



Engineering Construction Plan Design Standards

The following design standards are intended to provide a basis upon which all residential, commercial, industrial and multiple sites within the Charter Township of Grand Blanc are to be designed. The requirements outlined herein reflect the requirements of the Department of Public Services and conform to current engineering practices in the Grand Blanc area. By no means are these standards intended as a substitute for sound professional engineering judgment. It is suggested that the applicant obtain a copy of the Township General Ordinances and Zoning Ordinance to supplement these standards.

No individuals shall engage in the practice of engineering or land surveying involving either public or private property where the safety of the public is directly involved without the project being under the supervision of a professional engineer for the preparations of plans and specifications for engineering projects, or a professional land surveyor for land surveying projects.

Approved by Grand Blanc Township Board on: _____

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Definitions

The following is a list of words and phrases defined for the purpose of their use in interpretation of this manual. Words and phrases not specifically defined shall rely on their definition in Grand Blanc Charter Township's Ordinances or its common or standard definition.

AASHTO – American Association of State and Highway Transportation Officials.

Contractor/Developer - The Contractor and/or the Developer is the person, partnership, corporation responsible for performing the work required by the Grand Blanc Charter Township in accordance with the Grand Blanc Charter Township's Design Standards and Construction Specifications Manual.

Design Standards - The applicable standards relevant to the planning, design and construction of infrastructure improvements within the Township as adopted and contained in the Grand Blanc Charter Township's Engineering Construction Plan Design Standards Manual.

Engineer - The Grand Blanc Charter Township's Engineer, or other Township officer, employee or agent acting on behalf of Grand Blanc Charter Township in the administration of the Township's Design Standards and Specifications Manual.

MDOT – Michigan Department of Transportation.

MMUTCD – Michigan Manual of Uniform Traffic Control Devices.

Project Drawings/Plans - Include Site Plans, Plats, Condominium Site Plans, Project drawings and plans, etc. detailing the construction plans, requirements and specifications applicable to the Grand Blanc Charter Township's Design Standards and Specifications Manual.

Township - Grand Blanc Charter Township, Michigan, and its officers, employees and agents, including, but not limited to the Township Board, Township Planning Commission, Township Staff, Township Attorney, Township Engineer, etc.

WATCH – Work Area Traffic Control Handbook. A field book consisting of layouts of traffic control devices for work zones.

GRAND BLANC CHARTER TOWNSHIP

ENGINEERING CONSTRUCTION PLAN DESIGN STANDARDS

AUGUST 2006

SECTION 1 DESIGN STANDARDS

Streets and Roadways

General

A. Roads

1. All public and private roads shall be designed in accordance with AASHTO guidelines for design. Additional guidance may be sought through the Genesee County Road Commission design standards.
2. See “paving” section for additional information.

B. Right-of-way width (generally)

1. Local roads – generally 60-66’ wide. Additional width necessary for islands.
2. Collector roads – 86’ wide.
3. Major mile roads – 120’.

C. End of Road Treatments – permanent

1. Cul-de-sac – turning radius for largest anticipated vehicle to be incorporated.
2. Hammer head for short stub streets – maximum length 100’.

D. End of Road Treatments - temporary

1. Temporary end of road treatments may consist of the following.
 - a. Hammer head.
 - b. Asphalt cul-de-sac.
2. Signage
 - a. At nearest intersection – “no outlet”
 - b. At end of road – road ends barricade and sign
 - i. Sign – “temporary barricade – to be removed upon connection to adjacent property.
 - ii. Road ends sign.

E. Lane improvements

1. Implementation of Planning/Zoning requirements based upon submitted traffic impact study shall be noted on the plans.
2. Not all connections to existing roads may require/need additional lane improvements.
3. Acceleration/deceleration tapers
 - a. Deceleration taper length = 100’.
 - b. Acceleration taper length = 75’.
 - c. Shoulders on tapers to be 6-8’ wide unless adjacent to curbed areas.
 - d. Overlap of new tapers to existing may require full lane width improvements.
4. Deceleration lanes
 - a. Deceleration lane length = 10’ minimum.

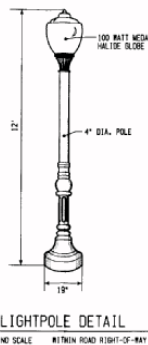
- b. Edge to be curbed.
- 5. Passing lanes
 - a. Begin taper length = 150'.
 - b. Full lane length = 250' – 150' before centerline of intersection, 100' after.
 - c. Ending taper length = 150'.
 - d. Shoulders on tapers to be 6-8' wide unless adjacent to curbed areas.
 - e. Overlap of new tapers to existing may require full lane width improvements.

F. Curb and Gutter

- 1. Concrete curb and gutter shall be used at the edge of all pavement unless a ditch type pavement section is approved. Asphalt curbing may be used at phase limits of private parking lots for a period not exceeding one year.
- 2. Concrete curbing shall be standard 7" high straight-faced curb with gutter along roads and 6" in parking areas.
- 3. All curbing shall drain to catch basins in the curb. Curbing shall be sloped using grades no less than 0.4% and a maximum grade of 6%.
- 4. Six-inch edge drain shall be used on all streets and connected into storm sewer catch basins.
- 5. Width of curb and gutter section to match pavement catch basins.

G. Above ground facilities

- 1. Entry way signs
 - a. Development entryway signs to be shown. Indicate proposed lighting and other features on the plans.
 - b. Subdivision signs are generally placed on private lots within platted easements for such purposes.
 - c. Entryway markers and signs shall be placed a minimum of 10' from back of curb in median islands. Encroachment agreement may be required.
- 2. Street lights
 - a. Proposed street light posts and underground wiring shall be shown for both roadway and parking lot lighting.



3. Utility poles

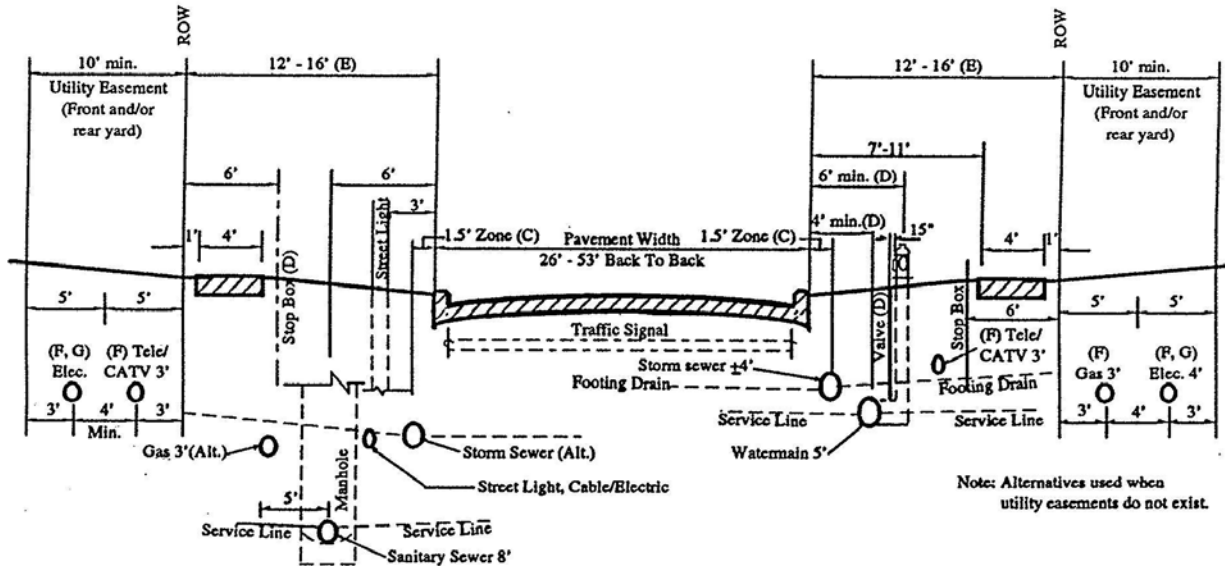
- a. Locations of existing and proposed poles to be shown along with associated overhead wires and guy wires.
 - b. Additional easements may be necessary for guy wires.
4. Standard signs
 - a. All signs within the roadway shall conform to MMUTCD.
 - b. All posts shall be standard u-channel or approved equal.
 - c. Specialty posts (fluted aluminum, etc.) may only be installed under an approved encroachment agreement.
5. Mailboxes – Indicate the location of mail delivery for small sites. For subdivisions, provide a typical location and style of box. The location, type and style of mailboxes and their supports shall be in accordance with the following.
 - a. AASHTO – (American Association of State Highway and Transportation Officials) – “A Guide for Erecting Mailboxes on Highways”.
 - b. United States Postal Bulletin – 21892, 4-27-95 pages 29-32.

H. Utility layouts

1. Public and private utilities shall generally be placed to minimize the disruption to right-of-way users in the event of future maintenance of that utility.
2. For subdivisions (plats / site condos) water, storm, sanitary and gas lines are generally in the roadway and front yard easement area. Power, telephone, cable are generally in the rear yard easement area. In the event that rear yard areas are to remain undisturbed (wetlands, trees, etc.) lines and pedestals may be placed in the front yard area with pedestals generally placed at the building set back location.
3. A general layout is highlighted below.

TYPICAL CROSS SECTION OF LOCAL STREET

Source: U.S. Department of Transportation, *FHA Highway/Utility Guide*, June 1993.



GENERAL NOTES:

- (A) ROW width varies (see Design Standards).
- (B) Unless otherwise approved, the following apply to utilities in the ROW:
 1. Utilities are normally buried. When overhead utilities are allowed and cross the roadway, the minimum vertical clearance for main cable is 20 feet and service cable is 18 feet.
 2. Telephone, cable TV and water are on east and south side of road
 3. Gas, electric and sanitary sewer are on west and north side of road
- (C) Storm Sewers: Normal clearance for intake is 1.5' from back of curb. When combination manholes and intakes are used, clearance increases to 5'.
- (D) Watermains, Valves and Hydrants. Normal watermain location is 4' back of curb. For combination manholes and intakes, this distance will increase to a minimum of 6'. For local streets and minor collectors with limited ROW, use a 6" 90° anchoring elbow o

- eliminate the coupling between the anchoring tee and valve. For maintenance purposes, the min. distance between centerline of valve box to face of hydrant must be 15". Stop boxes should be located 1' from ROW line in areas without sidewalks.
- (E) Parking Area Widths. Varies by roadway classification (see Design Standards). Jurisdiction may require wider parking area for future widening.
- (F) Utility Easements - Telephone, Fiber Optics, Cable T.V., Electric and Gas Lines: Located in front or rear yard easements on local and minor collector routes. For major collectors and arterials, they may be placed in ROW upon approval of the Jurisdiction. Normally, telephone and cable T.V. lines are placed in rear yards; fiber optics, electrical lines and gas lines in front yards. Placement of electric lines in rear yards depends on transformer locations and requires approval of the electric company and Jurisdiction.
- (G) Electric Recommended bury for electric cable is 4'. Minimum bury for electric lines is per the National Electric Safety Code.

Driveways and Approaches

General

All driveways must adhere to the requirements of the Township Zoning Ordinance.

A. Residential

1. All residential driveways within the roadway connecting to a paved road with curb and gutter shall be concrete with a minimum thickness of 6". Driveways connecting to a road with gravel shoulders may be asphalt or gravel. Gravel driveways may be required to be paved if gravel is being tracked onto the road. On gravel roads, driveway approaches shall not be paved.
2. Residential driveway shall have a minimum width of 10 feet (maximum 20 feet) or match the existing drive. No residential driveway shall be wider than 20 feet unless approved in writing by the Township.
3. Slopes
 - a. Minimum drive slope shall be 2%
 - b. Maximum recommended drive slope is 7%
 - c. Maximum slope shall not exceed 10%.

B. Commercial/Industrial

1. All commercial driveways within the road right-of-way shall be concrete with a minimum thickness of 8" and reinforced with 6" x 6" x 10" steel mesh. Commercial drives shall be of a width approved by the Township.
2. The maximum slope on all commercial driveways shall not exceed 10%.

C. Approaches

1. Approaches shall have adequate flares to provide a safe turning radius. Minimum flaring shall be 6 feet on the right side and 4 feet on the left. Flaring length shall be minimum of 10 feet.
2. Commercial and industrial approaches shall be MDOT Type "M" openings when attached to an existing curbed street.
3. Driveways shall be constructed according to the Concrete Drive Construction Specification. Driveways shall be sloped to direct drainage to the street. Drive approach slopes shall not exceed 2%

D. Curb Removal

1. For residential approaches constructed on an existing curbed street, the curb and gutter shall be entirely removed or cut horizontally.
2. When an MDOT Type "M" approach is constructed on an existing curbed street, the curb and gutter must be entirely removed. The extent of the removal shall extend to the nearest joint past the spring line of the new curb.

Parking Lots

General

Parking lot design considerations will vary due to use considerations. The following design criteria are meant as a minimum guideline only. Parking lots will also need to follow requirements of current Township zoning ordinances, which pertain to parking.

A. Classifications

Parking lots can be grouped as follows:

1. Class “A” - Light duty driveways, schoolyards, playgrounds and small parking lots with less than forty stalls. This cross section is not suitable for heavy refuse truck pick-up or delivery service. In areas where this service is used, the commercial/industrial cross section should be used for routing to and from the service area.
2. Class “B” - Parking lots containing more than forty stalls, medium to heavy truck traffic, some commercial lots.
3. Class “C” - Industrial lots, heavy truck uses, some commercial lots, bus routes.
4. Class “D” - Parking areas where extremely heavy truck traffic is encountered should be designed on a per case basis by a qualified professional engineer.

B. Service Drives

Service drives should utilize the Class “C” cross section. Design alternatives should be considered where extremely high volumes of truck traffic would be encountered.

C. Curb

Bituminous curbing may be permitted in areas where a phasing is proposed. Such curb type may be allowed for limited periods of time.

Water Lines

General

The Grand Blanc Township standard water main notes and detail sheets must appear on the plan.

A quantity list itemizing all proposed public water main construction must appear on the plan to include length, size, type of pipe and type of hydrants.

Water main shall be sized to provide the volumes required by the proposed developments. Design shall include ample research to verify that the required volumes and pressures are available. No water main smaller than 8" in diameter shall be permitted.

Water main shall be looped in order to increase reliability.

Water main shall be extended to an appropriate property line(s) of the proposed development for future connections to neighboring properties.

Water mains shall be designed to provide adequate volumes for fire fighting purposes. ISO standards shall be used as a minimum guideline to provide 1000 GPM for emergency use. Depending on the development, higher flow rates may be required.

All tees, plugs, bends, hydrants and similar fittings shall be braced to undisturbed ground by use of concrete thrust blocks.

Whenever possible, water main shall be located on the south side of an east-west street and on the west side of a north-south street.

Water main shall be polywrapped and installed with tracer wire and tracer wire connectors.

Water main shall be ductile iron class 53 for 6" and 8" lines, class 54 for 12" and above.

Water main shall have a standard cover of 6' in all cases.

Compacted sand backfill to 95% maximum density shall be used where the water main is within a 1:1 influence of a paved surface.

