

RAY TOWNSHIP
LAND DEVELOPMENT
AND ENGINEERING STANDARDS

ORDINANCE #60

SECTION I

I-1 **PURPOSE**

The purpose of this Ordinance is to provide reasonable and proper standards for the construction of storm drainage systems; sanitary sewers; water mains; roads and streets; and other related systems for residential, commercial, or industrial projects within the Township.

I-2 **GENERAL PLAN REQUIREMENTS**

A. **Submission**

No person shall construct, attempt to construct, repair or replace any storm drains, surface drains, sub-surface drains, sanitary sewers, water mains, roads or streets without submitting plans as required here under.

1. **Prior to Commencing Work.** All submissions required by this Section shall be made prior to any work commencing on any premises.
2. **Concurrent With Plats or Site Plans.** If the proposed work is in conjunction with the platting of lands or an application for site plan approval under the Zoning Ordinance of Ray Township, submissions here under shall be concurrent with the requirement of those Ordinance and Code provisions. Engineering plans must be in accordance with the approved site plans.
3. **Complete Prior to Review.** Complete project improvement plans shall be submitted prior to review and approval of any portion thereof.

B. **Plan Drawing Specifications**

1. **Prints.** 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 and layout and presentation of proposed improvements. A legible location map shall be shown on the first sheet of these plans.

2. **Scale.** Detail plans shall be a minimum scale of 1 inch equals 50 feet horizontal and 1 inch equals 5 feet vertical on profile sheets. Plan view sheets shall be a minimum scale of 1 inch equals 50 feet unless otherwise approved in advance by the Township Engineer.
3. **Elevations.** Elevations shall be on U.S.G.S. datum. Two bench marks for the work shall be indicated on each sheet of plans with description, elevation, and location.
4. **General Plan.** For projects having more than one sheet of plans a general plan having a scale of 1 inch equals 100 feet shall be provided showing the overall project and indicating the location of all improvements shown on the detailed plans, a legal land description of the project, location sketch, and all required easements. Superimposed on this general plan shall be elevation contours of the project area at least 100 feet outside the project. The contour interval shall be one foot or as approved by the Township Engineer.
5. **Lines and Numbers.** Street names, lot lines, lot numbers, parcel lines and County tax plate numbers shall be shown on all plans.
6. **Certification.** All plans submitted shall bear the seal and signature of the Registered Professional Engineer responsible for the design.

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PLAN APPROVAL PROCEDURE

A. Submission by Applicant

For Township approval of any of the systems covered by this Ordinance, the applicant shall furnish to the Township;

1. Three (3) sets plans for the system on which approval is desired (additional sets will be required later);
2. Detailed design computations as required.
3. A detailed estimate of cost of the proposed work separated by type of work i.e. paving, storm drain, etc.
4. Payment of the required plan review fee.

B. Fees and Inspection Costs

1. **Review of Plans.** At the time of submittal of plans, specifications and detailed estimate of cost of the proposed project improvements, the owner shall pay the Township a fee for review of such plans equal to one and one quarter (1/4) percent of the estimate of cost of the improvement.
2. **Inspection.** Further, prior to the construction of project improvements, the owner shall deposit with the Township an amount equal to five (5%) percent of the construction contract price for inspection. When inspection costs exceed the deposit, the developer will be required to pay the balance before final approval of the project is given and before any building permits are issued. When the inspection costs are less, a refund will be given.

C. Review and Certification of Plans

The Township shall collect the review fee and refer 2 sets of plans to the Township Engineer who shall check the estimate, review the plans for conformity to standards set forth herein, and certify that they are consistent with the overall public works plans of the Township, after which they will return one of the two sets with appropriate comments.

D. Resubmission by Applicant

The applicant, after making any changes requested on the set of plans returned to him shall then resubmit two sets of revised plans to the Township Engineer for final approval. Failure to properly make the requested changes may result in additional review fees.

E. Township Approval

The Township Engineer shall then review these revised plans for conformity to the comments mentioned heretofore, and upon approval of such plans will request sufficient additional sets of plans to provide (3) sets to the Township, (2) sets to the Township Engineer, (1) set to the applicant, (1) set to the applicants engineer, and such additional sets as may be required by others.

F. Alterations Prohibited

After the approval is obtained no alterations thereof shall be made before resubmission and reapproval is obtained in accordance with this Section.

G. Other Approvals

The applicant shall obtain approval of the Road commission of Macomb County, the Macomb County Public Works Office, the Michigan Department of Transportation, Michigan Department of Natural Resources, and the Health Department, where applicable.

I-4 INSURANCE

Prior to the start of construction of the project the contractor shall procure and maintain during the life of any contract or agreement for such construction, insurance protecting the Township and the Township Engineer from any claim f or damages, real, personal or otherwise in the amount of \$1,000,000 for bodily injury including death and \$250,000 per occurrence and \$500,000 aggregate for property damage.

All such policies of insurance shall specifically include underground hazard protection.

This insurance may be in the form of a separate Owners Protective Policy with the Township and the Township Engineer; as named insured or a rider to the contractors policy naming both of the above as additional insured (provided that policy limits meet the above requirements).

I-5 IMPROVEMENT ACCEPTANCE STANDARDS

A. Compliance with Code of Ordinances

All construction improvements, and/or alterations within the Township on public or private property shall comply with all of the provisions and requirements of this or any other related Ordinance Code provisions.

B. Bond

Prior to the start of construction, unless otherwise approved by the Township, Performance, Labor, & Material Bonds equal to 100% of the cost of the project shall be provided to assure proper and timely completion of the work. In addition prior to the acceptance of improvements by the Township, a two-year maintenance bond in the full amount of the contract for such improvements shall be posted by the owner. Additional bonds may be required as stated in each subsequent section.

C. "As-Built" Plans and Certification

One mylar copy of "As-Built" plans for the project and certification from a Registered Professional Engineer that all work has been completed in substantial conformance with the approved plan shall be provided prior to acceptance of the improvements by the Township.

The "As built" plan must be provided before building permits are issued for units in the project, (Models excepted). At the option of the owner, the Township Engineer may prepare the "As Built" plan, at the owner's expense on original mylars, supplied by the owner. In no case shall a project be accepted as complete until the "As Built" plans are on file at the Township.

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INTERPRETATION

A. Minimum Requirements

The provisions of these regulations shall be held to be the minimum requirements adopted for the promotion and preservation of public health, safety and general welfare of the Township.

B. Other Applicable Requirements

Materials, methods, and specifications not specifically addressed herein shall conform to the appropriate Michigan Department of Transportation, Macomb County Road Commission, and/or Macomb county Public Works specifications applicable to the item in question. The Township Engineer shall determine the suitable specification and application of same to be used in each instance.

C. Greater Restriction

These regulations are not intended to repeal, abrogate, annul or in any manner interfere with existing regulations or laws of the Township or any other governmental authorities having jurisdiction; provided, however, these regulations shall prevail in cases where they impose a greater restriction, or control.

D. Specification References

Reference to MDOT, ASTM, AWWA, etc. are intended to refer to the most current applicable revision of the specification. The Township Engineer shall determine if said specification is appropriate for the conditions.

E. **Permits Required**

Prior to final Township approval, a permit shall be applied for, from any other government agency having jurisdiction or approval authority over the work being proposed. Such agencies may include but are not limited to the following; Public Works Office, Road Commission, Department of Natural Resources, Health Department, etc.

F. **Adjudication of Disputes**

All disputes arising in the interpretation of the technical provisions of this section shall be resolved in accordance with the opinion of the Township Engineer.

**SECTION II
STORM DRAINAGE SYSTEMS**

II-1 PURPOSE

The purpose of this section is to provide reasonable and proper standards for the design and construction of storm drainage systems for residential, commercial or industrial projects including surface drainage, and open and enclosed storm drains.

II-2 PLAN REQUIREMENTS

A. Requirement Established

No person shall construct, attempt to construct, repair or replace any storm drainage structure, ditch, culvert, pipe, water course or other drainage system without submitting plans as required hereunder and in Section I.

