



ARMADA TOWNSHIP

ENGINEERING

AND

CONSTRUCTION STANDARDS

ORDINANCE

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**TOWNSHIP OF ARMADA
MACOMB COUNTY, MICHIGAN
ORDINANCE NO. E-2006
ENGINEERING AND CONSTRUCTION STANDARDS ORDINANCE**

Title

An ordinance providing a reasonable and proper basis for the design and construction of site improvements for commercial or industrial projects, wetland mitigations, utility extensions and residential projects requiring approval from the Township Planning Commission and appealing any and all ordinances and/or resolutions in conflict therewith. Residential projects covered by this ordinance include, but may not be limited to, condominiums, simple split developments, apartments and subdivisions. The Township Building Official may apply the grading aspects of this ordinance to individual home construction during plot plan review. When the word "residential" appears in this ordinance, it refers to residential projects as described in this paragraph.

THE TOWNSHIP BOARD OF THE TOWNSHIP OF ARMADA, MACOMB COUNTY, MICHIGAN
ORDAINS:

Section 1. Short Title. This ordinance shall be known and cited as the Armada Township Engineering and Construction Standards Ordinance.

Section 2. Purpose. The purpose of this ordinance is to set forth a reasonable, uniform and sound basis for engineering design, preparation of plans and specifications, and construction of site improvements for public and private developments in the Township of Armada. The Standards may not include all conditions that may possibly exist and may consist of items that may be applicable only in the future. These provisions shall be used in combination with sound engineering judgment for design and construction activities. Innovative and alternate solutions may be permitted if approved by the Township Engineer.

Section 3. General Requirements.

- A. All plans submitted shall be on 24 inch x 36 inch white prints having blue or black lines and shall be neatly and accurately prepared. Judgment should be exercised in the design, layout and presentation of proposed improvements.
- B. Engineering plans shall have a scale of one inch equals 50 feet or one inch equals 40 feet horizontal. Profile views shall have a scale of one inch equals five feet or four feet vertical respectively.
- C. Any land development project requiring more than one sheet of plans must be submitted with a "General Plan" having a scale of one inch equals 100 feet (or larger scale) showing the overall project layout (including building locations) and indicating the location of all site improvements proposed.
- D. Street names, lot or property lines and property identification numbers and addresses (of existing buildings) shall be shown on all plans.
- E. Public Utilities in easements shall be located at least two feet away from parcel or lot boundary lines (this is meant to avoid conflicts with property irons and monuments). Easements for public utilities dedicated to the Township shall be submitted on a

standard form, prepared by the Township Attorney, and approved by the Township Engineer prior to final approval of the Engineering Plans. Drawing exhibits showing the relationship of the easement to property lines and key physical features (i.e., buildings) shall accompany each easement document.

- F. Superimposed on a general plan of the site shall be contour lines of the project area, including the area at least 100 feet outside of the project area. Contour lines shall be shown at intervals as follows:
 - 1. Where the general slope of the land is 1% or less, the interval shall be one foot.
 - 2. Where the general slope of the land is more than 1% but less than 5%, the interval shall be two feet.
 - 3. Where the general slope of the land is 5% or greater, the interval shall be five feet.
- G. Any underground or overhead public utilities shall be located in the road (public or private) right-of-way according to the Section 11, "Schedule of Standard Utility Locations."
- H. All sewers and those water mains having a diameter of 16 inch or greater, or involving other proposed underground public utilities and major gas lines, shall be indicated in profiles. There shall be a separate profile view for each utility. However, it shall be the responsibility of the Design Engineer to ascertain that the depth of the storm sewer (or storm drain) does not interfere with the building service sewers crossing the storm sewer. Profiles shall indicate the size of the pipe, class of pipe, slope of the utility, and control elevations of the utility. The existing and proposed grade lines shall be shown along the profile view of each utility.
- I. Elevations shall be based on U.S. Geological Survey datum. The Township Bench Marks shall be used where available and at least three benchmarks shall be indicated on the plans for each 40 acres of the project site area.
- J. Finish grade elevations planned for each structure shall be indicated on both the plan view and the profile view.
- K. A copy of the site boundary survey with computed control lines indicated, or a copy of the computed plat, if applicable, shall be submitted with the engineering plans. The boundary survey plans shall bear the seal of the Professional Surveyor licensed in Michigan and responsible for the survey.
- L. Plans shall have all lettering a minimum height of one-tenth of an inch and be of such quality as to provide for a clear and legible digitally scanned record.
- M. All plans submitted shall bear the seal of the Professional Engineer who is licensed in Michigan and responsible for the design.

- N. The plans covering all of the required Site Improvements for a specifically designated area of the Developer's land shall be submitted as one package before any plan review shall commence.

Section 4. Site Grading and Drainage water Collection and Disposal.

- A. All sets of plans, which include plans for storm sewers, shall include the current Township Storm Sewer Detail Sheets, which shall be considered an inseparable part of the plans when said plans are approved.
- B. A Site Grading and Drainage Water Collection and Disposal Plan is required for all developments, except if the building site is a site in a subdivision or other project for which a general site grading plan has been submitted and approved, no separate grading plan or permit will be required. A rear yard (in the case of land subdivisions) or a general site open and/or enclosed storm drainage system shall be designed for all land development projects. If there are any upstream watershed drainage areas which need to be drained through the site under design consideration, sufficient capacity shall be provided to take fully developed upstream drainage into the system. All downstream properties shall be protected by limiting proposed site improvement discharge rates to the existing conditions unless the accepting drainage course is under the jurisdiction of a public agency having authority.
- C. Site grading for all building sites shall be reviewed to determine that proposed and/or actual site grading is proper, that drainage from land lying upstream is not obstructed and that downstream properties will not be adversely affected by run-off from the property under design consideration. Before a Certificate of Occupancy for any building is issued, the Township Building Official shall approve the final site grading and drainage for each building. The Township Building Official may require that a survey, drawing, and certificate, done by a Professional Engineer or Professional Land Surveyor, licensed to practice in Michigan, be furnished by the Developer indicating that the work has been done in conformity to the approved site grading and drainage plan. It shall be unlawful for any person to interfere with, modify, or obstruct the flow of drainage water across any property in any manner different from the approved plan.

During periods of the year when weather conditions make site grading work unfeasible, a Temporary Certificate of Occupancy may be issued, subject to the furnishing of a satisfactory bond, letter of credit, or cash deposit guaranteeing the completion of the work when weather conditions permit.

- D. The fall of the land away from any building shall be a minimum of six inches in the first 25 feet. From this elevation the land shall slope to a drainage water collection swale at a minimum slope of one foot in one hundred feet (1%).
- E. The maximum slope of the land for the site, except for transitional ramps between usable site areas, shall be seven feet in 100 feet (7%). The sodded ramp slopes shall be a maximum of one foot vertically and three feet horizontally.
- F. Adequate soil erosion and sedimentation control measures shall be specified on the plans, and followed during construction, to conform to the requirements of Michigan

Act 347, P.A. of 1972, entitled, "Soil Erosion and Sedimentation Control Act of 1972."

