

March 2007

Charter Township of Superior

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Engineering Standards Manual

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E. S. M.



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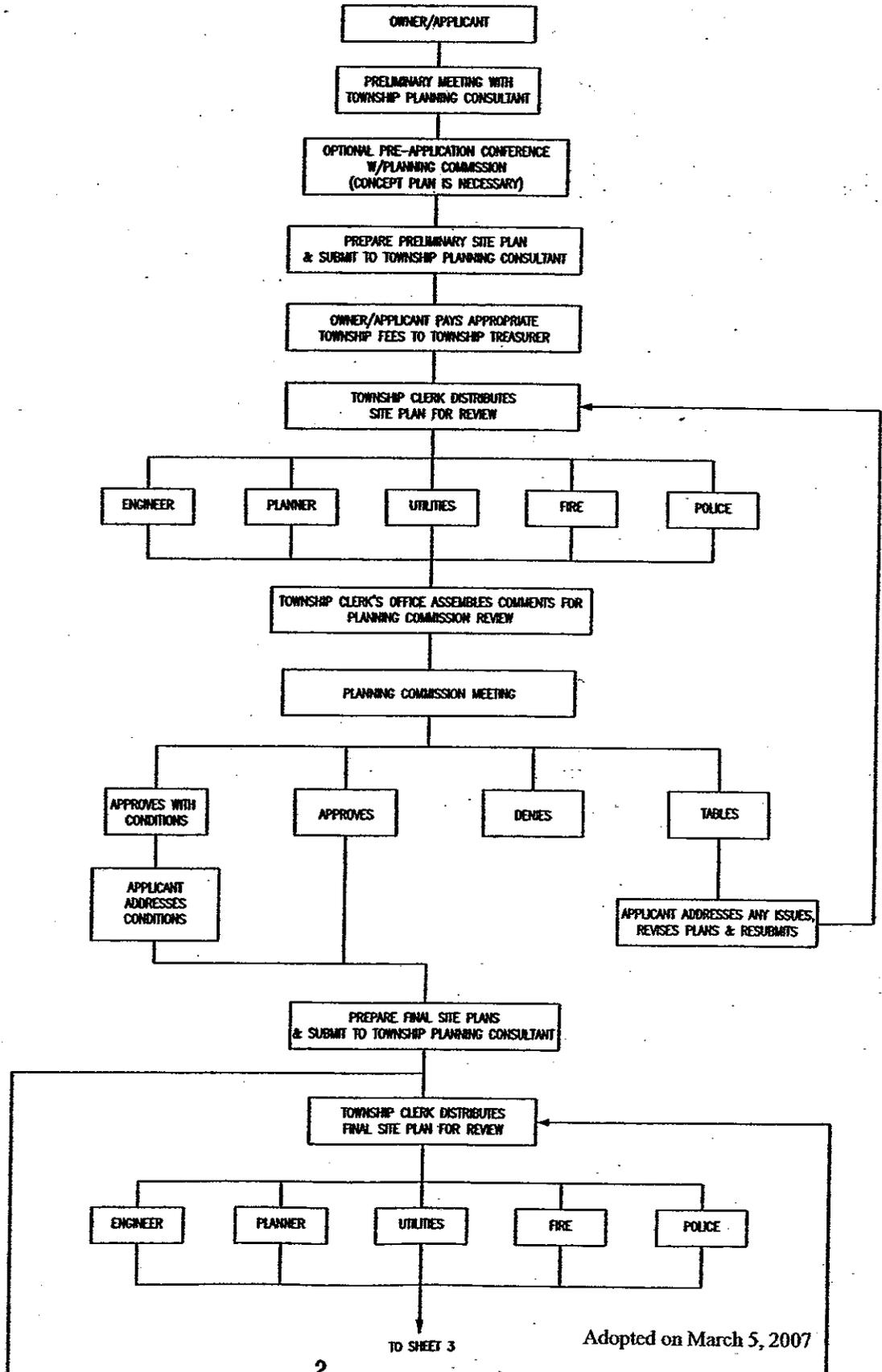
I. General Requirements and Procedures

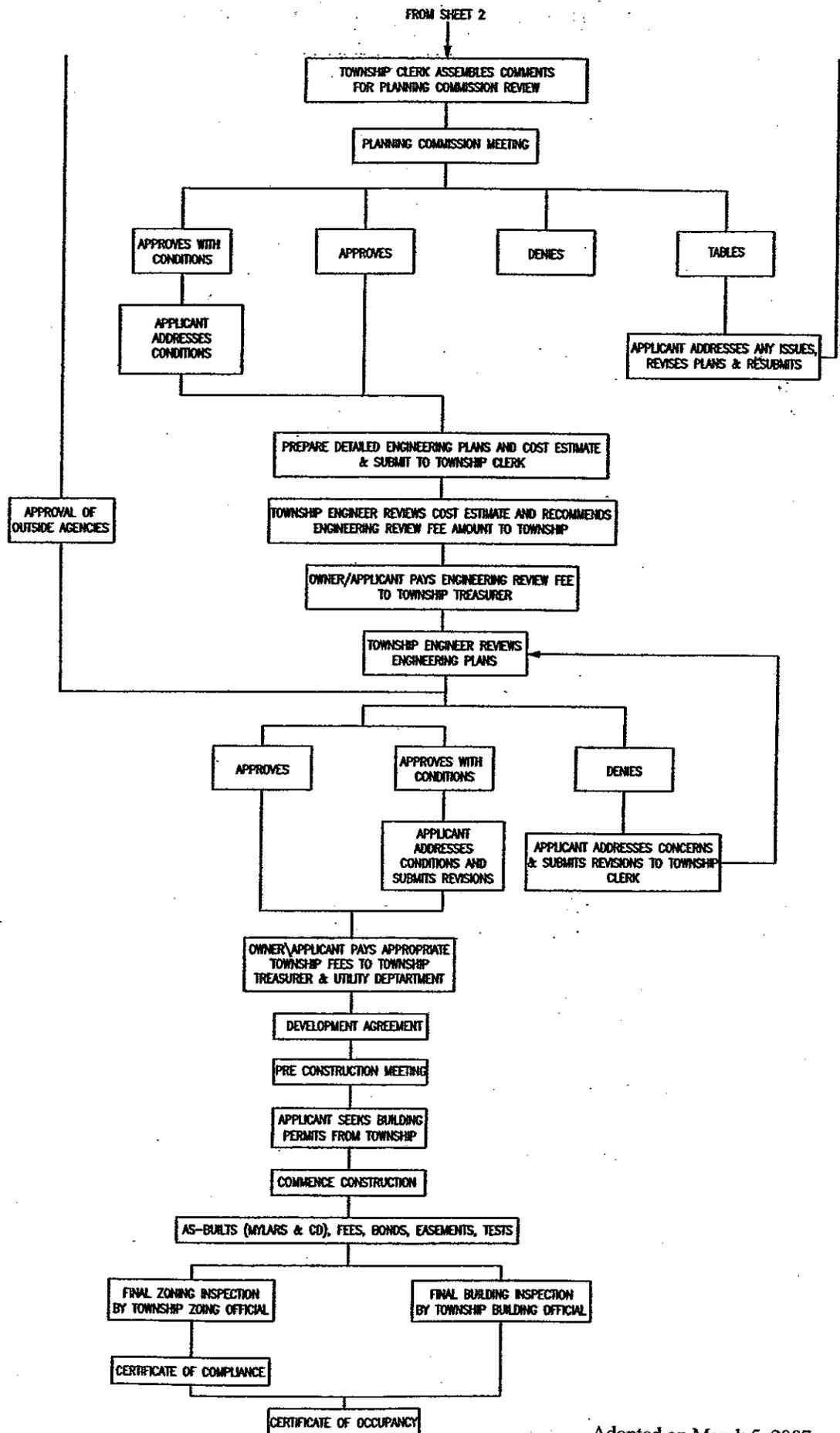
A. General Plan Review Procedures:

1. The plan review and approval process generally consists of two phases. The site plan and engineering reviews must be completed before construction begins.
 - a. **Site Plan Review:** The first phase includes the submittal of two separate plan sets. The first step is the submittal of the preliminary site plan followed by the final site plan. Prior to the start of any review, an application must be completed with associated fees paid to the Charter Township of Superior (see Appendix Section for details on all review fees). The Township Clerk's Office then distributes the plans to the appropriate Township departments and outside consultants. For both reviews, these agents do a conceptual plan review of the drawings to verify that they meet zoning ordinances, basic Township standards, and are generally feasible. They make recommendations to the Planning Commission who takes action to approve, deny or table the plan.
 - b. **Engineering Review:** The second phase begins when the Planning Commission approves the final site plan. The Owner then submits detailed engineering plans, application and fees to the Charter Township of Superior. The Township distributes the plans to the Township Engineer who performs a detailed review of the plans. The Township Engineer issues an engineering approval when the plans meet all engineering standards and all of the review agents have given final approval to the plans. Additionally, the Owner shall have paid all the required fees and any outstanding fees before engineering approval is granted.
2. A flow chart illustrating the site plan and engineering review process is included in the following pages. An illustration of the subdivision platting and engineering review process, as set forth in the Subdivision Control Act, Act 288 of the Public Acts of 1967, as amended, and the Superior Township's Subdivision Control Ordinance, is also provided.
3. Detailed descriptions of the review process and requirements are subsequently described in Sections C and D under this Section.
4. The Owner is responsible for posting all necessary fees and escrows. A Fee Schedule for Reviews is provided in the Appendix Section. The most current edition shall be used.

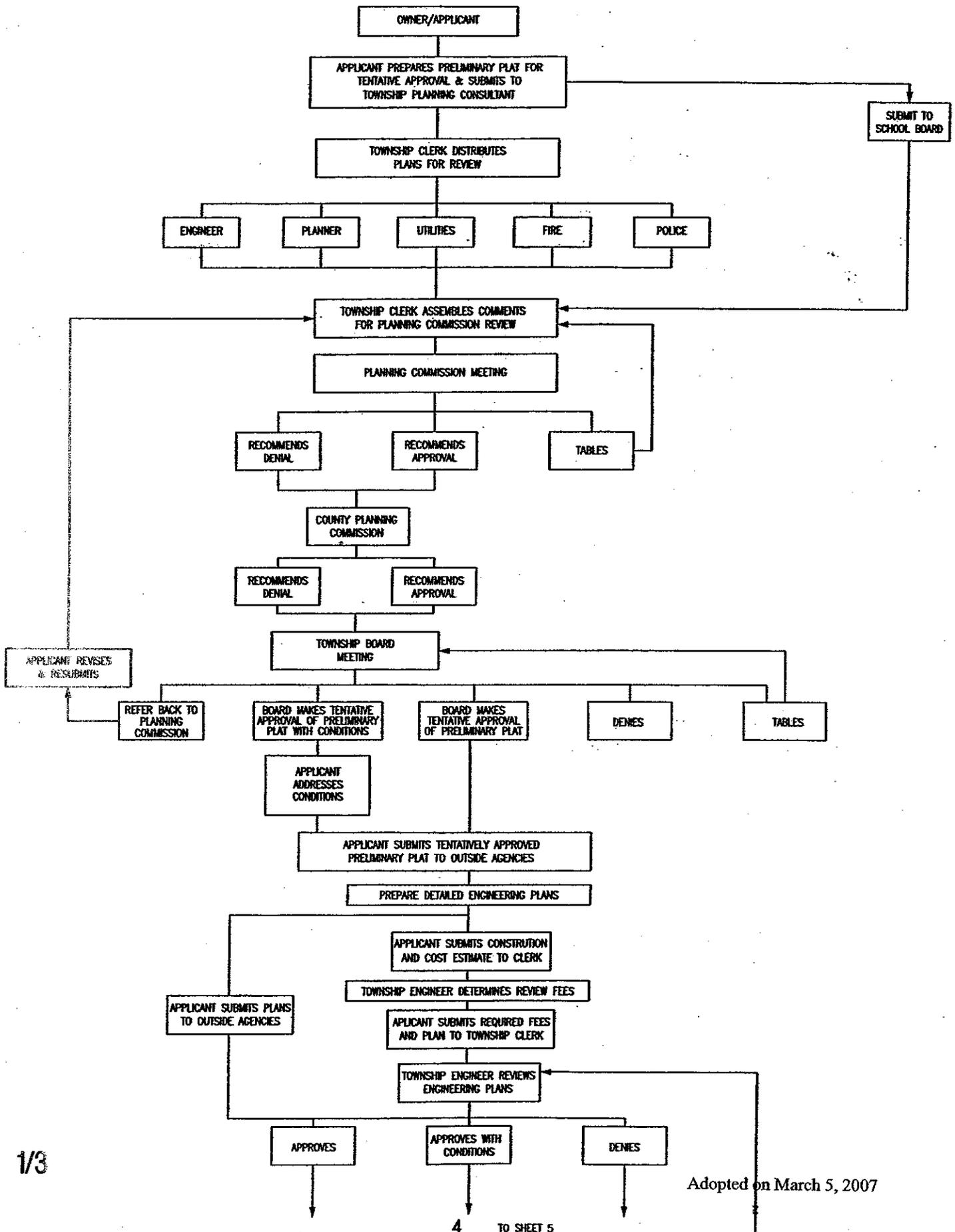
B. Flow Charts:

1 SITE PLAN PROCESS (PER THE TOWNSHIP ZONING ORDINANCE)

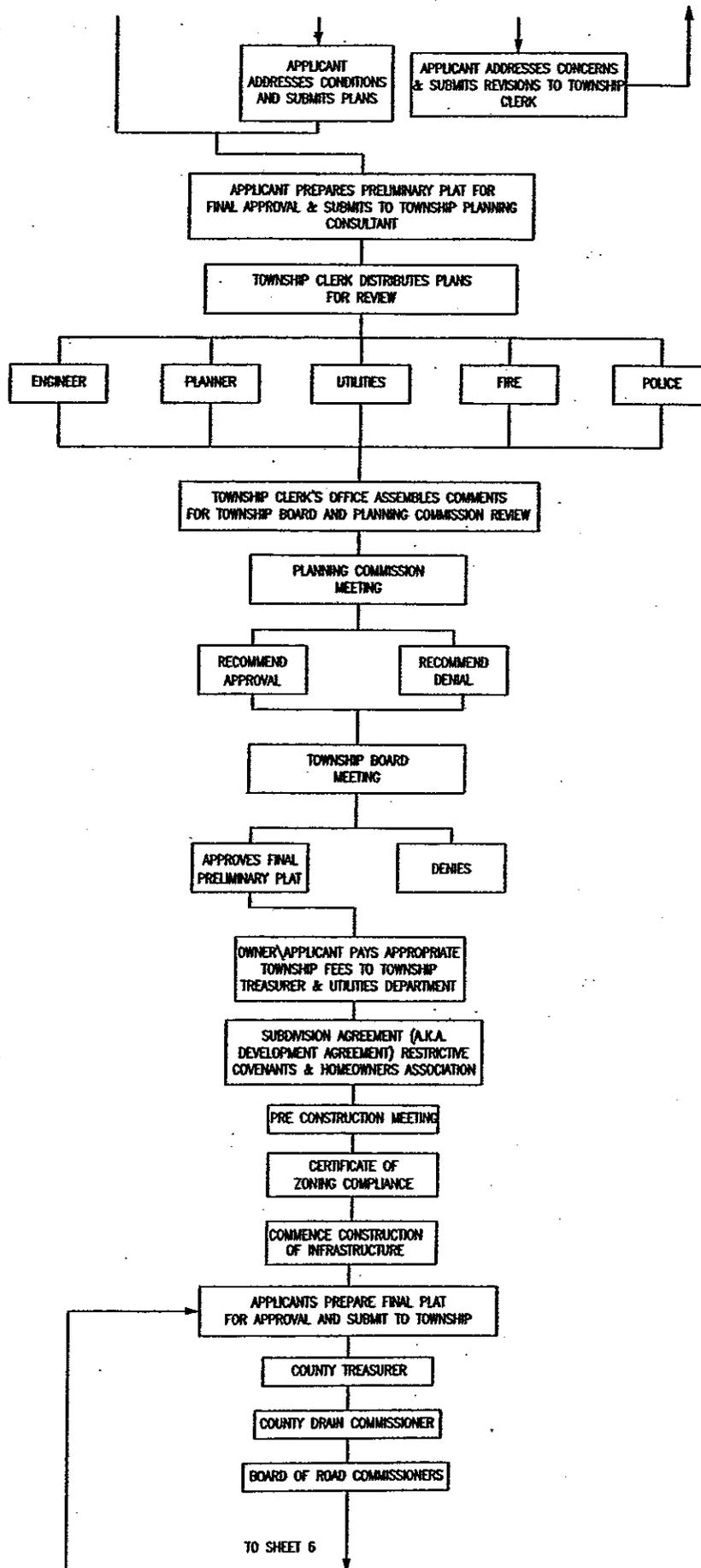


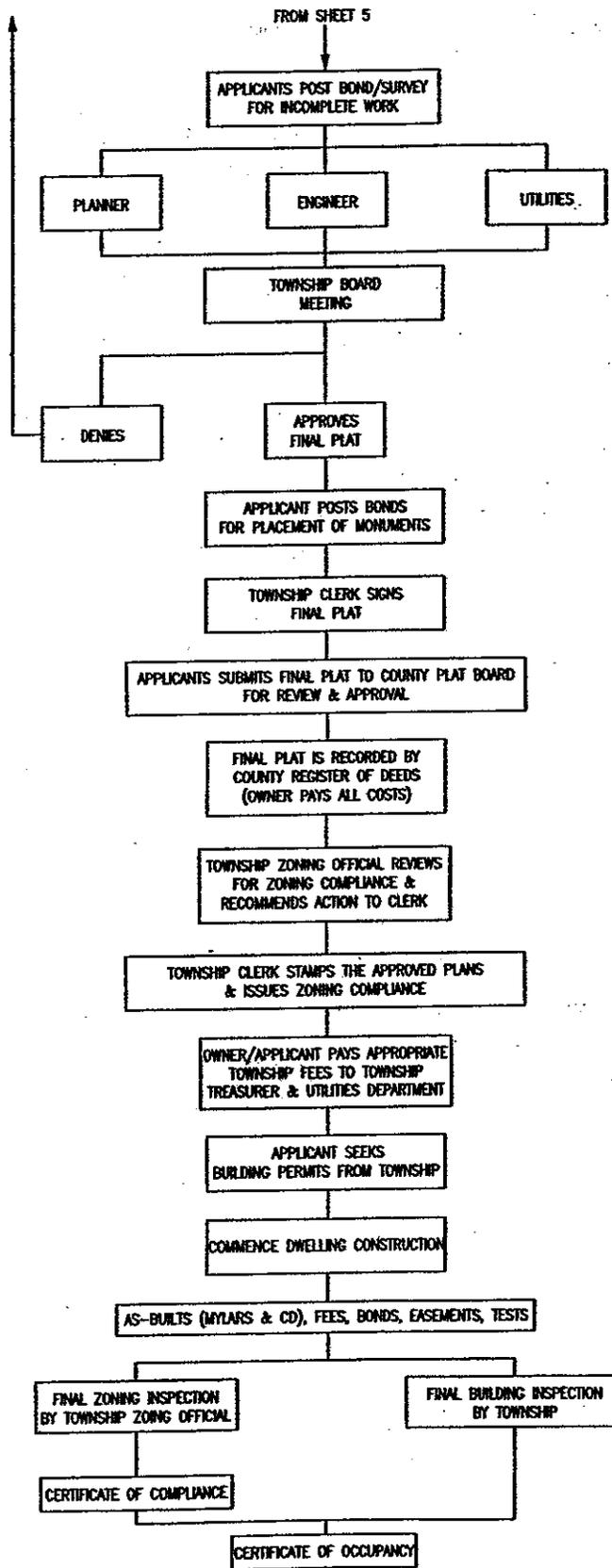


2. SUBDIVISION PROCESS/PLATTING (PER THE TOWNSHIP SUBDIVISION ORDINANCE)



Adopted on March 5, 2007





C. Preliminary Site Plan Requirements

1. The applicant seeking site plan approval from the Charter Township of Superior is strongly recommended to meet with Township staff consultants prior to plan preparation. It is important that the plan reflect the many requirements needed to assure passage through the Township reviews and approval process. Once the applicant has reviewed the project with staff and prepared a complete site plan in accordance with these standards, a formal submittal to the Township is in order. All documents and fees required for Planning Commission approval must be received by the Township treasurer prior to being placed on the planning commission agenda according to the Township ordinance and planning commission calendar. A schedule of regular meeting dates is posted for public display at the Township Hall.
2. The completed plan shall be submitted to the Township, by appointment. It will be distributed to the staff and consultants for review and comments. Plans are reviewed to determine the practicality of the project and impact on services and surrounding properties. Compliance with Township Standards and Ordinances will also be reviewed. Special engineering design considerations may also be addressed.
3. Upon completion of the review, the Township Engineer may return one set of plans to the Design Engineer with any necessary revisions and/or corrections noted on the plans or in a review letter. If necessary, directions will be given then as to how many plans must be resubmitted. The plan will be returned to the Design Engineer as often as is necessary to meet Township requirements. Applicants shall pay all costs in excess of review fees for adequate reviews of submittals.
4. The Township Clerk will assemble all comments and provide them to the Planning Commission for their review. The Planning Commission will approve, table or deny the plan. If the Planning Commission approves the plan, the applicant may begin preparing final site plans. No construction work may begin with only preliminary site plan approval except as specifically allowed in the zoning ordinance.
5. All documents and fees required for Planning Commission approval must be received by the Township Planning Consultant and Treasurer no later than three weeks prior to the next regularly scheduled meeting. As mentioned earlier, schedule of regular meeting dates is posted for public display at the Township Hall.
6. The site plan must conform to the Zoning Ordinance checklist as well as those items required on the site plan application form.
7. If applicable, the plans shall be in compliance with the Township's Private Community Wastewater Systems Ordinance No. 166 and the related Engineering Standards for Private Community Wastewater Systems.

Preliminary Site Plan Check List (as per the Zoning Ordinance)

- 1. 15 sets of plans, completed application, and review fees shall be submitted to the Township Clerk. Plans shall be submitted on 24 inch X 36 inch paper.
- 2. Date, scale and north arrow.
- 3. Property Owner's and Petitioner's name with address of the Property-Owner. Additionally a signed consent if the Petitioner is not the Owner.
- 4. Evidence that the Petitioner is legally authorized to apply for site plan review.
- 5. Dimensions and area indicated for site in question.
- 6. Legal description for the site in question.
- 7. General topography and soil information. Additional topographic information will be required at different stages of the review, and is specified in Section II.
- 8. Proposed buildings and/or structures (number, location, general dimensions, outline, floor area, number of floors, height, and type of dwelling unit and distances between all).
- 9. Location and size of recreation areas and open areas.
- 10. Show existing features to be preserved, or removed (trees, hedgerows, upland brush, prairies, woodlands, and meadows).
- 11. Delineation of the 100-year floodplain.
- 12. Watershed for all lakes, ponds, streams, and wetlands (a copy of the Superior Township Wetland and Watercourse Ordinance is provided in the Appendix Section).
- 13. Delineation of any wetlands or watercourses.
- 14. Delineation of all vegetation within 25 feet of all surface water features.
- 15. Description and delineation of groundwater recharge areas.
- 16. Proposed and existing street/drives (rights-of-way, general alignment, surface type, width, public/private).
- 17. Proposed parking location and dimensions of lots, including number of spaces, typical dimensions of spaces and aisles, angle of spaces, and surface type.
- 18. Fill/cut areas clearly shown.

- 19. Outline of existing buildings/structures-indicate any removals.
- 20. Building Envelope
- 21. Location and size of required transition and landscape strips.
- 22. Land uses of adjacent land.
- 23. Location and area of development phases including projected schedule.
- 24. Identify all existing and proposed easements (location, width and purpose).
- 25. General description of proposed sanitary sewer, and water main, including the basis of design.
- 26. The plan will be reviewed from a Traffic perspective. Adequate space must be provided for turning movements of vehicles including trucks and fire engines. Plans shall be designed to Washtenaw County Road Commission standards.
- 27. General description of proposed storm management system proposed, including an appropriate outlet, if applicable.

D. Final Site Plan Requirements:

1. Before final site plan approval is granted by the Township Planning Commission, the plans must first be reviewed by the Utility Department, the Township Engineer, the Township Planner, Fire Department, and the Police Department.
2. 15 complete sets of final site plans shall be required for final site plan application. It is recommended that the applicant schedule a time to meet with the Township staff/consultants before submitting any plans. All plans must be signed and sealed by an appropriate design professional, registered to practice in the State of Michigan. A complete submittal requires an application and fees to be paid to the Township treasurer.
3. The Township Clerk will forward the plans to all other concerned departments that may have jurisdiction over a certain phase or area of the site. The review comments of other departments will then be incorporated into the reviews from the planning and engineering consultants.
4. Upon completion of the review, the Township may return one set of plans to the Design Engineer. Any necessary revisions and/or corrections will be noted on the plans or in a review letter. Directions will be given to the applicant if plans must be submitted for further review.
5. The Township Clerk will assemble all comments and provide them to the Planning Commission for their review. The Planning Commission will approve, table or deny the plan. When the plan is approved, the Township Clerk will file an approved copy of the site plan and application at the Township.
6. Partial approvals will not be given. All revisions on all phases must be made before final site plan approval.
7. The Township will not give final approval until all required fees have been paid to the Township Treasurer.
8. 3 copies of a detailed, itemized construction cost estimate for all water main, sanitary sewer, paving and drainage improvements must be submitted to the Township Clerk at the time of plan submittal. The Design Engineer must seal the estimate. The construction cost estimates will be used by the Township Engineer to determine the engineering review fee and maintenance and guarantee bond amounts. The Township Engineer will report these amounts to the Township Treasurer in a written form and copy the Clerk.

9. The final site plan must include storm drainage and detention calculations.
10. All local permits shall be obtained or reasonably assured. Including, but not limited to: Washtenaw County Road Commission, Washtenaw County Drain Commission. Any necessary state permit applications will not be submitted until the Township Planning Commission and the Township Engineer grants final engineering approval.
11. The final site plan must conform to the requirements of the site plan application form as well as those items required on the final site plan check list.
12. If applicable, the plans shall be in compliance with the Township's Private Community Wastewater Systems Ordinance No. 166 and the related Engineering Standards for Private Community Wastewater Systems.

Final Site Plan Check List (as per the Zoning Ordinance)

- 1. 15 sets of plans, completed application, and review fees shall be submitted to the Township Clerk. Plans shall be submitted on 24 inch X 36 inch paper.
- 2. General plan at a scale not greater than one inch equals 200 feet. All scales must be those customarily found on an engineer's scale (e.g. 10, 20, 40, 50). The information shall be presented on more than one drawing if necessary.
- 3. Plans prepared and sealed by a qualified (as determined by the Township) professional licensed or registered in the State of Michigan. A qualified professional may be an architect, engineer, landscape architect, or land surveyor depending on the project.
- 4. Date of plan, scale, and north arrow shown along with any revision dates.
- 5. Property Owner's and Petitioner's name and addresses and phone numbers.
- 6. If the Petitioner is legally authorized to apply for site plan review, the Property Owner's signed consent must be provided.
- 7. Name, address, phone number and fax number of designer.
- 8. A vicinity map, legal description of the property and dimensions/lot area.
- 9. Lot line angles or bearings (based on a boundary survey prepared by a licensed professional surveyor) shall be indicated on the plans where a metes and bounds description is used.
- 10. Existing topography, with a minimum contour interval of one foot, extended 100 feet beyond the site in all directions, showing existing natural features (on the site and within 100 feet of the site) such as: shrubs, bushes, trees, wooded areas, marshes, streams, ponds, and wetlands (a copy of the Superior Township Wetland and Watercourse Ordinance is provided in the Appendix Section) with any removals indicated.
- 11. A complete listing of tree species present on the site shall be included on the plan. Groups of trees (defined as at least four trees with overlapping canopies) shall be shown by an approximate outline of the total canopy. All landmark trees to be indicated by species, location and size, regardless of location; individual deciduous trees of six inch diameter or larger and individual evergreen trees six feet in height or higher. Reference Section 3.25 of the Township Zoning Ordinance for additional details.
- 12. Existing buildings and structures, on the site and within 100 feet of the site in all directions, including but not limited to drives, utility poles and towers, easements, pipelines, excavations, ditches, bridges, and culverts with any removals indicated.
- 13. If applicable, description of deed restrictions.

- 14. Information on adjacent properties shall be indicated (use, zoning classification, location and outline of buildings, drives, parking lots, and other improvements).
- 15. Existing public utilities serving the property (location, size, and inverts for sanitary sewer and storm sewer lines; location of manholes and catch basins; location and size of wells, septic tanks, and drain fields and location and size of water lines and hydrants).
- 16. Existing drainage patterns shown.
- 17. Location and size of detention/retention ponds with calculations shown on the plans and side-slopes indicated.
- 18. Location, size and type of electric, telephone, gas and cable utilities.
- 19. If applicable, the location and size of underground tanks and outdoor incinerators.
- 20. Name and rights-of-way of existing streets adjacent to the property- the following shall be indicated: surface type, width, and spot elevations of street surface.
- 21. Plans shall be in conformance with the Township's Tree Ordinance, including the protection measures during construction.
- 22. Grading plan, showing finished contours at a minimum interval of one foot with cut/fill areas indicated.
- 23. All proposed contour lines are to be connected to existing contour lines at or inside the property lines.
- 24. Location and exterior dimensions of proposed buildings and structures with the following information shown: distance from property line, distances between buildings, height (in feet and stories), finished floor elevations and contact grade elevations.
- 25. Proposed streets and drive information including but not limited to: alignments, proposed street names; rights-of-way, detailed cross-sections of paving improvements, typical details of curbs, surface elevations, and grades of all entries and exits, curve-radii, and turning lanes.
- 26. Location and dimensions of proposed parking lots with numbers of spaces in each lot, drainage pattern, dimensions of spaces and aisles, typical cross-section, and angle of spaces indicated.
- 27. Location and size of proposed recreational areas and open spaces with maintenance provisions provided for.
- 28. Location, width, and surface of proposed recreational pathways or sidewalks.

- 29. Location and type of proposed screens and fences with height, typical elevation, vertical section of screens, and material type and dimensions shown.
- 30. Outdoor trash container enclosure with size, typical elevation, vertical section of enclosures, and material type and dimensions shown.
- 31. Type, size, location, area, and height of all proposed signs.
- 32. Landscape plan showing size, location and type of all plant materials.
- 33. All soil erosion and sedimentation control measures must be shown and maintained during grading and construction operations or until a permanent groundcover is established.
- 34. Location of proposed retaining walls with the following information provided: dimensions, materials, fill materials, typical sections, and restoration notes.
- 35. If applicable, right-of-way expansion indicated with reservation or dedication clearly noted.
- 36. A permit or waiver from the Washtenaw County Environmental Health Division shall be provided if on-site water and sewer facilities are to be used.
- 37. A waiver or approval letter from the Superior Township Utility Department shall be obtained if public water and sanitary sewer facilities are to be used.
- 38. A waiver or approval letter from the Superior Township Fire Chief or other designated official shall be provided.
- 39. A permit or approval letter from the Washtenaw County Drain Commission shall be obtained for any action that may affect a county drain.
- 40. The final site plan must conform to the preliminary site plan as approved by the Township Planning Commission.
- 41. The proposed development conforms to all regulations of the Zoning Ordinance for the district in question.
- 42. The plan meets specifications of Superior Township for police and fire protection, water supply, sewage disposal or treatment, storm drainage, and any paving improvements.
- 43. Any grading will not destroy the character of the area, and will not adversely affect the neighboring properties.
- 44. Soil erosion will be controlled during and after construction to protect adjacent properties or facilities.

