SPECIFICATIONS

FOR

THE CONSTRUCTION OF SANITARY SEWER LINES

AND

APPURTENANCES

MARSHALL TOWNSHIP
MUNICIPAL SANITARY AUTHORITY
525 PLEASANT HILL ROAD
SUITE 200
WEXFORD, PA 15090
724-935-6260
724-935-1411 (fax)

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MARSHALL TOWNSHIP
ALLEGHENY COUNTY, PENNSYLVANIA

MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

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SECTION 100

GENERAL REQUIREMENTS

101 INTRODUCTION

A. These specifications cover the requirements for the construction of all sanitary sewer lines within the service area of the Marshall Township Municipal Sanitary Authority. Where the term "Authority" is used within these specifications, it shall mean the Marshall Township Municipal Sanitary Authority.

102 INSPECTION OF WORK BY THE AUTHORITY

A. All work performed in connection with the extension, modification or improvement of public wastewater facilities within the service area of the Marshall Township Municipal Sanitary Authority shall be required to meet all of the specifications and shall be inspected during construction by an authorized representative of the Authority. All work shall be required to meet the approval of the Authority or its Engineer, and shall be changed, modified, replaced, removed or otherwise corrected by the Contractor to such extent as directed by the Authority or its Engineer.

B. The Contractor is advised that work shall only be permitted during Monday through Friday between the hours of 7:00 a.m. and 6:00 p.m., unless prior approval is obtained by the Contractor from the Engineer to work on weekends.

C. The work will be periodically or continuously inspected during its progress and when substantially completed, shall be inspected jointly, by the Authority's Engineer, the Developer and the Contractor, at which time a list of uncompleted or corrective work will be prepared. After all of the list items have been corrected to the satisfaction of the Authority's Engineer, the work will be declared complete, and the maintenance bond period shall simultaneously commence. During the term of the maintenance bond, the Developer shall make arrangements with the Contractor to return when and as required to reconcile any problems resulting from construction, such as water or sewer line leakage, mechanical malfunctions, trench settlement, pavement failure, surface restorations, drainage, etc. In addition, a maintenance bond inspection shall be made by the Authority's Engineer at a date between six (6) and twelve (12) months following the date of declaration of completion of construction. The Developer will be notified in advance of that inspection and may participate therein.

103 AS-BUILT DRAWINGS

A. The Contractor shall retain one reasonably clean set of drawings of the proposed improvements at the job, on which he shall note changes in pipe line alignments

and elevations and, any other changes from the pre-construction approved plans. He shall also reference the locations and depths of the ends of sewer service laterals, so that the same may be uncovered and connected at future times. The set of prints on which such field information is recorded shall be turned over to the Developer or the Authority's Engineer for transposing that information onto the original drawings.

104 RIGHT-OF-WAYS

A. The alignment and location of the proposed pipe lines and appurtenances shall be shown on the plans on which street, highway and/or acquired right-of-ways have also been shown. No pipe line shall be relocated outside of the street or other right-of-way without obtaining the formal written approval for such change from the Authority. Where a special pipe line right-of-way is obtained through private property, the minimum permanent width for operation and maintenance purposes shall be 20 feet.

B. The Contractor shall make his own arrangements for any work completed outside of the right-of-ways or easements, or for private agreements regarding office space, material storage yards, trailers, sanitary facilities, utility services, debris or earth disposal, ingress and egress or similar matters.

105 CONTROL OF PIPE LINE ELEVATIONS AND ALIGNMENTS

A. The Contractor shall confirm the elevation of all existing facilities to which the proposed facilities will connect prior to the commencement of construction to confirm compatibility.

B. All sewer lines and appurtenances shall be required to be constructed and the elevations and alignments shall be controlled by the use of laser equipment.

C. The Developer shall employ competent field survey personnel as may be required to control grades and/or alignment of proposed facilities and to assist the Authority's Engineer or inspector by obtaining information during construction progress and, for purposes of preparing as-built record drawings.

106 TRAFFIC WARNING SIGNS, BARRICADES, LIGHTS AND CONTROL

A. Where pipe lines and/or other facilities are constructed along State Highways and/or Municipal Streets and, where construction activities may otherwise impede normal vehicular traffic patterns on said highways or streets, the control of traffic shall be accomplished in accordance with the details set forth in Publication 203 of the Pennsylvania Department of Transportation, the title of which is "Work Zone Traffic Control Guide". The position of work zone signs, flagmen, erection of signs, sizes of signs, details and configuration of signs, traffic channelizing, tapered lengths/spacing, cones, drums, vertical panels, lighting devices, arrow boards and all flagging conduct and activities shall conform to the details described therein. The location and configuration of traffic control methods shall conform to those graphically illustrated on the appropriate Tables and Figures shown in the publication.

B. At a minimum, all streets shall be maintained during construction so as to provide one-way traffic at all times. No street shall be completely closed to through traffic unless prior permission is obtained from the Authority's Engineer, or unless an emergency condition arises.

107 EXPLORATORY EXCAVATIONS

A. In those existing streets, roadways, berms or other areas expected to have a number of underground utility lines, where there are large trees which may be saved by realignment, and where the Authority's Engineer so directs, the Contractor shall make appropriate exploratory excavations for the purpose of locating said lines. The Authority's Engineer will then confer with the Authority and the Contractor regarding the method of construction proposed to be used for performing the work in said areas, and realignment of the proposed pipe lines and/or appurtenances appears possible and/or reasonable without conflicting with the terms set forth elsewhere in these specifications, said alignment adjustments shall be made.

108 EXISTING UTILITY LINES - LOCATION, PROTECTION AND HAZARDS

A. The drawings should show those underground water lines, gas lines, electric lines, cable TV lines, telephone lines, sanitary sewers, storm drains, conduits and other similar utility lines and appurtenances for which said approximate location information was either made available to the designer, or was observed in the field. Neither the number of such underground facilities nor their respective types, sizes and/or locations can be assured or guaranteed and it is, therefore, the responsibility of the Contractor to obtain such additional information as is required to properly complete the work in compliance with the specifications, and to contact the owners of the various utilities in the area prior to starting and during performance of the work in accordance with PA Act No. 287 of 1974, as amended by Act No. 187 of 1996.

B. The approximate locations of many power and telephone poles and guy poles along the route of the work should be shown on the drawings and the overhead lines supported by all such poles shall be observed and located by the Contractor prior to commencement of the work.

C. The Developer and his Contractor shall be completely and solely responsible for any and all property damages, bodily injuries, financial losses and interruption of service that results from or are attributable to his construction activities and, which affect water lines, gas lines, electric lines, telephone lines, drain lines, sanitary and storm sewer lines, cable TV lines, and all appurtenances and service facilities connected thereto. Restoration of all such disturbed facilities shall be accomplished immediately after incurrence thereto.

D. Water, sewer, gas, power and telephone service to dwellings or places of business shall be maintained with a minimum of interruption throughout the construction of the contract work. No such service shall be intentionally interrupted without the approval of the respective utility company concerned, and without first giving due warning to the occupants of said dwelling or business establishment.

E. In some cases, it may be found that existing pipe lines are in a location where construction of the proposed work cannot reasonably proceed until the utility has been relocated. The Contractor shall make all necessary sub-surface investigations and shall locate such utility mains far enough in advance of the trenching work so that work progress is not unnecessarily interrupted.

F. Attention is directed to the fact that much of the proposed work is in close proximity to overhead power lines which transmit electric current at high voltages and which, if disturbed or contacted during construction, would be hazardous to construction personnel and/or other persons. The Contractor shall, therefore, properly protect such wires, pole supports or other power line appurtenances to avoid disturbance to those facilities, and shall operate all machinery and conduct all other construction activities in a manner which will assure protection of all construction personnel and other persons against said hazards. Work in the vicinity of the existing underground gas lines and appurtenances is also hazardous because, under certain conditions, such materials are flammable and/or explosive and, the Contractor shall avoid disturbance and/or displacement of those facilities and shall provide all temporary and permanent supports and other required protection to prevent exposure of same to construction personnel and/or other persons. Where such lines are exposed during construction and leakage is detected, sewer construction work in those areas shall be immediately suspended, the owner of the pipe line shall be immediately advised of the condition and the sewer construction work shall not resume until all repairs have been properly completed.

G. The construction activities required to be performed in the conduct of the work may necessitate the interconnection, interception, surveying, inspection, removal, replacement and repair of certain existing manholes, sewer pipes and appurtenances. Said manholes, sewer pipes and appurtenances are conveying all wastes and runoff discharged to and infiltrating into the public sewer system within the area served, which wastes may contain and/or generate toxic, noxious, oxygen depleting or other liquid or gaseous substances harmful to human beings. The Contractor shall also provide all personnel with all tools, clothing and other devices necessary for such safe practice, including appropriate waterproof clothing, respirators, protective glasses, mechanical air blowing equipment to preventilate manholes and other chambers, explosive atmosphere detectors, ladders, safety harnesses, etc. No work shall be performed under any unsafe conditions and if same is detected at any time, the Contractor shall, therefore, thoroughly instruct all personnel involved in such work so that appropriate and complete safety practices are observed at all times.

109 RECORD PHOTOGRAPHS AND VIDEOTAPE

A. Prior to the commencement of any earthmoving activities, the Contractor is responsible for supplying the Authority with photographs or videotape of all driveway crossings, retaining walls, sidewalks, road crossings, lawns and any other substantial landscaping items, i.e. fences, hedges, flower beds, gardens, etc., to be crossed be the installation of the sewerline. Also, in wooded areas, the Contractor shall supply the Authority with photographs or videotape of trees of significant diameter, stream crossings and areas where benching is expected preparatory to trench excavation.

110 CLEARING AND GRUBBING

A. Clearing shall consist of the felling, trimming, cutting up and disposing of all trees, vegetation, brush, undergrowth, downfalls, trash and rubbish designated for removal.

B. Grubbing shall consist of the removal of all stumps, roots and/or other buried or embedded organic material by excavating, pulling, cutting or other methods.

C. All clearing and grubbing work in excavation and embankment shall be conducted in a manner as set forth in Section 201 "Clearing and Grubbing" of the Pennsylvania Department of Transportation Specifications, Publication 408, current edition.

D. The Contractor shall cut, clear and remove all brush, sapling, scrub and other wild growth along the route of the pipe lines. No trees shall be cut, without the specific approval and prior designation for cutting, by the Engineer. It is the intent of these specifications to minimize the removal of trees, and therefore, only those which will positively prevent the application of reasonable construction methods and procedures will be permitted to be removed. Trees (six inches in diameter or less) brush, scrub growth, stumps, saplings and tree limbs so directed to be cut, shall be placed into piles and shall be destroyed by mechanical chipping or completely removed from the site of the work. All firewood size logs (with brush and stumps removed) shall remain on the property for the use of the property owner unless otherwise directed. No such debris shall be buried or included in any backfill and as part of the clean-up work shall be required to be removed and transported away from the site.

E. No burning of vegetation, trees, stumps, etc. will be permitted.

SECTION 200

MATERIALS AND INSTALLATION METHODS

201 GENERAL

A. The Contractor shall be responsible for all materials furnished by him. All material that is defective in manufacturing or has been damaged in transit must be replaced at his expense. All defective or damaged material discovered prior to the final acceptance of the materials will be removed from the site by the Contractor and he will supply the replacement materials at his own expense.

B. All materials and equipment to be furnished under this Contract shall be new and shall conform to the grade, quantity and standards specified herein. All equipment shall be the latest and standard products as advertised in printed catalogs by reputable manufacturers for the purpose intended.

C. Materials shall be delivered in strict accordance with the manufacturer's instructions. The Contractor shall obtain these instructions from the manufacturer and such instructions will be considered to be a part of these specifications for the type, capacity and application of material.

D. All materials proposed to be utilized for construction are required to be approved for use in advance of shipment to the job site. No materials shall be incorporated in any sewer line which have not received prior approval of the Authority. Such approvals shall be obtained by submitting four (4) sets of shop drawings to the Authority's Engineer for materials to be utilized in the project, prior to ordering any materials.

202 POLYVINYL CHLORIDE (PVC) PIPE MATERIAL

A. Polyvinyl chloride pipe, wyes and fittings shall be extruded polyvinyl chloride conforming to ASTM D-3033 or D-3034, SDR-35. Flexible elastomeric seals and joints shall be provided conforming to ASTM F-477 and ASTM D-3212, respectively.

B. All pipe, wyes and fittings shall be subject to inspection at the factory, trench or other points of delivery by the Authority's Engineer. The purpose of the inspection shall be to cull and reject any pipe, wyes or fittings that, independent of the physical tests specified in the designated ASTM specifications, fails to conform to the requirements of these specifications.

C. All pipe, wyes and fittings must be clearly marked with the manufacturer's name and trademark, nominal size, materials designation PVC, SDR-35 and ASTM D-3034.

203 DUCTILE IRON PIPE

A. Ductile iron pipe shall be Class 52, ANSI A21.10 with a standard cement-mortar lining conforming to ANSI A21.4.

B. Fittings shall be ductile iron conforming to ANSI A21.10 with a standard lining as for ductile iron pipe.

C. Joints may be either mechanical joint or push-on joint, unless specified and shall conform to ANSI A.21.11. Rubber gaskets, lubricants, glands, bolts and nuts shall also conform to ANSI A.21.11.