- G. All buildings having foundation drains shall direct the flow of drainage water from such foundation drains into an enclosed conveyance pipe or drain having adequate soil erosion control devices. No building permit for any building having a basement shall be issued unless the plans for such building indicate a building service sewer (drainage water) with drainage to a storm sewer or storm drain. When the building service sewer (drainage water) is planned to be connected to a storm sewer located in the road right-of-way (R.O.W.), the Developer shall provide service extensions, for each lot, from the public sewer to a point located 12 feet outside of the R.O.W., such service leads shall be installed prior to paving.
- H. Drainage water run-off from building roofs shall be piped to a point 10 feet away from the outside walls of any building.
- I. The longitudinal grade of any drainage swale shall not be less than 0.4 feet per 100 feet (0.4%). Swale grades of 1% to 2% are encouraged. Planned final swale grade elevations shall be indicated on the plans at a maximum spacing of 50 feet.
- J. Where required by the Township Engineer, a six inch diameter underdrain pipe shall be provided, with said pipe trench being backfilled entirely with pea gravel up to within four inches of the grade line of swale. The purpose of the underdrain is to eliminate standing water in swale that cannot achieve the minimum acceptable grade.
- K. Storm water run-off drainage systems shall be designed for a 10-year storm by means of the rational method formula: $Q = CIA$; where Q is the peak rate of run-off in cubic feet per second, A is the area in acres, C is the co-efficient of run-off for the drainage area, and I is the average rainfall intensity in inches per hour for a certain time of concentration. The rainfall intensity shall be determined by the formula $I = 175 / (25 + T)$ where T is the time of concentration equal to the time required for a drop of water to run from the most remote point of the watershed to the point for which run-off is being estimated. The Design Engineer shall use judgment in arriving at proper imperviousness factors, but in general the following factors are acceptable minimums:
 - 1. Lawn areas - 0.1
 - 2. Pavement and roof areas - 0.9
 - 3. Overall area of single family subdivision - 0.35
 - 4. Overall area of multiple housing development - 0.55
 - 5. Overall area of commercial development - 0.90
 - 6. Overall area for industrial development - 0.80

The Design Engineer shall submit a map outlining the various watershed drainage areas, including off site upstream areas, which drain to each inlet point used for

design. The map shall be accompanied by storm sewer design computation made on forms supplied by the Township Engineer. The minimum acceptable size of storm sewer downstream of any storm water inlet structure is 12 inches in diameter.

For the design of storm sewers, use the Manning's formula for pipe sizing with an "N" factor of 0.013 for reinforced concrete pipe and an "N" factor of 0.025 for corrugated metal pipe if corrugated metal pipe is allowed. Storm sewers shall be designed to provide a minimum velocity when flowing full of 2.5 feet per second. The maximum velocity of storm water flow shall be 10 feet per second.

In general, trunk storm sewers or any sewer that carries street drainage water shall be located within a public street right-of-way. Where public storm sewers are located outside of public streets, they shall be placed in a recorded public utility easement that provides for access to the storm sewer for repairs, connections, and maintenance. The minimum acceptable width of easements for storm sewers shall be: 12 feet wide for sewers 21 inches and under in diameter; 20 feet for sewers 24 inches through 48 inches in diameter; and 30 feet wide for sewers over 48 inches in diameter. The sewer shall be placed within the middle third of the designated easement width. The Township Engineer may require wider easements where the sewer invert depth exceeds the distance of the sewer to the standard easement boundary.

- L. Where open drains are proposed for drainage water disposal, the Manning's Formula shall be used for determination of flow depth and capacity. However, if the Township Engineer and/or the Michigan Department of Environmental Quality (MDEQ) deem it advisable, the Developer's Engineer may be required to furnish computations and plans showing the backwater curve for the open drain under 50-year-flood-flow fully developed upstream watershed conditions.
- M. Where possible, provide a minimum of three feet of cover from the top of finish road or earth grade to the top of any storm sewer. In some cases it will be acceptable to allow the hydraulic gradient to be above the top of the sewer pipe. If this is the case, the design elevation of the hydraulic gradient profile shall be indicated on the sewer profile view, but hydraulic gradients shall not be less than one foot below the surface at any location. However, hydraulic gradients shall be maintained within the pipe on any storm sewers considered to be trunk storm sewers.
- N. Access manholes shall be provided along the storm sewer at every change of pipe size, change of grade, or change of direction. However, the maximum spacing for storm sewer manholes shall be as follows:

<u>Diameter of Sewer</u>	<u>Absolute Maximum Manhole Spacing</u>
12" to 30"	350'
36" to 42"	400'
48" to 60"	500'
66" & larger	600'

Note: Height of Lo-Hed pipe shall be used as the criteria for manhole spacing.

Catch basin leads may tap directly into sewers 42 inches and larger, except that taps shall not be made into a precast manhole tee pipe section.

- O. Catch basins shall not be constructed over a main sewer line to replace manholes in street sewers or trunk sewers outside of streets. Moreover, a manhole normally shall not be used as a storm water inlet structure. However, if a normal manhole location (outside of streets) coincides with a storm water inlet structure location and at least 75% of the upstream storm water inlet structures are catch basins (with sumps), the manhole may be used as a storm water inlet structure by placing a catch basin cover on the manhole.

Not more than three upstream catch basins will be allowed to discharge into any catch basin.

- P. A prefabricated bar screen shall be installed on the end of all storm sewers 18 inches in diameter and larger which outlet into an open drain. Openings of the bar screen shall be no more than six inches on centers.

- Q. In general, pavement type catch basins shall be located as follows:

- 1. At the radius return of street intersections such that drainage water travels 150 feet or less around a corner to an intercepting catch basin.
- 2. At all low points in streets.
- 3. At intermediate points along the street such that there is a maximum pavement drainage area structure as follows:
 - a. Intercepting Catch Basins 7,500 S.F. /C.B.
 - b. Low point Catch Basins 10,000 S.F. /C.B.

- R. Yard type catch basins shall be provided at all low points in drainage swales. Unless otherwise approved by the Township Engineer, provide intercepting yard type catch basins such that not more than 350 feet of swale drainage runs into any one catch basin.

- S. Generally, Armada Township policy is to use open drains for drainage of storm water. However, multiple residential, institutional, commercial and industrial developments including parking lots and critical areas (as determined by the Township Engineer) will require enclosed storm sewers and perhaps, retention/detention ponds. In cases where the enclosed storm sewer sizes become 60 inches or larger in diameter, the Township Engineer may require improved open drains. When open drains outside the road R.O.W are used, the easement width shall be sufficient to accommodate a 30 feet wide maintenance plateau (with a maximum slope of 10 percent) on each side of the channel.

- T. The side slopes of open drains shall have a maximum slope of one foot vertical to four feet horizontal, except that a low flow channel may have side slopes of one foot vertical to three feet horizontal. Open drain side slopes shall have an established sod

surfacing as soon as possible after construction. In any event, sufficient measures shall be taken to conform to the erosion and sedimentation control requirements of applicable state or local ordinances.

- U. An extension of the storm sewer system shall be provided to furnish an outlet for foundation drain service pipe for any buildings not otherwise serviced; such extensions shall have a minimum diameter of eight inches.
- V. When, in the opinion of the Township Engineer and/or the Macomb County Drain Commissioner, there is inadequate drainage water outlet capacity, the Developer may be required to install retention/detention basins or reservoirs. Many design considerations need to be incorporated in the design of retention/detention basins. Section 5 provides detailed discussions and design standards for retention/detention ponds. It includes site drainage, storm water management facilities, including various types of basins, and other pertinent issues related to storm water retention.

