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ARTICLE V. CONSTRUCTION PERMITS

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Sec. 24-171. Definitions.

For the purpose of the article, the following definitions shall apply:

Private street means all vehicular traffic routes other than public streets which serve more than one (1) building or which service a fire hydrant and shall be constructed to county road commission standards.

Public sanitary sewer means any enclosed, reasonably watertight conduit for transporting sewage, which is operated under the control of any public body for the transporting of sewage into any intercepting sewer or sewers of the county, or which is designated for carrying such sewage treatment plant also operated by any public body.

Public storm sewer means a drainage system serving more than one (1) premises designed and constructed to be operated and maintained by the county drain commission.

Public street means those thoroughfares intended to be maintained by the county road commission and shall meet the design and construction standards of and be acceptable to the county road commission.

Storm sewer means any enclosed or unenclosed conduit or system for the collection and removal of stormwater or surface water of any kind from any property. Storm sewers shall include

existing streams, rivers, creeks, brooks, ponds, lakes or other natural watercourses if such natural water courses are to be included as part of such.

Water supply system means any well or other system for bringing water from any source onto any premises.

(Ord. No. 49A, § 1, 2-3-86)

Cross reference— *Definitions and rules of construction generally, § 1-2.*

Sec. 24-172. Permit required.

No water supply system designed to serve more than one (1) premises and no public sanitary sewer or other sanitary sewers or storm sewers which shall serve or be designed to serve more than one (1) premises shall be constructed, reconstructed or altered in the township unless a request for such construction, reconstruction or alteration is approved by the township engineer and appropriate permits are obtained from the township, county, state and other governmental agency that may be involved.

(Ord. No. 49A, § 2, 2-3-86)

Sec. 24-173. Application.

- (a) Application for a permit under this article shall be accompanied by complete plans and specifications which shall be submitted to the township engineer for review and approval before such permit is issued.
- (b) Plans, specifications and detailed estimates for the proposed system shall be submitted by the owner to the township in duplicate for approval. Necessary corrections, if any, will be marked on all sets and one (1) set returned to the design engineer. Sufficient sets of final water, storm sewer and sanitary sewer plans and specifications shall be submitted to the township. The township will, after approval by its engineer, forward the plans to the appropriate agency for ultimate approval and construction permit by the state department of health. No construction shall be started until such permit is received and inspection fees have been provided for.

(Ord. No. 49A, § 3, 2-3-86; Ord. No. C-262, § 1, 3-19-90)

Sec. 24-174. Issuance upon approval of plans, specifications; appeal from denial.

If the plans and specifications are approved by the township engineer, construction permits shall be applied for upon payment of the fees as hereinafter provided. If the township engineer does not approve the plans and specifications, he shall give his recommendations in writing to the township board with a copy to the applicant. The applicant may amend the plans and specifications in accordance with the recommendations or may appeal the decision of the engineer to the township board in writing, in which event he shall be given a hearing before the board at a regular meeting within thirty (30) days after notice of appeal is received by the township clerk.

(Ord. No. 49A, § 4, 2-3-86)

Sec. 24-175. Inspections.

The township engineer shall make or cause to be made all inspections of the project as the work progresses as he shall deem necessary to ensure that water, sewer or street systems will be

built in accordance with the approved plans and specifications and in accordance with all ordinances and regulations of the township or the county. The township engineer shall have the right to authorize departures from the approved plans and specifications where necessary because of unforeseen circumstances, but no departures from the approved plans and specifications shall be made without the authorization of the township engineer. If the township engineer shall find that the improvements are not being installed or constructed in accordance with the aforementioned standards, he shall order such construction to be stopped immediately and issue a written notice of violation requiring the improper installation to be so corrected. In the notice, the engineer shall specify a time limit for the correction of the violations. If the violations are not corrected within the specified time, the township may take any other legal steps necessary to obtain compliance.

(Ord. No. 49A, § 5, 2-3-86)

Sec. 24-176. Fees.

Review and estimated inspection fees pursuant to this article shall be paid to the township treasurer in such amounts and at such times as established by resolution of the township board.

(Ord. No. 49A, § 6, 2-3-86)

Sec. 24-177. Engineering and construction standards—Generally.

The following minimum standards as provided in this section and in sections 24-178, 24-179, 24-180, 24-181 and 24-182 are intended to provide consistently good public facilities by establishing minimum standards for design, construction, testing and materials for certain improvements under the ultimate jurisdiction of the township. Conditions may arise which are not covered by these specifications. In such cases, the consulting engineer must prescribe the course of action to be followed and submit same to the township engineer. These standards are minimum standards and more desirable requirements may be employed by the consulting engineer to attain greater functional efficiency, security and protection. These standards are not intended to violate or jeopardize any of the requirements of the state department of health or the county department of public works.