- ❑ 45. The natural features of the area will be preserved and protected as much as possible.
- ❑ 46. The plan meets the standards of other government agencies and the approval of such agencies is obtained or assured.
- ❑ 47. Copies of all permits and permit applications, obtained to date, shall be forwarded to outside regulatory agencies. The status of all necessary permits shall be included on the cover sheet, in both preliminary and final site plan submissions.
- ❑ 48. Owner shall submit documentation that all Township fees have been paid.
- ❑ 49. Three copies of a detailed itemized construction cost estimate for all water main, sanitary sewer, paving, grading, soil erosion control and drainage improvements must be submitted to the Township at time of plan submittal. The estimate must be signed and sealed by a Design Engineer licensed in the State of Michigan.

E. Engineering Plan Requirements:

1. The applicant shall submit a minimum of 7 complete sets of site engineering plans (6 when not in the water and sewer district), depending on the various agencies influenced by the proposed development. The plans shall include an approved Engineering Application, signed by the Township Engineer.
2. Drainage and detention calculations must be submitted and incorporated into the plan drawings.
3. Prior to the issuance of a building permit, the plans must first receive an approval from the Planning Commission, Utilities Department, Township Engineer, and Fire Department.
4. It is recommended that the applicant meet with the Township prior to submittal of any plans. The plans will be received at the Township Hall. All plans must be signed and sealed by the Design Engineer licensed to practice in the State of Michigan.
5. The Township will forward the plans to all other concerned departments that may have jurisdiction over a certain phase or area of the site. The review comments of these other departments will then be incorporated into the review.
6. If applicable, the plans shall be in compliance with the Township's Private Community Wastewater Systems Ordinance No. 166 and the related Engineering Standards for Private Community Wastewater Systems.
7. Upon completion of its review, the Township Engineer may return one set of plans to the Design Engineer with revisions and/or corrections noted on the plans upon request. Directions will be given at that time as to how many plans must be resubmitted.
8. The plans will then be reviewed again and further revisions made if required. The plan or review comments may be returned to the Design Engineer until the plan meets all Township requirements.
9. Upon approval from all agencies, notification will be given to the Township that the engineering plan is approved. An approved plan will be returned to the Township.
10. Partial approvals will not be given. All revisions on all phases must be made prior to engineering approval.
11. Approval will not be given until all required fees and inspection escrow accounts have been deposited and the necessary permits obtained.

12. A copy of the computed plat shall be submitted with all subdivision plans, as well as all design calculations for the storm, sanitary sewers and water mains.
13. Submittal on 24" x 36" white paper having blue or black lines with a minimum horizontal scale of 1" = 50' and vertical of 1" = 5'. Other acceptable scales are 1" = 20', 1" = 30' and 1" = 40'. This includes, but is not limited to, utility and grading plan sheets.
14. General plan at 1" = 100' or 1" = 200' when size of site prohibits a single plan sheet may be included. Such a plan should show street names, units, utilities, pavement, site dimensions, phase lines, lot lines and lot numbers. This plan will not substitute for detailed plans at 1" = 50' scale or larger.
15. Location map showing section number and major thoroughfares.
16. North arrow; scale; MISS DIG notice.
17. Lot number, parcel dimensions and adjoining rights-of-way.
18. Name, address and phone number of the Design Engineer/Architect and the Owner.
19. Legal description of property.
20. Setbacks and building separations noted in accordance with zoning requirements.
21. Striping plan for parking lot areas in accordance with zoning requirements.
22. Walls or berms, as required by zoning, must be shown in cross-section. Walls separating a grade differential of more than 18" are considered retaining walls and require a structural engineering review. The Design Engineer must complete a retaining wall design form and submit for review (see Appendix Section VII for sample copy and requirements).
23. The storm sewer, sanitary sewer and water main shall be shown on the same plan view.
24. Title block for each sheet. When many plans are in a set, each plan shall include a summary of that particular sheet in its title block.
25. Include landscape plans. Plantings and existing features must not interfere with utilities or public easements.
26. Adequate space must be provided to allow for turning movements of vehicles including trucks and fire engines.
27. Concrete pads provided for trash dumpsters.

28. Utilities must be a minimum of 10' from building envelopes.
29. Exact drive locations must be shown on the engineering drawings including the utility plan sheet. Structures (e.g. gate valves, sanitary manholes and storm manholes) will not be allowed on paved surfaces (e.g. sidewalks / driveways) including the road. Exceptions will only be allowed with written permission from the utility department and the Township Engineer.
30. Design computations for residential development for water main analysis by the Township Engineer. The Township will model the water system at this time (see Water Main Section for specific requirements).
31. A minimum of two fire hydrants is required for a development with a proposed cul-de-sac (one at the intersection and one at the end of the cul-de-sac).
32. A traffic study must be provided to the Township Engineer for review. Exceptions will be only allowed with written permission from the Township Engineer.
33. All jack and bores, within the Right-of-Way or Utility Easement, to save trees or preserve natural features must be approved by Township Utility Director.
34. Plans shall include a one sheet, Overall Utility Plan, including existing and proposed structures, pipes, and pipe diameters.
35. No construction work may begin until all permits have been secured, engineering approval has been granted, and a preconstruction meeting has been held. Copies of all required permits shall be submitted to the Township Engineer prior to the scheduling of a preconstruction meeting. Under rare circumstances, when the Township deems that it is in their best interest, a pre-construction meeting may be scheduled prior to the receipt of all permits. However, under no circumstances shall the meeting be held until all the permits necessary are submitted to the engineers.
37. Preconstruction meeting requests must be made at least 10 business days prior to the date of the proposed meeting. Additionally, the preconstruction meeting for projects should occur no later than 10 business days before the start of construction. This meeting will not be scheduled until all permits have been received, all fees (including preconstruction meeting fee) and escrows have been paid to the Township Treasurer, and final engineering approval has been granted. Some exceptions can be made with scheduling requirements, subject to approval of the Township.

36. Before issuing substantial completion, record drawings will be prepared and certified by a Design Engineer licensed in the State of Michigan and submitted to the Township for review by the Township Engineer. The “as-constructed” plans will show the location of all utilities and final grades for all sanitary and storm sewers and appurtenances. The “As-constructed” plan checklist is provided in the Appendix. The Township shall then submit “As-constructed” plans, on a Mylar base, certified by a registered professional Design Engineer, for acceptance after approval of the “as-constructed” plans by the Township Engineer. An electronic copy, conforming to the Township’s GIS and GIS layering requirements, of the “as-constructed” plans will also be required at this time along with a maintenance and guarantee bond. Guidelines for GIS requirements are as follows.

- Geo-referenced (Assigning a Coordinate System).
- Submitted documents must be in the ESRI shape file format.
- There are to be no spaces or dashes in filenames or attribute field names. Specification are outlined in the Appendix
- Topology for points, lines, or polygons built (no dangles or extra features).
- AutoCAD text is to be converted into ESRI annotation layers.

F. Permit Requirements:

1. Building Permit:

Before any building/structure construction can begin, a building permit must be obtained from the Charter Township of Superior. This permit will not be issued until all fees have been paid (including utility fees) and construction plans have been approved by the Utility Department, the Township Planner, the Township Engineer, and the Fire Department.

2. Soil Erosion and Sediment Control Permit:

This permit is required prior to the start of any site improvements. Applications are available at the Washtenaw County Department of Environmental Services. A bond will be required in accordance with Washtenaw County code.

3. Michigan Department of Environmental Quality, (Water Main):

Construction of public water main requires a construction permit from the Michigan Department of Environmental Quality (MDEQ) as well as the approval of the Detroit Water and Sewerage Department, the Charter Township of Superior, and the Ypsilanti Community Utilities Authority. Upon request of the Township Engineer, the Owner shall submit 9 sets of plans and specifications, signed and sealed by a Design Engineer licensed in the State of Michigan. In addition, a tabulation of water mains consisting of their size, location, type and length shall be prepared by the Design Engineer and submitted to the Township. The Township Engineer will transmit the plans to the Ypsilanti Community Utilities Authority and request approval for an MDEQ permit.

4. Michigan Department of Environmental Quality (Sanitary):

Construction of public sanitary sewer requires a construction permit from the MDEQ (as required under Part 41 of Act 451, Public Acts of 1994) as well as the approval of the Charter Township of Superior and the Ypsilanti Community Utilities Authority. Upon request of the Township Engineer, the Owner shall submit 5 sets of plans and specifications, signed and sealed by a Design Engineer licensed in the State of Michigan. In addition a permit application, design flow computations for the proposed sewers and a tabulation of the capacities of the proposed sewers and the existing outfall sewer shall be submitted by the Design Engineer. The Township Engineer will transmit the plans to the Ypsilanti Community Utilities Authority and request approval for an MDEQ permit.

5. Washtenaw County Road Commission, (Roads):

All work in the road right-of-way under the jurisdiction of Washtenaw County requires a permit from the Washtenaw County Road Commission.

6. Washtenaw County Drain Commissioner's Office, (Storm Drainage):

A Washtenaw County construction permit is required for any connection to a county drain.

7. Michigan Department of Environmental Quality (Wetlands, Inland Lakes and Streams):

It is the Owner's responsibility to obtain MDEQ permits as required under the Wetlands Protection Act 203 and the Inland Lakes and Streams Act 346.

8. Other Permits:

Other agencies from which the Owner may need a permit will be designated on the approved plan. These permits are generally the Contractor's responsibility and will generally be required prior to construction.

Michigan Department of Transportation
Michigan Water Resources Commission
Washtenaw County Health Department
United States Army Corps of Engineers

G. Fees:

All plan review fees must be submitted to the Township prior to commencement of any plan reviews. A fee description is provided in the Appendix Section.

H. Contacts:

See the Appendix Section for a list of various Township and outside agency contacts.

I. Insurance:

Prior to construction, the Contractor shall procure and maintain, during the term of the project, public liability and property damage insurance with a responsible insurance company which meets the approval of the Township of Superior, in such amounts as will be adequate to protect the public, the Charter Township of Superior interest, and shall not be less than the limits set forth herein.

Type of Insurance:

1. Workmen's Compensation Insurance and Employer's Liability
Limit: As required by laws of State of Michigan
2. Public Liability & Property Damage:
 - a. Bodily Injury: Each Occurrence: \$1,000,000
Aggregate: \$2,000,000
 - b. Property Damage: Each Occurrence: \$1,000,000
Aggregate: \$2,000,000
3. Owner's and Contractor's Protective Liability & Property Damage:
 - a. Bodily Injury: Each Occurrence: \$1,000,000
Aggregate: \$2,000,000
 - b. Property Damage: Each Occurrence: \$1,000,000
Aggregate: \$2,000,000
4. Motor Vehicle (including Owner, Hired and Non-Owned Vehicles):
 - a. Bodily Injury: Each Occurrence: \$1,000,000
 - b. Property Damage: Each Occurrence: \$1,000,000
 - c. Combined single limit: \$2,000,000

Policies shall be made available to Superior Township and the Township Engineer for examination as to their validity and any undesirable exclusions deemed improper by legal opinion rendered to the Township regarding same. Underground construction, where applicable, shall be specified in the coverage. Certificates of coverage signed by the insurance carriers shall include a guarantee that 30 days written notice shall be given by the insurance carrier to the Charter Township of Superior prior to cancellation of, or any change in the respective policies. In the event that the insurance is canceled, operations shall cease prior to the cancellation date and shall not resume until evidence is provided that proper insurance is again in effect. Additional Named Insured under Owners and Contractors Protective Public Liability and Property Damage Insurance shall include the Charter Township of Superior, the Township Engineer and members of staff, employees and agents for the Township.

The name of the proposed development must be included on the insurance documents.

J. Bonds/Letters of Credit:

The amount of these bonds or letters of credit will be based on the sealed Design Engineer's estimate for the work approved by the Township Engineer.

Prior to setting a pre-construction meeting the following bonds will need to be submitted:

- Performance Bond - 100% of the cost for improvements as outlined in the Township Zoning Ordinance, including the cost for public utilities.
- Utility Repair Bond - 5% of the construction costs for all public utilities.
- Maintenance of Unsold Lots – Amount will be determined by the Township Engineer, based on the area of proposed Lots.
- Monuments & Corner Markers – Amount will be determined by the Township Engineer, based on the amount of Monuments and Corner Markers required.

Prior to the Final acceptance, the applicant will post a two-year Maintenance and Guarantee Bond in an amount equal to the full cost for the public improvements with the Township. The Zoning Ordinance may require additional bonds, and the petitioner will be responsible for those as well.

II. Topography

A. General:

1. A complete topographical survey is required for all sites. Existing off-site elevations must be given at a minimum of 100' abutting the entire perimeter of the site. Grades shall be indicated at all property corners and along all property lines. Contour lines (minimum contour interval of one foot) are required to establish the existing site drainage.
2. All existing conditions shall be shown, including but not limited to the following items (location and elevation):
 - a. Existing drainage courses, including all wetlands-regardless of size. A copy of the Superior Township Wetland and Watercourse Ordinance is provided in the Appendix Section.
 - b. Upstream and downstream culverts.
 - c. All utilities including sanitary, water main, gas, telephone, cable, and electrical. Inverts, castings and finished grades are required where applicable.
 - d. Sidewalks.
 - e. Finished grades of all adjacent buildings.
 - f. All easements.
 - g. Trees (per zoning ordinance).
 - h. 100-year flood plain (per F.E.M.A.). If published information is not available, it is the responsibility of the applicant to determine the extent of the floodplain by investigation and study.
3. A minimum of 2 N.A.V.D. 88 benchmarks are required on, or within 200 feet of, the site. Benchmarks may need to be established by the Proprietor based upon the review of the Township and the Township Engineer.
4. For developments greater than 5 acres, the Owner will be required to establish a concrete benchmark (standard, with bronze top) at a reasonable location approved by the Township.
5. Road topography shall extend across the entire site with grades shown on both sides of the road, from right-of-way line to right-of-way line for:
 - a. Property line.
 - b. Ditch centerline and top of bank.
 - c. Edge of shoulder.
 - d. Edge of pavement or top of curb
 - e. Crown or centerline.
6. Property lines must be indicated by bearings and distances.
7. Existing and proposed right-of-ways of adjacent roads must be indicated.

III. Soil Erosion and Sediment Control

A. Sites Requiring Permits:

1. The Washtenaw County Department of Environment and Infrastructure Services is the enforcing agent for soil erosion control in the Township.
2. A Washtenaw County Soil Erosion & Sedimentation Control Program Guide is provided in the Appendix Section. The Owner is responsible for following the current revision of the above.
3. A permit is required for all earth moving activities as follows:
 - a. All projects that disturb 1 or more acres.
 - b. All projects that occur within 500 feet of surface water and disturb more than 225 square feet.
 - c. Construction of new ponds or alterations to existing ponds.
 - d. All major projects as defined by Washtenaw County.

B. Intent of Permit:

The intent of this requirement is to ensure that no silt or sediment enters the public stream or watercourses. This is accomplished through means of sediment basins, filters, diversions, etc.

C. Plan Requirements:

1. A soil erosion and sediment control plan is required for all sites that require a permit. This can be made a part of the plan documents. Itemized on this plan shall be step-by-step requirements for controlling erosion (sequence of construction). No work, including site clearing, will be allowed until approved soil erosion and sediment control measures are in place.
2. All proposed erosion control measures shall be shown on the plans.
3. Accelerated erosion and sedimentation must be prevented during all phases of construction including:
 - a. Initial site clearing.
 - b. Utility construction.
 - c. Building construction.
 - d. Site paving.
 - e. Final site approval.

Inspection:

1. Inspection will be made periodically throughout construction on the maintenance and effectiveness of soil erosion control methods by W.C.S.E.C.
2. If inspection reveals that the controls are not being implemented, a cease and desist order on all site construction may be issued.

IV. Water Main

A. General:

1. When construction of water main is proposed, the Charter Township of Superior Standard Water Main Detail Sheets must accompany the plans.
2. A quantity list itemizing all proposed water mains must appear on the cover sheet of the plans. Including pipe diameter, length, hydrants, and gate valve and wells.
3. The basis of design shall be provided on the cover sheet of the plans.
4. Water main shall be located between the road and the right-of-way line (opposite of the sanitary sewer), wherever possible. Variations must be approved in writing by the Township Utility Department.
5. Soil borings must be taken and analyzed by a professional engineering firm qualified to do such work at the locations of all proposed roads. The Township may request copies of the report. It is recommended that a soils investigation be done and a report prepared for all areas where pavement is proposed.
6. Pipe size, length, type and all easements must be shown on plan view.
7. A 10 feet horizontal separation is required between water main and sanitary or storm sewer.
8. Public water mains may be required for any new main servicing a fire hydrant or where multiple users are serviced. Township approval will be required for private lines serving more than one building.
9. An 18-inch minimum clearance between storm or sanitary sewer and water main is required. Top-of-pipe and bottom-of-pipe elevations must be provided.
10. All water main fittings, valves, and hydrants shall be dimensioned from property corners or another coordinate system.
11. A minimum 10 feet separation must be maintained between the water main and any permanent structures, such as a building.
12. It is strongly discouraged to have water main located between homes, in the side yards. If it cannot be avoided a minimum 60 foot easement shall be provided. If a main larger than 8-inch is installed, a larger easement may be required.

13. Water main jacking and boring shall extend a minimum of 10 feet outside the edges of the pavement. Length, size and invert of casing and pipe shown at all bore locations. All casing pipes shall be grouted when complete unless otherwise directed by the Township Utility Department.
14. The applicant shall submit design computations for residential development for analysis by the Township Engineer. The Township will model the water system. The following information must be provided: number of units, anticipated water demand (average, maximum, peak, and fire), location of development, and digital AutoCAD drawing of water system in conformance with current requirements on state plane coordinates.
12. Use of 90-degree bends shall be minimized, and may be placed only as specifically directed by the Township and as specifically approved by the Township Engineer in writing.
13. Use of vertical deflections shall be minimized. The storm sewer and water main system shall be designed such that it includes the minimum number of vertical water main deflections and is approved by the Township Engineer.
14. The provisions of Act 230 of the Public Acts of 1972 requires that the materials and methods indicated in the currently adopted Michigan Plumbing and Michigan Residential codes shall apply without local modification. The plumbing codes provisions apply to building sewers, storms and water services up to their connection with the public system.
15. New or existing sites may be required to connect into existing public water mains based on Township review.
16. It is strongly discouraged to have any type of structure or casting in sidewalks, driveways, or roadways. In the event that it is absolutely unavoidable, additional precautions will be required. An East Jordan Iron Works 1795 frame will be required.
17. Water main alignment in cul-de-sacs shall be “wrapped around” the exterior of the cul-de-sac pavement.
18. A culvert shall be placed in the ditch line of all open-graded ditches impeding access to a well or hydrant.

B. Sizes and Distribution:

1. The minimum size of water main allowed in the Charter Township of Superior shall be 8 inch. 6 inch mains may be used only for single fire hydrant leads having a maximum length of 40 feet. 10 inch mains are not allowed. No service leads are allowed from a 6 inch main. Maximum dead-end mains are as follows:
 - a. 450 feet for 8 inch mains.
 - b. 1,000 feet for 12 inch mains.
2. Reducers are not allowed to meet the dead-end requirements.
3. A 12 inch water main shall be considered as minimum for internal transmission on industrial and commercial, office and institutional. Size of main required is based on site location; see appendix section for guidelines.
4. Looping of mains will be generally required. All mains must end with a gate valve and hydrant or blow-off.
5. No private services will be allowed from a 6 inch hydrant lead or a water main over 16 inches in diameter.
6. The extension of water main will be required across the entire frontage of the site.
7. Water main shall be located so they provide unrestricted access for maintenance and inspection.

C. Depth of Water Main:

All water mains shall be 5.5 feet deep. No pipe will be allowed deeper than 10 feet.

D. Easements:

All public water mains must be located in a dedicated water main easement or public right-of-way. The minimum easement width shall be 12 feet for the permanent easement and 20 feet for the temporary construction easement. The easement shall be recorded prior to Township acceptance of the system.

Water main between homes, in the side yards, shall have a minimum easement width of 60 feet. If a main larger than 8-inch is installed, a larger easement may be required.

E. Profile:

The following information shall be indicated on the water main profile for mains 8 inches and greater:

1. Length of run between structures.
2. Type and class of pipe between structures.
3. Size of pipe between structures.
4. Top of casting elevations of all structures.
5. Existing and proposed ground elevation along the route of the water main.
6. Progressive numbering system.
7. All utility crossings. (18 inch minimum clearance).
8. Special backfill areas shown graphically as well as in notes.
9. Adjacent existing or proposed utilities plotted where parallel.

F. Construction:

No building permits will be issued above the foundation for any development prior to the required mains and hydrants being issued substantial completion. Adequate access for fire fighting equipment must also be provided. No occupancy will be allowed without the required mains, hydrants and sprinklers in active service.

Model homes may be constructed in accordance with the Township zoning ordinance and subdivision ordinance.

Construction methods shall conform to the Installation of Ductile-Iron Water Mains and their Appurtenances, AWWA C-600, latest revision.

G. Testing:

Testing standards shall conform to the Installation of Ductile-Iron Water Mains and their Appurtenances, AWWA C-600, latest revision and Disinfecting Water Mains, AWWA C-651, latest revision.

H. Valves:

1. Gate valve spacing will generally be regulated by providing the following provisions in event of a breakage:
 - a. No more than 30 single-family unit structures will lose service.
 - b. No more than 30 unit structures will lose service.

- c. No more than two hydrants will be out of service.
 - d. Generally, on line valve spacing will be a maximum of 800 feet for water main 8 inches in diameter. On water main 12 inches or larger, valves will be spaced not more than 1/4 mile apart.
 - e. Gate valves shall be arranged so that any section can be isolated by closing not more than 3 gate valves, with a maximum of 30 lots or apartment units out of service.
2. Gate valves shall be located so they will not be in the influence of sidewalks or in driveways.
 3. All valves except those at hydrants shall be installed in wells. Valves at fire hydrants shall be installed with a three-piece, adjustable cast iron valve box.
 4. Valves and wells shall be placed on all dead end mains for future extension, as well as a hydrant.
 5. Plans shall indicate finished grades of all gate well top of castings.
 6. Connection of new mains to existing mains shall be provided with a tapping sleeve valve and well unless otherwise directed by the Township. Like-sized taps using a tapping sleeve are discouraged and only accepted with Township approval.

I. Automatic Fire Sprinkler Service Connections:

1. In no case should hydrants be placed downstream of any check valve used for automatic sprinkler protection.
2. Sprinkler systems are not a substitute for standard requirements for hydrants.
3. Special Requirements for Automatic Sprinkler Fire Protection Systems:
 - a. All sprinkler systems require a minimum of double-check valves. If the system is treated with anti-freeze or other additives, then a reduced pressure principal backflow prevention device is required.
 - b. Sprinkler systems directly connected to public water supply mains and also having supplemental supplies of non-potable water must comply with Superior Township cross-connection control program.

J. Hydrants:

1. The Fire Department must approve all hydrant locations.
2. No one shall obstruct or prevent free access to, or place or store temporarily or otherwise any object, material, snow, debris, automobile, or structure of any kind within a distance of 20 feet of any hydrant.
3. In all cases, hydrants shall be located in accessible locations and maintained as highly visible.
4. A minimum of two fire hydrants are required for a development with a proposed cul-de-sac or dead-end (one at the intersection and one at the end of the cul-de-sac/dead-end).
5. The plans shall indicate the finished grade of all hydrants.
6. Fire hydrants to be located at each intersection; fire hydrants shall be spaced a maximum distance of 400 feet apart.
7. Placing of Hydrants in Right-of-Way:

Generally, hydrants shall be located within the public right-of-way, at least 8 feet from any driveway location. Pumper connections must face the road, unless otherwise directed by the Township.

8. Coverage:

Generally, fire hydrants shall be spaced such that they will be not more than 250 feet from the farthest corner of any proposed building. This distance shall be measured along the shortest feasible exterior route for laying fire hose.

9. Placing of Hydrants Near Buildings:

Hydrants shall be located no closer than 50 feet from the exterior wall of the building unless a closer location is explicitly allowed by the Fire Department.

10. Hydrant Leads:

All hydrant leads shall be not less than 6 inch, and 6 inch leads shall be not more than 40 feet in length. All hydrants must be 3 to 10 feet from curb unless otherwise directed by the Township.

11. Internal Sprinkling Systems:

A fire hydrant must be located within 50 feet of the proposed building where sprinklers can be serviced by a Stortz connection.

K. Joint Restraint:

“Mega Lugs” or “Field Lock Gaskets” shall be used for joint restraint. Concrete thrust blocks may only be used with the specific written permission of the Township Utility Department.

L. Water Services and Meters:

The Superior Township or its authorized representative shall install all water services to the property line per the Township ordinance. House meters shall be purchased from and installed by Superior Township or its authorized representative. A Water Meter Sizing Worksheet is provided in the Appendix Section.

M. Backflow Prevention:

Backflow prevention shall be in compliance with the Township cross connection control program and the Michigan Department of Environmental Quality requirements.

N. Wells:

If water main is not available, a copy of a valid well permit from the Washtenaw County Health Department must be submitted prior to final approval. The M.D.E.Q. Water Well Construction Code, Part 127, is provided in the Appendix Section.

O. Materials:

1. Mains - Ductile Iron:

- a. Ductile iron pipe shall be manufactured in accordance with AWWA C-151, latest revision. Pipe shall be standard wall thickness Class 54 for pipe diameters of 6 inch thru 16 inch.
- b. Pipe shall be standard cement lined and seal coated with approved bituminous seal coat in accordance with the latest revisions of AWWA C-104.
- c. Pipe material and details for water main greater than 16 inches in diameter will be subject to the approval of the Township Engineer.

2. Joints:

- a. Rubber gasket joints for ductile iron pipe shall be push-on type conforming to AWWA C-111, latest revision. Mechanical or flanged joints are accepted for special applications (for instance at bend instead of thrust blocks). Sealing gaskets, retainer glands and lubricants for joints shall meet pipe manufacturer's specifications.
- b. For connection to materials not specified herein, shop drawings of such pipe and fittings shall be submitted to the Township Engineer by the Contractor for approval.

3. Fire Hydrants:

- a. Fire hydrants shall be Mueller A-425 Super Centurion 250, or East Jordan Iron Works Model 5BR250 breakable flange, opening counter-clockwise with 5.25 inches valve opening and 6-inch diameter inlet, or approved equal. Drain holes in hydrant shall be plugged and watertight. Hydrants shall be designed for 5.5 feet of cover (6 feet bury) and meet current AWWA standards.
- b. Fire hydrants shall have two 4.5 inch pumper connections facing the centerline of the road. Pumper connections shall have:
 - 1) National Standard Threads on One Pumper Connection.
 - 2) 4.5 inch inside diameter.
 - 3) 4 threads per inch
 - 4) 5.389 minor diameter.
 - 5) 5.761 major diameter.
 - 6) 5.586 pitch diameter.
 - 7) 1 1/8" operator nut
 - 8) Stortz Fitting on other Pumper Connection (RLS Manufacturing) or approved equal.
- c. All hydrants shall be constructed with a companion valve in a three-piece, adjustable cast iron valve box.

4. Gate Valves and Wells:

- a. Gate valves for sizes 6 inches through 16 inches in diameter will be iron body, fully bronze mounted, resilient wedge with non-rising stems opening counterclockwise with a 2 inch square operating nut. Valves shall conform to AWWA C-509 (all ductile iron only) or C-515, latest revision, all with stainless steel bolts. The valves will be ordered with inlet and outlet connections compatible to the water pipe joint used on the system Mueller, East Jordan or approved equal.
- b. All gate wells shall be constructed of pre-cast reinforced concrete sections in accordance with Township standard details.
- c. Valves in gate wells shall be at least 6 inches above the floor or gate well supported with either brick or formed concrete.
- d. Gate well and frame shall be East Jordan Iron Works #1040 with type "C" cover or approved equal. Covers shall be set with the Superior Township logo and the words "SUPERIOR TOWNSHIP-WATER" in raised letters spaced in from the periphery of the cover.

5. Water Services:

- a. The minimum water service size is 3/4-inch. Other allowable sizes are 1.5 inches, 2 inches, 4 inches and 6 inches.
- b. Water services lines 1 inch through 2 inches in diameter shall be domestic Type "K" copper. All services larger than 2 inches shall be Class 54 ductile iron pipe.

- c. The Superior Township Utility Department must inspect all water service connections. Contact the Utility Department at 734-480-5500 at least 48 hours before work is to be started.

6. Meters:

All water service users shall have approved meters supplied by the Township. Residential meters must be installed by Township personnel. Meters 2 inches or larger must be installed by a licensed plumber and inspected by Township personnel. Meters $\frac{3}{4}$ -inch thru 2-inch shall be Census Sealed Register with Remote Readers. Meters larger than 2 inches shall be a brand and type approved by the Township. Meter pit installations require engineering drawings, signed and sealed by a Design Engineer licensed in the State of Michigan and will be reviewed by the Township.

7. Fittings:

Ductile iron fittings shall conform to AWWA C-110 or AWWA C-153, latest revision. All fittings shall be ductile iron only and made in the United States.

8. Brass Corps, Curb Stops & Boxes, Rods, etc.:

Solid brass ball valves are required for all corporation stops and curb stops. Manufacturer of all brass items shall be either Mueller, Ford or approved equal. Stop boxes shall be Mueller, Ford or approved equal and shall be arch pattern, adjustable, 1" uppers with rods and 2-hole lids meeting Township key requirements.

V. Sanitary Sewer

A. General:

1. When construction of sanitary sewer is proposed, the Charter Township of Superior Standard Sanitary Sewer Detail Sheets must accompany the plans.
2. A quantity list itemizing all proposed sanitary sewer must appear on the first sheet of the plans.
3. The basis of design shall be provided on the cover sheet of the plans.
4. Sanitary sewer shall be located between the road and the right-of-way line (opposite of the water main), wherever possible. Variations must be approved.
5. Soil borings must be taken and analyzed by a professional engineering firm qualified to do such work at the locations of all proposed roads. The Township may request copies of the report. It is recommended that a soils investigation be done and a report prepared for all areas where pavement is proposed.
6. Pipe size, length, type and all easements must be shown on plan view.
7. A 10 feet horizontal separation is required between sanitary and water main or storm sewer.
8. 18-inch minimum clearance between storm or water main. Top-of-pipe and bottom-of-pipe elevations must be provided.
9. All sanitary structures shall be dimensioned from property corners or another coordinate system.
10. A minimum 10 feet separation must be maintained between the sanitary sewer and any permanent structures, such as a building. Excessive depth may require additional separation.
11. Public sanitary sewers may be required when two or more new connections are made to, or are possible on, the same sewer. In most instances, including multiple unit developments, the sewer may have to be public even though the project has one Owner. Township approval will be required for private lines serving more than one building.

