

INTERIM TOWNSHIP ENGINEERING STANDARDS

CHARTER TOWNSHIP OF WATERFORD

OAKLAND COUNTY
MICHIGAN



"Moving Forward Together"

Adopted: February 22, 2010
Effective: March 10, 2010

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SECTION TES-001 SITE PLAN REVIEW STANDARDS FOR GROUNDWATER PROTECTION

1. Applicability

These provisions shall apply to all businesses and facilities, including private and public facilities, which use, store or generate hazardous substances and polluting materials in quantities greater than 100 kilograms per month (equal to about 25 gallons or 220 pounds), and which require authorization in accordance with **Section 2-203** or site plan review in accordance with **Section 4-004**.

2. Site Plan Information Requirements

- A. The Township may require a listing of types and quantities of hazardous substances and polluting materials which will be used or stored on-site at the facility in quantities greater than 100 kilograms per month (equal to about 25 gallons per month) if necessary to ensure compliance with the provisions of this or other Township ordinances.
- B. Completion and submission of the "Hazardous Substances Reporting Form for Site Plan Review" and "The Environmental Permits Checklist" is required.
- C. Location of existing and proposed service facilities and structures, above and below ground, shall be shown including:
 - (1) Public and private groundwater supply wells on-site and on adjacent properties.
 - (2) Septic systems and other waste water treatment systems (the location of the drain field and the septic tank, if applicable, shall be clearly distinguished).
 - (3) Areas to be used for the storage, use, loading/unloading, recycling, or disposal of hazardous substances and polluting materials, including interior and exterior areas.
 - (4) Underground storage tank locations.
 - (5) Location of exterior drains, dry wells, catch basins, retention/detention areas, sumps and other facilities designed to collect, store, or transport storm water or waste water. The point of discharge for all drains and pipes shall be specified on the site plan.
 - (6) Location of all above-ground storage tanks for such uses as fuel storage, waste oil holding tanks, chemical storage, hazardous waste storage, collection of contaminated storm water or wash water, and all similar uses.
- D. Location of existing wetlands and watercourses, including lakes, ponds, rivers, and streams.
- E. Soil characteristics of the parcel, at least to the detail provided by the U.S. Soil Conservation Service.
- F. Delineation of areas on the site which are known or suspected to be contaminated, together with a report on the status of site cleanup.

3. Site Plan Review Standards

- A. Groundwater Protection Standards,
 - (1) The project and related improvements shall be designed to protect the natural environment, including lakes, ponds, streams, wetlands, floodplains and groundwater, and to ensure the absence of an impairment, pollution, and/or destruction of the air, water, natural resources and the public trust therein.
 - (2) Storm water management and drainage facilities shall be designed to retain the natural retention and storage capacity of any wetland, water body, or watercourse, and shall not increase flooding or the potential for pollution of surface water or groundwater, on-site or off-site, and shall not result in a loss of the use of property by any third party.
 - (3) General purpose floor drains shall be connected to a public sewer system, an on-site holding tank, or a system authorized through a state groundwater discharge permit.
 - (4) Sites at which hazardous substances and polluting materials are stored, used, or generated shall be designed to prevent spills and discharges to the air, surface of the ground, groundwater, lakes, streams, rivers or wetlands.
 - (5) State and federal agency requirements for storage, spill prevention, record keeping, emergency response, transport and disposal of hazardous substances and polluting materials shall be met. No discharges to groundwater, including direct and indirect discharges, shall be allowed without required permits and approvals.
 - (6) In determining conformance with the standards in this zoning ordinance, the Township shall take into consideration the publication entitled "Small Business Guide to Secondary Containment" and other references.