- (1) Plans shall be submitted on sheets not greater than twenty-four (24) inches by thirty-six (36) inches white prints and shall be neatly and accurately prepared by a registered professional engineer.
- (2) For projects having more than one (1) sheet of plans, a general plan having a scale of 1" = 100' shall be provided showing the overall project and indicating the location of all improvements shown in detailed plans. Show all street names, dimensioned lot lines and lot numbers on the plans. Easements shall be twelve (12) feet minimum width. On this general plan show two-foot contours of the area at least one hundred (100) feet outside of the project.
- (3) All sewers shall be shown in plan and profile. Profiles shall indicate size, invert, slope of sewer, existing ground and proposed finished grades.
- (4) Elevation shall be on U.S.G.S. datum with bench marks listed and indicated at least every one thousand two hundred (1,200) feet.
- (5) Finished grades of structures shall be shown on the plan or profile of all structures.
- (6) In case of subdivisions, a copy of the completed plat shall be referenced with "as-built" construction plans.
- (7)

In new land developments, sewers and water mains may be required to be installed from boundary to boundary as ultimate use dictates.

- (8) There shall be a note on the plans requiring that all construction is to be done in accordance with the township and county department of public works construction specifications.
- (9) "As-built" plans shall be prepared by the consulting engineer from his field measurements taken during construction before the project is accepted by the township.
- (10) All water and sewer mains shall be installed in accordance with grade stakes set by the consulting engineer.
- (11) Any and all regulations, specifications and/or materials required in this article that are approved or not approved by county, state, federal or governing agencies shall be honored and permitted or not permitted as the case may be.

(Ord. No. 49A, § 7, 2-3-86; Ord. No. C-262, § 1, 3-19-90)

Sec. 24-178. Same—Water mains.

Engineering and construction standards for water mains are as follows:

- (1) *Design standards:*
 - a. The distribution system in all developments requiring more than six hundred (600) feet of water main shall have a minimum of two (2) connections to a source and shall be a looped system. Water mains are to be looped whenever possible. Water mains must be sized to serve at least two thousand (2,000) gpm for single-family detached residential; three thousand (3,000) gpm in apartment or multiple residential, institutional and school areas; and at least four thousand (4,000) gpm in office, industrial and shopping centers. Water mains shall be extended along all road frontages abutting the proposed development. In new developments, water mains shall be installed from boundary to boundary in abutting roads and interior streets, and at other locations as may be deemed necessary by the township engineer for future extensions.
 - b. In general, the minimum size of mains shall be eight (8) inches in diameter. Gate valves shall be located so that not more than three (3) must be turned off to isolate any section of water main. In addition, not more than twenty (20) lots or living unit or eight hundred (800) feet of mains will be in any one (1) section for isolation. Where possible, gate valves shall be located at street intersections five (5) feet from intersections of street right-of-way lines.
 - c. Depth of cover shall be minimum of five and one-half (5½) feet, including those under ditches and watercourses.
 - d. Minimum design shall be such that during normal operating conditions thirty-five (35) psi at any point in the distributing system shall be maintained, with not less than twenty (20) psi during peak demand. Maximum safe operating pressure shall be eighty-five (85) psi unless special provisions are made. Generally, operating pressures shall be between forty (40) and sixty (60) psi.
 - e. All hydrant installations must include a valve between the hydrant and the main, with an adjustable cast-iron box to protrude above the proposed finished grade.
 - f.

Gate wells shall be used at all main line valve installations.

- g. All service installations shall be made by employees or agents of the township water department according to charges established by the then-current resolution adopted by the township board. However, on public infrastructure projects being constructed by the township or its contractors, service installations may be made as part of the construction of the project if it is deemed by the township engineer to be necessary and in the best interest of the township, taking into consideration the location of the public utility, the condition of the road, and the restoration required, as well as other relevant circumstances.
 - h. "As-built" drawings shall show exact location of valves, hydrants, main locations, house leads and services from lot or street corners and stationing from grade wells or hydrants.
 - i. Hydrant water mains not exceeding twenty-five (25) feet in length shall be a minimum diameter of six (6) inches.
 - j. A profile view is required for water mains of sixteen-inch diameter and larger, and for other sizes when deemed necessary under the circumstances by the township engineer.
 - k. In no case shall any sewer be connected to a gate well, for any purpose.
- (2) *Hydrants:*
- a. In general, hydrants should be installed with a maximum spacing of five hundred (500) feet for platted single-family, and two hundred fifty (250) feet for clusters, condominiums and multiple-family, with no house more than four hundred (400) feet from a hydrant, as measured in the street. In commercial or industrial districts, all points on the building shall be within two hundred fifty (250) feet of a hydrant.
 - b. Hydrants shall be installed at all dead-ends of water mains as blow-offs.
 - c. Grades, on U.S.G.S. datum, shall be established by the consulting engineer for all mains, structures and hydrants.
 - d. Steamer or pumper openings shall face the street.
- (3) *Testing and disinfection:*
- a. Upon completion of mains, system shall be treated by one hundred fifty (150) pounds pressure for four (4) hours by the contractor and in no case shall there be any visible leakage or leakage exceeding one hundred (100) gallons per twenty-four (24) hours per inch diameter of pipe per mile of length in a two-hour period or in accordance with the requirements of the governing body.
 - b. After testing is completed and approved, all water systems shall be flushed and disinfected in accordance with the requirements of American Water Works Association Specifications AWWA 7DA-1947 before being put in service. Three-quarter-inch sampling cocks shall be installed for this purpose.
 - c. The contractor shall be responsible for the cost and furnishing of all water necessary for flushing and disinfecting the water main.
- (4) *Materials required:*
- a. Pipe of sixteen-inch diameter or smaller shall be Class 54 ductile iron or better. Pipe sizes sixteen-inch to twenty-inch diameter shall be prestressed concrete cylinder pipe with rubber and steel joints. Pipe sizes twenty-four-inch and larger shall be prestressed concrete embedded cylinder pipe with rubber and steel