II-3 STORM DRAINAGE SYSTEMS

A. Plan Drawing Specifications

1. Elevations. If any portion of the project is in a street R.O.W. show the adjacent top of curb or edge of pavement grade (existing or proposed) on the profile.
2. Structure Finished Grades. Finished grades of structures shall be indicated on the plan or profile for all structures.

B. Drain Plan Specifications

All drains except catch basin connections shall be shown in plan and profile. Profiles of drains shall indicate the size, invert and slope of the drain and shall indicate the existing and proposed ground elevation along the route of the drain. The following information shall also be indicated on the storm drain profile:

1. Length of run and type of drain pipe between manholes; or typical cross sections of ditches.
2. Size and slope of drain between manholes. Unless otherwise approved by the Township Engineer, the slope of the drain shall provide a minimum velocity of 2.5 feet per second.

3. Top elevation of all manholes and catch basins.

C. **Extension of Improvements**

Improvements which are necessary to serve adjoining property as determined by the Township Engineer shall be extended entirely across the project at the project owner's expense.

D. **Plats**

If the project is in an existing or proposed subdivision a copy of the plat and overall engineering plan shall be attached to the plan.

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OPEN CHANNEL AND ENCLOSED DRAIN STANDARDS

A. **Design Computations**

Storm drainage systems shall be designed for a ten year storm. The rational method for arriving at storm water run-off shall be used. A clearly labeled chart showing all pertinent values used in the drainage calculations shall be included on the plans. In general, sufficient capacity shall be provided in the storm drain system to take upstream drainage district area into the system.

1. **Drainage Map.** The Design Engineer shall submit a map outlining the various areas, including off-site upstream areas, which drain to the points of inlet used for design together with the storm drain design computations.

2. **Rainfall Intensity Formula.** The formula for rainfall intensity shall be "i" equals 175 divided by "t" plus 25 in which "t" is the time of concentration.

3. **Velocity.** The roughness coefficient "n" used in the Manning Formula for determining velocities will be as follows: ("n" for other types of pipe may be approved by the Township Engineer upon receipt of suitable substantiating information)

- | | | |
|-----|------------------------------------|-----------------|
| (a) | Corrugated Metal Pipe | n = .028 |
| (b) | Concrete Pipe | n = .013 |
| (c) | PVC-ABS or other
"Plastic" Pipe | n = .012 |
| (d) | Paved Channels | n = .011 - .026 |

- (e) Rubble or Rip Rap : n = .020 - .035
- (f) Grass, sod, etc. n = .035 - .060

4. **Coefficient of Imperviousness.** The coefficient of imperviousness shall be determined by the design engineers but shall generally be guided by the following minimums:

- (a) Lawn or Park Area .10
- (b) Normal Subdivision overall .35
- (c) Multiple Development .55
- (d) Commercial and Ind. Devel. .90
- (e) Paved Areas Including Roof .90

A composite coefficient determined by a weighted mean approach is acceptable and will require verification by the design engineer.

5. **Time of Concentration.** The time of concentration used in runoff computations will generally not exceed 20 min.; values lower than 20 min. will be assigned by the Township Engineer if conditions warrant and values greater than 20 min. will require verification by submission of calculations.

6. **Allowable Runoff.** Generally, the runoff from the proposed development shall be limited to the runoff equal to undeveloped land for a 10 year storm. This requirement may be modified by (1) written approval from the agency having jurisdiction of the proposed storm outlet, or (2) improvement of all downstream facilities to a point where #1 above can be obtained. Calculations demonstrating that the proposed runoff is not greater than the runoff from the undeveloped site will be required.

7. **Minimum Diameter.** The minimum diameter storm drain pipe is 8 inches.

8. **Retention.** One or more retention ponds shall be provided to restrict the runoff from the site. Generally, retention ponds are to be designed to be totally drained within 24 hours of the storm with a maximum water depth of 4 feet. Side slopes shall not be steeper than 1 on 7 for totally drained ponds and 1 on 5 for permanent ponds or lakes used for retention. Ponds which do not meet these requirements may require fencing or pumping. Ponds shall have a suitable overflow channel to restrict erosion and to allow for controlled overtopping. Permanent ponds or lakes which are to be

utilized as retention ponds shall conform to the above requirements except that the normal pond water elevation will be considered as the bottom of the retention pond and 1 on 5 slopes are acceptable.

The retention volume "V" of the pond will be determined as follows:

$$V = h/3 (A_1 + A_2 + (A_1 A_2)^{1/2})$$

where:

A_1 & A_2 are the water surface areas at elevations 1 & 2, and h is the difference between elevations 1 & 2.

The method used by the Township Engineer to verify retention requirements will be "A Simple Method of Retention Basin Design" by Yrjanainen & Warren.

Retention basins shall be constructed prior to any other work on the site. Outlet pipes and overflow devices shall be protected to prevent damage and avoid off site sedimentation in the event of major storms during the construction of the development.

B. Hydraulic Gradient

1. **Enclosed Drain.** Where the hydraulic gradient is above the top of the drain pipe, the design elevation of the hydraulic gradient must be indicated on the profile plan. The hydraulic gradient shall not be higher than the rim elevation of a structure unless the area around that structure is part of an approved retention area.
2. **Open Channel.** The design water surface elevation for open channels shall be shown at all critical locations along the system and upstream from all constrictions.

C. Depth of Cover

Where possible, provide a minimum of 3 feet of cover from the pavement or earth grade to the top of any storm drain. Under roadways and shoulders, if the depth of cover to the top of pipe is less than two feet, C-76 Class IV shall be used.

D. Location of Underground Utilities

Underground utilities in or near the street Right-of-Way shall be located as near as possible to the dimensions measured from the centerline of the pavement as shown in the following table:

<u>R.O.W.</u>	<u>Sanitary Sewer</u>	<u>Gas Main</u>	<u>Water Main</u>	<u>Storm Drain</u>
60	36'L	16'R	22'R	20'L
70	41'L	21'R	27'R	26'L
86	36'L	27'R	22'R	27'L

*Note: (R) means Right of centerline of pavement. (L) means Left of centerline of pavement.
Refer to Road Commission specifications for other utilities.*

E. Catch Basins

1. **Location.** In general, catch basins shall be located as follows:

- (a) At the radius return of street intersections, 150 feet maximum distance along the street between a high point and a corner catch basin is allowed when drainage is required to go around the corner;
- (b) At all low points in street;
- (c) At intermediate points along the street such that there is a maximum of 400 feet of drainage from a high point to a catch basin;
- (d) As required in parking lots and grass areas;
- (e) Rear yard catch basins shall be located, so as to limit overland drainage to a maximum of 300 feet of travel before entering storm drain pipes. A catch basin shall be located at any deflection point of the rear yard swale. Every lot in subdivisions and condominium developments, shall be adjacent to a catch basin.

F. Manholes

Manhole spacing for storm drains shall be as follows:

<u>Diameter of Drain</u>	<u>Maximum Manhole Spacing</u>
8 in. to 42 in.	400 ft.
48 in.	450 ft.
54 in. & 60 in.	500 ft.
66 in. & Larger	600 ft.

G. Headwalls & Inlet Structures

Headwalls and inlet structures shall be placed as required. End Sections with approved grates may be required where headwalls are deemed to be unsuitable.

H. Materials

Generally, materials shall conform to those shown on the Township Detail Plans. Materials other than those shown may be approved by the Township Engineer when calculations provided by the Design Engineer, or MDOT specifications indicate that the substituted material is equal and suitable for the intended use.

I. Easements

1. **Enclosed Drain.** Easements shall have a minimum width of 20 feet, and shall be computed as follows: 2 times Pipe Depth, plus pipe diameter, plus 4 feet. Drains in easements shall be kept at least 2 feet away from side or rear parcel lines.
2. **Open Channel.** Easements shall have a minimum width of 20 feet, the top of slope in easements shall be kept at least 2 ft. away from side or rear parcel lines.