204 HANDLING AND STORAGE OF PIPE

A. All pipe shall be stored on flat surfaces so that the barrel is evenly supported. The pipe shall be protected from the sunlight by an opaque material cover. Any pipe material showing discoloration will not be permitted. Pipe shall be stored such that it is no higher than four feet (4') in height. The pipe shall not be dropped or dragged across hard surfaces or sharp objects. All pipe shall be protected during handling against impact shocks and free fall.

B. The Contractor will provide tools, implements and facilities for handling and placing of the pipe. The pipe, fittings and other appurtenances will be carefully lowered into the trench by means of ropes or other suitable tools or equipment, in such a manner as to prevent damage to the pipe or pipe coating, where the type of materials require such handling. The pipe and fittings shall, under no circumstances, be dropped or rolled into the trench or dropped on the surface of the ground.

C. The pipe and fittings shall be inspected for defects immediately before placing into the trench. Those pipes and fittings found unsatisfactory shall be rejected. All materials must be thoroughly cleaned before placement into the trench and thereafter must remain cleaned.

205 LAYING OF PIPE

A. The laying of pipe in finished trenches shall be commenced at the lowest points so that the spigot end is pointing in the direction of the flow. All pipes shall be laid with ends abutting and true to line and grade. They will be carefully centered so that when laid, they will form a sewer with uniform invert.

B. Sockets will be carefully cleaned before pipes are lowered into trenches. The pipes will be so lowered as to avoid unnecessary handling in the trench.

C. At all times when work is not in progress, all open ends of the placed pipes and fittings shall be securely closed by temporary watertight plugs or by other means. If water is in the trench when the work is resumed, the plug(s) shall not be removed until the danger of earth or other materials entering the pipe has passed.

D. Any section of the pipe already laid and found to be defective will be removed and replaced with a new pipe at no additional expense to the Authority.

E. Laying of sewer pipe will be accomplished to line in the trench only after it has been dewatered and the foundation or bedding has been prepared in accordance with these specifications. Mud, silt, gravel and other foreign materials shall be kept out of the pipe and off the jointing surfaces.

F. The sewer will be laid upgrade from the point of connection to the existing sewer or from a designated starting point. The sewer pipe will be installed with the bell end forward or upgrade.

G. All pipe will be retained in position so as to maintain alignment and joint closure until sufficient bedding and backfill has been completed to adequately hold the pipe in place. All pipe will be laid to conform to prescribed line and grade as shown on the drawings.

H. No pipe will be laid when trench conditions or weather are unsuitable for such work, except when permitted by the Authority's Engineer or his authorized agent. Under no circumstances will any material be placed, advertently or inadvertently, in the pipe either for storage or other reasons.

I. During the process of laying the pipe, care must be taken to protect both the pipe and joint from disturbance, and the trench will be kept free from water until the joints have set. At all times when pipe laying is not actually in progress, the open ends of the pipe will be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug will not be removed until all danger of earth or other materials entering the pipe has passed.

J. No special compensation will be made to the Contractor to defray costs of any work or delay occasioned by giving or altering lines and elevations, or making other necessary measurements, or by inspection, but such costs shall be considered as having been included in the price stipulated for the several items of the work to be done under this Contract.

206 ASSEMBLY OF PVC SEWER PIPE

A. Pipe joints shall be carefully lowered into the excavated trenches to avoid damage to the pipe barrel and the bell and spigot ends. All rubber gaskets shall be examined to assure there is not damage during handling and shipment. Both the bell and spigot ends shall be wiped clean with a reasonably dry cloth. The spigot end of the pipe shall then be lubricated by application of a suitable grease-like product which will not adversely affect either the gasket or pipe wall. The entire circumference of the spigot shall be coated with a cloth, sponge or glove and the lubricated spigot shall be inserted into the bell. The pipe shall be shoved home by hand or by use of a bar and block. A representative of the pipe manufacturer shall, when the Authority's Engineer so directs, spend a reasonable amount of time on the job site (at the beginning of the work) demonstrating pipe laying techniques and instructing the Contractor's personnel on proper construction methods.

207 BEDDING FOR GRAVITY SEWERLINE

A. The Contractor will excavate six inches (6") below the bottom of the pipe and backfill the six-inch (6") depth with aggregate backfill material AASHTO No. 57 (formerly PennDOT No. 2B) such material to be suitable for bedding of pipe and shall not be subject to floating where water conditions exist. Aggregate bedding material must be approved by the Authority's Engineer.

B. In all cases, the bottom quadrant of the entire length of the pipe will be fully and uniformly supported, except the bell, under which a recess will be excavated to a sufficient depth to relieve the bell of any load and to allow ample space for making the joint.

C. If the excavation has been made too deep, granular bedding material will be placed in the bottom of the trench, thoroughly rammed, and a new bed made for the pipe. The pipe will not be raised by ramming earth beneath the bottom. When the pipe has been bedded satisfactorily and the joint made, the recess under the bell shall be refilled with bedding materials and enough granular material placed and tamped on each side of the pipe to hold it securely in place, care being taken not to disturb the position of the pipe during this process.

D. Following installation of the pipe, aggregate backfill PennDOT AASHTO No. 57 (formerly PennDOT No. 2B) shall be placed aside and above the pipe so as to provide a six-inch (6") aggregate cover above the top of the pipe.

208 OPEN EXCAVATION AND BACKFILL

A. Except where otherwise shown on the drawings, all pipe lines shall be constructed in open trenches. All excavation shall be unclassified and no extra payment will be made for rock, boulders, shale, timbers, logs, stumps, muck, old foundations, masonry, or other natural or artificial materials encountered in the trenching operations. The Contractor shall make personal examination of the locations in which pipe lines are to be constructed to determine for himself the extent and character of any rock that may be encountered. No information regarding subsurface conditions along the routes of the pipe lines will be given by the Authority, but the Contractor may make his own borings (subject to him obtaining any required right-of-ways, permits, approvals, etc. for such work) to determine the soil or rock characteristics. The Contractor shall not at any time claim a misunderstanding in regard to depth or character of the excavation to be made or in the nature of the materials to be encountered.

B. The width of all trenches shall not exceed the outside diameter of the pipe, plus two feet (2'), from the bottom of the respective pipe trench to a horizontal plane located six inches (6") above the top of the pipe. That section of the trench is identified as the pipe zone. In the event that the Contractor's construction methods/activities result in a trench wider than the pipe diameter plus two feet (2') within that pipe zone, he shall install concrete bedding or encasement or shall make such other provisions as may be directed by the Authority's Engineer to protect and assure the structural integrity of the pipe.

C. The excavation material from the trench may be stored along its alignment on rights-of-way obtained for construction purposes. It may not, however, prohibit traffic flows along the streets and roadways, access to private properties, or access to existing utility lines by the respective utility companies. The temporary storage of excavated material shall not obstruct or alter the flow of surface water run-off to the detriment of the operation of existing surface water drainage facilities and ditches and, shall be placed at a location which will not superimpose excessive loading on the trench walls and/or the sheeting, shoring or bracing installed within the trenches.

D. Backfill material placed in trenches above the pipe zone, where such trenches are located within Municipal street cartways, State highway cartways, driveways and parking areas shall consist (for the entire trench width and depth) of material conforming to the requirements specified for bedding, conforming to PennDOT aggregate number 2A. Backfill material in trenches above the pipe zone in traveled ways, road shoulders or berms and at all other locations where trench settlement must be avoided, shall be excavated material placed in lifts not exceeding eight inches (8") in thickness and shall be thoroughly and mechanically compacted by the use of vibratory or reciprocating tamping equipment for the full depth of the trench. At other locations along the alignment of the pipes where trench settlement is not of concern and, where designated by the Authority's representative during construction progress, backfill above the pipe zone may be loosely placed by machine, mounded over the trench and after settlement has satisfactorily occurred and subject to a time approved by the Authority's representative on the site, the excess material shall be leveled and blended with the slope of adjacent ground surfaces in a manner which does not adversely impede the flow of surface water or otherwise have a deleterious affect on the finished landscape.

E. No material shall be used for backfill at any location which, in the opinion of the Authority's representative, is too wet, frozen, mucky or contains debris, tree stumps or an excessive amount of rocks. All excavated material which is unfit for refilling must be removed from the work area and shall be disposed of by the Contractor at a site mutually agreeable to the Authority and the Contractor. The disposal site shall be out of the influence of streams and outside of the floodplain. Disposal sites shall be in compliance with all applicable Federal, State and local municipal codes. The Contractor shall be required to bring in material from an outside source at no additional cost to the Authority.

F. All excess excavated material resulting from the construction of the pipe lines and appurtenances shall be disposed of by the Contractor at a location and in a manner which shall be the Contractor's responsibility to determine. The disposal site shall be out of the influence of streams and outside of the floodplain. Disposal sites shall be in compliance with all applicable Federal and State Regulations and local municipal codes.

G. Where muck, quicksand, soft clay, swampy or other material is encountered in the trench bottom, which in the opinion of the Authority's representative, is unsuitable for pipe foundation subgrade or backfill, such material shall be removed to a depth satisfactory to the Authority's representative. The trench shall then be backfilled to grade with acceptable Authority approved material, mechanically compacted in successive layers. For the removal and replacement of such unsuitable materials, to a depth greater than six inches (6") below the bottom of the pipe, and when authorized by the Owner's representative, the Contractor shall be reimbursed on the basis of the invoiced unit cost of the delivered material times the actual measured unit quantity installed times a multiplier of 1.50. The source of the aggregate shall be approved by the Owner. The cost of disposal of such objectionable material shall be borne by the Contractor.

H. Where necessary to maintain the required trench configuration in the pipe zone, in confined areas where trench walls above the pipe zone cannot be sloped, or for the protection and safety of construction personnel, sheeting, shoring and/or bracing

shall be installed in accordance with the requirements of the appertaining regulatory agencies. Said sheeting, shoring and/or bracing shall be designed by the Contractor and shall be adequate to withstand the loads to be imposed during the construction operations. Its placement and removal shall be carefully performed to avoid displacement or disturbance of the entrenched pipe. All trench supports shall also be required to provide complete safety to construction personnel working within. Trench boxes may be utilized, however, their design, fabrication, structural adequacy, handling, placement and removal shall be the responsibility of the Contractor.

I. Trenches at any and all locations where pedestrian or vehicular traffic hazards would result, shall not be left open during non-construction hours, unless they are suitably covered with a steel plate which is adequately anchored and reinforced to sustain pedestrian and/or vehicular traffic loads which may be imposed.

J. All structure excavations and open trenches shall be constructed in accordance with the regulations set forth under Subpart P, "Excavation, Trenching and Shoring", published as a part of the Safety and Health Regulations for construction by the U.S. Department of Labor, as amended, as the same pertains to the shape of trenches, trench side-wall supports, the construction methods employed, the general protection requirements, the general excavation requirements, and the minimum requirements for the respective Contractor for the conditions encountered. Methods of installation shall be compatible with assuring the protection against disturbance of adjacent facilities and/or grounds and, the safety of construction and other personnel.

K. The Contractor shall schedule construction activities and provide all required equipment and personnel such that the backfilling of trenches located along or crossing streets, street berms, roadways, driveways and other traveled ways, results in resumption of normal traffic patterns reasonably soon after pipe construction.

209 LENGTH OF TRENCH EXCAVATION

A. The Authority's Engineer shall have the right to limit the amount of trench opened in advance of backfilling, but in no case shall this amount exceed one hundred feet (100'). Trench excavation shall be fully completed, except for the shaping of the bottom trench, at least twenty feet (20') in advance of the pipe placement and shall be kept free from obstructions, except that at the close of work at night, or at the discontinuance of the work, the pipe-laying may be completed to within five feet (5') of the end of the open trench.

B. The Authority shall be empowered, at any time, to require the refilling of open trenches over completed pipe lines, if, in his judgement, such action is necessary.

C. If work is stopped on any trench, for any reason except by order of the Authority, and the excavation is left open for an unreasonable length of time (in the opinion of the Authority) in advance of construction, the Contractor shall, when so directed, refill such trench, and shall not again open said trench until he is ready to

complete the structure therein.

210 BLASTING

A. Blasting shall not be permitted during the course of the project unless all other means to excavate the necessary trench widths and depths are futile. In no event shall blasting occur within two hundred feet (200') of any dwelling. If necessary, approval to blast must be obtained from the Authority's Engineer prior to initiating any such activity. The Contractor assumes any and all risk and liability if blasting is necessary irregardless of advice or approvals given by the Authority or its Engineer.

B. All blasting shall be done by licensed blasters and shall be performed in accordance with all applicable Federal, State and local laws, rules and regulations regarding registration, transportation, storage, handling and otherwise using explosives.

211 DEWATERING

A. All excavation shall be dewatered thoroughly in advance of the installation of any of the construction work; no facilities shall be constructed in any excavation where water flows or is pooled, or where groundwater infiltration or surface water inflow is not immediately removed. Where dewatering does occur, the Contractor shall conduct those operations in a manner which complies with regulations of the subject of Soil Erosion and Sedimentation Control as promulgated by the Pennsylvania Department of Environmental Protection. No such discharges shall be permitted to erode or otherwise adversely effect any public or private property and all such discharges shall be trapped, settled, rough-filtered, retained and/or checked (depending upon the clarity, turbidity, and concentration of suspended solids within such discharges).