joints. All design shall conform to AWWA Standard 301, Section 1.5 Ductile iron Class 54 may be used. Joints shall be bell-and-spigot rubber joint or approved mechanical joint. In general, all pipe and joints shall meet the standards of the Oakland County Department of Public Works and the Detroit Water Board.

- b. Concrete thrust blocks shall be placed at twenty-two and one-half (22½) degree bends or greater, dead-ends, T's, hydrants, some crosses, etc. Thrust blocks shall be constructed of three thousand (3,000) psi wet mix concrete.
- c. Valves shall be iron body, fully bronze mounted, double disc: parallel or wedge, set valves, nonrising stems, opening counterclockwise, conforming to federal specifications WW-V-58, Type II, Class A as manufactured by Mueller, East Jordon, or approved equal.
- d. Gate wells shall be precast concrete four-foot minimum diameter for six-inch and eight-inch valves, five-foot diameter for ten-inch to twelve-inch valves, and six-foot diameter for twelve-inch valves. Gate wells shall have six-inch floors of three thousand (3,000) psi concrete, four hundred (400) pounds cover and frame, and covers shall be marked "Water Supply Gate."
- e. Hydrants shall be Mueller No. A-24015, East Jordon Model 6-BR, or approved equal. Hydrants shall not be self-draining. Check with the township fire department for thread sizes and placement.
- f. Water services—Type K. Soft copper pipe or an approved equal from one-inch to two-inch diameter shall be used. Over two (2) inches, Class 150 cast-iron pipe shall be used. Adjustable curb boxes only shall be installed similar to Mueller or approved equal.

(Ord. No. 49A, § 8, 2-3-86; Ord. No. C-262, § 1, 3-19-90; Ord. No. C-262-C, § 1, 7-13-98)

Sec. 24-179. Same—For sanitary sewers.

Engineering and construction standards for sanitary sewers are as follows:

- (1) Show size of pipe on cover sheet.
- (2) Sewer profiles shall indicate length of run between manholes, size, slope and class of pipe, special bedding and special backfill of all lines.
- (3) Generally, no sewer will be less than nine (9) feet in depth below centerline of road.
- (4) Laterals shall be a minimum of eight (8) inches in diameter. Lines should be designed for obvious future and ultimate use.
- (5) To assure minimum velocities of two (2) feet per second flowing full, minimum slopes for sanitary sewer shall be:

8" @ 0.40%	18" @ 0.12%
10" @ 0.28%	21" @ 0.10%
12" @ 0.22%	24" @ 0.08%
15" @ 0.15%	

Maximum velocities flowing full shall be twelve (12) feet per second.

- (6)