A. Service Leads

1. Service leads shall be type "K" copper with a minimum size of 1" in diameter. Service leads shall be sized according to volume and pressure requirements of the development.
2. Service leads shall be located in the center of the lot if possible with every effort to avoid locating the lead under the driveway.

3. All service leads proposed to penetrate a slab or foundation must be sleeved.
4. All services shall include corporation at the main and curb stop inside of right-of-way. Curb stops shall be placed 1' inside right-of-way.

B. Valves

1. Valves shall be located at strategic points along the water main to provide adequate isolation.
 - a. No more than 24 single family units will lose service
 - b. No more than 30 multiple units will lose service
 - c. No more than two hydrants will be out of service
 - d. No more than four valves shall have to be closed to isolate the break. Where possible, three valves should isolate the break.
 - e. On line valve spacing shall be a maximum of 800 ft.
2. Valves shall be located near tees and other looping measures.
3. Valves shall be placed at all tees and connections.
4. All gate valves shall be installed in a concrete manhole. Manholes shall be precast concrete with rubber boots.
5. Valves shall open counter clockwise unless otherwise specified by the Township.

C. Hydrants

1. Hydrants shall be spaced to provide a maximum service radius of 400'.
2. In residential developments hydrants should be positioned as close to lot lines as possible.
3. Hydrants shall be factory painted in accordance with AWWA C502 and color to meet Township standards.
4. Hydrants shall be East Jordan Iron Works model number EJIW 5BR 250.
5. Hydrant valves shall open counterclockwise.
6. No parking is permitted within 15' of a fire hydrant. Landscaping is not permitted within 7' of a hydrant.
7. Fire department connections (FDC) to buildings shall be shown on the plans. A fire hydrant should be located within 100' of a FDC. A minimum 5' wide clear isle must be maintained for access to the FDC.
8. Hydrants located in a parking lot shall be protected by a minimum of six-inch concrete curb or standard hydrant guard posts.

D. Sizes and Distribution

1. The minimum size water main in the Township shall be eight inches. Six-inch mains may be used only for single fire hydrant leads having a maximum length of 75 feet. No service leads are allowed from a six-inch main. Maximum dead end mains are as follows:
 - a. 450 feet for 8" mains
 - b. 1,000 feet for 12" mains
2. Reducers are not allowed to meet the dead end requirements.

3. Twelve-inch water main may be considered as minimum for internal transmission on industrial and multiple sites.
4. All mains must end with a gate valve in well, hydrant gate valve then a hydrant.
5. No private services are permitted from a water main over 16 inches in diameter.
6. The extension of water main will generally be required across the entire frontage of the site.
7. All water main installations shall conform to the Township Master Water Plan.

E. Construction

1. No building permits for wood frame construction will be issued above the foundation for any development prior to the active service of the required mains and hydrants and adequate access for fire fighting equipment.
2. No occupancy shall be allowed in any instance without the required mains, hydrants and sprinklers being in active service.

F. Easements

1. All public water mains must be located in an easement or public right-of-way.
2. The minimum easement shall be 12 ft. Additional widths may be required due to depth and/or size of water main.
3. The dedication of the easement will be required prior to construction of the system. The description may be altered to conform to the final “as-built” location.

Sanitary Sewer

General

Public sanitary sewers are generally required when two or more connections are made to the same sewer.

In most instances, including multiple unit developments, the sanitary sewer system must be public, even though the project has one property owner.

The extension of the sanitary sewers will generally be required across the entire frontage of the site and at other locations deemed necessary for future upstream service.

A quantity summary itemizing all proposed public sanitary sewer construction must appear on the plans including length, size and type of pipe.

The developer shall undertake sufficient research to determine if the sewer has adequate capacity to handle the anticipated volumes. Such research will be provided to the township at the township's request. The Township may require capacity analysis to account for both wet and dry weather flows.

All applicable permits must be in hand prior to sanitary sewer construction.

Sanitary sewer shall, whenever possible, be installed on the north side of an east-west street and on the east side of a north-south street.

Sanitary sewers shall be designed with adequate slope to produce self-cleaning velocities and to provide capacity for future expansion.

No manholes, cleanouts or structures shall be located in any pavement, including roads, driveways, parking lots, and sidewalks.

Designs shall incorporate the use of materials and sizes as specified in the Sanitary Sewer section of the Construction Specifications.

A five-year guarantee bond must be submitted to the Township on sewers deeper than 15' equal to the cost of sewer installation.

A. Service Leads

1. All service leads within the right-of-way/easement area shall be a minimum of 6" diameter PVC SDR 26 and shall be extended to the limits of the right-of-way and/or easement area, whichever is greater.

2. Service leads outside of the right-of-way shall be a minimum of 4" diameter schedule PVC schedule 40.
3. All service leads shall be located in green areas, avoiding locating lead under driveways.
4. Service leads shall have a minimum slope of 1%.
5. A cleanout must be installed on all sewer leads at the property line and at any bend. Maximum spacing 100'.
6. Private sanitary sewer leads of excessive length, although not a public sewer, may require inspection and testing.

B. Sewer Capacity

1. For all developments the Township will determine existing capacity of sanitary sewer during plan review process. The developer may be required to provide capacity analysis data with township reviewing data to verify capacity.
2. Any upgrades to existing sanitary sewer or existing pump stations required by the increased capacity will require developer to be responsible for all design and construction costs.

C. Grades

The following table represents the minimum and maximum grade for public sanitary sewers. Note that these are minimum and maximum requirements and will generally be used only when topography requires it.

Size	Standard Grade	Minimum Grade	Maximum Grade
8"	0.80%	0.40%	8.0%
10"	0.60%	0.30%	6.2%
12"	0.40%	0.22%	6.0%
15"	0.24%	0.16%	3.6%
18"	0.18%	0.12%	2.8%
21"	0.14%	0.10%	2.2%

All upstream dead end sewers shall have a minimum last run grade of 1.0%.

D. Manholes

Sanitary Sewer Manholes shall be spaced as follows

Size	Standard Run	Maximum Sewer Run
8"	300 Ft.	400 Ft.
10"	300 Ft.	400 Ft.
12"	400 Ft.	450 Ft.
15"	500 Ft.	500 Ft.
18"	600 Ft.	600 Ft.
21"	600 Ft.	600 Ft.

A manhole will be required at all changes in alignment, size or grade.

E. Location

1. Sanitary sewers shall be located so as to provide unrestricted access for maintenance and inspection.
2. Suitable access for maintenance and inspection vehicles must be provide for all sewer lines more than 20' from edge of paved roadway.
3. A minimum alignment separation of 10 ft. must be maintained between the sewer and all water mains.
4. The water main and sanitary sewer shall be located on opposite sides of the street, wherever possible.
5. All public sewers must be located in a public right-of-way or an easement. Standard Easement forms are available at the Township.
6. The easement size will vary individually as required for maintenance and access.
7. The minimum sanitary sewer easement shall be 20 feet.
8. Dedication of easements will be required prior to construction of the system while the description of the easement may be altered to fit the as-built location.

F. Profile

The following information shall be indicated on the sanitary sewer profile:

- 1) Length of run between manholes.
- 2) Type and class of pipe between manholes.
- 3) Size and grade of pipe between manholes
- 4) Top of casting and invert of all manholes and sewers at manholes.

- 5) Existing and proposed ground elevation along the route of the sewer.
- 6) Progressive numbering system
- 7) All utility crossings.
- 8) Special backfill areas.
- 9) Provisions for infiltration testing.

G. Drop Connections

The design of the system should minimize the need for drop connections. External drop connections are required where the invert of the outlet pipe is 18 inches or more below the invert of the inlet pipe. Internal drop connections will generally not be allowed.

H. Septic Tanks

If sanitary sewer is not available, a copy of a valid septic tank permit from the Genesee County Health Division must be submitted prior to approval.

Storm Water Management

A. General

1. Underground storm sewer drainage facilities will generally be required.
2. All run-off on site must be accommodated and discharged in a controlled manner.
3. All surface water storm water collection systems shall have a minimum pipe size of 12”.
4. Sump pump discharge must be directed into the storm sewer via an enclosed system.
5. Areas without direct connection to a 12” storm water system may be connection with an 8” diameter sump pump collection system. A minimum of 4- inch pipe shall be utilized and will also be allowed to discharge unrestricted.

B. Structure

1. Catch basins at the upstream end of the system shall be a minimum of 24” diameter.
2. All catch basins and yard drains accepting surface water shall have a 24” sump.
3. Catch basins with an inlet pipe shall have a minimum diameter of 36 inches. All manholes and public catch basins shall be a minimum of 48 inches in diameter.
4. The first structure upstream from a public system within the confines of the private development shall be 48 inches in diameter and have a 24” inch sump.
5. Manholes shall be located at:
 - a. All changes in alignment.
 - b. Points where the sewer changes size.
 - c. Points where the grade changes
 - d. Junction of sewer lines
6. Catch basins shall be spaced no more than 350 feet from the crest of the road.
7. Subsequent catch basins shall be spaced a maximum of 400 feet apart.
8. Catch basins shall also be placed at intersections to prevent water from crossing an intersection.
9. Catch basins shall be located at every other lot for rear yard drainage. The use of swales alone for back yard drainage is not permitted.
10. Castings shall be to EJIW standards and sized to handle anticipated runoff volumes.
11. All catch basins at curb shall be EJIW 7045 Catch Basin Curb Inlet with Type M2 adjusting grate type T4 back with “Dump no waste – Drains to river” lettering and fish image.

C. Storm Sewer Design

1. All public storm sewer pipes and swales must be located in a 20’ wide dedicated drainage easement.
2. Storm sewers shall be sized using the Chezy-Manning equation ($Q=VA=1.49(A)(r_H)^{2/3}\sqrt{s}/n$) to determine the size required. The required capacity shall be determined using the rational method.
3. Storm sewers shall be designed using slopes to develop self-cleaning velocities of 2.5 feet per second, minimum. Maximum velocity is 8 feet per second.
4. Storm sewer pipe shall have minimum cover of three feet and be reinforced concrete pipe (RCP).

5. All proposed storm sewer shall be designed to handle 10-year storm flows. The proposed hydraulic grade line shall be below all storm structure rim elevations. Hydraulic calculations must be provided with site plan submittal.
6. Storm sewer design shall include adequate research by the developer to provide verification that the receiving storm sewers have adequate capacity.
7. Sump leads for each parcel shall be provided for all new storm sewers installed. Leads shall be a minimum of 4" PVC SDR 26. The leads shall be placed with a minimum slope of 1% and 3' of cover.

D. Detention/Retention Areas

1. Any site that utilizes an unimproved outlet for drainage must detain the increased runoff on site. Acceptable means of detention can be achieved through standing water in parking areas, oversize storm pipes and a separate detention/retention basin. Any or all of these designs may be utilized to achieve the required volume.
2. In areas where the detaining of surface water runoff may exacerbate the 100-year floodplain, detention will not be permitted. Where the downstream storm system has been designed for a post development runoff discharge, detention may not be necessary.
3. Detention/retention basins shall be owned by the property owner with an agreement in place for maintenance with the Township.
4. Detention basins shall be designed so as not to exacerbate the downstream flooding conditions. The detention basin outlet shall discharge to an approved outlet.
5. Detention basins shall be designed to store all runoff in excess of existing runoff for a 100-year storm. Runoff volumes shall be determined by calculating the time of concentration for the watershed area and applying the latest rainfall intensity/duration curves or an equivalent method.
6. A minimum 1.0 feet freeboard shall be included with all open basins.

E. Design of Detention/Retention areas

1. The Rational Method ($Q=CIA$) may be used to determine the amount of existing runoff from the proposed development area.
2. All areas that are undeveloped shall be assumed to have a "C" value (runoff coefficient) of 0.20. Values of "C" for Residential Areas shall range from 0.4 to 0.5. Values of "C" for Commercial/Industrial areas shall range from 0.75 to 0.90 depending on the type of project and the amount of impervious surface vs. lawn and other areas.
3. The volume of detention required shall be calculated by using a generally accepted method that evaluates the inflow minus the outflow over time to determine the maximum volume required.
4. Basins designed to retain water for extended periods of time shall be aerated.
5. Storm water detention on improved parking surfaces shall be allowed to a maximum depth of six inches. The control of runoff for all methods however, shall be through pipe sizing. The use of restricted structure covers that could easily be changed or modified at a later date are not permitted.
6. All open detention basins having side slopes steeper than 1 vertical on 6 horizontal shall be fenced, except where their design is an integral part of the landscape and where the

Township determines that depth and location are not a potential concern. Fences shall be 8' high chain link. Gates shall be 12' wide with double opening. The maximum side slopes of the basins shall be 1 vertical on 4 horizontal, with a 3-foot minimum shoulder inside the fence.

7. Detention basins specifically designed architecturally and aesthetically for a location within such yard setback areas shall be approved as to their concept and location by the Planning Commission.
8. The entire detention basin must be seeded or sodded.
9. Concrete riprap is required at all pipe entrances to the basin. The minimum width of the riprap shall be twice the outside diameter of the pipe. The riprap shall extend from bottom of the basin to a minimum of 1' above the top of the pipe. Two types of riprap may be used: 1) field stone or broken concrete of four (4) inch minimum thickness and one (1) square foot minimum area. Broken concrete or stone shall be mortared to form a monolithic slab with a minimum thickness of eight (8) inches; 2) poured grade "A" concrete of four (4) inch minimum thickness. It shall be scored at a maximum of two (2) foot intervals. A two (2) foot deep poured concrete header shall be installed at the outer edges.
10. All pipe entering a detention basin shall have either a headwall or end section at the end of the pipe.
11. Bar screens must be installed on all open ends of pipe twelve (12) inches or larger in diameter.
12. All detention basins shall be designed with a perforated riser outlet structure. The structure must restrict flow to the allowable discharge rate.
13. An overflow system must be provided. Where possible, an overflow structure shall be designed to outlet into an adequately sized storm sewer. There are two (2) possible alternate methods: 1) using an overflow pipe. The invert elevation of this pipe shall be at the freeboard elevation of the basin. 2) a low point overflow. The low point of the basin shall be set at an elevation no lower than the freeboard storage elevation of the basin. The overflow shall have riprap adequate to prevent scour. The overflow must be designed as to not flood adjacent properties, and the backwater elevation must be no higher than (1) foot below the lowest ground elevation of the developed area.
14. Detention basins that are gravity drained into a drainage ditch must have the outlet pipe invert above the normal water level of the drain. Where this is not possible, a variance must be requested and the design shall include a back flow-preventing device.

F. Culverts

1. Cross-culverts shall be required at all drive locations that cross drainage and roadside ditches. Crest drives are the only exception.
2. Culverts shall be placed to provide positive drainage. No culvert shall be placed flat or with back fall.
3. Culverts shall be sized according to the size of the existing ditches. Proper analysis and supporting calculations shall be provided for all culvert designs greater than 15 inches in

diameter. Minimum culvert size shall be 12". All culvert sizes shall be subject to review by the Township.

4. Culvert material may be in corrugated steel pipe or concrete with flared end sections.
5. Headwalls are not permitted.