212 TUNNELING, JACKING OR BORING

A. At those locations indicated on the plans and/or profiles where open cut excavation will not be permitted, the Contractor shall tunnel, jack or bore the casing pipes and/or sewer lines of force mains.

B. After installation of casing pipes (Steel Casing ASTM A-53) or tunnel liners the carrier pipe shall be threaded within. The method of placement shall be determined by the Contractor, however, care shall be exercised to not displace or disturb the interior pipe. The Contractor shall submit to the Authority's Engineer for approval his method of placement.

C. Where tunneling is employed, the tunnel liner plate shall be designed by the Contractor for the particular diameter or shape which he elects to use. The plate shall be designed and assembled in accordance with the manufacturer's published recommendations for the material encountered in the tunnel excavation.

D. Tunnels shall be carefully excavated by experienced tunnel workers and shall be trimmed to such a size and shape as to allow the proper placing of the sanitary sewers and force main to the lines and grades shown on the plans after the liner is in place. Care shall be exercised in excavating tunnels so that voids outside the

casing and disturbance of the surrounding material are kept to a minimum. Large voids are to be filled immediately with grout. The space between the tunnel bore and the casing shall be completely filled with an approved sand-cement mortar.

E. All sheeting, shoring, bracing, lining, etc., required for the construction of tunnels, shafts, portals, etc. shall be furnished and installed by the Contractor. All work relative to the installation of liners and carrier pipes by means of jacking, boring or tunneling shall be performed in accordance with the regulations set forth under Subpart S, "Tunnels and Shafts, Caissons, Cofferdams and Compressed Air" published as a part of the Safety and Health Regulations for Construction by the U.S. Department of Labor.

F. The Contractor shall make all arrangements necessary for the location, construction and operation of any intermediate shafts and/or drifts he may require.

G. The Contractor shall excavate the tunnel and support the surrounding earth so that no movement of the earth over or adjacent to the work shall occur at any time. In case, due to unforeseen conditions or otherwise, any such movement does occur, the Engineer may order the Contractor to stop any and all work except that which assists in making the tunnel secure and in preventing further movement of the ground over or adjacent to the work. The Contractor shall resume tunneling at the place at which such movement occurred only when, in the opinion of the Authority's Engineer, he has taken all necessary precautions to prevent movement.

H. Where jacking is employed, a minimum one half of one inch (1/2") thick steel shield at least twenty-four inches (24") long shall be required to extend beyond the forward end of the casing pipe, liner plate, or conduit being jacked. The outside radius of the shield shall not exceed the outside diameter of the pipe by more than one inch (1"). Excavation ahead of the casing, liner plate, or conduit shall not progress beyond the end of the shield being used.

I. Where the boring method is being used, the pipe shall at all times follow immediately behind the boring auger at a distance no greater than two feet (2'). The method of augering the entire hole and then pushing the pipe through will not be permitted. If unstable material is encountered, retract the cutting head into the casing to permit a balance between the pushing pressure and the ratio of pipe advancement to quantity of soil.

J. It is the intent of these specifications to permit the Contractor to select either of the three above-mentioned methods of installing pipe lines where open cut is not permitted, provided construction details and methods employed comply with the requirements of the authorities having jurisdiction, in addition to the requirements of these specifications.

K. Regardless of whether tunneling, jacking or boring is employed, the Contractor shall be responsible for construction of the various pipe lines true to line and grade and shall be held fully responsible for protection against surface subsidence, damages or disturbances to adjacent property and facilities from his construction operations, and shall rectify resultant subsidence, damages or disturbances to the satisfaction of the Authority.

L. The Contractor shall be responsible for reimbursing all agencies owning the property where boring, jacking or tunneling is required for any inspection and/or flagmen costs incurred and deemed necessary by those agencies at any and all locations where work under this Contract is performed, to insure safe traffic conditions and safe conduct of the work. Submission of the afore-described details, subsequent approvals and responsibility for inspection costs for either parallel or longitudinal occupancies shall be required and shall also be provided for in the bid prices.

213 STEEL CASING PIPE

A. All steel casing pipe furnished where boring and jacking is required or, where otherwise required, shall conform to the ASTM A-53 specifications and shall have a minimum yield strength of 35,000 psi. Joints shall be full-circumference welded and the pipe shall be the diameter indicated on the plans and/or profiles. Wall thicknesses shall be one quarter of one inch (1/4") for casing less than twenty-four inches (24") in diameter and three eighths of one inch (3/8") for casing twenty-four inches (24") in diameter to thirty-two inches (32") in diameter.

B. Casing spacers located within the casing pipe and supporting the carrier pipe shall be properly sized to accommodate the carrier pipe. Casing spacers shall be as manufactured by Advance Products & Systems, Inc., Model CI or approved equivalent. Spacers shall be placed at eight-foot (8') intervals along the carrier pipe. The use of timber skids and stainless steel bands is not acceptable without approval by the Authority's Engineer.

C. The ends of the casing pipe shall be sealed using neoprene boot seals with stainless steel attachment bands.

214 MANHOLES

A. Manholes constructed on the pipe lines shall be fabricated of precast concrete in accordance with the requirements of ASTM C-478, having a 28 day compressive strength of 4,000 psi. The manhole structures may be furnished with prefabricated base sections or, the bases may be cast-in-place for reinforced concrete as shown on the appertaining detail drawings.

B. Manholes greater than five feet (5') deep shall be furnished with eccentric cone top sections. Manholes less than five feet (5') deep are required to be constructed with the flat-slab top sections. Manhole barrel sections shall be sealed with bitumastic materials placed in the field, as manufactured by Concrete Sealants, Inc. Two (2) rings of said material shall be installed - one on the inside of the joint in the groove and the other on the outside of the tongue. The exterior of the manholes shall be sealed with an asphaltic compound such as a foundation sealer or other material suitable for this application.

C. All manhole frame and covers, and the top cone section of the manhole will be set so the vertical wall of the top section is that portion of the manhole furthest from the edge of the road.

D. Manholes furnished with prefabricated base sections shall be installed on twelve inches (12"), minimum thickness, of crushed stone (AASHTO No. 57, formerly PennDOT No. 2B) or washed gravel. Said material shall also be placed in the bottom of the manhole excavation between the limits of the influent and effluent pipe trenches to an elevation six inches (6") above the top of the connecting pipes. In other words, all sewer pipe connections to manholes shall be completely supported (to the bottom of the excavation) on bedding and, shall be enveloped in the same material to an elevation located six inches (6") above the top of the pipe.

E. Manholes where the largest connecting sewer is eighteen inches (18") in diameter or less shall have a four foot (4') diameter barrel section; where any connecting sewer exceeds eighteen inches (18") in diameter, manhole barrel sections shall be five feet (5') in diameter.

F. All manholes shall be provided with steps located twelve inches (12") on center, which shall be as manufactured by M.A. Industries, Inc., Peachtree City Georgia, Model PS2-PF, or approved equal. The steps shall be deformed steel encapsulated with injection molded polypropylene.

G. Invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section. Inverts may be formed directly in the concrete for the structure base, or where reinforced concrete culvert pipe is used, may be built up of mortar or may be constructed by laying a full section of sewer pipe straight through the structure and breaking out the top half after the base is constructed. Where necessary, invert channels in manhole bottoms shall be shaped and smoothed with cement mortar. The size and depth of the inverts will vary to suit the size of the pipe used and shall have a height of at least six inches (6") higher than the springline or to the top of the inlet pipe, whichever is higher. Manhole inverts shall be poured.

H. Changes in grade shall be made gradually and evenly. Changes in the direction of the sewer and entering branch or branches shall have a true curve of as large a radius as the size of the structure will permit. Changes in the pipe size shall be made gradually and evenly by dropping the invert in the manhole a distance equal to the difference in diameter of the pipe entering and leaving the manhole. Elevations shown on the drawings shall indicate invert elevations of the center of manhole unless indicated otherwise. No manhole bottom which results in the collection of solids or in pooling of wastewater will be accepted. Gradients in manholes which accommodate smooth gravity flows must be provided.

I. All prefabricated manhole bases/barrels shall, where pipes connect, be furnished with resilient and/or flexible connectors to accommodate the respective pipe diameters.

J. The date of manufacture and the name or trademark of the manufacturer will be clearly marked on the inside of the barrel and riser sections. Sections will be steam cured and will not be shipped until at least five (5) days after having been cast. Acceptance of the sections will be on the base of the material tests and inspection of the completed product as delivered to the construction site.

K. Cones may be precast sections of similar construction and will be designed to resist the effect of highway loadings. They will be eccentric with the manhole

steps installed on the straight side. The clear opening at the top of the manhole will be thirty inches (30") in diameter. If the manhole is to be provided with a watertight frame and cover, the clear opening shall be adjusted to provide proper bearing surface for the frame.

L. All manhole sections will be carefully handled during shipment and unloading. They will not be rolled under any conditions. Any chipping of manhole joints will be cause for rejection of that particular section.

M. Field adjustments in pipe openings will be done with a light hammer and cold chisel. A heavy sledge hammer will not be permitted for this use. The base will be poured as described herein before.

N. All lifting holes will be grouted inside and outside after erection. All mortar joints will be brushed to insure resistance to moisture penetration.

O. Manhole bases will be precast reinforced concrete. The manhole base will be placed on twelve inches (12") of compacted aggregate and the base will be reinforced and eight inches (8") thick. Precast manhole bases will have a minimum base diameter of five feet ten inches (5'-10").

215 MANHOLE FRAMES AND COVERS

A. Every manhole and lamphole, unless otherwise called for on the drawings, shall be fitted with a cast iron frame and cover of the type and dimensions shown on Construction Detail Standard No. 4 or as designated in these specifications.

B. Manhole frames and covers shall be approved by the Authority's Engineer. Frames and covers shall be of cast iron conforming to Federal Specification QQ-1652 and ASTM Specification A-48 Class 30 Iron. They shall be of good quality and of such character as will make the metal of the casting strong, tough and even grain. They shall be smooth, free from scales, limps, blisters and sand holes and any defects of any kind which would make them unfit for the use for which they are intended. No filling will be permitted.

C. Standard frames and covers shall be as manufactured by Allegheny Foundry Company, Pittsburgh, Pennsylvania, Frame 109, Cover 110, or approved equal.

D. Watertight frames and covers shall be used when the manhole is located within a 100-year floodplain area or in a stream or where required by the Authority's Engineer. Watertight frames and covers shall be as manufactured by Allegheny Foundry Company, Frame 109W, Cover 110, or approved equal.

E. Lids shall be imprinted with the label "MARSHALL SANITARY".

F. The frame and cover shall be straight and true to pattern and the cover must have a continuous and even bearing in the frame and shall be properly seated as to avoid rocking. The cover must also fit into the frame as nearly as possible without jamming and must fit the frames in any position.

216 INFLOW PROTECTORS - MANHOLE INSERTS

A. Within each non-watertight manhole frame and cover shall be installed a polyethylene manhole insert as manufactured by Parson Environmental Products, Inc., Reading, PA, or approved equal. Inflow protectors shall be of shallow bowl design and have a valve-type method of ventilation.

217 CONNECTION TO EXISTING SEWERS

A. Before any sewer pipe construction, the Contractor will verify that elevations and grades provided on the drawings will enable the construction work to proceed without problems and that the existing structures can be intercepted at the proper elevation to provide the service intended. Any discrepancies will be reported to the Authority's Engineer immediately. It is extremely important that the beginning and terminal elevations be established early (before the new sewer pipe lines are constructed).

B. Connections to existing sewers shall be protected in such a manner as to prevent water, dirt and/or debris from entering the existing sewer system at any time during construction.

C. When connections are made to existing sewers or manholes, no discharge of sewage will be permitted to the ground or any watercourse.

D. Connection to existing manholes shall be made by core drilling the manhole for the appropriate size pipe and installing a flexible rubber boot. The flexible rubber boot shall be cemented into the opening in the manhole with a non-shrink waterproof grout. Upon completion of the installation of the first section of pipe, a plumbers plug shall be installed at the new connection point to the existing manhole and shall remain throughout the course of the project construction, except when required to be removed for laser use or testing.

E. The existing invert of the manholes shall be reconstructed to accommodate the flow path of all inlet and outlet pipes. Alternatively, the invert shall be reshaped by grinding or other means to provide a new flow path for the newly connected sewer.

218 CAST-IN-PLACE CONCRETE FOR STRUCTURES, BEDDING, PAVING, THRUST RESTRAINTS, TRENCH CAPS IN ROADWAYS, ENCASEMENTS, UNDERPINNING, ETC.

A. Construction of all concrete work shall be in accordance with the applicable portions of "Specifications for Structural Concrete for Building" ACT 301 of the latest revision, except as modified hereinafter. Concrete shall be ready-mixed and shall be batches, mixed and transported with sufficient facilities to deliver the concrete at the rate required and in accordance with the standards set forth in ASTM Specification C-94. Mixing and flushing water in transit mixtures shall be equipped with a calibrated glass gage. The ready-mix concrete supplier shall furnish the Authority with a certified statement that the concrete furnished to the job conforms to the provisions of these specifications.

(Added by Revision 9/26/2006)

G. An external manhole encapsulation system made of a heat shrinkable thermoplastic material that conforms to the shape of the manhole and forms a tight monolithic seal of the joints, shall be installed around the exterior of the cast iron frame and the precast concrete cone or barrel section of each manhole pursuant to the recommendations of the manufacturer. The system shall also be utilized to seal joints in all underground vaults and wetwells. The WrapidSeal heat shrinkable sleeve system, manufactured by Canusa – CPS in Houston and Huntsville, Texas, or an approved equal, meets this specification.