- Maximum allowable infiltration shall be two hundred (200) gallons per one-inch of diameter of sewer per twenty-four (24) hours. An acceptable exfiltration testing method may be required in dry weather or when sewer is above groundwater table.
- (7) In general, manholes should be placed at each change in grade, alignment and change in pipe size, and be at three hundred fifty (350) feet maximum spacing, and shall be in street right-of-way.
 - (8) External drop manholes shall be used whenever a disparity of more than eighteen (18) inches between inlets and outlets of sewers will exist.
 - (9) The same energy gradient shall be maintained through a manhole when pipe sizes change.
 - (10) When change of direction of greater than forty-five (45) degrees occurs through a manhole, an allowance of two-tenths (0.2) feet in grade shall be made for loss of head.
 - (11) Minimum inside diameter of a manhole shall be forty-eight (48) inches.
 - (12) Bolted covers shall be used on all manholes located in other than public thoroughfares and easements adjacent thereto.
 - (13) A note or detail shall indicate type of bedding to be used.
 - (14) Inverted siphons shall have a minimum of two (2) pipes, with minimum velocities of three (3) feet per second and be of cast iron or cement asbestos pressure pipe.
 - (15) Pumping stations shall be of duplex design (two (2) or more pumps) and will be considered individually.
 - (16) Compacted selected granular backfill is required under and within the influence of all existing and proposed pavements and structures and existing driveways.
 - (17) Each wye or end-of-house connection shall have a plug with the same type of joint as the main sewer.
 - (18) Allowable types of sewer pipe, joints and manholes shall be current township and county department of public works standards and shall be noted on plans.
 - (19) House leads—Sewer running from lateral to property line shall be six (6) inches minimum diameter with maximum depth of ten (10) feet at property line, except for special cases.
 - (20) Lead or stub shall be marked at property with a 2 by 4, four (4) feet long, buried on end or in another approved manner.
 - (21) Notes on plans: In addition to above conditions appropriately noted on plans, the following notes shall appear:
 - a. At all connections to Farmington Interceptor Systems, the following shall be shown: "Oakland County D.P.W. Permit required \$50.00 fee";
 - b. Downspouts, weep tile footing drains, or any groundwater or stormwater shall not be permitted into sanitary sewer;
 - c. Note on infiltration;
 - d. Wherever existing manholes or sewer pipe are to be tapped, drill holes at four-inch centers around periphery of opening to create plane of weakness before breaking section out;
 - e. For infiltration test, a temporary twelve-inch deep sump shall be provided in the first manhole above connection and will be filled in and channeled after successful completion of test. Provide watertight bulkhead with a capped one-inch diameter pipe through bulkhead for measurement of infiltration. Air testing

according to county department of public works standards may be allowed and televising of lines may be required by the township;

- f. For new manholes to be constructed over existing Farmington System Sewers or extension, use the county department of public works wet ground manhole according to details obtained from the county department of public works;
 - g. Include notes relative to pipe classes, joints, stoppers and all pertinent information for methods of construction, permit, etc.
- (22) Materials required:
- a. Sewer pipe shall conform to the following specifications:
 - 1. Clay pipe: ASTM C-200 and NCPI-ER 4-67 ES;
 - 2. Concrete pipe: ASTM C-14 extra strength C-76 Class 1-5;
 - 3. Asbestos cement: Federal Specifications SS-P-331;
 - 4. Plastic pipe: ABS Truss pipe. Plastic leads shall be SDR 23.5 six-inch diameter minimum as approved by the county department of public works;
 - 5. All pipe material and joints shall be equal to the county department of public works requirements and standards or better as approved by the township engineer.
 - b. Joints shall be Tylox cast-in-bell or approved similar premium joint.
 - c. Manholes shall be precast with eccentric cone type and have steel reinforcement conforming to ASTM specifications for C-75 pipe. Bottoms shall be eight (8) inches thick and extend six (6) inches beyond outside diameter of structure.
 - d. Concrete for manholes and structures shall be three thousand (3,000) psi wet concrete.
 - e. Manhole steps shall be of one-inch approved aluminum or wrought iron.
 - f. Manhole frames and covers shall be of "Detroit Standards" East Jordon #1040, or approved equal, four hundred (400) pounds minimum weight, twenty-four-inch opening bolt down covers per county department of public works standard details.
- (23) Sewers shall be extended to the property boundary within a twenty-foot easement, to provide for future extension, as and in such locations determined appropriate by the township engineer, taking into consideration all facts and circumstances.
- (24) Force mains:
- a. All force mains shall be Ductile Iron Pipe Class 54.
 - b. The minimum depth of force mains shall be five (5) feet.
 - c. Force mains shall be provided with automatic and release valves in wells at all main high points as approved by the township engineer.
 - d. The owner shall be responsible for furnishing and for the cost of all water required for pressure testing. Such person shall test by filling the main with clean water under a minimum hydrostatic pressure of one hundred (100) pounds per square inch.
- In no case shall the leakage in any stretch of pipe being tested exceed the following amounts in a two-hour period:
- 2" pipe—0.06 gallons per 100 linear feet
 - 3" pipe—0.12 gallons per 100 linear feet

- 4" pipe—0.16 gallons per 100 linear feet
- 6" pipe—0.24 gallons per 100 linear feet
- 8" pipe—0.32 gallons per 100 linear feet
- 12" pipe—0.48 gallons per 100 linear feet

The owner shall pressure test sections of force main as directed by the engineer. Pressure testing shall be made in increments of two thousand (2,000) feet or less unless otherwise authorized by the engineer, and then only the allowable leakage for two thousand (2,000) feet will be permitted.

(Ord. No. 49A, § 9, 2-3-86; Ord. No. C-262, § 1, 3-19-90; Ord. No. C-291, §§ 1, 2, 12-3-90)

Sec. 24-180. Same—For storm sewers.