Storm Water Management Submittal Requirements

The Owner/Developer must provide a Complete Storm Water Permit Submittal to the Township for review by the Township Engineer. This includes a completed permit application with calculations, complete set of the site drainage and grading plan, one copy of the calculations for allowable discharge and on-site storage requirements as prepared by a Registered Professional Engineer or Architect, any other support information, a completion of drainage checklist outlined below.

Complete the drainage checklist by checking each of the following items after you have verified they are clearly indicated on the plan.

- Total acres of site.
- Drainage district line showing all land to be drained through proposed drainage system including rear lot drainage system.
- Location of site including dimension to nearest intersection road or section line.
- Existing and proposed ground elevations at maximum 50' centers, including shots on perimeter of site and 100' beyond or contour lines at 1 foot intervals extending 100 feet beyond the site limits. Existing drainage patterns shown.
- Existing and proposed elevations of at edge of pavement or buildings within 100' of site.
- Existing and proposed elevations of top of curb, gutter, ditch line, and centerline of road at maximum 50' intervals within 50' of site.
- Site grading provides for collection of runoff on-site.
- Rim and invert elevations of existing catch basins, manholes, sewers and culverts.
- Location of all existing and proposed utilities, water main, storm drains, sanitary sewer and corresponding right-of-ways.
- Easements provided to township for review.
- Location of proposed lawn/landscape areas, paved areas and building location.
- Location, size, length, slope and type of proposed storm sewer and rear lot drains.
- Rim and invert elevation(s) of proposed manholes and catch basins, including rear lot drainage.
- Location of on-site storage showing contour lines for detention system and volume provided calculations for basin.

- Cross-sections, profiles, horizontal control and detailed volume calculations of proposed storm water detention areas.
- Drainage calculations showing existing and proposed drainage, including offsite tributary areas, if applicable.
- Location and elevation of emergency overflow.
- Floodplains and wetlands shown, if applicable.
- Drainage outlet is to an established drainage system within its established drainage district.
- Verification that storm sewer material, sizes, and minimum grades comply with stormwater management plan.
- Verification that rear lot drainage complies with stormwater management plan.
- Location and size and detail of proposed restrictor.
- Trench details, manholes detail, catch basin details, restrictor detail, curb detail, pavements detail storm water detention basin detail and top soil and seeding detail.
- Detailed hydrology and hydraulic calculations used for sizing storm sewer (can be submitted on separate form).

Beyond the Grand Blanc Charter Township requirements, the developer must submit applications for permit with all agencies that regulate storm water within the area of development. These may include Michigan Department of Transportation, Michigan Department of Environmental Quality, Genesee County Drain Commissioner, Genesee County Road Commission and others.

Grand Blanc Charter Township Storm Water Discharge Permit Application

PROJECT NAME:	
Property Tax Identification #	
Site Plan Review Date:	Date Applied:
NAME OF DEVELOPER/OWNER:	ENGINEER/ARCHITECT:
Contact Person:	Contact Person:
Street Address:	Street Address:
Township, State, ZIP:	Township, State, ZIP:
Telephone:	Telephone:
Fax:	Fax:
PROJECT LOCATION:	
Street Address:	
Name of Subdivision/Plat:	
Drainage District:	
STORM WATER DESIGN INFORMATION (*Calculation must be submitted for verification. Calculation must have clearly labeled headings and clearly labeled formulas and clearly labeled units.)	
Type of Development: Commercial Site, Industrial Site, Residential Platted, Residential Condominium, Other	
* Area of development (acres):	
* Area of contributing drainage district (acres):	
* Area of existing impervious surface (acres):	
* Area of proposed impervious surface (acres):	
Unit allowable discharge (Qa) (cfs/ac.):	
* Allowable discharge rate (Qa) (cfs):	
* Total volume of storage required (Vt) (cu. ft.):	
* Total volume of storage designed (cu. ft.):	
100 year design stormwater detention storage elevation:	
Emergency overflow maximum storage elevation:	
Lowest finished floor elevation:	
Outlet drain size and design flow capacity:	
Outlet drain invert elevation:	
* 100 year design discharge (cfs):	
* Diameter of proposed restrictor (in.):	
* Actual restricted discharge (cfs):	
Authorized Signature	Date

Site Grading

A. General

1. In general, developments should follow the existing contours of the land. Any changes which alter the established drainage patterns must be addressed.
2. Grading plans shall be provided for all projects. Individual lot grading plans are necessary prior to the issuance of building permits.
3. Existing and proposed contours and drainage patterns shall be provided by the developer. Proposed grading of a site should not adversely impact drainage from adjacent projects.
4. Existing off-site drainage that currently enters a site must be accommodated.

B. Overall Site Grading

The proposed grading shall direct run-off into proposed or existing storm sewer facilities and maintain all proposed runoff on applicant's property prior to discharging to an approved outlet at the pre-developed rate.

C. Lot Grading

1. Individual lots shall be graded to provide positive drainage away from proposed and existing structures.
2. This template applies for maximum density-type developments where spacing between homes will not be large.
3. Rear and side yard swales may be required.
4. Proposed grading shall meet abutting property line elevations. Differentials in grade must incorporate a minimum 4 horizontal to 1 vertical slope to the abutting property line.
5. Retaining walls are discouraged. Any wall separating a differential grade of more than 12 inches shall be considered a retaining structure and may require a structural engineering design and review.

D. Swales

1. All proposed swales shall have a minimum slope of 2%. Appropriate soil erosion control measures might be required to control sedimentation and erosion of swales.
2. The use of bio-swales may be approved on a case-by-case basis at the discretion of the Township.

E. Roadway Drainage

1. Enclosures of drainage ditches across the frontage of the site will generally not be permitted.
2. The Township may, however, require the enclosure if adequate controls on pavements and shoulders cannot be maintained and the health, safety and welfare of the general public is endangered.

3. Side slopes on open ditch drainage shall be 4 minimum horizontal to 1 vertical.
4. The ditch bottom shall be 2 feet wide.

F. Spot grades

1. Sufficient proposed grades must be indicated on the plan to ensure that:
 - a. Drainage is adequately discharged off- site with proper retention.
 - b. No upstream drainage is restricted.
 - c. Paving is in accordance with standards outlined herein.
 - d. The site in general drains without standing water.
2. Elevations representing the brick ledge, finished grade, and the first floor grade must be indicated.

Paving

A. General

1. Public and private roads shall be designed for a minimum life span of 20-years.
2. All pavement, including onsite parking lot areas may require inspection by the Township during construction.
3. Soil boring results in sufficient locations to verify the proposed pavement design must be provided during plan submittal for review.
4. Upon completion of construction, pavement core results in sufficient locations may be required to be submitted to verify that the actual pavement design was indeed constructed.

B. On-Site Parking areas

1. A cross-section of all paving shall be shown on the plans.
2. Minimum pavement thickness for commercial / multiple residential areas = 3" Asphalt on 6" 21AA aggregate base or 6" concrete.
3. Minimum pavement thickness for industrial areas = 4" Asphalt on 8" 21AA aggregate base or 8" concrete.
4. Minimum surface grade for asphalt paving shall be 1.0%.
5. Minimum surface grade for concrete paving shall be 0.6%.
6. Bumper blocks are not permitted where pedestrians may be expected to traverse.

C. Roadways (public/private)

1. A cross section of all off-site paving is required. Minimum requirements are dependent on the type of existing pavement as follows:
 - a) Concrete major thoroughfare and collector roads required 8 inches of PC concrete on sand sub-base.
 - b) Asphalt major thoroughfare and collector roads require 8 inches of asphalt.
 - c) Concrete local roads generally require 6 inches of PC concrete on sand sub-base.
 - d) Asphalt local roads generally require 3 inches of asphalt on an 8" gravel base.
 - e) Requirements for existing gravel roads will be considered on an individual basis by the City Engineering Division.
2. 7" concrete curb and gutter is required on all approaches.
3. Passing lanes, acceleration lanes and tapers, and deceleration lanes and tapers may be required. If curb is required on the passing acceleration, or deceleration lanes, it shall be 7" concrete curb and gutter.
4. The dedication of the following right-of-way along the frontage of the site to the ultimate requirement for future improvement is requested. 120 feet - major thoroughfare, 86 feet - collector road, 60 feet - local road.
5. All shoulders shall be 8" of 22A gravel, 8 ft. wide on thoroughfares, 4 ft. wide on local roads.
6. Sufficient proposed grades must be given to determine proposed grading of all right-of-way improvements.

Sidewalks/Pathways

A. General

1. Sidewalks, pathways, bike lanes shall be installed in accordance with the Township master plan and were required to facilitate non-motorized traffic.
2. Pathways are generally installed along all major roadways and in open space areas.
3. Sidewalks are generally installed along all non-major roadways on both sides of the street including cul-de-sacs and between properties on long blocks.

B. Design

1. Sidewalks shall generally be constructed of concrete and be 5 foot wide 4" thick, increased to 6" thick at residential driveways (8" on non-residential drive approaches), on compacted sand subgrade.
2. Pathways shall generally be constructed of concrete 6' to 8' wide 4" thick, increased to 6" thick at residential driveways (8" on non-residential drive approaches), on compacted sand subgrade or asphalt 3" on 6" 21AA crushed limestone base.
3. Sidewalks and pathways shall generally be 1.0' from the public right-of-way while maintaining 10' from back of curb.
4. Sidewalk to be a minimum of 2' from above ground facilities. Transitions around fixed objects to be gradual with a general guideline of 20' of length for each 1' of horizontal transition.
5. Deviations around fixed objects may be allowed. Sidewalks around fixed objects should generally be away from the street. In the event of limited right-of-way, easements for sidewalks are acceptable.
6. Elevations – 0.50 feet above top of curb grades except at ramps.
7. Concrete of not less than three thousand (3000) pounds P.S.I. or six (6) sack of cement to each cubic yard must be used, the transit mix delivery slip should so read and be shown to the inspector if so required. The finished concrete shall be troweled and broomed.
8. Cross slope of sidewalk to be 1/4"/foot sloped towards the street.
9. Ramps at intersections – smooth transition with slope not exceeding 1:20, horizontal:vertical. This may require saw cutting of mountable curb to meet the slope requirement.
10. The sidewalk base shall be compacted to 95% of the maximum density (Modified Proctor) prior to placement of the concrete.
11. Sidewalk pattern to be carried through driveways.
12. Dummy transverse joints shall be placed at five (5) feet intervals and the joints shall be finished with a scoring tool.
13. Expansion joints shall be constructed every fifty (50) feet and at the end points of new sidewalks and at connections to existing sidewalks. Where curb is replaced, an expansion

joint shall be placed at the radius point. Sidewalk carried through driveways shall have expansion joints.

14. Concrete shall be laid in one course in acceptable forms and shall be worked and floated so as to give a smooth uniform surface free of holes.
15. No concrete shall be laid until the form installation and sub-base preparation is inspected and approved by the Township.
16. The concrete shall be finished to produce a smooth surface and then lightly broomed to a uniform texture. This broomed finish shall be perpendicular to the walking flow in a straight line. Any other finish is not acceptable.
17. Curing compound shall be sprayed to produce a uniform color white in appearance.
18. Contractor stamps are generally not permitted.
19. Patterned or stamped concrete is generally not permitted.
20. Reference MDOT standard detail R-28-B1 for additional standards of construction.
21. A right-of-way use permit from the Township and/or other agencies to include County Road Commission, MDOT, may be necessary.
22. When sidewalk placement is permitted within the influence of gate valve/manhole covers, castings that allow for vertical movement without adversely impacting the sidewalk shall be installed.
23. Work zone traffic control – see MMUTCD for work zone traffic control devices for vehicles and pedestrians.
24. Applicant shall have adequate insurance coverage for the work being performed.

Soil Erosion and Sedimentation Control

A. General

1. A Soil Erosion and Sedimentation Control Permit must be obtained from the County Enforcing Agent / Municipal Enforcing Agent prior to start of construction.
2. An NPDES permit may be required if land disruption exceeds 5 acres.
3. The Unified Keying System shall be used as a design guideline. If specific details are required they shall be shown on the plans.
4. Soil erosion controls shall be used to prevent silt from entering public roadways, storm sewers and watercourses at all times.
5. Inlet filters shall be used at all drainage structures to prevent sedimentation.
6. All disturbed areas shall receive 4" of topsoil, seeding, fertilizer in accordance with construction specifications.
7. Crushed Aggregate mud mats may be used at the entrance of construction sites where a soil erosion permit is required. All mud tracked upon the roadways/sidewalks must be removed immediately. Wash racks may be required to enhance this effort along with street sweepers.

Traffic Control/safety Standards

General

1. A detailed plan for traffic control shall be provided on projects as determined necessary by the Township. The current MMUTCD shall be referenced for all traffic control plans.
2. All traffic control plans shall be reviewed by the Township as well as any governing authorities having jurisdiction in the construction area.
3. The intent of all traffic control is to limit the duration of any closure to the minimum time required to complete construction as well as to provide as much advance warning as possible while creating minimal confusion.
4. Any traffic control devices left in place overnight shall be lighted and maintained on a regular basis.
5. All excavations and hazardous areas shall be protected by barricades or snow fencing.
6. Show all proposed significant detour proposals on the plans. Additional detours may be necessary during the construction phase with prior approval of the Township.
7. The contractor shall notify the Township of proposed road closures or traffic alterations a minimum of 3 business days in advance. Serving notification does not guarantee approval as the Township coordinates other projects and conflicts may arise.

Insurance Requirements

The following insurance requirements are suggested amounts and shall be used as a guideline only.

Developer's Liability Insurance

The limits of liability for the insurance required by this section shall provide the following coverages for not less than the following amounts or greater where required by Laws and Regulations:

	<u>MINIMUM LIMITS</u>
WORKERS COMPENSATION	
Part One: Compensation	Statutory
Part Two: Employee's Liability:	
accident	\$1,000,000
disease	\$1,000,000
GENERAL LIABILITY ("1973" form)	
Combined Single Limit	\$2,000,000
Each Occurrence Limit	
Combined Single Limit	\$2,000,000
Aggregate Limit	
COMPREHENSIVE AUTOMOBILE LIABILITY	
Bodily Injury-Each Occurrence Limit	\$500,000
Property Damage-Each Occurrence Limit	\$250,000
OR	
Combined Single Limit	\$1,000,000
No Fault	Statutory
OWNER'S AND CONTRACTOR'S PROTECTIVE LIABILITY ("1973" form)	
Bodily Injury-Each Occurrence Limit	\$500,000
Property Damage-Each Occurrence Limit	\$250,000
Property Damage-Aggregate Limit	\$500,000
OR	
Combined Single Limit	\$1,000,000
UMBRELLA or EXCESS LIABILITY	\$1,000,000

The Owner's and Contractor's Protective Liability Insurance shall include the following persons or entities as insureds:

- (1) The Grand Blanc Charter Township and its representatives, officers and employees.
- (2) Engineer

If an Owner's and Contractors protective liability is not required, consider naming the following as additional insureds in the Contractor's liability policy:

- (1) The Grand Blanc Charter Township and its representatives, officers and employees.
- (2) Engineer

Performance Bond

KNOW ALL MEN BY THESE PRESENTS that _____ as Principal, hereafter called Developer, and _____ as Surety, hereinafter called Surety, are held and firmly bound unto Grand Blanc Charter Township as Obligee, hereinafter called Owner, in the amount of _____ Dollars (\$_____)

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Developer has by written agreement dated _____ 20__ entered into a Contract with Owner for _____ in accordance with drawings and specifications prepared by _____ which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

1. The Surety hereby waives notice of any alteration or extension of time made by the Owner.
2. Whenever Contract shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly.
 - a. Complete the Contract in accordance with its terms and conditions, or
 - b. Obtain a bid or bids for submission to Owner for completing the Contract in accordance with its terms and conditions, and upon determination by Owner and Surety of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Contract price", as used in this paragraph, shall mean, the total amount payable by Owner to Contractor under the contract and any amendments thereto, less the amount properly paid by Owner to contractor.

3. Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.
4. No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of Owner.

SIGNED AND SEALED this _____ day of _____ A.D.20__.

In the presence of :

_____(Seal)
Principal

Witness

Title

_____(Seal)

Witness

Title

Maintenance and Guarantee Bond

KNOW ALL MEN BY THESE PRESENTS, That

Developer, as principal and _____ as
surety, are held and firmly bound unto
in the sum of _____ Dollars

(\$ _____) good and lawful money of the United States of America, to be paid to Grand
Blanc Charter Township, its legal representatives and assigns, for which payment well and truly
made, we bind ourselves, our heirs, executors, administrators, successors and assigns, and each
and every one of them jointly and severally, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, A.D., 20__.

WHEREAS, the above named principal has entered into a certain written contract with____, dated
this ___ day of _____, A.D., 20__, wherein the said principal covenanted and agreed as
follows, to wit:

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that by and under
said contract, the above named principal has agreed with the Grand Blanc Charter Township that
for a period of two years from the date of final Township acceptance to keep in good order and
repair any defect in all the work done under said contract either; by the principal or his sub-
contractors, or his material suppliers, that may develop during said period due to improper
materials, defective equipment, workmanship or arrangements, and any other work affected in
making good such imperfections, shall also be made good all without expense to Grand Blanc
Charter Township, excepting only such part or parts of said work as may have been disturbed
without the consent or approval of the principal after the final acceptance of the work, and that
when ever directed so to do by Grand Blanc Charter Township, by notice served WILL
PROCEED at once to make such repairs as directed by Grand Blanc Charter Township; and in
case of failure so to do within one week from the date of service of such notice, or within
reasonable time not less than one week, as shall be fixed in said notice, then Grand Blanc Charter
Township shall have the right to purchase such materials and employ such labor and equipment
as may be necessary for the purpose, and to undertake, do and make such repairs, and charge the
expense thereof to, and receive same from said principal or surety.

If any repair is necessary to be made at once to protect life and property, then and in that case,
Grand Blanc Charter Township may take immediate steps to repair or barricade such defects

without notice to the contractor. In such accounting Grand Blanc Charter Township shall not be held to obtain the lowest figures for the doing of the work, or any part thereof, but all sums actually paid therefore shall be charged to the principal or surety. In this connection the judgment of Grand Blanc Charter Township is final and conclusive. If the said principal for a period of two (2) years from the date of payment of Final Estimate, shall keep said work so constructed under said contract in good order and repair, excepting only such part or parts of said work which may have been disturbed without the consent or approval of said principal after the final acceptance of the same, and shall whenever notice is given as hereinbefore specified, at once proceed to make repair as in said notice directed, or shall reimburse Grand Blanc Charter Township for any expense incurred by making such repairs, should the principal or surety fail to do as hereinbefore specified, and shall fully indemnify, defend and save harmless the Grand Blanc Charter Township from all suits and actions for damage of every name and description brought or claimed against it for or on account of any injury or damage to person or property received or sustained by any party or parties, by or from any of the acts of omissions or through the negligence of said principal, servants, agents or employees in the prosecution of the work included in said contract, and from any and all claims arising under the Workmen's Compensation Act, so-called, of the State of Michigan, then the above obligation shall be void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed by their respective authorized officers this ____ day of _____ A.D., 20__.

Signed, Sealed and Delivered
In the Presence of:

_____	_____ (L.S.)
_____	_____ (L.S.)
_____	_____ (L.S.)

NOTE; Bond must show complete NAME AND ADDRESS OF LOCAL AGENT AND HOME COMPANY.

SECTION 2 CONSTRUCTION SPECIFICATIONS

Water/Sewer Tap Permit Instructions

Requirements

1. Water/Sewer Tap Permit Application Form to be completed by the applicant. (A sample is provided at the end of this section).
2. Required fees for water and sewer taps - to be computed pursuant to fee schedule.
3. Inspection fee will be charged for each water and sewer by the Township to cover associated inspection costs with fee according to current township fee schedule.
4. Township inspection is required for all utility installation. The contractor shall contact the Township inspection division 48 hours prior to the proposed work start date. Approval of the inspection date depends on available inspectors and status of site work amongst other items.
5. Inspector will need to witness water and sewer tap being made and all underground pipe for proper installation and material in accordance with Township specifications.
6. If an inspection is not scheduled, the Contractor performing the work may be required to uncover the utilities at their cost, so an inspection can be done.
7. Water will not be turned on until an inspection has been performed.
8. Deposit and inspection fees will be based upon Township current fee schedule.

FOR A WATER OR SEWER TAP INSPECTION, PLEASE CALL TOWNSHIP TO MAKE ARRANGEMENTS FOR INSPECTION.

APPLICATION FOR WATER/SEWER TAP PERMIT

Grand Blanc Charter Township

No. _____

New Tap Additional Tap Disconnection Replacement

Service

Address: _____

Lot Number: _____

Subdivision: _____

Type of Facility: Single Family Residential Multiple Family Residential (Units ____)
 Office or Commercial Industrial, Government or Institutional

Gross Floor Area of Building (sf): _____

Applicant _____

Billing Address: _____

Contractor

Name: _____

Contractor

License

Number: _____

Street Cut Permit Number: _____

Tap Size: Storm _____ Sanitary _____ Water _____

Number of Connections: Storm _____ Sanitary _____ Water _____

Approximate date of service installation: _____ NOTE: call 810-424-2640 24 hours in advance to schedule inspection.

APPLICANT TO PROVIDE AND FILL IN ALL INFORMATION ABOVE.

OFFICE USE BELOW

Tap

Number: _____

Computation Fees (Sewer) _____

Total: _____

by: _____

(Water) _____

Total: _____

by: _____

INSPECTION REPORT

Type of _____ Tap Made by: _____
Tap: _____
Type of Material _____
Used: _____
Condition of Tap: _____
Condition of Sampling _____
Manhole: _____
Remarks _____

Township Inspection Requirements for Land Development

Definitions

The following definitions apply to the respective terms as they are used in this section

A. Land Improvements

Any paving, grading or filling of land or changing of surface drainage of land and the construction or installation of sanitary sewer, storm sewer, water main or storm water detention basin.

1. Exceptions

- a. Resurfacing of existing areas that do not affect the course of drainage as determined by the township engineer.
- b. Residential driveways.

2. Grading

Any change or alteration of existing ground surface elevations by excavation or filling.

3. Surface Drainage

Any storm water collecting on or flowing over the surface of the ground.

B. Permit Required

No person shall commence land improvements on any parcel of land without having first applied for and received a land improvement construction permit in accordance with this section.

C. Application for Land Improvement Permit

1. Application

- a. Prior to the construction or installation of land improvements on any parcel of land, the owner of such land or an agent having the written authorization of the

owner, shall submit an application for a land improvement permit with the department.

- b. The application shall include the estimated cost of the land improvements, estimated time schedule for construction (number of estimated construction days required), the appropriate plan review fee and plans and specifications.

2. Plans and Specifications

- a. The plans and specifications shall be prepared by and signed and sealed by a professional engineer.
- b. Plans detailing parcel surveys must be signed and sealed by a licensed land surveyor.
- c. Plans shall be prepared on 24" x 36" size sheets and shall generally be drawn to scale of not more than 50 feet to the inch.
- d. The drawings shall contain sufficient detail to properly show the proposed locations and methods of construction or grading.
- e. The Township may require the plans to be drawn to a scale of 20 feet to the inch when deemed necessary for proper review.
- f. Three (3) complete sets of plans and specifications shall be submitted with the permit application.
- g. After completion of the project, as-built plans, in an electronic format and acceptable to the township, must be submitted showing the exact location of all land improvements prior to final approval of the project by the township. These plans must be prepared and certified by the owner's engineer.

D. Duties of Department

Upon receipt of the permit application, plans and specifications, cost estimate and plan review fee, the Department shall transmit copies to the appropriate departments for their review.

E. Review

The Township shall review the plans and specifications and approve the same if they comply with the Township's design and construction standards and meet all site plan review approval requirements. In the event any item does not comply with said standards, the plans shall be returned to the landowner or agent, with notations as to any deficiency. The land developer or owner shall resubmit the required number of copies of corrected plans directly to the Township Engineer. Upon approval of the plans and specifications, the Township shall notify the owner or agent of such approval.

F. Issuance of Permit

Following approval of the plans and specifications, a land development construction permit will be issued upon receipt of the following:

1. Inspection fees, as required herein.

2. Performance Bond.
3. All approvals and/or permits from other governmental agencies having jurisdiction if applicable.

G. Inspection

No land improvements shall be undertaken without township inspection. Any facilities installed without inspection may be required to be removed and reinstalled at the owner's expense, with proper township inspection.

H. Inspection Fees

Inspection fees shall be deposited with the township to cover the inspection costs. Deposit shall be based on estimated construction schedule provided by applicant. A set hourly rate will be provided to the applicant in relation to inspection costs.

In the event the developer exceeds the estimated time, the developer shall be billed at the hourly rate. Any unused portion of the fee shall be returned to the applicant at the completion of the project. If the deposit is used up prior to completing the project, the township may require the applicant to deposit an additional amount based on an estimated construction schedule provided by applicant, to finalize the project. The township may require receipt of the deposit prior to allowing construction to continue.

I. Performance Bond

The owner or contractor shall post a performance bond in the name of the township and guaranteeing completion of land improvements. The amount of the bond shall be equal to the construction cost.

**APPLICATION AND PERMIT
FOR LAND DEVELOPMENT
GRAND BLANC CHARTER TOWNSHIP**

(Print in ink or type)

DO NOT WRITE IN THIS SPACE	
PERMIT NO.	
APPL. DATE	DATE ISSUED
BOND NO.	BOND AMOUNT
	\$

APPLICANT'S NAME	CONTRACTOR'S NAME (INDIVIDUAL COMPANY, ETC.)
MAILING ADDRESS	MAILING ADDRESS
TOWNSHIP ZIP	TOWNSHIP ZIP
STATE	STATE
TELEPHONE NO.	TELEPHONE NO.

REQUEST: I do hereby make application for a permit to perform land improvements at the following location:
(Give distance & direction from nearest main intersection)

For a period _____ and ending _____ ; for the commencing _____

following purposes (provide a detailed description of the activity):

Estimated days of construction: _____ Estimated cost of land improvements: \$ _____

Plan review fee (1% of estimated construction cost or \$750, whichever is greater) \$ _____

Construction plans and specifications shall be provided with permit.

Applicant's Signature _____ Title _____ Date _____

Authorized Agent Signature _____ Date _____
(I hereby certify that I am acting as authorized agent on behalf of the named applicant.)

APPROVED FOR GRAND BLANC CHARTER
TOWNSHIP BY: _____

DAT
E _____

NOTICE OF COMPLETION

The Notice of Completion was
received: _____

By: _____

FINAL INSPECTION REPORT

	Yes	No
Work covered by permit has been completed satisfactorily	<input type="radio"/>	<input type="radio"/>
Recommend performance bond be released	<input type="radio"/>	<input type="radio"/>
Have all other charges been paid?	<input type="radio"/>	<input type="radio"/>

Remarks: _____

INSPECTED BY:

BY: _____

DATE _____

CERTIFICATE OF FINAL INSPECTION

ISSUANCE
DATE _____

BY: _____

Adjusting/Reconstructing Structure Covers

Adjusting Structure Covers

A. General

Adjusting covers shall apply where the elevation of the cover is not changed more than 6" and no other alterations are necessary.

The Contractor shall adjust drainage structure covers where shown on the plans or directed by the Township. On projects where drainage structure covers are to be adjusted to meet a new bituminous surface, final adjustment shall be made after all base and leveling courses have been constructed, if any, and just before the final wearing course is placed.

B. Execution

Adjustment of covers shall be made by adding or removing grade rings, block, or brick. Concrete grade rings, block, or brick shall be set in mortar. Joints shall be struck and properly pointed and the exposed surfaces shall be true and smooth. The entire exterior or the new structure shall be plastered with 1/2" of mortar.

Adjusting Water Shut-off Valve Covers

Valve boxes shall be raised to the proposed finish grade. These valve boxes are of the screw type. Extensions may be required and they will be approved by the Township. Any excavation required shall be filled with 3500 psi concrete.

A. Reconstructing Structures

1. General

- a. Reconstructing covers shall apply where the elevation of the cover is changed more than 6" or other alterations are necessary.
- b. The Contractor shall reconstruct the drainage structure to conform to the details shown on the plans. Where reconstruction to the top of footing is necessary, the work shall be considered a new structure.

2. Execution

Reconstruction of structure shall be made by adding or removing grade rings, block, or brick. Concrete grade rings, block, or brick shall be set in mortar. Joints shall be struck and properly pointed and the exposed surfaces shall be true and smooth. The entire exterior or the new structure shall be plastered with 1/2" of mortar.

Bituminous Paving

Materials

A. Bituminous Mixtures

Materials shall meet the requirements of the latest MDOT Standard Specifications for Construction.

Bituminous mixtures and application rates shall be as shown on the plans.

B. Aggregate

Aggregate for base under a proposed bituminous pavement shall meet the requirements for either Series 22A or 23A aggregate, as specified in the latest MDOT Standard Specifications for Construction, unless noted otherwise on the plans or in the proposal.

Construction of Bituminous Pavements

A. Equipment

Equipment shall meet the requirements of the latest MDOT Standard Specifications for Construction.

B. Preparation of Aggregate Base (for pavements constructed on an aggregate base)

An aggregate base, of the thickness shown on the plans, shall be constructed on a prepared subgrade. The subgrade shall be free of unstable or yielding soils or organic material and shall be compacted to at least 95 percent of its maximum density as determined by ASTM D1557. Unstable, yielding, and organic soils shall be excavated and replaced with suitable soil.

The aggregate base shall be constructed of aggregate meeting the requirements of Series 23A aggregate as specified in the Latest MDOT Standard Specifications for Construction, unless another aggregate is called for on the plans in the project specifications, or directed by the Township. The aggregate shall be placed in lifts not less than three (3) inches nor more than six (6) inches and compacted to at least 95 percent of its maximum density as determined by the One Point Michigan Cone Test, as described in the MDOT Density Control Handbook. The finish grade of the aggregate shall be graded and shaped to the dimensions and elevations required within a tolerance of 3/4 inches.

C. Preparation of Existing Pavement (for overlays)

Catch basins, manhole covers, valve boxes, and water shutoffs shall be adjusted before placement of the surface course.