B. All concrete shall be dense and workable and shall be placed utilizing pneumatic vibrators. It shall be required to develop a minimum compressive strength of 3,000 psi in 28 days. Reinforcing steel shall conform to the requirements of ASTM A-615, Grade 60; mesh reinforcement shall conform to ASTM A-185 requirements.

219 BURIED PIPE IDENTIFICATION MARKER

A. Electronically locatable brightly colored plastic tape displaying the printed notation "Sanitary Sewers" shall be laid between backfilling lifts over the pipe not less than two feet (2') above the pipe nor less than two feet (2') below the finished ground surface. In no event shall the tape be more than four feet (4') below the finished surface.

220 PIPE CAPS

A. The free end of all service lines, whether it be the end of a wye, bend or straight piece, shall be provided with a cap of the same material as the pipe and having a joint of the same type as that of the pipe and the pipe fittings, such that the cap will be securely placed and the connection between the pipe and the cap will be watertight. The stopper shall be installed with the last section of the service pipe or fitting placed.

221 MARKING SEWER SERVICES

A. All ends of service lines and service sewers, not permanently connected, shall be marked with minimum 2" x 2" lumber placed at the end and depth of said service and extending above the ground surface a minimum of three feet (3'). Sewer service markers shall be painted red.

222 STREAM CROSSINGS

A. Where sanitary sewer lines cross creeks or streams, such crossing shall be accomplished using polyvinyl chloride pipe encased in a minimum of six inches (6") of concrete all around the pipe. The minimum vertical distance between the lowest elevation of the stream along the pipe alignment and the top of the concrete encasement shall be three feet (3').

B. The concrete encasement shall extend a minimum distance of five feet (5') on each side beyond the normal stream channel.

C. Disturbed bank areas shall be stabilized immediately upon completion of the crossing. Rip-rap, as shown on the drawings, shall be installed to prevent erosion of the slopes. Installation of rip-rap shall be in accordance with Pennsylvania Department of Environmental Protection's requirements.

223 TEMPORARY ROAD CROSSINGS OF STREAMS

A. Temporary road crossings may remain installed for a period of time not to exceed one (1) year from the date of the acknowledgement of the GP-8 permit from the Department of Environmental Protection (DEP), unless it is extended in writing by the DEP.

B. The site of a temporary road crossing shall be restored to its original topography and stabilized within five (5) days after the termination of its intended use or at the end of the one (1) year period, whichever occurs first.

C. Temporary road crossings must cross the watercourse at a right angle, unless it is physically impossible to cross at a right angle.

D. Culverts must provide a waterway area sufficient to adequately discharge the normal flow of the watercourse or stream, and shall be of sufficient length to extend beyond the toe of the clean rock fill.

E. Culverts must be installed in such a manner that overtopping of the roadway will occur within the stream channel. This can be accomplished by providing a depressed roadway embankment.

F. Road embankments shall consist of only clean rock material to prevent stream channel sedimentation during placement, removal and periods of overtopping.

G. Approach roads to temporary road crossings shall utilize original grades. However, clean rock material or gravel to a depth of six inches (6") above original grade shall be utilized for approaches as necessary.

H. Temporary road crossings shall be kept open and functioning at all times by maintaining the crossings free of debris and other obstructions.

I. The Contractor shall be responsible for any damages resulting from increased backwater caused by the temporary road crossing. The Contractor shall remove the temporary road crossings in the event of high waters to prevent the increased backwater.

J. The site of a wetlands crossing shall be stabilized by any appropriate means, including but not limited to using removable, temporary mats, pads or other similar devices to insure minimization of impact on the wetlands ecology.

K. Embankments for temporary roads across wetlands shall be installed to maintain the hydrology of the wetland.

L. Any archeological artifacts discovered during the performance of work must be adequately protected and their discovery promptly reported to the Director, Bureau for Historic Preservation, Pennsylvania Historical and Museum Commission, P.O. Box 1026, Harrisburg, PA 17120.

M. Pollution of the waterway with harmful chemicals, fuels, oils, greases, bituminous material, acid and/or any other harmful or polluting materials is prohibited.

N. Access roads should not approach the stream channel directly downslope, but should traverse the slope obliquely to prevent high velocity road drainage flows from directly entering the stream channel. Road drainage shall include proper erosion and sedimentation control measures.

224 WETLANDS CROSSINGS

A. Mats, pads and other similar devices shall be used where crossings of wetlands by construction equipment cannot be avoided. Original grades through wetlands must be restored after trenching and backfilling. Any excess fill material must be removed from the wetland and not spread on-site. Mounding of fill material to allow for settlement in the trench will be permitted in accordance with best construction methods.

SECTION 300

RESURFACING AND RESTORATION OF SURFACES

301 GENERAL

A. The Contractor will restore, unless otherwise stipulated, all pavement, sidewalks, driveways, curbing, gutter, fences, poles or other property and surface structure removed or disturbed as a part of the work to a condition equal to that before the work began, furnishing all labor and materials incidental thereto. He will also be responsible for replacement of signs, mailboxes, shrubs, trees, guiderailing, sidewalks, ditches, drainageways, etc., to their original condition.

B. The Contractor will be responsible for removal of excess excavation and finishing the ground surface to a smooth, even contour. He shall be responsible for any settlement work damaged due to trench settlement. Topsoiling and/or seeding will be required to restore all disturbed areas to a condition equal to or better than their condition prior to beginning of construction. All material and labor required for this work will be supplied by the Contractor for the period required by the Maintenance Bond.

C. The restoration of all surface work disturbed shall be in accordance with the following requirements set forth herein.

302 RECORD PHOTOGRAPHS AND VIDEOTAPE

A. Prior to the commencement of any earthmoving activities, the Contractor is responsible for supplying the Engineer with photographs or videotape of all driveway crossings, retaining walls, sidewalks, road crossings, lawns and any other substantial landscaping items, i.e. fences, hedges, flower beds, gardens, etc., to be crossed be the installation of the sewerline. Also, in wooded areas, the Contractor shall supply the Engineer with photographs or videotape of trees of significant diameter, stream crossings and areas where benching is expected preparatory to trench excavation.

303 RESTORATION OF LANDSCAPING

A. The Contractor will in the preparation of the site, provide adequate protection for all lawns, trees, shrubs and landscape work that are to remain in place or shall remove and preserve all topsoil within areas in which the lawns cannot be protected. Such protection or preservation will be maintained so long as necessary to prevent damage or deterioration due to the operations of the Contractor.

B. All landscape work and topsoil that must be removed will be stored and protected and replanted, or relaid following backfill and tamping of the excavated areas, providing it is suitable for reuse. If such material is not suitable, it must be replaced with suitable materials and the unused portion removed from the site.

C. In lawns and gardens, and in other improved areas (except for streets, roadways, and traveled ways), the top of the backfill material shall be placed to an elevation

approximately six inches (6") below the finished ground surface. Commercial topsoil shall then be obtained by the Contractor from a local garden supplier or nurseryman, and shall be placed and lightly rolled in the top six inches (6") of all excavated areas and other places where construction equipment and activities impose damage to ground surfaces.

D. Areas to be seeded shall be seeded with Formula B, Perennial Ryegrass Mixture (20%), Creeping Red Fescue or Chewings Fescue (30%) and Kentucky Bluegrass Mixture (50%), in accordance with PennDOT Publication 408, Section 804, Seeding and Soil Supplements, current edition. Formula B shall be sown evenly at a rate of 21 pounds per 1,000 square yards of lawn area, one-half sown in one direction and the remainder sown in the quarterly direction (perpendicular) and shall be lightly raked into the surface. The area shall then be thoroughly watered with a fine spray. Care shall be taken that the seed is not washed out.

E. No seeding shall be permitted after rain unless the surface of the ground is loosened or when the velocity of the wind exceeds a gentle breeze of about five (5) miles per hour. Extreme care should be taken during seeding and raking so that no change in grade is made and so that the seed is not raked from one spot to another.

F. Prior to seeding, soil supplements shall be uniformly applied to the areas to be seeded, in accordance with PennDOT Publication 408, Section 804.3(c), current edition. The initial soil supplements shall be blended into at least the top two inches (2") of the topsoil be raking, disking, harrowing or by another acceptable method. The soil supplements shall be lime and fertilizer. The lime shall be Pulverized Agricultural Limestone and shall be applied at a rate of 6 tons per acre or 2,500 pounds per 1,000 square yards. Commercial Fertilizer shall be applied at a rate of 1,000 pounds per acre of 10-10-10 or 200 pounds per 1,000 square yards of 10-20-20.

G. After seeding, uniformly apply mulch at a rate of 3 tons per acre or 1,250 pounds per 1,000 square yards to produce a loose layer of 0.75 to 1 inch deep. Mulch shall be either hay or straw and shall be reasonably free of mold or other evidence of decomposition and weed seed. Mulch shall be in accordance with PennDOT Publication 408, Section 805, Mulching, current edition.

H. Prior to project completion, apply slow-release nitrogen fertilizer to the surface of the Formula B seeded areas.

I. In areas where it is necessary to bench the trench area to a more level slope for construction purposes, the Contractor shall be responsible for restoring the slope and contour of the ground in the area of the bench to its original condition.

304 RESTORATION OF ROAD SURFACES

A. Road and paved berm surfaces shall be restored as shown on the construction detail standards. In that some of the work contemplated is within the confines of state highway, right-of-ways which are owned and maintained by the Pennsylvania Department of Transportation (PennDOT), strict compliance to PennDOT regulations and requirements shall be made. The Contractor shall review and adhere to conditions of permits issued by PennDOT. The Contractor shall also maintain on the site a copy of the relative PennDOT permit.

SECTION 400

SANITARY SEWERLINE TESTING

401 TESTING GRAVITY SEWERS

A. All sewer lines will be thoroughly flushed with water to obtain free flow through the lines. All water shall then be removed from the lower manhole(s). All obstructions will be removed and all defects corrected prior to testing. Sewer lines will be given all the following tests in the presence of the Authority's Engineer and submit the test results in writing. Written test results will be signed by the Contractor's representative and, in certain cases, by the testing lab.

402 LAMPING

A. After flushing and cleaning, the Contractor shall lamp the gravity pipe line. A flashlight or similar lighting device will be projected into the end of each pipe entering each manhole. A visible observation will be made from the next adjacent manhole. The pipe, when laid and completed, will not be accepted unless a full circle of light from the lamp is visible from manhole to manhole. Observations of less than a full pipe circle may be acceptable provided the deflection is not in a vertical plane. Any deviation from perfect alignment will be noted on the test result log.

B. The Contractor shall remove and relay any rejected sections of pipe at his expense. The pipe line shall then be re-cleaned and lamped until the pipe line section achieves uniform line and grade to the satisfaction of the Authority.

403 AIR TESTING

A. All gravity sewers will be subject to a low pressure air test. The Contractor shall furnish all necessary labor, equipment and materials to perform the test.

B. After flushing and removal of all obstructions, the sections of sewer line will be tested from manhole to manhole. All openings, laterals, stubs, branches, wyes, tees and pipe ends will be securely capped and the sewerline plugged in accordance with the recommendations of the manufacturer of the testing equipment.

C. The air will be slowly supplied to the plugged pipe until the internal pressure reaches 4.0 psi greater than the average back pressure of any groundwater that may be above the pipe but not greater than 9.0 psi. Two (2) minutes will be allowed for a stabilization period before proceeding further.

D. When the pressure stabilized at 4.0 psi (greater than the average groundwater back pressure), the air hose from the control panel to the air supply will be shut off or disconnected. The continuous monitoring pressures gauge will then be observed while the pressure is decreased to no less than 3.5 psi (greater than the average back pressure of any groundwater over the pipe). At a reading of 3.5 psi, or any convenient observed pressure reading between 3.5 psi and 4.0 psi, timing will commence.

E. The acceptance of the line will then be determined by measure the time required in minutes for the internal pressure to decrease 0.75 psi. The time interval for this 0.75 pound loss of air must not be less than the following:

Pipe Diameter (Inches)	Time (Minutes)
6" or 8"	5
10"	6
12"	7
15"	10
18"	12

F. If the time shown above for the designated pipe size elapses before the air pressure drops 0.75 psi, the section undergoing testing will have passed. The test may be discontinued once the prescribed time has elapsed even though the 0.75 psi drop has not occurred.

G. If the section fails to meet these requirements, the Contractor will determine at his own expense the source, or sources of leakage, and he will repair or replace all defective materials and/or workmanship to the satisfaction of the Authority's Engineer. The extent and type of repair which may be allowed as well as results, will be subject to the approval of the Authority's Engineer. The completed pipe installation will then be retested and required to meet the requirements of this test.

404 DEFLECTION TESTS

A. After installation and final backfill, all pipe lines constructed of flexible materials will be measured for vertical ring deflection by passing a test ball, mandrel, or go/no/go gauge through them to demonstrate that the deflection is less than 5% of the diameter of the pipe. The gauge will be furnished by the Contractor, and will be certified as to its calibration and shall be subject to the approval of the Authority's Engineer.