- B. Above-ground Storage and Use Areas for Hazardous Substances and Polluting Materials.
- (1) Secondary containment of hazardous substances and polluting materials shall be provided. Secondary containment shall be sufficient to store the substance for the maximum anticipated period of time necessary for the recovery of any released substance.
 - (2) Outdoor storage of hazardous substances and polluting materials shall be prohibited except in product-tight containers which are protected from weather, leakage, accidental damage and vandalism.
 - (3) Secondary containment structures such as out buildings, storage rooms, sheds and pole barns shall not have floor drains which outlet to soils, groundwater, or nearby drains or natural water bodies.
 - (4) Areas and facilities for loading/unloading of hazardous substances and polluting materials, as well as areas where such materials are handled and used, shall be designed and constructed to prevent discharge or runoff to floor drains, rivers, lakes, wetlands, groundwater, or soils.
- C. Underground Storage Tanks.
- (1) Existing and new underground storage tanks shall be registered with the authorized state agency in accordance with requirements of the U.S. Environmental Protection Agency and the State Police Fire Marshal Division.
 - (2) Installation, operation, maintenance, closure, and removal of underground storage tanks shall be in accordance with requirements of the State Police Fire Marshal Division. Leak detection, corrosion protection, spill prevention and overflow protection requirements shall be met. Records of monthly monitoring or inventory control must be retained and available for review by government officials.
 - (3) Out-of-service abandoned underground tanks shall be emptied and removed from the ground in accordance with the requirements of the State Police Fire Marshal Division, and the Michigan Department of Natural Resources.
- D. Sites with Contaminated Soils and/or Groundwater.
- (1) Site plans shall take into consideration the location and extent of any contaminated soils and/or groundwater on the site, and the need to protect public health and the environment.
 - (2) Development shall not be allowed on or near contaminated areas of a site unless information from the Michigan Department of Natural Resources is available indicating that cleanup will proceed in a timely fashion and that such development is authorized.

SECTION TES-002 ENGINEERING AND CONSTRUCTION PLANS AND STANDARDS

1. General.

- A. The plans and specifications shall be prepared under the supervision of an Engineer registered in the State of Michigan and each sheet of the plans shall have imprinted thereon the seal of that Engineer.
- B. Plans shall consist of: (a) a cover sheet showing a plan view of the complete job, (b) plan and profile sheets, and (c) detail sheets. Sheet size shall be 24" X 36". Plan and profile sheets shall be drawn to a minimum scale of 1" = 50' horizontally and a minimum of 1" = 5' vertically. Details shall be drawn to scale.
- C. Elevations shall be based on USGS datum (unless a local datum has been approved by the Township) with two permanent bench marks established at least every 1200 feet and shown on the plans.
- D. All easements, lengths and sizes of sewers and water mains shall be shown on the cover sheet and the plan and profile sheets.
- E. Location (relative to property lines) of proposed streets and sanitary, storm and water lines shall be shown on the plans.
- F. Street design shall be in accordance with either Oakland County Road Commission or MDOT standards, as applicable.
- G. Proposed site grading shall be shown on the plans by the use of contours and spot elevations and flow arrows to realistically demonstrate the proposed route of flow of surface drainage.
- H. Place notes on the plans as follows:
 - (1) All construction shall be in accordance with the Township's current standards and specifications.
 - (2) The Contractor shall notify the Township Engineer and/or the authority having jurisdiction, 48 hours prior to the beginning of construction.
 - (3) Contractor shall contact MISS DIG at (810) 647-6344, 24 hours in advance of construction, for existing underground utility locations.

- (4) Full-time construction review will be required during all phases of construction including grading, paving, installation of sanitary sewer, storm sewers, drains, watermains and appurtenances, and streets, where applicable.
- I. Where it is necessary to extend off site improvements and/or utilities in order to meet the current requirements of the Township ordinances, these improvements shall be the sole responsibility of the developer. However, once these improvements become public property, the entity having jurisdiction shall have all rights and responsibilities to the improvements or utilities, subject to maintenance and guarantee bonds and agreements.
- J. Two reproducible "as-built" tracings and three sets of "as-built" prints acceptable to the Township shall be submitted by the Design Engineer, showing the exact location of all improvements including building locations, elevations, paved areas, sewer lines, watermains, gate wells, manholes, inlets, etc., after completion of the project, but before the project is accepted by the Township.

