PORT HURON CHARTER TOWNSHIP
ENGINEERING DESIGN STANDARDS

A. GENERAL

1. The construction plans and specifications shall be prepared under the supervision of an Engineer registered in the State of Michigan and each sheet of the plans, excepting standard detail sheets provided by the Township, shall have imprinted thereon the seal of that Engineer.

2. Plans at a minimum shall consist of: (a) a cover sheet showing a plan view of the complete project, (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. Preferred scale for smaller site plans is 1" = 20'. Plans not drawn neatly in a professional manner shall be rejected.

3. Elevations shall be based on USGS datum (NGVD, 1929) with two permanent bench marks established at least every 1200' and shown on the plans.

4. All easements, lengths and sizes of sewers and water mains shall be shown on the cover sheet and the plan and profile sheets.

5. Location (relative to property lines) of proposed streets and sanitary, storm and water lines shall be shown on the plans.

6. Design of public streets shall be in accordance with either the St. Clair County Road Commission (SCCRC) or Michigan Department of Transportation (MDOT) standards, as applicable. Private roads serving site condominiums shall meet SCCRC standards for residential subdivisions unless open ditches are requested for imperative environmental reasons, in which case pavement width shall be not less than 22 feet. All private roads shall also meet the requirements of the Private Easement Roads section of the Township Zoning Ordinance.

7. 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.

8. Place notes on the plans as follows:

   a. All construction shall be in accordance with the Township's current standards and specifications.

   b. The Contractor shall notify the Township Engineer and/or the authority having jurisdiction, 48 hours prior to the beginning of construction.

c. Contractor shall contact MISS DIG (1-800-482-7171), 72 hours in advance of construction, for existing underground utility locations.

d. Full-time construction review may be required during all phases of construction including grading, paving, installation of sanitary sewer, storm sewers, drains, watermains and appurtenances, and streets, where applicable.

9. 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.

B. GRADING AND PAVING

1. 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 St. Clair County Department of Public Works.

2. Minimum and maximum grades shall be as follows unless approved by the Township Engineer:

	Minimum	Maximum
Grass Areas	1%	1 v to 3 h, max. of 3 ft. high. 1 v to 6 h, no height limit
Asphalt	1%	4% (8% in driveways)
Concrete	0.5%	4% (8% in driveways)

3. The limits of earth disruption shall be shown on the site plan.

4. All disturbed areas shall be revegetated prior to issuance of the certificate of occupancy. Topsoil in a quantity to cover disturbed areas to a depth of 3" must be retained on site.

5. All grading shall meet the adjacent property grades unless a grading easement is obtained from the adjacent property owner.

6. 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 Consultant.

7. 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.

8. Minimum standards for the construction of all asphalt parking areas and drives shall be 3 inches of MDOT #1100 bituminous mix, placed in two lifts, on 6 inches of compacted MDOT 21AA stone or 8 inches of compacted 22A gravel.

9. All concrete areas shall be constructed in accordance with MDOT standards.

10. 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.

C. STORM DRAINAGE SYSTEMS & RETENTION/DETENTION STANDARDS

Port Huron Township adopted St. Clair County Drain Commission Standards, Please refer to St. Clair County Drain Commissioner 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. One copy of a plan shall be submitted to the Township Engineer on which is delineated in color the limits and acreage of the area(s) contributing surface drainage to:

(1) each catch basin and inlet structure;
(2) each proposed crossroad culvert;
(3) each existing crossroad culvert affected.

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' apart for sewers less than 30" diameter and 600' apart for larger sewers.

b. The minimum inside diameter of all manholes, catch basins and inlet structures shall be 48", with the following exception:

Inlet structures from which water will be discharged directly into a catch basin, may be 24" inside diameter. The depth of such inlets shall be no greater than 5.0' and no less than 3.5' from top of frame and cover to invert and shall allow no entrance pipes other than sub-drains. The exit pipe shall be no larger than 12".

c. Manholes and inlet structures may be constructed of brick, manhole block, precast concrete (ASTM C478), or cast-in-place concrete.

d. All manhole block or brick structures shall be plastered on the outside with 1 to 2.5 mix of portland cement mortar, 1/2" thick. No lime shall be added.

e. The type of covers and grates for catch basins and inlets shall be shown on the plans.

f. Horizontal separation from buildings shall be a minimum of 10 feet.

g. Where different sized pipes come together in a manhole the 8/10ths flow lines shall match.

h. In commercial or industrial districts the 1st manhole upstream from an outlet which is released to the storm sewer system, a wetland, or open watercourse, even through a detention basin, shall have a 3 ft. deep sump and a trapped outlet designed to retain 12" of floating solids or liquids. All truck docks shall discharge to the sanitary sewer system. No adjacent area or roof drainage shall discharge to the sanitary sewer system through the truck dock.

i. Storm sewers which discharge to any wetland or natural water course shall be treated for sedimentation by use of a detention basin, leaching/sedimentation basin or a long, flat, broad swale.

j. Minimum pipe size for private storm sewers shall be 8". Any storm sewer carrying off-site water and/or in a public easement shall be at least 12" in size.