B. If this test indicates that the material has not been compacted to the required density, the Contractor will recompact said material at no additional cost to the Authority, and its Engineer will then have the right to require additional tests to insure that this or other material is compacted to the proper density without any additional cost to the Authority. If the required density is reached and the diametric deflection of the pipe exceeds 5% of the actual inside diameter, the Contractor, at his own expense, will remove that pipe which failed and replace it with a new pipe following the procedures as outlined within these specifications for the installation methods.

C. The test shall be run not less than thirty (30) days after the final backfill has been placed and the test shall be performed without mechanical pulling devices.

405 VACUUM TESTING OF MANHOLES

A. After erection of the manholes, connection of the sewers and placement of the backfill to approximately the finished ground elevation, each manhole shall be vacuum tested for watertightness. Connecting pipes shall be securely plugged and a vacuum testing device similar to that manufactured by P.A. Glazier, Inc., or equal, shall be placed and sealed within the manhole frame and cover section.

B. A vacuum of 10 inches of mercury (Hg) shall be drawn after which the vacuum pump shall be turned off. If the indicated vacuum pressure drops to 9 inches of mercury in less than one minute, the test apparatus shall be removed and the appropriate repairs/plugging shall be performed. The test shall be repeated, as necessary, until a time period of a minimum of one minute occurs before the vacuum pressure drops 1 inch of mercury.

C. Appropriate repairs/plugging is defined as sealing the grade rings and inside joints with Parsons Epoxy Compound, Parsonpoxy FG, or approved equal.

(Added by Revision 9/26/2006)

406 CLOSED CIRCUIT TELVISION "CCTV" INSPECTION

A. All gravity sewers will be subject to a closed circuit television inspection prior to acceptance by the Authority. The television camera used for the inspections shall be one specifically designed and constructed for such inspections. Lighting for the camera shall be sufficient to provide a clear picture of the entire pipe periphery. The camera shall be operative in 100% humidity conditions. The camera, television monitor and other components of the video system shall be capable of producing color picture quality to the satisfaction of the Authority's Engineer.

B. Self-propelled robotic pan and tilt cameras shall be used for the entire project. If a robotic camera is not possible to be utilized due to site limitations or equipment failures, a winch, cable or other device that does not obstruct the camera view or interfere with observation of the sewer conditions may be used. Push rod type cameras are not acceptable.

C. The inspection shall be logged in WinCan software using the NASSCO PACP defect coding.

D. All inspections originating at a manhole shall begin with the camera in the manhole and shall include a visual inspection of the manhole wall, bench area and pipe entrance or exit into the manhole.

E. The camera operator shall video capture images of all defects, root intrusions, lateral locations and at a minimum provide at least two (2) screen captured images of a typical section of the sewer line per segment. At a minimum, the tape shall show the up and downstream numbers and footage at all times.

F. In the event that the camera is unable to pass by an obstruction, the sewer segment shall be cleaned and re-inspected.

G. The importance of accurate distance measurements is emphasized. Measurements for location of defects and any building lateral connections shall be surface distances by means of a line counter or meter device. Accuracy of the meter shall be checked by the use of a walking meter, rolo-a-tape, or other suitable device, and the accuracy shall be satisfactory to the Authority's Engineer.

H. Each sewer segment shall be logged in WinCan software, and each segment will clearly indicate the plan/subdivision name, the street name at the sewer segment, the MTMSA identification numbers of the upstream and downstream manholes, the MTMSA number of the sewer segment and the direction of camera travel.

I. The Authority requires that the video be recorded direct to a portable hard disk as an MPEG file. Two(2) copies of the hard disk(s) shall be provided to the Authority upon completion of the CCTV inspection. The contractor shall assist the Authority to insure that the video can be viewed by the owner and that the file naming approach is approved by the Authority.

J. The Contractor shall remove and relay any rejected pipe as the result of this CCTV inspection, at his expense. The pipe line shall then subject to a new CCTV inspection to verify that no defects exist.

SECTION 500

SOIL EROSION AND SEDIMENTATION CONTROL

501 MINIMIZING WATER POLLUTION FROM SOIL EROSION

A. All Contractors shall conduct their activities and shall program trenching and restoration operations in such a manner as to minimize pollution of the ditches, streams and creeks and their tributaries from erosion of the freshly excavated and/or backfilled material during periods of excavation and surface water runoff. The Contractor shall reduce the area and duration of exposure of all erodible soils by the greatest extent practicable and to that end, hydromulching, reseeding and other surface restoration shall be required to closely follow backfilling operations. Where the Authority's Engineer so directs in the field, sediment traps, haybales, and/or other means to retard runoff rates shall be installed; similar holding basins or other sediment trap arrangements shall also be required to be installed at the discharge of dewatering pumps. Discretion shall be exercised in selecting the number and location for encroachments during construction both in and along the creeks such that a minimum of stream disturbance and erosion pollution results.

B. Prior to earthmoving activities the Contractor shall install the necessary erosion protection devices required as outlined below and as detailed in the latest edition o the Erosion and Sediment Pollution Control Program Manual, as published by the Bureau of Soil and Water Conservation of the Pennsylvania Department of Environmental Protection:

1. Immediately downstream of stream or creek crossings and where directed by the Authority's Engineer, the Contractor shall install a temporary short term stream disturbance sedimentation check.

2. For equipment stream crossings, the Contractor shall use the same criteria as set up for channel disturbance.

3. Where the pipe line is located in wooded or planted areas the downstream side of the area to be excavated will be protected by installation of fabric fence or straw bales.

4. Where the pipe line is located in traveled roadways or road berms, drainage facilities and ditches immediately downstream of the construction area shall be protected by constructing a straw bale debris filter in the existing drainage ditch. After construction, the ditch is to be removed of straw bales and all silt and debris, and returned to its original condition.

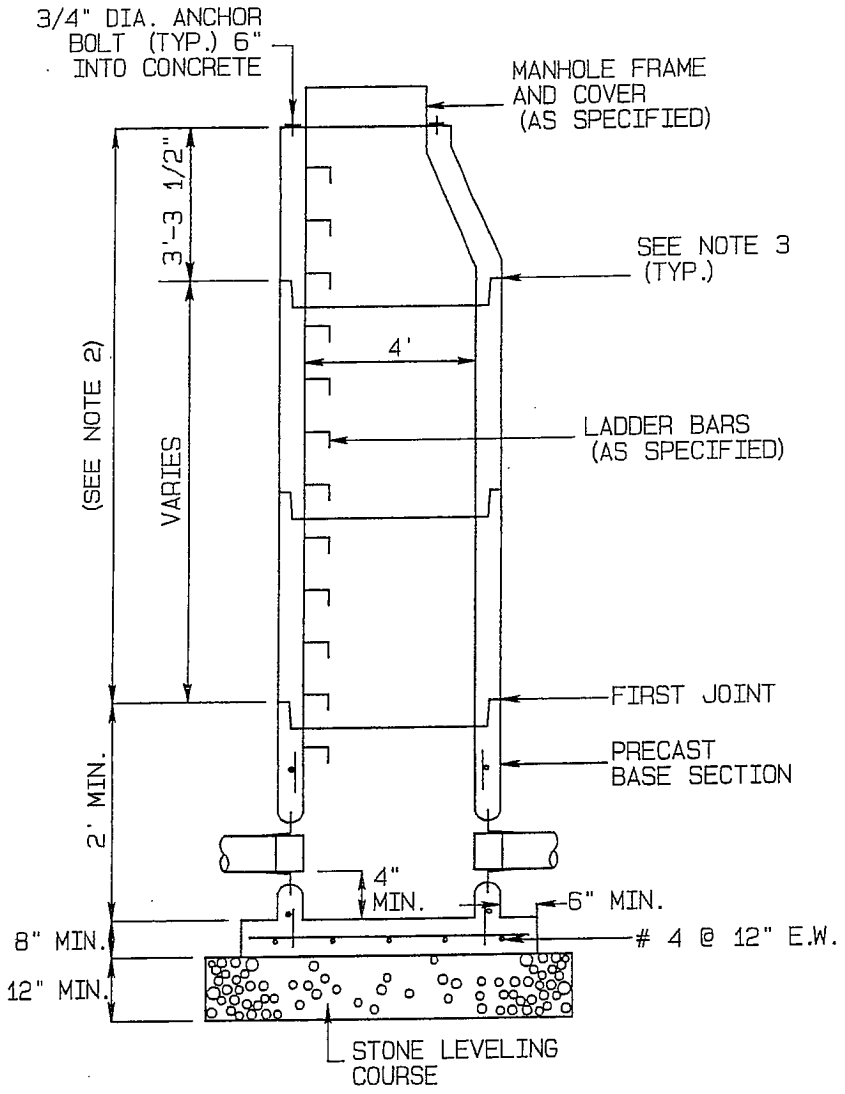
C. During construction, there shall be no discharge of petroleum products from construction equipment into ditches, streams, creeks, storm sewers or on ground surfaces, and water removed during the trench dewatering operation shall be free of suspended material and/or mud, or shall be pumped to sediment trap before conveyance to the stream.

502 DUST AND MUD CONTROL ON STREETS AND OTHER TRAVELED WAYS

A. Dust control palliatives shall be utilized where and when necessary to satisfactorily maintain roads, streets, berms and other traveled ways for vehicular traffic. In addition, the accumulation of mud and/or dirt from the excavation, backfill and trenching operations shall be cleaned off the surfaces to properly maintain the roadway in a condition satisfactory to the Authority and its Engineer.

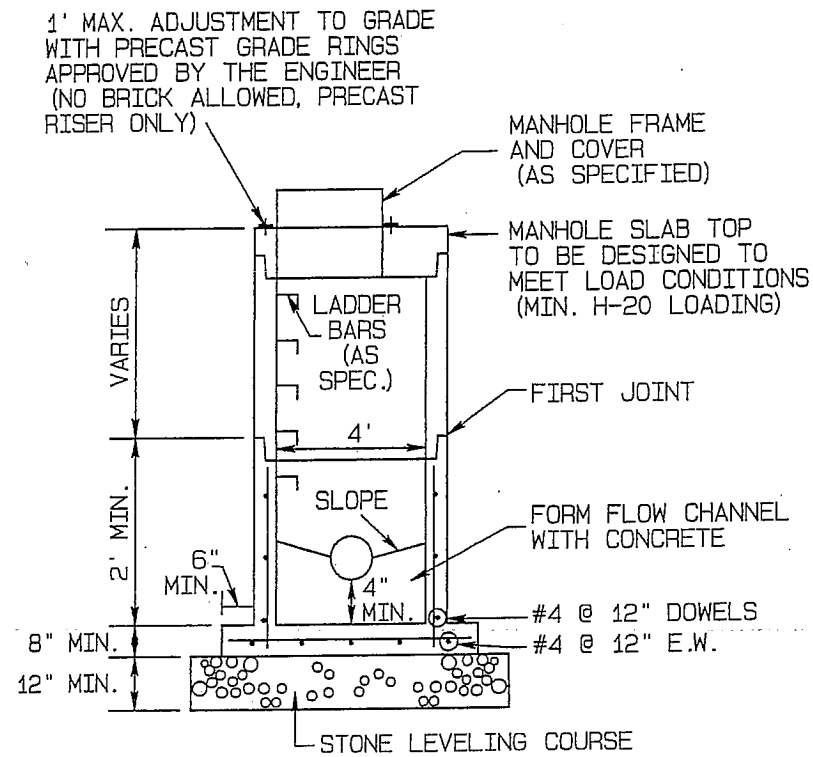
APPENDIX A

CONSTRUCTION DETAIL STANDARDS



NOTES

1. PRECAST CONCRETE MANHOLE SECTIONS SHALL CONFORM TO ASTM C-478, LATEST REVISIONS.
2. IF THIS DIMENSION IS LESS THAN 3'-3", USE A PRECAST CONCRETE SLAB TOP AS SHOWN BELOW.
3. JOINTS SHALL BE EQUIPPED WITH DOUBLE FLEXIBLE BUTYL RUBBER JOINT SEALANT APPROVED BY THE ENGINEER. (BOTH INNER AND OUTER JOINTS)
4. LIFTING HOLES SHALL BE POINTED WITH MORTAR, MADE WATERTIGHT AND LEFT NEAT AND SMOOTH.
5. BASE SLAB POURED MONOLYTHICALLY WITH WALLS.
6. LADDER BARS TO BE ON 12" CENTERS (M.A. INDUSTRIES, INC., MODEL PS2-PF OR APPROVED EQUAL).
7. EXISTING MANHOLES ACCOMMODATING NEW SEWERLINES SHALL BE MACHINE CUT (HAMMERS SHALL NOT BE UTILIZED).