2. Grading and Paving

- A. Any earth disruption of more than one acre or within 500 feet of a lake or stream or adjacent to any protected wetland will require a soil erosion control permit from the Oakland County Drain Commission's Office.
- B. Minimum and maximum grades shall be as follows unless approved by the Township Engineer:

	<u>Minimum</u>	<u>Maximum</u>
Grass Areas	1%	1 ft. vertical to 3 ft. horizontal to a maximum of 3 ft. high.
Asphalt	1%	4% (7% in driveways)
Concrete	0.6%	4% (7% in driveways)

- C. The limits of earth disruption shall be shown on the site plan.
- D. All disturbed areas shall be revegetated prior to issuance of the certificate of occupancy.
- E. All grading shall meet the adjacent property grades unless a grading easement is obtained from the adjacent property owner.
- F. Any grade changes which, in the opinion of the Township Engineer require a soil retaining system shall be designed by a qualified structural or geotechnical engineer. A detail of the retaining structure, with calculations shall be submitted to the Engineering Department.
- G. No filling or structures shall be placed in any floodplain unless compensatory volume is provided. All buildings shall comply with B.O.C.A., F.E.M.A., and Township codes and ordinances regarding floodplain elevations.
- H. All curbs and gutters shall be 3500 p.s.i. concrete with proper reinforcement, in accordance with Waterford Township standard details. All curbs must be backfilled.
- I. All asphalt parking areas and drives shall be constructed of 3 inches of M.D.O.T. #1100T bituminous mix, placed in two lifts, on 6 inches of compacted 21AA gravel.
- J. All concrete areas shall be constructed in accordance with M.D.O.T. standards.
- K. When paved areas are excavated, asphalt areas shall be saw-cut and removed to a distance equal to the depth of excavation (i.e., within a 1:1 slope from the bottom of excavation). Concrete shall be removed to the first joint past the distance equal to the depth of excavation. Compacted sand backfill is required in all excavations within a 1:1 slope of existing or proposed pavement.

SECTION TES-003 STORM DRAINAGE SYSTEMS AND RETENTION/DETENTION STANDARDS

1. General.

- A. When concentrated storm water is proposed to be discharged over, onto or across private property other than that owned by the developer, an agreement between the owners must be executed relieving the Township of any responsibility for damage that might occur. Both the form and content of said agreement shall be subject to the approval of the Township's legal counsel. Such an agreement shall be submitted to (and approved by) the Township prior to construction.
- B. A plan shall be submitted on which is delineated the limits of the area(s) contributing surface drainage to:
 - (1) Each catch basin and inlet structure,
 - (2) Each proposed crossroad culvert, and
 - (3) Each existing crossroad culvert affected.

The acreage of each area shall be noted on the plan. Color coding is required. The plan must contain dimensions and references to a section corner(s) or 1/4 corner(s).
- C. All notes, details and specifications found on the "Storm Sewer Standard Details Sheet" shall apply.

2. Manholes, catch basins and inlets.

- A. Generally, manholes shall be placed not more than 400 feet apart for sewers less than 30 inch diameter and 600 feet apart for larger sewers.
- B. The minimum inside diameter of all manholes, catch basins and inlet structures shall be 48 inches, with the following exception:
- C. Inlet structures from which water will be discharged directly into a catch basin, may be 24 inches inside diameter. The depth of such inlets shall be no greater than 5.0 feet and no less than 3.5 feet from top for frame and cover to invert.
- D. Manholes and inlet structures may be constructed of brick, manhole block, precast concrete (ASTM C478), or cast-in-place concrete.
- E. All manhole block or brick structures shall be plastered on the outside with 1 to 2.5 mix of Portland cement mortar, 2 inch thick. No lime shall be added.
- F. The type of covers and grates for catch basins and inlets shall be shown on the plans.
- G. Horizontal separation from buildings shall be a minimum of 10 feet.
- H. Where different sized pipes come together in a manhole the 8/10ths flow lines shall match.
- I. The first manhole upstream from an outlet which is released to a wetland area shall have a 2 ft. deep sump and an oil separator.
- J. Storm sewers which discharge to any wetland or natural water course shall be treated for sedimentation by use of a detention basin, sedimentation basin or a long, flat, broad swale.