- (a) *Generally.* Hydraulic design calculations and a copy of the drainage area layout used for the hydraulic design shall accompany construction plans submitted for review. The drainage area layout shall be superimposed on the proposed grading plan for the development.
- (b) *Engineering and construction standards.* Engineering and construction standards for storm sewers are as follows:
 - (1) Show size of pipe on cover sheet.
 - (2) Sewer profiles shall indicate length of run between manholes, size, slope and class of pipe, special bedding and special backfill of all lines.
 - (3) Notes on plans:
 - a. Note all pertinent information necessary for contractor; information such as pipe classes, joints, manholes, etc.;
 - b. State that all construction backfill, bedding, etc., shall be in accordance with township and county drain commission specifications.
 - (4) Storm drainage:
 - a. Systems shall be of minimum design according to the rational formula using the Detroit ten-year curve for one (1) hour rainfall.
 - b. The consulting engineer shall submit a drainage map outlining the various areas contributing surface water runoff to the storm sewers involved, drainage along with design computations and runoff coefficients for review and approval and shall place his professional engineering seal on the map.
 - c. In general, sufficient capacity shall be provided in storm system to adequately serve fully developed upstream drainage.
 - d. Minimum velocity with pipe flowing full shall be two and five-tenths (2.5) feet per second and maximum velocity shall be ten (10) feet per second.
 - e. Where hydraulic gradient is above top of pipe, show design elevation on plans.
 - f. The following minimum slopes shall be used:

12" @ 0.36%	30" @ 0.10%
15" @ 0.24%	36" @ 0.08%
18" @ 0.20%	42" @ 0.06%
21" @ 0.16%	48" @ 0.05%
24" @ 0.14%	54" @ 0.04%
27" @ 0.12%	60" @ 0.04%

Note: Storm sewers shall be of twelve (12) inches minimum diameter.

- g. All inlets shall be laid at one (1) percent minimum grade.
- (5) When concentrated stormwater is outletted on downstream property, the rate and nature of discharge shall be designed to assure than no damage results.
- (6) Where possible, provide three (3) feet minimum cover over sewers to top of pipe. Storm sewer shall be C76-IV premium joint or better. Catch basin leads within a street shall be C-76-IV pipe.
- (7) A note or detail shall show the type of bedding to be used.
- (8) Manholes:
 - a. Manholes shall be placed at each point of change in grade, alignment or pipe size, and shall be a minimum of forty-eight (48) inches in diameter.
 - b. Maximum manhole spacing should be three hundred fifty (350) feet for twelve-inch to thirty-inch sewers; four hundred (400) feet for thirty-three-inch to forty-two-inch sewers; four hundred fifty (450) feet for forty-eight-inch sewers; five hundred fifty (550) feet for fifty-four-inch to sixty-inch sewers; six hundred (600) feet for sewer larger than sixty (60) inches in diameter.
 - c. When a change in pipe sizes occurs, grades of each size sewer shall be set so as to match energy gradients.
 - d. When a change in direction occurs through a manhole, one-tenth-foot allowance for loss of head shall be made.
 - e. Catch basins shall not be substituted for manholes.
- (9) Catch basins shall generally be located at:
 - a. Low points in streets.
 - b. Low points in easements with maximum of six (6) acres of drainage per catch basin, the maximum being the amount carried by a twelve-inch pipe.
- (10) Catch basins leads shall connect to a manhole.
- (11) Finished easement grades shall be shown on plans.
- (12) Improved open drains may be permitted.
- (13) Headwalls and inlet structures shall be placed as required.
- (14) Materials required:
 - a. Sewer pipe shall conform to the following specifications:
 1. Concrete pipe: ASTM, C-14 extra strength, or C-76 Class 1-5;
 2. Corrugated metal pipe: AASHTO, M-36-47 and Bureau of Public Roads specifications 5G3 or 5S1;
 3. State of the art materials as approved by the county drain commission.
 - b. Joint material shall be premium class.
 - c. Manholes shall be precast, as specified with eight-inch-thick floors extending six (6) inches beyond outside diameter.
 - d. Concrete for manholes, catch basins and structures shall be three thousand (3,000) psi wet concrete.
 - e. Manhole steps shall be of approved aluminum or wrought iron.
 - f. Manhole frames and covers shall be equal to East Jordon Iron Works 1040 of four hundred (400) pounds in weight.
 - g. Inlet frame and covers shall be in accordance with county road commission specifications.

- (15) Retention basin design shall be in accordance with [section 24-185](#) of this Code.
- (16) Wetlands: any construction within twenty-five (25) feet of designated wetlands must receive approval by the governing wetlands authority.
- (17) Rear yard catch basins may be used to drain local areas where complete drainage toward the front yard is impossible. In general, lots should slope from rear to front and drain toward the street. Side swales shall be used to prevent drainage onto adjacent property.
- (18) Storm sewers used to collect water from sump pump discharges shall be minimum eight-inch diameter.
- (19) All storm sewers shall be centered within a twenty-foot permanent drainage easement minimum.
- (20) Surcharging under approved design conditions is allowed; however, the hydraulic gradient should not exceed any structure cover elevations.
- (21) Eccentric cones shall be provided on all access structures, regardless of the material used.
- (22) Service leads provided for footing drain discharge shall consist of schedule 40 P.V.C. or cast-iron pipe. Minimum pipe diameter shall be four (4) inches. Minimum slope shall be one (1) percent.
- (23) Oil and grease separators shall be provided, unless specifically waived by the township engineer, under the circumstances.