J. Lateral Storm Drains

Lateral storm drains with catch basins shall be constructed to provide an outlet for the footing drain/sump pump discharge leads for each proposed building site.

1. **Specifications.** Such storm drain laterals to provide for footing drain/sump pump discharge only shall be a minimum of 8 inch diameter on a minimum 0.4% grade with manholes spaced a

maximum of 400 feet. The hydraulic gradient shall be lower than the lowest basement floor elevation unless suitable methods of preventing flooding are present in the system.

2. **Footing Drain Leads.** Where such lateral drains are constructed in a street R.O.W., a minimum 3 inch diameter storm drain lead shall be constructed from a catch basin to the property line to provide an outlet for a footing drain/sump pump for each parcel. The lead shall be constructed at a minimum depth of 3 feet on a minimum of 1.0% grade. Footing drain leads may be connected to catch basins.

The materials and methods of construction shall be in accordance with the current Township Standards.

K. Ditch Slopes

Unless otherwise approved, ditch slopes shall not be steeper than 1 foot vertically to 2 feet horizontally. Wherever possible in side or rear yards, slopes shall be 1 on 5 or flatter.

II-5

Surface Drainage Standards

A. Minimum slopes

1. **Asphalt or Grass.** Covered Asphalt or grass covered areas shall have a minimum general slope of 1% with specific water carrying swales having a minimum slope of 0.4%.
2. **Concrete Paved.** Concrete paved surfaces shall have a minimum slope of 0.4%.

B. Inlet Structures

All project areas shall drain storm waters to suitable inlet structures which will prevent such storm water from flowing across adjacent private property and prevent damage to both private and public properties.

C. Grading Plan

1. All new construction and/or alterations shall require a suitable grading plan. Storm water shall be drained to an approved outlet.
2. Buildings shall be located at such an elevation that a sloping grade will be maintained in order to cause the surface water to flow away

from the walls of the structure, wells, or septic fields. In general the height of the finished grade line of any dwelling should be not less than 12 inches nor more than 24 inches above the curb or crown of the street, as measured from the center of the front of the dwelling. In cases where these limitations cannot be met consideration will be given to fitting the grades to the terrain.

3. When a new building is to be constructed on a vacant site between two existing structures on adjacent sites, the grade shall be established in such a manner as to harmonize with the respective grades of the adjoining sites so as to prevent unreasonable surface water run-off on any such adjoining sites.
4. An established surface drainage grade shall not be altered in a manner or to an extent that would materially obstruct or deter the normal surface drainage. UPSTREAM DRAINAGE SHALL NOT BE BLOCKED.

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SUB-SURFACE DEWATERING DRAINS

A. Plan Drawing Specifications

1. Map. A map showing the area to be dewatered shall be provided.
2. Elevations. If any portion of the project is in a street R.O.W., show the adjacent top of curb or edge of pavement grade (existing or proposed) on the profile.
3. Structure Finished Grades. Finished grades of structures shall be indicated on the plan or profile for all structures.

B. Drain Plan and Profile Specifications

All sub-surface dewatering drains shall be shown in plan and profile. Profiles of sub-surface dewatering drains shall indicate the size, invert and slope of the drains and shall indicate the existing ground and proposed grade along the route of the drains. The following information shall be indicated on the drain profile:

1. Length of run and type of drain pipe between outlets or manholes;
2. Size and slope of drain between manholes. Unless otherwise approved by the Township Engineer, the slope of the drain shall provide a minimum velocity of 2.5 feet per second.

3. Top elevation of all manholes.
4. Available borings indicating soil types, and characteristics, and water table data.

C. Extension of Improvements

Improvements which are necessary to serve adjoining property as determined by the Township Engineer shall be extended entirely across the project at the project owner's expense.

D. Sub-surface Dewatering Drains

All existing sub-surface dewatering drains disturbed by the contractor shall be repaired and/or reconstructed to assure that existing systems are not disrupted.

E. Design Computations

1. **To Lower Water Table.** Sub-surface dewatering drains shall be designed to comply with Macomb County Health Department specifications when said dewatering drains are only used to lower the water table of land to be developed and not used for surface storm water drainage.
2. **Surface Storm Water Drainage.** Where subsurface dewatering drains are designed to accommodate surface storm drainage and/or downspout discharge, then the design computations shall be as required under the Enclosed Drain Standard of this Ordinance.

F. Pipe Specifications

1. **Minimum Diameter.** Minimum diameter of subsurface dewatering pipe is six (6) inches provided pipe does not receive surface or down spout discharge.
2. **Material.**
 - (a) **Types.** Perforated pipe shall be ABS Plastic Pipe, ABS Truss Pipe, P.V.C. Plastic Pipe, or Polyethylene Pipe.
 - (b) **Crushing Strength.** All pipe shall have a minimum crushing strength of 1000 pounds per foot.

- (c) **Wrapping.** All pipe shall be spiral wrapped with approved type fiber glass mat or approved knitted sock prior to installation.

G. Bedding, Cover, and Back-fill

All pipe shall be placed on a minimum pea gravel bedding thickness of 6 inches, shall have 6 inches of pea gravel on the sides of the pipe, and shall have pea gravel used as back-fill material to a height of at least 2 feet above the pipe with the balance of the back-fill being sand meeting the MDOT Specifications for Granular Material Class II.

H. Manholes

Manholes shall be a minimum of 3 feet in diameter with steps, and shall have a frame and cover 1000 Type C-2, East Jordan Iron Works, Inc., or equal and shall be spaced no more than 400 feet apart.

I. Location

Sub-surface dewatering drains in rear yard areas to be placed at least five (5) feet from the property line. Other locations than rear yards are to be approved by governmental agencies having jurisdiction.

J. Easements

Easements shall have a minimum width of 20 ft. Drains in easements shall be kept at least 2 ft. away from parcel lines.

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INSPECTIONS

A. Intervals

The Township Building Inspector or the Township Engineer shall inspect the installation of all storm drainage systems for compliance with plans filed hereunder and conformity with the standards for construction. Additional inspections may be required by other agencies as provided. Inspections will be performed at such intervals as are necessary to assure substantial compliance with the requirements.

B. Written Notice of Deficiencies

Any deficiencies or deviations shall be reported in writing by the inspector and a copy of the same shall be given to the contractor or proprietor.

C. **Corrective Action**

It shall be the duty of the contractor or proprietor to correct and remedy same before further construction is commenced .

D. **Penalty For Failure to Correct**

Failure thereof shall be grounds for stopping construction and/or the occupancy of buildings.

E. **Maintenance**

Unless otherwise provided the Owner shall be responsible for necessary maintenance of the system.

**SECTION III
LAKES AND PONDS**

III-1 PURPOSE

The purpose of this section is to provide reasonable and proper standards for the construction or modification of lakes and ponds; the reduction of soil erosion; and the prevention of sediment being deposited on off-site locations or in lakes or streams. The word "pond" as used in this section shall mean lakes, ponds, or other bodies of water regardless of sizes.

III-2 PLAN REQUIREMENTS

No person shall construct or alter a pond nor attempt any other earth change without first submitting plans as required hereunder and in Section I.

III-3 PONDS

A. Plans

1. **Watershed.** Plans shall outline all watershed areas which drain into the pond. UPSTREAM DRAINAGE SHALL NOT BE BLOCKED.
2. **Downstream.** Plans shall show all down-stream areas affected by the pond construction as well as all downstream areas which may be effected by an overflow on the pond. When the pond is constructed on or near an active stream, provisions shall be made to maintain the minimum continuous flow required to meet all downstream needs both during and after construction.
3. **Calculations.** Provide calculations showing what effect a 100 year storm will have on the pond. The design engineer may use $275/t+25$ for the rainfall intensity.
4. **Elevations.** Provide elevations of waterways upstream and downstream from the pond as well as a profile around the perimeter of the pond.
5. **Details.** Plans shall include sufficient detail of all related construction to clearly show the required location, elevation, and dimensions.
6. **Over-flow.** All ponds must be provided with overflow devices capable of safely discharging the over-flow from a 100 year storm.