3. Storm Sewer Capacity, Design and Velocity.

- A. The following are permissible slopes for each pipe size:

Pipe Size	<u>Minimum</u>	<u>Desirable Range</u>		<u>Maximum</u>
	% of Grade <u>2.5 ft/sec</u>	% of Grade <u>4 ft/sec</u>	% of Grade <u>8 ft/sec</u>	% of Grade <u>10 ft/sec</u>
12"	0.32	0.78	3.12	4.88
15"	0.24	0.58	2.32	3.62
18"	0.20	0.46	1.82	2.84
21"	0.16	0.38	1.48	2.30
24"	0.14	0.30	1.24	1.94
27"	0.12	0.26	1.06	1.66
30"	0.10	0.22	0.92	1.44
36"	0.08	0.18	0.72	1.12
42"	0.06	0.14	0.58	0.92
48"	0.06	0.12	0.50	0.76
54"	0.04	0.10	0.38	0.60
60"	0.04	0.10	0.34	0.54
66"	0.04	0.08	0.32	0.48

- B. Sewer design capacity shall be determined by the rational method, ($Q = A.C.I.$), based on a 10 year storm with a minimum 15 minute concentration time. Velocities, Capacity and friction losses shall be based on Manning's formula generally with $n = 0.013$ for concrete pipe and 0.021 for corrugated metal pipe.
 - C. Hydraulic gradient and percent of grade shall be shown, to scale, on profile.
 - D. Inlet structures in the public street right-of-way shall be spaced a maximum of 400 feet apart or a maximum of 400 feet each way from high points. The spacing and/or number of inlet structures required to accommodate the design flows in streets and in private drives and parking areas, shall be based on a maximum of 1 cfs per 90 square inches of opening in an inlet or catch basin cover.
 - E. Generally, drops of over 2.0' at manholes, from invert of higher pipe to lower pipe, shall be avoided. Drops of over 2.0' require a two foot sump in the manhole to act as a water cushion.
4. **Storm Water Retention/Detention.** Storm water management in the form of retention, detention or the controlled release run-off shall be required and maintained for all new commercial, industrial, multiple, office and condominium developments, whenever the design engineer is unable to substantiate the adequacy of the receiving body of water or storm drainage facility. Storm water management will be required whenever runoff is increased.

In general, detention shall be defined as storm systems utilizing a controlled release rate, thereby detaining the storm water. Detention basins have a positive outlet. Retention basins are defined as those systems which do not have a positive outlet, except through percolation and/or evapotranspiration.

Wherever possible, detention shall be preferred over retention or leaching basins. Leaching basins should only be used in a very specific set of circumstances as outlined herein and then only when other storm water management systems are not possible.

- A. Release rates for storm water detention facilities shall comply with the requirements of the governmental unit having jurisdiction of the receiving facility.
 - (1) For road ditches, storm sewers, catch basins or storm manholes under the jurisdiction of the Oakland County Road Commission, the release rate shall be restricted to either that of: [1] a 6" diameter pipe or, [2] an outlet size dictated by the County Road Commission, Permit Department.
 - (2) For road ditches, storm sewers, catch basins, inlets or storm manholes under the jurisdiction of the Michigan Department of Transportation, the release rate shall be restricted to either that of: [1] a 4 inch diameter pipe, or [2] an outlet size dictated by the Michigan Department of Transportation. This criteria would only apply to parcels which, in their undeveloped state, naturally drained to the road drainage system. If all or part of the parcel does not naturally drain to the road drainage system, then the Permit Department of the Michigan Department of Transportation shall be consulted.
 - (3) For county drains under the jurisdiction of the Oakland County Drain Commission, the release rate shall be restricted to the undeveloped discharge rate (0.2 c.f.s./acre or a rate dictated by the Drain Commissioner's Office). In County drainage districts which have drainage facilities of sufficient size to carry flows in excess of the undeveloped runoff, then the release rates shall be consistent with design of the receiving drain, subject to O.C.D.C. approval.
 - (4) For existing open and enclosed drains which are not under the jurisdiction of the governmental units mentioned under items a, b and c of this section, the discharge rate shall be restricted to the undeveloped discharge rate (0.2 c.f.s./acre or as dictated by the Township Engineer). If a natural retention area is altered by the development of a site, then the allowable discharge rate will be proportionally reduced in accordance with the volume of the natural retention area.