12. Sewer design flow computations shall be submitted to the Township Engineer for approval with a map of the area to be serviced. Developmental phases, present and future, with acreages and off-site areas contributing, shall be shown with the number of lots included. A permit application for a sanitary sewer construction permit as required by Part 41 of Act 451, Public Acts of 1994 (formerly Act 98) must be completed by the Design Engineer and submitted for review and approval by the Township Engineer. All design calculations and diagrams of service area shall be provided on the plan set.
13. Sewer capacities shall be based upon the Recommended Standards for Wastewater Facilities (Ten States Standards, latest edition). The peak sanitary flows shall be designed using 100 gallons per capita per day, multiplied by the appropriate peaking factor.
14. For residential developments of single homes, design population factor shall be at least 3.5 persons per prospective dwelling unit. In developments for housing of other types, and institutions, commercial, and industrial developments, refer to the Sanitary Sewer Unit Assignment Table provided in the Appendix Section.
15. Minimum design velocity for sanitary sewers shall be 2 feet per second with pipe flowing full. The 0.8 depth flow line of sewers shall be matched at manholes when changing sizes of sewers.
16. Compare flows with existing downstream sewer capacity to assure available capacity present for proposed development.
17. Maximum design velocity for sanitary sewers shall be 10 feet per second with pipe flowing full.
18. A 0.10 drop through manholes shall be required at all proposed structures.
19. A 2-foot sump and temporary bulkhead shall be placed in the first manhole upstream of the connection to the existing sewer. A note to this effect shall be added to the profile. The sump shall be filled and bulkhead removed after successful testing.
20. The provisions of Act 230 of the Public Acts of 1972, as amended, requires that the materials and methods indicating in the currently adopted Michigan Plumbing and Michigan Residential codes shall apply without local modification. The plumbing codes provisions apply to building sewers, storms and water services up to their connection with the public system.
21. New or existing sites may be required to connect into existing public sanitary based on Township review and State of Michigan requirements.

22. Hydrogen sulfide protection shall be provided where applicable. The extent of the protection will be determined by the Superior Township Utility Department on a case-by-case basis.
23. It is strongly discouraged to have sanitary sewer located between homes, in the side yards. If it cannot be avoided a minimum 60 foot easement shall be provided. A larger easement may be required, dependent on size and depth of sewer.
24. A culvert shall be placed in the ditch line of all open-graded ditches impeding access to a manhole.
25. In certain situations, the Township may require special service linings in sanitary sewer applications of ductile iron pipe, such as Protecto 401.

B. Sizes and Distribution:

1. The extension of the sanitary sewer shall generally be required across the entire frontage of the site.
2. Minimum size for public sanitary sewer shall be 8 inches in diameter.
3. Sanitary sewers shall be located so they provide unrestricted access for maintenance and inspection.

C. Depth of Sewers:

1. Minimum depth of cover to top of pipe shall be 4 feet.
2. The minimum depth of invert below finish grade of the building to be served shall be 10 feet, unless otherwise approved. Deep setbacks or unusual conditions may require additional depth.
3. The maximum depth to invert of any sanitary sewer shall not exceed the depth recommended by the manufacturer for each size and class of pipe.
4. Sanitary sewer's that reach a depth greater than 20-feet shall be Ductile Iron CI-54.

D. Easements:

All public sewers must be located in a public right-of-way or a dedicated sanitary easement. The easement size will vary individually as required for maintenance and access based upon the sewer depth. The minimum sanitary sewer easement shall be 20 feet. The easement shall be recorded prior to Township acceptance of the system for continuous maintenance and service.

E. Profile:

The following information shall be indicated on the sanitary sewer profile for all proposed improvements (except house leads):

1. Length of run between manholes.
2. Type and class of pipe between manholes.
3. Size and slope of pipe between manholes.
4. Top of casting and all invert elevations of all manholes.
5. Existing and proposed ground elevation along the route of the sewer.
6. A progressive numbering system.
7. All utility crossings. (18 inch minimum clearance).
8. Special backfill areas (shown graphically as wells as in notes).
9. Provisions for infiltration testing.
10. Adjacent existing or proposed utilities plotted where parallel and may conflict with sewer leads.
11. All existing sewer inverts must be field measured and so noted on the plans.

F. Construction:

No building permits will be issued above the foundation for any development prior to the issuance of substantial completion. No occupancy will be allowed without the required sewer in active service.

G. Testing:

Testing shall conform to the notes provided in the Township standard sanitary sewer detail sheets. Infiltration rates for all sanitary sewers shall not exceed 200 gallons per inch diameter per mile of pipe per 24 hours. Infiltration and air tests shall comply with the current testing standards and requirements of the Township. Where ground water is greater than 7 feet over the top of the pipe, an infiltration test may be used instead of air testing. Air testing should not be used if the groundwater level is 2 feet or more above the top of the pipe at the upstream end (reference ASTM F1417) or if the air pressure required for testing is greater than a psi-gage. In addition, all sanitary sewer pipe should be checked for alignment.

Testing standards for sanitary force main shall be in accordance with the specifications and requirements of the Township Engineer and pipe manufacturer's recommendations. Force mains shall be pressure tested for water tightness to a test pressure equal to twice

the total system head but no less than 50 psi held for a minimum 1-hour period. Amount of leakage shall be limited to not more than 25 gallons per inch diameter per mile of pipe per 24 hours at required test pressure.

The videotaping of the complete sanitary system shall be completed by the Contractor and considered incidental to sanitary sewer construction. The videotaping shall be done no sooner than 30 days after completion of backfill and shall be televised by competent and experienced sewer television technicians as described below. The Contractor shall provide a 48-hour notice to the Owner prior to televising so that a representative may be present. A satisfactory review of the videotape by the Township Engineer and Owner shall be a condition of sewer acceptance.

The technician shall have the capability to adjust the brilliance of the built-in lighting system and must be able to change the focus of the television camera to insure a clear picture.

The view seen by the television camera shall be transmitted to a monitor of not less than 14 inches. The monitor shall be located inside a mobile TV studio that is large enough to accommodate up to six (6) people for the purpose of viewing the monitor while the inspection is in progress. The Owner's representative shall have access to view the television screen at all times.

The Contractor if required to improve the quality of the television inspection, shall furnish electricity for all operations, and a ventilating system.

Television equipment shall consist of a self-contained camera and a monitoring unit connected by a coaxial cable. The camera shall be small enough to insure passage through an 8-inch diameter sewer, shall be waterproof, and shall have a self-contained lighting system capable of producing at least 100 foot-candles of light. Picture quality shall be such as to produce a continuous 600-line resolution picture showing the entire-inside periphery of the pipe.

The television inspection shall be performed on one section (between adjacent manholes) at a time. Each section being inspected shall be isolated from the remainder of the line by the use of a line plug to insure total viewing of the inside periphery of the pipe. The inspection shall be performed by pulling the television camera through the line, along the axis of the pipe by use of a wire cable. The inspection shall be performed in forward and/or backward direction, according to line conditions at the time the inspection is made.

During the television inspection an operation inspection record shall be kept which will show clearly the exact location, in relation to the center of the adjacent manhole, of each point of infiltration or pipe defect discovered by the televising. To insure accurate measurement, the measurement shall be made from an object a fixed distance in front of the television camera that is positioned at the location for the leak or failure. The measurement reading shall be made at ground level by means of a meter device. Marking on a cable or the like which would require the inspector to be in the manhole or which would require interpolation for the depth of the manhole will not be used.

All television inspection shall be recorded on a videotape that shall be turned over to the Owner. The recording must be made on a continuous running tape on which sound and

video information can be recorded. The speed and electronics of the videotape shall be equal to that which can be played back on a standardized recorder of the electronics industry. The recording shall be made on VHS format tape. The inspection shall be carried out under the direct supervision of the Engineer's representative with all television inspection being observed by the Engineer.

A written record or log shall be kept of the exact location of all service connections, root growth, crushed or broken pipe, cracked pipe, irregular pipe alignment or grade, and points of infiltration including reference to quadrant of pipe in which leakage occurs. The points where the camera goes into the water and out of the water must be recorded for each section televised. Sections of sewer that have dips causing the camera to be submerged for periods of time shall be dewatered and re-televised to determine the condition of the sewer line in areas of submergence. Two written logs shall be submitted to the Owner bound in notebooks for permanent records. Payment for television inspections shall be considered incidental to sewer construction and no additional payment will be allowed therefore.

Joints or manholes that are found to be leaking at time of television inspection may be repaired at time of television inspection by "grouting". Such grouting repairs shall be made in accordance with good practices for this type of sewer repair work and by methods acceptable to the Township Engineer. Cost of all grouting and sealing or other repairs shall be borne by the Contractor.

Deflection Gauge (Mandrel): Mandrel testing shall take place to ensure the flexible pipe has been properly bedded and back-filled. The deflection test must be conducted no less than 30 days after installation of the final backfill. The maximum allowable deflection is 5 percent. Installation shall conform to ASTM 2321-89. A nine-arm (point) mandrel shall be used. Cherne Fixed Steel Deflection or approved equal.

H. Storm/Ground Water Discharge:

Downspouts, weep tile, footing drains, or any conduit that carries storm or ground water shall not be allowed to discharge into the sanitary sewer system.

I. Grade:

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

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

J. Manholes:

1. Minimum manhole size is 4 foot in diameter.
2. All upstream dead-end sewers shall have a minimum last run grade, or minimum of 300 feet, of 1.0 percent.
3. Manholes shall generally be placed at intervals of 300 feet, at every change of grade, direction, and pipe size and at each junction of sewers.
4. Manholes must be placed in locations accessible by sewer cleaning equipment.
5. Sanitary manholes shall not be located in the influence of sidewalks or drive approaches.
6. Whenever there is a change in pipe size, the grade shall match at a line 0.8 of the diameters above the inverts.
7. An allowance 0.10 feet in grade shall be made for loss of head through all manholes.
8. External drop connections are required where the invert of the outlet pipe is 18 inches or more below the inlet pipe invert. Internal drop connections will generally not be accepted.
9. Flexible watertight joints are required for pipe connections to all manholes
10. A manhole bench shall be provided on each side of the flow channel, per township details.
11. The flow channel straight through a manhole should be made to conform as closely as possible in shape, and slope to that of the connecting sewers. The channel walls should be formed or shaped to the full height of the crown of the outlet sewer in such a manner to not obstruct maintenance, inspection or flow in the sewers.
12. A bench shall be provided on each side of any manhole channel when the pipe diameter (s) are less than the manhole diameter. The bench should be sloped no less than ½ inch per foot (4 percent). No lateral sewer, service connection, or drop manhole pipe shall discharge onto the surface of the bench.
13. Every manhole shall be wrapped with Infi-shield rubber, Elastomeric seal, or approved equal at every joint on the structure, up to and including the casting/adjusting section joint.

K. Leads:

1. Service leads shall be 6 inches in diameter with a minimum slope of 1 percent to the right-of-way line.
2. Invert elevations at the building or the finished floor grade of the building shall be provided on the plan.
3. Private sanitary sewer leads of excessive length may require inspection and testing. Each site will be considered individually by the Township.
4. Sanitary lead connections shall be made on the public sanitary line and not at a manhole, unless otherwise approved.
5. Clean-outs will be required for lead lengths in excess of 100 feet.
6. Sanitary service leads shall be located 10 feet away from the water service lead.

L. Septic Tank:

If sanitary sewer is not available, a copy of a valid septic tank permit from the Washtenaw County Health Department must be submitted prior to final approval. Septic design guidelines are provided in Appendix Section.

M. Inverted Siphons:

In general, sanitary sewer siphons shall be avoided and will only be accepted where no other feasible alternative exists and where there will be sufficient flow in the sewer so that maintenance will be held to a minimum. The minimum pipe size for inverted siphons shall be 6 inches in diameter. There will be a minimum of 2 pipes for each inverted siphon and a minimum velocity of 3 feet per second for design average flows.

Siphons shall be provided with necessary appurtenances for maintenance, convenient flushing, and cleaning equipment. The inlet and outlet structures shall have adequate clearances for cleaning equipment, inspection, and flushing. The inlet and outlet details shall be so arranged that the design average flow is diverted to one pipe, and so that either pipe may be cut out of service for cleaning. The vertical alignment should permit cleaning and maintenance.

N. Lift Stations:

1. Shall be designed in accordance with "10-State Standards Recommended Standards for Wastewater Facilities."
2. In general, the use of pump stations shall be avoided and will only be accepted where no other feasible alternative exists.

3. There will be a minimum of 2 pumps in a pumping station and minimum size of discharge lines shall provide adequate cleaning velocities and shall conform to Michigan Department of Environmental Quality requirements.
4. Where only two units are provided, they shall be of the same size. Units shall have capacity such that, with any unit out of service, the remaining units will have capacity to handle the design peak hourly flow.
5. All pumping station plans will be considered separately.
6. Pipe for force mains shall be designed to withstand both internal pressures and external trench and live loads. Design computations shall be submitted by the Design Engineer for review and approval.
7. Pumps handling raw wastewater shall be capable of passing spheres of at least three (3) inches (76 mm) in diameter. Pump suction and discharge openings shall be at least four (4) inches (102 mm) in diameter.
8. Each pump shall have an individual intake. Wet well and intake design should be such as to avoid turbulence near the intake and to prevent vortex formation.
9. Provisions shall be included for above-ground bypass pumping.
10. Use submersible pumps in pump stations, installed on a non-sparking stainless steel guide rail system for easy retrieval during maintenance and repair. Lifting chains shall be stainless steel.
11. All nuts, bolts, screws, etc. shall be stainless steel.
12. Suitable shutoff and check valves shall be placed on the discharge line of each pump. The check valve shall be located between the shutoff valve and the pump. Check valves shall be suitable for the material being handled and shall be placed on the horizontal portion of discharge piping except for ball checks, which may be placed in the vertical run. Valves shall be capable of withstanding normal pressure and water hammer.
13. Design wet well volume for a minimum of 10 minutes between pump starts at the average daily flow rate. Size wet well storage so that sewage is pumped out at least once every four (4) hours at the average daily flow rate.
14. Pipe materials shall be ductile iron. Ductile iron Class 54 pipe shall be cement lined. Joints and fittings shall be equal to the requirements for pressure pipe used in the domestic water distribution system.
15. Directional bores shall not be used without the written permission of the Superior Township Utility Department.

16. Hydrogen sulfide protection shall be provided on proposed wet wells as well as the first down stream discharge manhole. The extent of the protection will be determined by the Superior Township Utility Department on a case-by-case basis.
17. Wastewater pumping station structures and electrical and mechanical equipment shall be protected from physical damage by the 100-year flood. Wastewater pumping stations should remain fully operational and accessible during the 25-year flood. Regulations of state and federal agencies regarding flood plain obstructions shall be considered.
18. The pumping station shall be readily accessible by maintenance vehicles during all weather conditions. The facility should be located off the traffic way of streets and alleys. It is recommended that security fencing and access hatches with locks be provided.
19. Where high groundwater conditions are anticipated, buoyancy of the wastewater pumping station structures shall be considered and, if necessary, adequate provisions shall be made for protection.
20. Electrical systems and components shall be designed per section 42.35 of "Ten States, Recommended Standards for Wastewater Facilities."
21. Provisions must be included for a permanent auxiliary power source and a telemetered alarm system compatible with the Township's system. (See Appendix)
22. Pump control panels shall include the following items:
 - UL listing;
 - Type 304 stainless steel cabinet, NEMA 4X enclosure with dead front;
 - Fully hinged inner door;
 - HOA switch for manual and automatic operation;
 - Disconnect fuse;
 - Circuit breaker;
 - Motor contactors;
 - Properly sized heaters;
 - Automatic pump alternator switch;
 - Power company access and meter mounting location;
 - Elapsed time meter, one per pump;
 - Counter, one per pump;
 - Programmable timer;
 - Intrinsically safe relays, one per float switch;
 - Low water/redundant off alarm;

- Visual high water alarm shall be on a circuit independent of the pump. The visual alarm shall require internal shutoff.
- Battery back-up for alarm system;
- Four function emergency autodialer;
- Emergency generator connection meeting specifications of the Township Utility Department and Township Engineer;
- Load rated transfer switch;
- Low voltage burnout protection for all motors and starters;
- Motor Saver by SymCom, Inc.;
- Convenience outlet meeting specifications of the Township Utility Department and Township Engineer;
- Latch, padlock and two keys.

23. Lift Station Installation:

Excavate and place pre-cast concrete structure on sand subbase. Pour concrete around base of structure to counteract buoyant forces, if necessary. Backfill with sand compacted to a minimum of 95% of maximum unit weight.

- Make watertight connections for building sewer lead, pump discharge, electric power and controls.
- Mount guide rails plumb and straight with half-inch (1/2") stainless steel expansion bolts.
- Provide concrete grout fillets at the base of wetwells, sloped at 1:1.
- Install pumps on guide rails. Demonstrate free sliding action and proper seating of pumps against base flanges.
- Install float switches and make electrical connections.
- Adjust float switches and demonstrate proper operation of the pumps with clean water.
- Place topsoil, seed and mulch so that cover of pump station is flush with surrounding grades. Slope grade away from hatch.

24. Wastewater pumping stations and portable equipment shall be supplied with a complete set of operational instructions, including emergency procedures, maintenance schedules, tools, and such spare parts as may be necessary. The Township will determine the required detail of these items.

25. Copies of all equipment warranties, O&M Manuals, shop drawings and test reports shall be provided to the Township.

26. No construction or installation may take place between November 1 and April 15 without written consent of the Township.

O. Construction of Sewers:

1. Building Sewers included with Sewer Construction:

Unless otherwise approved due to exceptional circumstances, construction of the building sewer, from public sewer to property line for each fronting parcel which the sewer is designed to serve, shall be included with construction of each sanitary sewer. Building sewer shall extend a minimum of 10 feet beyond the property line.

2. Wyes, Tees and Risers:

Where cover over sanitary sewer to finished grade is more than 10 feet, risers shall be installed from wyes or tees to an elevation ten 10 feet below finished grade. Location of the wye or tee shall be marked from the downstream manhole on the record sewer plans prepared. Where the water table is high, the riser shall end at a depth of 1 foot above the water table.

When house leads are to be cut into an existing sanitary sewer, tap shall be made with the use of a saddle or other connections approve by the Township utility department.

3. Size and Material of Building Sewers:

Ordinary house connections shall be 6 inch diameter up to the property line and shall be constructed of ABS plastic solid wall pipe ASTM D-2751, latest revisions, or PVC SDR 23.5 solid wall. Larger building sewers may be constructed of materials permitted for sanitary sewers under the same conditions.

Joints in building sewers, including fittings, and stoppers for wyes and tees, risers and building sewer leads, shall conform to the requirements of these specifications.

4. Grade:

Minimum grade of building sewers shall be 1 percent for 6-inch sewers.

P. Force Mains:

1. At design pumping rates, a cleansing velocity of at least 2 feet per second should be maintained. The minimum force main diameter for raw wastewater shall not be less than 4 inches.
2. An air relief valve shall be placed at high points in the force main to prevent air locking. Vacuum relief valves may be necessary to relieve negative pressures on force mains. The force main configuration and head conditions should be evaluated as to the need for and placement of vacuum relief valves.

3. Force mains should enter the gravity sewer systems at a point not more than 2 feet above the flow line of the receiving manhole.
4. Pipe and joints shall be equal to water main strength materials suitable for design conditions. The force main, reaction blocking, and station piping shall be designed to withstand water hammer pressures and associated cyclic reversal of stresses that are expected with the cycling of wastewater lift stations. Surge protection chambers should be evaluated.
5. A culvert shall be placed in the ditch line of all open-graded ditches impeding access to a force main.
6. Force mains shall be ductile iron, conforming to the standards specified in the materials section below.
7. All ductile iron force main shall be polyethylene encased, as specified by ANSI/AWWA C105/A21.5.
8. In certain situations, the Township may require special service linings in sanitary sewer applications of ductile iron pipe, such as Protecto 401.

Q. Materials:

1. Sewer Pipe and Fittings:

Sanitary sewer pipe shall conform to the current ASTM standards for the following materials:

- a. ASTM D2680- Truss Cement rubber gaskets (8"-15") (ABS or PVC truss pipe).
- b. ASTM D3034 -SDR 26 (4"-15") pipe (heavy wall sewer)
- c. ASTM F1803-97- (closed profile) gravity pipe and fittings based on controlled inside diameter D2321 (8"-60" pipe) or ASTM F949 PVC (A-2000) corrugated sewer pipe with a smooth interior and fittings (4"-36") pipe (A-2000). (18"-102")

PVC pipe and fittings shall conform to requirements of latest applicable ASTM standard. Deflection of pipe shall be limited to a maximum of 5 percent.

2. Force Main Pipe and Fittings:

Force main pipe shall conform to the following standards:

- a. ANSI/AWWA C105/A21.5 Polyethylene encasement for ductile iron pipe systems
- b. ANSI/AWWA C110/A21.10 Ductile iron and gray iron fittings, 3-in. through 48-in. for water and other liquids
- c. ANSI/AWWA Rubber gasket joints for ductile iron pressure pipe fittings

- d. ANSI/AWWA Flanged ductile iron pipe with ductile iron or gray iron threaded flanges
- e. ANSI/AWWA Thickness design of ductile iron pipe
- f. ANSI/AWWA Ductiel iron pipe, centrifugally cast for water
- g. ANSI/AWWA Ductile iron compact fittings, 3-in. through 24 in. and 54-in. through 64 in. for water service
- h. ANSI/AWWA Installation of ductile iron water mains and their appurtenances

Pipe Joints:

Pipe joints shall conform to the following requirements depending on the allowable type of pipe used:

- a. Joints for plastic pipe shall be push-on type or in special applications, solvent-cemented. Push-on type joints shall conform to ASTM Specifications D-3212 and F-477 latest revision. Solvent-cemented joints, where specified, shall conform to ASTM Specification D-2855, latest revision.
- b. Joints on truss pipe shall consist of ABS plastic couplings chemically cemented to the ends of the pipe being connected. Solvents and methods used in making the chemical bond shall be in accordance with manufacturer's printed instructions, and the installation technique shall conform to ASTM Specification: D-2321, or latest revision thereof.
- c. The joints for ductile iron pipe shall be push-on type conforming to AWWA C111 (ANSI A21.11). Joints for fittings shall be mechanical joint conforming to AWWA C111 (ANSI A21.11).
- d. Push-on type joints shall have an annular recess in the pipe socket to accommodate a single rubber gasket. Plain ends shall be suitably beveled to permit easy entry into the bell. Plain ends shall have home marks to indicate when the spigot is fully seated in the bell. The gasket and annular recess of the socket shall be so designed and shaped that the gasket is located in place against displacement as the joint is assembled. Push-on joints shall be of a type that employs a single elongated groove gasket to effect the joint seal such as "Tyton" (US Pipe), "Fastite" (American Cast Iron Pipe Company), "Super Bell-Tite" (James B. Clow & Sons), or approved equal.
- e. Mechanical joints shall be bolted and of the stuffing box type and shall consist of a bell, with exterior flange and interior recess for the sealing gasket, a pipe plain end, a sealing gasket, a follower gland, tee-head bolts and hexagon nuts. All joints for fittings shall be restrained with "Mega-Lug" retainer glands or approved equal.
- f. The cleaning and assembly of pipe and fitting joints shall be in accordance with these specifications, the manufacturer's recommendations and AWWA standards.

3. Manholes:

Manholes shall be constructed of precast reinforced concrete sections in accordance with the Township's standard details.

- a. Precast reinforced concrete manhole sections shall conform to requirements of the American Society for Testing and Materials "Tentative Specifications for Precast Reinforced Concrete Manhole Risers and Tops" - ASTM Designation: C-478, latest revision.
- b. Precast manhole joints shall be MGT with rubber gaskets.
- c. Manhole steps shall be ASTM Specifications D 2146 reinforced polypropylene plastic or approved equal.
- d. Where manholes are located outside of pavements and sidewalks, final grade adjustments shall be made with pre-manufactured adjustment plastic rings; for manholes in paved areas, final grade adjustments may be made with pre-cast concrete rings, HDPE risers, or other similar structures, subject to the approval of the Township. Brick adjustments will not be accepted. Grade rings shall be a minimum of 3 inches thick and reinforced with 2 full circles of 3/16 inches diameter steel reinforcing wire. Manhole casting frame and concrete adjustments rings shall be secured to precast cone section with a minimum of 4, 5/8 inches diameter cadmium coated threaded studs or bolts. All joints in the assembly shall be sealed with Butyl rope or approved equal.
- e. Every manhole shall be wrapped with Infi-shield rubber, Elastomeric seal, or approved equal at every joint on the structure, up to and including the casting/adjusting section joint.
- f. Manhole covers and frame shall be East Jordan Iron Works #1040 with type "A" cover or approved equal. Covers shall be cast with the Superior Township logo and the words, "SUPERIOR TOWNSHIP-SANITARY" in raised letters spaced in from the periphery of the cover. Special approved wet area manholes with precast rubber gasket type pipe fittings and lockdown rubber gasket type manhole covers such as EJIW #1040 ZPT, or approved equal, shall be required in areas of high ground water table and where manholes are to be located in or adjacent to drainage ditches, low areas and flood plains.

VI. Storm Sewer and Detention/Retention Basin

A. General:

1. All construction must, as a minimum, conform to the Rules of the Washtenaw County Drain Commissioner-Procedures and Design Criteria for Storm Water Management Systems, latest revision. This applies to both public and private storm sewer systems. Certain other minimum design requirements are presented here.
2. When construction of storm sewer is proposed, the Charter Township of Superior Standard Storm Sewer Detail Sheets must accompany the plans.
3. If existing infrastructure is present, storm sewer shall be located to best conform to the layout of the existing facilities in new subdivisions.
4. Pipe size, length, type and all easements shown on plan view.
5. A 10 feet horizontal separation is required between storm sewer and water main.
6. 18 inch minimum clearance between water main and sanitary sewer. Top-of-pipe and bottom-of-pipe elevations shall be provided.
7. All storm structures shall be dimensioned from property corners or other coordinate system.
8. Minimum design velocity for storm sewers shall be 3 feet per second with the pipe flowing full.
9. Maximum design velocity for storm sewers shall be 10 feet per second with pipe flowing full.
10. In general, a drop of 0.10 feet shall be made for loss of head through a structure. If the storm sewer changes size through a structure, the 0.8 flow line of the sewers shall be matched.
11. The 100-year storm flood plain elevation contours shall be provided along with the indicated source of information. If no flood plain exists, a note as such shall be indicated on the plan. Any development within a flood plain will require an MDEQ permit.
12. Concrete headwalls may be required where storm sewers or culverts enter open ditches or county drains.
13. Trench drains shall not be permitted, unless written permission from Township utility.

14. Sufficient capacity shall be provided in the storm sewer system to handle upstream drainage areas. All upstream drainage must be accommodated onsite. Allowances for upstream area must be based on ultimate improvements and runoff.
15. Discharge must not be diverted onto abutting properties. The outlet must follow the existing natural drainage courses in the area.
16. A storm drainage area map shall be provided in the plan set overlaid on a proposed grading plan for the site. This sheet shall include the storm system, sub-areas contributing to each structure, along with the overall drainage district limits (including off-site flow). Areas and structures shall be labeled and correspond with the calculations.
17. Composite runoff coefficient may be determined for each individual drainage area and calculations for each drainage area must be submitted as part of the design computations. Composite coefficient design is based on the sum of the percentages of each drainage area covered by impervious and pervious areas multiplied by the respective coefficient per the W.C.D.C. standards.
18. Storm sewers will be designed using the Manning Equation for pipes flowing full. Runoff will be determined using the $Q=CIA$, Rational Method with a 10-year storm intensity formula of $I = 175/(t+25)$. The initial time of concentration, (t) shall be 15 minutes maximum.
19. Roughness coefficient for concrete pipe shall be $n=0.013$.
20. Storm sewer design computations must be submitted for review on a sewer design form/spreadsheet. These calculations shall be provided on the plan set.
21. The hydraulic gradient shall be shown on the storm sewer profile.
22. Typically, the hydraulic gradient shall be maintained within the pipe. However, the gradient must always be maintained a minimum 2 feet below the top of all structures.
23. The provisions of Act 230 of the Public Acts of 1972, as amended, requires that the materials and methods indicating in the currently adopted Michigan Plumbing and Michigan Residential codes shall apply without local modification. The plumbing codes provisions apply to building sewers, storms and water services up to their connection with the public system.
24. Soil borings shall be provided in detention areas.

B. Sizes:

Minimum size for storm sewers shall be 12 inches in diameter. However, a sump pump lead or roof drain which accepts no direct surface runoff may be 4 inches in diameter.

C. Depth of Sewers:

1. Minimum depth of cover to top of pipe shall be 3 feet. 2.5 feet of cover is acceptable for the most upstream catch basin.
2. Low-head structures are required if cover is less than 4 feet at a structure. Plan and profile shall specify low-head where necessary.
3. The maximum depth to invert of any storm sewer shall not exceed the depth recommended by the manufacturer for each size and class of pipe.

D. Easements:

1. All storm sewers must be located in a public right-of-way or an easement. The exception to this would be a site with a single lot, building, and owner. The easement size will vary individually as required for maintenance and access based upon sewer depth.
2. Public storm sewer easements shall be dedicated to the W.C.D.C. office.
3. Private storm sewer easements shall be dedicated to the organization or association responsible for maintenance of the storm sewer system.
4. Dedication of the easement will be required prior to the acceptance of the development.

E. Profile:

The following information shall be indicated on the storm sewer profile for all proposed improvements:

1. Length of run between manholes and catch basins.
2. Type and class of pipe between manholes and catch basins.
3. Size and slope of pipe between manholes and catch basins.
4. Top of casting and invert elevations of all manholes and catch basins.
5. Existing and proposed ground elevation along the route of the sewer.
6. Progressive numbering system.
7. All utility crossings (18 inch minimum clearance).

8. Special backfill areas (shown graphically as well as in notes).
9. Hydraulic grade line for the 10-year storm.
10. Adjacent existing or proposed utilities plotted where parallel.
11. All existing sewer inverts must be field measured and so noted on the plans.