(Ord. No. 49A, § 10, 2-3-86; Ord. No. C-262, § 1, 3-19-90)

Sec. 24-181. Same—For water supply.

Engineering and construction standards for water supply are as follows:

- (1) Well sites:
 - a. Sites shall be selected with approval of the state health department as to drainage isolation and desirability being dependent on well locations.
 - b. Before acceptance, each site shall be properly graded, seeded and mulched, or sodded, and shall have a paved access drive twelve (12) feet wide installed.
- (2) Wells:
 - a. In general, a twelve-inch minimum diameter production well of two and one-half (2½) gallons per minute per residence capacity and a six-inch minimum standby well of one (1) gallon per minute per residence capacity shall be required for a municipal water supply as approved by the state department of health. Such wells shall be a minimum of twenty (20) feet apart. All wells, pressure tanks and appurtenances shall be housed.
 1. In a system contemplating adequate overhead storage, one and one-fourth (1¼) gallons per minute per residence may be permitted.
 2. Such wells having a minimum of fifteen (15) feet continuous horizontal impervious layer of soil through which the well is drilled shall have one hundred (100) feet of isolation area.
 3. Wells having less than fifteen (15) feet of impervious material over them shall have two hundred (200) feet of isolation.
 - b. Before a test well is started, approval of the site should be obtained from the state department of health. After approval by the state department of health of the test well, application for permit to dig production well shall be made by and

in the name of the township. No production well shall be drilled without such permit.

- c. Production wells shall be pump tested, using a step-draw-down procedure. A professional consultant's report of the test and recommended well rating shall be submitted to the township engineer. The township shall apply for a production well permit on behalf of the owner. The permit shall be made out in the name of the township.
 - d. After a permit is issued, the well system shall be turned over to the township as a public utility, to be owned and operated by the township.
 - e. No building permits shall be made available prior to the successful installation, and testing of the production well, and a permit is obtained from the state health department.
 - f. All discontinued wells shall be abandoned in accordance with A.W.W.A.-A-100-66, or most recent addition, entitled *Standard Specifications for Deep Wells*.
- (3) Tests:
- a. Pumping tests shall be a minimum of eight (8) hours' duration, more if required by the state health department or the state water resources geological division.
 - b. Pumping rate for each well shall be at the maximum rate to determine ultimate capacity.
 - c. Pumping log shall show following data:
 - 1. Total depth of well;
 - 2. Static water level;
 - 3. Length and size of column and tailpipe;
 - 4. Length of air line;
 - 5. Size of discharge pipe;
 - 6. Size of orifice;
 - 7. Length and description of screen, including openings.
 - d. Reading of amount of draw-down and pumping rate shall be taken according to the state department of health specifications: every minute for the first ten (10) minutes; every two (2) minutes for the next ten (10) minutes; every five (5) minutes for the next twenty (20) minutes; every ten minutes for the next twenty (20) minutes; every thirty (30) minutes thereafter for the duration of the test.
 - e. For the test well, readings on rate and recovery shall follow the same schedule for the first hour after pumping; then the overnight recovery shall be shown if not fully recovered in the first hour.
 - f. For the production well, in addition to the above requirements, the draw-down and recovery on the test well shall be taken on the same schedule and shown on the log. Recovery schedule for this test shall be altered to provide for readings every thirty (30) seconds for the first three (3) minutes of recovery. Recovery readings shall be continued for three (3) hours unless full recovery has been made before that time.
 - g. If required by the state department of health for the determination of the safe maximum capacity of the production well, a six-hour step-draw-down test shall be made. Pumping rate shall be two (2) hours at fifty (50) percent of the continued pumping rate; two (2) hours at seventy-five (75) percent thereof; and two (2) hours at one hundred (100) percent thereof. Simultaneous observation shall be made on the test well; recovery measurements will not be required.