INTERIM TOWNSHIP ENGINEERING STANDARDS

B. Detention volume, in cubic feet, shall be calculated by the O.C.D.C. simplified detention basin design method or by the formula $\text{vol.} = 7200 \text{ ACI} \text{ minus the volume of water to be released from the detention area during the stated time interval.}$

A = Tributary area, in acres

C = Runoff coefficient for the tributary area, in the developed state.

SURFACE

C FACTOR

Lawn area or open space

0.20

Residential

0.35

Multiple Housing

0.60

Pavement

0.80

Buildings

0.90

I = Rainfall intensity for a 50-year storm of 2 hour duration (1.52 ins/hour for Waterford Township).

(NOTE: For the O.C.D.C. Method I = $\frac{175}{t + 25}$

where t = time of concentration in minutes.)

C. For retention or detention basins a minimum 12 inch free board shall be provided between the design high water level and the overflow.

D. The top berm of a retention or detention basin shall be a minimum of 6 inches above the overflow spillway. Overflow spillways shall be provided to prevent destruction of the basin.

E. Generally, side slopes shall be no steeper than 3 to 1.

F. Slope bottom of detention basin to outlet, to provide for total dewatering. Minimum slope shall be 1.00 percent.

G. Specify method(s) to be used for sealing the bottom and sides of the basin, where warranted due to existing soil characteristics.

H. Indicate method(s) to be used to prevent possible failure of proposed dams and embankments.

I. For any retention basin designed to retain over 2 feet of water, a minimum 4 foot high chain link fence with a 12 foot wide access gate shall be installed. This shall not apply to areas which have standing water prior to development, or where the bank slope is less than 1 vertical to 6 horizontal.

J. Provide 12 foot wide easements for access.

K. The outlets for retention/detention basins shall be protected from clogging with a minimum 4 foot diameter, 2 foot deep sump.

L. Detention in parking areas shall not exceed 0.5 feet in depth.

M. Limits of detention must be clearly shown on the site plan.

N. If detention is provided in an area which has permanent standing water, detention volume will be calculated above the permanent water line.

O. Where it is not possible to provide a positive outlet for storm water management a retention basin (i.e., no outlet) may be used. This basin shall be designed to accommodate storm water from two consecutive 100 year storms. In areas of sand and gravel some consideration for the percolation rate may be given subject to the approval of the Township Engineer. In no case shall the retention pond be smaller than that necessary to hold two consecutive 50 yr. storms.

P. There shall be no retention (i.e., no positive outlet) in parking areas.

Q. All retention/detention and sedimentation basin areas shall be re-vegetated prior to issuance of a certificate of occupancy. All soil erosion control measures shall remain in place until vegetation is re-established sufficiently to control erosion.

R. Depending upon the size and/or location of the retention and/or detention facility, an agreement for operation and/or maintenance of said facility may be required by the Township. The agreement will stipulate a perpetual care fund amount which shall be deposited with the Township Treasurer. The agreement, both as to form and content, shall be subject to the approval of the Township Attorney.

5. **Leaching Basins.** Leaching basins may be utilized when all the following conditions exist:

A. No adequate storm sewer, open ditch, or road drain is available for storm water disposal and a retention pond is not prudent or feasible.

B. Soil composition is optimum and ground water table is suitable for percolation. Optimum soil conditions defines soil composed entirely of course sand, gravel, or a course sand gravel mixture.

- C. Total area of site shall be one acre or less. Consideration will be given for the utilization of leaching basins for sites larger than one acre, provided that soil conditions are optimum.
- D. Generally, the drainage area to each leaching basin shall be 1/5 acre or less, however; for sites larger than one acre, consideration will be given to larger drainage areas.

Leaching basins shall be designed by the following standards:

- (1) The leaching basin shall be at least 1,000 gallons in volume with openings in the bottom and sides. The basin shall be bedded in 10-A washed stone with a minimum thickness of 12 inches at the bottom and along the sides.
- (2) Leaching basins which incorporate a sump with 4 inch perforated drain tile may also be considered acceptable. The basin shall be 48 inch diameter, 6 foot deep, with an open bottom. There shall be a minimum of 40 foot of 4 inch perforated pipe bedded in 10-A washed stone installed with each basin.

