ENGINEERING DESIGN STANDARDS

SECTION 4 - SANITARY SEWER

4.0 GENERAL

This standard establishes the minimum requirements for the design of sanitary sewer systems in the Township.

Prior to starting any sanitary sewer design, the design engineer is encouraged to make use of maps and information available at the Township offices and at the Oakland County Water Resources Commissioner's office. It shall be the responsibility of the design engineer to verify utility locations provided by the Township and the Oakland County Water Resources Commissioner.

4.1 DESIGN CONSIDERATIONS

A. GENERAL CONSIDERATIONS

1. No connection receiving storm water, surface water, or ground water shall be made to sanitary sewers.
2. In general, a minimum vertical clearance of 18 inches shall be provided at all crossings with other utilities. A minimum horizontal separation of 10 feet shall be provided between all utilities.
3. Sanitary sewers shall be located to provide unrestricted access for maintenance and inspection purposes.
4. Sewer pipe and appurtenances shall conform to the current standards of the Charter Township of Commerce and the Oakland County Water Resources Commissioner's office.
5. A grease interceptor will be required for all food service operations. No connections for sanitary waste will be allowed to the interceptor.
6. The current Oakland County Water Resources Commissioner Sanitary Standard Detail Sheets along with the related Commerce Township standard sanitary sewer notes shall be considered a part of the Engineering Design Standards and must be included with the sanitary sewer plans.

B. LOCATION OF GRAVITY, FORCE MAIN AND LOW-PRESSURE SANITARY SEWERS

1. In Street Right-of-Way - Sanitary sewers for existing subdivisions and other establishments shall generally be located on opposite sides of streets from water mains. Sanitary sewers may be placed in an easement in the front of the lot. The sewer should be within 15 feet of the right-of-way line in existing subdivisions where the ROW is under 60 feet wide. Other developments shall follow the guidelines of the Utility Ordinance. In general, sanitary sewers will not be approved in the rear lot easement.
2. In Easements - All sanitary sewers shall be located within a minimum 20-foot wide easement, centered upon the sewer. Such easement shall be dedicated to the Township.
    a. A written description and drawing of the easement shall be prepared by the Design Engineer and be presented to the Township for examination before recording.
    b. Easements for possible extensions shall be provided to the property lines at locations designated by the Township Engineer.

c. Sewers shall preferably be constructed outside of paved parking areas, streets, drives and rear-yard areas.

d. Within unplatted projects, sewers shall be installed parallel to the property lines, or building lines, with clearance distances to accommodate the full width of the proposed easement or the distance necessary to accommodate a slope of one horizontal to one vertical from invert of sewer to ground surface, whichever is greater.

C. SEWER CAPACITY

1. Tributary Area - Sanitary sewers shall be designed to serve all natural tributary areas with due consideration given to topography, the Township Sanitary Sewer Master Plan, established zoning, and the adopted Township Master Land Use Plan. Sanitary sewers serving a tributary area beyond the project limits shall extend to the boundary of the project site to provide for future extension.

2. Population - For design purposes, population shall be based on a minimum of 2.7 persons per detached single-family home site (or REU) in the Commerce Township WWTP service area and 2.38 persons per REU in the Walled Lake – Novi WWTP service area. Population figures for all other dwelling units and buildings shall be based upon the current "Schedule of Unit Assignment Factors" as published by the Oakland County Water Resources Commissioner's Office. The adopted unit factors shall be used to convert the different occupancy types to equivalent single-family units.

3. Submission for review shall include a tabulation of occupancy (usage) types and the conversion of these into terms of equivalent single-family units. The tributary area, in acres, may be used to calculate dwelling units based on density allowed in the Zoning Ordinance.

4. Sewage Quantities for Pipe Design

   a. For service areas with design populations of 500 or less, sewer design capacity shall be 400 gallons per capita per day.

   b. For service areas with design populations greater than 500 but less than 28,400, sewer design capacity per capita shall be based on the following formula: (based on the Ten States Standards peaking factor formula)

      $Q = 100((18+\sqrt{P})/(4+\sqrt{P}))$
      Q = Design capacity in gallons per capita per day
      P = Design population expressed in thousands

   c. For service areas with design populations of 28,400 or more, sewer design capacity shall be 250 gallons per capita per day.