- k. All electrical work shall be in accordance with correct rules and regulations of the National Board of Fire Underwriters and state and local regulations.
- (6) Materials required:
- a. Well casting shall be new and uniform to ASTM Specifications A-53 A-72.
 - b. Screens shall be Johnson Everdur or approved equal, and slot openings shall be determined by manufacturer from a sieve analysis of a sample of aquifer. Copies of same shall be furnished to the township.
 - c. Pressure tanks shall be in accordance with ASME code entitled *ASME Boiler and Pressure Vessel Code*, Section 8, "Unfired Pressure Vessels," 1956 Edition, and shall be clearly stamped when delivered to site. Pressure tanks shall be of adequate size, one hundred twenty-five (125) psi test, be of circulating type, with manhole; a two-inch bottom drain with valve piped to outside of building, sufficient taps for sight glass, controls, relief valve, compressor, etc., and flanged stubs of sufficient size to feed and discharge line.
 - d. All pressure tanks should be housed.
 - e. Tanks shall be painted of approved rust-inhibiting material.
 - f. Generally, operating pressure shall be forty (40) to sixty (60) psi, depending on ground elevations throughout system.
 - g. The air pressure relief valve on tank shall be set at high operating pressure. In addition, an adequate pressure relief valve shall be set on the feed line to the mains. This shall be set at ten (10) psi above the high operating pressure. The relief blow-off shall be piped outside of building, generally being six (6) feet above ground at outlet.
 - h. Water glass on tank should serve the full range of water variations and be valved at both ends.
 - i. Pressure gage should be a minimum of four (4) inches in diameter.
- (7) Pump well house:
- a. Pump houses should conform architecturally to surrounding design and the township building code.
 - b. Pump house walls shall be of masonry construction, eight (8) inches thick, or approved equal. Insulation shall be one-inch styrofoam.
 - c. Concrete floors shall be four-inch thick reinforced. Floors shall pitch two (2) inches in ten (10) feet and drain through approved screen scuppers at base of walls.
 - d. No glass-paned windows should be installed.
 - e. Roofs may be of frame construction with three (3) inches of blanket insulation and one-half-inch celotex, or approved equal.
 - 1. Concrete roof shall have two-inch styrofoam insulation.
 - 2. Roof insulation shall be removable underneath hatches.
 - f. Ventilation shall be provided by screened louvres for eaves above ceilings as well as interior of pump house. Minimum of two (2) ventilators should be provided. Doors should be metal hinged to open out, locks to fit master key systems of the township. All sash shall be metal.
 - g. Footings shall be insulated on inside by two (2) inches of styrofoam.
 - h.

Electrical heat shall be provided to maintain temperature of forty (40) degrees Fahrenheit when outside temperature is zero (0) degrees Fahrenheit and shall be controlled by a low-range thermostat.

- i. Adequate lighting shall be provided, including a protected outside light over entrance. A duplex electrical outlet should be provided at each pump.
- j. Hatches shall be five (5) feet minimum width opening, including door frame below.

(Ord. No. 49A, § 11, 2-3-86; Ord. No. C-262, § 1, 3-19-90; Ord. No. C-291, § 3, 12-3-90)

Sec. 24-182. Same—For street systems.

All public and private streets shall be constructed to county road commission standards. Engineering and construction standards for public and private street systems are as follows:

- (1) Show pavement details on the plans including curbs.
- (2) Show pavement grades on the plans (six (6) percent maximum, one-half percent minimum) and horizontal control.
- (3) Gravel roads shall have a twenty-foot-wide surface with minimum five-foot-wide graded shoulders.
- (4) Street widths:
 - a. Collector street: twenty-four-foot surface or twenty-seven-foot back-to-back of curb;
 - b. Fire access street: twenty-four-foot-wide surface.
 - c. Parking access street: twenty-four-foot-wide surface.
- (5) Construction of private streets and roads will be inspected by the township's consulting engineers. The cost of this inspection will be borne by the developer/owner.
- (6) Parking lots and driveways are to be considered incidental to paving systems and are to meet state-of-the-art design and construction standards for hard-surfaced systems. The source of the standard is to be referenced on the plan.
- (7) The developer's engineer shall submit cost estimates of all paving and the township plan review fee will be based on this estimate.
- (8) Bike paths are considered incidental to street systems and shall meet the standards, review and construction procedures set forth by the township engineering department.
- (9) Cul-de-sacs shall have a minimum paved diameter of sixty (60) feet and a minimum turning clearance diameter of one hundred (100) feet.
- (10) Completed select granular backfill is required under and within the influence of all existing and proposed pavements, structures and driveways. On-site material may be used if authorized by the township engineer, based upon a review to determine whether such material has satisfactory qualities for backfill purposes. Maximum Standard Proctor 95% density shall be substantiated by a professional soils testing lab. The cost of testing shall be borne by the owner/developer.

(Ord. No. 49A, § 12, 2-3-86; Ord. No. C-262, § 1, 3-19-90)

Sec. 24-183. County permits.

Sanitary sewer system shall be connected directly or indirectly into the intercepting sewer or sewers of the county. In addition to all of the other requirements of this chapter, no sanitary sewer

systems or public sanitary sewer shall be connected directly or indirectly into the intercepting sewer or sewers to the county unless a permit therefor is obtained from the county department of public works and such connection is completed in accordance with the current regulations of that department applicable thereto.

(Ord. No. 49A, § 13, 2-3-86; Ord. No. C-262, § 1, 3-19-90)

Sec. 24-184. Ditches.