- 6. **Debris or Sedimentation Basins.** Debris or sedimentation basins shall be installed at the lower terminus of all storm drainage outlets to lakes, rivers or wetlands. Design of debris or sedimentation basins shall be in accordance with Township standards.

SECTION TES-004 WATER DISTRIBUTION SYSTEMS

- 1. Water systems shall be looped (two or more sources of supply) whenever possible. It shall be the decision of the Township Engineer whether a water system must be looped.
- 2. All water mains shall be installed in a public street right-of-way, or in easements exclusively reserved for such use. All easements shall be a minimum of 12 feet wide and shall be dedicated to the Township.
- 3. No water mains shall be installed closer than 10 ft. distant from any building, swimming pool, or other structure or with less than 10 ft. horizontal separation (measured edge-to-edge) from any sanitary sewer, storm sewer or sewer manhole.
- 4. Water mains shall be a minimum of 8 inch diameter except for hydrant leads which may be 6 inch diameter.
- 5. Maximum 6 inch hydrant lead length shall be 100 feet.
- 6. Water mains shall be installed a minimum of 5 feet - 6 feet deep except at gate wells where they shall be installed with a 5 ft. depth of cover, so that a standard valve key can be used to operate the valve.
- 7. Valves and gate wells shall be so located that:
 - A. No more than 800 feet of water main will be of service at one time.
 - B. No more than four valves must be closed to isolate a section of water main.
 - C. In general, the number of water services to buildings will be balanced between valves. (Note: Location and size of each service line shall be shown on the plans.)
 - D. In general, at least one hydrant located per item 8 (below) will remain in service at all times.
- 8. Distribution systems shall be designed to be capable of delivering a minimum of 1,000 gallons per minute at 20 pounds per square inch pressure at each hydrant.
- 9. Hydrants shall be located:
 - A. So that the most remote part of every building can be reached from a minimum of two hydrants, utilizing a maximum unobstructed hose length of 300 feet from any hydrant.
 - B. So that they are readily accessible by fire fighting equipment. An improved all-weather-surfaced road or drive, at least extending to within 15 feet of each hydrant, shall be provided.
 - C. So that they are at least 50 feet distant from any building.
- 10. Traffic islands with 6 inch concrete curbs shall be provided for hydrants located in paved areas, to protect them from accidental damage by vehicular traffic.
- 11. In traffic island areas, 6 ft. hydrants shall be used.
- 12. Water service leads shall be less than 100 ft. and for multiple type uses the following minimum sizes shall apply:

NUMBER OF UNITS PER BUILDING	WATER SERVICE SIZE
4	1 ½
12	1 ½
16	2
24	2
32	3

Domestic service shall be run separately from a water main to a building and/or structure. No domestic service shall be allowed on a standby fire line per Section 17-339, "Fire lines; standby," of the Waterford Charter Township Code.

13. The watermain shall be extended across the entire frontage of the site. Size and location shall be dictated by the Township Engineer.
14. All watermain quantities must appear on the plans.
15. All notes, details and specifications found on the "Watermain Standard Details" sheet(s) shall apply.