3. Storm Sewer Capacity, Design and Velocity

a. The following are permissible slopes for each pipe size:

Pipe Size	Minimum % of Grade 2.5 ft/sec	Maximum % of Grade 10 ft/sec
8"	0.60	8.35
10"	0.40	6.20
12"	0.32	4.88
15"	0.24	3.62
18"	0.20	2.84
21"	0.16	2.30
24"	0.14	1.94
27"	0.12	1.66
30"	0.10	1.44
36"	0.08	1.12
42"	0.06	0.92
48"	0.05	0.76
54"	0.04	0.60

b. Sewer design capacity shall be determined by the rational method, (Q = A.C.I.), based on a 10 year storm with a 15 minute initial time of concentration. Rainfall intensity shall be calculated using the formula I=140/(t+22), where t is the time of concentration. 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. A n = 0.010 may be used for smooth bore plastic pipe.

c. Hydraulic gradient, if above the crown of the pipe, shall be shown, to scale, on the profile.

d. Inlet structures in the public street right-of-way shall be spaced a maximum of 400' apart or a maximum of 400' 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 detention, or retention shall be required and maintained for all new developments, whenever the design engineer is unable to substantiate the adequacy of the receiving body of water or storm drainage facility.

In general, detention is defined as storm systems utilizing a controlled release rate, thereby detaining the stormwater. 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 evapo-transpiration.

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 over the receiving facility.

b. In general, the release rate shall not exceed 0.2 cubic feet per second (cfs) per acre of that land currently draining to the proposed outlet.

c. Detention volume, in cubic feet, shall be calculated by using "A Simple Method for Detention Basin Design" by Yrjanainen modified to use the 10 year design frequency rainfall of 140/(t+22) where t is the time of concentration in minutes. Applicable formulas are found in Appendix A of these standards.

d. In general, the following runoff factors shall be used, either the given weighted value or an alternate calculated value based on actual mix of area types. An alternate green space C factor may apply (natural forest/porous soils could be lower, steep grass slopes on heavy soil could be higher).

SURFACE	C FACTOR
Green space	0.20
Pavement	0.80
Roof	0.90
Connected open water (wet basin)	1.00
SF developments (Weighted)	0.35
Multiple Developments (Weighted)	0.60
Commercial (Weighted)	0.75

e. Detention basins shall be designed with features such as those shown in the "Guidebook of Best Management Practices for Michigan Watersheds" by the

Michigan Department of Environmental Quality - Surface Water Quality Division to prevent oil and grease and sediment from entering the storm sewer system, wetlands, or watercourses.

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

g. The top berm of a retention or detention basin shall be a minimum of 6" above the overflow spillway. Armored overflow spillways of bermed basins shall be provided to prevent destruction of the basin in the case of overtopping.

h. Generally, side slopes shall be no steeper than 1v to 3h if fenced with chain link 5' high, or 1v to 6h if unfenced. An 8' gated access opening shall be provided for all fenced basins.

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

j. Specify method(s) to be used for sealing the bottom and sides of the basin, where elevated groundwater or seepage would adversely affect nearby properties.

k. The detention basin shall provide a permanent outlet filter set to overflow at the 1 year frequency storm, and a primary overflow structure at the 10 year frequency level. The filter shall be equal to the Detention Basin Outlet Filter (CMP) standard detail, as shown on the Township Storm Sewer Standard Details sheet.

l. Provide 12' wide easements for access when a basin maintenance agreement is required by the Township.

m. Detention in parking areas shall not exceed 9 inches in depth over the outlet catch basin.

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

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

p. 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 yr. storms and soils and water table information shall be provided to substantiate that water levels will return to pre-existing conditions at least once per year. The

required retention volume in cubic feet is V=33,000 CA, where A is the drainage area in acres and C is the weighted runoff coefficient.

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

r. All retention/detention 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.

s. 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, 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 coarse sand, gravel, or a coarse sand gravel mixture. The Township Engineer shall witness a "perc" test at each basin location prior to site plan approval.

