with pre-cast concrete grade adjustment rings or bricks. Grade rings shall be a minimum of 3" thick, reinforced with 2 full circles of 3/16" diameter steel reinforcing wire. Watertight and standard manhole casting frames and concrete adjustment rings shall be secured to the precast cone section with a minimum of four (4) - 5/8" diameter cadmium coated threaded studs or bolts. All joints in the assembly shall be sealed with rubber "O" ring gaskets. The maximum allowable grade adjustment using grade rings shall be 12 inches. For brick adjustment, a maximum of three courses of brick shall be placed on top of the precast cone section.

B. Storm Drainage Structures

Final grade adjustments may be made using either brick and mortar construction or precast concrete adjustment rings at the option of the contractor; all other provisions for grade rings and brick and mortar adjustments stated above for sanitary sewers shall apply.

8.3.16 Frames and Covers:

Cast iron frames and covers shall be furnished and placed incidental to all proposed structures. Gray iron castings shall be of the type, size, and weight specified on the standard detail drawings. The castings shall conform to the requirements of MDOT Specification 8.07.05, latest revision, except as provided herein.

8.3.17 Stubs, Connections and Bulkheads:

Where called for on the drawings, drop connections, bulk heads, and stubs for future sewer connections shall be provided.

Where required, bulkheads shall be constructed or removed.

Unless otherwise noted on the drawings, stubs shall consist of one length of sewer pipe with watertight stopper bulkhead, or where approved by the Engineer, a brick and mortar bulkhead. Pipe stubs shall be of the same material as the sewer to which they connect unless specified otherwise.

8.3.18 Service Laterals

The location of the service laterals shall be determined by the developer's surveyor or engineer. He shall also submit an as-built location sketch verified by the Township Inspector for each lateral location. Each lateral shall be marked with a stake at the property line. The contractor shall install a lateral fitting opposite the stake and construct the six inch service lateral to the property line. The contractor shall cap, block and mark the end of the service lateral. The blocking of the service lateral cap shall be sufficient to withstand all tests.

A. Marking

The contractor shall mark the end of the service lateral with a treated, non-rotting 2x4 of sufficient length to extend from the service lateral to 2 feet above grade color coded.

B. Record of Locations

The contractor shall record and submit to the Owner and the Township, a location sketch of the service lateral fitting measured from the nearest downstream manhole and shall record the location of the service lateral at the features on an as-built drawing.

C. Risers

Where sanitary sewers are constructed deeper than 15 feet, service risers shall be constructed as shown in the standard detail. VCP tees shall be encased in concrete. Risers shall be constructed such that the service lateral is 11 feet deep at the property line. When main sanitary sewers are less than 15 feet deep, no riser is required and the lateral shall be constructed at a slope such that the service lead is 11 feet deep maximum at the property line, if feasible. The service laterals shall be constructed at a minimum slope of 1%. Lateral fittings shall be installed with the branch connection tilted 45 degrees up. (See detail)

Service Lateral Inspection - All service lateral pipes shall be left with at least the top of the pipe exposed until inspected by the Township representative and authorization for backfill given.

8.3.19 Infiltration Limitations:

The infiltration rate for all sanitary sewers and for storm sewers, where rubber gasket joints are

specified to be used, shall not exceed a maximum of 250 gallons per inch diameter per mile of sewer per 24 hours. In the event of infiltration in excess of the above amounts, joints shall be remade or, if necessary, the pipe shall be re-laid. The test and repair procedure shall be repeated until results show that seepage has been reduced below the above maximums. The method of testing and measurement shall be approved by the Engineer. The contractor shall provide the necessary equipment and labor for making the tests and the cost of same shall be incidental to the unit price bid for sewer.

8.3.20 Wyes and Risers:

Wye branches, slants or stubs fitted with suitable stoppers shall be set for each lot shown and at such other points as called for on the plans.

Concrete pipe wye openings shall contain factory installed Premium Joint Material of a type suitable and approved for use with sanitary lead joint specified.