SECTION TES-005 SANITARY SEWER SYSTEMS

1. Generally, no sewer shall be less than 8 feet in depth to the invert below crown of road, and in no case shall have less than 4 foot of cover.
2. Pipe materials and joints as well as standard construction details for manholes, drop connections, sumps, house lead and risers shall be in accordance with the current standards of Waterford Township and the Oakland County Department of Public Works.
3. A listing of the current Oakland County Department of Public Works "Sanitary Sewer Construction Notes" shall be incorporated in the plans and all requirements and all regulations contained in these notes shall be followed.
4. The "Standard Bedding" details of the Oakland County Department of Public Works shall apply for type of pipe utilized.
5. Service leads to buildings shall be a minimum 6 inch diameter and a maximum length of 100 feet.
6. Service leads shall be installed at a minimum one percent (1%) grade.
7. Any sewer serving more than one building shall be a minimum 8 inch sewer.
8. No sanitary sewer shall be installed closer than 10 ft. distant from any building, swimming pool or other structure.
9. There shall be a temporary 1 foot sump in the furthest downstream manhole for construction and testing purposes.
10. The last run (furthest upstream run) shall have a minimum grade of 1%, unless approved by the Township Engineer.
11. All leads to food service operations shall have a 1000 gallon grease interceptor. The kitchen facilities only shall be connected to this interceptor.
12. Downspouts, foundation drains, weep tiles or any conduit that carries storm water or groundwater will not be permitted to discharge into the sanitary sewer system.
13. Extension of the sanitary sewer across the entire frontage of the site is required. The site and location shall be dictated by the Township Engineer.
14. Sanitary Sewer will be located so as to provide unrestricted access for maintenance and inspection. Wherever possible the sanitary sewer should be located within 15 feet of a paved road or parking area.
15. Both existing and proposed ground elevations shall be shown on profiles.
16. Utility crossings (sanitary, storm, water, houselead and water services), with elevations, shall be shown on all profiles. Generally, a minimum of 18 inch clearance, vertically shall be provided between utilities. Watermain should be above sanitary sewer.
17. Lengths of run between structures, pipe size and class, percentage of grade, and elevation of tops of frame and cover, and dimensions to all leads from the nearest down-stream manhole shall be indicated on the profiles of storm and sanitary.
18. External drop connections shall be used for all manhole locations with 18 inches or more difference between inverts of pipes.
19. Where pipes of differing sizes join in a manhole the 8/10ths flow lines shall match.
20. Where an angle of less than 135° is created by two pipes in a manhole, the outflowing invert shall be a minimum of 0.1 ft. lower than the inflowing invert.
21. All sanitary sewers shall be installed in a public street right-of-way or in an easement exclusively reserved for such use. All easements shall be 20 feet wide and shall be dedicated to the Township.
22. Additional items pertaining to sanitary sewer capacities and depths of cover for pipe materials, etc., can be found in the "Sanitary Sewer Standard Details" sheet(s). All notes, standards and specifications found on the "Sanitary Sewer Details" sheet shall apply.

SECTION TES-006 CONSTRUCTION INSPECTIONS

1. Pre-construction meeting.

Prior to the start of construction of any project the following are required:

- A. A pre-construction meeting involving the project owner, general contractor, underground contractor, Township Engineering, Planning, Building, Water and Sewer and/or Fire Departments. This meeting may be waived by the Township for small projects as determined by the Township Engineer.
- B. Applicant must provide copies of all applicable permits.
- C. Applicant must deposit all anticipated construction inspection fees. These fees shall be established by the Township Engineer based on estimated inspection days. Full time inspection is required on all grading, paving, storm sewer, sanitary sewer, watermain. Also charged will be testing and related paperwork time. The fees will be held in the Engineering Department Escrow Account until all site work is completed and a certificate of occupancy is granted, at which time any unused fees will be returned to the owner or his designate.

If the inspection deposit is depleted work on the site may be stopped until additional funds are deposited.

2. Construction.

- A. All construction including building locations, parking lots, driveways, utilities, etc. must be staked by a professional engineer or registered land surveyor. "Cut sheets" will be provided to the contractor and inspector for all utilities including watermain, sanitary sewer and storm sewer.
- B. All storm and sanitary sewer will be laid using a laser and "cut sheets".
- C. Copies of all permits must be on the site at all times. All conditions of the permits must be followed.
- D. It shall be the contractors responsibility to repair any utility which is damaged during construction.
- E. All notes and standards of the Township found in the "Standard Detail Sheets" and discussed in the pre-construction meeting shall be followed.

3. Acceptance of Construction by Township.

In circumstances where easements and/or deeds and construction are to be accepted by the Charter Township of Waterford, all claims or liens arising out of the project must be satisfied prior to acceptance.

Evidence of title, acceptable to the Township Attorney, shall be provided. The contractor shall deliver a complete release of any and all claims, including any and all liens arising from said construction, and also supply a sworn statement indicating that all subcontractors, material men and laborers connected with the project have been paid. In lieu of the release of lien, at the discretion of the Township Engineer, the contractor may submit paid receipts.