Section 5. Design Standards for Retention/Detention Basins

A. Storm Water Discharge

The maximum design rate or volume of discharge shall not exceed .20 cubic feet per second (cfs) per acre for a 10-year storm. The Armada Township Engineer may, at their discretion, determine that a lower rate is appropriate, when the required discharge rate exceeds drain capacity.

The volume and manner of water discharged due to development of the site shall not create adverse impacts to downstream property owner(s) and watercourses.

It is the Property Owner(s) obligation to meet this standard. Should a storm water system, as built, fail to comply with the design rate of discharge, it is the Property Owners' responsibility to design and construct, or to have constructed at his/her expense, any necessary additional and/or alternative storm water management facilities to bring the system into compliance. Such additional facilities will be subject to Armada Township's review and approval. Additional volume controls will be required in such cases as will acquisition of rights-of-way from downstream property owner(s) receiving the storm water flow.

B. Determination of Surface Run-off

The rational method of calculating storm water run-off as described in subsection 4-K earlier, is generally acceptable for sites less than 100 acres in size. For larger sites, due caution should be exercised. Other methodologies such as run-off hydrographs may be required by Armada Township for sizing the drainage systems on sites that are deemed potentially problematic. Acceptable alternative methods include:

- U.S. Army Corps of Engineers HEC-RAS
- Soil Conservation Service UD-21, TR-20 and TR-55
- U.S. Environmental Protection Agency's Storm Water Management Model ("SWIMM")

All design rainfall events will be based on the Soil Conservation Service (SCS) Type II distribution.

Computations of run-off hydro-graphs that do not rely on a continuous accounting of antecedent moisture conditions will assume a conservative wet antecedent moisture condition.

C. Retention and Detention Systems

All run-off generated by proposed impervious surfaces, unless otherwise permitted by Armada Township, must be conveyed into a storm water storage facility for water quality treatment and retention/detention prior to being discharged from the site. The following criteria will apply to the design of all storm water retention and detention facilities:

1. In general, wet ponds and storm water marsh systems will be preferred to dry ponds. Dry ponds providing extended storage will be accepted when the development sites physical characteristics or other local circumstances make the use of a wet pond infeasible.
2. Public safety will be a paramount consideration in storm water system and pond design. Providing safe retention/detention is the Property Owner(s)' responsibility. Pond designs will incorporate gradual side slopes, and vegetative and barrier plantings. Where further safety measures are required, the proprietor is expected to include them within the proposed development plans.
3. Storm water management systems incorporating pumps shall not be permitted in developments with multiple owners, such as subdivisions and site condominiums. Variances from this rule will be considered only as a measure of last resort, subsequent to demonstration that no alternative system designs are technically feasible. Special requirements, such as the establishment of an operations/maintenance/replacement escrow account by the Developer, may be imposed to help defray special assessments that would be levied upon future Property Owners for maintenance of the system.
4. For basins with pumped outlets, a silt trap and bar screen shall be installed on the inlet pipe to the pump station. The screen clean opening shall be a maximum of two inches.
5. Pumping stations for de-watering of the retention basins shall include duplicate pumps with each pump capable of handling the design flow. The controls shall include a lead-pump start and stop, a lag-pump start and stop, an alternator for alternating the lead-lag pump, a high water alarm system with a light and a horn and a safety all-pumps-off control. The control panel, pumps and wet-well shall be installed inside of the fenced enclosure and the controls shall be installed in a suitable weatherproof and vandal-proof enclosure.
6. For drainage systems proposed to not be under the ownership of Armada Township, detention/retention facilities, and associated buffer strips, shall be

located on common-owned property (e.g. parks, etc.) and not on private lots or condominium units. The only exception to this provision is for simple lot spit developments which cannot have common-owned property. In this case, these storm drainage facilities may be located on a private lot within an easement dedicated to the benefited properties for the operation and maintenance of the facility.

7. The use of underground retention/detention on new or existing developments is strongly discouraged. Underground storage must be treated for water quality improvements before discharge to any watercourse, lake, or pond. Treatment may include storm water quality improvement devices, as approved by the Township Engineer. Provisions for periodic testing of the water quality may be required by the Township.
8. Sediment forebays (lower stage) or approved storm water quality improvement devices will be provided at the inlet of all storm water management facilities to provide energy dissipation and to trap and localize incoming sediments.
 - a. The forebay will be a separate basin, which can be formed by gabions or a compacted earthen berm.
 - b. The capacity of the forebay will be equivalent to the capacity of a 1.5 year storm.
 - c. Direct maintenance access to the forebay for heavy equipment will be provided.
9. Vegetative Plantings Associated with Retention/Detention Facilities
 - a. Basins and marsh designs will be accompanied by a landscaping plan that gives preference to native plant species.
 - b. A permanent buffer strip of natural vegetation extending at least 10 feet in width beyond the freeboard is required around the perimeter of all storm water storage facilities. Storm water storage facilities located at the perimeter of a development shall be provided with an additional landscape buffer, at least 10 feet in width, along the common property line with adjacent parcels.
10. For safety purposes and to minimize erosion, basin side slopes will generally not be flatter than one foot vertical to 20 feet horizontal (20:1), nor steeper than one foot vertical to four feet horizontal (4:1). For all developments other than residential, all basins having side slopes steeper than one foot vertical to six feet horizontal (6:1) will be permitted only with the installation of a six foot high chain link fence completely surrounding the detention facility and a minimum 10 foot flat maintenance shoulder between the top of the slope and the fence. Gates shall be provided that are 12 feet wide with a double opening.

Detention basins requiring fencing shall not be located within setback areas adjacent to public thoroughfares unless they are designed architecturally and aesthetically for the specific site. The location and concept of these basins shall be subject to approval by the Planning Commission prior to the Engineering review.

11. For all subdivisions and site condominiums all basins shall be unfenced with side slopes no steeper than one foot vertical to six feet horizontal (6:1) with a minimum 10 foot flat maintenance shoulder between the top of slope and property line. Storm water storage facilities located at the perimeter of a development shall be provided with an additional landscape buffer at least 10 feet in width, along the common property line with adjacent parcels.
12. Anti-seep collars should be installed on any piping passing through the sides or bottom of the basin to prevent leakage through the embankment.
13. All basins will have provisions for a defined emergency spillway, or overflow, routed such that it can be picked up by the main outflow channel or enclosed storm drain while not discharging directly over the outlet pipe. Where possible, an overflow structure shall be designed to outlet into an adequately sized storm drain. There are two possible alternate methods:
 - a. Using an overflow pipe, the invert elevation of this pipe shall be above the maximum storage elevation of the basin; and,
 - b. A low point overflow, the low point of the basin shall be set at an elevation no lower than the maximum storage elevation of the basin.
14. Adequate maintenance access from public or private right-of-way to the basin will be reserved. The access will be on a slope of 5:1 or less, stabilized to withstand the passage of heavy equipment, and will provide direct access to both the forebay and the riser/outlet. Access easements will be required.
15. The placement of retention/detention basins within a 25-year floodplain of a stream, creek or lake is prohibited.
16. The entire detention basin must be sodded, except below the waterline for wet detention basins, and except where wetland systems require wetland seed mixtures. The Township Engineer may approve the use of seed and mulch based upon seasonal and bank stabilization factors.
17. All developments requiring storm water storage facilities shall satisfy the following operation and maintenance requirements:
 - a. In the case of a platted subdivision, the Declaration of Covenants and Restrictions shall state that all property owner(s) within the Subdivision assume ownership of the facility and are responsible for its operation and maintenance. The Developer shall establish a Special Assessment District (SAD) to reimburse the Township for any expenses incurred for operation and maintenance of said facility due to lack of action by the subject property owner(s). The Final Plat shall

note all easements necessary for the operation and maintenance of the entire facility including access driveways.