Risers shall be constructed where shown on the plans. They shall be constructed of bell and spigot sewer pipe. They shall connect to wye branches constructed as part of the sewer proper and shall be constructed as shown on the detail sheet to a minimum depth of 6 feet below the surface of the ground, unless otherwise instructed by the Engineer. A pipe stopper shall be placed in the top bell. Fittings and stoppers shall be equipped with the allowable type of joint used on the sewer. Backfill at all risers shall be carefully placed and compacted sufficiently to ensure against damage from backfill settlement.

8.3.21 House Leads:

The contractor shall construct house leads where shown on the drawings. They shall be constructed of the sewer pipe material as called for on the drawings. A pipe stopper shall be placed in the end of the connection. Pipe and stopper shall be equipped with allowable type of joint used on the sewer.

The invert of the house connections at the point of terminus shall be a minimum of 8 feet, 6 inches below grade except where otherwise approved by the Engineer.

8.3.22 Contractor Safety Requirements:

Trenching operations shall be conducted by the contractor in a manner which will provide safe working conditions (in compliance with 40 CFR and MIOSHA) for both the workmen and the general public, and which will protect adjacent property from damage.

Trench sides shall be either cut back to the slope, as necessitated by soil and ground water conditions, which will provide stable sides, or supporting systems shall be installed which are capable of restraining the earth sides from movement.

Contractor shall employ at all times at the site of the work, a qualified (competent) person who will be responsible for the safety of the work and the workmen and who will make all decisions relevant to the stability of the trenches, the adequacy of any and all protective devices, proper operation of equipment, and all other matters related to safety.

Contractor shall not store, along and adjacent to trench, excavated material, heavy equipment, backfill materials, sewer pipe and other construction materials which may impose too great a load on the earth and cause squeezing or caving of the earth. Contractor shall at all times provide a safe means of emergency exit from all trench excavations.

8.3.23 Sanitary Sewer Acceptance Tests:

All sewers public and private which connect to the Township's sanitary collection system shall be subjected to low pressure air tests and video inspection, unless otherwise approved by the Township Engineer prior to acceptance by the Township. The contractor shall provide all labor, tools and equipment necessary to perform the tests. All tests shall be done in the presence of an inspector.

Within a reasonable length of time following pipe laying and backfilling, the contractor shall complete all the work necessary to perform testing. The contractor shall perform all the necessary preliminary tests and shall make all necessary repairs, including the repair of all visible leaks, cracks, and retests with his own forces to ready the sewers for final inspection and witnessing of test by the inspector. Immediately after the sewers have passed such preliminary tests, the contractor shall notify the Township at least 48 hours in advance to arrange for final inspection and witnessing of tests.

Where ground water conditions require de-watering operations in order to construct sewers of 24-inch diameter or smaller, the contractor may, at his option, perform preliminary air tests after backfilling and while the de-watering equipment is still operating.

Where preliminary acceptance tests have been performed shortly after sewer construction, such tests will not result in acceptance of the sewer. The Township will cooperate fully with the contractor in the performance of preliminary tests, but recognizes the value of such tests as an early means of only tentative evaluation of workmanship and materials. Final acceptance will not be considered until after a reasonable length of time following pipe laying and backfilling to allow as much as possible for development of the earth load on the pipe.

Manholes on sewers to be subjected to air tests shall be equipped with a ½ inch diameter galvanized capped pipe nipple extending through the manhole, 3" into the manhole wall and at an elevation equal to the top of the sewer pipe. Prior to air test, the groundwater elevation shall be determined by blowing air through the pipe nipple to clear it and then connecting a clear plastic tube to pipe nipple. The tube shall be suspended vertically in the manhole and groundwater elevation determined by observing the water level in the tube. The air test pressure shall be adjusted to compensate for maximum groundwater level above the top of the sewer pipe to be tested. The height of water in feet shall be divided by 2.3 to determine the additional pressure to be added to all low pressure air test readings. After all tests are performed and sewer is ready for final acceptance, the pipe nipple shall be removed and the hole in the manhole wall be plugged with hydraulic cement.

If a sewer fails to pass any of the previously described tests, the contractor shall determine the location of the leaks, repair them and retest the sewer. The tests shall be repeated until satisfactory results are obtained.