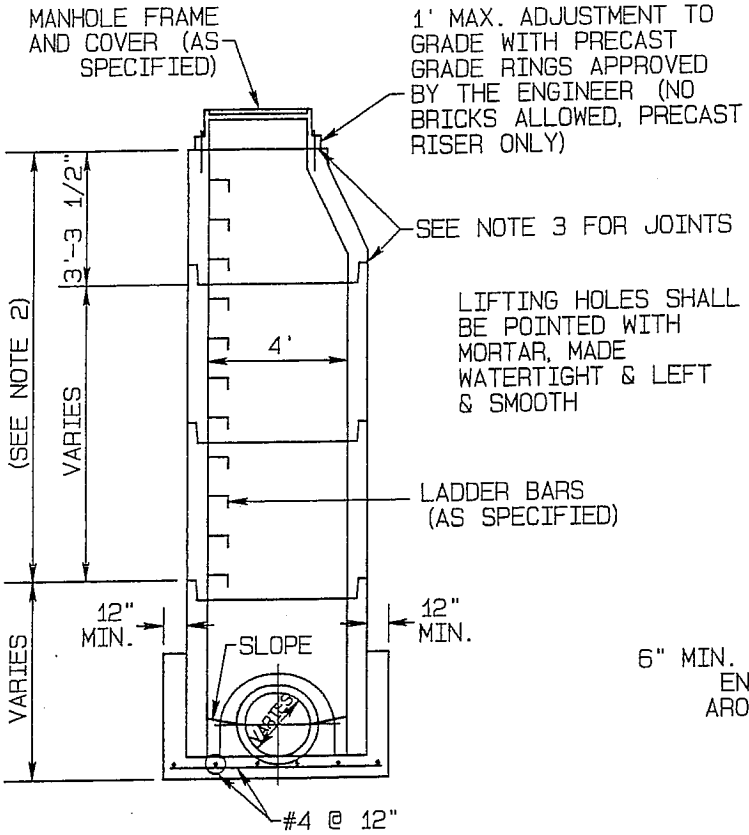


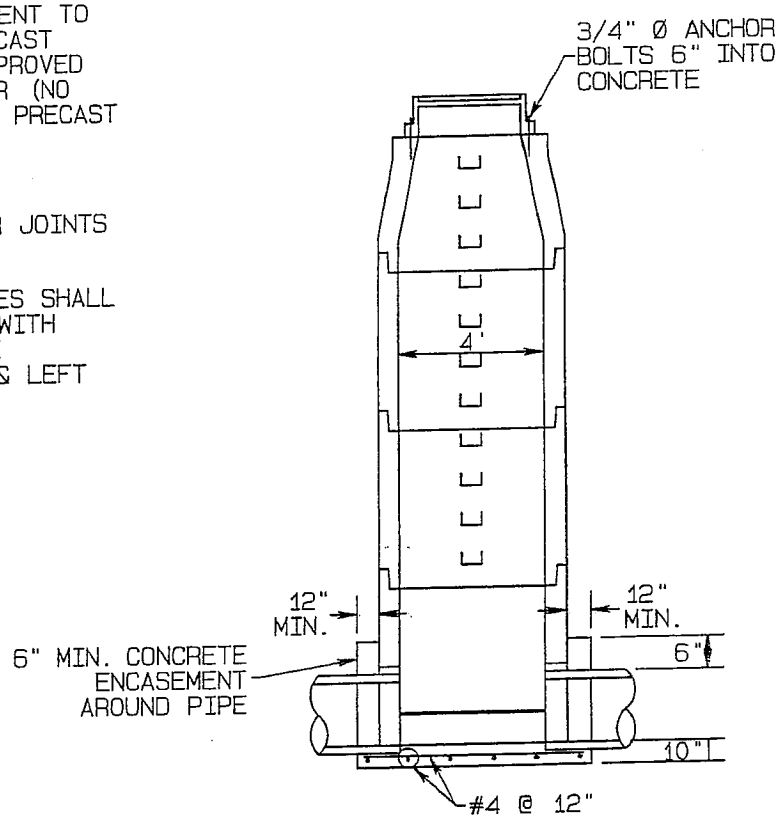
MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

CONSTRUCTION DETAIL STANDARD NO. 1

PRECAST CONCRETE MANHOLE FOR SEWERS 8" TO 18" PRECAST BASE SECTION

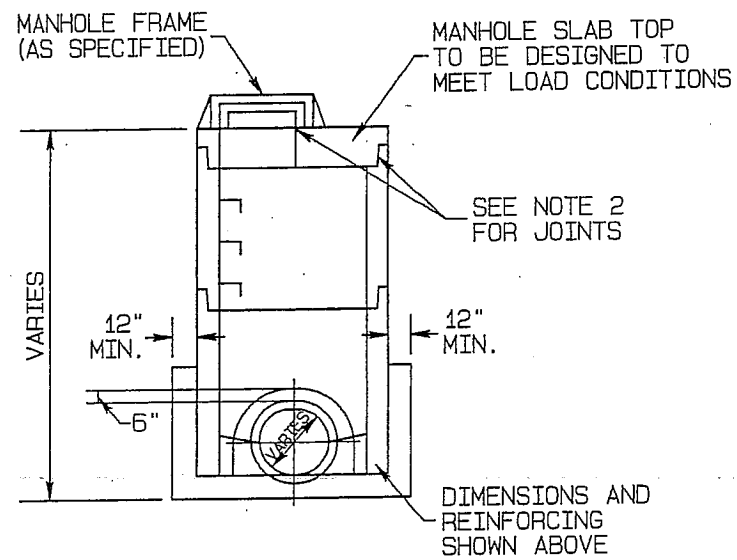
SCALE: NONE	DATE: 07/27/99
SHOUP ENGINEERING INC.	





NOTES

1. PRECAST CONCRETE MANHOLE SECTIONS SHALL CONFORM TO ASTM C-478, LATEST REVISIONS.
2. IF THIS DIMENSION IS LESS THAN 3'-3", USE A PRECAST CONCRETE SLAB TOP AS SHOWN BELOW.
3. JOINTS SHALL BE EQUIPPED WITH DOUBLE FLEXIBLE BUTYL RUBBER JOINT SEALANT APPROVED BY THE ENGINEER. (BOTH INNER AND OUTER JOINTS)
4. EXISTING MANHOLES ACCOMMODATING NEW SEWERLINES SHALL BE MACHINE CUT (HAMMERS SHALL NOT BE UTILIZED).



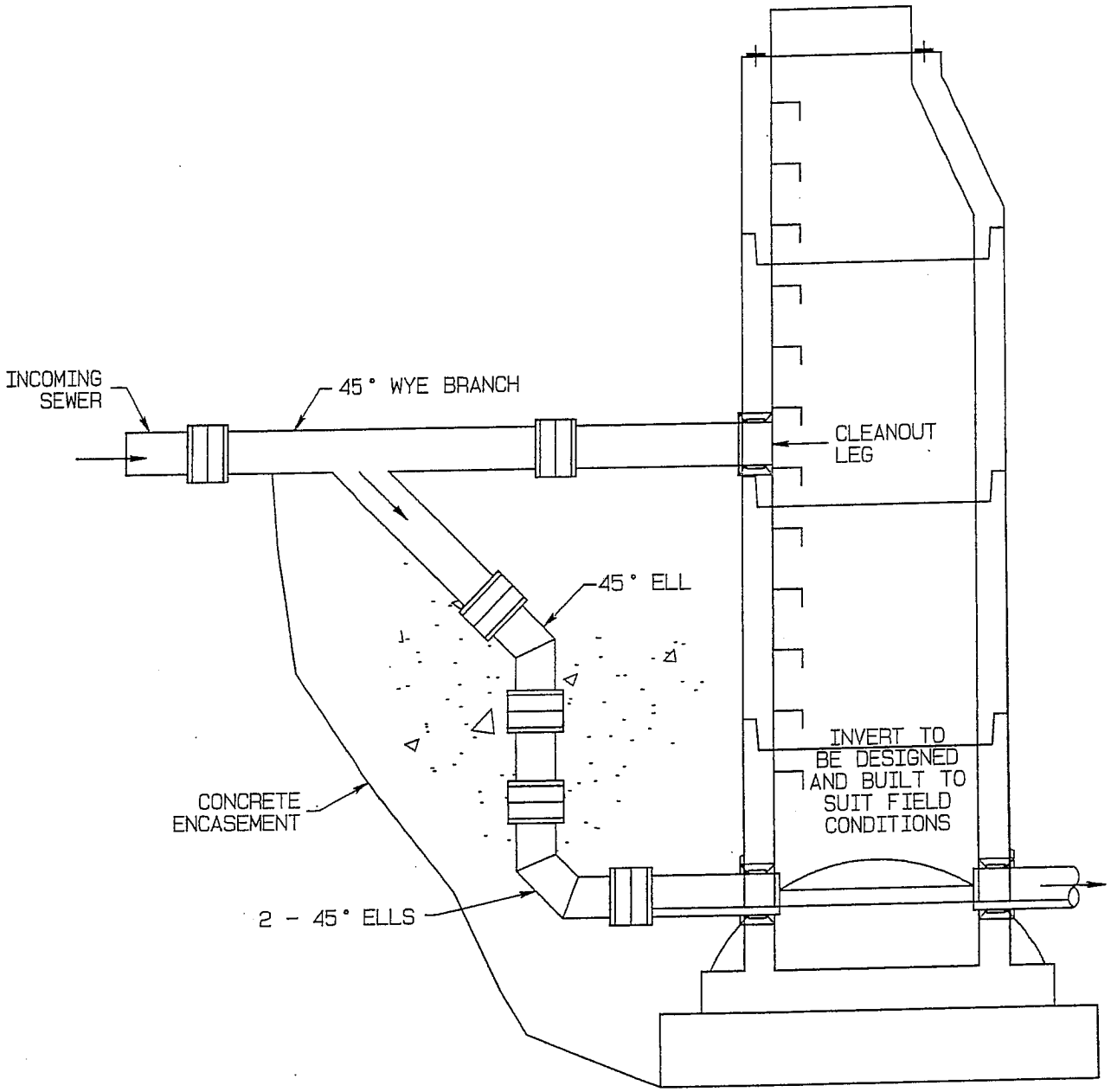
MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

CONSTRUCTION DETAIL
STANDARD NO. 2

CAST-IN-PLACE BASE
PRECAST CONCRETE MANHOLE
FOR SEWERS 8" TO 18"

SCALE: NONE

SHOUP ENGINEERING INC.



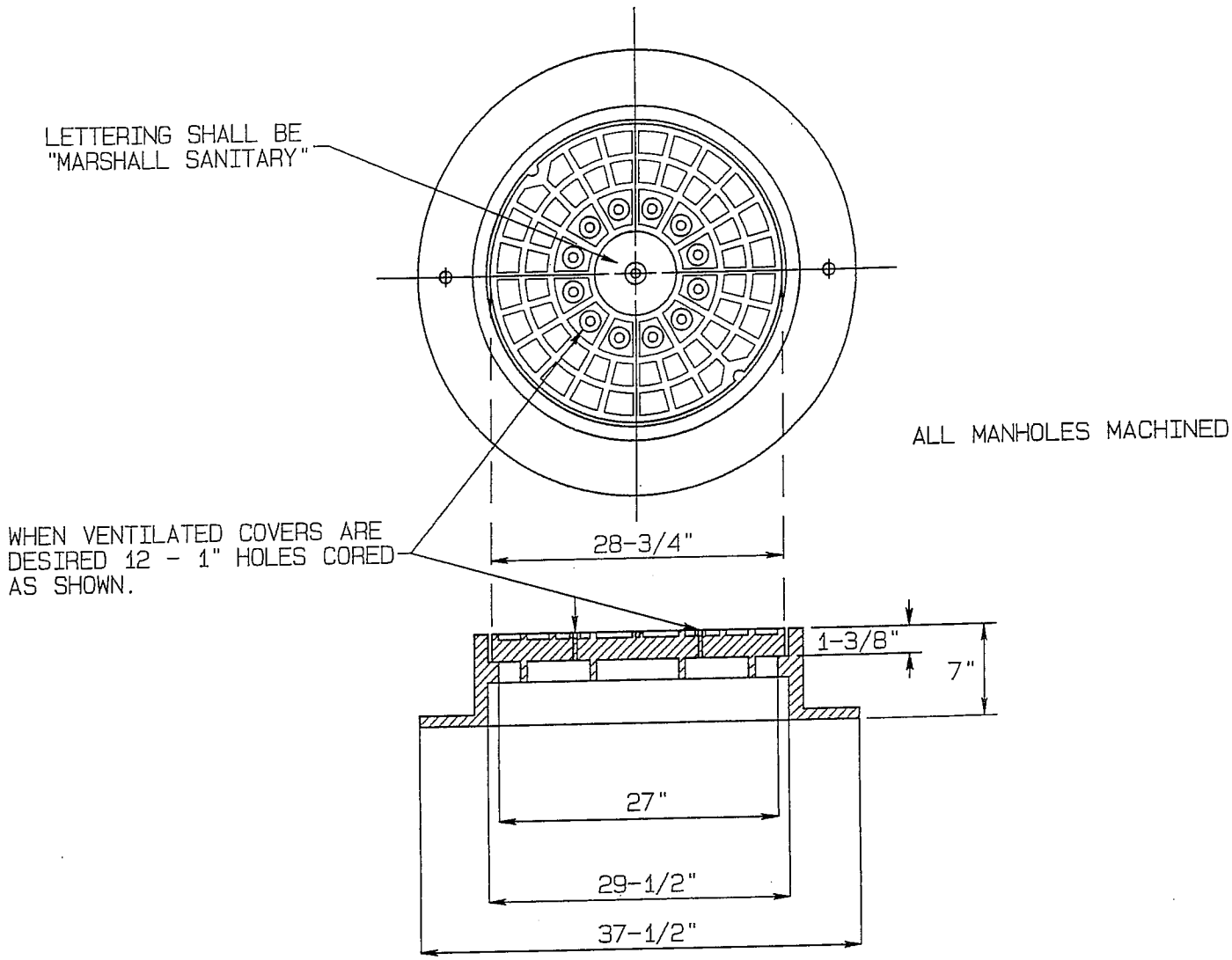
MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

CONSTRUCTION DETAIL
STANDARD NO. 3

DROP MANHOLE
FOR PVC PIPE

SCALE: NONE

SHOUP ENGINEERING INC.