The existing pavement surface shall be thoroughly cleaned of all dirt and debris. Joints and cracks in the existing pavement shall be cleaned of all dirt and debris. The Contractor shall not place any pavement courses until the existing surface has been inspected and approved by the Township.

Existing bituminous patches with a high bituminous content which may cause bleeding or instability, as determined by the Township, shall be removed. Holes, depressions, cracks, and removed patches shall be patched with bituminous material, flush with the existing pavement.

A bituminous bond coat shall be uniformly applied in advance of paving using a pressure distributor. The rate of application shall be as specified by the Township; the rate will be between 0 and 0.10 gallons per square yard.

Paving shall not be placed until the bond coat has cured.

D. Transportation of Mixtures

Transportation of mixtures shall meet the requirements of the latest edition of the Michigan Department of Transportation Standard Specifications for Construction.

E. Placing Bituminous Pavement

Construction procedures shall meet the requirements of the latest edition of the Michigan Department of Transportation Specifications for Construction.

F. Weather and Seasonal Limitations

Neither bituminous mixtures nor bond coats are to be placed when rain is threatening nor when the moisture on the surface would prevent satisfactory bonding.

Bituminous pavements shall not be constructed before May 5 nor after November 15 unless otherwise approved by the Township. The temperature, as measured in the shade, shall exceed the following before placing bituminous pavements.

Temperature of Surface being Overlaid, Degree F	Thickness of Proposed Bituminous Pavement, lbs/sy
50	Less than 120
40	120 to 200
35	More than 200

Developer shall provide bond for final bituminous wearing course to allow majority of building to be completed prior to placing wearing course. Final wearing course shall be placed within two years after leveling course is applied.

Cleanup and Restoration

General

The Contractor shall restore areas disturbed by construction activities to the same condition before the project, unless shown otherwise on the plans. Restoration work should be performed as soon as possible after construction work is completed in a particular area per acceptable seasonal periods as required by MDOT.

Upon the completion of work in an area, all excess materials, debris, equipment, and similar items shall be removed from the project area by the Contractor, and disposed of properly.

Materials

A. Topsoil

Topsoil shall be dark, organic, natural soil suitable for sustaining vegetation. Topsoil shall be screened to remove any debris and foreign matter. Topsoil from outside of the grading limits shall be approved by the Township.

B. Seed

Seed mixtures shall meet the requirements for purity and germination as specified in the proceedings of the association of official seed analysis, rules for testing seeds.

Seed shall be supplied in durable bags with a tag specifying the supplier, lot number, net weight, purity, germination and mixture proportion.

Seed mixture shall be composed of certified seed of the purity, germination and proportions by weight shown below.

Seed	Minimum Purity	Minimum Germination	Mixing Proportions
Kentucky Blue Grass	98%	80%	30%
Perennial Rye Grass	96%	85%	20%
Creeping Red Fescue	97%	85%	50%

C. Fertilizer

Fertilizer shall be ready mixed granular chemical fertilizer containing equal amounts by weight of available nitrogen (N), readily available phosphorus acid (P205), and total available potash (K20) mixed with not less than 40% by weight filler.

Fertilizer shall be supplied in suitable bags, with the net weight of the contents and guaranteed analysis shown therein, or in bulk with certification of the fertilizer analysis and net weight of the shipment.

Execution

A. Restoration

Unless otherwise provided; aggregate surfaces, bituminous pavements, and concrete pavements shall be restored by construction of similar replacement surfaces. Aggregate surfaces shall be replaced with the materials and thicknesses described in the specification for aggregate surfaces. Bituminous pavement shall be replaced with the cross sections(s) shown on the plans and in accordance with the specification for bituminous paving. Concrete pavement shall be replaced with pavement in accordance with the specification for Concrete Driveways and Miscellaneous Pavement.

Turf areas shall be restored by re-establishing the turf as described in the specification. All areas disturbed by construction that are not to be surfaced with aggregate or pavement shall be restored with 4" of topsoil, fertilized and seeded.

Turf areas to be seeded shall be properly graded, sloped, and shaped with an allowance for the thickness of the topsoil layer. The earth bed upon which topsoil will be placed shall be friable to a depth of at least four inches. Earth beds not in a friable condition shall be harrowed with a disk, spring tooth drag, or similar equipment.

After 4" of topsoil has been spread on a prepared area, any large clods or lumps shall be broken and all stones larger than 1-inch diameter, rocks, roots, litter and other foreign debris shall be raked up and disposed of.

B. Placement of Fertilizer, Seed, and Mulch

Fertilizer shall be evenly applied at a rate, which will provide 240 pounds per acre of chemical fertilizer nutrients, in equal proportions of Nitrogen, Phosphoric Acid, and Potash.

Seed mixtures shall be applied at a uniform rate of 150 pounds per acre. Areas where a visual inspection fails to yield an average of two seeds per square inch shall be reseeded at the Developer's expense.

When seed, fertilizer, and mulch are to be applied hydraulically, they shall be mixed in the specified proportions with water to produce slurry and then uniformly applied under pressure at the specified rates on the areas to be restored with turf. When wood cellulose mulch materials are used, it shall be added after the seed and fertilizer have been thoroughly mixed.

The mixture shall be constantly agitated from the time they are mixed until they are applied. Mixtures shall be applied within eight hours of mixing.

If mulch adhesives are used, the Developer shall protect signs, traffic, structures, and other objects from being marked or disfigured by the adhesive material. Mulch adhesives shall be applied by spraying simultaneously or immediately following the mulch application. Asphalt emulsion adhesives shall be applied at a rate of 150 gallons/acre; latex based adhesives shall be applied at a rate of 400 gallons/acre.

If mulch net is used to anchor the mulch, the net shall be spread over the mulch layer and secured with staples driven into the ground. The net shall not be held in contact with the ground.

The Developer shall thoroughly water the earth beds and seeded areas at such times, in such locations, and in such amounts as may be required to obtain good growth. Areas where turf does not become well established shall be reworked by the Developer. Areas that produce sparse turf growth shall be reworked, reseeded and mulched until turf has been established.

Mailboxes, fences, signs, ornaments, and similar items shall be replaced at the completion of construction. Posts shall be installed plumb. Items that are lost or stolen shall be repaired or replaced at the Contractor's expense. Repairs or replacements shall meet the Township's approval.

C. Temporary Restoration of Driving Surfaces

Where a pavement or gravel surface is removed as a result of construction activities, a temporary surface shall be provided and maintained by the Developer until the permanent surface is provided. Unless otherwise directed, the temporary surface shall be twelve (12) inches of aggregate compacted to at least 95 percent of its maximum density (ASTM D1557) and graded to meet the adjacent, remaining surfaces. Aggregate shall meet the requirements of Series 23A as described in the latest Michigan Department of Transportation Specifications.

The Contractor shall regrade the temporary surface and add additional aggregate at intervals necessary to maintain them in a relatively smooth condition.

Trees and Landscaping

Review

Trees and landscaping requirements are found in the Township Zoning Code Ordinance and review may be required by the Township Planner. All landscaping shall be shown on the proposed utility plans. Conflicts between utilities and plantings shall be reviewed on a case by case basis.

Installation

Trees/landscaping shall be installed in a sound workman line manner and conform to the American Standard for Nursery Stock ANSIZ60.1. If building or paving construction is completed during a planting season, then no certificate of occupancy will be issued unless the landscaping meets the requirements herein provided. If building or paving construction is completed in an off planting season, the certificate of occupancy will be issued only after the developer provides a performance bond to ensure installation of required landscaping in the next planting season.

Material Removal

Tree stakes, guy wires and tree wrap are to be removed after one year.

Maintenance

Plant materials shall be maintained in a healthy growing condition, neat and orderly in appearance. If any plant material dies or becomes diseased, they shall be replaced within thirty (3) days of written notice from the Township or within an extended time period as specified in said notice.

Concrete Curb and Gutter

General

A. Work Included

This work includes all preparation, forming, concrete production and placement, finishing, jointing, reinforcing, curing, protection, and restoration for the construction of concrete curb and gutter.

The concrete curb and gutter shall be constructed substantially in accordance with the cross section provided on the Township approved plans.

Curb and gutter may be constructed either by slip-forming or using fixed forms.

Products

A. Materials

1. Portland cement shall meet the requirements of ASTM C150.
2. Coarse aggregate shall meet the requirements of Class 6A aggregate as described in the latest Michigan Department of Transportation Specification for Construction.
3. Reinforcing steel shall be grade 60 steel bars meeting the requirements ASTM A615, A616, or A617.
4. White membrane curing compound shall conform to ASTM C309, Type 2, Class B vehicle.
5. Fiber joint filler shall meet the requirements of ASTM D1751.

B. Mixtures

Concrete for driveways and miscellaneous pavements shall be transit mixed concrete in accordance with ASTM C94.

Air content shall be 4-6%, slump shall be 1-4 inches, and compressive strength shall be at least 3500 psi after 28 days. Concrete shall contain at least six sacks of cement per cubic yard of concrete.

Execution

A. Removal of Existing Curb and Gutter

Where the proposed curb and gutter is to replace existing curb and gutter, the existing curb and gutter shall be removed in accordance with the requirements for pavement removal, included elsewhere in these documents.

B. Preparation

The base shall be excavated, filled, and shaped as required to construct the proposed curb and gutter at the elevations and alignment required. The base shall be compacted to at least 95% of its maximum unit weight as determined by ASTM D1557. Soft and yielding material shall be excavated and replaced with suitable soils.

Forms, if used, shall extend the full depth of the concrete. Face forms for the exposed curb face are not required. Forms shall be of sufficient strength and staked to prevent springing or yielding after placement of concrete. Flexible forms capable of making a smooth arc shall be used for curved sections.

Steel reinforcement shall be placed as shown on the plans. Reinforcing shall be spliced and held in place in a manner approved by the Township. Splices shall be overlapped by 10 inches.

C. Placing Concrete

Concrete shall not be placed until the forms or the prepared grade (if slip forming) have been inspected by the Township. Concrete shall be deposited to the full depths and spaded or vibrated to ensure proper consolidation.

Joints shall be constructed perpendicular to the surfaces and shall not vary more than 1/4 inch from their designated position. Contraction joints shall be spaced at 50 foot intervals and shall be at least 1/4 the thickness of the section. Steel reinforcing shall not extend through contraction joints. Expansion joints shall be constructed at spring points, at intervals not exceeding 400 feet, and 10 to 50 feet each side of a drainage structure. Expansion joints shall be 1 inch thick and extend through the full cross section of the curb and gutter. Plane-of-weakness joints shall be provided at uniform spacing, not exceeding 10 feet. Plane-of-weakness joints shall extend through at least 1/4 the thickness of the section.

The edges of the gutter, the back of the top edge of curb, and all transverse joints shall be rounded with a finishing tool having a radius of 1/4 inch. The face of the curb, at the top and bottom, shall be shaped with suitable tools to provide the required radius.

Any material required to fill low spots shall be obtained from the mixture used in the work. Exposed surfaces shall be finished smooth and even by means of a moistened wood float, followed by light brushing.

The gutter and top of curb shall not vary more than 3/16 inch in 10 feet when using a 10 foot straight edge. Other surfaces shall not vary more than 3/8 inch in 10 feet.

Water shall not be added as an aid to finishing.

Exposed concrete surfaces shall be cured using white membrane curing compound applied uniformly at a rate of 200 square feet per gallon. Curing compound shall be applied regardless of temperature or humidity conditions.

D. Protection

Concrete shall not be placed until the air away from artificial heat is at least 25 °F and rising. Concrete shall be protected from damage by freezing or precipitation.

The Contractor shall provide barricading and security as necessary to protect fresh concrete from accidental damage or vandalism. Damaged concrete shall be removed to a joint and replaced at the Contractors expense.

E. Cleanup and Restoration

Forms shall be removed when the concrete has attained sufficient strength. After removal of forms, the curb and gutter shall be backfilled.

Areas to be restored with turf shall be backfilled with suitable soil, compacted, and surfaced with three inches of topsoil such that the topsoil surface is flush with the top of curb. Areas to be surfaced with pavement or sidewalk shall be backfilled with sand to the bottom of the proposed pavement, sidewalk, or base, and compacted.

Where curb and gutter is constructed adjacent to an existing pavement, the void between the curb and gutter and the pavement shall be filled full depth with material in kind as the existing pavement.

Concrete Drives and Miscellaneous Concrete Pavement

General

A. Work Included

This work includes all preparation, forming, concrete production and placement, finishing, jointing, reinforcing, curing, protection, and restoration for the construction of concrete driveways and miscellaneous concrete pavement.

B. Minimum Driveway Cross Sections

Driveways shall be constructed of concrete to the following minimum cross sections, unless otherwise directed.

1. Commercial or industrial driveways, subject to heavy truck traffic: 8" thick reinforced with 6" x 6" x#10 steel mesh.
2. Residential driveways: 6 inches thick.

Products

A. Materials

1. Portland cement shall meet the requirements of ASTM C150.
2. Coarse aggregate shall meet the requirements of Class 6A aggregate as described in the latest Michigan Department of Transportation Specifications for Construction.
3. Reinforcing steel shall be grade 60 steel bars meeting the requirements of ASTM A615, A616, or A617.
4. White membrane curing compound shall conform to ASTM C309, Type 2, Class B vehicle.
5. Fiber joint filler shall meet the requirements of ASTM D1751.

B. Mixtures

Concrete for driveways and miscellaneous pavements shall be transit mixed concrete in accordance with ASTM C94.

Air content shall be 4-6%, slump shall be 1-4 inches, and compressive strength shall be at least 3500 psi after 28 days. Concrete shall contain at least six sacks of cement per cubic yard of concrete.

Execution

A. Coordination of Traffic

Hazardous areas shall be barricaded to protect pedestrian and vehicular traffic.

Work shall be scheduled so that access is maintained to driveways and entrances through the project area to the extent possible. Where a driveway or entrance must be closed for a period, the property owner or occupant shall be notified in advance of the closing.

B. Preparation

The base shall be excavated, filled, and shaped as required to construct pavement of the required thickness at the proposed grades and alignment. The base shall be compacted to at least 95% of its maximum unit weight as determined by ASTM D1557. Soft and yielding soils shall be excavated and replaced with suitable soils.

Forms shall extend the full depth of the concrete. Forms shall be of sufficient strength and staked to prevent springing or yielding after placement of concrete.

Where steel reinforcement is used, it shall be spliced and held in place in a manner approved by the Engineer. Splices shall be overlapped by ten inches.

C. Placement of Concrete

Concrete shall not be placed until the forms have been inspected by the Township.

Concrete shall be deposited to the proper depth and spaded or vibrated to ensure proper consolidation.

Joints shall be constructed perpendicular to surfaces and shall not vary more than 1/4 inch from their designated position. Transverse plane-of-weakness joints shall be placed at intervals not exceeding ten feet.

In irregularly shaped areas, joints shall be perpendicular as much as possible.

Expansion joints shall be constructed using 1/2-inch fiber joint filler as follows:

1. At intervals not exceeding 50 feet.
2. At fixed objects such as curbs, sidewalks, and buildings.
3. At intersections and changes in direction.
4. Between sidewalks and driveways.