D. PIPE AND JOINTS

1. Gravity sewer up to 15" inside diameter:

   a. Pipe shall be composite (truss) pipe or solid wall SDR 26 pipe of ABS or PVC plastic meeting the Oakland County WRC Materials - Sanitary Sewer Pipe specification.

   b. Joints of ABS pipe shall be solvent weld Type SC sleeve coupling

   c. Joints of PVC pipe shall be elastomeric gasket push-on type

d. Gravity sewer leads shall be solid wall SDR 23.5 pipe with material matching the sewer main for joint compatibility

2. Low-pressures sanitary sewers and force mains:

a. Pipe shall be HDPE SDR 11 pipe meeting the Oakland County WRC Low Pressure Sewer specifications.

b. Joints shall be heat fused butt joints.

3. Other pipe and joints as approved by the Township Engineer.

4. Minimum pipe size

a. Minimum pipe size for gravity sanitary sewers shall be eight (8) inches in inside diameter.

b. Minimum pipe size for low pressure sanitary sewers shall be 2 inches in inside diameter.

E. HYDRAULICS

1. Calculations

a. For gravity sanitary sewer, Manning's Formula, with n = 0.013, shall be used for hydraulic calculations.

b. For low pressure sanitary sewer, the Hazen-Williams formula with C = 120, shall be used for hydraulic calculations.

c. On force main trunk sewers, the Hazen-Williams formula with C = 120 shall be used for hydraulic calculations.

2. Minimum and Maximum Velocities

a. Minimum design velocity for gravity and low-pressure sanitary sewers shall be two (2) feet per second, and maximum design velocity shall be ten (10) feet per second at peak flow. The slope of the sewer between the last two manholes at the upper end of any gravity lateral shall be increased above the minimum permissible pipe slope, to 1.0%, typical and 0.60% minimum.

3. Allowable Pipe Slopes For Gravity Sewers

PIPE DIAMETER (INCHES)	MINIMUM SLOPE (FEET PER 100 FEET)
8	0.40
10	0.28
12	0.22
14	0.17
15	0.15
16	0.14
18	0.12
21	0.10
24	0.080
27	0.067
30	0.058
36	0.046

4. Allowances for Changes in Pipe Size in Gravity Sewers
    a. Maximum flow velocity for pipe flowing full shall be maintained by matching the 0.80 x diameter depth point above the invert for pipe size increases.
5. Allowance for Direction Change in Gravity Sewers
    a. Provide a drop of 0.10 feet in the downstream sewer invert for direction changes of 30 degrees or greater to compensate for velocity head loss of the incoming flow.
    b. The interior angle of a direction change shall not be less than 90 degrees.

F. BASIS OF DESIGN-LOW PRESSURE SANITARY SEWER

1. Areas of Use
    a. Low pressure sanitary sewer systems consisting of individual grinder pump stations at each building site, connecting to a common pressurized sewer to convey domestic waste to an acceptable outlet will be considered for use in the Township.
    b. The use of a low-pressure sanitary sewer system in any development within the Township will require preliminary approval by the Township. A request for approval shall be submitted to the Township, together with a preliminary plan of the proposed development that delineates the extent of the proposed pressure sewer system, including future extension. The preliminary plan shall include existing ground contours at a two-foot interval, proposed grades over the site, and the outlet for the pressure sewer system.
    c. Upon securing the Township's preliminary approval for use of a low-pressure sanitary sewer system and prior to commencing with final construction plans and specifications for the system, the project's Design Engineer shall submit for review and approval a basis of design for the low-pressure sewer system. The basis of design shall include as a minimum but not necessarily limited to the following:
    d. Layout of development and pressure sewer system, including future extension, indicating:
        i. Proposed grades over the site.
        ii. Sewer pipe sizes and lengths.
        iii. Sewer line numbering system for each branch of sewer by pipe size.
        iv. Elevation along centerline of sewer approximately 100-foot intervals, and with maximum centerline of pipe denoted.
        v. Elevation along pipe centerline at each individual grinder pump station.
        vi. Location and elevation along pipe centerline at connection of pressure sewer to source of outlet.
    e. Tabular system analysis that is similar to and provides the system data as required on the following exhibit sheet "Low pressure Sewer System Pipe Schedule and Zone Analysis". (Reference: Low Pressure Sewer Systems Using Environment One Grinder Pumps, Rev. A, June 2008).
    f. Submissions for review shall include a tabulation of occupancy (usage) types and the conversion of these into terms of equivalent single-family units. The tributary area, in acres, may be used to calculate dwelling units based on density allowed in the Zoning

Ordinance. The adopted "Schedule of Unit Assignment Factors" shall be used to convert the different occupancy types to equivalent single-family units.