NOTES:

1. STANDARD MANHOLE FRAMES AND COVERS SHALL BE AS MANUFACTURED BY ALLEGHENY FOUNDRY CO., FRAME 109, COVER 110, OR APPROVED EQUAL.
2. WATERTIGHT MANHOLE FRAMES AND COVERS, WHERE REQUIRED BY ENGINEER, SHALL BE AS MANUFACTURED BY ALLEGHENY FOUNDRY CO., FRAME 109W, COVER 110, SEAL PL 300, OR APPROVED EQUAL.
3. INFLOW PROTECTORS SHALL BE INSTALLED IN ALL NON-WATERTIGHT SANITARY SEWER MANHOLES.

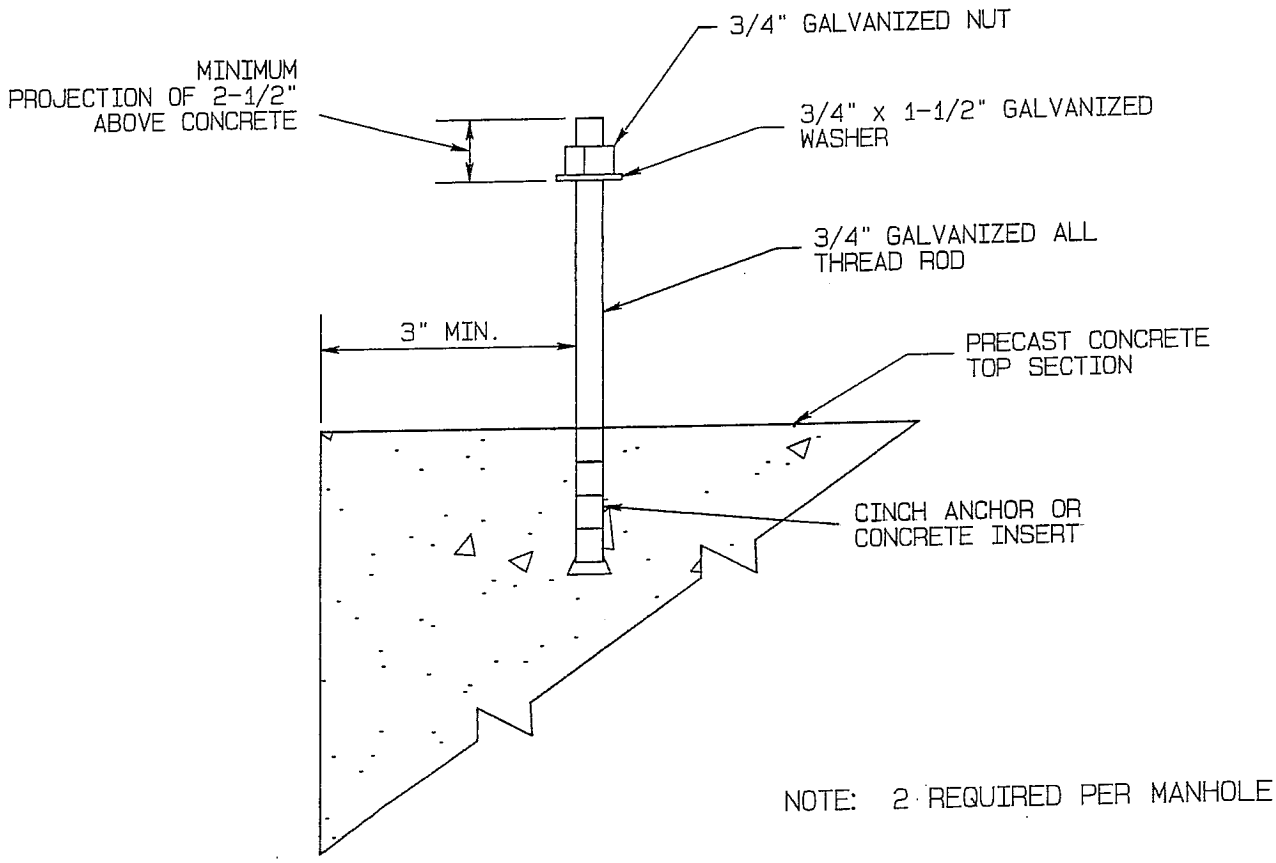
MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

CONSTRUCTION DETAIL
STANDARD NO. 4

MANHOLE COVER
AND FRAME

SCALE: NONE

SHOUP ENGINEERING INC.



NOTE: 2 REQUIRED PER MANHOLE

PRECAST MANHOLE
ANCHOR BOLT

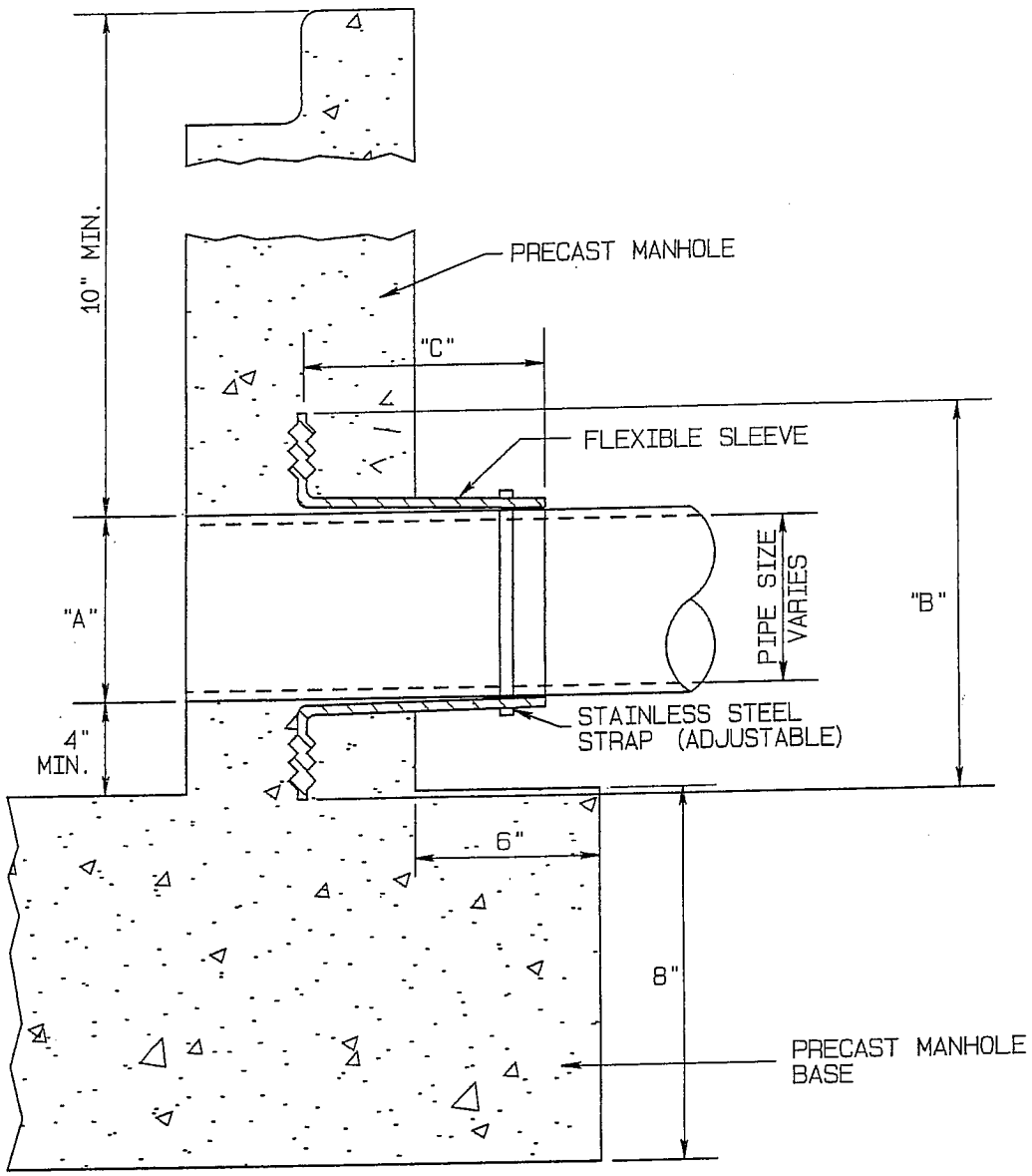
MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

CONSTRUCTION DETAIL
STANDARD NO. 5

MANHOLE COVER AND FRAME
ANCHOR BOLT DETAIL

SCALE: NONE

SHOUP ENGINEERING INC.



PIPE DIA.	"A"	"B"	"C"
4"	6"	14"	6"
6"	8-1/8"	16-1/8"	6-1/2"
8"	10-3/8"	18-3/8"	7-1/2"
10"	12-5/8"	20-5/8"	7-1/2"
12"	14-7/8"	22-7/8"	7-1/2"
15"	18-7/8"	26-7/8"	9"

MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

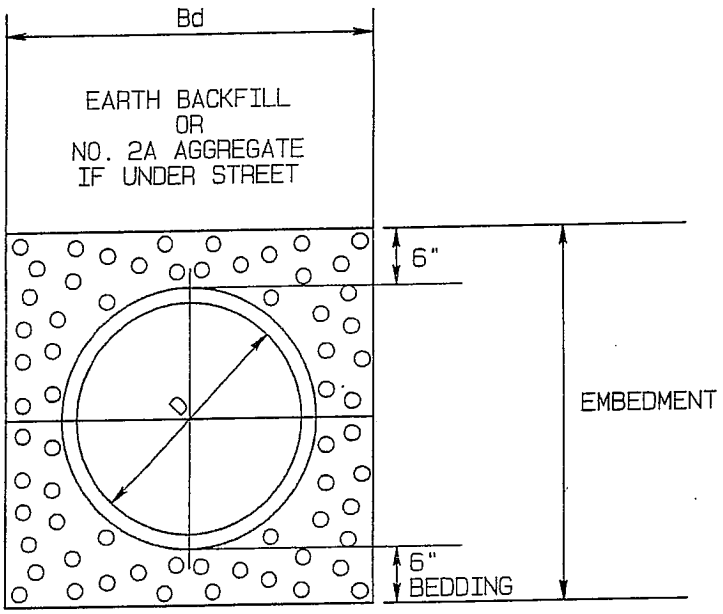
CONSTRUCTION DETAIL
STANDARD NO. 6

MANHOLE FLEXIBLE SLEEVE CONNECTION FOR ALL PIPE

SCALE: NONE

SHOUP ENGINEERING INC.

PVC PIPE INSTALLATION



GRANULAR EMBEDMENT
AASHTO NO. 57 AGGREGATE
UNLESS OTHERWISE APPROVED

MINIMUM TRENCH WIDTH

NOMINAL PIPE SIZE	UNSUPPORTED TRENCH WIDTH, MINIMUM - Bd	SUPPORTED TRENCH WIDTH, MINIMUM - Bd
6"	18"	36"
8"	24"	36"
10"	26"	42"
12"	30"	42"
15"	30"	48"

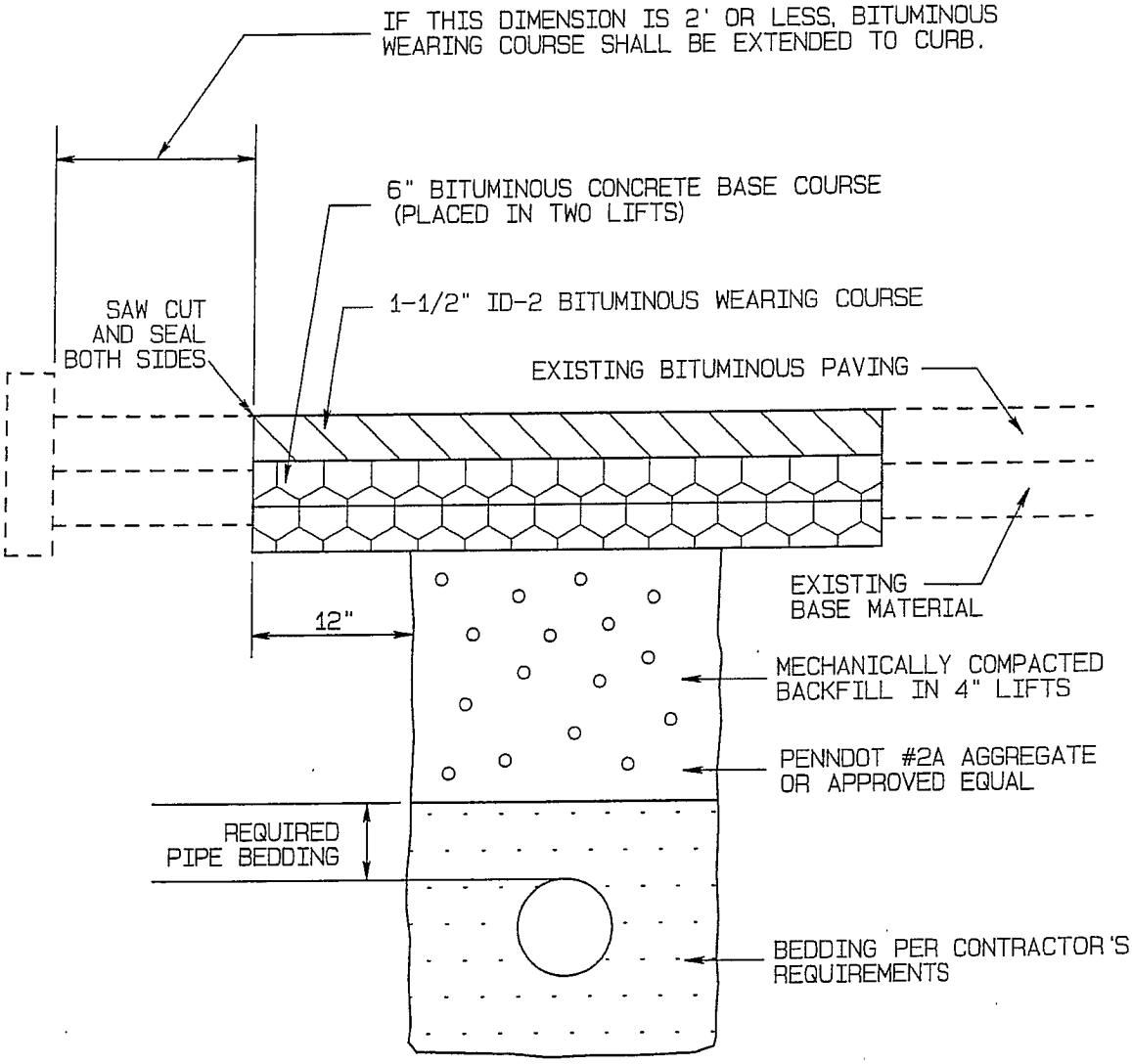
MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