F. Grade:

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

Size	Minimum Grade	Maximum Grade
12"	0.34%	4.80%
15"	0.26%	3.60%
18"	0.20%	2.60%
21"	0.16%	2.20%
24"	0.14%	1.80%
27"	0.12%	1.50%
30"	0.10%	1.30%
36"	0.08%	1.00%
42"	0.06%	0.80%
48"	0.05%	0.70%

G. Structures:

1. Structures (manholes and catch basins) shall generally be placed at intervals of 300 feet, at every change in grade, alignment, direction, pipe size, and at all junctions. A 0.10-foot drop should also be placed at all changes in horizontal alignment. Maximum distance between manholes shall be 325 feet for sewers 36 inches in diameter and smaller. Sewer larger than 36 inches in diameter will be considered individually.
2. Catch basins shall be placed at all low points in the gutter lines and not over 500 feet from a high point. Multiple catch basins may be required at a low point based upon the drainage area (catch basins at low points shall not receive drainage from an area larger than one acre for a paved surface). Catch basins shall be placed at rear lot lines as directed by the Township Engineer to provide proper site drainage.
3. All structures receiving storm run-off shall have 2 feet sumps. All structures excluding 2' inlets.
4. The minimum diameter for manholes and catch basins shall be 48".

5. 24" diameter inlets may be used in greenbelt areas.
6. Low-head structures are required if cover is less than 4 feet at a structure. Plan and profile shall specify low-head where necessary.
7. Sump pump discharge (footing drains, roof drains, etc.) must be directed into the storm sewer via an enclosed system. The minimum size for these applications is 4 inches and taps must occur at a structure.
8. All connections must be made at a structure. Blind taps are not allowed.
9. Storm structures shall not be located in sidewalks or drive approaches.

H. Detention/Retention:

1. All detention and retention pond design must, as a minimum, conform to the Rules of the Washtenaw County Drain Commissioner regarding "Procedures and Design Criteria for Storm Water Management Systems", latest revision. Sample design formulas and calculations are provided in that manual. Certain minimum design requirements are presented here.
2. Where no outlet exists for a site, a retention pond shall be designed to be capable of storing two consecutive 100-year storms.
3. Maximum side slopes of basins are 5 horizontal to 1 vertical. If slopes steepness exceeds 5 horizontal to 1 vertical, a fence is required. The minimum requirements for this fence are 6 feet high chain link with an 8 foot wide access gate.
4. The bottom of the basin must be sodded. Minimum grade on the bottom of the retention basin will be 1 percent when sodded. If paved swales in basins are allowed, the minimum will be 0.5 percent. All basins must be permanently stabilized with maintainable densely rooted turf.
5. When sizing detention basins, any volume of water provided below the invert of the gravity outlet will not be considered as storage volume.
6. Rip-rap must be provided around the inlet and outlet pipes.
7. Maintenance:
 - a. Subdivisions and Residential Sites: The Owner must provide for continued maintenance of detention basins, through acceptance of ownership and maintenance responsibility by the Washtenaw County Drain Commissioner or when allowed, an acceptable private system maintained by the developments homeowner's association will be accepted.

- b. Commercial, Industrial and Office Sites: The Owner shall maintain the detention basins in proper working order at all times.
- c. The Township will not accept the responsibility for the maintenance of any basin or other site drainage feature.

I. Storm Water Quality

A storm water treatment device may be required prior to final discharge from the site. New development will be reviewed on an individual basis. Acceptable devices include the "Hydro-Kleen Filtration System," and "Vortechics Treatment System." A detail of the system must be provided on the plan drawings.

J. Materials:

1. Storm sewer pipe will conform to the ASTM "Tentative Specifications for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe," ASTM C-76 for circular pipe, latest revision or C-507 for horizontal elliptical pipe, latest revision. If other materials are proposed for use, the Owner will furnish the load carrying design analysis for the pipe for the proposed depth conditions. Plastic storm sewer pipe may be allowed in green belt areas only depending on the depth of the pipe. Type of plastic pipe will be reviewed by the Township on a case-by-case basis.
2. Pipe joints will conform to one of the following requirements:
 - a. Modified Grooved Tongue (MGT) pipe will have a rubber gasket snapped into a groove cast into the tongue. The modified groove or bell end of the pipe will be made smooth and will have not over a 3.5 degree slope for sizes 10 to 24 inches, or a 2 degree slope for sizes 27 inches to 108 inches, tapered to fit the rubber gasket to tolerances as determined by the gasket manufacturer. MGT joints will be lubricated and coupled according to the pipe manufacturer's printed instructions.
 - b. Rubber gasket joints will follow the Tentative Specification for "Joints for Circular Concrete Sewer and Culvert Pipe, Using Flexible, Watertight, Rubber Type Gaskets," ASTM Designation: C-443, latest revision. Rubber gasket joints will be lubricated and coupled according to the pipe manufacturer's printed instructions.
 - c. Flexible, watertight, rubber gasket joints will be required for plastic storm sewer pipe. Rubber gasket joints will be lubricated and coupled according to the pipe manufacturer's printed instructions
3. Manholes:
 - a. Manholes will be constructed of concrete block or precast reinforced concrete sections according to the Township of Superior standard details.

- b. Precast reinforced concrete manhole sections will follow the requirements of the ASTM "Tentative Specifications for Precast Reinforced Concrete Manhole Risers and Tops," ASTM Designation C-478, latest revision. Wall thicknesses will depend on depth and will be subject to the approval of the Township Engineer.
- c. Final grade adjustments for structures shall be made with precast concrete rings. Brick adjustments shall not be accepted. Grade rings shall be a minimum of 3 inches thick and reinforced with 2 full circles of 3/16 inches diameter steel reinforcing wire. Manhole casting frame and concrete adjustments rings shall be secured to precast cone section with a minimum of 4, 5/8 inches diameter cadmium coated threaded studs or bolts. All joints in the assembly shall be sealed with rubber "O" ring gaskets.
- d. Precast manhole joints will be as described in Section J, Item 3 of this chapter.
- e. Manhole covers and frames shall be EJIW #1040 with Type "C" cover or approved equal.

4. Catch basins:

- a. Catch basins shall be precast reinforced concrete manhole sections, according to the Township of Superior standard details.
- b. Catch basin and inlet frame and covers will be EJIW, MDOT Type K cover, Type J cover, or approved equal when in pavement edge or gutter line, depending on the type of curb and gutter.
- c. If accepted by the Township, catch basin and inlet frame and covers can be EJIW No. 1010 Type M cover, or approved equal when in paved areas other than edge gutter line.
- d. Catch basin and inlet frame and covers will be EJIW M.D.O.T. beehive with Type G cover or equivalent when in yard areas.

VII. Paving

A. General:

1. All paving improvements for public or private roadways, including but not limited to cross-sections, horizontal alignment/vertical curves, drainage/ditch design, sidewalks, guardrail, signage, and restoration shall conform to the Washtenaw County Road Commission (W.C.R.C.)- Procedures and Guidelines for Developing Public Roads, latest revision with the exception of pavement width which should be 33 foot back to back. Some improvements may defer to the Michigan Department of Transportation (M.D.O.T.) Standard Specifications for Construction, latest revision. Certain minimum design requirements are presented here.
2. Any road improvements in the Washtenaw County right-of-way are subject to the review and approval of the Washtenaw County Road Commission. A permit must be secured from the Washtenaw County Road Commission for construction.
3. Any road improvements in M.D.O.T. right-of-way are subject to the review and approval of M.D.O.T. A permit must be secured from M.D.O.T. for construction.
4. Cross-sections of all proposed pavement improvements must be shown on the plans with thicknesses and materials clearly indicated.
5. Concrete curb and gutter will be required for all public and private roadways and parking lot construction in the urban/sewer service area of Superior Township. An appropriate detail shall be provided. Underground storm sewers will be installed with all paving, which requires concrete curb and gutter. The storm water runoff from all proposed site development will be collected and conveyed by means of storm sewers to approved points of discharge.
6. Edge drains will be required for all paving improvements according to W.C.R.C. guidelines.
7. Soil borings must be taken and analyzed by a professional engineering firm qualified to do such work at the locations of all proposed roads. The Township may request copies of the report. It is recommended that a soils investigation be done and a report prepared for all areas where pavement is proposed.
8. Sufficient proposed grades must be shown on the plan to clearly show the drainage patterns.
9. The Township Planner will verify parking lot dimensions, drive widths and other requirements stipulated in the Township ordinance.

10. Passing lanes, acceleration lanes/tapers and deceleration lanes/tapers will be required according to W.C.R.C. guidelines.
11. Minimum general paving slopes:
 - a. Asphalt: 1.0%
 - b. Concrete: 0.4%
12. Maximum general paving slopes:
 - a. Road/Approaches: 6.0%
 - b. Parking Lots and Sidewalks/Pathways: 4.0%
13. All driveways shall be constructed of Portland Cement Concrete. Internal roads within the Project will be public roads. All driveways shall be a minimum of six inches (6") thick and a maximum grade of eight percent (8%).

B. Typical Road Cross Sections:

The following minimum thickness requirements are based on adequate subgrade, subgrade drainage and average live loads. Each site must be examined individually and additional pavement thickness and/or base requirements may be necessary.

1. Residential, Commercial, Office, Industrial, Private Roadways and Sidewalks/Pathways:

Cross-sections and design guidelines shall follow the W.C.R.C.-Procedures and Guidelines for Developing Public Roads, latest revision.

2. Parking Lots:

Cross-section shall match the W.C.R.C.-Typical Rural, Local & Residential Bituminous Section or the W.C.R.C.-Typical Rural, Local & Residential Concrete Section. Concrete curb and gutter is required for all urban areas (based on sewer service).

3. Loading/unloading areas, if required by the Township, shall have 8" thick non-reinforced concrete over 4" of compacted Granular Material Class II.

C. Sidewalks/Pathways:

1. All sidewalks/pathways shall conform to the A.A.S.H.T.O. Guide for the Development of Bicycle Facilities, latest revision and the specifications of the A.D.A.
2. Sidewalks/pathways shall be required along the frontage of the proposed improvements. They will be in the right-of-way and 1 foot from the ultimate right-of-way line.

3. Cross-section shall meet W.C.R.C. guidelines.
4. Proposed grades must be shown along the property line, driveways, and intermittent locations along the length of the walk.
5. Any structures, hydrants, poles, etc., which exist along the alignment of the walk, must be adjusted or relocated at the expense and coordination of the Owner.

VIII. Grading

A. General:

1. Sufficient proposed grades indicated to ensure that:
 - a. Drainage is adequately discharged offsite with proper retention/detention.
 - b. No upstream drainage is restricted.
 - c. Paving slopes are adequate.
 - d. The site in general drains without standing water.
 - e. Sight lines are not obstructed.
 - f. Grades must be provided at least 100 feet off-site in all directions.
2. Elevations representing finished grade are required for:
 - a. Finished floor grade.
 - b. Hydrants.
 - c. Structure rims.
 - d. Centerline of ditch.
 - e. Retaining walls.
3. Proposed grading shall meet abutting property line elevations.
4. Differentials in grade must incorporate a 4 horizontal to 1 vertical maximum slope to the abutting property line.
5. Erosion control blankets may be required for slopes in excess of 4 horizontal to 1 vertical.
6. Easement from adjacent property owner will be required for any offsite grading. This document will need to be submitted prior to final engineering approval.
7. Any wall four (4) foot in height or more measured from the bottom of the footing to the top of wall, or less than four (4) feet in height and supporting a surcharge, shall be considered a retaining wall. The Design Engineer will be required to submit a retaining wall design form (see Appendix Section) to the Township Engineer along with a complete detail of the wall for a structural review.
8. Where retaining walls with differences in grade on either side of the wall in excess of 4 feet are located closer than 2 feet to a walk, path, parking lot or driveway on the high side, such retaining wall shall be provided with railings that are constructed in accordance with appropriate BOCA standards.
9. Any face of a retaining wall shall be a minimum of 2 feet from the nearest property line. Easement from abutting parcels may be necessary.

10. Grading plans shall take into account the natural features of the land as much as possible.
11. No filling will be allowed within the flood plain of a river, stream, creek, or lake unless under the terms of a permit granted by the MDEQ.
12. The Owner shall certify that the as-built site grading and building elevation and setbacks confirm to the Township approved site and engineering drawings at the completion of the improvements. This certification shall be prepared by, and bear the seal of, a professional land surveyor licensed in the State of Michigan. The certification shall be submitted as directed on forms provided by the Township (see Appendix Section for form). The following conditions shall be noted:
 - a. No certificate of occupancy will be granted until grading certificates are received and approved for each lot.
 - b. After a grading certificate is submitted, funds may be pulled from the inspection escrow to have the Township Engineer spot-check grades at the Township's discretion. The detention pond grades may be verified at this time as well.
 - c. The Building and Zoning Official has the right to waive all or some of these grading requirements.

B. Requirements for Subdivisions:

1. All single family lots shall be graded for rear to front drainage per the Standard Lot Grading-Detail A provided in the Appendix Section. The Standard Lot Grading-Detail B (front to rear drainage) will be allowed by only where, due to existing topography, rear to front drainage would be very difficult to achieve or not feasible. Large acreage lots will be reviewed on an individual basis.
2. A single-family lot shall be graded to drain away from the house/structure and foundation walls. The grade away from the foundation walls shall be 6-inches of fall within the first 10 feet. Where lot lines, retaining walls, slopes, or other physical barriers prohibit 6-inches of fall within 10 feet, drains or swales shall be constructed to ensure drainage away from the home or structure. Swales shall discharge to a catch basin or other approved drainage course.
3. Walk-out basements may be accepted with the permission of the Township.
4. Where front to rear drainage is permitted, the longitudinal slope along a rear yard drainage easement shall be not less than 1.0% or more than 3.0%. Maximum distance from a high point to a drain outlet shall not exceed 250 ft. or four lots, whichever is the less.
5. Where front to rear drainage is used, private easements for drainage shall be dedicated and recorded. For perimeter lots, easement width shall be 12 feet minimum (or as required), and for abutting lots with a common rear yard lot line, easement width shall be at least 6 feet on each lot (or as required).

6. All grade point elevations shall be shown for each lot per Detail A or B, illustrated in the Appendix Section.
7. The general direction of overland drainage in the rear yard shall be indicated on each lot with arrow.
8. High and low street grade points, slope direction (by arrow) and the location of all catch basins inlets and drainage ditches shall be shown on the grading plan.
9. A maximum slope of 4 feet horizontal to 1 foot vertical shall not be exceeded for all terracing. The toe of slope shall be located outside of the rear and/or side lot line drainage easements.
10. Complete site grading plans shall be drawn to a maximum scale of 1" = 100' (e.g. 1" = 200' will not be accepted).
11. Grading plans shall include details of typical lot grading and drainage patterns intended to be used.
12. The grading plans shall show the existing elevation topography by contour lines. Topography on abutting property within 100 feet of the site boundary shall be shown.
13. All elevations shall be to N.A.V.D. 88 datum (see Topography Section for specific details).
14. Drainage patterns, other than those shown in Details A and B, may be used and will be acceptable for review. A detail of the typical lot drainage pattern shall be shown on the grading plan with all grade control points identified.
15. In general, for streets with ditches and no curbs, elevation of the front lot line shall be at least 6 inches above the centerline of the road.
16. All non-conforming lots with drainage patterns other than those in Standard Details A or B shall be noted on the grading plan.
17. Catch basins shall be placed in rear yard swales at low points where front to rear grading is used.
18. Gravel filters or other acceptable temporary measures shall be provided at rear yard catch basins to prevent sedimentation of storm sewers. The Owner shall be responsible for maintaining temporary erosion control devices.
19. **Driveways.** All driveways shall be constructed of Portland Cement Concrete. Internal roads within the Project will be public roads. All driveways shall be a minimum of six inches (6") thick and a maximum grade of eight percent (8%).

20. **Plot Plans.** The developer or developer's representative shall certify that the as-built site grading and building elevations and setbacks conform to the Township approved site and engineering drawings. This certification shall be prepared by, and bear the seal of, a professional land surveyor licensed to practice in the State of Michigan. If the as-built site grading or finished floor elevation is more than two-tenths of an inch (0.2") higher or lower in elevation than the approved grading and engineering drawings, than an as-built grading plan shall be submitted for review and approval of the Township Engineer. The grading certification shall be submitted as directed on forms provided by the Township (see Appendix).

Lot numbers and addresses shall appear on the plot plans.

The Township shall have the right to spot-check certification grades at its own discretion. The final certificate of use and occupancy shall be withheld until the site grading/setback certification is received and approved by the Township. The Township shall have the right, at its own discretion, to waive some or all of the site grading and building setback certification requirements.

IX. Construction Specifications

A. Field Requirements:

1. The Township will provide inspection on all public utilities and improvements. Whenever possible, inspection will be full time on water mains, sanitary sewers, storm sewers, sidewalks, approaches, roadways and on-site paving. The Township, at its own discretion, may verify site grading and detention and check soil erosion control. Washtenaw County will provide inspection for public roads and work associated with county drains. Additional inspection by the Township Engineer will be required if determined necessary by the Township.
2. A minimum of 72 hours notice is required to ensure the presence of a Township Inspector when work commences.
3. Prior to starting any construction, the Owner must obtain all required permits and a preconstruction meeting must be held. The meetings shall be held at Township Hall unless otherwise noted.
4. All public improvements must be field staked under the supervision of the Design Engineer that prepared the plans. Staking must be in accordance with the approved plans.
5. All construction must conform to the current MIOSHA safety standards.
6. Soil erosion control measures may be spot checked throughout the construction phase of the project. These measures must be installed and maintained according to the approved plan.
7. At the time of final inspection for all public improvements, the Owner or his Contractor shall provide all necessary labor and equipment to allow the Township to inspect the system.
8. Generally, one inspector will be assigned to a particular project and will be responsible for that project until its completion. The Contractor and the inspector may make arrangements for day-to-day inspection. Any interruption or moratorium on the flow of work may result in a re-assignment of that inspector to another project and require the normal 72 hour notice before work is resumed.
9. At the completion of the project, a certification from the Design Engineer will be required indicating that all work has been completed in accordance with the approved plans.

B. General Requirements:

1. Payment of Fees:

All fees, bonds, escrows and connection costs (e.g. benefit charges, trunk line and transmission charges, tap fees and the inspection fee deposit (see below), etc.) must be paid prior to the scheduling of a pre-construction meeting.

2. Insurance:

Certificates in accordance with the General Requirements and Procedures section of this document shall be submitted to and approved by the Township prior to the scheduling a pre-construction meeting.

3. Inspection Fee Deposit:

The inspection fee deposit shall be based upon the contract amounts as follows:

Contract Amount	Percentage
0 to \$25,000	10%
\$25,000 to \$100,000	\$2,500 + 7% of amount over \$25,000
\$100,000 to \$250,000	\$7,750 + 5% of amount over \$100,000
Over \$250,000	\$14,500 + 4% of amount over \$250,000

4. Pre-construction Meeting:

A preconstruction meeting shall be held prior to the start of all construction in Superior Township. Prior to scheduling a pre-construction meeting the Proprietor shall deliver all necessary permits and fees to the Township, as stated above. Pre-construction meeting requests must be made at least 10 business days prior to the date of the proposed meeting. Additionally, the Owner should request the meeting time at least 10 days prior to start of work. The Proprietor, Project Managers, Contractors, Design Engineers, Township Officials, and the Township Engineer must be in attendance at the pre construction meeting.

5. Inspection:

All underground utilities, private roads, bike path, sidewalks, driveway approaches, detention/retention, soil erosion control, and any other work designated at the preconstruction meeting must be inspected by the Township Engineer. Grading may be spot checked by the Township Engineer at the Township's request. 72 hour notice is required (not including weekends or holidays) to schedule inspection prior to construction. This applies for construction start and anytime work is suspended for two days or more, contact the Township Engineer (see Contact Information in the Appendix).

Any work installed without inspection will not be accepted by the Township and will not be allowed to connect to the system.

6. Density Testing:

All density testing shall be provided by the Owner through their Design Engineer or an independent testing company to verify the compaction requirements as required by the approved plans and specifications. This report shall be signed and sealed by a registered State of Michigan Design Engineer and submitted to the Township Engineer.

7. The Contractor must comply with current OSHA, MIOSHA and confined space regulations.

8. Shop Drawings:

Shop drawings will need to be reviewed and approved by the Petitioner's Engineer prior to construction. Shop drawings shall be furnished to the Township Engineer for all special fabricated structural and mechanical parts of the system as determined by the Township Engineer. Operation manuals shall be furnished for all water booster pump stations, sanitary lift stations, and similar installations.

9. Final Inspections and Acceptance:

Substantial Completion: Prior to substantial completion for use, all necessary tests of the system must be completed, and preliminary punchlist items addressed. Any portions of the work found to be unacceptable shall be repaired or replaced prior to acceptance. For home construction, this will allow 50% of the utility permits to be issued.

Final Completion: Final Completion is required for the remaining 50% of permits. Post punchlist items need to be addressed, as-builts shall be submitted and approved, all easements have been submitted and approved. Any portions of the work found to be unacceptable shall be repaired or replaced prior to acceptance.

Final Acceptance: Prior to final acceptance for use and maintenance by the Township, final inspections and all necessary tests of the system must be completed. Any portions of the work found to be unacceptable shall be repaired or replaced prior to acceptance.

Prior to final acceptance, the Proprietor shall post a two-year maintenance and guarantee bond in the amount equal to the cost of the improvements with the Township. At this time the five percent (5%) Utility Repair bond can be returned.

Final acceptance will not be made until all improvements on the site have been completed and all of the development agreement items have been fulfilled.

X. Appendices

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Note: Documents in these Appendices are for reference and may not represent Official Board Action

APPENDIX I

Superior Township Review Fee Documents

**SUPERIOR CHARTER TOWNSHIP
WASHTENAW COUNTY, MICHIGAN**

**A Resolution to Amend Fees Pertaining to the
Superior Charter Township Zoning Ordinance
September 6, 2005**

At a regular meeting of the Township Board of Trustees of Superior Charter Township, Washtenaw County, Michigan, held at the Township Hall of said Township on the sixth day of September, 2005, at 7:30 p.m. Eastern Standard Time, the following resolution was offered by

McKinney and supported by Caviston:

WHEREAS, this Board is authorized by Zoning Ordinance of the Charter Township of Superior to set fees by resolution for various matters arising in the course of administration of the Subdivision Ordinance; and

WHEREAS, this Board has reviewed the fees previously in effect and has found that they are in need of revision;

LET IT THEREFORE BE RESOLVED, that the Charter Township of Superior, Washtenaw County, Michigan, does hereby amend the fee schedule adopted on March 2, 1998, for rezoning petitions, site plan review, special district review and other fees as set forth below; and

BE IT FURTHER RESOLVED, that all of the following fees are refundable if they are not used.

1. REZONING PETITIONS (OTHER THAN SPECIAL DISTRICTS)

The following fees shall be paid by the petitioner to the Superior Charter Township Treasurer at the time of submittal of the application to rezone:

Application fees:	\$ 900.00
Review fees:	\$ 1,000.00
Total:	<hr/> \$ 1,900.00

Review fees include engineering, planning and legal reviews. If the review costs exceed the amount of the fee paid, additional hours shall be billed at the actual costs plus fifteen percent (15%) for administration. Billing rates are available upon request. If a second public hearing must be scheduled due to the petitioner's failure to post required signage or provide information as required, an additional fee of \$300.00 to offset the Township's additional costs of public notices and affidavits of notice shall be paid by the petitioner prior to the Township scheduling the public hearing.

2. APPLICATION FOR CONDITIONAL USE PERMIT

The following fees shall be paid by the applicant to the Superior Charter Township Treasurer at the time of submittal of the application for a Conditional Use Permit.

Application fees:	\$ 500.00
Review fees:	\$ 300.00
Total:	<u>\$ 800.00</u>

Administrative fee includes one Planning Commission meeting in addition to the meeting at which the public hearing is held. For placement on each additional agenda, an additional fee of \$150.00 shall be payable in advance.

Review fees include engineering, planning and legal reviews. If the review costs exceed the amount of the fee paid, additional hours shall be billed at the actual costs plus fifteen percent (15%) for administration. Billing rates are available upon request.

3. SITE PLAN REVIEW (OTHER THAN SPECIAL DISTRICTS)

The following fees shall be paid by the applicant to the Superior Charter Township Treasurer at the time of submittal for each review:

A. PRELIMINARY SITE PLAN REVIEW

Application fees:	\$ 900.00
Review fees:	\$ 1,200.00 + \$75 per acre
Total:	<u>\$ 2,100.00 + \$75 per acre</u>

Review fees include engineering, planning and legal reviews. If the review costs exceed the amount of the fee paid, additional hours shall be billed at the actual costs plus fifteen percent (15%) for administration. Billing rates are available upon request.

B. FINAL SITE PLAN REVIEW

Application fees:	\$ 900.00
Review fees:	\$1,200.00
Total:	<u>\$ 2,100.00</u>

Review fees include engineering, planning and legal reviews. If the review costs exceed the amount of the fee paid, additional hours shall be billed at the actual costs plus fifteen percent (15%) for administration. Billing rates are available upon request.

C. REVISED SITE PLAN REVIEW (EACH REVISION)

Application fees:	\$ 300.00
Review fees:	\$1,100.00
Total:	<u>\$1,400.00</u>

Review fees include engineering, planning and legal reviews. If the review costs exceed the amount of the fee paid, additional hours shall be billed at the actual costs plus fifteen percent (15%) for administration. Billing rates are available upon request.

4. PETITION FOR SPECIAL DISTRICT REVIEW

The following fees shall be paid by the petitioner to the Superior Charter Township Treasurer at the time of submittal of the application For a Special District and at the time of each subsequent submittal:

A. REZONING PETITION AND AREA PLAN REVIEW

Application fees:	\$ 900.00
Review fees:	\$1,200.00
Total:	<u>\$2,100.00</u>

Review fees include engineering, planning and legal reviews. If the review costs exceed the amount of the fee paid, additional hours shall be billed at the actual costs plus fifteen percent (15%) for administration. Billing rates are available upon request.

If a second public hearing must be scheduled due to the petitioner's failure to post required signage or provide information as required, an additional fee of \$300.00 to offset the Township's additional costs of public notices and affidavits of notice shall be paid by the petitioner prior to the Township scheduling the public hearing.

B. PRELIMINARY SITE PLAN REVIEW

Application fees:	\$ 900.00
Review fees:	\$1,200.00 + \$75.00 per acre
Total:	<hr/> \$2,100.00 + \$75.00 per acre

Review fees include engineering, planning and legal reviews. If the review costs exceed the amount of the fee paid, additional hours shall be billed at the actual costs plus fifteen percent (15%) for administration. Billing rates are available upon request.

C. FINAL SITE PLAN REVIEW

Application fees:	\$ 900.00
Review fees:	\$ 1,800.00
Total:	<hr/> \$2,700.00

Review fees include engineering, planning and legal reviews. If the review costs exceed the amount of the fee paid, additional hours shall be billed at the actual costs plus fifteen percent (15%) for administration. Billing rates are available upon request.

D. MAJOR/MINOR CHANGE

Application fees:	\$ 100.00
Review fees:	300.00
Total:	<hr/> \$ 400.00

5. ENGINEERING REVIEW FEES

At the time of submittal of detailed construction plans, specifications, and detailed estimates of total costs of the proposed construction and improvements, the applicant shall pay to the Township Treasurer a fee for review equal to one and one-half percent (1 ½%) of the estimated total costs of construction and improvements, plus one dollar (\$1.00) per dwelling unit or, in the case of non-residential developments, one and one-half percent (1 ½%) of the estimated costs of construction and improvements, plus one dollar (\$1.00) 1500 square feet of the total building size. The estimates shall be provided by the applicant, and verified by the Township engineer, with the Township engineer retaining final authority to determine the total costs upon which the percentage shall be based. The fee shall be paid prior to the Township engineer’s review of any part of the construction plans. In the event engineering review fees exceed the amount of the fee paid (above), additional hours shall be billed at the actual costs plus fifteen percent (15%) for administrative fees.

6. PRECONSTRUCTION AND DEVELOPMENT AGREEMENT MEETING

The following fees shall be paid by the applicant to the Superior Township Treasurer at the time of scheduling a preconstruction and development agreement meeting:

A. PROJECT WITH PUBLIC WATER AND SANITARY SEWER

One and one-half hour \$650.00
(maximum meeting time)

B. PROJECT WITHOUT PUBLIC WATER AND SANITARY SEWER

One and one-half hour \$500.00
(maximum meeting time)

If the meeting exceeds one and one-half hours, or if a subsequent meeting is required, the additional fees shall be payable at the above rates rounded to the nearest quarter hour.

7. INSPECTION FEES DEPOSIT (IN FIELD)

The fees for inspection shall be borne by the applicant and paid to the Township Treasurer. Fees for inspection shall be established at the preconstruction meeting by the Township engineer, who shall transmit a copy of the amount required for inspection fees to the applicant, the Township Clerk, and the Township Treasurer. The Township Treasurer shall place the amount determined by the Township engineer in an escrow account. Inspection fees shall cover the costs of actual inspection and any administrative engineering time

incurred by the Township's engineer(s) in association with the project. The extent of inspection and field engineering required may be determined by the Township's engineer based upon the contractor's performance and the applicant's engineering involvement. The costs associated with any field design changes, reviews, evaluations or interpretations of the plans due to discrepancies evolving from the construction operation shall be deducted from the inspection fee escrow accounts.

The applicant will be notified in the event the escrow fees have been depleted and additional funds are required. Prompt attention to reestablishing the escrow funds will prevent the project construction from being stopped and/ or occupancy permits withheld. Any account balance remaining upon completion of the project and acceptance of the record plans will be returned to the applicant.

Review of "as-built" plans shall be invoiced against the inspection funds.

The fees herein contained shall be in addition to those charges for connection charges and other charges or fees required for sanitary sewer and water supply.

8. ZONING BOARD OF APPEALS PETITION

At the time of filing an appeal to the Zoning Board of Appeals, fees shall be paid by the petitioner to the Superior Charter Township Treasurer as follows:

Appeals brought by the owner of a single-family dwelling and involving a variance request regarding "Density and Height Regulations" for one such dwelling:

\$175.00

Any other appeal:

\$500.00

9. MISCELLANEOUS FEES

A. SPECIAL MEETING OF THE TOWNSHIP BOARD

At the time of filing a request with the Township Clerk for a special meeting of the Township Board, a fee of \$600.00 shall be paid by the requester to the Superior Charter Township Treasurer. If the Board determines for any reason that special meeting cannot be held, \$450.00 of the \$600.00 fee shall be refunded, with the remaining portion of the fee to be retained by the Township for administrative costs.

B. SPECIAL MEETING OF THE TOWNSHIP PLANNING COMMISSION

At the time of filing a request with the Township Clerk for a special meeting of the Township Planning Commission, a fee of \$750.00 shall be paid by the requester to the Superior Charter Township Treasurer. If the Planning Commission determines for any reason the special meeting cannot be held, \$650.00 of the \$750.00 fee shall be refunded, with the remaining portion of the fee to be retained by the Township for administrative costs.

C. PRE-APPLICATION CONFERENCE

At the time of scheduling a pre-application meeting with the Township Planner, a fee of \$100.00 shall be paid by the applicant to the Superior Charter Township Treasurer. If additional meetings are requested, an additional \$75.00 per meeting shall be paid.