- b. In the case of a site condominium, the Master Deed shall state that the Condominium Association assumes ownership of the facility and is responsible for its operation and maintenance. The Developer shall execute an Operation and Maintenance Agreement to reimburse the Township for any expenses incurred for operation and maintenance of said facility due to lack of action by the subject Condominium Association. The Developer shall also dedicate all easements necessary for the operation and maintenance of the entire facility including access driveways.
- c. For all other developments, the tributary property owner(s) who are contributing improved run-off shall assume ownership of the facility and be responsible for its operation and maintenance. The property owner(s) shall execute an Operation and Maintenance Agreement to reimburse the Township for any expenses incurred for operation and maintenance of said facility due to lack of action by the subject property owner(s). If the facility is to serve more than one property, the Developer shall dedicate all easements necessary for the operation and maintenance of the entire facility including access driveways.

The provisions of this Section shall apply to the entirety of the facilities noted such as: detention basin, sedimentation basin and other pollution control devices, flow control devices, pump stations, force main and all appurtenances, bypass and overflow devices, fences, access driveways and any other appropriate item necessary for the operation and maintenance of the facility, as intended.

The Township will not approve subdivision and site condominium basins until turf is established in accordance with this Ordinance and approved by the Township Engineer.

D. Detention Requirements

On-site management of storm drainage will be designed for control of flooding, control of downstream erosion, and improving water quality. Submission of flow calculations, cross-sections, and other pertinent data will be required.

1. A minimum of one foot of freeboard will be required for all detention basins.
2. At a minimum, the volume of storage provided for flood control will be equal to, or in excess of, that required by the method outlined in "A Simple Method of Detention Basin Design" developed by Glen Yrjanainen, P.E, and Alan W. Warren for a 10-year frequency storm. If the methodology in this design results in the maximum design rate or volume of discharge exceeding 0.20 cfs per acre or downstream impacts, additional storage will be required.

3. The volume and storage provided for controlling the bank full flood will be equal to or in excess of the total rain from a 1.5-year, 24-hour storm. This can be determined by:

$5160 \times \text{acreage} \times \text{the relative imperviousness factor } C = \text{cubic feet}$

The release rate from the bankfull storage volume will be such that this volume will be stored not less than 24 or more than 40 hours.

4. The first flush of run-off is defined as the first 0.5 inch of run-off over the entire site. The majority of this volume will be captured in the sediment forebay with the residual volume detained for a minimum of 24 hours. The volume of the first flush which can be determined by:

$1815 \times \text{acreage} \times \text{the relative imperviousness factor } C = \text{cubic feet}$

5. Basin Inlet/Outlet Design

- a. Engineered velocity dissipation measures, based on discharge flow rates and velocities, will be incorporated into basin designs to minimize erosion at inlets and outlets, to minimize the re-suspension of pollutants and to create sheet flow conditions where feasible.

- b. To the extent feasible, the distance between inlets and outlets will be maximized. The length and depth of the flow path across basins and marsh systems can be maximized by:

1. Increasing the length to width ratio of the entire design.

2. Increasing the dry weather flow path within the system to attain maximum sinuosity. If possible, inlets and outlets should be offset at opposite longitudinal ends of the basin.

- c. The outlet will be well protected from clogging.

d. Riser Design

1. The use of a perforated standpipe-type riser structure to assure an appropriate detention time for all storm events is required.

2. Orifices used to maintain a permanent pool level should withdraw water at least one foot below the surface of the water.

3. Hoods or trash racks shall be installed on the riser to prevent clogging. Grate openings shall be a maximum of three inches.

4. Orifice plates are discouraged. Where an orifice plate is to be used in the standpipe to control discharge, it will have a minimum diameter of four inches.
5. The riser shall be placed near the pond embankment to provide for ready maintenance access.
6. Barrels and risers will be constructed of materials that will reduce future maintenance requirements. The riser pipe shall be a minimum of 36 inches in diameter for riser pipes up to four feet in height. Riser pipes greater than four feet in height shall be 48 inches in diameter. Riser pipes will be constructed with concrete bottoms.
7. Riser outlets must include a simple oil/water separator consisting of a T or elbow-shaped pipe.
8. Where feasible, a drain for completely de-watering the pond should be installed for maintenance purposes.

e. Outlet Design

1. All outlets will be designed to be easily accessible for heavy equipment required for maintenance purposes.
2. Discharging at the crest of slopes will not be permitted.
3. Backwater on the outlet structure from the downstream drainage system shall be evaluated when designing the outlet.

E. Permanent Retention Ponds (i.e., no outlet)

1. Freeboard: Retention Basins shall provide three feet of freeboard.
2. Storage Volume

Retention basins will be capable of storing two inches of run-off from the entire tributary area, contingent upon the following:

- a. An overflow assessment will be required. The assessment should include descriptions of the surrounding areas, including nearby homes, which would be impacted in the event of an overflow.
- b. The proprietor must submit a soil boring log taken within the basin bottom area to a depth of 25 feet below existing ground or 20 feet below proposed basin bottom elevation to determine permeability.

The Township Engineer reserves the right to require additional storage up to that required by two consecutive 100-year storm events based on the results of soils data

or the overflow assessment. If such additional storage is required, freeboard requirements may be reduced at the discretion of the Township Engineer.

F. Wet Detention Basins

1. Storage Volume and Freeboard Requirements

Storage volume and freeboard requirements shall be identical to that for a dry basin. For a gravity outflow wet basin storage volume is defined as the volume of detention provided above the invert of the outflow device. Any volume provided below the invert of the outflow device will not be considered as detention.

At a minimum, the volume of the permanent pool should be at least:

$2.5 \times 0.5 \text{ inch}^* \times \text{run-off coefficient} \times \text{site drainage area}$

*0.5 inch represents the mean storm event. This was determined by adding the total precipitation rainfall recorded at Detroit Metro Airport from 1977 to 1987 and dividing by the total number of storm events. Storms below 0.2 inch of precipitation, snowfall, and snowmelt were omitted.

2. Wet detention pond configuration will be as follows:

- a. Surface area to volume ratio should be maximized to the extent feasible.
- b. In general, depths of the permanent pool should be varied and average between three and six feet.
- c. A minimum length to width ratio of 3:1 should be used unless structural measures are used to extend the flow path.
- d. Ponds should be wedge-shaped, narrower at the inlet and wider at the outlet.
- e. Irregular shorelines are preferred.

3. A marsh fringe should be established near the inlet or forebay and around at least 50% of the pond's perimeter.

4. A shelf, a minimum of four feet wide at a depth of one foot, will surround the interior of the perimeter to provide suitable conditions for the establishment of aquatic vegetation and to reduce the potential safety hazard to the public.

5. In-line detention basins are strongly discouraged in all circumstances, and are prohibited on watercourses greater than two square miles of drainage area upstream. In-line basins are also prohibited if the waterway to be impounded traverses any area outside of the proposed development.