CONSTRUCTION DETAIL
STANDARD NO. 7

TRENCH DETAIL
FOR
PVC PIPE

SCALE: NONE

SHOUP ENGINEERING INC.



FOR USE ON OPEN CUTTING OF EXISTING TOWNSHIP ROADS FOR INSTALLATION OF UTILITY LINES, SEWER LINES, WATER LINES, ETC.

NOTES:

1. APPROVAL MUST BE OBTAINED FROM THE TOWNSHIP PRIOR TO OPEN CUTTING A STREET.
2. BORINGS SHALL BE REQUIRED UNLESS IMPRACTICAL.

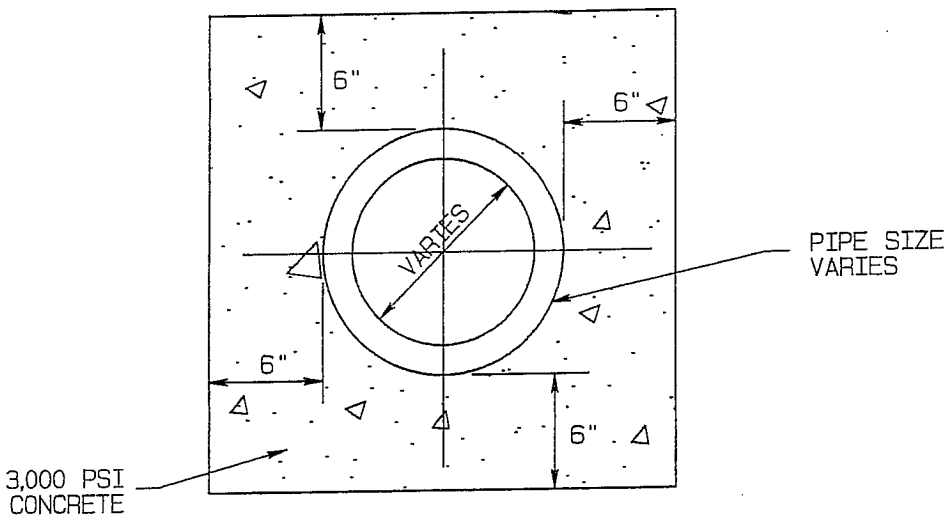
MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

CONSTRUCTION DETAIL
STANDARD NO. 8

RESTORATION OF
BITUMINOUS SURFACES

SCALE: NONE

SHOUP ENGINEERING INC.



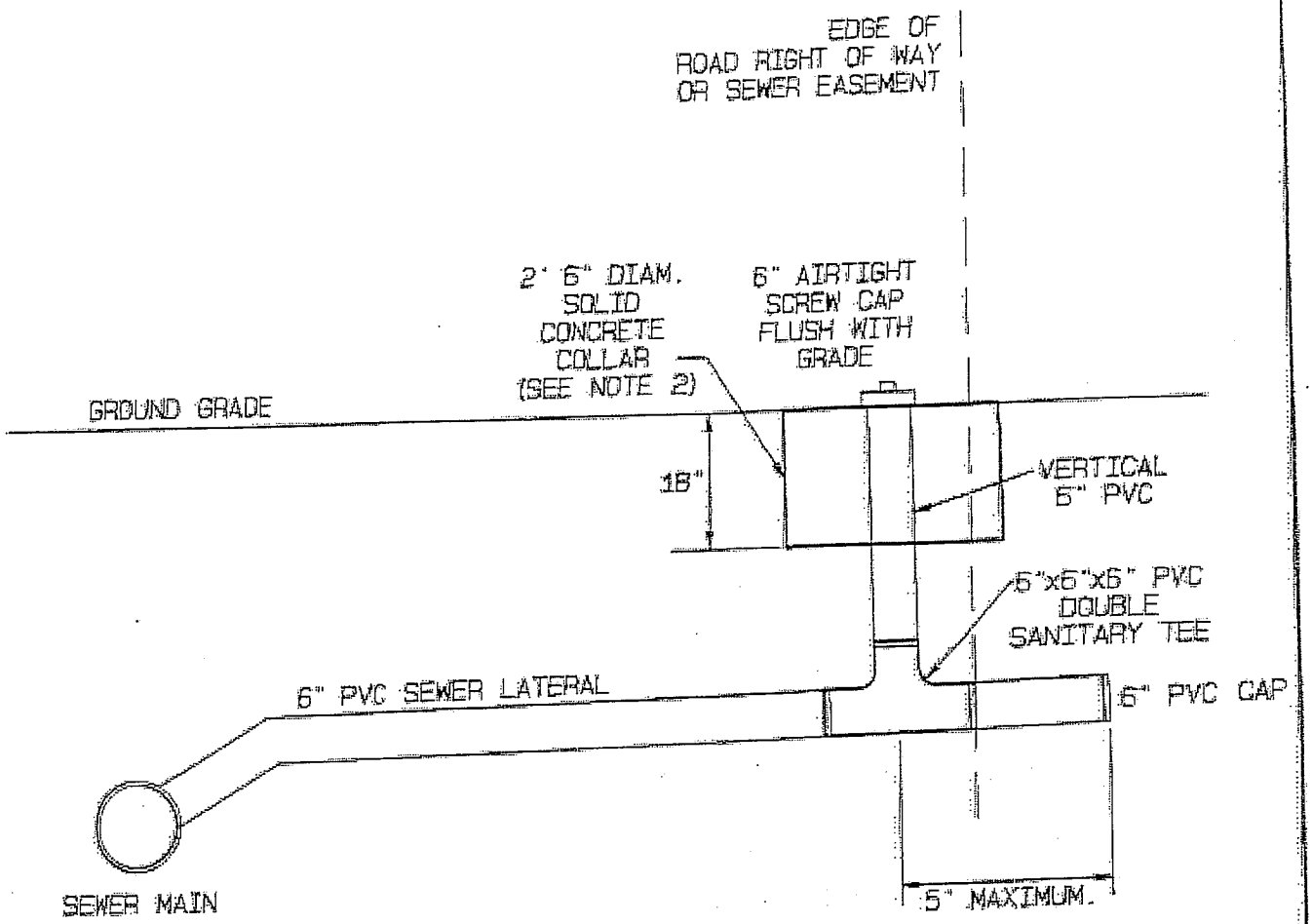
MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

CONSTRUCTION DETAIL
STANDARD NO. 9

CONCRETE
ENCASEMENT

SCALE: NONE

SHOUP ENGINEERING INC.



NOTES:

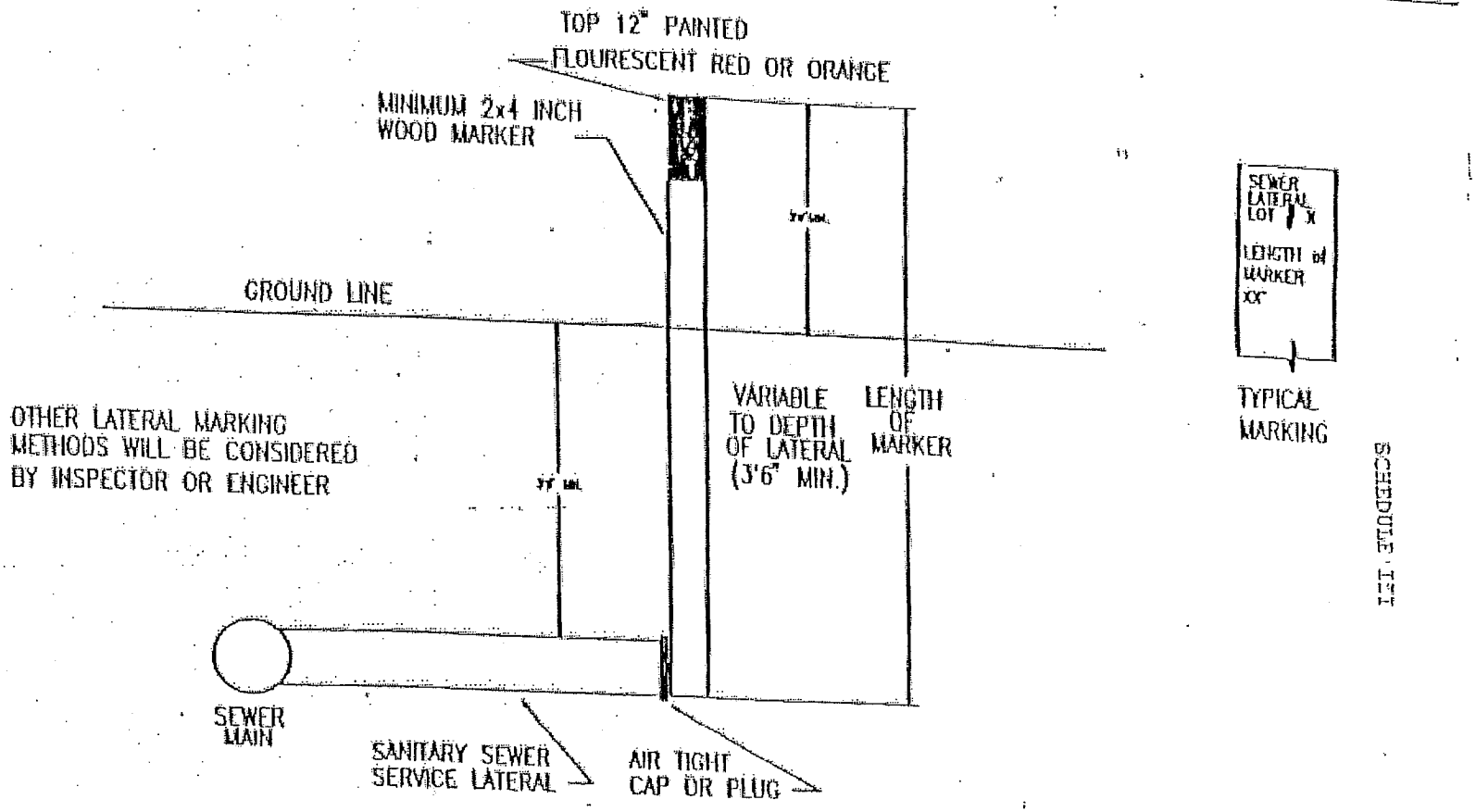
1. ALL PIPE AND TEE SIZES MAY BE 4" IF APPROVED BY THE AUTHORITY.

2. FOR ANY TEE LOCATED WITHIN ANY PAVED AREA, AN EAST JORDAN IRON WORKS, INC. CATALOG NO. 2975 A LID AND 2885 Z FRAME WITH AN 18" DEEP - 12" DIAM. ADS N-12 PIPE AS CASING SHALL BE USED.

MARSHALL TOWNSHIP MUNICIPAL SANITARY AUTHORITY

SEWER LATERAL INSPECTION TEE DETAIL

SCALE: NONE	DATE: 04/27/04
SHOUP ENGINEERING INC.	


TOP 12" PAINTED
FLOURESCENT RED OR ORANGE
MINIMUM 2x4 INCH
WOOD MARKER
GROUND LINE
OTHER LATERAL MARKING
METHODS WILL BE CONSIDERED
BY INSPECTOR OR ENGINEER
VARIABLE LENGTH
TO DEPTH OF
OF LATERAL MARKER
(3'6" MIN.)
SEWER
MAIN
SANITARY SEWER
SERVICE LATERAL
AIR TIGHT
CAP OR PLUG
SEWER
LATERAL
LOT
LENGTH OF
MARKER
TYPICAL
MARKING
SCHEDULE 11.1
MARSHALL TOWNSHIP