D. PRE-APPLICATION REVIEW

Before an application for rezoning, conditional use or site plan review is filed, the petitioner may request a pre-application review by the Township's planner and/or engineer. A fee of \$500.00 shall be paid by the applicant to the Superior Charter Township Treasurer before such a review is undertaken.

10. PUBLICATION AND EFFECTIVE DATES

This resolution and fee schedule shall become effective immediately upon publication in the *Ypsilanti Courier*, a newspaper of general circulation within the Township on September 15, 2005.

CERTIFICATION

I, Kay Williams, the duly qualified Clerk of the Charter Township of Superior, Washtenaw County, Michigan, do hereby certify that the foregoing is a true and correct copy of a resolution adopted at a regular meeting of the Superior Charter Township Board held on September 6, 2005, and that public notices of said meeting were given pursuant to Act No. 267, Public Acts of Michigan, 1976, as amended.

Kay Williams, Superior Township Clerk

APPENDIX II

Contact Information

CONTACT INFORMATION

Superior Township:

William McFarlane
Supervisor
3040 N. Prospect Rd.
Ypsilanti, Michigan 48198
(734) 482-6099
fax (734) 482-3842

Kay Williams
Clerk
3040 N. Prospect Rd.
Ypsilanti, Michigan 48198
(734) 482-6099
fax (734) 482-3842

Brenda McKinney
Treasurer
3040 N. Prospect Rd.
Ypsilanti, Michigan 48198
(734) 482-6099
fax (734) 482-3842

Diane Aho
Assessor
3040 N. Prospect Rd.
Ypsilanti, Michigan 48198
(734) 482-6099
fax (734) 482-3842

Richard Mayernik
Building & Zoning Official
3040 N. Prospect Rd.
Ypsilanti, Michigan 48198
(734) 482-6099
fax (734) 482-3842

James Roberts
Superior Township Fire Department
3040 N. Prospect Rd.
Ypsilanti, Michigan 48198
(734) 482-6099
fax (734) 482-3842

Rick Church
Utility Department Director
575 E. Clark
Ypsilanti, Michigan 48198
(313) 480-5500
fax (313) 484-4883

Township Engineer:

Orchard, Hiltz & McCliment, Inc.
34935 Schoolcraft Road
Livonia, Michigan 48150
(734) 522-6711
fax (734) 466-4557

Township Planner:

Donald Pennington
5427 Pine View
Ypsilanti, Michigan 48197
(734) 485-1445
fax (734) 485-0212

Outside Agencies

Water Main:

Michigan Department of Environmental Quality
Water Bureau
Community Water Supply Program
Jackson District Office
301 East Louis Glick Highway
Jackson, Michigan 49201-1556
Bethel Skinker
(517) 780-7874

Sanitary Sewer:

Michigan Department of Environmental Quality
Jackson State Office Building
301 East Louis Glick Highway
Jackson, Michigan 49201-1556
(517) 780-7690

County Drains:

Washtenaw County Drain Commissioner
110 North Fourth Street
Suite 202
Ann Arbor, Michigan 48107-8645
(517) 994-2525

County Roads:

Washtenaw County Road Commission
555 North Zeeb Road
P.O. Box 1528
Ann Arbor, Michigan 48106
James Harmon
(313) 761-1500

Soil Erosion Control, Building Permit and Building Inspection:

Washtenaw County Department of Environmental and Infrastructure Services
4101 Washtenaw Avenue
P.O. Box 8645
Ann Arbor, Michigan 48107-8645
Soil Erosion Control: Beverly Barton (313) 971-4542
Building Permit: Dale Behnke (313) 971-1441
Building Inspection: Debbie Schmidt (313) 971-1441

State Highways:

Michigan Department of Transportation
18101 West Nine Mile Road
Southfield, Michigan 48075
(313) 569-3993

APPENDIX III

Wetland and Watercourse Ordinance

**SUPERIOR CHARTER TOWNSHIP
WETLANDS AND WATERCOURSE PROTECTION ORDINANCE**

WETLANDS AND WATERCOURSE PROTECTION AND RESTORATION

**CHARTER TOWNSHIP OF SUPERIOR
WASHTENAW COUNTY, MICHIGAN**

Ordinance No. 135

As adopted on December 16, 1996 and amended January 20, 1998

An Ordinance for the control and preservation of wetlands and watercourses within the Charter Township of Superior and to protect the wetlands of the Township from sedimentation, destruction, and misuse; to prescribe the powers, duties and functions of the Township enforcing agency; to provide for the promulgation of rules; to establish permits and a fee schedule; to establish design standards, specifications, and bond requirements; to provide for variance and exceptions; to provide for inspections and enforcement; to provide for violations, remedies and penalties thereof; and to provide for severability and effective date of the Ordinance.

THE CHARTER TOWNSHIP OF SUPERIOR HEREBY ORDAINS:

SECTION I. GENERAL

Section 1.1 - Findings

The Township Board of the Charter Township of Superior finds that wetlands and watercourses are indispensable and fragile resources that provide many public benefits, including maintenance of water quality through nutrient cycling and sediment trapping as well as flood and storm water runoff control through temporary water storage, slow release, and groundwater recharge. In addition, wetlands provide open space; passive outdoor recreation opportunities; fish and wildlife habitat for many forms of wildlife, including migratory waterfowl; and rare, threatened or endangered wildlife and plant species; and pollution treatment by serving as biological and chemical oxidation basins.

Preservation of the remaining Township wetlands in a natural condition shall be and is necessary to maintain hydrological, economic, recreational, and aesthetic natural resource values for existing and future residents of the Charter Township of Superior, and therefore the Township Board declares a policy of no net loss of wetlands. Furthermore, the Township Board declares a long term goal of net gain of wetlands to be accomplished through review of degraded or destroyed wetlands in the Township, and through cooperative work with landowners, using incentives and voluntary agreements to restore wetlands.

To achieve these goals, and with authority from Section 30307(4) of the *Natural Resources and Environmental Protection Act* (Act 451 of 1994 [previously Section 8 (4) of the *Goemaere-Anderson Wetlands Protection Act* Act 203, Public Acts of 1979, as amended]), the Township Board finds that it is desirable to regulate wetlands in Superior Township. Pursuant to Article 4, Section 52 of the Constitution of the State of Michigan, the conservation and development of natural resources of the state is a matter of paramount public concern in the interest of the health, safety, and general welfare of the people. The Township Board therefore finds that this Ordinance is essential to the long term health,

safety, and general welfare of the people of the Charter Township of Superior, and to the furtherance of the policies set forth in Section 1701 *et. seq.* of the *Natural Resources and Environmental Protection Act* (Act 451 of 1994 [previously the *Michigan Environmental Protection Act* Act 127, Public Acts of 1970] hereinafter the *Michigan Environmental Protection Act*) and Section 30301 *et seq.* of the *Natural Resources and Environmental Protection Act* (Act 451 of 1994 [previously the *Goemaere-Anderson Wetlands Protection Act* Act 203, Public Acts of 1979, as amended] hereinafter the *Wetlands Protection Act*).

Section 1.2 - Purposes

The purposes of this Ordinance are to provide for:

- A. The protection, preservation, replacement, proper maintenance, restoration, and use in accordance with the character, adaptability, and stability of the Township's wetlands, in order to prevent their pollution or contamination; minimize their disturbance and disturbance to the natural habitat therein; and prevent damage from erosion, siltation, and flooding.
- B. The coordination of and support for the enforcement of applicable federal, state, and county statutes, ordinances and regulations including, but not limited to, the:
 - 1. *Wetlands Protection Act*, enforced by the Michigan Department of Environmental Quality which is hereinafter referred to as the MDEQ;
 - 2. *Inland Lakes and Streams Act*, Section 30101 *et seq.* of the *Natural Resources and Environmental Protection Act* (Act 451 of 1994 [previously Act 346, Public Acts of 1972, as amended]) enforced by the MDEQ;
 - 3. *Soil Erosion and Sedimentation Control Act*, Section 9101 *et seq.* of the *Natural Resources and Environmental Protection Act* (Act 451 of 1994 [previously Act 347, Public Acts of 1972, as amended]), enforced by the County of Washtenaw and the Township of Superior (*after enactment of ordinance*); . .
 - 4. *Floodplain Regulatory Authority*, incorporated into the *Natural Resources and Environmental Protection Act* (Act 451 of 1994 [previously Act 245, Public Acts of 1929, as amended]), enforced by the MDEQ.
- C. Compliance with the *Michigan Environmental Protection Act* which imposes a duty on government agencies and private individuals and organizations to prevent or minimize degradation of the environment which is likely to be caused by their activities, . .
- D. The establishment of standards and procedures for the review and regulation of the use of wetlands and watercourses,
- E. The establishment of penalties for violation of this Ordinance.
- F. A procedure for appealing decisions.
- G. The establishment of enforcement procedures and penalties for the violation of this Ordinance.

H. Creation of a board to assist in the protection of wetlands and to build public support for the values of wetlands.

I. Assurance that the right to reasonable use of private property is maintained.

Section 1.3 - Construction and Application

The following rules of construction apply in the interpretation and application of this Ordinance:

A. In the case of a difference of meaning or implication between the text of this Ordinance and any caption or illustration, the text shall control.

B. Particulars provided by way of illustration or enumeration shall not control general language.

Section 1.4 - Applicability to Private and Public Agency Activities and Operations

The provisions of this Ordinance including wetlands use permit requirements and criteria for wetlands use permit approval, shall apply to activities and operations proposed by federal, state, local and other public agencies as well as private organizations and individuals. .

SECTION 2 - DEFINITIONS

Section 2.1 - Definition of Terms

Terms not specifically defined shall have the meaning customarily assigned to them.

CONTIGUOUS shall mean any of the following:

1. A permanent surface water connection or any other direct physical contact with an inland lake or pond, a river or stream.
2. A seasonal or intermittent direct surface water connection to an inland lake or pond, a river or stream.
3. A wetlands that is partially or entirely located within five hundred (500') feet of the ordinary high water mark of an inland lake or pond or a river or stream, unless it is determined by the Township or the MDEQ in accordance with Rule 281.924 of the *Wetlands Administrative Rules*, adopted in connection with the Wetlands Protection Act, that there is no surface or groundwater connection to these waters.
4. Two (2) or more areas of wetlands separated only by barriers, such as dikes, roads, berms, or other similar features, but with any of the wetlands areas contiguous under the criteria described in Subsections (1)(2) or (3) of this definition.

DEPOSIT means to fill, place or dump.

LOT means a designated parcel, tract, building site or other interest in land established by plat, subdivision, conveyance, condominium master deed, or as otherwise permitted by law, to be used, developed or built upon as a unit.

MATERIAL shall mean soil, sand, gravel, clay, peat moss and other organic material.

MITIGATION shall mean: (1) methods for eliminating or reducing potential impact to regulated wetlands; or (2) creation of new wetlands to offset unavoidable loss of existing wetlands.

PERSON means an individual, sole proprietorship, partnership, corporation, association, municipality, this state, any instrumentality or agency of this state, the federal government, or any instrumentality or agency of the federal government, or other legal entity.

PROTECTED WETLANDS shall mean any of the following:

1. All wetlands subject to regulation by the MDEQ including:
 - (a) Wetlands, regardless of size, which are contiguous to any lake, stream, river, or pond whether partially or entirely contained within the project site. .
 - (b) Wetlands, regardless of size, which are partially or entirely within five hundred (500') feet of the ordinary high water mark of any lake, stream, river or pond unless it is determined by the MDEQ that there is no surface water or groundwater connection between the wetlands and the water body.
 - (c) Wetlands which are larger than five (5) acres, whether partially or entirely contained within the project site, and which are not contiguous to any lake, stream, river, or pond.
 - (d) Wetlands, regardless of size, which are not contiguous to any lake, stream, river, or pond, if the MDEQ determines the protection of the wetlands is essential to the preservation of the natural resources of the state from pollution, impairment or destruction.
2. All wetlands subject to regulation by the Township including:
 - (a) Wetlands two (2) to five (5) acres in size, whether partially or entirely contained within the project site, which are not contiguous to any lake stream, river or pond.
 - (b) Wetlands smaller than two (2) acres in size which are not contiguous to any lake, stream, river or pond and are determined to be essential to the preservation of the natural resources of the Township as provided for in Section 7.6 of this Ordinance.

RUNOFF shall mean the surface discharge of precipitation to a watercourse, drainageway, swale, or depression.

REMOVE means to dig, dredge, suck, pump, bulldoze, drag line, or blast.

RESTORATION means to return from a disturbed or totally altered condition to a previously existing natural or altered condition by some action of man.

SEASONAL shall mean any intermittent or temporary activity which occurs annually and is subject to interruption from changes in weather, water level, or time of year, and may involve annual removal and replacement of any operation, obstruction, or structure.

STRUCTURE shall mean any assembly of materials above or below the surface of the land or water, including but not limited to, buildings, bulkheads, piers, docks, landings, dams, waterway obstructions, paving and roadways, poles, towers, cables, pipelines, drainage tiles, and other underground installations. .

TOWNSHIP BOARD shall mean the legislative body of Superior Charter Township, Washtenaw County, Michigan.

TOWNSHIP WETLANDS MAP refers to the Superior Charter Township Wetlands Map, based on the National Wetlands Inventory Map of the U.S, Fish and Wildlife Service; the Michigan Resource Information System Mapping (MIRIS) of the Michigan Department of Environmental Quality; the soils maps of the Soil Conservation Service; aerial photography; and onsite inspections.

WATERCOURSE shall mean any waterway including a river, stream, lake, pond or any body of surface water having definite banks, a bed and visible evidence of a continued flow or continued occurrence of water.

WETLANDS shall mean land characterized by the presence of water at a frequency and duration sufficient to support and that under normal circumstances does support wetlands vegetation or aquatic life and is commonly referred to as a bog, swamp or marsh,

WETLANDS ADMINISTRATOR shall mean a person(s) knowledgeable in wetlands protection, appointed to administer this Ordinance and to carry out certain duties hereunder. Any firm or individual appointed on a contract basis.

WETLANDS BOARD shall mean the body of the Charter Township of Superior which makes decisions on wetlands use permit appeals and advises the Township on wetlands resource policy, education and restoration.

WETLANDS USE PERMIT shall mean the Township approval required for activities in wetlands and watercourses described in Section 7 of this Ordinance.

WETLANDS VEGETATION shall mean plants, including but not limited to, trees, shrubs, and herbaceous plants, that exhibit adaptations to allow, under normal conditions, germination or propagation and to allow growth with at least their root systems in water or saturated soil.

SECTION 3 - RELATIONSHIP TO STATE AND FEDERAL PERMIT REQUIREMENTS

Whenever persons requesting a wetlands use permit are also subject to state and/or federal permit requirements, the following shall apply:

- A. The Township shall have jurisdiction for the regulation of wetlands under this Ordinance concurrent with the jurisdiction of the Michigan Department of Environmental Quality.
- B. Approvals under this Ordinance shall not relieve a person of the need to obtain a permit from the MDEQ and/or the U.S. Army Corps of Engineers, if required,
- C. Issuance of a permit by the MDEQ and/or the U.S. Army Corps of Engineers shall not relieve a person of the need to obtain approval under this Ordinance, if applicable.

SECTION 4. ADMINISTRATION

Section 4.1 - Township Wetlands Map

The Township Wetlands Map is a guide to the location of wetlands in Superior Charter Township. The Map shall be used in the administration of this Ordinance.

The Township Wetlands Map, together with all explanatory matter thereon and attached thereto, as may be amended through the Wetlands Verification and Delineation process, is hereby adopted by reference and declared to be a part of this Ordinance. The Township Wetlands Map shall be on file in the office of the Township Clerk.

The Township Wetlands Map shall serve as a general guide for the location of protected wetlands. The Township Wetlands Map does not create any legally enforceable presumptions regarding whether property that is or is not included on the inventory map is or is not in fact a wetlands,

The Wetlands Verification Process, as set forth herein, shall be used to verify wetlands on properties where wetlands is shown on the Wetlands Map or on properties where wetlands exist as defined in Section 2.1 herein. The Wetlands Delineation Process, as set forth herein, shall be used to establish the actual boundaries of wetlands in the Township. The identification of the precise boundaries of wetlands on a project site shall be the responsibility of the applicant.

A. Wetlands Verification Process

1. The Township or property owners of wetlands may initiate a verification of the areas shown on the Township Wetlands Map as wetlands or on properties where wetlands exists as defined in Section 2.1 herein. The verification shall be limited to a finding of wetlands or no wetlands by the Wetlands Administrator. The finding shall be based on, but not limited to, aerial photography, topographical maps, site plans, and field verification.
2. In the event that there is a finding of no wetlands on the property, then no further determination would be required and the finding shall be included in the Map Amendment Process (found later in this Section).
3. In the event that there is a finding of wetlands, then the establishment of the exact boundary through a wetlands delineation shall be required to alter the Township Wetlands Map through the Map Amendment Process.
4. The applicant shall pay fees for the Wetlands Verification Process as established in Section 9.1.

B. Wetlands Delineation Process

Prior to the issuance of any permit or land development approval for a property which is shown to include a wetlands on the Township Wetlands Map, the applicant may be required to provide a wetlands delineation to the Township. The Wetlands Administrator shall determine whether a delineation is required based on the proximity and relationship of the project to the wetlands.

1. To establish actual wetlands boundaries on a property, the applicant shall provide a surveyor dimensional site plan, drawn at an appropriate scale, showing property lines, buildings and any points of reference along with the wetlands boundaries, according to one of the following:
 - (a) Wetlands delineation by the Michigan Department of Environmental Quality (MDEQ)
 - (b) Wetlands delineation by the applicant's wetlands consultant subject to review and approval by the Township's Wetlands Consultant.
2. Where a wetlands delineation is required by this Section, the Township Wetlands Consultant shall establish wetlands boundaries following receipt of the above required information and after conducting a field investigation.
3. The applicant shall pay fees for the Wetlands Delineation Process as established in Section 9.1.

C. Map Amendment

1. The Township Wetlands Map shall be updated when new data is available or when corrections are needed in order to maintain the integrity of the map.
2. The Township shall ensure that each record owner of property on the property tax roll shall be notified of any amendment to the Township Wetlands Inventory Map on an annual basis. The notice shall include the following information:
 - (a) the Township wetlands map has been amended;
 - (b) the location to review the map;
 - (c) the owner's property may or may not be designated as a wetlands on the map;
 - (d) the Township has an Ordinance regulating wetlands;
 - (e) the map does not necessarily include all of the wetlands within the Township that may be subject to the wetlands ordinance.

Section 4.2 Wetlands Board

There is hereby created a Wetlands Board:

- A. The Wetlands Board shall consist of six (6) residents of the Township appointed by the Township Board upon recommendation of the Planning Commission; four of whom shall have knowledge and experience in the areas of botany, soils, geology, hydrology, or natural resources. One member of the Wetlands Board shall be a member of the Township Board. The initial terms of appointment shall be as follows: 2 individuals for 3 years, 2 individuals for 2 years, and 1 individual for 1 year. Thereafter, appointments shall be for a term of three years. The term of the Township Board representative to the Wetlands Board shall be concurrent with the term of office.
- B. The Wetlands Board shall establish rules of procedure.

C. The Wetlands Board is authorized to undertake activities to protect wetlands including the following:

1. Conduct public hearings and review appeals of wetlands use permit, mitigation, and/or restoration decisions made by the Wetlands Administrator, the Planning Commission or the Township Board.
2. Serve in an advisory role in setting policy guidelines on wetlands issues in the Township.
3. Identify conflicts between wetlands protection and present Township ordinances, Township operating procedures, and Township activities.
4. Provide recommendations and assist in map administration.
5. Coordinate with the Michigan Department of Environmental Quality in keeping up-to-date on issues affecting wetlands protection.
6. Recommend a program to protect and acquire important wetlands through tax incentives, donation, development rights, easements, land exchange, purchase, and other means.
7. Develop educational programs for the public and for Township schools. The program should promote the values of wetlands and awareness of the hazards and threats to wetlands. The program should be particularly targeted to landowners with wetlands and emphasize how best to protect wetlands values on their property.
8. Develop an adopt-a-wetlands program for interested citizens to participate more directly in preservation of specific wetlands.
9. Review degraded or destroyed wetlands in the Township for possibility of rehabilitation or restoration.

D. Members of the Wetlands Board shall receive a stipend as determined from time to time by resolution of the Township Board.

E. Members of the Wetlands Board may be removed from said Board following a hearing held by the Township Board and a written finding by the Township Board that cause for removal has been determined.

SECTION 5 - ACTIVITIES IN A PROTECTED WETLANDS OR WATERCOURSE

Section 5.1 – Activities Prohibited Without First Obtaining A Wetlands Use Permit

Except for those activities expressly permitted by Section 5.2, it shall be unlawful for any person to do any of the following in a protected wetlands or watercourse unless and until a wetlands use permit is obtained from the Township pursuant to this Ordinance.

A. Deposit or permit to be deposited any material or structures into any watercourse or within or upon any protected wetlands.

- B. Remove or permit to be removed any soil from any watercourse or from any protected wetlands.
- C. Dredge, fill or land balance watercourses or protected wetlands.
- D. Create, enlarge, diminish or alter a lake, pond, creek, stream, river, drain or protected wetlands.
- E. Construct, operate or maintain any development in or upon protected wetlands or watercourses.
- F. Erect or build any structure, including but not limited to, buildings, roadways, bridges, tennis courts, paving, utilities, or private poles or towers in or upon protected wetlands or watercourses.
- G. Construct, extend or enlarge any pipe, culvert, or open or closed drainage facility which discharges silt, sediment, organic or inorganic materials, chemicals, fertilizers, flammable liquids or any other pollutants to any lake, stream, protected wetlands, or watercourse, except through a retention area, settling basin, or treatment facility designed to control and eliminate the pollutant. This Subsection shall apply to all land uses except single family uses on lots of two (2) acres or less.
- H. Construct, enlarge, extend or connect any private or public sewage or waste treatment plant discharge to any lake, stream, river, pond, watercourse, or protected wetlands except in accordance with the requirements of Washtenaw County, State of Michigan and/or the United States, to the extent that such entities have jurisdiction.
- I. Drain, or cause to be drained, any water from a protected wetlands or watercourse.
- J. Fill or enclose any ditch which would result in a significant reduction of storm water absorption and filtration into the ground or would otherwise have an adverse impact on receiving watercourses or wetlands.

Section 5.2 - Permitted Activities

Notwithstanding the prohibitions of Section 5.1, the following activities are permitted within watercourses or protected wetlands without a wetlands use permit, unless otherwise prohibited by statute, ordinance or regulation.

- A. Fishing, swimming, boating, canoeing, hiking, horseback riding, bird-watching, or other similar recreational activities which do not require alteration of wetlands vegetation or grading of soils.
- B. Grazing and/or watering of animals,
- C. Education, scientific research, and nature study.
- D. Installation for noncommercial use of temporary seasonal docks, rafts, diving platforms and other recreational devices customarily used for residential purposes.
- E. Maintenance or repair of lawfully located roads, sewers, ditches, structures and of facilities used in the service of the public to provide transportation, electric, gas, water, telephone, telecommunication, or other services, provided that such roads, sewers, ditches, structures, or facilities are not materially changed or enlarged and provided that the work is conducted using best management practices to ensure that flow and circulation patterns, and chemical and biological

characteristics of watercourses and wetlands are not impaired and that any adverse effect on the aquatic environment will be minimized.

- F. Excavation and filling of no more than fifty (50) cubic yards of material if necessary for the repair and maintenance of bridges; walkways, and other existing structures, provided that such structures allow for the unobstructed flow of water and preserve the natural contour of the protected wetlands, except as authorized by permit or in connection with Section G (below),
- G. Improvement or maintenance of the Huron River or Rouge River or its tributaries when such operations are organized or sponsored or approved by the Township and are specifically intended to preserve natural resources. Such permitted activities shall include, but not be limited to: (1) removal of materials which may cause diverted flows and bank erosion, including the removal of trees, brush, and debris; (2) bank stabilization projects which require minimal disturbance of existing conditions; (3) wildlife and aquatic habitat improvement projects; and (4) removal of pernicious, invasive plant species (e.g., purple loosestrife).
- H. Farming, horticulture, silviculture, lumbering, and ranching activities, including plowing, irrigation, irrigation ditching, seeding, cultivating, minor drainage, harvesting for the production of food, fiber, and forest products, or upland soil and water conservation practices. Wetlands altered under this subdivision shall not be used for a purpose other than a purpose described in this subsection without a permit from the MDEQ.
- I. Construction or maintenance of farm or stock ponds.
- J. Maintenance, operation, or improvement which includes straightening, widening, or deepening of the following which is necessary for the production or harvesting of agricultural products:
 - 1. An existing private agricultural drain,
 - 2. That portion of a drain legally established pursuant to Act No. 40 of the Public Acts of 1956, as amended, being sections 280.1 to 280.630 of the Michigan Compiled Laws, which has been constructed or improved for drainage purposes.
 - 3. A drain constructed pursuant to other provisions of the Wetlands Protection Act.
- K. Construction or maintenance of farm roads, forest roads, or temporary roads for, moving mining or forestry equipment, if the roads are constructed and maintained in a manner to assure that any adverse effect on the wetlands will be otherwise minimized.
- L. Drainage necessary for the production and harvesting of agricultural products if the wetlands is owned by a person who is engaged in commercial fanning and the land is to be used for the production and harvesting of agricultural products, This subsection shall not apply to a wetlands which is contiguous to a lake or stream, or to a tributary of a lake or stream, or to a wetlands which is necessary to be preserved for the public interest, in which case a permit shall be required. Except as otherwise provided in the Wetlands Protection Act, wetlands improved under this Subsection after October 1, 1980 shall not be used for nonfarming purposes without a permit from the MDEQ.
- M. A wetlands use permit shall not be required for any use which is exempt from a permit under Section 30305 of the Wetlands Protection Act (previously Section 6 of Act 203 of the Public Acts of 1979 as amended).

Section 5.3 - Existing Non-conforming Lots, Uses and Structures

Lots, uses and structures lawfully existing at the effective date of this Ordinance shall be subject to the requirements of this Ordinance, except as follows:

- A. Plats that have received tentative preliminary or later approval and site plans and condominium plans approved prior to the effective date of this Ordinance shall be entitled by right to all uses authorized by those approvals according to the zoning district in which the property is located, and provided that said lots have buildable sites outside of the wetlands. Lots which do not have a buildable site outside of the wetlands shall require a wetlands use permit prior to any construction on said lot.
- B. Any activity, structure, or use lawfully existing prior to the effective date of this Ordinance, but not in conformity with the provisions of this Ordinance, may be continued, maintained and operated.
- C. Any structure lawfully existing prior to the effective date of this Ordinance damaged by fire, explosion, act of God, or other causes beyond the control of the owner, may be restored, rebuilt, or repaired without obtaining a wetlands use permit

SECTION 6 - APPLICATION

Application for approval, appeal, and issuance of wetlands use permits shall be concurrent with the application for approval, appeal, and issuance of other necessary Township approvals, except that in the case of any such application for another approval which is pending on the effective date of this Ordinance and which has not been approved and which, by the terms of this Ordinance, would require a wetlands use permit application, the applicant shall be notified by the Wetlands Administrator that an application for a wetlands use permit is required, and processing of the other application shall not proceed until the wetlands use permit application has been filed. The applicant for a wetlands use permit shall submit four copies of the following to the Township:

- A. An application completed in full, on a form supplied by the Michigan Department of Environmental Quality.
- B. A wetlands delineation including, but not limited to the following information: dominant tree, sapling, shrub and herb vegetation; presence or lack of accepted wetlands hydrology indicators; analysis of soil including a description of the soil profile to at least 20 inches and comparison to Washtenaw County Soil Survey and maps of the wetlands mapped. Mapped data shall be represented in a manner that allows comparison to the Superior Charter Township Wetlands Map.
- C. Soil drainage and stormwater management plans.
- D. A mitigation plan, if the proposed activity will result in the loss of wetlands resources.
- E. A cover letter signed by the applicant including the following information:
 - 1. Name of project and brief description (one sentence).
 - 2. Date upon which the activity is proposed to commence.

3. Explanation of why the project meets the wetlands use permit standards and criteria contained in this Ordinance.
 4. List of all federal, state, county or other local government permits or approvals required for the proposed project including permit approvals or denials already received. In the event of denials, the reasons for denials shall be given. Attach copies of all permits which have been issued.
 5. Identification of any present litigation involving the property.
- F. For a wetlands use permit approval required in conjunction with a site plan, plat or other proposed land use, the applicant shall at the time of application elect to have the application processed under either Subsection (1) or (2) below:
- (1) The wetlands use permit application shall be reviewed, either prior to or concurrent with the review of the site plan, plat or other proposed land use submitted by the applicant, with the understanding that the land use review may not be completed at the time the decision is rendered on the wetlands use permit application. Election of this alternative may require a reopening of the wetlands use permit application if the land use approval is inconsistent with the wetlands use permit approval; or,
 - (2) The wetlands use permit application shall be reviewed and acted upon concurrent with the review of the site plan, plat or other proposed land use submitted by the applicant, and the 90-day review period limitation specified in Section 30307(6) of the Wetlands Protection Act shall thereby be extended accordingly.
- G. Copies of wetlands permit applications filed with the MDEQ and forwarded to the Township in accordance with Section 30307(6) of Wetlands Protection Act shall become part of the application for a Superior Charter Township wetlands use permit.

SECTION 7 - REVIEW

Section 7.1 - Method of Review of Wetlands Permit Application

- A. Before a wetlands use permit application is submitted, the necessity of the wetlands use permit shall be determined by the Wetlands Administrator or designee by reference to the "Township Wetlands Map".
- B. Whenever a wetlands use permit is required, applicant may request an administrative meeting with the Wetlands Administrator to review the proposed activity in light of the purposes of this Ordinance.
- C. Upon receipt of an application, the Township shall ensure that all required information including a wetlands determination has been submitted. The receipt of the application shall constitute permission from the owner to complete an on-site investigation. Applicant will pay fees as established in Section 9.1.
- D. The Township Clerk shall transmit one copy of the application and supporting materials to the Township Wetlands Consultant to confirm the boundaries of the wetlands and to review the proposal in light of the purpose and review standards of Section 7 and other applicable sections of

this Ordinance. If an application is not complete, the applicant may be granted additional time to complete the application provided that the applicant agrees that the additional time shall not be charged against the Township's 90-day time limit for making a decision. The receipt of the application shall constitute permission from the owner to conduct an on-site investigation of wetlands.

- E. The Township Wetlands Consultant shall prepare and transmit a report and recommendation to the Wetlands Administration documenting the review required by Section 7.1 D.
- F. Upon receipt of an application, the Township Clerk shall:
 - 1. Transmit one copy of the application to the Michigan Department of Environmental Quality.
 - 2. Cause to be published a notice of the application and the date and time for submission of written public comments in a newspaper of general circulation in the Township.
 - 3. Advise the applicant of his/her obligation to post the subject property with a sign that shall be no less than ten (10) square feet in size. The sign shall be clearly visible from the abutting street(s) and shall state that an application has been filed for a wetlands use permit on the property.