G. Extended Detention (ED) Basins

Background

Extending the detention time to at least 24 hours of dry or wet ponds is an effective, low cost means of removing particulate pollutants and controlling increases in downstream bank erosion. Positive impacts of ED ponds include creation of local wetland and wildlife habitat, limited protection of downstream aquatic habitat and recreational use in the infrequently inundated portion of the pond.

A two-stage design is required, with separate outlet controls to detain both the 1.5-year and larger rain events.

1. Lower Stage (forebay)

The lower stage should contain a shallow, permanent pool designed to store and treat the “first flush” of run-off over the entire site. This pool should be managed as a shallow marsh or wetland and average six to twelve inches in depth.

At a minimum, the volume of run-off detained in the entire lower stage should be equivalent to the run-off volume produced by a 1.5-year storm.

2. Upper Stage

The upper stage should be sized for the 25-year, 24-hour storm and should be graded to remain dry except during large storms.

A low flow channel, stabilized against erosion, will be provided through the dry portion of the basin. This channel should have a minimum grade of 0.5%, and the remainder of the basin should drain toward this channel at a grade of at least 1%. The low flow channel should end at the lip of the lower stage, where rip-rap or gabion baffles will be placed to prevent scour and re-suspension.

H. Storm Water Wetland Systems

Background

Storm water wetlands are defined as constructed systems explicitly designed to mitigate the storm water quality and quantity impacts associated with development. They do so by temporarily storing storm water run-off in shallow pools that create growing conditions suitable for emergent and riparian wetland plants. The run-off storage, complex micro-topography, and emergent plants in the storm water wetland together, form an ideal system for the removal of urban pollutants. Because of their water quality benefits, the use of storm water wetlands is encouraged.

As a general rule, storm water wetlands should not be located within delineated natural wetland areas.

The design of an effective and diverse storm water wetland requires a sophisticated understanding of hydrology and wetland plant ecology. Therefore, a qualified professional with specific wetland expertise must oversee wetland design, construction, re-construction or modification. A reference for the design of storm water wetlands is by Thomas R. Scheduler, "Design of Storm Water Wetland Systems" (published by the Metropolitan Washington Council of Governments).

1. Storm water wetland systems must be designed to perform in conformance with all standards for storage volume and discharge rate established in these rules.
2. For developments with storm water wetlands systems requiring maintenance, the Developer will provide for the monitoring of wetland plantings and replacement as needed for a two-year period after construction.

I. Natural Wetlands

This section governs natural wetlands (as distinct from storm water wetland systems that are constructed expressly for storm water management purposes), when a natural wetland is incorporated in an overall storm water management scheme.

1. Wetlands will be protected from damaging modification and adverse changes in run-off quality and quantity associated with land developments. Before approval of the final plat or construction plans, all necessary wetland permits from the MDEQ will be in place.
2. Per MDEQ regulations, direct discharge of untreated storm water to a natural wetland is prohibited. All run-off from the development will be pre-treated to remove sediment and other pollutants prior to discharge to a wetland. Such treatment facilities will be constructed and vegetation established before property grading begins.
3. Whenever possible, a permanent 25-foot buffer strip, preferably vegetated with native plant species, will be maintained or restored around the periphery of wetlands.
4. Wetlands will be protected during construction by appropriate soil erosion and sediment control measures.

J. Floodplains.

It is the responsibility of the Developer to demonstrate that any activity proposed within a 100-year floodplain will not diminish flood storage capacity. In certain instances an analysis to determine the 100-year floodplain may be required. Where available, the community flood insurance study shall be used. Compensatory storage will be required for all lost floodplain storage.

K. Safety Considerations

1. Drainage system components, especially all ponds, will be designed to protect the safety of all persons coming in contact with the system. The following criteria will apply:
 - a. All wet detention basins will have a level safety ledge at least four feet in width and one foot below the invert of the outlet pipe water depth, and other design and landscaping features as may be needed to provide for protection of the public.
 - b. Animal guards shall be placed on all outlet pipes with a diameter greater than 12 inches.
 - c. Signs may be required to alert residents to use limitations (i.e. Warning against swimming, ice skating, etc.) of any storm water basin if the Township of Armada has permanent maintenance jurisdiction. Warnings may also be required in the master deed.

Section 6. Street and Parking Lot Paving

- A. All sets of plans, which include plans for street and/or parking lot paving, shall include the current Township Paving and/or Parking Lot Detail Sheet which shall be considered an inseparable part of the plans when said plans are approved.
- B. Unless otherwise specified in the Township's current Zoning Ordinance, paving for all streets, whether public or private, shall conform to the specifications of the Macomb County Road Commission or the following Township specifications whichever has the more demanding requirements:
 1. The compressive strength of concrete pavement at 28 days after pouring shall be at least 3,500 pounds per square inch. Concrete pavement shall be placed over an approved base of angular graded stone adequately designed for sufficient thickness (minimum of six inches) and type to be compatible with expected loading and sub-soil conditions.
 2. Bituminous pavement shall be as per Armada Township's standards and as specified in the current version of Michigan Department of Transportation Specifications for hot mix asphalt over an approved base of angular graded stone adequately designed for sufficient thickness (minimum of six inches) and type to be compatible with expected loading and sub-soil conditions.
 3. The widths and thickness of the street pavement sections shall be as specified below and as shown on the current Township standard paving details:
 - a. Residential with open ditches: 60 foot wide right-of-way; 24 foot wide paved roadway with 3' angular graded stone shoulder; seven inches of concrete or eight inches of bituminous pavement over an approved base of angular graded stone (minimum of six inches).

- b. Residential with curbs: 60 foot wide right-of-way; 28 foot wide paved roadway (back of curb to back of curb); seven inches of concrete or eight inches of bituminous pavement over an approved base of angular graded stone (minimum of six inches).
 - c. Commercial and Industrial: 70 foot wide right-of-way; 36 foot wide paved roadway with curbs (back of curb to back of curb); nine inches of concrete or 10.5 inches of bituminous pavement over an approved base of angular graded stone (minimum of six inches).
 - 4. Maximum allowable pavement grade shall be 7% for concrete pavement and 6% for asphalt pavement.
 - 5. Minimum allowable pavement grades shall be as follows:
 - a. Concrete pavement gutter grades - 0.3%
 - b. Asphalt pavement gutter grades - 0.5%
 - c. Concrete pavement surface grade to gutter line 1%
 - d. Asphalt pavement surface grade to gutter line - 2%
 - 6. Whenever a change in the grade of 2% or more occurs, provide a vertical curve with a length determined (to the nearest 50 feet) by the following formula: $L = 1/2 (G1 - G2)$; where L is the length in stations of 100 feet per each station and G1 - G2 is the algebraic change of grade in percent.
 - 7. At all intersections allow for a minimum of 1% in drop in elevation around the curb return (2% is preferred).
 - 8. Centerline curve data (radius, deflection angle, and total arc length) for all street pavement curves shall be indicated on the plans.
 - 9. The top of curb or the gutter grade elevations every 50 feet shall be indicated on the profile view for each street.
 - 10. The minimum sight distances for all roads shall be 200 feet for local streets; 300 feet for collector streets.
 - 11. When street centerlines have a deflection of more than 10 degrees, but less than 75 degrees, the centerline shall have a curve with a minimum radius of: 150 feet for local streets; 300 feet for collector streets. Between reverse curves, there shall be a tangent section of 50 feet for local streets; 200 feet for collector streets. For deflections of 75 degrees or greater, the curvature requirements shall be determined by the Township Engineer.
- C. In general streets in residential areas shall have open ditches with no curbs. However, street pavements in multiple family residential areas shall have mountable

curbs. In multiple family residential areas where the pavement is a boulevard section, island curbs shall be six inch high roll curbs.