Any material required to fill low spots shall be obtained from the mixture used in the work. Exposed surfaces of the concrete slab shall be finished smooth and even by means of a moistened wood float, followed by a light brushing perpendicular to sidewalk. Water shall not be added to the concrete surface as an aid to finishing. The top edges of the slab and all transverse joints shall be rounded with a finishing tool having a radius of 1/4 inch. Pavement surfaces shall not vary more than 3/8 inch from the alignment and typical cross section.

Exposed concrete surfaces shall be cured using white membrane curing compound applied uniformly at a rate of 200 square feet per gallon. Curing compound shall be applied regardless of temperature or humidity conditions.

D. Protection

Concrete shall not be placed unless the temperature of the air away from artificial heat is at least 25°F and rising. Concrete shall be protected from damage caused by freezing or rain.

The Developer shall provide sufficient barricading and security to protect fresh concrete from accidental damage or vandalism. Damaged concrete shall be removed to a joint and replaced at the Developer's expense.

E. Cleanup

After the concrete has attained sufficient strength, the forms shall be removed.

Concrete Sidewalks

General

A. Work Included

This work includes all preparation, forming, concrete production and placement, finishing, jointing, reinforcing, curing, protection, and restoration for the construction of concrete sidewalks meeting current American with Disability (ADA) requirements for slope.

B. Minimum Sidewalk Cross Sections

Sidewalk shall be constructed to the following minimum cross sections, unless otherwise directed.

1. Sidewalk through commercial or industrial driveways, subject to heavy truck traffic: 8" thick reinforced with 6" x 6" x#10 steel mesh.
2. Sidewalk through other driveways: 6 inches thick.
3. Sidewalk ramps: 6 inches thick.
4. All other sidewalk: 4 inches thick.

Products

A. Materials

1. Portland cement shall meet the requirements of ASTM C150.
2. Coarse aggregate shall meet the requirements of Class 6A aggregate as described in the latest Michigan Department of Transportation Specifications for Construction.
3. Reinforcing steel shall meet the requirements of ASTM D1751. Steel shall be grade 60.
4. White membrane curing compound shall conform to ASTM C309, Type 2, Class B vehicle.

B. Mixtures

Concrete for sidewalks shall be transit mixed concrete in accordance with ASTM C94.

Air content shall be 4-6%, slump shall be 1-4 inches, and compressive strength shall be at least 3500 psi after 28 days. Concrete shall contain at least six sacks of cement per cubic yard of concrete.

Construction Requirements

A. Coordination of Traffic

Hazardous areas shall be barricaded to protect pedestrian and vehicular traffic.

Work shall be scheduled so that access is maintained to driveways and entrances through the project area to the extent possible. Where a driveway or entrance must be closed for a period, the property owner or occupant shall be notified in advance of the closing.

B. Preparation

The base shall be excavated, filled, and shaped as required to construct pavement of the required thickness at the proposed grades and alignment. The base shall be compacted to at least 95% of its maximum unit weight as determined by ASTM D1557. Soft and yielding soils shall be excavated and replaced with suitable soils.

Forms shall extend the full depth of the concrete. Forms shall be of sufficient strength and staked to prevent springing or yielding after placement of concrete.

Sidewalk transverse slopes shall not exceed 1/2 inch per foot. Transverse slopes less than 1/4 inch per foot shall not be used unless longitudinal drainage is provided. Longitudinal grades shall not exceed one inch per foot.

Sidewalk ramps shall be constructed at intersections where the sidewalk intersects a curb and where otherwise directed. Ramps shall not be steeper than one inch per foot.

Where steel reinforcement is used, it shall be spliced and held in place in a manner approved by the Township. Splices shall be overlapped by ten inches.

C. Placement of Concrete

Concrete shall not be placed until the forms have been inspected by the Township.

Concrete shall be deposited to the proper depth and spaded or vibrated to ensure proper consolidation.

Joints shall be constructed perpendicular to surfaces and shall not vary more than 1/4 inch from their designated position. Transverse plane-of-weakness joints shall be placed at intervals equal to the width of the sidewalk, except as follows.

1. Where the sidewalk abuts an existing sidewalk, joints shall coincide.
2. Joint spacing shall not exceed six feet.
3. In irregularly shaped areas, joints shall be perpendicular as much as possible.
4. Individual slab size shall be between 16 square feet and 36 square feet, as much as possible.

Expansion joints shall be constructed using 1/2 inch fiber joint filler as follows:

1. At intervals not exceeding 50 feet.
2. At fixed objects such as poles, stairs, manholes, drain inlets, curbs, and buildings.

3. At intersections and changes in direction.

Any material required to fill low spots shall be obtained from the mixture used in the work. Exposed surfaces of the concrete slab shall be finished smooth and even by means of a moistened wood float, followed by a light brushing perpendicular to sidewalk. Water shall not be added to the concrete surface as an aid to finishing. The top edges of the slab and all transverse joints shall be rounded with a finishing tool having a radius of 1/4 inch. Pavement surfaces shall not vary more than 3/8 inch from the alignment and typical cross section.

Exposed concrete surfaces shall be cured using white membrane curing compound applied uniformly at a rate of 200 square feet per gallon. Curing compound shall be applied regardless of temperature or humidity conditions.

D. Protection

Concrete shall not be placed when the air temperature is less than 25 degrees F. Concrete shall be protected from damage caused by freezing or rain.

The Contractor shall provide sufficient barricading and security to protect fresh concrete from accidental damage or vandalism. Damaged concrete shall be removed to a joint and replaced at the Contractor's expense.

E. Cleanup

After the concrete has attained sufficient strength, the forms shall be removed.

F. Standard Details

See attached Standards for typical sidewalk details.

Developer shall submit bond for sidewalk construction to require sidewalk to be installed within two years after completion of infrastructure. Allow sidewalk to be constructed as homes are constructed; however, if homes are not complete within a two year period, all remaining sidewalk shall be constructed as required in approved construction plans.

Culverts

General

This work includes constructing new culverts of the size and type shown on the plans. Excavation, laying and jointing the pipe, and backfilling are included.

Materials

Culverts shall be of the size(s) shown on the plans. Materials shall be one of the following unless a specific type, class, or thickness is called for on the plans or in the proposal.

A. Corrugated Galvanized Steel Pipe

Corrugated galvanized steel pipe with circular cross-section and reformed corrugated galvanized steel pipe with pipe-arch shape shall conform to the requirements of AASHTO M-36. The Developer shall furnish the Township with two copies of a certification of compliance with the chemical requirements of the base metal, as specified in AASHTO M-36.

Corrugated metal pipe culverts shall be provided in accordance with the following table, unless a particular gage is specifically called for on the approved plans.

Round Pipe Size or Arch Pipe Span	Minimum Gage Acceptable with 2-2/3" x 1/2" Corrugations	Minimum Gage Acceptable with 3" x 1" Corrugations
12"	16	
15"	16	
18"	16	
21"	16	
24"	16	
30"	14	
36"	14	16
42"	14	14
48"	12	14
54"	10	14
60"	8	12

For pipe arch shapes, minimum thickness shall be based on the next larger size if the actual span dimension is not listed.

B. Culvert End Sections

Culvert end sections shall be flared and beveled to conform with ditch slopes.

Metal end sections shall conform with AASHTO M36, where applicable. The metallic coating on the end sections shall be the same as on the pipe. End sections shall be furnished

complete with coupling bands or hardware necessary for connecting them to the end of the pipe culvert.

Construction Methods

A. Excavation and Bedding

The Developer shall call MISS DIG (1-800-482-7171) to arrange for staking of underground utilities in advance of performing any excavation.

The Developer shall excavate to the depths indicated on the plans material of whatever nature is encountered. Existing pipes that are to be replaced, headwalls, rip rap, and similar items may be encountered in addition to soil.

Where unsound material underlying the proposed culvert is encountered, the Township shall be notified immediately. If in the Township's opinion the material is unsuitable, the Contractor shall remove the material to the limits defined by the Township. The unsuitable material shall be replaced to the grade of the proposed culvert with sand, compacted in 10 inch lifts to at least 95% of its maximum unit weight (ASTM D 1557). If required by the Township, any unsuitable material below the proposed culvert will be excavated and replaced with compacted sand.

Culvert bedding shall be constructed in accordance with the details shown on the plans. Where rock or hardpan is encountered, the trench shall be undercut four inches and a sand bedding, compacted to 95% of its maximum unit weight (ASTM D 1557) shall be provided. In stable soils, the soil under the pipe shall be hand excavated and shaped to fit the surface of the pipe. The excavation shall be to a depth necessary to support the bottom 1/4 of the pipe circumference.

The area at each end of the pipe shall be excavated and shaped to provide a smooth transition to the adjacent ditch or swale.

B. Special Requirements for Corrugated Steel Pipe Culverts

1. Repair of Damaged Galvanized Surfaces:

The Contractor shall take special care when removing salvaging, storing, handling, or placing new culverts or culverts that are to be relayed so that they are not dented, scraped, or the galvanized coating is otherwise damaged.

Large diameter or long culverts shall be provided with shop attached lift rings to facilitate handling. Lift holes shall not be cut in corrugated steel pipe.

Saw cut ends of corrugated steel pipe shall be reasonably free from excessive jagged burrs or sharp spurs.

Surfaces on which the coating has been damaged, whether by transporting, handling, or installation, shall be repaired thoroughly cleaned by wire brushing and then painted with two (2) coats of zinc rich paint conforming to federal specification: Paint, High Zinc Dust Content, Galvanizing Repair (Ready Mixed Type), MIL-P-21035.

2. Laying and Jointing Pipe:

All pipe shall be laid true to the lines and grades given. Each length shall have full, firm bearing throughout its length.

Separate sections of corrugated pipe shall be securely joined together with standard corrugated metal bands. The bands may be up to two standard thicknesses lighter than the culvert, but shall not be less than 0.64 inches (16 gage). Bands for culverts shall not be less than the following widths:

<u>Pipe Diameter</u>	<u>Band Minimum Width</u>
up to & including 18"	7 inches
21" through 60"	12 inches
over 60"	24 inches

The corrugations of the band shall match those of the pipes being joined. The band shall be secured with bolts and angles. Couplings may be either one piece or two pieces. Smooth coupling bands, dimpled bands, and helical-rod and lug bands will not be considered acceptable.

C. End Sections

End sections shall be attached to the ends of pipe culverts, where directed. Metal end sections shall be used on metal culverts and on smooth lined plastic pipe culverts. Concrete end sections shall be used on concrete pipe culverts. Metal end sections may be used on concrete pipes if sized larger than the outside diameter of the pipe.

End sections shall be installed on firm ground. The slope adjacent to the end section shall be graded and shaped to meet the geometry of the end section.

D. Backfill

Backfill shall be placed evenly and alternately on each side of the pipe. Backfill shall be placed in 8 inch lifts and hand compacted to at least twelve inches over the crown of the pipe. Backfill material shall be sand and shall be compacted to at least 95% of the maximum unit weight (as determined by ASTM D 1557).

Backfill above 12 inches above the top of the pipe shall be sand and shall be compacted to 95% of its maximum unit weight (ASTM D 1557).

The Contractor shall provide a sufficient cushion of earth over culvert to protect it from damage if heavy equipment will be operated over it before backfilling and surfacing is complete.

In any case, pipe that is broken, bent, or otherwise damaged by the Developer's operations shall be removed and replaced, at the Developer's expense.

E. Cleanout

The Developer shall maintain all existing and proposed culverts free of sediment and debris until final acceptance.

Edge drain

General

This work shall consist of constructing edge drains, including excavation and backfilling, as described herein.

Materials

A. Pipe

Corrugated plastic pipe used for edge drains shall be perforated uniformly along the length and circumference and shall be wrapped in geotextile. Corrugated plastic pipe used for edge drain outlet shall be non-perforated. Corrugated plastic piping shall meet the requirements of AASHTO M 252 for polyethylene piping.

B. Geotextiles

Geotextile wrapped edge drain shall be packaged and delivered in ultraviolet resistant wrapping, and in addition, shall be stored and handled carefully and in accordance with manufacturer's recommendations. Torn, deteriorated, or punctured geotextiles shall not be used unless repaired to the satisfaction of the Township. See Section 8.09 of the latest edition of Michigan Department of Transportation Standard Specifications for Construction for the Geotextile Technical requirements.

Execution

A. Utility Notification

The Developer shall be responsible for contacting, coordinating, and working with the utility companies such that the project proceeds in an orderly and productive manner. The Developer is also responsible for protecting the existing utilities. Changes resulting from damaged utilities are to be incurred by the Developer.

B. Excavating the Trench and Laying Under drain

All edge drains shall have the trench excavated and the material removed from the trench area by a wheel or chain trencher or other positive volume removal method(s) approved by the Township. The trench shall be constructed to the dimensions shown on the plans. The trench for the edge drain shall be constructed after the sub-base has been placed and compacted.

Plastic pipe, or geotextile wrapping which has deteriorated due to ultraviolet exposure (sunlight) during storage or has been damaged in placing will be rejected.

Backfill material for excavated trenches shall be placed on sections of edge drain only after that section has been approved by the Township for backfilling.

Edge drains shall be backfilled as shown on the approved plans. The granular material shall be carefully placed around the pipe until the drain is completely covered to a depth of at least 12 inches. The remainder of the backfill shall be placed in layers not exceeding 12 inches in depth, unless otherwise approved, and compacted to at least 95 percent of maximum unit weight.

The edge drain outlet shall be laid to a minimum slope of 2 percent. The outlet trench shall not be backfilled until the Township has inspected and approved the outlet. The outlet shall be temporarily secured or the outlet end section placed so that positive drainage of the system is available after outlet construction.

The outlet ending shall be located as shown on the plans or as directed by the Township. All outlet endings shall be fitted with a rodent screen.

Edge drains installed on the project shall be maintained and shall be reasonably free from accumulations of silt, debris, and other foreign matter at the time of final acceptance.

Pavement Removal and Restoration

General

A. Work Included

This work includes removal of an existing pavement, including streets, driveways, sidewalks, curb and/or gutter, and parking areas. For purposes of the work "pavement removal", pavement may include bituminous, concrete, or brick.

Execution

A. Pavement Removal (including curb and gutter removal)

Pavement shall be removed to an existing joint or to a sawed joint. An existing crack is not suitable for the limit of removal. Sawed joints for pavement removal are to be either parallel or perpendicular to the longitudinal centerline. Sawed joints shall extend substantially through the full thickness of the pavement so that a "clean break" is made and that the adjacent pavement or structures that are to remain are not damaged. If adjacent pavement or structures that are to remain are damaged as a result of the developer's removal operations, they shall be replaced to the Township's satisfaction at the Developer's expense.

Broken concrete, bituminous, brick, and other debris resulting from pavement removal operations shall become the Developer's property and disposed of properly by him.

Where pavements are encountered that are composed of more than one material or multiple courses of the same material, the pavement shall be removed in its entirety and all components shall be considered part of the same pavement area.

The Developer shall provide sufficient barricades and fences to protect pedestrians and vehicles from hazardous areas.