The method of testing and measurement shall be approved by the Township Engineer. The contractor shall provide the necessary equipment and labor for making the tests.

Chemical or cement grouting will not be considered an acceptable method of repairing leaking pipe, joints or structural failures, except where specifically approved by the Township Engineer. In this regard, the decision of the Township Engineer shall be final.

A. Low Pressure Air Tests:

All sewers of 24" dia. or less, where ground water level above top of the sewer is 7 feet or less, shall be subjected to low pressure air tests. The procedure for air testing of sewers shall be as follows:

The sewer line shall be tested in increments between manholes. The line shall be cleaned and plugged at each manhole. Such plugs shall be designed to hold against the test pressure and shall provide an air- tight seal. One of the plugs shall have an orifice through which air can be introduced into the sewer. An air supply line shall be connected to the orifice. The air supply line shall be fitted with suitable control valves and a pressure gauge for continually measuring the air pressure in the sewer. The pressure gauge shall have minimum divisions of 0.10 PSIG and an accuracy of +/- 0.05 PSIG.

The sewer shall be pressurized to 4 PSIG greater than the greatest back pressure caused by ground water over the top of the sewer pipe. At least 2 minutes shall be allowed for the air pressure to stabilize between 3.5 and 4 PSIG. If necessary, air shall be added to the sewer to maintain a pressure of 3.5 PSIG or greater.

After the stabilization period, the air supply control valve shall be closed so that no more air will enter the sewer. The sewer air pressure shall be noted, and the timing for the test begun. The test shall not begin if air pressure is less than 3.5 PSIG, or such other pressure as is necessary to compensate for groundwater level.

The time required for the air pressure to decrease 1.0 PSIG during the test shall not be less than the time shown in the following "Air Test Tables":

NOTE: To be used when testing one diameter only. For more than one pipe size in a test section, the minimum holding time shall be computed by the Engineer in accordance with ASTM Spec. C-828.

B. Air Test Table for PVC and ABS Pipe

The minimum holding time for the pressure to drop from 3.5 to 3.0 PSIG (greater than the added ground water pressure) shall be less than that given in the following table for each tested run of sewer between manholes:

PIPE SIZE (Inches)	TIME IN SECONDS
6	240
8	300
10	390
12	450

8.3.24 Hydrostatic Tests of Force Mains:

Prior to acceptance, force mains shall be flushed, inspected and hydrostatically tested as specified herein. The contractor shall furnish all necessary personnel, temporary bracing, plugs, test pumps and all other necessary apparatus for conducting the test.

Before applying test pressure, all air shall be expelled from the pipe. If necessary to accomplish this, taps shall be made at the points of highest elevation in the pipe and such openings subsequently closed, prior to test, with tight threaded brass plugs.

Test pressure shall be maintained at 50 pounds per square inch or 1.5 times the maximum head

pressure, whichever is greater, at the point of highest elevation in the test section by pumping water into the pipe for a period of 2 hours and in all cases long enough to permit assurance of a satisfactory test. Leakage, as measured by the quantity of water pumped into the pipe to maintain 50 psi pressure during the test, shall not exceed a rate of 50 gallons per inch diameter of main per mile of pipe in 24 hours.

The developer shall furnish all water used on this project including water used for hydrostatic testing. If he elects to purchase water from the Township, he shall pay for the full metered amount at the current water rate for the system used.

8.3.25 Test for Alignment:

All sewers shall be laid accurately to the line and grade shown on the approved plans. Private sewers will be tested for alignment by shining a light through the pipe at a manhole and viewing the light from an adjacent manhole. Any section of sewer in which a light cannot be seen from one manhole to the next shall be corrected to the satisfaction of the Engineer to pass this test. Public sewers shall be television inspected along their entire length prior to approval.

8.3.26 Test for Deflection of PVC Pipe:

PVC pipe sewers shall be installed in such manner that the initial deflection of the conduit shall not exceed 5% of the inside diameter of the pipe.