Section 7.2 - Wetlands Use Permit Decisions by the Wetlands Administrator

The following process shall apply to wetlands use permit decisions by the Wetlands Administrator:

- A. For wetlands use permit applications submitted in conjunction with activities that do not require approval by the Planning Commission and/or Township Board, the Wetlands Administrator shall approve, approve with conditions or deny the application within 90 days after receipt of an application.
- B. Persons wishing to comment on the application must submit their comments in writing to the Wetlands Administrator prior to the date and time set in the notice. Persons wishing to receive notice of the Wetlands Administrator's decision must submit a written request to the Wetlands Administrator.
- C. After completing the review and reviewing the written comments, the Wetlands Administrator shall approve, approve with modifications or conditions, or deny the wetlands use permit application in accordance with the standards of this Ordinance.
- D. When a wetlands use permit is approved, approved with modifications or conditions, or denied, written notice shall be sent to the applicant and to all persons who have requested notice of the Wetlands Administrator's decision. A permit approved by the Wetlands Administrator shall not be issued or effective until ten (10) calendar days following the date of approval.

Section 7.3 - Wetlands Use Permit Decisions by Planning Commission or the Township Board

The following process shall apply to wetlands use permit decisions by the Township Planning Commission or by the Township Board:

- A. Wetlands use permit applications submitted in conjunction with a related land development activity

shall be decided by the same entity that decides the related land development activity consistent with the Wetlands Protection Act. The Planning Commission shall decide any wetlands use permits in conjunction with special use permit applications and shall require that the delineation and wetlands use permit application requests be submitted prior to the special use permit hearing. The Wetlands Administrator shall transmit application materials and the report and recommendation prepared by the Township Wetlands Consultant to the Planning Commission or Township Board as applicable.

- B. After review and study of the application materials and the Township Wetlands Consultant's report and recommendation, the Township Planning Commission or Township Board, as applicable, may hold one public hearing after publication in a newspaper of general circulation in the Township not less than five (5) days nor more than fifteen (15) days prior to the date of the hearing. Such notice shall indicate the place, time and subject of the hearing and the place and time the proposed wetlands use permit may be examined. The wetlands use permit hearing may be held in conjunction with a review of the related land use request(s).
- C. In the event of a public hearing, notice shall be sent by mail or personal delivery to the owners of property for which approval is being considered, and to all owners of property, as listed on the most recent tax roll, within 300 feet of the boundary of the property in question. Notification need not be given to more than one (1) occupant of a structure, except that if a structure contains more than one (1) dwelling unit or spatial area owned or leased by different persons, one (1) occupant of each unit shall receive notice, In the case of a single structure containing more than four (4) dwelling units, notice may be given to the manager or owner of the structure who shall be requested to post the notice at the primary entrance to the structure, A notice containing the time, date, place and purpose of the hearing shall be posted on the subject property by the applicant at least eight (8) days prior to the hearing. The posting sign shall be no less than ten (10) square feet in size, shall be clearly visible from the abutting street(s), and shall state that an application has been filed for a wetlands use permit.
- D. After completing the review the Planning Commission or Township Board as applicable shall approve, approve with conditions or deny the application within ninety (90) days after receipt of an application, in accordance with this Ordinance.
- E. Written notice shall be sent to the applicant upon approval, approval with conditions or denial of a wetlands use permit by the Township. The denial of a permit shall be accompanied by a written reason for denial.
- F. A permit approval by the Planning Commission or Township Board, as applicable, shall not be issued or effective until ten (10) calendar days following the date of the approval and compliance with Section 7.5 of this Ordinance.

Section 7.4 - Appeals Of Decisions Of The Wetlands Administrator, Planning Commission or Township Board

The following process shall apply to appeals of decisions made by the Wetlands Administrator, the Planning Commission, or the Township Board, as applicable:

- A. Any person who is aggrieved by the approval, approval with modifications or conditions, or denial of a wetlands use permit by the Wetlands Administrator, the Planning Commission or by the

Township Board, may appeal the decision to the Wetlands Board. A written letter containing the specific reasons for appeal shall be filed with the Township Clerk within ten (10) calendar days after the date of the decision to be appealed. Timely filing of an appeal shall have the effect of suspending the effect of the permit pending the outcome of the appeal. In the event that the person(s) filing the appeal do not own property within 300 feet of the wetlands affected, the Planning Commission shall determine whether the person(s) are aggrieved.

- B. After a hearing, the Wetlands Board shall determine that the decision of the Wetlands Administrator, Planning Commission or Township Board be affirmed, affirmed with modification, or reversed. The time limitation may be extended with the consent of the applicant. The Board's decision shall be based on written findings.

Section 7.5 - Wetlands Use Permit Conditions

- A. The Wetlands Administrator, the Planning Commission or the Township Board, as applicable, shall attach any reasonable conditions considered necessary to ensure that the intent of this Section will be fulfilled, to minimize or mitigate damage or impairment to, encroachment in or interference with natural resources and processes within the protected wetlands or watercourses, or to otherwise improve or maintain the water quality. Any conditions related to wetlands mitigation shall follow the provisions of Section 8 of this Ordinance.
- B. The Wetlands Administrator, the Planning Commission or the Township Board, as applicable, shall fix a reasonable time to complete the proposed activities.
- C. The Wetlands Administrator, the Planning Commission or the Township Board, as applicable, may require the applicant file with the Township a cash or corporate surety bond or irrevocable bank letter of credit in an amount, if any, determined necessary to ensure compliance with the wetlands use permit approval conditions and this Section.
- D. The Wetlands Administrator, the Planning Commission or the Township Board, as applicable, shall require that final approval of a wetlands use permit application shall be contingent upon receipt of evidence by the Township that required state and federal permits, if any, have been obtained by the applicant.
- E. At no time shall the Wetlands Administrator, the Planning Commission or the Township Board, as applicable, issue a wetlands use permit that allows a more extensive alteration of the wetlands than permitted by state or federal law.
- F. Wetlands use permits for seasonal operations need not be renewed annually unless otherwise stated in the permit.
- G. Any change that increases the size or scope of the operation and that affects the criteria considered in approving the permit as determined by the Wetlands Administrator, the Planning Commission or the Township Board, as applicable, may require the filing of a new wetlands use permit application.
- H. Any temporary, seasonal, or permanent operation that is discontinued for two (2) years or two (2) seasons shall be presumed to have been abandoned and the wetlands use permit automatically voided.

- I. Any permit granted under this Ordinance may be revoked or suspended by the Planning Commission or Township Board, as applicable, after notice and an opportunity for a hearing, for any of the following causes:
 - 1. A violation of a condition of the permit.
 - 2. Misrepresentation or failure to fully disclose relevant facts in the application.
 - 3. A change in a condition that requires a temporary or permanent change in the activity.

- J. An applicant who has received a wetlands use permit under this Ordinance shall comply with the following in connection with any construction or other activity on the property for which the wetlands use permit has been issued:
 - 1. Maintain soil erosion control structures and measures, including but not limited to, silt fences, straw bale berms, and sediment traps. The permittee shall provide for periodic inspections throughout the duration of the project.
 - 2. Maintain clear delineation of the protected wetlands and wetlands setbacks (so marked by the Wetlands Administrator or Township Wetlands Consultant during the on-site inspection) so that such locations are visible to all construction workers.
 - 3. Post on the site, prior to commencement of work on the site and continuing throughout the duration of the project, a copy of the approved wetlands use permit containing the conditions of issuance, in a conspicuous manner such that the wording of said permit is available for public inspection.

- K. The wetlands use permit shall remain effective for a time period coincidental with any other land use permit reviewed and approved concurrent with the wetlands use permit. If applied for prior to the expiration date and concurrent with the expiring land use permit, the applicant may be granted an extension that corresponds to additional time granted for the underlying land use permit. Extensions shall be approved by the same person or body that made the original decision. The maximum number of extensions shall coincide with the maximum number allowed for the underlying land use permit.

- L. When there is no other activity or permit involved, the wetlands use permit shall remain effective for one (1) year. A maximum of a one (1) year extension may be approved.

Section 7.6 - Review Standards And Criteria For Non-Contiguous Wetlands Less Than Two (2) Acres In Area.

- A. A wetlands use permit shall be approved with respect to a non-contiguous wetlands less than two (2) acres in area unless the Planning Commission or Township Board determines that the wetlands is essential to the preservation of the natural resources of the Township. It shall not be the burden of the property owner to prove that the wetlands is not essential to the preservation of the natural resources of the municipality.

- B. All non-contiguous wetlands areas of less than two (2) acres which appear on the wetlands map, or which are otherwise identified during a field inspection by the Township, shall be analyzed for the

purpose of determining whether such areas are essential to the preservation of the natural resources of the Township. If there is to be a denial of a wetlands use permit in a non-contiguous wetlands area of less than two (2) acres, then, on the basis of data gathered by or on behalf of the Township, findings shall be made in writing and given to the applicant stating the basis for the determination that such wetlands is essential to preservation of the natural resources of the Township. In order to make such a determination, there shall be a finding that one (1) or more of the following exist within such wetlands:

1. The site supports state or federal endangered or threatened plants, fish, or wildlife appearing on a list specified in Section 36505 of the Natural Resources and Environmental Protection Act (Act 451 of 1994 [previously Section 6 of the Endangered Species Act of 1974, Act No. 203 of the Public Acts of 1974, being Section 299.226 of the Michigan Compiled Laws]).
 2. The site represents what is identified as a locally rare or unique ecosystem.
 3. The site supports plants or animals of an identified local importance.
 4. The site provides groundwater recharge documented by a public agency.
 5. The site provides flood and storm control by the hydrologic absorption and storage capacity of the wetlands.
 6. The site provides wildlife habitat by providing breeding, nesting, feeding grounds or cover for forms of wildlife, waterfowl, including migratory waterfowl, and rare, threatened, or endangered wildlife species.
 7. The site provides protection of subsurface water resources and provision of valuable watersheds and recharging groundwater supplies.
 8. The site provides pollution treatment by serving as a biological and chemical oxidation basin.
 9. The site provides erosion control by serving as a sedimentation area and filtering basin, absorbing silt and organic matter.
 10. The site provides sources of nutrients in water food cycles and nursery grounds and sanctuaries for fish
- C. In connection with the determination whether the wetlands is essential to the preservation of the natural resources of the Township, the property owner shall make an election and response under Subsection 1 or 2 below, relative to each noncontiguous wetlands area less than two (2) acres.
1. In lieu of having the Township or its consultant proceed with the analysis and determination, the property owner may acknowledge that one (1) or more of the criteria in Subsections (B-1) through (B-10) above, exist on the wetlands in question, including a specification of the one or more criteria which do exist; or
 2. An election to have the Township or its consultant proceed with the analysis of whether each of the criteria in Subsections (B-1) through (B-10) exist or do not exist in the wetlands in question, including specific reasons for the conclusion in respect to each criteria.

- D If the Township determines that the wetlands is not essential to the preservation of the natural resources of the Township, the Township's decision shall be so noted on the Township Wetlands Map, at the time it is amended. The requested activity shall be approved subject to all other applicable laws and regulations.

When a wetlands under two (2) acres in size has been determined to be essential to the natural resources of the Township and the Township has found that one or more of the criteria set forth exist at the site, the Township shall notify the applicant in writing stating the reasons for determining the wetlands to be essential to the preservation of the natural resources.

After determining that a wetlands less than two (2) acres in size is essential to the preservation of the natural resources of the Township, the wetlands use permit application shall be reviewed according to the standards in Section 7.7.

Section 7.7 - Review Standards for Wetlands Use Permits

The criteria to evaluate wetlands use permits under this Ordinance and to determine whether a permit is granted are as follows:

- A. A permit for any activity listed in Section 5.1 shall not be approved unless the proposed activity is in the public interest and is otherwise lawful in all respects. Public input shall be evaluated in approving, approving with conditions, or denying the application. The reasonable use of the property involved in accordance with applicable local ordinances and state law shall also be considered.

In determining whether the activity is in the public interest, the benefit which reasonably may be expected to accrue from the proposal shall be balanced against the reasonably foreseeable detriments of the activity. The decision shall reflect the national, state, and local concern for the protection of natural resources from pollution, impairment, and destruction. The following general criteria shall be considered:

1. The relative extent of the public and private need for the proposed activity.
2. The availability of feasible and prudent alternative locations and methods to accomplish the expected benefits from the activity.
3. The extent and permanence of the beneficial or detrimental effects which the proposed activity may have on the public and private uses to which the area is suited, including the benefits the wetlands provide.
4. The probable impact of each proposal-in relation to the cumulative effect created by other existing and anticipated activities in the watershed.
5. The probable impact on recognized historic, cultural, scenic, ecological, or recreational values and on the public health or fish or wildlife.
6. The size and quality of the protected wetlands being considered.

7. The amount and quality of remaining wetlands in the area.
8. Proximity to any waterway.
9. Extent to which upland soil erosion adjacent to protected wetlands or drainageways is controlled.
10. Economic value, both public and private, of the proposed land change to the general area.
11. Findings of necessity for the proposed project which have been made by federal, state or local agencies.

B. A wetlands use permit shall not be granted unless it is shown that:

1. An unreasonable disruption of aquatic resources will be avoided; and
2. The proposed activity is primarily dependent upon being located in the protected wetlands; and
3. A feasible and prudent alternative does not exist; and
4. The manner in which the activity is proposed to be undertaken will result in the minimum negative impact upon protected wetlands, watercourses, and attendant natural resources under all of the circumstances.

C. Following approval of the application, a wetlands use permit shall be issued upon determination that all other requirements of ordinance and law have been met, including site plan, plat or land use approval as applicable, and including issuance of a permit by the MDEQ, if required under the Wetlands Protection Act. In cases where a MDEQ permit allows activities not permitted by the wetlands use permit approval granted under this Section, the restrictions of the approval granted under this Section shall govern.

SECTION 8 - WETLANDS MITIGATION AND RESTORATION

Section 8.1 - Findings That Wetlands And Watercourse Loss Is Unavoidable

Mitigation shall not be considered a substitute for making all prudent attempts to avoid wetlands impacts.

- A. Prior to considering a proposal for wetlands mitigation, the Wetlands Administrator, the Planning Commission or the Township Board, as applicable, shall make all of the following findings:
1. That all feasible and prudent efforts have been made to avoid the loss of protected wetlands.
 2. That all practical means have been considered to minimize protected wetlands impacts.
 3. That it is practical to replace the protected wetlands which will be unavoidably eliminated.
 4. That all alternatives for preserving protected wetlands and water courses have been evaluated and found to be impractical, inappropriate, or ineffective.

- B. To ensure no net loss of wetlands in the Township, mitigation shall be required in instances where there are losses of wetlands resources and where the Wetlands Administrator, the Planning Commission or the Township Board, as applicable have made the findings required in Section 8.1.A.

Section 8.2 - Criteria For Approving Proposals For Wetlands Mitigation

If the Wetlands Administrator, Planning Commission or the Township Board, as applicable determines that it is practical to replace the protected wetlands which will be impacted, mitigation plans shall be approved only if all of the following criteria are met:

1. That the mitigation plan provides for the substantial replacement of the predominant functional values of the protected wetlands to be lost.
2. That the mitigation plan provides for no net loss of protected wetlands resources and watercourses unless the Wetlands Administrator, the Planning Commission or the Township Board, as applicable determines that the net loss will result in a minimum negative impact upon protected wetlands, watercourses, and attendant natural resources under all of the circumstances.
3. Mitigation shall be provided on-site where practical and beneficial to the wetlands resources. If mitigation on-site is not practical and beneficial, then mitigation in the immediate vicinity, within the same watershed, of the permitted activity may be considered. Only if all of these options are impractical shall mitigation be considered elsewhere.
4. The mitigation plan will comply with all applicable federal, state, and local laws.
5. A plan to monitor preserved and replacement wetlands over a minimum of five years has been specified.

Section 8.3 - Other Mitigation Requirements

- A. Wetlands mitigation and monitoring plans shall become conditions to the wetlands use permit and shall be the responsibility of the applicant.
- B. Financial assurances that mitigation is accomplished as specified by the permit condition may be required by the Wetlands Administrator, Planning Commission or Township Board, as applicable.
- C. Any mitigation activity shall be completed before initiation of other permitted activities, unless a phased concurrent schedule can be agreed upon between the Wetlands Administrator, Planning Commission or Township Board, as applicable, and the applicant.
- C. Wetlands mitigation plans that create less than two (2) acre wetlands shall meet one of the conditions listed in Section 7.6 B.1-10.

SECTION 9 - FEES, PENALTIES AND ENFORCEMENT

Section 9.1 - Fees

Applications for a wetlands use permit under this Section shall be accompanied by a nonrefundable administrative application fee in an amount specified from time to time by resolution of the Township Board. In addition an applicant shall pay an escrow fee in an amount determined by resolution of the Township Board for the estimated cost of outside consultant(s) who may be retained by the Township in connection with the review of the application. In the event the cost of the services of the consultant(s) is less than the escrow fee, the applicant shall be refunded the balance. In the event the cost of the services of the consultant(s) exceeds the amount of the escrow fee, the applicant shall provide to the Township an additional escrow amount equivalent to no less than one-half (1/2) the original escrow amount. All review of the wetlands use permit application shall cease until such additional escrow amount is deposited with the Township, and the number of days during which all review of the wetlands use permit application is ceased shall be deducted from the time limits within which the Township would otherwise act upon the application. In the event the cost of the service of the consultant(s) is less than the subsequent escrow fee(s), the applicant shall be refunded the balance. A denial of an application for a wetlands use permit shall not affect the applicant's obligation to pay the fees provided for in this Section.

Section 9.2 - Penalties And Enforcement

A. Restoration Requirements for Illegal Wetlands Alteration

In the event of a violation involving illegal alteration of a watercourse or protected wetlands under this Section, the Township shall have the power to order complete restoration of the watercourse or protected wetlands area by the person or agent responsible for the violation. If such responsible person or agent does not complete such restoration within a reasonable time following the order, the Township shall have the authority to restore the affected watercourse or protected wetlands to their prior condition wherever possible, and the person or agent responsible for the original violation shall be held liable to the Township for the cost of restoration. Requirements and watercourse or protected wetlands restorations ordered by the Township shall be coordinated with state and/or federal agency requirements and specifications for watercourse or wetlands restoration.

B. Penalties

In addition to the rights and remedies herein provided to the Township, any person violating any of the provisions of this Ordinance shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined in an amount not exceeding Five Hundred Dollars (\$500.00), or be imprisoned in the county jail for a period not exceeding ninety (90) days, or be both so fined and imprisoned. Each day such violation is continued or permitted to continue shall constitute a separate offense and shall be punishable as such hereunder.

C. Injunction

Any activity conducted in violation of this Section is declared to be a nuisance per se, and the Township may commence a civil suit in any court of competent jurisdiction for an order abating or enjoining the violation, and/or requiring restoration of the protected wetlands or watercourse as nearly as possible to its condition before the violation.

D. Stop-Work Order

The Township may also issue a stop-work order or withhold issuance of a Certificate of Occupancy, permits or inspection until the provisions of this Ordinance, including any conditions attached to a wetlands use permit, have been fully met. Failure to obey a stop-work order shall constitute a violation of this Ordinance.

E. Appearance Tickets

In all arrests and prosecutions for violation of this Ordinance, appearance tickets and the appropriate procedures set forth in Act 147, Michigan Public Acts of 1968, as amended, may be used.

F. Enforcement

The Wetlands Administrator or his/her agent, officer or employee shall have authority under this Ordinance to enter upon privately-owned land for the purpose of performing the Township's duties under this Ordinance and may take or cause to be made such examinations, surveys or samplings as are deemed necessary.

Section 9.3 Reporting and Record Keeping

A. Any citizen observing what he or she believes or suspects may be an instance of noncompliance with the provisions of this Ordinance may report the observation to any official or employee of the Township.

B. Any report received pursuant to Subsection A. of this Section shall be forwarded immediately to the Township Ordinance Officer and the Township Clerk.

C. Township Ordinance Officer Duties

1. The Township Ordinance Officer shall inspect the site of the suspected noncompliance as soon as is reasonably practical, but in no case later than the close of business five (5) business days after receiving the report.
2. The Township Ordinance Officer shall complete an entry for the report into the Compliance Docket.
3. The Township Ordinance Officer may enlist the expertise of the Wetland Administrator if necessary to determine whether a violation of this Ordinance has occurred.
4. The Township Ordinance Officer shall take any actions within his or her authority necessary to ensure this Ordinance is enforced.

D. Compliance Docket

The Township Ordinance Officer shall maintain a Compliance Docket at the Township Office. The Docket shall be used to identify all properties or uses of properties which have been evaluated for compliance with this Ordinance. The Docket shall be available to the public upon demand during normal business hours. The Docket shall contain the following information:

1. Date: the date the Docket entry was initiated.
2. Address/Location of Property: the street address, if available, or descriptive text or vicinity map sufficient to enable citizens to identify the property in question.
3. Permit or Docket Number: If it has been determined that the use being made of the property does not require a Wetlands Permit from Superior Township, a Docket number shall be assigned. Otherwise, the Permit number shall be maintained.
4. Compliance Status: A record shall be made of whether the use being made of the property is in compliance with the Provisions of this Ordinance, the date the determination was made, and the name(s) of the Township official and/or consultant who made the determination.
5. Sidwell property number.

E. Violation Docket

The Township Ordinance Officer shall maintain a Violation Docket at the Township Office. The Docket shall be used to track the status of violations of this Ordinance. The Violation Docket shall contain the following information as it becomes available:

1. The permit or Docket number: This number shall be the same number as is used to identify the property in the Compliance Docket.
2. Address/Location of property: The street address, if available, or descriptive text or vicinity map sufficient to enable citizens to identify the property in question.
3. Nature of violation.
4. Date violation confirmed.
5. Name of person confirming the violation.
6. Enforcement action taken.
7. Date of enforcement action taken.
8. Outcome of enforcement action: If outcomes are appealed by the property owner or any other party, each appeal shall be noted, and its outcome shall also be noted under this heading.

SECTION 10 - STATE NOTIFICATION

Section 10.1 - Notice to the Michigan Department of Environmental Quality

The Township shall notify the MDEQ of the adoption of this Ordinance. The Township shall cooperate with the MDEQ in the enforcement of the Wetlands Protection Act as to wetlands under the MDEQ's jurisdiction as defined under this Ordinance.

SECTION 11. ORDINANCE CONFLICT

Section 11.1 - Abrogation and Conflict of Authority

Nothing in this Ordinance shall be interpreted to conflict with present or future state statutes in the same subject matter; conflicting provisions of this Ordinance shall be abrogated to, but only to, the extent of the conflict. Moreover, the provisions of this Ordinance shall be construed, if possible, to be consistent with relevant state regulations and statutes. If any part of this Ordinance is found to be invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct and independent provision. Such holding shall not affect the validity of the remaining portions thereof, and the remainder of the Ordinance shall remain in force. Rights and duties which have

matured, penalties which have been incurred, proceedings which have begun (except as set forth in Section 5.3 and Section 6 herein) and prosecutions for violations of law occurring before the effective date of this Ordinance are not affected or abated by this Ordinance.

SECTION 12 - PROPERTY TAX ASSESSMENT

If a wetlands use permit is denied by the Township, a landowner may appear at the annual Board of Review for the purpose of seeking a re-valuation of the affected property for assessment purposes to determine its fair market value under the use restriction.

SECTION 13 - EFFECTIVE DATE

This Ordinance shall take full force and effect upon December 30, 1996, following final publication of said Ordinance.

SECTION 14 - CERTIFICATION

I, Colleen O'Neal, Clerk of the Charter Township of Superior, do hereby certify that the foregoing is a true and correct copy of an ordinance adopted at first reading by the Superior Charter Township Board at a regular meeting on December 2, 1996 and adopted at second and final reading by said Board at a regular meeting of said Board on December 16, 1996; further that this ordinance was amended for first reading on January 5, 1998 and final reading on January 20, 1998 and published on January 25, 1998 being effective January 25, 1998.

Published 12-28-96

APPENDIX IV

Washtenaw Co. Soil Erosion and Sedimentation Control Guide

WASHTENAW COUNTY



SOIL EROSION & SEDIMENTATION CONTROL PROGRAM GUIDE

- application • fee schedule • goal • plan review • sample plan •
- details • standards • requirements • staff information •

SOIL EROSION PERMITS are required for all projects involving earth moving activities that...

- ◆ occur **within 500 feet of surface water** (as defined) and **disturb more than 225 square feet**
- ◆ **disturb one or more acres**
- ◆ are classified as **MAJOR** projects, **regardless of size**
- ◆ include the construction of **new ponds** or **alterations to existing ponds**.

Permits are divided into **two categories**:

MAJOR For projects undertaken **for the purposes of commerce, multiple residential, or public service**, including but not limited to: residential development, commercial or industrial projects or additions, recreation developments, churches, schools, roads for lot splits, street construction, drainage construction, and mining.

MINOR For projects undertaken for a proposed or existing **private residence**, or undertaken on private land not intended for commercial or public use or multiple residential development.

An application must be submitted for a Soil Erosion Permit, with an initial application fee due at time of application submittal.

SOIL EROSION WAIVERS are required for projects involving earth moving activities that...

- ◆ **disturb less than one acre** and are located **more than 500 feet from surface water**
- ◆ are located **within 500 feet of surface water**, but **disturb less than 225 sq. ft.**, and do not contribute sediment to surface water.

An application must be submitted for a Soil Erosion Waiver, but no fee is required.

SOIL EROSION EXEMPTIONS are allowed for those projects that...

- ◆ **disturb less than 225 square feet** and are **stabilized within 24 hours**
- ◆ include only **post holes for decks**
- ◆ include only **shrub and tree removal** when no vegetation is disturbed
- ◆ include only the **plowing and tilling of fields** for crop production
- ◆ include only borings and percolation tests **when stabilized within 24 hours** of the initial earth change and **disturb less than 225 square feet**.

No paperwork is required or exchanged for projects eligible for a Soil Erosion Exemption.

SURFACE WATER is defined as

ponds, lakes, streams, rivers, wetlands, designated drains, and storm drains (including culverts, natural channels, catch basins, or roadside drainage ditches) . These surface water areas may hold or convey water continually or seasonally.

When turning in an Application for a SOIL EROSION PERMIT, be sure to:

- completely **fill out and sign** the Soil Erosion Permit application
- include **two sets of site plans** showing:
 - an outline of all **areas to be disturbed**,
 - surface water** within 500 feet,
 - existing and proposed structures** within 500 feet,
 - prominent land features** within 500 feet,
 - existing (and proposed) drainage patterns**,
 - all **soil erosion control measures** to be used (silt fence, silt sacks, riser pipes, detention/retention basins, etc.), if applicable,
 - location and duration of **soil stockpiles**, if applicable,
 - location of any **de-watering**, if applicable, and
 - a **locator/vicinity map**.
- See the back page of this guide for an example of a complete site plan and vicinity map for a MINOR project.
- indicate whether you want to **pick up** the permit when it is ready or **have it mailed**, and if mailed, **which party** to mail it to. Please keep the SESC Program Office updated of address changes.
- include the **application fee** (see the Soil Erosion Permit Fee Schedule)

For MAJOR projects, also include:

- a **legal description** of the property boundaries
- surveyed contour lines** on site plans (2 ft. intervals, scale 1"=100 ft), including any proposed changes to contours, along with existing and proposed on-site and off-site drainage areas (within 500'), in detail.
- location of soil types** with associated written description
- schedule of grading operations**
- street sweeping schedule**
- maintenance schedule** of soil erosion controls
- for residential developments, a **Copy of Master Deeds**
- a **performance guarantee**, or alternatively, if offered, a **resource remediation fee**

When turning in an Application for a SOIL EROSION WAIVER, be sure to:

- completely **fill out and sign** the Soil Erosion Waiver application
- include a **site plan** or sketch a site plan in the area indicated on the back of the application.
- fill out and sign** the official Soil Erosion Waiver.
- post the Waiver** on site visible from the road



MAILING ADDRESS:
Western County Service Center
Resource Management Division
P.O. Box 8645
Ann Arbor, MI 48107-8645

BUSINESS LOCATION:
Washtenaw County
Western County Service Center
705 N. Zeeb Rd.
Ann Arbor, MI 48103

eWashtenaw.org

(734) 222-3888

Soil Erosion Permit Fee Schedule

(Natural Resources and Environmental Protection Act, Part 91, Soil Erosion & Sedimentation Control, 1994, Act 451, as amended 2000, Act 504; and Washtenaw County Soil Erosion & Sedimentation Control Ordinance, 1997, as amended)

INITIAL APPLICATION FEE:

Applicants seeking to obtain a Soil Erosion Permit will be required to pay an initial application fee upon submitting the Soil Erosion Permit application. **(A \$5.00 GIS FEE IS REQUIRED IF THE INITIAL APPLICATION FEE TOTALS \$100.00 OR MORE.)**

MINOR PROJECTS: \$50.00 PER ACRE DISTURBED
MAJOR PROJECTS: \$65.00 PER ACRE DISTURBED

This initial fee covers the plan review, preliminary inspection and the first month (major projects) or two months (minor projects) of disturbance. Note that the initial fee is calculated based on the total acreage to be disturbed throughout the duration of the project. The GIS Fee is required of all County permits of \$100.00 or more and is used to develop and maintain the county's Geographic Information System. **Checks should be made payable to Washtenaw County Soil Erosion.**

IN THE EVENT THAT EARTH-MOVING ACTIVITIES OCCUR PRIOR TO ISSUANCE OF A SOIL EROSION PERMIT, THE OWNER IS SUBJECT TO DOUBLE THE INITIAL APPLICATION FEE.

MONTHLY/BI-MONTHLY INSPECTION FEES:

Following the payment of the initial fee, SESC Program staff will perform monthly or bi-monthly inspections, and issue invoices to each project based on the acreage disturbed on-site at the time of inspection. **ANY UNPAID RE-INSPECTION FEES RESULTING FROM STOP WORK ORDERS WILL BE ADDED TO THE INVOICE.**

MINOR PROJECTS: \$50.00 PER ACRE DISTURBED, BILLED BI-MONTHLY
MAJOR PROJECTS: \$65.00 PER ACRE DISTURBED, BILLED MONTHLY

Invoices are calculated based only on the area that is disturbed at the time of inspection. If an area is stabilized using approved permanent or temporary stabilization methods, the permit holder will not be billed for the stabilized area. A list of approved methods of stabilization will be given out with permits, and more are available through the SESC Program Office.

PERMIT TRANSFER:

If you transfer ownership of property prior to permanent stabilization, an SESC Transfer Form must be completed, submitted, and signed by Washtenaw County SESC (Soil Erosion and Sedimentation Control, Resource Management).