- D. A detail shall be indicated for all intersections, "eyebrows" and cul-de-sacs. The detail shall show jointing and detailed pavement surface grades, including gutters and tops of curbs. The minimum scale of the detail shall be one inch equals 30 feet.
- E. At the end of a street that will be extended in the future, install a one foot header and standard road end barricade and sign.
- F. Where a proposed development abuts a public roadway, under the jurisdiction of the Road Commission of Macomb County, the ultimate right-of-way (as determined from the Macomb County Master Thoroughfare Plan) shall be shown and labeled on the proposed development plan. Dedication of the ultimate right-of-way to the Road Commission of Macomb County should be considered when developing any property abutting a public roadway.
- G. Where the Township Zoning Ordinance requires off-street parking, the design of the parking area shall conform to the requirements as follows:
 - 1. All parking lot layouts shall be designed to meet all the requirements of Armada Township and shall receive approval from the Township Planning Commission and/or Board of Trustees.
 - 2. All parking areas shall be paved with minimum thickness of either six inches of concrete placed over six inches of angular graded stone or four inches of bituminous concrete surface course placed over nine inches of angular graded stone for residential, commercial *and* industrial areas. If subgrade conditions allow, the Design Engineer may submit an alternate pavement design meeting a pavement structural number of at least three and a subgrade California Bearing Ratio (CBR) of at least 10. This alternate pavement design must include a geotechnical report on the subgrade, design calculation and any other information deemed necessary by the Township Engineer to support the design. A six-inch high concrete curb shall be placed around the entire perimeter of the paved residential and commercial parking areas. For industrial facilities, a six-inch high concrete curb shall be provided around the perimeter of maneuvering lanes and areas used for transient parking as well as parking areas along pedestrian walkways. Paved areas used primarily for the industrial facility's employee parking may be allowed without curb subject to the approval of the Township Engineer. All driving lanes in parking lot areas (through parking bays) shall have a 24-foot minimum width for two-way traffic and a 20-foot minimum width for one-way traffic and angular parking.
 - 3. When the parking area is to serve three or more automobiles, the individual car spaces shall be marked in accordance with the approved engineering plans by painted-on yellow stripes a minimum of three inches wide.
 - 4. The parking bays for multiple bay perpendicular parking areas shall have 64-foot wide bays. However, for a single bay, a car overhang of two feet may be assumed and the width between face of curbs may be reduced to 60 feet.

Moreover, on the curbside of a multiple bay parking area, a two feet overhang may be assumed for the purposes of reducing the pavement width of the outside bay to 62 feet from the face of the curb. Sixty degree angular parking bays with 20 feet wide drive lanes and shall have 60-foot wide bays. Forty-five degree angular parking bays with 20-foot wide drive lanes shall have 56-foot wide bays. In both cases, the length of angular parking bays may be reduced two feet for the assumed overhang. Where the parking area is adjacent to the project boundary line, the back of curb shall be located at least 20 feet from such boundary line where the adjacent property is residential and four feet where the adjacent property is commercial.

5. Parking lot layouts shall be designed in accordance with the general standards indicated on the Township Parking Area Standards Sheet.
6. When sidewalks are provided adjacent to the parking area curbs where car overhangs occur, such walks shall be a minimum width of seven feet as measured from the face of the curb.

Section 7. Water Supply and Distribution System

- A. All sets of plans which include plans for water mains shall include the current Township Water Main Detail Sheets which shall be considered an inseparable part of the plans when said plans are approved.
- B. All water mains shall be shown in a plan view. Water main, at location of crossings with other utilities or drains, and those water mains 16 inches or larger in diameter shall also be shown on a profile view.
- C. The plans shall indicate the proposed finished grade elevations of all hydrants, gate wells, and/or other structures and, where a public main or hydrant is not located in a public street, shall show an easement for the main and hydrants. The easement shall extend a minimum of six feet each side of the main.
- D. The type capacities, location and layout of a building service water supply pipe shall comply with all requirements of the Township Engineer, the Macomb County Health Department and the State of Michigan. A building service water supply pipe shall be shown on the plans for each building in the project. Where water mains are planned along the roadways, the building service water supply pipe for each lot shall be extended (by the Developer) across the roadways prior to paving.
- E. The type of pipe and joints indicated on the plans shall be in accordance with the currently adopted Township Standards.
- F. All water mains shall be installed with a minimum cover of five feet below finished grade. Where water mains must dip to pass under a storm sewer or sanitary sewer, the minimum acceptable clearance shall be 18 inches. At all open drain crossings, a five feet minimum clearance between bottom of drain and top of water main shall be provided. The sections which are deeper than normal shall be kept to minimum length by the use of a vertical bends (maximum deflection allowed 22 1/2 degrees) properly anchored.

- G. Water mains, other than hydrant leads, shall be eight inches minimum in diameter. All single hydrant leads longer than 100 feet shall be eight inches minimum diameter and shall be valved as a dead end main.
- H. All valves, except hydrant valves, shall be installed in a standard gate well. Valves shall be located in the system such that not more than four valves need to be turned off to isolate any individual section of water main. Moreover, sufficient valves shall be placed such that not more than 30 dwelling units or service establishments shall be serviced within such section of water main that can be isolated. Where possible valves shall be located at street intersections five feet from the intersecting street right-of-way line.
- I. Hydrants shall be installed along the water main at least every 500 feet. However, in no case shall any external part of any building be more than 300 feet from hydrant. In commercial or industrial districts, additional hydrants may be required. Hydrants shall be installed at the ends of all dead-end water mains. When near a street intersection, hydrants shall be located a minimum of 15 feet from the intersecting street right-of-way line.
- J. On each side of all roads in new subdivision plats, a "12 foot wide easement for public utilities" shall be provided. For developments other than subdivisions, appropriate easements for water service curb stops shall be provided.

Section 8. Wastewater Collection and Disposal System

- A. All sets of plans that include plans for sanitary sewers shall include the current Township Sanitary Sewer Detail Sheets, which shall be considered an inseparable part of the plans when said plans are approved.
- B. For every sanitary sewer project, there shall be indicated on the profile view (near the downstream end of the sewer) a manhole with a 12 inch deep manhole sump to be used for testing for infiltration. No sanitary sewer section having an infiltration rate, or an exfiltration rate, of more than 250 gallons per inch of pipe diameter per mile of pipe per 24-hour period shall be approved for connection to the Township Sanitary Sewer System.
- C. The minimum allowable size for public sanitary sewers shall be 10 inches diameter. The minimum size of building service sewer (wastewater) shall be six inches diameter, except that a single mobile home dwelling unit may have a four-inch building service sewer (wastewater). However, a minimum of six inch building service sewer shall be provided for a building containing from one to twelve dwelling units (or equivalent-); a minimum of eight inch building service sewer shall be provided for a building containing from 13 to 100 dwelling units (or equivalent-).
- D. The following table of acceptable slopes for sanitary sewers shall be adhered to:

<u>Sewer Size</u>	<u>Minimum Slope</u>	<u>Maximum slope</u>
4"	2.00%	
6"	1.00%	

8"	0.40%	
10"	0.30%	4.00%
12"	0.15%	3.00%
15"	0.22%	2.00%
18"	0.15%	1.50%
21"	0.10%	1.30%
24"	0.08%	1.20%

- E. Sanitary sewage force mains shall be designed for a minimum velocity of two feet per second and a maximum velocity of 12 feet per second, unless otherwise approved. Force mains shall be shown in a profile view with grades and elevations indicated thereon. An air relief and clean out assembly manhole shall be provided at high points. Access (clean out assembly) manholes shall be provided along the force main at least every 600 feet.
- F. A building service sewer shall be indicated on the plans for each building in the project. Where sanitary sewers are planned along roadways, the building service sewers shall be extended (by the Developer) for each lot to a terminus that is located at the outside edge of the 12 feet public utility easement or road right-of-way whichever is farther. Building service sewers shall be extended across the road right-of-way prior to paving.
- G. Manholes shall be provided along all sanitary sewers (eight inch and larger) at:
1. Points of horizontal deflection;
 2. Points where the size of sewer is changed;
 3. Points where the slope of the sewer is changed;
 4. At junctions with other sewer lines;
 5. At the upstream terminus of a sewer run; and
 6. Along the sanitary sewer at other locations such that the maximum spacing between manholes shall not exceed the following:
 - a. For 8" through 21" diameter 350'
 - b. For 24" and larger diameter 400'
- H. At manholes where size of sewer changes, match 0.8 diameter elevation points of inlet and outlet sewer. At horizontal deflections in the sanitary sewer greater than 45 degrees, a minimum of 0.1 feet additional adjustment in grade elevation shall be provided to allow for loss of head. However, additional elevation adjustments may be made when conditions allow same; provided that, when the invert of any inlet sewer is more than 18 inches above the outlet sewer, a drop assembly shall be provided.
- I. In general, sanitary sewers shall be located within a public street right-of-way. Sanitary sewers shall not be located within rear lot line easements, except in

extremely unusual circumstances as determined by the Township Engineer. Where public sanitary sewers are located outside of public streets, they shall be placed in a recorded public utility easement that provides for unlimited access to the sanitary sewer for repairs, connections and maintenance. The minimum acceptable width of easements for public sanitary sewers shall be 20 feet wide. The sanitary sewer shall be located within the middle third of the above designated easement width.

- J. The sanitary sewers shall be designed to have a minimum depth from finish grade. Elevation to top of sewer of eight and one-half feet at local control points or Nine feet at locations where the sewer grade is parallel to the road grade. The sewer shall be designed deep enough to serve a standard depth basement for the type of building for which the land is zoned.
- K. Each wye, or terminus, of building service sewer shall be plugged with an infiltration-proof plug having a joint similar to those of the main sewer.
- L. The type of pipe and joints for sanitary sewers shall be in accordance with currently adopted Township Standards.

Section 9. Other Site Improvements and Borrow Pits

- A. Sidewalks and Driveways.
 - 1. Sidewalks shall have a minimum thickness of four inches in pedestrian only areas and a minimum of six inches in areas where vehicular traffic will cross the walk.
 - 2. The width of the walk shall be a minimum of five feet for public walks and a minimum of three feet for other than public walks and are subject to review and approval by the Township.
 - 3. Driveways shall be a minimum of four inches thick. However, where loads heavier than standard automobile loads are anticipated, the minimum thickness should be six inches.
 - 4. Construction joints with a half inch premolded expansion filler shall be placed at maximum intervals of 50 feet. Contraction joints shall be placed at maximum intervals of five feet, or equal to the width of walk, whichever is greater.
 - 5. Sidewalks shall be constructed along a planned longitudinal grade line. The maximum longitudinal slope shall be 5%. The transverse slope of the sidewalk shall be 2% (1/4 inch per foot).
 - 6. Concrete for sidewalks and driveways shall have a 28-day compressive strength of at least 3,000 pounds per square inch (commonly referred to as a six-sack mix).
 - 7. Culverts for residential driveway approaches shall be a minimum of 24 feet in length, plus end sections. Culvert diameter shall be a minimum of 12 inches.

If an area does not have an existing ditch, and a culvert is established in the future, a culvert will be required at the current property owner's expense. No gravel or aggregate approaches are allowed onto a paved road.

B. Other Public Utilities

1. Unless otherwise approved by the Township Engineer, the installation of public utilities other than storm sewers shall not be started until the finished grade has been established. The utility company's Contractor shall be required to restore the ground to the finished grade. The drainage water swales shall be restored to a workable condition at least as good as existed prior to construction. Furthermore, all land and/or other physical features affected by the construction of the public utility shall be restored to a condition at least as good as that existing at the time construction was begun.

C. Borrow Pits

1. Borrow pits may be allowed within a land development, provided the procedure and regulations cited below are complied with.
 - a. No borrow pits may be dug within 50 feet of a building for which a building permit has already been issued.
 - b. As part of the land development's engineering plan submittal, the Developer's Engineer shall indicate the proposed elevations, depths, widths, lengths, slopes and locations of any borrow pits proposed for the land development. The only acceptable locations for borrow pits are as follows:
 - (1) In Subdivision Developments -- within the rear 30 feet of any lot, but not within five feet of any public utilities.
 - (2) In Developments other than Subdivisions - any more than five feet from proposed building, pavement (including streets, parking lots, and sidewalks), and/or public utilities.
 - c. Borrow pits shall be fully described in Building and Use Restrictions to be recorded with the land development plat, to run with the land, so as to describe each lot therein affected by the borrow pit with the further restrictive covenant: "No structures, such as, but not limited to, houses, accessory buildings, or in-ground pools, shall be constructed on areas of certain lots unless footings for the same are placed on undisturbed soil or to the satisfaction of the Armada Township Building Official."
 - d. Borrow pit side-slopes shall not be steeper than 71 degrees from the horizontal plane (i.e. not steeper than three feet vertically for each foot horizontally) nonetheless, the Developer and his Contractor are responsible for complying with OSHA requirements.

- e. Borrow pits may not be excavated deeper than eight feet below original undisturbed ground elevation.
- f. Borrow pits shall be backfilled with clean earth (i.e. free from any debris, building materials, trees, etc.) as soon as possible after excavation.
- g. When a borrow pit is more than five feet deep and is to be left open for more than 10 days, the Developer shall install a five foot high fence completely around the borrow pit and maintain such fence until the borrow pit is filled in.
- h. No building permit shall be issued for any building within the land development until the following requirements are fulfilled:
 - (1). All borrow pits within the development are filled to within two feet of original grade.
 - (2). The Developer has furnished a certification from his Engineer indicating (a) actual elevations, depths, widths, slopes, and lengths as excavated; and (b) that all borrow pits in the development are back filled to within two feet of original grade.
- i. When the requirements of above paragraphs "h (1)" and "h (2)" have been fulfilled, building permits may be issued for buildings on sites not affected by a borrow pit. However, on those sites affected by a borrow pit, a building permit will not be issued until the Township Engineer has been furnished with representative compaction tests for said building site, indicating that the complete borrow pit has been back filled in layers (no greater than 12 inches deep) of earth fill compacted to a density that is at least 80% as dense as the maximum obtainable density for such backfill material. The soil borings and compaction tests shall be performed under the direction of a licensed Geotechnical Engineer and submitted to the Township Engineer for review. A site will be considered "affected by a borrow pit" if a borrow pit existed on the subdivision lot or if a borrow pit is on constructed within 30 feet of a building on a non-subdivision site.