7. **Depth.** Unless otherwise approved by the Township Engineer, the pond depth must be a minimum of 10 feet below the average summer level of water.
8. **Slopes.** Banks of all ponds shall be sloped not steeper than one foot vertical to five feet horizontal (1 on 5 slope) and shall extend into the water to a depth of 5 feet.
9. **Dikes.** When ponds are constructed by filling or excavating to provide dikes or dams, the plans shall include:
 - (a) Types of soil in the dike,
 - (b) Compaction requirements,
 - (c) Slope protection,
 - (d) Statement regarding maintenance requirements of dikes and responsibility for same.

B. Permit

A permit may be required from the Macomb County Public Works Office and/or the Michigan Department of Natural Resources, depending on the type and location of the pond.

C. Soil Conservation Details

All pond construction shall be in accordance with the established Township ordinances and in accordance with the construction details and requirements of the Soil Conservation Department.

**SECTION IV
ROAD SPECIFICATIONS**

IV-1 GENERAL SPECIFICATIONS

A. Scope

These specifications establish minimum standards for roads within the township. All roads shall be designed to meet or exceed the following requirements, requirements of other applicable Ordinances, or those of the Macomb County Road Commission, whichever are more restrictive.

All public roads shall come under the jurisdiction of the Macomb County Road Commission. All private roads shall meet the requirements of the Township Private Road Ordinance and the applicable requirements in this Section. Residential Lanes shall meet the applicable specifications of this Ordinance.

B. Plans

1. Plans shall consist of plan and profile sheets, a cover sheet, standard detail sheets, where applicable special detail sheets and a copy of preliminary plat drawn to scale by a Registered Land Surveyor or Registered Engineer. Plans shall be *drawn* on 24 in. x 36 in. format sheets, with a horizontal scale of 1 in. = 50 ft. and a vertical scale of 1 in. = 5 ft. unless otherwise authorized by the Township Engineer. Projects requiring more than 1 plan sheet shall have a general plan sheet showing the roads together with all storm, sanitary, and water lines and all related easements. This general plan sheet shall be drawn at 1 in. = 100 ft.
2. All plans shall be submitted in triplicate to the Municipality and shall include the following in addition to the requirements of Section I of this Ordinance:
 - (a) Elevations shown at every 100 ft. station on tangent, every 50 ft. station in a vertical curve, and at such intermediate points as may be necessary to define the profile.
 - (b) Elevations at spring points of all intersection radii.
 - (c) Profile of existing ground on centerline of proposed road. Stationing shall be on centerline of the proposed road.

Centerline of proposed road shall be on centerline of Right-of-Way. Proposed centerline elevations shall be shown on uncurbed roads and top of curb elevations shown on curbed roads.

- (d) Location of all existing and proposed manholes and catch basins within the project, and related adjacent areas.
- (e) Distances and grade between high points and catch basins, or between catch basins.
- (f) Minimum fall around radius on curbed roads from spring point shall be 0.2 ft.
- (g) Pavements with curbs shall give curb elevations on plans in lieu of centerline elevations. Gutter grades shall also be shown in areas where curb height varies.
- (h) Corner and/or stopping sight distance in areas where sight distance may be restricted. Unless otherwise noted, AASHTO guides will be used.

C. Grade

Generally, minimum grade shall be 0.4% and maximum grade shall be 7.00%, unless varied by the Township Engineer. Generally, all grades shall be divisible by two.

D. Intersection Radii

Minimum intersection radii shall be twenty (20) feet. Thirty (30) feet or larger radii shall be used at intersection with main roads.

E. Vertical Curve

When the algebraic difference in grade exceeds 0.8% a vertical curve is necessary. Equal tangent vertical curves shall be used unless special circumstances exist. The following information shall be shown for the vertical curves.

1. Station and elevation at the Point of Intersection, Point of Curvature, and Point of Tangency.
2. Length of vertical curve.

3. Station and elevation of high point or low point of curve.
4. Corrected or curve elevations at 50 foot intervals along the curve.

F. Signs

1. All signs shall be erected in conformance with the current edition of the Michigan Manual of Uniform Traffic Control Devices.
2. Street name signs shall be provided and placed as follows, in order of preference:
 - (a) Above the stop sign.
 - (b) Next to the stop sign:
 - (c) At NW Corner of Intersection
 - (d) At SE Corner of Intersection

G. Right of Way and Drainage Easements

1. Right of way shall be 60 ft. for low volume local roads, 86 ft. for collector roads, and 120 ft. or greater for primary or high volume roads.
2. Right of Way for cul-de-sacs shall be a 60 ft. radius from the center of the cul-de-sac.
3. Additional Right of Way or easements shall be provided for road or drainage purposes when required by the engineer. Drainage easements will be required over all related properties within the development as well as beyond the boundary of the development to a county drain, or river, or other suitable outlet.

H. Sidewalks

When sidewalks are to be provided, sidewalk construction shall conform to the requirements of Section V "Sidewalk and Bicycle Path Specifications".

I. Access Standards

1. **Access to Interior Roads.** Whenever a parcel has frontage on an interior public or private road and a perimeter county road, driveway access shall be limited to the interior road.
2. **Number of Driveways.** The number of non-residential driveways to a major or secondary road shall be limited to the minimum necessary. Shared commercial and industrial driveways are encouraged, subject to the approval of a reciprocal access easement and maintenance agreement between all property owners. The number of driveways allowed shall be determined by the Planning Commission as part of site plan review based on the use of the site and circulation patterns.
3. **Driveway Entrance Design.** The design and construction of all driveway entrances to a public road shall meet the standards of the Macomb County Road Commission. All driveway entrances to private roads shall observe the design and construction standards of this Ordinance.
4. **Distance to Intersection.** Commercial or industrial driveways shall not be located closer than 250 feet from an intersection, unless the Planning commission determines there is no feasible alternative.
5. **Drainage.** The surface of the driveway shall be properly drained so that water drainage and frost heave will not create driving hazards.

IV-2 PUBLIC ROADS

A. Surfacing

1. Unless otherwise approved, all public roads, shall be hard surfaced. No surfacing shall be placed until all utilities have been installed and properly backfilled.
2. Grade of road shall be placed at 0.02 grade of incline per foot on concrete and asphalt.
3. The minimum pavement width shall be 28 ft. back to back of curb on local roads and 36 ft. back to back of curb on collector roads. When a storm drainage outlet of sufficient depth is not available, uncurbed pavements with open ditches may be approved. In such cases, the minimum pavement width on local roads shall be 22 ft.

with a 3 ft. paved shoulders plus a 3 ft. gravel shoulder on each side, and on collector roads 30 ft. with a 4 ft. paved shoulder and a 4 ft. gravel shoulder on each side. All uncurbed pavements shall be marked with 4 in. wide pavement edge lines placed at each edge of the pavement to separate the pavement from the paved shoulder.

B. Fill Material

All fill material under and within 2 ft. of edge of pavement, and under sidewalk shall be approved porous back-fill and shall be properly drained.

C. Completion of Construction

1. **Final Inspection.** When construction is completed the Macomb County Road Commission or the Township Engineer shall make a final inspection before issuing a letter stating that the streets and grading have been constructed in accordance with plans and specifications.
2. **Owner Certification.** The owner shall certify in writing that all contractor fees, engineering fees and any other monetary claims against the development have been paid in full. Waivers of Lien from each contractor shall be provided before final approval by the Township.

D. Road Types and Special Conditions

Road types and special conditions shall meet the Macomb County Road Commission's Specifications, and Township requirements as may be directed. Installation of roads shall be inspected by Macomb County Road Commission, or by the Township Engineer as required.

IV-3

PRIVATE ROADS

A. Definition

For the purposes of this Section, a Private Road shall be considered to mean the vehicular ingress and egress for 2 or more residences or 2 or more commercial or industrial buildings; and where such roads are not to be under the jurisdiction and control of a public agency. All applicable foregoing requirements shall apply except as follows.