The contractor shall provide a Maintenance Bond equal to fifty percent (50%) of the contract price of the sanitary sewer or water main constructed, guaranteeing the work or any part thereof, for a period of one year from the date of acceptance.

SECTION TES-007 UTILITY CONSTRUCTION LEGAL DOCUMENTS

1. Legal Documents to Township.

The proprietor shall provide to the Charter Township of Waterford a valid: (1) Bill of Sale and, (2) Easements. These documents shall be in a form acceptable to the Township Attorney.

The Bill of Sale shall convey to the Township all portions of the main or lateral. Recordable Easement Documents, signed by all individuals and entities having an ownership interest in the property, shall be provided to the Township for all public sanitary sewers and water mains.

A. Easements:

(1) General.

- (A) All proposed utility easements shall be submitted to the Township for approval prior to being recorded.

INTERIM TOWNSHIP ENGINEERING STANDARDS

- (B) Requests for Township approval of a utility easement shall be accompanied by:
 - (i) A legal description (metes and bounds) of the parcel embracing the easement, and a complete legal description (metes and bounds) of the utility easement, or
 - (ii) A blanket easement, including an 8 ½" X 14" "as built" drawing of the utility installation. (This is an option.)
 - (iii) Easements for public utilities will be recorded with the Register of Deeds by the Township after approval and acceptance of the easements.
 - (iv) Easements for water transmission and/or distribution systems shall be no less than 12 feet wide, centered on the installed water main.
 - (v) Easements for sanitary sewers shall be no less than 20 feet wide, centered on the installed sewer.
 - (vi) Easements for storm drainage, where required, shall be no less than 20 feet wide, centered on the installed enclosed drains; and no less than 24 feet plus the top width of the channel, centered on the centerline of the channel of open drains.

B. Easements Crossing Property Owned By Developer. Requests for Township approval of such easements shall be accompanied by (in addition to (2)a and (2)b above, under the heading entitled "General"):

- (1) An "as-built" drawing (to scale) on which the easement is delineated and the "as-built" location and dimensions of the complete installation area shown, and
- (2) A certification by a registered professional engineer or registered land surveyor, that the utility is within the described utility easement and is located as shown on the submitted "as-built" drawing.

C. Easements Crossing Properties Not Owned By Developer.

- (1) Easements of this category must be obtained prior to either site plan approval or construction plan approval and must be recorded with the Register of Deeds for the County, prior to construction within the limits of the easement.
- (2) Following completion of construction and prior to municipal acceptance of facilities located within the easement, the following shall be submitted:
 - (A) An "as-built" drawing (to scale) on which the easement is delineated and the "as-built" location and dimensions of the complete installation are shown, and
 - (B) A certification by a registered professional engineer or registered land surveyor, that the utility is within the described utility easement and is located as shown on the submitted "as-built" drawing.

2. As-Built Drawings.

A. Sanitary Sewers.

Prior to the acceptance of any sewer system, two copies of "as-built" plans shall be provided to Waterford Township. Said "as-built" plans shall be reproducible (mylar) of legible quality and shall show a statement by a registered engineer or surveyor certifying them to be "as-built" plans. The plans shall include, but not limited to, length of sewer (manhole to manhole distance), invert elevation, cover elevations, locations with respect to property lines or base lines, wye and riser locations and depths, a minimum of three witnesses to each manhole, sewer material and joint used, a minimum of three witnesses to all forcemain bends, details where appropriate, and all easements shown as outlined in this section.

B. Water Mains.

Prior to the acceptance of any water main system, two copies of "as-built" plans shall be provided to Waterford Township. Said "as-built" plans shall be reproducible (mylar) of legible quality and shall show a statement by a registered engineer or surveyor certifying them to be "as-built" plans. The plans shall include, but not limited to, length of water main (fitting to fitting) locations with respect to property lines or base lines, a minimum of three witnesses to each gate well and fitting, type and class of pipe, details where appropriate, and all easements shown as outlined in this section.