RE-INSPECTION FEE:

If a Stop Work Order is posted due to failure to adhere to Soil Erosion Permit requirements, a re-inspection will be performed when notified that the situation has been corrected. A Re-Inspection Fee of \$45.00 will be applied to the next regular inspection invoice.

MAJOR PROJECTS MUST ALSO SUBMIT A PERFORMANCE GUARANTEE OR RESOURCE REMEDIATION FEE

PERFORMANCE GUARANTEE

A Performance Guarantee is a monetary guarantee of the proper completion and stabilization of the project. Applicants for major projects are required to submit cash, a check, or letter of credit for the amount of \$500.00 per acre disturbed, with a minimum of \$2,000.00. **The performance guarantee provides an assurance that all exposed soil surfaces will be stabilized should development discontinue or proper control measures are not installed and/or maintained.** Monies are held until the completion of the project, and released once the site is stabilized and permanent Erosion Control Measures are functioning. Checks should be made payable to the Washtenaw County Clerk's Registrars Office.

RESOURCE REMEDIATION FUND

The Washtenaw County SESC Program may accept a Resource Remediation Fee in lieu of a Performance Guarantee. It is a non-refundable fee equal to 5% of the Performance Guarantee requirement for the project (\$100.00 for a \$2,000.00 Performance Guarantee). Funds taken in through the Resource Remediation Fee **are** used to remediate sites that have been abandoned, failed to properly stabilize, **or have** special concerns. Make checks payable to Washtenaw County Soil Erosion.

Goal

The purpose of the **Soil Erosion and Sedimentation Control Program** is to serve the public by protecting the waters of the State of Michigan and Washtenaw County, and to ensure clean water for drinking, swimming, fish and wildlife habitat.

Soil Erosion Control Requirements

- ◆ No earth moving activity can begin without a Soil Erosion Permit or Soil Erosion Waiver. **The Soil Erosion Permit or Soil Erosion Waiver must be posted and be clearly visible from the road.**
- ◆ Soil erosion and sedimentation control measures as designated on plans and/or as required must be installed prior to any earth moving activities.
- ◆ Earth changes to a property must not adversely affect drainage to surrounding areas.
- ◆ Detention/retention/sedimentation ponds must be constructed and stabilized prior to other earth moving activities
- ◆ Outlets of detention/retention/sedimentation ponds shall be designed and constructed to reduce the water flow to a non-erosive velocity. Rip rap must be installed on all stormwater outlets.
- ◆ Riser pipes in detention ponds must be wrapped in geotextile fabric and choked with pea gravel.
- ◆ All earth moving shall be designed, constructed and completed in such a manner that limits the exposed area of any disturbed land for the shortest possible period of time. The site must be stabilized within 5 calendar days after final grading or earth moving activity has been completed.
- ◆ Stone access drives, if required, must be installed prior to construction for purposes of mud tracking.
- ◆ Soil, sediment, and miscellaneous debris must be kept off streets and out of drainage ditches and catch basins throughout the duration of the project.
- ◆ Rock check dams are to be used instead of straw bales or silt fencing in concentrated flow locations such as ditches or pipe outlets. Straw bales should never be used for soil erosion control.
- ◆ Silt fencing, if required, must be trenched in and backfilled. Fencing may be toed-in with pea gravel if installed in winter.
- ◆ Catch basins, if installed, must be protected with a sediment filter with overflow.
- ◆ Dewatering operations must have some type of control, e.g.: filter bag and vegetative filter area. There shall be no dewatering of unfiltered water.
- ◆ Stockpiling of any excavated material must be kept clear of sensitive areas. Adequate controls must be in place to ensure this requirement.
- ◆ Erosion control blankets are required on slopes of 4:1 or steeper.
- ◆ All areas of a project that are disturbed must be stabilized by December 1.
- ◆ All permanent erosion control measures shall be permanently maintained by the owner or homeowner association

Soil Erosion and Sedimentation Control Measures

CATCH BASIN FILTER..... Geotextile filter fabric placed inside a catch basin (storm drain) to filter suspended sediment from water. Must have regular maintenance after storm or melt events to function properly.

CHECK DAM..... Temporary measure consisting of a line of 4-8” stone piled a maximum of 2 ft. high that slows the flow of water in ditches, swales or natural drainage areas. Check dams should be built so that the center of the wall is lower than the outside edges, and should be spaced so that the top of the downslope check dam is level with the bottom of the upslope check dam.

DETENTION/RETENTION BASIN..... Drainage basins or ponds designed to hold and filter water draining from developed site so as to prevent flooding and filter suspended sediment from water. Required for most Major projects. Detention basins retain inlet and outlet water. Retention basins retain inlet water only.

EROSION CONTROL BLANKET..... A blanket composed of a mesh of biodegradable material, usually interlaced with straw mulch, and sometimes containing grass seed, used for controlling erosion on steeper downslopes. Erosion Control Blankets must be staked in, trenched in at the top and flat against the ground.

RIP-RAP..... Rock-type material (usually 6-8” stone) placed on the edges of culverts or drainage outlets to slow water to a non-erosive velocity, preventing erosion. Stone should be arranged in a half-circle around the end of the outlet.

SILT FENCING..... Temporary measure consisting of wooden fence posts, support system, and a geotextile filter fabric (usually nylon) used to keep suspended soil particles from leaving the site. Required to be trenched in to a depth of 6”.

VEGETATIVE BUFFER..... A strip or area of vegetation used to filter sediment and pollutants from runoff. The minimum width for a filter strip is usually 25’.

Frequently Asked Questions about Soil Erosion (Grading) Permits

There's no water on my site, why do I need a permit?

Proximity to drainage ditches, drainage swales, catch basins, detention or retention basins, wetlands, and designated drains must be taken into account. These may appear dry for much of the year, but all serve a vital role in the conveyance of surface water, and can carry sediment into larger bodies of water.

How do I complete the timing sequence?

The timing sequence gives us a general idea of when your project will begin and when it will be finished, and also lays out a sequence of steps to follow for erosion control. Temporary measures, such as silt fence, check dams, or vegetative buffers should be installed at the beginning of the project. The stone aggregate drive should also be in at the start of construction. Permanent measures, such as grass, shrubs, pavement or other vegetation should be installed as soon as possible after final grade. Removal of temporary measures should be done after the site is completely stabilized. For major projects please note in determining a timing sequence, detention/retention/sediment pond installation should occur at the beginning of a project and that catch basin covers should be cleaned at least once a month until permanent measures are functioning.

How big is an acre?

One acre is 43,560 square feet, or 208' x 208' if square. Determine from your plans the areas where earthwork will occur and measure the areas length and width. Remember to include area for utilities, well, septic, fill brought in, lot grading, building structures and driveways.

What are impervious surfaces?

Impervious surfaces are areas that do not absorb rainfall, these are covered by pavement or structures. Pervious surfaces are areas that do absorb rainfall such as vegetated ground.

Who is the party responsible for on-going maintenance of permanent erosion control measures?

Examples of permanent erosion control measures are vegetation and stormwater detention/retention areas. The responsible party is the property owner and/or homeowners association for commonly held properties.

Why is Soil Erosion and Sedimentation Control Important?

Economic Reasons

- ◆ Excess sediment can increase the cost of treating drinking water and negatively affect the equipment used in the treatment process.
- ◆ Sites developed with sound erosion control avoid the costs of removing sediment from storm water structures. Clean sites are also more appealing to potential buyers.

Health & Safety Reasons

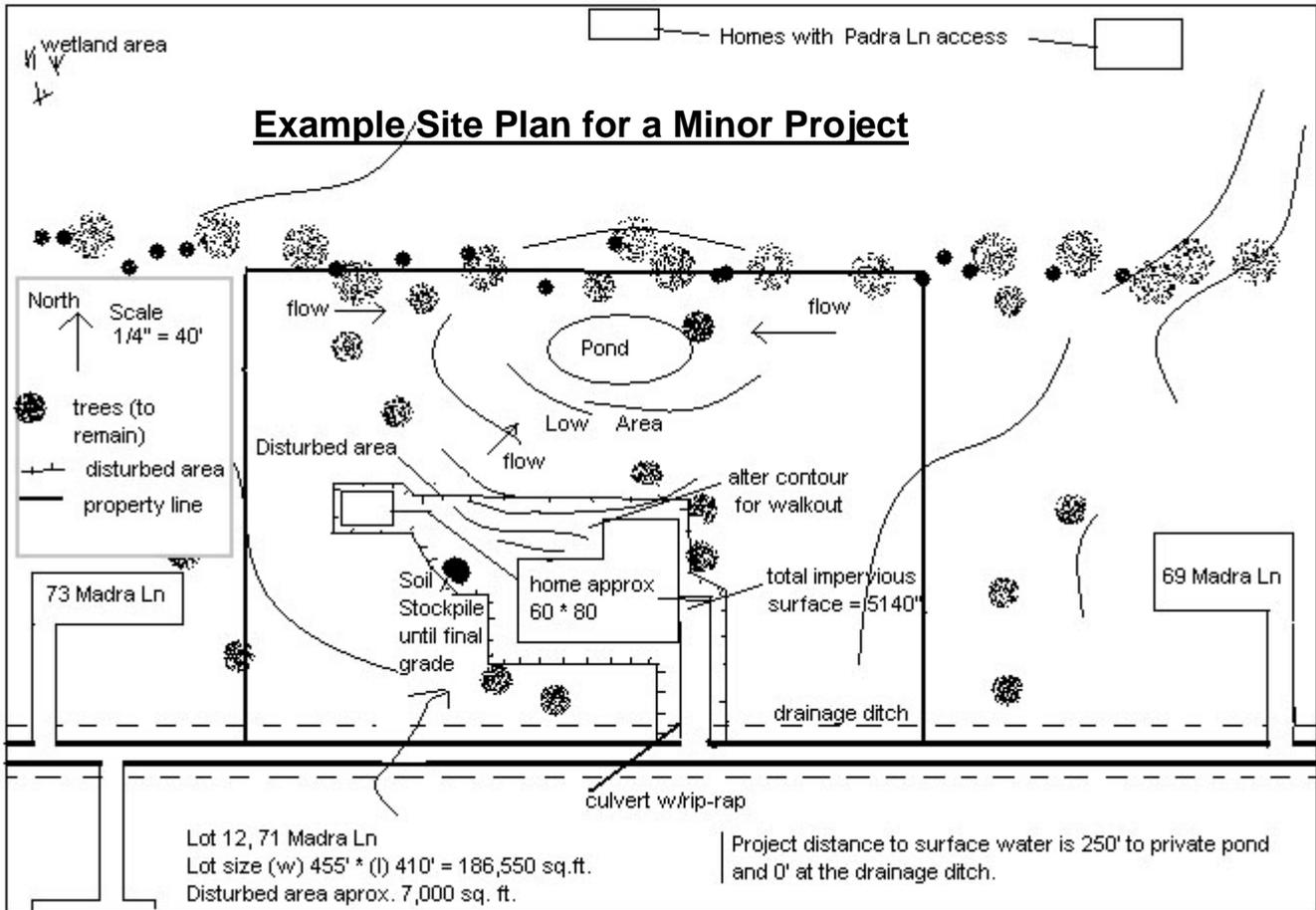
- ◆ Eroded soils enter water bodies and channels, raising water levels and blocking culverts, flooding surrounding land.
- ◆ Sediment can be deposited onto streets and roads by vehicles leaving the site or by stormwater runoff. These sediments can make roadways dangerous.
- ◆ Soil particles carry pollutants such as pesticides, oil and herbicides, that enter water bodies along with the soil, creating unhealthy conditions for wading and swimming, and affecting water quality.

Environmental Reasons

- ◆ Sediment in water bodies can cover the eggs of fish and other organisms, preventing them from hatching.
- ◆ Excess sediment that is suspended in streams and rivers acts like sandpaper on fish and other organisms and can clog their, making breathing difficult.
- ◆ Sediment reduces light penetration, making photosynthesis more difficult for water plants.
- ◆ Soil particles absorb heat, raising the temperature of the water and driving off desirable fish populations.

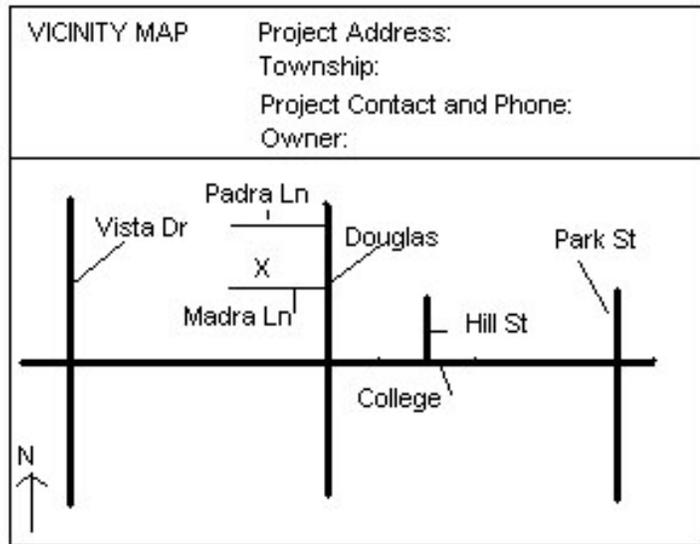
Aesthetic & Recreational

- ◆ Clear water is more desirable for swimming, boating, canoeing and fishing than muddy water.
- ◆ Excess sediment builds up in lakes and rivers. This raises the water level but reduces water depth, which decreases canoeing and fishing opportunities.



The site plan above includes:

- ❖ Existing natural and constructed features property and nearby areas
- ❖ Surface water features and drainage pattern.
- ❖ Existing & proposed site contours.
- ❖ Expected erosion controls and their placement, including stockpile duration.
- ❖ Area to be disturbed.
- ❖ Total lot size and total impervious (paved & built upon) surface.
- ❖ Property identifier.
- ❖ Adjacent property features.
- ❖ A scale.



**Washtenaw County
Department of Environment and Infrastructure
Resource Management Division Staff**

Main Line	Resource Management Division	734-222-3888	Fax: 734-222-3930
Beverly Barton	Resource Management Division Director	734-222-3863	bartonb@eWashtenaw.org
Jamie Kryscynski	Soil Erosion Control Officer	734-222-3921	kryscynj@eWashtenaw.org
Chris Benbow	Soil Erosion Control Officer	734-222-3871	benbowc@eWashtenaw.org
Katie Fennell	Soil Erosion Control Program Assistant	734-222-3978	fennellk@eWashtenaw.org
Bill Fults	Soil Erosion Control Program Assistant	734-222-3816	fultsw@eWashtenaw.org
Jennifer Langen	Soil Erosion Control Program Assistant	734-222-3857	langenj@eWashtenaw.org
Marlene Todd	Soil Erosion Permit Coordinator (Accounting)	734-222-3829	toddm@eWashtenaw.org

Within this Program Guide

is valuable information concerning soil erosion and sedimentation control at your site.

Please read through the guide carefully.

When turning in an Application for a Soil Erosion Permit, be sure to:

- ◆ **completely fill out and sign** the Soil Erosion Permit Application
- ◆ **include two sets of site plans** showing: **an outline of the area disturbed, existing and proposed drainage patterns** (any cut or fill activity), **soil erosion control measures** to be used, location of **soil stockpiles**, location of **nearest surface water**, location of any **de-watering**, and a **locator/vicinity map**. See the back page of this guide for an example of a complete site plan for a MINOR project.
- ◆ **be sure to indicate:** 1) whether you want to pick up the permit when it is ready or have it mailed and 2) whether to mail it to the owner or contractor, or to the billing address. Please check that the address information provided within the application is complete, accurate and current and keep the SESC Program Office updated of address changes.
- ◆ include the **application fee** (see the Soil Erosion Permit Fee Schedule)

For MAJOR projects, also include:

- ◆ a **legal description** of the property boundaries
- ◆ **schedule of grading operations**
- ◆ **street sweeping schedule**
- ◆ **location of soil types** with associated written description
- ◆ for residential developments, a **Copy of Master Deeds**
- ◆ **performance guarantee** or **resource remediation fee**
- ◆ **surveyed contour lines** (2 ft. intervals, scale 1"=100 ft), on site plans, including any proposed changes to contours, along with existing and proposed onsite and offsite drainage areas (within 500'), in detail.
- ◆ details of all **soil erosion control measures** (riser pipes, detention/retention basins, silt fence, silt sacks, etc.)

When turning in an Application for a Soil Erosion Waiver, be sure to:

- ◆ **completely fill out and sign** the Soil Erosion Waiver Application
- ◆ include a site plan or sketch a site plan in the area indicated on the back of the application.
- ◆ **fill out and sign** the official Soil Erosion Waiver.
- ◆ **post waiver** on site visible from the road



MAILING ADDRESS:

Washtenaw County Service Center
Resource Management Division
P.O. Box 8645
Ann Arbor, MI 48107-8645

eWashtenaw.org

BUSINESS LOCATION:

Washtenaw County
Western County Service Center
705 N. Zeeb Rd.
Ann Arbor, MI 48103

(734) 222-3888

Soil Erosion Permit Application

(Natural Resources and Environmental Protection Act, Part 91, Soil Erosion & Sedimentation Control, 1994, Act 451, as amended 2000, Act 504; and Washtenaw County Soil Erosion & Sedimentation Control Ordinance, 1997, as amended)

IDENTIFICATION

PROPERTY Tax ID/Parcel # City/Village/Twp (CIRCLE ONE)

Property Location Crossroads and

OWNER Address

City State Zip Phone

CONTRACTOR Address

City State Zip Phone

EXCAVATOR Address

City State Zip Phone

PARTY TO BE BILLED (CHECK ONE) Owner Contractor Other (if other, enter information below)

Name Address

City State Zip+4 Phone

PERSON RESPONSIBLE FOR EARTH CHANGE (CONTACT)

Fax

Name Phone

E-mail Mobile

PARTY RESPONSIBLE FOR PERMANENT EROSION CONTROL MEASURES

Current Property Owner Prospective Property Owner Homeowners Association Other

SIZE OF EARTH CHANGE

Total site (lot) size, in acres Total size of area cleared or disturbed acres sq ft (CHECK ONE)

Total size of new impervious surfaces (drives, parking areas, roofs, etc.), in square feet

LOCATION OF NEAREST SURFACE WATER

Types of surface water within 500 feet (CHECK ALL THAT APPLY)

lake stream/river pond wetland detention area ditch/swale catch basin/storm sewer none

Distance to nearest surface water, in feet Body of water (if named)

PROJECT PLAN (attach two copies to this application)

[APPROVED BY]

◆ **EARTH CHANGE DESCRIPTION (CHECK ALL THAT APPLY)**

Type(s) of Earth Change, MINOR

(MINOR INCLUDES PRIVATE RESIDENCE PROJECTS)

- single family residential (new)
- single family residential (addition/alt.)
- garage (addition or detached)
- pole barn
- pool (in ground)
- pond
- other _____

Type(s) of Earth Change, MAJOR

(MAJOR INCLUDES COMMERCIAL, MULTIPLE RESIDENTIAL, PUBLIC SERVICE PROJECTS)

- commercial/industrial (new)
- commercial/industrial (add./alt.)
- residential development
(subdivision, multi-family)
- recreation development
- golf course
- other _____
- road
- pipeline (gas, water, sewer)
- utility
- school/church
- hospital
- wetland mitigation

Additional Features of Earth Change, MINOR and MAJOR Projects (CHECK ALL THAT APPLY)

- | | | |
|---|--------------------------------------|---|
| <input type="checkbox"/> driveway | <input type="checkbox"/> road | <input type="checkbox"/> pond |
| <input type="checkbox"/> culvert | <input type="checkbox"/> bridge | <input type="checkbox"/> detention/retention pond |
| <input type="checkbox"/> well | <input type="checkbox"/> parking lot | <input type="checkbox"/> stormwater structure |
| <input type="checkbox"/> septic field | <input type="checkbox"/> berm | <input type="checkbox"/> wastewater structure |
| <input type="checkbox"/> utilities | <input type="checkbox"/> landscaping | <input type="checkbox"/> underground storage tank |
| <input type="checkbox"/> pool (in ground) | <input type="checkbox"/> other _____ | |

Additional Earth Change Information, MINOR and MAJOR Projects (CHECK YES OR NO)

- | | | |
|--|--|---|
| Has earth-moving activity started? | Yes <input type="checkbox"/> No <input type="checkbox"/> | |
| Is the earth-moving activity over 5 acres? | Yes <input type="checkbox"/> No <input type="checkbox"/> | If yes, an NPDES permit may be reqrd. from MDEQ |
| Will work be occurring in a wetland? | Yes <input type="checkbox"/> No <input type="checkbox"/> | If yes, permit(s) may be required from MDEQ |
| Will de-watering occur? | Yes <input type="checkbox"/> No <input type="checkbox"/> | If yes, special requirements may apply |
| Will work be occurring in a waterway/floodplain? | Yes <input type="checkbox"/> No <input type="checkbox"/> | If yes, permit(s) may be required from MDEQ |
| Will a designated county drain be affected? | Yes <input type="checkbox"/> No <input type="checkbox"/> | If yes, contact the Washtenaw County Drain Office |
| Will chemicals be used, stored, or mfg. on site? | Yes <input type="checkbox"/> No <input type="checkbox"/> | If yes, a Pollution Prevention Review may be reqrd. |
| Will fill be brought on-site? | Yes <input type="checkbox"/> No <input type="checkbox"/> | Amount in cubic yards: _____ |
| Will material be removed from the site? | Yes <input type="checkbox"/> No <input type="checkbox"/> | Amount in cubic yards: _____ |

◆ **APPROXIMATE PROJECT TIMING**

Month/Year (MINOR AND MAJOR PROJECTS)

Month/Year (MAJOR PROJECTS ONLY)

- | | |
|--|--|
| ____/____ Temporary Erosion Control Measures Installed | |
| ____/____ Gravel Drive/Entrance Installed | ____/____ Detention/Retention/Sediment Ponds Installed |
| ____/____ Land Cleared | ____/____ Road Constructed |
| | ____/____ Utilities Installed |
| ____/____ Final Grading/Seeding | ____/____ Catch Basins/Ponds Cleaned |
| ____/____ Permanent Erosion Control Measures in Place | |
| ____/____ Temporary Erosion Control Measures Removed | |

◆ **PERMIT DELIVERY METHOD**

Pickup Mail TO Owner Contractor
(CHOOSE ONE) (CHOOSE ONE)

◆ **SIGNATURE**

I hereby certify that the above information is accurate to the best of my knowledge and have read/understand the Washtenaw County Soil Erosion & Sedimentation Control Program Guide and **fee schedule**, and agree to conform to all applicable laws/requirements of the State of Michigan and Washtenaw County.

Owner's Signature _____ Date _____

Designated Agent's Signature _____ Date _____

MUST HAVE A WRITTEN STATEMENT FROM LANDOWNER AUTHORIZING HIM/HER TO SECURE A PERMIT IN THE LANDOWNER'S NAME

REV. 4/02

For office use only. You do not need to complete.

Avg. % of Slope _____ Types of Soil on Property _____

Street Sweeping Schedule Submitted Yes No N/A Master Deeds Submitted: Yes No N/A

Watershed _____ Creekshed _____ Fragile Lands Elements _____

Category of Soil Erosion Permit (CHECK ONE)

MINOR (single family residential) **MAJOR** (commercial, multiple residential, public service)

Is this is a request for an **Extension*** of an existing permit? Yes No If yes, permit #: _____

*CURRENTLY ISSUED PERMITS DO NOT EXPIRE

◆ PARTY RESPONSIBLE FOR PERMANENT EROSION CONTROL MEASURES

Property Owner Homeowners Association Other _____

◆ **Soil Erosion Permit #: SOI200** ___ - ___ **Project:** _____

MINOR 1ST Review: Initials: _____ Date: ___/___/___ 2ND Review: Initials: _____ Date: ___/___/___

MAJOR 1ST Review: Initials: _____ Date: ___/___/___ 2ND Review: Initials: _____ Date: ___/___/___

INSP.	✓ SITE PLAN CHECKLIST		INSP.
Have	N/A		Need
<input type="checkbox"/>	<input type="checkbox"/>	Map scale: 1" = 200' or less (for minor projects) or 1" = 100' or less (for major projects)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Vicinity/location map	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Legal description of property	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Location and physical limits of each proposed earth change	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Location and physical limits of all temporary soil stockpiles	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Location and description of all predominant land features and landmarks	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Location and perimeters of all existing buildings and structures	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Location of all tree lines and forested areas	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Locations and descriptions of soil types	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Proximity of proposed earth changes to surface water within 500 feet of earth changes.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Location of all existing and proposed on-site drainage facilities (ditches, catch basins, etc.) and dewatering facilities (used for pumping and filtering water from basement excavations, ponds, wetlands, etc.)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	2' contour interval lines extending 50' beyond property line describing current and proposed site contours (for major projects), or general slope information (for minor projects)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Location and description of all proposed temporary and permanent soil erosion and sedimentation control measures, including silt fences, inlet protection, stone check dams, erosion control blankets, seeding, etc.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Program proposal for the continued maintenance of all permanent soil erosion and sediment control measures (e.g. on-site catch basins; detention/retention ponds; grass, mulch, or other ground cover) that remain after project completion, including person(s) responsible for maintenance	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Schedule of street sweeping (for major projects)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Copy of Master Deeds (for residential developments)	<input type="checkbox"/>

Date	Insp.	Contact	Notes
/ /			
/ /			
/ /			
/ /			



MAILING ADDRESS:
Western County Service Center
Soil Erosion Division
P.O. Box 8645
Ann Arbor, MI 48107-8645
 eWashtenaw.org

BUSINESS LOCATION:
Washtenaw County
Western County Service Center
705 N. Zeeb Rd.
Ann Arbor, MI 48103
Phone: (734) 222-3888
Fax: (734) 222-3930

Soil Erosion Permit Transfer

(and SESC Certificate of Occupancy Authorization)

◆ IDENTIFICATION

Permit # _____

Property Address _____ City/Village/Twp _____
(CIRCLE ONE)

Current Landowner*:

Name _____ Address _____
 City _____ State _____ Zip _____ Phone (_____) _____

◆ WILL A TRANSFER OF PERMIT OWNERSHIP BE OCCURRING? Yes No

If yes, complete the following:

Planned Date of Soil Erosion Permit Transfer: ____/____/____
(e.g. today's date, expected date of closing, expected date of final grade)

Has a Final Grade Been Established? Yes No

(WARNING: if a transfer is occurring and a final grade has not yet been established, the new landowner may not be able to stabilize soils and will be responsible for inspection fees. If no transfer is occurring, the builder will continue to be subject to inspection fees until a transfer form with new homeowner information and signature is received by this office.)

New Landowner*:

Name _____ Address _____
 City _____ State _____ Zip _____ Phone (_____) _____

◆ SIGNATURE OF CURRENT LANDOWNER*

The current Landowner*, as designated above, hereby attests that the property currently meets all soil erosion permit standards and requirements of Washtenaw County, and, if ownership of the permit is to be transferred, acknowledges that Washtenaw County will not transfer the ownership of the permit until the planned date of transfer has been reached and all outstanding soil erosion permit fees due on the property have been paid.

Signature of Current Landowner*

Date

◆ SIGNATURE OF NEW LANDOWNER* (if permit transfer is to take place)

The **new landowner***, as designated above, agrees to take over maintenance of soil erosion control measures, including lawn installation. By signing this document the new landowner is certifying that they have received, read and understand both the Soil Erosion & Sedimentation Control Program Guide (available on the county web site and at our Program Office) and a copy of the Soil Erosion Permit for which they will be responsible. The new property owner also agrees to take over all fees that will be applied to this permit after the date this properly completed permit transfer form is received by WC SESC with both required signatures, and with all fees paid through that date. The new property owner will not be held responsible for unpaid balances incurred prior to the date of transfer.

Signature of New Landowner*

Date

*OR DESIGNATED AGENT. AGENT MUST HAVE A WRITTEN STATEMENT FROM LANDOWNER AUTHORIZING HIM/HER TO SECURE A PERMIT IN THE LANDOWNER'S NAME.

◆ WASHTENAW COUNTY SOIL EROSION & SEDIMENTATION CONTROL (FOR OFFICE USE ONLY)

Received By (WC Representative) _____ Date Received _____ Fees Due _____ Permit Transfer Date _____

Why is a Soil Erosion Permit Transfer Required?

In accordance with state and local ordinances, a soil erosion permit is required for this site until permanent stabilization occurs and final approval has been obtained. When a change of ownership takes place prior to the establishment of permanent stabilization (e.g. vegetation), a soil erosion permit must be obtained by the new owner. The new owner is provided with the choice of applying for a new permit or transferring the existing permit into their name.

The benefits of a Soil Erosion Permit Transfer allows a builder to transfer the existing permit to the new owner saving their customer the initial fee of applying for a new permit. A transfer will release the builder of their soil erosion permit responsibilities while supporting environmental cooperation and compliance with the County. By cooperatively working together we will be able to preserve and protect our natural resources.

The Builders Role

If you are receiving this transfer form, your builder is acknowledging that the site is currently in good standing with the SESC Program. **The site must be in compliance and all accounts must be paid by the builder prior to permit transfer.** The builder must also provide a copy of the permit being transferred to the new owner.

The New Owners Role

The new owner is responsible for taking over all maintenance of soil erosion control measures including permanent stabilization. They are also agreeing to take over all fees that may apply to this permit in the future. The new landowner will **not** be held responsible for unpaid balances incurred prior to the date of the Soil Erosion Permit Transfer. **If the new landowner does not wish to or is unable to take over an existing permit, a new permit must be obtained by the new owner. This new permit will remain active until permanent stabilization and final approval have been obtained.**

Inspection Process & Fee Structure

The SESC Program Staff will perform monthly (major projects) or bi-monthly (minor projects) inspections and issue invoices to each permit holder based on the amount of acreage disturbed on site at the time of inspection. Based on the area disturbed, each project will be assessed in accordance with the following:

Minor Project (single family residential, etc.) **\$50.00 bi-monthly** for each acre disturbed
Major Project (commercial, etc.): **\$65.00 monthly** for each acre disturbed

Areas disturbed will be rounded up to the nearest whole acre.

Refer to the Soil Erosion & Sedimentation Control Program Guide for more information or contact SESC Program Staff at 734-222-3888 or visit us on the web at eWashtenaw.org.