B. Length

Unless otherwise specifically permitted under other applicable ordinances, the length of dead-end roads shall be 800 ft. and shall be provided with a suitable turnaround.

C. Surfacing

Private roads may be surfaced with asphalt, gravel or concrete. Road width shall be a minimum of 22 ft. wide with a minimum of 2 ft. gravel shoulders on each side. Roads for commercial or industrial purposes shall be designed to serve the type of traffic generated.

D. Turnarounds

A cul-de-sac shall be required at the end of any dead end road. The cul-de-sac shall have a minimum easement radius of 60 ft. and a minimum improved surface radius of 44 ft.

E. Surfacing

All private roads shall have the following surfacing materials placed on an approved subgrade;

<u>Gravel Roads</u>	<u>Asphalt</u>	<u>Concrete</u>
8 in. 21AA Aggregate	6 in. 21AA Subbase 3 in. Asphalt	7 in. Concrete MDOT Type35P

F. Easements

The following easements shall be dedicated to the Township prior to the start of construction.

1. A permanent 60 foot easement along the center of all private roads for public utilities.
2. A permanent easement (minimum 20 ft. wide) shall be dedicated to the Township along all natural or manmade drainage courses for drainage purposes. Such easements will be required over all related properties within the development as well as beyond the boundary of the development to a county drain, river, or other suitable outlet.

Such other temporary or permanent easements as may be required to construct the project or to protect the interests of property

owners in or adjacent to the development.

IV-4 RESIDENTIAL LANES

A. Definition

A residential lane shall mean a vehicular access for two, three or four single-family residences, which has been designated as such and approved according to Section 12.03.T. as part of an Open Space Development.

B. Design Specification

Residential lanes are permitted only if there is direct access from an interior public or private road. Adequate maneuvering room shall be provided when necessary.

C. Length

Unless otherwise specifically permitted under other applicable ordinances, the maximum length of dead-end lane shall be 800 feet and shall be provided with a suitable turnaround.

D. Surfacing

Residential lanes may be surfaced with asphalt, gravel or concrete. Road width shall be a minimum of twelve (12) feet wide.

All residential lanes shall have the following surfacing materials placed on an approved subgrade:

Gravel Road	8 in. 21AA Aggregate
Asphalt	6 in. 21 AA Subbase 3 in. Asphalt
Concrete	7 in. Concrete MDOT Type 35P

E. Easements

A permanent 60 foot easement along the center of all residential lanes is required for access and public utilities. This easement does not have to be cleared unless such is necessary for utilities or engineering considerations.

**SECTION V
SIDEWALK AND BIKE PATH SPECIFICATIONS**

V-1

Purpose

The purpose of this section is to provide reasonable and proper standards for the construction, reconstruction, and/or modification of sidewalks, bike paths, and such other non-motorized transportation facilities as may be desired. These standards shall apply to facilities required by Ordinance as well as those placed at the option of a resident or developer.

V-2

Plan Requirements

No person shall construct, reconstruct, or otherwise modify any sidewalk, bike path, or other non-motorized travel way without first submitting plans as required hereunder and in Section I.

A. Plans

1. Show location of the walk or path with respect to other identifiable features.
2. Show profile of proposed walk or path.

B. Location

1. **Subdivisions.** In subdivisions or other residential areas with closely spaced homes, sidewalks shall generally be placed one foot off the property line into the right of way.
2. **Other Areas.** When non-motorized facilities are proposed in areas which do not fall under paragraph #B-1. The Design Engineer shall select the route and location, subject to approval of the Township Engineer.

C. Width

Generally, the minimum width will be five feet for sidewalks, six feet for bike paths, and 6 feet for bridle paths. Minimum width of facilities not stated above shall be determined by the Township Engineer.

D. Grade and Slope

Generally, the maximum grade shall be five percent however, short stretches may exceed this limitation when necessary to blend with the existing terrain. Appropriate resting places must be provided in areas where long sections of steep grade are proposed. Such resting places

outside of the main traveled way. A cross-slope of 1/2 inch will be required to provide surface drainage.

E. Drainage

Walks and paths must be constructed to provide for surface drainage. Generally, street flow from adjacent upland areas may drain across the walk or path, however, provisions shall be made for all swales or channels to drain under the walk or path. Areas where street flow is deemed to be excessive shall provide for such street flow to be picked up and conveyed under the walk or path.

F. Materials

1. **Subdivisions.** When sidewalks are provided in subdivisions or other residential areas with closely spaced homes, they shall be 3500 psi concrete with a medium broom textured finish. Thickness shall be shown in the table below.

2. **Other areas.** When sidewalks or bike paths are proposed in areas which do not fall under paragraph F-1, they may be either asphalt or concrete at the thickness shown in the following table.

Concrete	Asphalt
4 in. MDOT 35P	2 in. MDOT 1100T
Sand Subbase*	6 in. MDOT 22A or 21AA**

**As required to prepare sidewalk grade*

***Additional thickness may be required to support construction equipment.*

3. **Driveways.** Where the walk or path crosses a driveway, the base and surfacing material thickness shall be increased by two inches or be made equivalent to the adjacent roadway thickness, whichever is the greater.

4. **Bridle Paths.** Generally, bridle paths will not require hard surfacing. Surfacing materials may be sand, gravel, stone, wood chips, sawdust and shall generally be a minimum of 4 in. in thickness. Surfaces shall be crowned or sloped to drain and a suitable method provided to prevent ponding of water in low areas. Shallow channels may be allowed to flow across the bridle path provided that erosion control provisions are made and surfacing materials remain in place.

G. Barrier Free

Whenever possible, non-motorized facilities shall be barrier free design. When terrain or other physical features are such that barrier free design cannot reasonably be attained, the Township Engineer may approve designs which are not barrier free.

H. Natural Features

Designs for walks and paths shall attempt to preserve trees, terrain, and other physical features in their natural state as much as possible while incorporating the safety considerations and the requirements of this section in the design. In cases where natural features can be preserved with a slight modification in the requirements, the Design Engineer shall call attention to the feature and the proposed modification on the plans.

The Township Engineer will review the plan and decide if such modification is in the best interest of the residents of the Township.

I. Materials

Unless otherwise provided, all materials and methods shall be in accordance with the applicable Michigan Department of Transportation Specifications.

J. Basements

Where walks or paths are outside the road right of way or existing easements and are intended for other than private use, suitable easements shall be provided to assure public access. Such easements shall run with the land.

K. Maintenance

Maintenance of walks and paths in the road right of way adjacent to their property shall be the responsibility of the property owner. Maintenance of walks and paths outside road right of way shall be the responsibility of the developer. The developer may make provisions to transfer this maintenance responsibility to others, however, all such arrangements shall be in writing signed by all affected parties (signatures notarized) with a copy submitted to the Township.

**SECTION VI
SEWER AND WATER MAIN SPECIFICATIONS**

VI-1 PURPOSE

The policy of the Township of Ray is to avoid the installation of municipal sanitary sewer and water improvements anywhere in the Township. In the event the installation of such improvements is mandated by law, the purpose of this section is to provide reasonable specifications for the design and construction of sanitary sewers and water mains.

VI-2 GENERAL

A. Municipal Water Supply and Sewage Disposal Systems

1. **Water Supply System.** The water supply system of Ray Township, including all property and employees in connection therewith, shall be known as the "Ray Township Water Supply System" and shall be under the control of the Ray Township Board.
2. **Sewage Disposal System.** The sewage disposal system of Ray Township, including all main and lateral sewers and all property and employees in connection therewith, shall be known as the "Ray Township Sewage Disposal System" and shall be under the control of the Ray Township Board.

B. Water Main and Sewer Installations

1. **Approval of Plans.** Any person, firm or corporation installing water mains or sewers at their expense shall first submit complete plans and specifications for such work to the Township for approval as required in Section I.
2. **Performance Guarantee.** After such plans and specifications have been approved, the person, firm or corporation shall enter into an agreement with the Township guaranteeing the installation and payment of the improvements (sewer and/or water).
 - (a) **Agreement.** Such agreement shall remain in effect for a period of two (2) years after the completion of the installation; guaranteeing that the installation conforms to all standards of this section and insuring that the job is completed in a good workman like manner and that the site of work is left in as good a condition as before the job was begun.