G. DEPTH OF SEWERS

1. No low-pressure sanitary sewer or force main shall have less than five (5) feet of cover.
2. In general, gravity sanitary sewers shall have a minimum depth of ten (10) feet from top of curb (or centerline if uncurbed) to the invert of sewer. The sewer shall have sufficient depth to serve a standard depth basement by gravity.

H. SPECIAL BACKFILL REQUIREMENTS

1. Sand meeting the requirements for MDOT Granular Material, Class II shall be required for full depth backfill of trenches, above pipe bedding, where the pipe is under or within a one-on-one influence of, or the trench is within three feet of, existing or proposed roads, pavements, curbs, driveways, parking areas, and sidewalks.
2. Compacted granular backfill shall be provided between all utility crossings to the top of the higher utility.
3. House lead trenches shall have compacted granular backfill within the entire street right-of-way where sidewalks are required.
4. Special backfill shall be placed in maximum lifts of twelve (12) inches and compacted to 95% of maximum dry density. Compaction results will be determined by Modified Proctor Test, ASTM Designation D-1557. An independent laboratory shall perform compaction testing.

I. HOUSE LEADS

1. Unless otherwise approved, construction of house leads from a gravity sanitary sewer shall extend 10 feet past the easement and/or property line, for each fronting parcel that the sewer is designed to serve, shall be included with the construction of the sanitary sewer.
2. Where construction of house leads to the property line is not required concurrently with gravity sanitary sewer construction, a wye branch with riser, and water-tight stopper or plug, shall be installed for every lot or building site which the sewer is designed to serve.
3. Minimum size for gravity sewer house leads shall be six (6) inches inside diameter.
4. Minimum slope for gravity sewer house leads shall be 1.00%.
5. House leads for low-pressure sewer systems shall be tapped at the time of house connection in accordance with township's current standard details for low pressure sewer systems.

J. MANHOLES - GRAVITY SEWER

1. Location: Manholes shall be constructed at every change in sewer grade, alignment, and pipe size, and at the end of each sewer line and per the "Ten States Standards for Wastewater" facilities. Generally maximum distance between manholes shall be as follows:

Diameter of Sewer	Maximum Manhole Spacing
8" -15"	400'
18" - 30"	500'
36" - 42"	500'

2. Monitoring: Manholes for non-residential connections shall be installed as required by the Oakland County Water Resources Commissioner.
3. Drop Connections: Internal drop connections are required at new manholes where the outlet pipe is 18 inches or more below the inlet pipe. Inverts shall be matched at the flow line if 18 inches or less. Generally, drop connections are discouraged and will be considered only if other alternatives are not acceptable.

K. MANHOLES - LOW PRESSURE AND FORCEMAIN SEWER

1. Air Release Valves (ARV) shall be located at all high points in low-pressure and force main sewers.
2. Intermediate Flushing Connections (IFC) in low-pressure and force main sewers shall be located so as not to allow more than 1000 feet between structures. Intermediate flushing connections may also be required at significant low points.
3. Branched Flushing Connections (BFC) shall be located at places where the low-pressure sewer branches off.
4. Terminal Flushing Connections (TFC) shall be located at the ends of the low-pressure and force main sewer systems.

L. STUBS

1. Where future connections to a manhole are anticipated, stubs or blind drop connections, with watertight bulkheads, shall be provided.
2. Stubs shall be 10 feet minimum in length.

4.2 FINAL ACCEPTANCE

A. All sewers shall be flushed and cleaned followed by infiltration or air testing in accordance with the Oakland County Water Resources Commissioner's recommendations.

B. Deflection in the pipe shall be measured by a mandrel test.

C. A set of approved Record Drawings, an approved Bill of Sale, and a copy of any recorded easement that was required for construction, shall be submitted to the Township prior to final acceptance of the sanitary sewer.