8.4 SPECIFICATIONS FOR OPEN CUT TRENCHING WITHIN PUBLIC RIGHTS OF WAY

All excavation, backfill, roadbed and surface material removal or replacement for installation or maintenance of utilities and the appurtenances within the public right-of-way shall be done in accordance with these specifications, except when the installation occurs within State or County right-of-way and is superseded by more restrictive standards.

The contractor shall saw-cut the pavement BEYOND the area to be trenched prior to removal or upon replacement. If the saw-cut is made prior to removal and the edges of the pavement should pull up or break away during construction, then it would be necessary to re-cut those areas, as indicated by the Township Engineer or his authorized representative. Alternative methods may be used only with the prior approval of the Township Engineer.

Excavated trench material such as sand or gravel may be re-used within the roadbed or shoulders as backfill if approved by the Township Engineer or his authorized representative. All other material must be hauled away as the trench excavation progresses. In no case shall the excavated material be left within the street roadway over night, without the prior approval of the Township.

Backfilling and compaction of trench material shall be maintained to within five feet of the end of the previous section of utility laid in place. All utility valve boxes within the trench area shall be kept plumb as the backfilling progresses, and all top of valve boxes or manhole covers shall be set even with the existing paved surface prior to temporary or permanent pavement patching.

All utility trenches crossing a ditch shall be backfilled with select excavated material and vibratory compacted to 95% max. density, including restoration and permanent erosion control.

All utilities laid in an open trench shall rest on a stable base.

Open cut trenching through existing paved roadbed or shoulders shall be sand backfilled, except for the cross-section needed to provide a crushed stone or slag base beneath the replaced pavement surface.

Existing unpaved roadbed or shoulders removed within the trench area shall have the top 8" replaced with crushed stone or slag.

Any deviations to the type or thickness of backfill must be approved by the Township Engineer.

All sand and gravel backfill shall be vibratory compacted to 95% density in 12" layers or less, beginning at a point 12" above top of installed utility.

The base course and temporary surface or permanent surface repair for an unpaved or paved roadway shall be placed by one of the following methods, except within State or County right-of-way and is superseded by more restrictive standards.

A. Method "A" - Temporary Repair

A 10" base course of crushed stone or slag shall be placed and compacted to 95% maximum density within the open cut trench to a point even with existing pavement surface. This type of temporary repair will require maintenance as needed and should be considered only on local streets. The contractor shall be responsible for maintenance of this repair until he installs a permanent surface material.

B. Method "B" - Temporary Repair

An 8½" base course of crushed stone or slag shall be placed and compacted to 95% maximum density within the open cut trench to a point 1½" (Local) 2½" (Major) below existing pavement surface. The top 1½" - 2½" of pavement trench shall be filled with bituminous cold patch mixture CP-1 (defined in MDOT standard specifications) and vibratory compacted or rolled to not less than 98% unit weight. This type of temporary pavement repair should be used mainly in the winter and spring months while asphalt plants are closed, but may be used in warm weather when extenuating circumstances prevail which prevent the contractor from making an immediate permanent repair. Cold patch material must be installed in trench cut prior to traffic flow. The contractor shall be responsible for maintenance of this repair until he installs a permanent surface material.

C. Method "C" - Permanent Pavement Repair to Method "A"

The aggregate base material within the trench shall be removed to the required depth.

The pavement surface adjacent to and parallel the trench shall be saw-cut to full depth of existing pavement. If trench was saw-cut prior to excavation and edges were pulled up or broken away during construction then those edges must be removed by re-saw cutting.

The permanent pavement surface material shall be bituminous aggregate #1300 placed to the thickness of the existing pavement, or the minimum thicknesses designated in these standards. All asphalt surface material shall be vibratory compacted or rolled to not less than 97% unit weight and not in more than 2" layers to a point even with the existing paved surface.

D. Method "D" - Permanent Pavement Repair to Method "B"

The pavement surface adjacent to and parallel the trench shall be saw-cut to full depth of existing pavement. If trench was saw-cut prior to excavation and edges were pulled up or broken away during construction then those edges must be removed by re-saw cutting.