- (b) **Security Bond.** Said agreement is to be secured by satisfactory bond or cash deposit.
 - (c) **Save Harmless.** Said Agreement is to contain provisions to Save Harmless the Township from all damages during the course of construction of said improvements and any subsequent construction of homes in the improved area.
3. **Construction Permit Required.** After execution of said agreement and bond and submittal of two approved sets of construction plans and specifications, the board shall issue a construction permit to a reliable Contractor engaged by the person, firm or corporation desiring the extension. No construction of water mains or sewers by persons other than the Department will be allowed without a construction permit.
 4. **Inspection of Construction.** The Township shall order such observation, inspection, and testing as deemed necessary to assure substantial conformance with the plans and specifications.
 5. **Certification of Approval.** The Board shall accept all, or part of, such installation for the Township upon the certification of the Engineer that the installation has passed final inspection.

VI-3

SANITARY SEWER SPECIFICATIONS.

A. Scope

This specification establishes minimum standards for the municipal sanitary sewer system.

B. Sewer Lines

1. The municipality will, after approval by its engineer, forward eleven sets of plans and specifications to the Michigan State Department of Natural Resources with a request for a construction permit. (It is recommended that a preliminary plan be submitted to the municipality).
2. An "As Built" plan on reproducible mylar acceptable to the municipality shall be submitted by the owner, showing exact locations of all house connections, manholes, etc., after completion of the project and before the project is accepted by the municipality.

3. Generally, no sewer shall be less than 7 feet in depth from the center of the road to the invert of the sewer line.
4. Both existing and proposed ground shall be shown on profiles wherever possible.
5. Generally, laterals shall be located in an easement outside the road right-of-way 6 feet North of North; or 6 feet West of West; property line, and on the opposite side of the street from water mains. Easement width will be governed by the depth of the sewer.
6. Generally in new subdivisions, all rough grading shall be completed prior to the installation of sanitary sewers.
7. Compacted sand backfill shall be required in trenches under those areas which are to be paved and within 2 feet of edge of pavement.
8. Generally, no gravel or surface of any type shall be placed until sewers and house leads to property lines have been properly installed and backfilled.
9. Laterals shall be minimum 10 inches in diameter, unless otherwise approved by the Superintendent.
10. The Superintendent shall determine size, depth and slope of trunk lines which will allow for future extensions.
11. Installation of sanitary sewers will be inspected by Ray Township.
12. ABS Composite pipe (8 in. - 15 in.) or Concrete Pipe (18 in. and larger) shall be used. Concrete pipe shall conform to ASTM C-76, wall thickness C, with ASTM C-361 Joints and gaskets. Whenever possible, pipe shall be manufactured with Type II or IP Cement. When special conditions require the use of Ductile Iron Pipe (DIP), the pipe shall conform to Double Cement Lined Class 54 (or heavier) with approved push on type joints.

C. Manholes

1. The maximum distance between manholes shall be 400 L.F. for sewers less than 24 inches in diameter. Special consideration may be given to the spacing of manholes on sewers 24 in. or larger.

2. Manholes shall be placed at every change of grade, direction, pipe size, and at the end of each sewer line. Wherever it is convenient, manholes should be placed at street intersections.
3. Drop manholes will be used whenever a sewer enters the manhole at an elevation of 18 inches or more above the manhole invert. Unless otherwise approved, all drop connections shall be interior type and the drop manhole shall be a minimum diameter of 5 ft..
4. Whenever there is a change of direction of 45° or more in a sewer, (at a manhole) an allowance of 0.10 ft. in grade shall be made for loss of head through the manhole.
5. The minimum inside diameter of all manholes shall be 48 inches for pipe of 15 in. diameter or less, 60 in. for 18 in. - 36 in. pipe and 72 in. for pipe 42 in. or greater in diameter. Whenever a manhole is located on the area of a possible future system extension, the minimum manhole size shall be 60 in. diameter.
6. The wall thickness of manholes shall conform to "Precast Reinforced Concrete Manhole Section", ASTM C-478, with premium rubber gaskets and joints conforming to ASTM C-367, (or alternative joint approved by the Superintendent).
7. All manholes shall rest on an 8 in. thick 3,000 p.s.i. concrete slab. This slab shall protrude a minimum of 6 inches beyond the outside diameter of the manhole.
8. Bolt down waterproof manhole covers shall be set to proposed grades whenever possible. Proposed manhole cover grades shall be shown on plans.
9. Precast concrete adjusting rings with rubber type seals shall be utilized to adjust all manhole covers. The maximum adjustment shall be limited to 18 in. from the top of the manhole cone to the top of the casting.
10. When a sewer changes size, match the 8/10 depth points of the inlet and outlet sewers.
11. Wherever possible flexible waterproof boot connections shall be required at all pipe to manhole connection. Any alternative connections must be approved by the Superintendent.

12. Manhole sections and slab shall, whenever possible, be manufactured with Type II or 1P cement.

D. Velocities

1. A minimum design velocity of not less than 2 feet per second shall be required with pipe flowing full.
2. Whenever possible, velocities shall exceed the minimum as set forth.
3. A maximum velocity, when the pipe is flowing full, shall be 8 feet per second.
4. The following are minimum slopes for each pipe size:

<u>Sewer Size</u>	<u>Minimum Slopes</u>
8 in.	0.40%
10 in.	0.28%
12 in.	0.22%
15 in.	0.15%
18 in.	0.12%
21 in.	0.10%

E. Capacities

1. Sewer capacities shall be based on 100 gallons average per capita per day with DWSD peak factors. In no case shall it be less than 0.4 cfs per 1000 population including peak loads and infiltration.
2. Trunk sewer capacities will be given special consideration by the Superintendent.

F. Infiltration

Infiltration into the sewer lines and manholes shall not exceed 100 gallons per inch of diameter per mile of pipe per 24 hours.

G. Maximum Depth

1. The maximum depth for any sanitary sewer from the proposed grade to the invert of the pipe for various classes of pipe are as follows:
 - (a) Reinforced concrete pipe shall conform to ASTM C 76-79

wall C, and shall be designed in accordance with the current edition of the American Concrete Pipe Association's Concrete Cement Pipe Design Manual.

(b) ABS Composite shall conform to ASTM D2680 and shall be designed for a 30 in. maximum trench with 7% maximum deflection in conformance with Ring Compression Design Techniques acceptable to the Township Engineer.

2. If a class of pipe is to be used at depths greater than these specified above, the pipe shall be cradled or encased in concrete or special bedding, as the situation demands.

H. Inverted Siphons

1. Inverted siphons are to be used only when absolutely necessary. The minimum pipe size for inverted siphons shall be 6 in. in diameter. The minimum number of pipes for each inverted siphon shall be two (2), and the minimum velocity three (3) feet per second.
2. Inverted siphon pipe shall be Ductile Iron, Class 54 Double Cement lined pipe.

I. Pumping Station

1. The minimum number of pumps in a pumping station shall be two (2), and the minimum size of the discharge lines shall be 4 inches in diameter.
2. All permanent pump station plans will be designed by the Township Engineer at project expense.

J. Materials

Unless otherwise specified herein, all materials shall conform to the requirements of the Township Sanitary Sewer Detail plans.

1. Sewer Pipe. Sewer pipe shall conform to the following specifications:
 - (a) Concrete Pipe - Reinforced ASTM - C-76 size 18 in. and larger with rubber gasketed joints.

- (b) ABS Composite pipe ASTM D - 2680, 8 in. to 15 in., with chemically fused joints.
- (c) PVC Composite pipe ASTM D-2680, 8 in. to 15 in. with rubber gasketed joints.

2. **Sewer Taps.**

- (a) **Concrete Pipe.** T's shall conform to specifications noted for concrete sewer pipe and approved by the Superintendent.
- (b) **ABS Composite** No extruded wyes will be allowed, use only factory fabricate wyes.