- (a) Ditch design shall include maximum side slopes of one vertical to three horizontal (1:3), unless a variance is given by the engineering department subject to existing soil conditions. Minimum ditch slope shall be one (1) percent. All ditches shall be topsoiled, seeded and mulched.
- (b) Open ditch shall not exceed two (2) feet in depth.
- (c) Open ditches shall not be permitted on subdivision lots. Where concentrated surface drainage in subdivision lots is necessary, the use of swales with one on three (1:3) side slopes and a maximum depth of one (1) foot shall be permitted.
- (d) Rip-rap erosion control shall be required at all drainage pipe outlet points that discharge to open ditches.
- (e) At all drainage pipe outlet points of eighteen (18) inches diameter or larger, a prefabricated bar screen shall be installed. Bar screens shall have clear openings of not more than eight (8) inches.

(Ord. No. C-262, § 1, 3-19-90)

Sec. 24-185. Stormwater holding facilities.

- (a) All new developments shall be required to provide stormwater holding facilities to retain runoff and limit peak discharge to that of the existing hydrology. Peak discharge shall not exceed the capacity of the downstream channel, receiving area or body of water. Calculations identifying the existing peak discharge shall be submitted to the township engineer for review and acceptance.
- (b) Stormwater filtering basins may be required by the township engineer prior to discharge to the receiving water body, designed to improve the quality of the stormwater effluent by removing sediment and dissolved nutrients.
- (c) All detention ponds must be capable of complete dewatering by gravity. Pump discharges must be approved by the township engineer where gravity drainage is not feasible and will be considered on an individual basis.
- (d) Detention volume must be provided for all on-site acreage. Off-site drainage originally draining across the proposed development may be allowed to pass unrestricted or may be required to be detained or controlled by the stormwater distribution system. Individual cases will be considered by the engineering department, considering the available downstream flow capacity.
- (e) All detention basins must have a one-foot freeboard above the design 100-year high water elevation. All basins must have an overflow provision draining to a location which can reasonably accept such overflow without damage to any property and without the creation of a health or safety problem. All spillway overflow must discharge into a recognized natural drainage course or drain. All spillways must have a hard surface consisting of concrete, asphalt or grouted rip-rap, or as otherwise approved by the township engineer, under the circumstances.

- (f) Detention basin side slopes shall be no steeper than one vertical to six horizontal (1:6). Slope protection shall be provided as required. Two (2) inches of topsoil with sod or with seed and mulch shall be installed over the entire basin.
- (g) A twelve-foot-wide access easement and gate and a ten-foot-wide paved access road shall be provided for all detention basins. Pavement shall be as specified in the engineering department.
- (h) A ten-foot-wide maintenance easement around the perimeter of the basin shall be provided. The inside border of this easement shall be at the top of the bank of the basin. Where fences are to be installed, it shall be located a minimum of eight (8) feet from the top of the bank of the basin.
- (i) An agreement for operation and maintenance of all detention basin systems must be executed by the developer/owner and submitted to the township prior to the issuance of a building permit or final approval of platted developments. The agreement both as to form and content shall be subject to the approval of the township's legal counsel.
- (j) Design criteria:
 - (1) The volume of stormwater detention shall be computed by the Oakland County Drain Commission's "Simplified Retention Basis Design Procedure," for a 100-year frequency storm.
 - (2) If the design engineer has the knowledge and capability of performing a hydrologic mass balance for a 100-year intensity design storm to size the retention basin, this will be encouraged and reviewed independently by the engineering department.
- (k) Parking lot detention of stormwater is not encouraged. It will only be permitted when it would not adversely affect the functioning of the facility. Maximum storage depths shall not exceed six (6) inches (time and maximum area).
- (l) If there is no outlet available, the volume of the retention pond shall be that of two (2) consecutive 100-year storms, as computed based upon standards established by the Oakland County Drain Commission.
- (m) Sizing of retention basin volumes shall not utilize volume below the existing groundwater table. A comprehensive soil investigation shall be furnished to the engineering department for review, including, but not limited to, the following:
 - (1) Soil boring logs with blow counts and descriptions.
 - (2) Location of water table during and after drilling.
 - (3) Grain size analysis of soil at base elevation of proposed basin (if requested by engineering).
 - (4) Hydraulic conductivity (permeability) test of soil sample taken at proposed base elevation of retention basin.
- (n) All subdivision stormwater holding facilities shall be located in parks or outlots and not on one or more subdivision lots.

(Ord. No. C-262, § 1, 3-19-90; Ord. No. C-443, § 1, 11-14-94)

Secs. 24-186—24-188. Reserved.

Sec. 24-189. Connection to main water transmission line; limitation.

In the event an owner of property has had the option of tapping into an existing main water transmission line, and does not do so prior to the date of a hearing to determine necessity for a project in connection with the establishment of a special assessment district for improvement of a

lateral water line designed to serve such property, such property may be included in the special assessment district, and, if the special assessment district is ultimately approved and the lateral water line constructed, the property owner shall not thereafter be tapped into the main transmission line unless it is determined by the township board to be in the public interest to permit such a tap.

(Ord. No. C-234, § 1, 10-16-89)

Secs. 24-190—24-200. Reserved.