B. Restoration

The Developer shall provide the Township with a detailed list of pavement cut locations. Prior to starting any restoration work in the right-of-way, the Township will paint the limits of all areas to be replaced. The Developer shall use the details at the end of this section for repair guidelines.

All disturbed areas below the road base shall be backfilled with granular material (MDOT Class II) compacted in 1 foot lifts to 95% of maximum unit of weight. Compaction testing shall be performed by a Certified Testing Company with written results submitted to the Township.

Flowable fill may be used as an alternative to granular fill provided that maximum compaction is obtained (see flowable fill specification later in this section).

Contractor shall maintain traffic using an approved traffic control plan during all restoration work.

Excavated material may not be used as backfill material.

Pavement replacement shall be according to bituminous paving specifications. Cross sections shall meet or exceed the existing cross sections.

The Developer shall coordinate inspection of daily repairs with the Township.

All roadway surface, shoulders and curbs adjacent to the work area must be cleared of spoils and resurfaced or replaced if damaged.

Flowable Fill

A. Description

Flowable fill (FF) shall consist of a mixture of (a) portland cement, fly ash and water (b) portland cement, granular material, fly ash and water, or (c) fly ash, granular material and water. All materials will be as specified in the MDOT Standard Specifications current edition or as stated. All flowable fill after setting is intended to be removable by conventional mechanical excavation methods.

B. Materials

				<u>Specific Gravities</u>

Portland Cement	B.01	MDOT	Std.	3.15
			Spec's	
Fly Ash			ASTM C 618(1)*	2.40
Granular material Class II**	8.02	MDOT	Std.	2.50
			Spec's	
Water	8.11	MDOT	Std.	1.00
			Spec's	

*Except there is no limit in the loss on ignition.

**Except that 100% shall pass 3/4-inch sieve.

***Specific gravity values used for mix proportions given. If material used differs from these values, appropriate adjustments should be made.

Optional Flowable Fill (FF) Mixtures

A. FF Mix Number One

Cement Stabilized Fly Ash Mixture (Class F Fly Ash)

Portland Cement		100 lbs/CYD
Fly Ash	(Class F)	2000 lbs/CYD
Water		Sufficient water to produce the desired flowability (approx. 80 gal/CYD)

B. FF Mix Number Two

Controlled Density Fill Mixture (Class F Fly Ash)

Portland Cement		50 lbs/CYD
Fly Ash	(Class F)	500 lbs/CYD
Granular material		2850 lbs/CYD
Water		Sufficient water to produce the desired flowability (approx. 40 gallons)

C. FF Mix Number Three

Controlled Density Fill Mixture (Class C Fly Ash)

Fly Ash	(Class C)	300 lbs/CYD
Granular material		3150 lbs/CYD
Water		Sufficient water to produce the desired flowability (approx. 40 gallons)

Transporting and Construction Methods

The temperature of the flowable fill mix as manufactured and delivered shall be at least 50°F.

Mixtures shall be transported to the point of placement in a revolving drum mixer or agitator.

During placement operations around manholes and in utility trenches, care shall be used to avoid dislocating any pipes due to fluid pressure from the flowable fill by even placing of the material. Any pipes within the backfill area should be considered for securing to avoid buoyant effect of flowable fill.

When Flowable Fill (FF) is used in pavement cuts the fill shall be placed to the top of pavement. After settling, the flowable fill is to be removed to the bottom of a concrete pavement patch or to the top of bituminous base course.

Sanitary Sewer

General

All sanitary sewers shall be designed and installed in accordance with the most recent edition of standard specifications of the Township and Genesee County Drain Commissioner Division of Water and Waste Services with the following exceptions in the technical details.

Technical Details

The following technical details (GBT-1 through GBT-12) are standards required by Grand Blanc Charter Township. All sanitary sewer installation shall follow the current GCDC-WWS standards and construction plans shall include the current standard detail sheet for sanitary sewer construction as provided by Grand Blanc Charter Township with the following exceptions:

1. For all new construction, proposed drop connections shall be precast concrete with the manhole.

Sanitary Forcemain

General

All sanitary forcemain shall be designed and installed in accordance with the most recent edition of standard specifications of the Township.

Submersible Sewage Pump Station

General

All submersible sewage pump stations shall be designed and installed in accordance with the most recent edition of standard specifications of the Township.

Soil Erosion-Sedimentation Control

General

A. Work Included

Provide permanent and/or temporary erosion and sedimentation control as called for on the plans and as required by the County or Local Soil Erosion Agent and permit.

B. General Soil Erosion-Sedimentation Content Procedures

1. Minimize disturbed areas.
2. Stabilize and protect disturbed areas as soon as possible.
3. Maintain low storm water runoff velocities.
4. Protect disturbed areas from runoff.
5. Retain sediment within the construction area.

C. Permit

The Developer shall apply for and obtain a Soil erosion and sedimentation control permit from the County/Municipal Enforcing agent as required by law. The Developer shall pay all permit fees.

D. Scheduling

Control measures shall be constructed by the Developer prior to the time construction starts uphill or upstream from the control measure location. Removal and cleanup of temporary control structures shall be provided by the Developer within one week after the control measure is no longer needed.

Products

A. Sodding:

1. 1990 MDOT, Sec. 6.51.01 through 6.51.04, Sec. 8.21.12 or latest version.
2. Temporary Measures: Class B sod.

B. Seeding:

1. 1990 MDOT, Sec. 6.52.01 through 6.52.07, or latest version.
2. Temporary Measures: Cereal Rye Seed.

C. Mulching:

1. Temporary Measures: MDOT, Sec. 6.54.01 through 6.54.04 or latest version. Required as specified on plans and/or in Project Specifications.

Execution

A. General

The Developer shall abide with all applicable rules and regulations as established by the State of Michigan and the Grand Blanc Charter Township pursuant to Part 91 of Act 451 as amended. (Soil Erosion and Sedimentation Control Act).

The Unified Keying System for erosion control measures shall be included with the construction plans. Specific erosion control measures, if required, are to be indicated on the plans.

Even if a specified erosion control measure is not called out on the plans or identified by the Township, this does not relieve the Developer from his obligation under the above Act to properly control and/or prevent all erosion caused by the Developer's construction operation.

B. Sediment Removal

The Developer shall take such steps as are necessary to assure the retention and removal of any sediment which enters an existing storm sewer or open ditch along the construction route before said sewer or ditch discharges into a stream or pond.

If eroded material is allowed to enter a storm sewer system it shall be the Developer's responsibility to see that all catch basins and manholes are cleaned following construction prior to final approval.

C. Street Cleaning

No sediment shall be permitted on township streets. In the event that sediment is deposited on the paved surface, the developer shall remove it immediately,

If a construction access road is to be used, it shall include a mud mat of crushed concrete (minimum size of 100' x 20'). The mud mat shall be maintained throughout the project.

Storm Sewers

General

This work includes construction of pipe storm sewers, drainage structures, and appurtenances. Drainage structures include catch basins, inlets, manholes, and manhole tees.

Materials

Reinforced Concrete Pipe - Pipe shall meet ASTM C76.

All pipe shall be a minimum of Class III and in areas under pavement influence (roads/parking lots), Class IV shall be required.

Joints shall be mastic type.

Reinforced concrete pipe is identified on the plans and on the proposal by the designation C76 and a roman numeral indicating the pipe class.

Reinforced concrete pipe to be installed by jacking shall be Class V and shall be provided with full circular reinforcement. Pipe joints shall be butt type.

A. End Sections

End sections shall be flared and beveled to conform with ditch slopes.

Concrete end sections shall be constructed of precast concrete and reinforcement conforming to the requirements of AASHTO M 170 (ASTM C76), Class II. Connection of end section to concrete pipe shall be made by tongue and groove joints.

B. Drainage Structures

Drainage structures shall be precast concrete units meeting the requirements of ASTM C478. Drainage structures shall be four feet in diameter, unless shown otherwise on the plans approved by the Township. Precast concrete grade rings, meeting ASTM C 478 shall be used to adjust the top of the structure to the final grade. At least 6 inches, but not more than 18 inches of vertical adjustment shall be provided with grade rings.

Manhole steps shall be provided in drainage structures where shown on the plans. Manhole steps shall be copolymer polypropylene plastic, equal to M.A. Industries PS-IPF with a 12 inch overall dimension and 1/2" grade 60 steel reinforcement.

C. Castings

Castings shall conform to the requirements of AASHTO M 105. The weights of castings shall not be less than described in the following table:

Cover Designation	Description	Min Weight (lb)	E.J.I.W. No.
A	Solid cover	375	1040 (labeled "Storm Sewer)
C	Low curb inlet	500	7066
D	Flat grate	435	5105
E	Beehive	200	6508
K	High curb inlet	500	704
X	Large clear opening	515	1890

All exposed surfaces of castings shall be completely coated with coal tar pitch varnish to which sufficient oil has been added to make a smooth coating which shall be tough and tenacious when cold, and shall not be tacky or brittle, nor have any tendency to scale off. Castings shall be Class 30 grey iron.

Execution

A. Open Cut Construction of Storm Sewers

Trench excavation shall begin at the outlet end of the system and proceed toward the upper end, unless otherwise directed. The trench shall be excavated in reasonably close conformity with the lines and grades of the flow line shown on the plans or established by the Township.

The trench shall be of sufficient width to provide free working space and to permit ramming and compacting the backfill around the pipe. The bottom of the trench shall be shaped so that the pipe will be uniformly supported and recesses shall be excavated to receive the bells. The trench shall be excavated at least 4 inches below the elevation established for the bottom of the pipe. Any excavation below the grade for the bottom of the pipe shall be replaced with sand, thoroughly compacted.

The Developer shall furnish, install, and operate pumps well points, wells, discharge piping and other equipment necessary to provide a dry excavation and work are. All water pumped from the project shall be disposed of in a manner acceptable to the Township.

Where unstable soil conditions, or obstructions other than rock, require excavation of the sewer trench below the elevation shown on the approved plans, such excavation shall be made to the dimensions authorized by the Township. Unstable soil removed by undercutting shall be replaced with stone meeting the gradation of MDOT, Class 6A.

Sections of sewer pipe shall be carefully laid in the prepared trench, bell ends upgrade, with the spigot end fully entered in the adjacent bell. Each section shall have firm bearing throughout its length and shall be substantially true to the line and grade required. The use of blocks to bring sections to grade will not be permitted.

Circular concrete pipe with lift holes shall be installed with the lift holes on top of the pipe. Holes shall be plugged with suitable concrete plugs before backfilling.

Existing live sewers that are to remain shall be carefully protected during construction of the new sewers. If they are damaged in any way, they shall be immediately repaired or replaced, as directed by the Township.

All junctions with house or building leads shall be made in a manner acceptable to the Township.

Flexible watertight joints shall be installed in accordance with the Manufacturer's recommendations.

Connections to sewers owned by other agencies shall be done in accordance with their requirements.

Connections to existing sewers having a plug or bulkhead shall be made with a watertight joint. The plug or bulkhead shall be removed without damage to the sewer, and the plug material shall be removed from the sewer and properly disposed of.

If there are no openings in the existing pipe or structures at the point of connection, an opening shall be cut or chipped in concrete pipe or the structure sufficiently large to permit 3 inches of mortar to be packed around the entering pipe and the mortar pointed up smooth and flush with the inner wall. Pipe passing through pipe or structure walls shall be cut at the end to conform with the shape of the inside of the wall and to be flush therewith. On the outside of the pipe or structure, the entering pipe shall be encased with sufficient mortar to provide bearing under the pipe. Any existing pipe broken or cracked while making the connection shall be replaced at the Developer's expense.

When replacing an existing sewer, connections to the original sewer or drain that are encountered shall be reconnected to the new sewer.

Backfill shall be placed only after the pipe has been inspected and approved by the Township.

Backfill shall be placed in layers not to exceed 12 inches in thickness. Backfill within the 1 on 1 influence of a roadbed or structure shall be sand, compacted to not less than 95% of its maximum unit weight (ASTM D1557).

Backfill for sewers outside the limits of the roadbed or structures shall be suitable material excavated from the trench. Backfill placed within 12 inches of the pipe shall not contain stones larger than 2 inches. Sound earth, free from large stones and lumps, shall be carefully placed under and around the pipe in layers. Each layer shall be thoroughly compacted

without displacing the sections, until the sewer is completely covered to a depth of at least one foot. The balance of the backfill shall be placed in layers, each layer shall be thoroughly compacted by hand tamping or approved mechanical methods.

Sewers shall be reasonably free of accumulation of silt debris and other foreign matter at the time of final acceptance.

B. Sewer Installation by Jacking

Sewers shall be installed by jacking where shown on the approved plans. Installation procedures shall be such that the roadbed or railroad above the sewer is not disturbed. (Installation details are provided at the end of this section.)

The pipe shall be jacked into place according to the required line and grade, shown on the approved plans.

The excavation ahead of the pipe shall be approximately one inch larger than the outside diameter of the pipe at the top and taper off towards the invert. The excavation shall not be carried ahead of the pipe far enough to cause caving of the earth. A steel cutting edge or shield may be attached to the front section of pipe to form and to cut the required opening for the pipe.

The approach trench shall be large enough to accommodate at least one section of pipe, jacks, and blocking. Two rails or sills shall be laid in the bottom of the trench to keep the pipe at the established line and grade.

Voids between the excavation and the pipe shall be filled using filler materials and placing methods, as approved by the Township.

Concrete pipe joints shall be protected from crushing due to jacking pressures. Upon completion of the jacking operations, joints shall be filled with mortar, wiped, and finished smooth. The joints shall be thoroughly wet before the mortar is placed.

C. End Sections

End sections shall be attached to the ends of pipe culverts, where directed. Metal end sections shall be used on metal culverts and on smooth lined plastic pipe culverts. Concrete end sections shall be used on concrete pipe culverts.

End sections shall be installed on firm ground. The slope adjacent to the end section shall be graded and shaped to meet the geometry of the end section.

D. Drainage Structures

The Developer shall excavate to the depths and widths required for construction of drainage structures. Unsound material at the proposed structure bottom shall be excavated to the

dimensions directed by the Township and replaced with stone meeting the gradation of MDOT Class 6A.

Precast concrete units shall be placed on a 6 inch sand base, leveled and thoroughly compacted. Joints shall be sealed with mortar. Joints shall be thoroughly wetted prior to sealing. The joints inside the structure shall be flush with the walls. Joints shall be completely filled with mortar.

Pipe or tile connections to concrete drainage structures shall extend through the structure wall and be cut flush with the inside surface. The opening around the pipe shall be neatly filled with mortar to prevent leakage.

The excavation for drainage structures shall be backfilled in layers not more than 12 inches in thickness. Backfill within the 1 on 1 influence of a roadbed or structure shall be backfilled with sand and compacted to at least 95% of its maximum unit weight (ASTM D1557).

Drainage structure covers shall be new and adjusted to the finish elevation using precast concrete grade rings. Covers shall be of the types shown at the end of Section 1.1. Covers and grade rings shall be set in full mortar beds. Structure cones shall be either concentric or eccentric.

Cover elevations given on the plans are for information only. The final elevation will be determined in the field, based on as-constructed conditions. All final elevations shall be approved by the Township.