3. **Manholes.**

- (a) Precast manholes shall be of the oblique type with reinforcing conforming to the ASTM Specifications C-478, with premium rubber joint conforming to ASTM C-443.
- (b) Manhole frame and cover shall be bolt down water proof EJIW 1040 ZPT, or approved equal. All covers shall include the legend "Sanitary Sewer". Covers shall be secured.
- (c) Precast cones shall be offset with the straight side in line with manhole steps and generally on sidewalk side.

K. **Service Leads**

- 1. All service leads shall be a minimum of 6 inches in diameter to the property lines, and shall be PVC Schedule 40 or ABS SDR 23.5.
- 2. Risers shall be installed on all sewers and a lead brought to the property line.
- 3. A riser with cap shall be provided for each platted lot or at intervals as directed by the Township.
- 4. The lead or stub shall be marked by placing a 2 in. x 4 in. timber vertically in the ground on the property line over or next to the connection extending 5 feet above the sanitary lead. The contractor shall turn a list of the connections, located from the adjacent downstream manhole, over to the Township after construction is

completed.

5. Inspection manholes shall be constructed, in an accessible area for all industrial and commercial developments.

L. Sewer Service Pipe

1. All sewer service pipe laid within the right-of-way of any street or alley shall be furnished and installed at the expense of the owner, or user. A fee for tapping the main sewer shall be charged as herein after provided.
2. All such service pipe shall be laid with a fall from the building to the sewer. Such fall, insofar as practicable, shall be uniform throughout the length of the sewer service pipe. Pipe shall have adequate cover to protect the pipe from frost penetration.
3. No sewer service pipe shall be covered until inspected and approved by the Township or authorized representative.
4. No excavation of the Township Sewage System shall be allowed without a Township representative present.
5. All service pipe shall be air tested if not inspected.
6. Clean outs - every 100 ft. and at all deflections.

M. Testing

All sewer pipe shall be tested as specified on the Township Sanitary Sewer Detail Plans.

VI-4

WATER SYSTEM SPECIFICATIONS

A. Scope

This specification establishes minimum standards for Water Systems in the municipality.

B. Mains

1. All water main plans and specifications shall be submitted to the municipality in triplicate. The municipality will, after approval by its engineer, forward eleven sets of plans and specifications to the Michigan State Department of Public Health with a request for a

construction permit. It is recommended that a preliminary plan be submitted to the municipality. Water construction plans shall not be detailed on the same plan sheets as road or storm drainage improvements.

2. An "As Built" plan, acceptable to the municipality, shall be submitted by the owner, showing exact locations of all mains, hydrants, gates, wells, fittings, etc., after completion of the project and before the project is accepted by the municipality.
3. The owner shall furnish the municipality a warranty of title and shall certify in writing that all contractors, suppliers, engineering fees and any other monetary claims against the system has been paid in full.
4. Transmission mains shall be located on section line roads where possible. Except as otherwise required by Master Water Distribution Plan approved by the Township Board, all transmission mains shall normally be 16 in. minimum except that the exterior 1 mile transmission mains need only be 12 in. In new subdivisions on roads requiring transmission mains, said mains shall be installed from boundary to boundary along the road by the developer.
5. Mains within residential subdivisions shall be 8 in. or larger as design dictates. Mains in industrial subdivisions and developments shall be a minimum of 12 in. and looped whenever possible.
6. Depth of cover shall be 5.5 feet minimum, 6.5 feet maximum. Greater depth of cover may be approved by the Township.
7. The Contractor shall furnish proper appliances and facilities for testing and draining the main without injury to the work, or surrounding territory. He shall test by filling the main with clean water under no more than 10 p.s.i. hydrostatic pressure. He shall then pressure test the main at 150 p.s.i. for a minimum of 2 hours. In no case shall there be any visible leakage or the leakage in any stretch of pipe exceed 1/4 gallon per hour per inch of diameter of pipe per 1000 feet. Water for making tests will be furnished by the owner if it is available under pressure; otherwise by the Contractor at his expense.
8. Main purification shall be made in accordance with Michigan Department of Public Health specifications by the pipe laying contractor.

9. Generally, mains shall be located 8 feet North of South or 8 feet West of East property line.
10. All rough grading shall be completed prior to installation of water distribution mains.
11. Compacted sand backfill is required in trench under all driveways (private and commercial) streets and within 2 ft. of edge of pavements.
12. Generally no gravel or surface of any type shall be laid until distribution mains have been properly installed.

C. Hydrant Spacing

1. In general the most remote portion of a house or building shall be within 250 feet of a fire hydrant and in no case more than 400 feet.
2. Hydrant spacing along a main shall be 500 ft. center to center in residential and commercial areas and 350 ft. in industrial zones, or closer if required by the Fire Marshall.
3. Spacing of hydrants around commercial or manufacturing establishments shall be considered as individual cases and shall be determined by consultation with the Fire Marshall.
4. In general, hydrants shall be located in the road right-of-way, 10 feet from the edge of the right-of-way and 10 feet from street intersections, and at least 5 ft. from the nearest driveway. On all new subdivisions hydrants shall be located near the center of the lots.
5. A hydrant shall be installed at the end of all dead end mains.

D. Gates

1. In general gate valves on cross connecting mains shall be located so that no single break shall require more than 1000 feet of main or 30 dwelling units be out of service. Gates shall be so arranged that any section can be isolated by closing not more than four gates.
2. Gates shall generally be located four feet back from the intersecting street right-of-way lines so as to clear the crosswalk.

3. All fire lines into buildings shall have an in line gate valve outside of the building and near the main water supply line. The valve shall have a visible "open/closed" position indicator.

E. Thrust Blocks

3000 p.s.i. concrete thrust blocks shall be placed at all 22 1/2 degree bends or greater, dead ends, tees, reducers, hydrants and some crosses. The size and location of thrust blocks shall be as approved by the Township Engineer.

In muck or peat, all thrusts shall be resisted by piling or tie rods to solid foundations or by removal of muck or peat and replacement with ballast of sufficient stability to resist thrusts.

F. Materials

Unless otherwise specified herein all materials shall conform to the requirements of the Township Water Main Detail Plans.

1. Mains

- (a) All mains shall be Ductile Iron Class 54 double cement lined W.M. conforming to AWWA C-150 standards with slip-on joints. River crossing pipe shall be "Ball and Socket" joint ductile iron pipe ASTM. Bituminous seal coated double cement mortar lining shall conform to AWWA C104-85.
- (b) Slip on W.M. joints shall be of the rubber gasket push-on type conforming to AWWA C 111 consisting of a single molded rubber gasket of a type designated as "Super-Tile", "Fastite", or Tyton or approved equal with electrical conductivity devices installed. Mechanical joints shall be AWWA C 111 with duck tipped gasket.
- (c) Fittings (including curves, tees, crosses, reducers, plugs, caps and sleeves) shall be Mechanical or slip on Joint Ductile Iron conforming to AWWA C 110 standard specifications for fittings. Fittings shall be noted for 350 p.s.i. working pressure.
- (d) Valve Boxes shall be three piece with 5 1/4 in. shaft, screw type, size CC, cover marked "Water", with round base to match the valve size, or approved equal.