The existing cold patch material within the trench shall be completely removed and the existing gravel base adjusted to receive the same thickness of bituminous aggregates #1300 as the surrounding pavement with a minimum of 3 inches. All asphalt surface material shall be vibratory compacted or rolled to not less than 97% unit weight and not in more than 2" layers to a point even with the existing paved surface.

E. Method "E" - Permanent Full Depth Asphalt Pavement Repair

For this type of permanent pavement repair it is not necessary to install an aggregate base on sand backfill within the trench area. However, this requires replacement of asphalt immediately after trench compaction and coordination between excavator and paving contractor.

The pavement surface adjacent to and parallel the trench shall be saw-cut to full depth of the existing pavement. If trench was saw-cut prior to excavation and edges were pulled up or broken away during construction then those edges must be removed by re-saw cutting.

The type of asphalt required for this patch will be a bituminous aggregate #1300 placed 7" thick for major streets (except State Highways) and 5" thick for local streets, being vibratory compacted or rolled in not more than 2" layers to not less than 97% density of unit weight.

The contractor will be responsible for the permanent repair. The permanent repair must be made the same day unless otherwise approved by the Township Engineer or his authorized representative.

One lane of traffic must be maintained at all times, unless closing off the road is approved by the Township Engineer, the LCRC & any other applicable governing authority.

8.5 SPECIFICATIONS PERTAINING TO EXCAVATION AND BACKFILL

8.5.1 Curb and Gutter Removal or Replacement

All excavation and, boring for installation of new utilities shall be made perpendicular to the existing pavement or roadway unless otherwise approved by the Township Engineer or his authorized representative.

All existing curb and gutters adjacent to roadways or pavements within public right-of -ways shall be saw-cut and removed.

If a contractor causes the complete loss of sub-grade and base support within a 1:1 influence of the trench beneath a section or more of concrete curb and gutter due to his excavation or tunneling, he shall saw-cut and remove that portion of suspended curb and gutter to at least two feet beyond outside edges of trench opening (1 to1 slope) unless otherwise approved by the Township Engineer or his authorized representative. A section of curb and gutter as mentioned above shall be considered herein as that portion between two contraction joints or contraction and expansion joint.

Prior to concrete curb and gutter replacement, the sub-grade and base shall be re-established within the trench by sand backfill in 6" layers or less and vibratory compacted to 95% maximum density, beginning at a point 12" above top of installed utility to the re-established grade for bottom of curb and gutter to be replaced.

That portion of concrete curb and gutter being replaced shall be formed to match existing ends of curb and gutter sections and their respective gradients.

The concrete for curb and gutter shall contain 5.5 Bag type 1-A (air-entrained) cement per cubic yard and obtain a minimum compressive strength of 3500 psi for 28 days. Acceptable slump tests for concrete shall not exceed 3". Concrete shall not be poured when temperature is 25 degrees F. or less, nor than 90 degrees F or more. All concrete must be protected from inclement weather prior to its initial set and from all car or truck traffic for at least 7 days, or until 70% of compressive strength is reached.

8.5.2 Sidewalk Removal or Replacement

The contractor shall take precaution to protect all sidewalks within the perimeter of his work that have not been proposed to be removed. After work has been completed, all sections of sidewalk, in poor condition, removed or damaged, shall be saw-cut, removed and replaced by the contractor. A section of sidewalk, as mentioned above, shall be considered herein as that portion between two contraction joints or contraction and expansion joint.

Contractors excavating for installation or maintenance of utilities crossing beneath a sidewalk shall saw-cut and remove a section or more of sidewalk to complete the work. If trenching activities cause the loss of adjacent sidewalk subgrade, the contractor shall saw-cut, remove and replace the affected sections of sidewalk. All sidewalk removed shall be hauled away by the contractor to an acceptable disposal site or recycling facility and new sidewalk placed after construction has been completed.

Open cut trenching within the sidewalk shall be sand backfilled and vibratory compacted to 95% maximum density in 12" layers or less, beginning at a point 12" above top of installed utility to the re-established grade for bottom of sidewalk to be replaced.

All sidewalks shall be placed in accordance with the general specifications for construction, repair or replacement of concrete sidewalks as set forth in section of this document.