Alternatively, soil borings performed by a soil testing consultant may be provided showing soil strata and groundwater level.

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.

Leaching basins shall be sized as a combination storage and groundwater discharge detention basin with storage volume determined the same as open detention basins. The discharge rate shall not exceed a perc rate of 6" per hour for the bottom and sides of the soil/stone interface (sides of the trenches). Stone voids ratio may be assumed as 0.40.

One of two standard basins may be used based on the designs shown on the Township Standard Storm Sewer Details Sheet.

D. WATER SUPPLY AND DISTRIBUTION SYSTEMS.

1. Water systems shall be looped (2 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' wide and shall be dedicated to the Township.

3. No water mains shall be installed closer than 10' distant from any building, swimming pool, or other structure or with less than 10' horizontal separation (measured edge-to-edge) from any sanitary sewer, storm sewer or sewer manhole.

4. Water mains shall be a minimum of 8" diameter except for hydrant leads which may be 6" diameter.

5. Hydrant leads over 100' long shall be 8" diameter.

6. Water mains shall be installed with a minimum of 5'-6" of cover over the pipe except at gate wells where they shall be installed with a 5' 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' of water main will be out 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.

   e. Ends of mains shall be stubbed for future extension.

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. At maximum intervals of 500' along residential streets, at cul-de-sacs ends, street intersections and watermain dead ends;

b. So that the most remote part of every commercial building can be reached from a minimum of two hydrants, utilizing a maximum unobstructed hose length of 300' from any hydrant;

c. So that they are readily accessible by fire fighting equipment. An improved all-weather-surfaced road or drive, at least extending to within 15' of each hydrant, shall be provided;

d. So that they are at least 50' distant from any building.

10. Traffic islands, with 6" 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' and for multiple type uses the following minimum sizes shall apply:

NUMBER OF RESIDENTIAL UNITS PER BUILDING	WATER SERVICE SIZE
1	1"
4	1-1/2"
12	1-1/2"
16	2"
24	2"
32	3"

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.

E. SANITARY SEWER SYSTEMS.

1. Generally, no sewer shall be less than 8' in depth to the invert below crown of road, and in no case shall have less than 4' 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 Port Huron Township.

3. A listing of the current "Township 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 Township shall apply for type of pipe utilized.

5. Service leads to buildings shall be a minimum 6" diameter and a maximum length of 150'. Approved cleanouts shall be located at intervals of no more than 75', and at all changes in direction.

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" sewer with manholes. Any sewer serving more than one property shall be a public sewer.

8. No sanitary sewer shall be installed closer than 10' distant from any building, swimming pool or other structure.

9. There shall be a temporary 1 ft. 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 commercial or institutional food service operations shall have a grease interceptor sized as specified in the BOCA National Plumbing Code, Section P-1002, INTERCEPTORS AND SEPARATORS. The kitchen facilities only shall be connected to this interceptor.

12. Downspouts, foundation drains, weep tiles or any conduit that carries stormwater or groundwater will not be permitted to discharge into the sanitary sewer system. Floor drains and truck wells shall connect to the sanitary sewer.

13. Extension of the sanitary sewer across the entire frontage of the site is required. The size and location shall be as required 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" 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 unless otherwise approved.

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 public 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' 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.

END

APPENDIX A
DETENTION BASIN FORMULAS
PORT HURON CHARTER TOWNSHIP

I (10 year rainfall intensity)

$= 140 \div (t+22)$ where t is the time of concentration

Q_a = Allowable discharge from basin in CFS (cubic feet per second)

$Q_o = Q_a \div (CA)$ where A is the tributary area in acres
C is the weighted runoff coefficient

T (storage time)

$= \text{sqrt}(4620 \div Q_o) - 22$ for a gravity (orifice) outlet

$= \text{sqrt}(3080 \div Q_o) - 22$ for a constant pumped outlet

V_s (volume of storage per acre of imperviousness)

$= [(8400T) \div (T+22)] - 40Q_oT$ for a gravity outlet

$= [(8400T) \div (T+22)] - 60Q_oT$ for a pumped outlet

V_t (total volume of storage required)

$= V_sAC$

O_a (Orifice area in sq ft)

$= Q_t \div (0.62\text{sqrt}(64.4H))$ where H is the hydraulic head on the orifice

Orifice diameter (in inches)

$= 24\text{sqrt}(O_a \div 3.1416)$

Adopted from *A Simple Method of Detention Basin Design* by Yrjanaien.