2. **Fire Hydrants.**

- (a) Hydrants shall be Mueller 2 way with a 5 1/4 in. valve opening or approved equal such as EJIW-BR5, Mueller Centurion A-425 Breakway Traffic models conforming to AWWA C-502.
- (b) Hydrants shall have one (1) 4 in. and two (2) 2 1/2 in. Nozzles with Detroit standard thread. Size of shoe shall be 6 in. Direction of opening shall be counter-clockwise.
- (c) Hydrants shall be provided with a 6 in. Mueller Resilient Seat gate valve conforming to AWWA C-500 and necessary gate box.
- (d) Except in the case of an extreme cut or fill section, the top of all hydrants shall be not less than 32 in. above or below the crown of the road.
- (e) Fire hydrants are to be opened and used only by the Fire Department of the township unless a permit is given. Any person, firm, or corporation desiring to use any fire hydrant in the township must apply for a permit specifying what hydrants are to be used and for what purpose. The applicant will be required to post a cash deposit with the Township. When the use of the hydrant is complete, the applicant shall notify the Township at which time a hydrant inspection will be made. In the event of damage to the hydrant, the cost of repairs or reconditioning of said hydrant shall be deducted from the deposit and the difference refunded to the depositor. In no case shall anyone turn a hydrant on or off with anything other than a standard hydrant wrench.
- (f) No person, firm, or corporation shall in any manner obstruct or prevent free access to any fire hydrant by parking a motor vehicle, placing or storing temporarily, or otherwise, any car, object, material, snow, debris, or structure of any kind, within a distance of fifteen feet of same.
- (g) Ductile Iron Retainer Glands and Thrust Blocks shall be required at all hydrants.

3. Gate Valves and Wells

(a) Gate valves shall be iron body, fully bronze mounted, double or single disc, parallel or solid wedge seat-valves, non-rising stem, opening clockwise, and conforming to AWWA Standard C-500 as manufactured by Mueller, East Jordan, or approved equal. Valves and fittings shall be rated at 250 p.s.i. working pressure. The Valve operating nut shall be a 2 in. square AWWA Standard.

(b) All valves shall be installed within gate wells. Gate wells shall be precast concrete conforming to ASTM C-478-64T and shall be sized as follows:

<u>size of main</u>	<u>size of well (I.D.)</u>
6 in. to 12 in.	5 ft. - 0 in.
over 12 in.	6 ft. - 0 in.

(c) Floors in gate wells shall be at least 8 in. thick, 3000 p.s.i. concrete protruding at least 6 in. out from the periphery of the well.

(d) Gate well covers shall be solid type covers, and shall have the words "Department of Water Supply" in raised letters spaced in from the periphery of the cover. The combined weight of frame and cover shall not be less than 400 lbs. and shall comply with ASTM A-48-56 and ASTM Class No. 30, and shall be EJTW 1040 or approved equal.

(e) Valves in gate wells shall be at least 4 in. above floor of gate well, and shall be blocked with either mortared brick or formed concrete.

4. Thrust Blocks. Thrust blocks shall be made of 3000 p.s.i. concrete, or approved equal.

G. Water Service Pipe

1. All Water Service Pipe on either private or public property shall be laid on a solid bottom not less than 5 ft. below the established grade. Water Service Pipe shall be at least 10 ft. horizontally distant from the sewer. In no case shall water service pipe be laid on fill.

2. All water service pipe shall be of Type K soft temper copper not less than 3/4 in. in diameter and extending from the main to the meter. All corporations or curb stops shall be at least 3/4 in. extra heavy, round way stop placed inside the right-of-way line. The top never is below the grade nor over three inches above grade and must be set on a brick or concrete foundation to prevent settlement. Curb stop boxes shall be Mueller Type A300 or equal.
3. Gate valves must be placed on the water service pipe just inside the building wall on each side of the meter so that the water may be turned off in order to make repairs or set the meter. Such stop shall be equal in quality to the curb stop. The upstream valve must be mechanical joint type.
4. Water Service Pipe from main to curb stop shall be maintained by the Township, but this clause shall not apply to old services installed by private parties. The curb stop, stop box and all water service pipe from the property line to the meter shall be maintained by the owner of the premises. Stop boxes shall be kept free from dirt, stones or other substances that will prevent access to the curb stop and if found in such condition shall immediately be cleaned out by the user. If after due notice the user fails to clean out such stop boxes the department will proceed with the work and bill the user for the cost thereof.
5. All water service pipe on private property shall be installed under the supervision of the Township or his representative. No trench shall be back filled until inspected and approved by the Township or authorized representative. There shall be no joints between the curb stop and the meter unless commercial lengths are not available to allow for this provision (in the event of excessive building setbacks). All joints between the main and the meter shall be three-piece flared heavy duty type joints. No person is permitted to turn water on or off at the curb stop except for the purpose of testing his work, in which case the curb stop shall be left in the same condition and position as it was found. Any plumber called upon to shut off water and drain pipes in any premises shall do so inside the building only.
6. All excavation in the public streets or alleys shall be back filled by thoroughly tamping sand in layers not to exceed 6 in. All excavated material shall be entirely removed from the roadway. Excavated or fill material that is wet, or otherwise unfit for back fill, shall be entirely removed and the back filling done with suitable sand hauled in for that purpose. Unless otherwise approved, sand used for

backfilling shall have a moisture content at or below optimum.

7. Connections under hard surfaced paving shall be made only by boring or jetting.
8. The cost of repairing and maintenance of street and alley surfaces, pavements and sidewalks, where holes or trenches have been dug, shall be paid for by the person requiring the connection.
9. No water service pipe from the house to the curb stop shall be covered until approved by the Township as to location and installation.
10. Before an owner, user, or contractor installs a water service pipe from house to lot line, he shall obtain clearance from the Water Superintendent as to the designated terminus of the water service pipe at the lot line. The terminus of the water service pipe shall be located such that, when the water service pipe from this point is installed to the water main in a straight line perpendicular to the main, there are no obstructions such as driveways, manholes, trees, fire hydrants, or any other obstacles.

H. Meters

1. All premises using public water shall have an approved type meter installed and shall pay for water and the disposal of sewage at the rates specified. In no case will water be supplied, except for temporary supply, at other than the established water rate. For new construction supply purposes a minimum bill will be charged for each premises for each three months period or fraction thereof until the Township is notified of the termination of the use for construction purposes. Such payments shall be made in advance. Temporary water service will be automatically shut off at the initial three months period unless payment of a like sum is made in advance for an additional three months period unless otherwise authorized by Superintendent.
2. Meters will be furnished by the Township and shall remain, the property of the Department and will at all times be under its control.
3. All meters shall be equipped with a digital display instrument capable of being remotely connected and read away from the meter itself. Such remote reading device shall be installed on the exterior of the building as directed by the Township.

4. For ordinary domestic consumption of water a 5/8 inch meter will be furnished. For multiple dwelling units the size shall be 1 inch for 2 to 4 dwelling units and 1-1/2 inches for 5 to 10 dwelling units. Except as above, where application is made for a meter larger than 5/8 inch the Superintendent shall determine whether a meter of such size is required, and his decision in the matter shall be final
5. Meters shall be set in an accessible location and in a manner satisfactory to the Township.
6. Meters will be sealed by the Township and no one except an authorized employee of the Township shall break such seals. No person other than an authorized employee of the Township shall change the location of, alter or interfere in any way with any meter..
7. The expense of maintaining meter will be borne by the Township. In cases where replacements, repairs, or adjustments of the meter are made necessary by any act, neglect, or carelessness of the user or occupant of any premises, the expense to the Township caused thereby shall be charged against and collected from the user of the premises.
8. The owner or user of any premises where a meter is installed will be held responsible for its care and protection from freezing, and from injury or interference by any person. In case of damage to the meter or in case of its stoppage or defective condition the owner or user shall give immediate notice to the department.
9. All public water used on any premises must pass through the meter. Any by-pass or connection between the meter and the main is prohibited unless it is sealed in a manner satisfactory to the Township.
10. If any meter is not working properly or fails to register, the consumer will be charged at the average quarterly consumption rate as shown by the meter when registering. The accuracy of the meter on any premises will be tested by the Township upon written request of the owner who shall pay in advance a fee to cover the cost of the test. If on such test, the meter shall be found to register over three percent more water than actually passes through it, another meter will be substituted therefor, and the fee will be refunded to the user of the premises, and the water bill may be adjusted in such manner as may be fair and just.

SECTION VII
REPEAL OF 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 VIII
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 IX
PUBLICATION

A true copy of this Ordinance or a summary thereof shall be published in The Armada Times, a newspaper of general circulation in the Township of Ray, within thirty (30) days after its adoption.