Section 10. Review and Observation Fees.

- A. Prior to construction of project improvements, the Owner or Developer shall file a copy of all engineering plans and a detailed estimate of costs of all proposed sanitary sewer, water, storm sewer, paving, earth work and drainage improvements with the Township Planning and Zoning Department. The Owner or Developer shall deposit a fee for the review of such plans in accordance with the schedule of fees adopted by the Township Board. When review costs exceed review fees paid, the Township will request additional funds to be deposited prior to further review of plans. Likewise, should review costs be less than the fee paid, the balance may be returned to the Developer upon final approval of the engineering plans. Additional fees will

be charged on an hourly basis at the effective rates under the current engineering contract.

- B. Prior to construction of project improvements, the Owner or Developer shall deposit with the Township Planning and Zoning Department, an amount equal to 6% of the estimated cost of construction for water, sanitary sewer, storm sewer, paving and other improvements as a construction observation deposit. Should the cost of inspection exceed this amount, the Owner or Developer shall pay such additional amounts upon demand. Likewise, should the cost of construction observation be less than the deposit, the balance may be returned to the Developer upon final release of the project. The fees and charges contained in this Section shall be in addition to those charged for debt service charges, connection charges and other charges or fees imposed for sanitary sewer and water supply.
- C. All work covered under a permit for construction site improvements shall be performed according to the approved plans and specifications and in accordance with requirements of this ordinance. By making an application for a permit for construction of site improvements, the Owner and/or Developer grants the Township the right to perform inspection of any and all work covered under the permit and the Owner and/or Developer shall correct, at their expense, any work or improvement constructed in conflict with approved plans, specifications or the requirements of this or any other Township ordinance.

Section 11. Schedule of Standard Utility Locations

Existing and New Streets Location of Utilities from Centerline (1)

<u>SUBJECT UTILITY</u>	<u>60' ROW</u> (24' Pavement without curbs) (2)	<u>60' ROW</u> (28' Pavement with curbs) (2)	<u>70' ROW</u> (36' Pavement with curbs) (2)	<u>86' ROW</u> (36' Pavement with curbs) (2)	<u>120' ROW</u> (64' Pavement with curbs) (2)
Sanitary Sewer (3)	36' L	36' L	41' L	49' L	50' L
Storm Sewer	--	20' L	26' L	27' L	40' L
Gas	16' R	18' R	21' R	27' R	35' R
Hydrants	20' R	20' R	25' R	25' R	38' R
Water Main	22' R	22' R	26' R	26' R	40' R
Second Sanitary Sewer	--	--	41' R	49' R	50' R
Second Water Main (or storm drain)	--	--	--	--	62' L
DTE -SBC (Underground)	--	--	--	--	45' R
DTE -SBC (Overhead)	31' R	31' R	44' R	44' R	61' L/R
Curb Radius at Intersections	25'	25'	40'	30'	35'

Notes:

- (1) L means Left; R means Right. In some existing streets where one or more of the utilities have been installed in a location other than described above, the location of remaining proposed utilities shall be determined by the Township Engineer with the concurrence of the Road Commission, when appropriate. Where, in the opinion of the Township Engineer, these locations are not desirable or possible, suitable adjustments may be made.
- (2) This is not a categorically approved width of pavement, but only an allowance assumed for purposes of this schedule.

Section 12. Interpretation.

The provisions of this Ordinance shall be held to be the minimum requirements adopted for the promotion and preservation of public health, safety and general welfare of the Township. These regulations are not intended to repeal, abrogate, annul or in any manner interfere with existing regulations or laws of the Township, nor conflict with any statutes of the State or County except that these regulations shall prevail in cases where these regulations impose a greater restriction than is provided by existing statutes, laws, or regulations.

Section 13. Insurance and bonds.

Prior to construction of project improvements, the Developer shall procure and maintain during the life of any contract or agreement for such construction, a comprehensive general liability insurance policy protecting the Township, and the Township Engineer from any claims for damages, real, personal or otherwise, in the following amounts: \$1,000,000 for bodily injury, including death, per person; \$1,000,000 per occurrence and \$500,000 aggregate for property damage. Prior to commencement of any work, the Developer shall provide a site improvement bond in the full amount of the approved construction costs for such improvements. Prior to acceptance of the project improvements by the Township, a one year maintenance bond in the full amount of the approved construction costs for such improvements (except commercial and industrial parking areas with a single owner) shall be posted by the Developer.

Section 14. Violations and penalties.

Any person or anyone acting on behalf of such person violating any of the provisions of this ordinance shall, upon conviction thereof, be punished by a fine of not more than \$500.00, or by imprisonment for a term not exceeding 90 days or by both such fine and imprisonment.

Section 15. Variance.

- A. The Township Board may authorize a variance of any of the engineering standards established or may waive the installation of an improvement, when it determines that undue hardship or practical difficulty necessitates such variance or waiver. In granting such variance or waiver, the Board shall prescribe other conditions that it deems necessary or desirable for the public interest. No variance shall be granted unless the Township Board finds:
 1. There are special circumstances or conditions affecting the project improvement such that a strict application of the provisions of this section would deprive the applicant of reasonable use of his property; and

2. That the variance is necessary for the preservation and enjoyment of the substantial property right of the applicant; and
 3. That the granting of the variance will not be detrimental to the public welfare or injurious to other property in the area in which such property is situated; and
 4. That an alternative standard or material proposed by the applicant provides the same functional equivalency as the standard or materials required by this section, and that the alternative standard or material will provide a useful life of the improvement equal to the expected useful life of such improvement had such improvement been installed in strict conformity with this section.
- B. Application for any such variance shall be submitted in writing by the Owner at the time the preliminary plans are submitted, stating fully and clearly all facts relied upon by the Owner, and shall be supplemented with maps, plans or other additional data which may be in the analysis of the proposed project. The plans for such development shall include such covenants, restrictions or other legal provisions necessary to guarantee the full achievement of the plan.

Section 16. Repeal of all conflicting provisions.

All resolutions, ordinances, or parts thereof in conflict with the provisions of this ordinance are to the extent of such conflict hereby repealed.

Section 17. Severability.

If any section, paragraph, clause or provision of this ordinance is for any reason held to be invalid or unconstitutional, the invalidity or unconstitutionality of such section, paragraph, clause or provision shall not affect any of the remaining provisions of this ordinance.

Section 18. Publication.

A true copy or summary of this ordinance shall be published in full in a newspaper of general circulation in the Township of Armada within 30 days after its adoption.

Section 19. Effective date.

This Ordinance shall take effect 30 days after publication of a true copy or a summary thereof in a newspaper circulating within the Township of Armada as provided by Section 18.

Section 20. Certification.

I hereby certify that the foregoing constitutes a true and complete copy of an Ordinance duly adopted by the Township Board of Armada, Macomb County, Michigan at a meeting held on the 11th day of October 2006, by the following vote of the members thereof:

AYES: MEMBERS: Eison, Ruthenberg, Hoxie, LeMieux, Jacob

NAYS: MEMBERS: None

ABSENT: MEMBERS: None

This Ordinance was published in the Armada Times Newspaper as required by law in its edition for October 25, 2006.

Margaret M. Ruthenberg
Armada Township Clerk