Drainage structures shall be maintained reasonably free of accumulations of silt, debris, and other foreign matter at the time of final acceptance.

Traffic Control

General

The Developer shall execute all work in a manner such that traffic is maintained and access is provided to all residences, businesses, and commercial establishments.

The Contractor and Developer shall provide the Township with 24-hour emergency contact numbers.

Products

Signing and barricading shall be provided by the Developer in accordance with the details on the approved plans, the latest edition of the Michigan Manual of Uniform Traffic Control Devices, and the requirements of the road agency. Signs and barricades left in place after dark shall be lighted.

Execution

A. Maintain Access to all Properties

It shall be the Developer's responsibility to notify residents or occupants of property along the project of temporary closures of driveways or roads. Sufficient advance warning shall be provided to allow notification of all affected parties.

The duration of any closure shall be limited to the minimum length of time necessary to complete the particular task requiring the closure. In no case, shall a closure extend overnight.

Upon completion of pipe installation or other work requiring a closure, the area shall be backfilled and regraded to meet adjacent grades. A temporary gravel driving surface shall be provided and maintained by the Developer. The gravel shall meet the requirements of 23A series aggregate, as specified in the latest edition of the MDOT Standard Specifications for Construction. The gravel shall be placed to a depth of at least eight inches.

B. Protection of Hazardous Areas

Excavation and hazardous areas shall be protected by barricades or snow fence. Barricades left in place at night shall be lighted.

C. Corrective Action

If in the Township's opinion inadequate protection or maintenance of traffic is provided, the Township will attempt to contact the Developer and notify him of the deficiency. If the Contractor cannot be notified or fails to make prompt corrections, the Township may

authorize that said deficiencies be corrected by others. The cost of making such corrections will be charged to the Developer.

Watermain

General

All watermain shall be designed and installed in accordance with the most recent edition of standard specifications of the Township and Genesee County Drain Commissioner Division of Water and Waste Services with exceptions as follows in the Technical Details.

Technical Details

The following technical details (GBT-1 through GBT-16) are standards required by Grand Blanc Charter Township. All watermain installation shall follow the current GCDC-WWS standards and construction plans shall include the current standard detail sheet for watermain construction as provided by the Grand Blanc Charter Township with the following exceptions.

1. All watermain shall be installed at a depth of six feet below finished grade.
2. Pipe shall be laid with tracer wire of type THHN 600 volt, blue coating, No. 12, or approved equal. Tracer wire connectors shall be 3M DBR-09964 or approved equal. Tracer wire shall be ran up the hydrant above grade and wrapped around the hydrant base. Tracer wire shall be extended and wrapped around the top step of all wells.
3. In GBT-7 (Bore and Jack Construction), the wood skids must be pressure treated.
4. All valves must be installed inside of a precast concrete gatewell with rubber boot gasket for the watermain. Size of the gatewell shall be as follows:

<u>Watermain Size</u>	<u>Gatewell Diameter</u>
6"	5'
8"	5'
10"-12"	6'
16"-20"	6'
24"	6'
30"-42"	8'

5. All hydrants shall meet the following specifications:
 - a. Manufacturers shall provide sufficient documentation to assure that their hydrant will successfully meet the latest revisions of AWWA Standard C502. Fire hydrants shall meet all test requirements and be listed by Underwriters Laboratories Inc. and meet the requirements of Factory Mutual.
 - b. Hydrants shall be of a true compression type, opening against the pressure and closing with the pressure. Composition of the main valve shall be a molded rubber having a durometer hardness of 95 +/- 5. The main valve shall be (5 1/4") and not be less than 1" thick.
 - c. Fire hydrants (EJIW 5-BR) shall be **three-way in design**, having **one 4 1/2" NST thread nozzle and two 2 1/2" NST hose nozzles**. Nozzles shall "thread" counterclockwise into hydrant barrel utilizing "o" ring pressure seals. A suitable

- nozzle lock shall be in place to prevent inadvertent nozzle removal. Ductile iron retainer rings to secure nozzles shall not be allowed.
- d. The lubrication system shall be sealed from the waterway and any external contaminants by use of “o” ring pressure seals. An anti-friction washer shall be in place above the thrust collar to further minimize operating torque. The grease reservoir shall be factory filled with a FDA approved non-toxic lubricant.
 - e. The operating nut shall be a one piece design, manufactured of ASTM B-584 bronze. It shall be **Square** in shape, measuring **1” flat to flat**. The operating nut shall be affixed to the bonnet by means of an ASTM B-584 bronze hold down nut. The hold down nut shall be threaded into the bonnet in such a manner as to prevent accidental disengagement during the opening cycle of the hydrant. A resilient weather seal shall be incorporated into the hold down nut, for the purpose of protecting the operating mechanism from the elements.
 - f. The direction of the opening shall be **Left**. An arrow shall be cast on the top of the hydrant to indicate the opening direction.
 - g. The hydrant bonnet shall be attached to the upper barrel by no less than six bolts and nuts.
 - h. The hydrant will have **6’ 6” of Bury** unless otherwise noted.
 - i. Hydrants shall be of the “Traffic Model” design, provided with a safety coupling and flange design that will permit a full 360 degree facing of the nozzles. The safety coupling shall be manufactured of a torque diverting design.
 - j. Pressure loss through the entire hydrant shall not exceed 2.5 PSI at a flow of 1000 GPM (through a 4 1/2 I.D. pumper nozzle connection) when tested as prescribed in AWWA C-502 latest revision. There shall be no internal obstructions, such as stem supports, between the shoe and the nozzles.
 - k. The operating stem shall be a two piece design, not less than 1 1/4” diameter (excluding threaded or machined areas) and shall be connected by a torque diverting stem coupling near the ground line flange. All other types of stem couplings will not be allowed. Screws, pins, bolts, or fasteners used in conjunction with the stem coupling shall also be stainless steel.
 - l. The inside diameter of the hydrant barrels shall not be less than seven inches (7”) and the hydrant shall be painted **RED**.
 - m. The 6” shoe connection shall be **6” MJ**, unless stated otherwise, having ample blocking pads for sturdy setting. A minimum of six bolts and nuts is required to fasten the shoe to the lower barrel.
 - n. The bronze seat ring shall thread into a bronze drain ring providing a bronze to bronze connection. Seat ring shall be sealed with o-rings.
 - o. Hydrants shall be East Jordan Iron Works 5BR-250 **EJIW#-56505D**.
 - p. Failure to comply with any of these above requirements is sufficient cause for rejection of proposed hydrants.
 - q. The township reserves the right to accept only those materials which are in full compliance with these specifications and deemed most advantageous to its interests.
 - r. Upon request, supplier shall furnish flow data indicating friction loss in psi at a flow

of 1,000 gpm from the pumper nozzle. Such friction loss shall not exceed 2.4 psi.

Water Service Leads

General

All watermain leads shall be designed and installed in accordance with the most recent edition of standard specifications of the Township and Genesee County Drain Commissioner Division of Water and Waste Services with exceptions as follow in the Technical Details.

Technical Details

The following details (GBT-15) are standards required by Grand Blanc Township. All water service leads installed shall follow the current Township and GCDC-WWS standards with the following exceptions:

1. All water services leads must be at least 1" in diameter
2. Per Grand Blanc Charter Township requirements, all curb stops, curb boxes and corporations shall be as follows:

Corporations	Mueller 300 Ball Corp valve B-25000 for 1", 1 ½" and 2" Ford FB600-4-1", FB600-1 ½" and FB-600-7-2"
Curb Stops	Mueller 300 Ball Curb Valve B-25204 for 1", 1 ½" or 2" Ford B22-444-1", B22-666-1 ½" and B22-777-2"
Curb Box rod for	Mueller Box H-10314 66" 82867 rod for 1", H-10310 66" 84128 1 ½" and 2" MEA-55-2H AY McDonald EA1-55-40-48R Ford

As-Builts

General

A. Requirements

As-built plans must be prepared at the completion of all new construction projects. It is the responsibility of the owner/developer to submit as-built plans for review by the Township upon completion of the project. Final acceptance and approval of the development will be contingent on the submittal of approved as-built plans.

B. As-Built Items

The following items must be field measured and included on the as-built plans.

1. Pavement Layout

Deviations in the approved site plan road layout must be measured and shown. This includes pavement grades, sidewalk grades/location, ramps and other surface infrastructure.

2. Lot Layout

Changes in the amount and location of the approved lot layout on the site plan must be shown.

3. Underground Utilities

All storm sewer, sanitary sewer and watermain must be field measured and labeled in the plan and profile. Deviations greater than 5' in the proposed location of hydrants, valves, structures, end sections, etc. from the site plan must be revised in the plan and profile of the utility.

As-built storm and sanitary sewer system plans shall indicate the offset of sanitary sewers from property lines and shall include, but not be limited to length of sewer, invert elevation, rim elevation, percentage of grade, manhole location, sewer material and joints used. Locations shall be shown on the plans with an accuracy of \pm one (1) foot. In addition, the location of all building service leads must be indicated from the downstream manhole. The length of the lead and any riser/clean out information must also be indicated.

As-built water system plans shall indicate the offset of water mains from property lines and shall locate gate valve wells, hydrants and all water system appurtenances from the nearest property corner. As-built profile drawing must also be provided for all water mains 16" in diameter or larger. Locations shall be shown on the plans with an accuracy of \pm one (1) foot. In addition, all underground appurtenances, such as gate valve wells, meter pits, pressure reducing valve pits, etc., shall be located from the nearest hydrant that is connected to the same water main as the appurtenances. As-built water system plans shall list the as-built quantities and the type, brand name and lengths of pipe used.

Hydrants, gate valves, etc., shall also be listed showing their type and brand name quantity. The location, size, manufacturer and model number of every restrained joint shall be noted.

Additional information regarding underground power, telephone, cable, irrigation, must be shown also including associated pedestals and any other above ground facilities.

4. Detention/Retention Ponds

As-built plans of the retention system must include as-built grade contours, with adequate spot elevations to substantiate these contours. The high water and freeboard elevation and contour lines must be clearly indicated. The side slopes of the pond also must be clearly indicated. As-built volumetric calculations must be shown to verify that this system was built as designed

C. Procedure

The following procedure must be followed for as-built plan approval.

1. Upon completion of the project, the project engineer will have as-built information obtain from actual field measurements. The Township's inspector daily reports may be used to supplement the information obtained in the field.
2. Utilizing the original approved plans, the actual field measurements are inserted and proposed values crossed out.
3. Two sets of paper as-built construction plans are then submitted to the Township for review.
4. Upon completion of the review, review comments will be provided. As-built construction plans must then be re-submitted for additional review.
5. Once as-built plans have been submitted in an approvable condition, the Township will then request the submittal of one complete set of sealed mylar drawings, and one digital copy of the drawings in JPEG (Joint Photographers Experts Group), TIFF (Tagged Image File Format), GIF (Graphics Interchange Format) format, PDF (Portable Document Format). If available, the Township would prefer the digital file in AutoCAD DGN format.

Well Abandonment

General

A. Work Included

This section describes the responsibilities of the Developer for abandoning all existing water supply wells on the project. All procedures shall comply with Michigan Water Well Construction and Pump Installation Code and the rules promulgated there under the following excerpt from the rules for Part 127 Act 368 shall be followed for this project.

B. State Regulations

Well abandonment shall be performed in accordance with applicable state regulations. Selected excerpts of Part 127 - Act 368 of PA 1978 follow:

1. Rule 162 (1) An abandoned well shall be plugged by a well drilling contractor who is registered pursuant to the provisions of the act (2) A pump, a drop pipe, a packer, other equipment, debris or obstructions shall be removed from the well, if possible, before plugging.
2. Rule 163. (1) An abandoned well or dry hole shall be plugged as follows:
 - a. A well or dry hole that terminates in overburden shall be plugged by filling with any of the following materials:
 - 1) Neat cement
 - 2) Concrete grout
 - 3) Bentonite chips
 - 4) Bentonite pellets
 - 5) Bentonite grout
3. Rule 164 Abandoned well plugging materials shall be placed as follows:
 - a. Bentonite chips or bentonite pellets shall be poured slowly into the top of the well to prevent bridging in the casing. Fine bentonite particles that accumulate in the shipping container shall not be used. The plugging operation shall continue until the bentonite chips or bentonite pellets appear at the ground surface. Upon completion of the plugging operation, water shall be placed into the casing or borehole to promote expansion of the bentonite above the static water level.
 - b. Neat cement, concrete grout, or bentonite grout shall be placed through a tremie pipe from the bottom of the well or dry hole to the ground surface.

C. Records

The contractor shall complete and file a completed copy of the following abandoned well plugging record for each well that is plugged.

D. Procedures

It shall be the Developer's responsibility to locate the wells on each parcel. Well logs may be available at the local Health Department.

The Developer shall remove all pumping equipment, tanks, pipes, debris and other obstructions from the well casing. The homeowner shall have first salvage rights for any material removed from the casing or well pumping area. Material not requested by the property owner shall be salvaged for the Developer. All Developer salvaged material shall be removed from the site.

The Developer shall measure the well depth and the casing diameter and record the information on the abandoned well plugging record. The Developer shall certify the type and quantity of material actually used to plug a well on the record.

The Developer shall remove or cut off the well casing at a point below the pitless adaptor to eliminate interference with future site use. The remaining casing may be abandoned in place.

The Developer shall mound and compact low permeability soil over the plugged well to prevent ponding of surface water.

A copy of the abandoned well reporting form required by state law shall be filed with the property deed. The municipality, owner, and Genesee County Health Department shall also receive a copy of this report.

All wells are to be inspected by Genesee County Health Department during the abandonment procedure. The Developer shall arrange for inspectors and pay fees for inspection, recording, or permits.

Demolition

General

A. Work Included

This work includes demolition of existing structures. This work also includes proper disposal of the materials resulting from the demolition.

The Developer shall take such precautions as necessary to protect existing equipment that is not to be removed from being damaged.

Developer shall obtain approval from Grand Blanc Charter Township Department of Public Works and Grand Blanc Charter Township Fire Department for demolition of any structure.

Execution

Developer shall coordinate with Township and other utility owners the proper disconnection of existing utilities. Existing sanitary and water services shall be properly bulkheaded and abandoned to the township's satisfaction.

Where items are to be removed or demolished, it shall be done in a manner that does not damage adjacent structures, piping, equipment or other items that are to remain in place or are to be salvaged.

Damage to adjacent items that are not to be removed will be replaced or repaired at the developer's expense.

Broken concrete, debris, old piping materials and other items resulting from demolition shall become the developer's property and disposed of properly.

Demolition must be performed expeditiously.

Grand Blanc Charter Township Utility Abandonment Checklist

Date of inspection: _____ Time: _____

Address: _____

Type of materials:

Water

Sewer

Cleanout out location

Curb box location

Size of Service

Water

Sewer

Ground condition

SKETCH: Include main, structure, clean-outs, and directions.

Water Remove Cross Connection (If well is for irrigation-non-potable use)
 Filled Capped Procedure for well, if applicable
 Service lead properly abandoned

Septic tank pumped and crushed: YES _____ NO _____

Sanitary lead properly bulkheaded: YES _____ NO _____

Inspector: _____ Date: _____