Washtenaw County Building Services Department Soil Erosion Division Staff

Main Line	Soil Erosion Division	734-222-3888	
Fax Line	Soil Erosion Division	734-222-3930	
Beverly Barton	Soil Erosion Division Director	734-222-3863	bartonb@eWashtenaw.org
Jamie Kryscynski	Soil Erosion Control Officer	734-222-3921	kryscynj@eWashtenaw.org
Chris Benbow	Soil Erosion Control Officer	734-222-3871	benbowc@eWashtenaw.org
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Bill Fults	Soil Erosion Control Program Assistant	734-222-3816	fultsw@eWashtenaw.org
Marlene Todd	Soil Erosion Permit Coordinator (Accounting)	734-222-3829	toddm@eWashtenaw.org

REV. 1/03

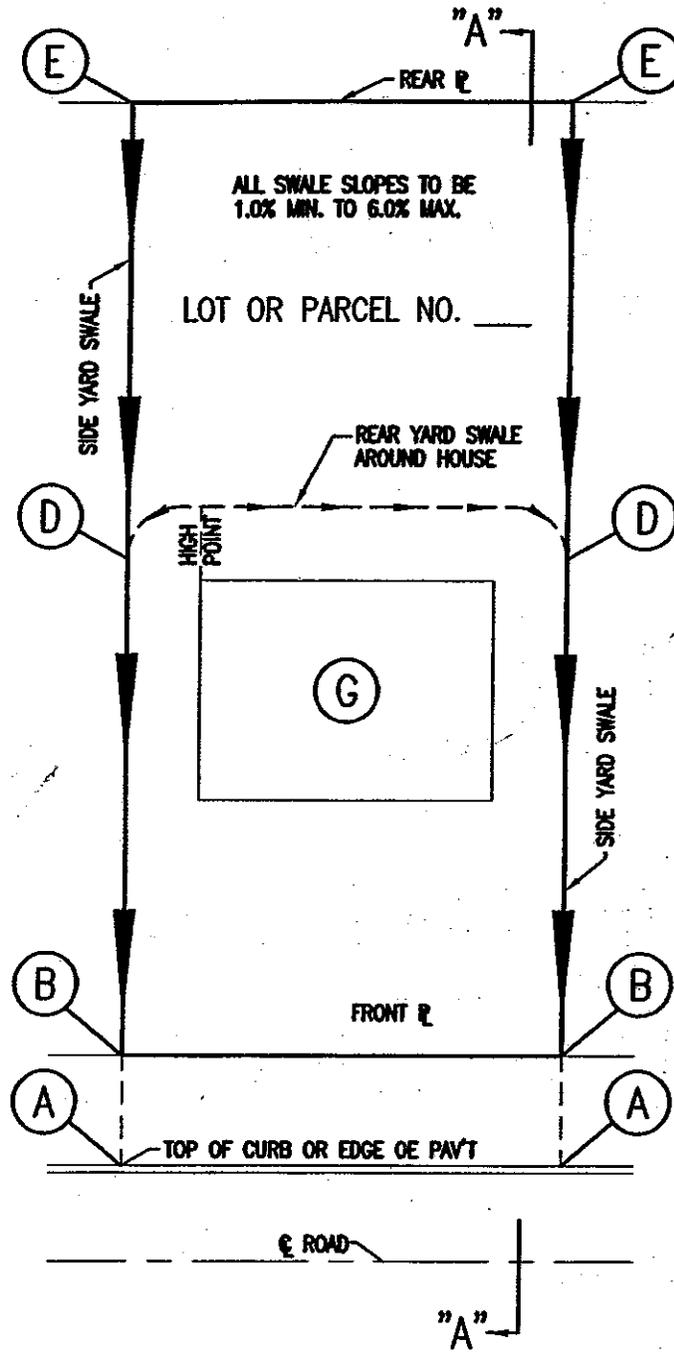
NOT USED...

(This form must be completed and signed to transfer billing and maintenance responsibilities from one party to another. May be required to issue a WCBD Certificate of Occupancy, even if no transfer of ownership takes place at that time.)

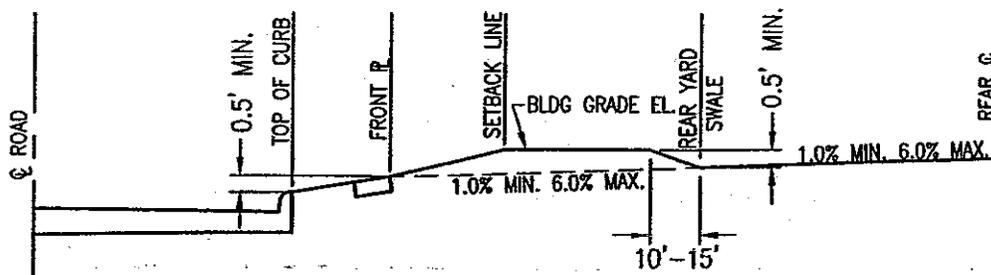
APPENDIX V

Standard Lot Grading Details

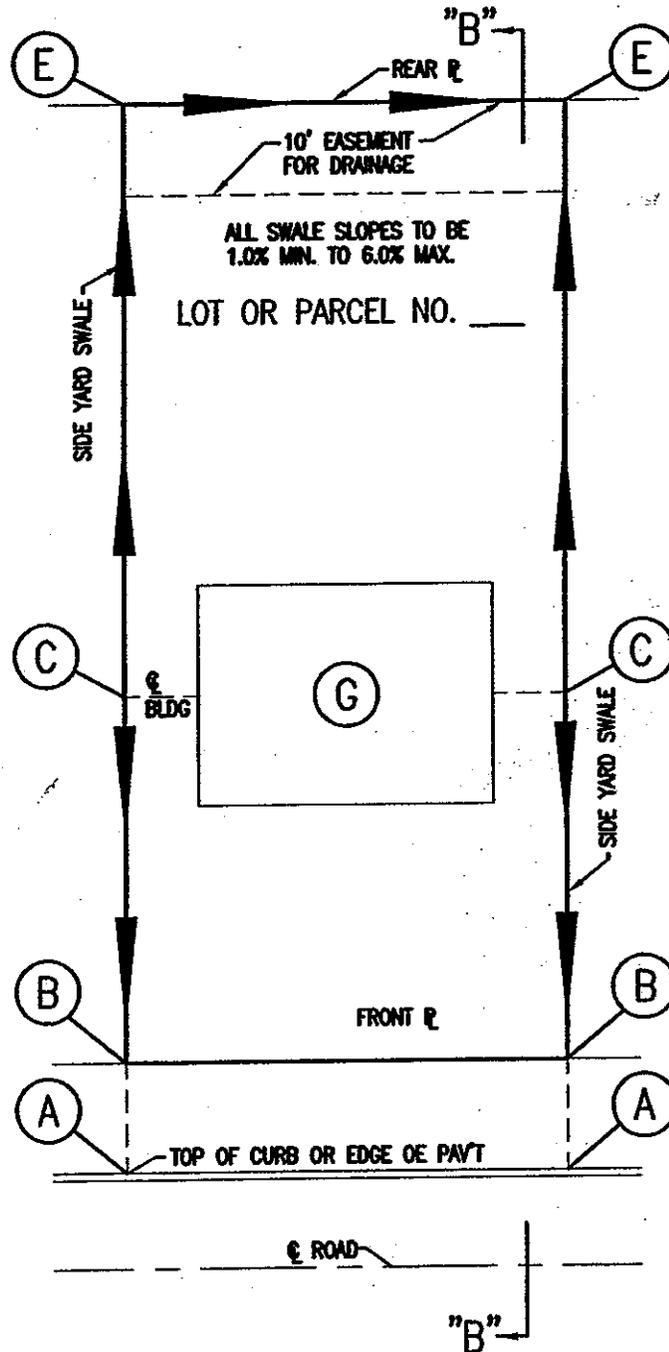
STANDARD LOT GRADING-DETAIL A



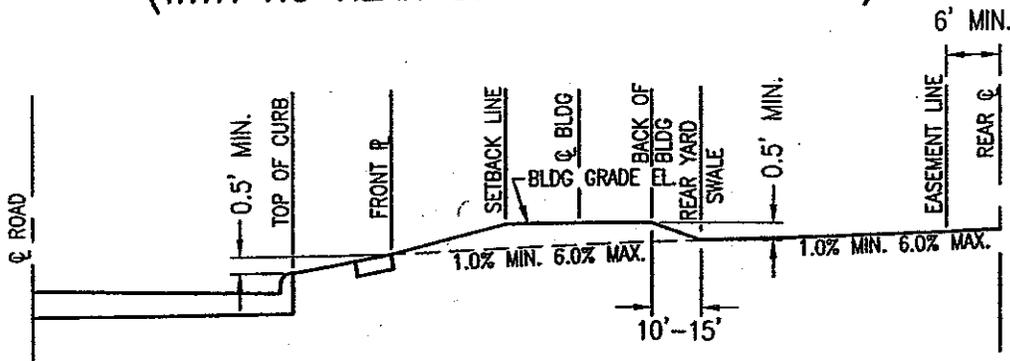
REAR TO FRONT DRAINAGE
(REAR SWALE CONTROL AT HIGH SIDE OF HOUSE)



STANDARD LOT GRADING-DETAIL B



FRONT TO REAR DRAINAGE
(WITH NO REAR SWALE AROUND HOUSE)



APPENDIX VI

Site Grading / Setback Certification Form

**CHARTER TOWNSHIP OF SUPERIOR
3040 N. PROSPECT ROAD
YPSILANTI, MI 48198**

Phone (734) 482-6099
Fax (734) 482-3842

Date: _____

Richard J. Mayernik, C.B.O.
Charter Township of Superior
3040 N. Prospect
Ypsilanti, Michigan 48198

SITE GRADING / SETBACK CERTIFICATION

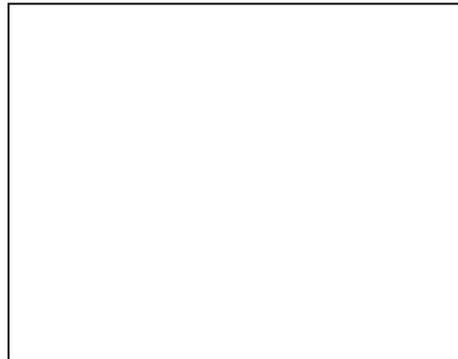
Regarding: Development: _____
Owner's Address: _____
Telephone: _____
Building Permit Number: _____

I certify that I have checked the distances from the side, rear, and front lot lines of the building(s) as well as building elevations, site and easement grades and find that the construction conforms with the Township approved engineering plans, except as specifically noted below.

Printed Name of Professional Land Surveyor

Michigan Registration Number

Date



Seal and Signature of Professional
Land Surveyor

Cc: Rhett Gronevelt, Orchard, Hiltz & McCliment, Inc., 34000 Plymouth Road, Livonia, Michigan 48150

APPENDIX VII

Retaining Wall Design Form

Date: _____

Richard Mayernik, C.B.O.
Charter township of Superior
3040 N. Prospect
Ypsilanti, Michigan 48198

Regarding: Retaining Wall Review for: _____
S.T.P.C. #: _____
Sidwell #: _____

Design Engineer and Firm: _____

Address: _____

Phone: _____ Fax: _____

A retaining wall(s) is proposed for the above referenced site. The wall(s) was designed to applicable standards, and all necessary loads (including vehicular surcharge) have been incorporated into the design. In addition, the wall meets minimum factors of safety against both overturning and sliding.

A retaining wall detail has been incorporated into the drawings and has been submitted for review.

Printed Name of Professional Land Surveyor

Michigan Registration Number

Date



Seal and Signature of Professional
Land Surveyor

Cc: Rhett Gronevelt, Orchard, Hiltz & McCliment, Inc., 34000 Plymouth Road, Livonia, Michigan 48150

APPENDIX VIII

Washtenaw Co. Guidelines for On-site Sewage Disposal Systems



Washtenaw County

**Department of Environment and Infrastructure Services
Environmental Health Division**

**ENGINEERING GUIDELINES
FOR ON-SITE SEWAGE
DISPOSAL SYSTEMS**

705 North Zeeb Road
P.O.Box 8645
Ann Arbor, MI 48107-8645
Phone: 734-222-3800

January 25, 2002

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INTRODUCTION

This engineering guideline is a result of our continuous effort to provide up to date information regarding on-site sewage and water supply systems in Washtenaw County. Through this revision, it is our hope to capture the changes and modifications that have been introduced in recent years in one single engineering guideline.

Further modification to this document is to be expected as the need arises in the future. The use of technology-based on-site sewage treatment and disposal systems are expected to be on the rise, as the demand of such systems becomes a necessity. Our commitment to use technology-based systems will be demonstrated in future guidelines and design manuals.

The Engineering Guidelines are specifically applied for residential sites. Non-residential properties may need to adhere to the Michigan Department of Environmental Quality publication titled "Michigan Criteria for Subsurface Sewage Disposal System".

The Washtenaw County Regulation for the Disposal of Sewage and Human Excreta provides for non-conventional sewage systems. Section 4:6 states "Nothing contained herein shall prevent the use of special construction methods to develop subsurface, permeable soil formations or use of other techniques providing the engineering design of such systems is first approved and their operation is in accord with the standards of Article II, Section 2:3".

A copy of this engineering guideline and other information can be obtained from our website at www.co.washtenaw.mi.us/depts/eis/htm#eh.

I want to acknowledge the assistance of our staff at the Washtenaw County Environmental Health Division (WCEHD) and consulting engineers in private practice for their support and review of this document. Their effort is greatly appreciated.

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Washtenaw County Environmental Health Division
Date: January 25, 2002

I. PERMITS REQUIRED

On-site sewage and water supply system permits are required for all new single-family residences not connected to a public system, as well as all new on-site sewage systems of less than 10,000 gallons per day, which do not have a Michigan Department of Environmental Quality (MDEQ) discharge permit.

In addition, under Section 3:3 of the Washtenaw County code, permits are required on existing premises with an on-site sewage system where a substantial increase in size or change in water use is proposed. When any alterations to a structure with an on-site sewage system are proposed, the existing sewage system must be reviewed by the WCEHD to determine if it is adequate for the intended use. On-site wells and sewerage systems serving more than one property owner must meet the requirements of Act 98, Public Acts of 1913 as amended, and current requirements of the WCEHD.

II. AVAILABILITY OF PUBLIC SEWER

A public sewer shall be used in place of on-site sewage systems when permission can be obtained for connection from the municipality and it is possible to connect from an engineering standpoint. Prior to evaluation of the site where the availability of the sewer is in question, a statement regarding the availability of the sewer must be obtained from the appropriate governmental entities.

Act 368, P.A. 1978 as amended by Act 421, 1980 defines an available public sewer system as “a public sewer located in a right-of-way, easement, highway, street, or public way which crosses, adjoins, or abuts upon the property and passing not more than 200 feet at the nearest point from a structure in which sanitary sewage originates”. For further information and definitions refer to MDEQ publication titled “The Michigan Criteria for Subsurface Sewage Disposal”, dated April 1994, Appendix B, Page 20.

III. ENGINEERING INVOLVEMENT

Where buildings other than single-family dwellings are to be constructed, a registered engineer or architect, registered to practice in the State of Michigan, shall design the sewage system. Plans must be signed and sealed by the registered Professional Engineer. Where the cost of the total project is \$15,000 or greater, Act 299, P.A. of 1980 requires that plans be submitted by a registered Professional Engineer only.

For single-family dwellings, the WCEHD requires an engineering plan when site conditions are such that a standard on-site sewage system could not be

installed or where site conditions are unsuitable for any of the conventional installations. Some examples of situations where engineers must be involved are:

- A. Design and construction of Modified Fill Type Drainfields (MFTDF)
- B. Sand filter systems
- C. Where multiple splits are proposed (5 splits or more each is five acres or less)
- D. Where drainage is required to lower high water table
- E. Where unusual topographical conditions exist between the house and the drainfield
- F. When a system is to serve more than two families on a property under one owner
- G. Where a non-standard sewage system design is proposed
- H. All new pumped sewage systems and all pressure distribution network for new and replacement systems

*On existing homes, provided no significant changes are to be proposed on the system and provided that the Pump Data Sheet (**see Appendix IX**) is completed and signed by the homeowner or his legal assigned representative, WCEHD staff may generate a pump design system curve that can be used to purchase a pump capable of meeting the demand of the system.*

IV. PLOT PLANS

A plot plan should be drawn to a scale of one-inch equals 40 ft or larger. On large parcels an enlargement of the drainfield area at one-inch equals 40 ft could be provided with the location shown on an outline of the entire parcel.

Unless the topography of a given site dictates otherwise, grading and cross sections are not routinely required on a plot plan. They are necessary on fill type fields, built up fields, and some other special designs.

When installing a drainfield, well or septic tank, minimum isolation distances as indicated in the following chart must be met.

ISOLATION	SEPTIC TANK	DRAINFIELD	WELL
Property line	10 ft	10 ft	—
Building foundation (no basement)	5 ft	10 ft	3 ft
Basement wall	10 ft	15 ft	3 ft
Residential water supply 25 feet or deeper	50 ft	100 ft	—
Lake or stream	25 ft	50 ft	—

Isolation distances may be increased as required for wells serving other than individual dwellings or if the wells are drawing water from an unprotected aquifer. A well shall not be located in an area subject to flooding. No swimming pool shall be located within 20 ft of any drainfield or its expansion area. Other isolation distances shall conform to Part 127 of Act 327 known as the Groundwater Quality Control Act.

V. SATURATED FORMATIONS

If a saturated sand formation is encountered, a sufficient number of test holes shall be dug to confirm:

- A. Area of consistent sand formation a minimum of 3 ft thick
- B. The degree of saturation throughout the area (Are portions of the formation dry?)
- C. Color and texture indicators of the soil formation
- D. Water table elevation in relation to the sand formation [ideally no less than one (1) hour after hole has been exposed] and confining layer, if any

In general, formations that show sufficient thickness of at least 3 ft, have dry areas or brown/bright colored sand, and a water table that does not rise into the confining layer, can be approved by the sanitarian. Saturated formations under hydraulic head shall be denied.

Sand formations that cannot be confirmed as to thickness of formation, or cannot demonstrate a uniform formation over at least a 4000 sq ft area will be denied regardless of the degree of saturation. This minimum area may be increased depending on the proposed use and the texture of sand encountered.

VI. SEASONAL HIGH-WATER TABLE EVALUATION AND PROPOSALS TO LOWER HIGH GROUNDWATER ELEVATION

In cases where soil mottling indicates a seasonal high water table (SHWT) in the upper 12 inches of the soil, the parcel is to be denied. The owner may elect to install site drainage improvements or perform a seasonal high water table evaluation using monitoring tubes. This procedure shall be followed when site drainage improvements are proposed to lower the SHWT elevation or in instances where only monitoring wells are installed. This procedure and accompanying diagram (Appendix VI) must be followed explicitly to help assure accurate, reliable results.

1) Monitoring high groundwater elevations shall be done during the normally wettest time period of the year and at least from February 1 to June 1. Any of the following persons shall provide monitoring results to the department:

- a) A licensed professional engineer
- b) A professional surveyor
- c) A registered sanitarian
- d) A certified professional geologist
- e) A certified professional soil scientist

2) The designated person shall monitor high groundwater elevations by placing a monitoring well at representative locations approved by the department. The designated person shall make observations on the first day of the monitoring period and at least once every 7 days thereafter until the monitoring period is complete.

3) The designated person shall provide representative precipitation data for the time period of September 1 to May 31. Results of high groundwater elevation monitoring are inconclusive if recorded precipitation totals are less than 90% of normal averages during the time period of September 1 to May 31.

Site Drainage Improvement

Systems to lower the water table should be attempted only as a last resort as they are frequently ineffective in permanently lowering the water table. The drainage system shall be at least 20 ft from the drainfield and expansion area.

Engineering plans prepared by a Professional Engineer showing the proposed design of the under-drainage system must be submitted to this office for review and approval prior to construction. Approval from the County Drain Commissioner or other responsible governmental agency may be required if drainage is to be directed to drains designated as "County Drains".

If the water table has not been lowered to provide at least 12 inches of naturally existing permeable soil above the high water table, a permit will not be issued. The design engineer shall substantiate that high groundwater elevation has been lowered to meet the requirement of Section 4:8 of the sewage code.

Refer to the most recent literature distributed by the Natural Resources Conservation Services on material specifications of agricultural drain tiles.

Suggested Monitoring Tubes Installation Procedure

A. Monitoring tubes must be installed prior to February 1st

- B. Bore at least 2 ft into the permeable sand formation and set a minimum of three (3) monitoring tubes in the 4,000 square foot area provided that one tube be set at the lowest drainfield elevation. (Ex. 40' X 100' or 50' X 80'). Four-inch diameter tubes are recommended, but two-inch diameter tubes would be an acceptable minimum
- C. The tubes shall be rigid, smooth wall plastic pipe (no corrugated tubing) and must be perforated from the bottom to within 12 inches of ground surface and solid pipe above that. Tubes must extend not less than 18 inches, and not more than 36 inches above grade
- D. Backfill around monitoring tubes with pea stone to the top of the permeable formation, then backfill with spoils to grade. Mound clay around the tubes at grade to divert surface water away from the tubes. Note: A geotextile material silt sleeve may be substituted for the stone as long as coarse sand is allowed to collapse around the sleeved, perforated portion of the monitoring tube
- E. Easily removable caps are required on all tubes

Installation of monitoring tubes is the responsibility of the owner or engineering firm hired by the owner. In the case of an engineering firm doing the monitoring, these tubes must be set by the engineering firm or installation supervised by them. Improperly set monitoring tubes may result in false evaluations. Consequently, if it is determined by the field sanitarian that tubes were improperly set, denial of the parcel will be upheld.

Applications for seasonal high water table evaluations shall be submitted not later than February 1st of the evaluation year. Applications made after this time will not be accepted. Furthermore, applications shall not be accepted without a prior soil evaluation having been conducted by this office. The application shall be accompanied by a plan showing all proposed monitoring wells location and any previously existing farm tiles on the property. WCEDH will conduct independent site visits to check monitoring tubes on a periodic basis.

VII. SURVEYS AND EASEMENTS

Section 2:4 of the sewage code requires a sewage system to be wholly located upon the property served. The best practical way to ensure this is to have a formal certified survey completed.

A. Boundary Surveys

Boundary surveys that are prepared, signed and sealed by a Registered Land Surveyor are required on the majority of parcels not in an approved subdivision or site condominium. Exception may be granted on large

parcels or 10-acre parcels located on an identifiable section line and corner. Lots in subdivisions may require a boundary survey where lot lines are not identifiable in the field. In general, a boundary survey will be required when:

1. The property is 40 acres or smaller in area
2. The property is not a part of a platted subdivision or a site condominium
3. Soil test pits are in close proximity to the property line
4. The property is a lake lot or located in densely populated areas

If work is performed on property that is intended to be split, WCEHD may withhold soil approval until a legal survey is submitted showing the accurate soil test pit location in relationship to the new property lines formed by the parcel split(s). Additionally, sewage systems may not encroach upon any type of easement (utility, ingress, egress, drain, etc.).

Where property lines are readily evident for existing homes, a survey may not be required.

B. Easements

Easements for on-site sewage and groundwater supply systems will generally not be accepted, but may be approved on a case-by-case basis after review by WCEHD staff. Easements or gerrymandering of lot lines that result in systems not in close proximity to the homes served will not be accepted. Variances to this policy may still be sought from the Washtenaw County Health Board Appeals Board-Public Health Advisory Committee (WCHCAB/PHAC).

C. Seasonal Use

In certain instances where the property is not large enough to comply with installation requirements or that does not permit use of a residence on a year round basis, the WCHCAB/PHAC has considered occupancy on a seasonal basis through the use of a "Seasonal Use Agreement". A Seasonal Use Agreement is a signed document, recorded with the Register of Deeds, and runs with the land as a restriction on that property, limiting occupancy to approximately six months of the year. The procedure is to have the Seasonal Use Agreement drawn up along with any supporting plans or documents required, submitted to the WCHCAB/PHAC for approval, and signature, and then recorded by the owner with the Register of Deeds. The Seasonal Use Agreement would set forth any conditions or requirements on the use of that property as relates to a sewage system or a water supply system.

VIII. DRAINFIELD CONSIDERATIONS

A. Backfill Sand

If the excavation is at such a depth that it will require backfilling, then the sand backfill shall meet the specifications provided in section XV of this document. "Bank run" material must undergo sieve analysis to determine acceptability prior to use. A copy of the sieve analysis must be provided to the WCEHD.

B. Installation

1. Excavating should not be done when the soil is wet since open surfaces may be "smeared", and compacted or otherwise have absorption characteristics negatively affected
2. Any water encountered during excavation must be removed at the time of the excavation inspection
3. The header must be leveled with watertight joints
4. The drainfield pipe lines between the header and the footer must be 4 ft on center and should not exceed 60 ft in length for a gravity system. If for any reason the length of the pipe is to exceed 60 ft in length, a dosing mechanism must be utilized
5. Drainfields may not be placed under driveways or paved areas
6. Drainfield pipe should be laid nearly level with no more than 1-in fall /50 ft
7. Drainfield stone in a vertical cross-section must be added as follows: 4 inches under the pipe lines; 4 inches beside; and 2 inches over, for a total thickness of 10 inches. For other than residential applications, the stone shall be a minimum of 12 inches in thickness, with 6 inches of stone beneath the pipe
8. In instances where a sewer line crosses a driveway or a drainage ditch, "sleeving" of the sewer line will be required

For further detailed information on drainfield construction, please refer to General Construction Requirements.

C. Stone

The stone used in the construction of the drainfield shall be 6-A stone and shall meet the specification provided in section XV of this document. **Crushed 6A limestone is not acceptable.**

D. Sewer Line Slope

The sewer line from the house to the septic tank shall meet the Plumbing Code of the Building Department having jurisdiction. The sewer line between two tanks and from the tank to the drainfield shall be sloped at a minimum fall of 1%. If this minimum fall cannot be attained, then the septic tank(s) should be reset at a higher elevation or a pump system must be considered.

E. Clean-Outs

Clean-outs shall be provided at every 80 ft of the sewer line connecting the tanks and the drainfield. The clean-out shall consist of a sweep tee fitting or a "WYE" and a riser slightly above grade with a threaded cap.

F. Cover

The drainfield shall have a minimum of one(1) ft and a maximum of two (2) ft of cover over the stone. The cover should be uncompacted loamy sand, mulched and seeded to provide vegetative cover. The final grade shall be completed in such a manner to prevent ponding and divert surface runoff away from the drainfield area.

G. Inspection Ports

Monitoring ports are highly recommended and sometimes required to be installed to allow evaluation of the performance of the drainfield once it is in operation. These ports are usually 4-inch diameter plastic PVC pipe perforated with ½ inch holes over the lower 6-inch length. The inspection port opening at the soil surface is covered with a friction fit or screw cap. Refer to Appendix X for further information on port installation.

I. Diverter/Alternator Valves

These valves, if required, shall be properly housed and installed. A riser would be required to facilitate easy access for repairs and maintenance.

IX. SEPTIC TANKS

The invert inlet of a septic tank shall be a minimum of three inches above the liquid level in the tank. An outlet tee or baffle shall extend below to the middle third of the liquid level and above the liquid level to within one inch of the top of the tank.

At a minimum, septic tanks shall have either two (2) separate single compartments tanks or one dual compartment. For dual compartment tanks, the first tank volume should be 2-3 times the capacity of the second.

When tank capacity exceeds 1800 gallons, two (2) tanks in series are highly recommended.

Septic tank lid(s) are required over all inlet/outlet baffle or tees. All dual compartment tanks shall have separate lids or a common one over the partition wall to provide easy access to both compartments.

It is advised that the tank supplier be consulted in instances where tank location is subject to vehicular traffic or excessive earth pressure. Such cases may necessitate additional reinforcement of the tank(s) to avoid structural failure.

Septic tanks other than precast concrete may be installed if site conditions restrict or prohibit the installation of a precast concrete tank. However, WCEHD approval is required prior to installation.

When the top of a septic tank is deeper than 18 inches below the ground surface, it shall have a manhole to bring the depth of the manhole to within 18 inches of the top of the ground for access. If located under a paved area, the manhole shall be flush with the pavement surface and surface water shall be diverted away from the manhole.

All septic tanks must be placed in an area and at an elevation that will allow for ease of maintenance and service.

All septic tank outlet/inlet seals must have pre-cast seals that meet **ASTM Standards C-923**. Mastic tar, mortar, cement or other seals are not acceptable.

The following chart describes the size requirement for a typical on-site sewage system in Washtenaw County. Sizes are based on estimated sewage flows utilizing the number of bedrooms as a basis of occupancy capacities.

TYPICAL SEPTIC TANK AND DRAINFIELD SIZES

(SINGLE FAMILY DWELLINGS)

Number of bedrooms	Total septic tank capacity (Gallons)	Drainfield size (sq.ft.). Coarse sand and gravel	Drainfield size (sq.ft.). Clean med sand	Drainfield size (sq.ft.) Fine/loamy sand	Fill type drainfield
2	1500	800	1000	1500	2500
3	2000	1000	1200	1800	2880
4	2500	1200	1600	2000	3200
5	3000	1600	1800	2200	3500
6	3500	1800	2000	2500	3500

The above listed sizes are for primary drainfield areas. The total drainfield area required is the sum of the primary and reserve areas. The reserve area is 1.5 times that of the primary drainfield.

Effluent filters are highly recommended and may be required on certain sites and alternative on-site sewage systems. Refer to manufacturer's recommendation. In some instances, they may be required at the discretion of the health officer or his representative.

Each additional bedroom shall increase septic tank capacity by 500 gallons and drainfield by 300 square feet.

Tank Tightness Test

Tank tightness testing is a method used to determine whether a septic tank and/or pump chamber leaks. In certain instances, WCEHD will require tightness testing as a permit condition. Typically, such instances would include engineered/alternative septic system installations, and locations where tank placement into saturated soils is likely. The testing shall be conducted in accordance with American Society for Testing and Materials (ASTM) Standard C1227, Section 9.2 Testing for Leakage (9.2.1 *Vacuum Testing* – Seal the empty tank and apply a vacuum to 2 in. or 50 mm of mercury. The tank is approved if 90% of vacuum is held for 2 minutes. 9.2.2 *Water-Pressure Testing* – Seal the tank, fill with water, and let stand for 24 hours. Refill the tank. The tank is approved if water level is held for 1 hour.) In the event that a tank or chamber fails testing, repairs or replacement shall be required to the extent necessary to resolve the leaking condition.

Tank First

In certain areas where a SHWT is encountered, it may be necessary to install a septic tank(s) prior to issuance of a sewage permit. The purpose of this is to assure that the tanks are set at the proper elevation to support gravity flow from the tanks to the drainfield. If the WCEHD requires that the tank(s) be installed prior to issuance of a sewage permit, the homeowner would be informed via a letter or a written report may be left in the field.

X. WASTEWATER FLOWS

Wastewater estimates are based on the number of bedrooms in the house. It is always estimated that each bedroom will generate 150 gal/day (GPD). This is based on 75 gal/person and 2 persons per bedroom. For example a 3-bedroom home will generate 3*150 or 450 GPD.

Wastewater estimates for developments other than a single-family dwelling shall be obtained from Table 1 or Appendix C of the Michigan Criteria for Subsurface Sewage Disposal.

XI. PUMP AND HAUL POLICY STATEMENT

Pump and haul for new developments shall not be permitted except as an interim measure when municipal sanitary sewer or approved on-site sewage disposal system are under construction. Pump and haul facilities to serve existing developments may be permitted only if all other alternatives for sewage disposal have been thoroughly investigated and are determined to be unavailable and unsuitable.

Once a proposal and an application for a pump and haul are submitted and reviewed by WCEHD staff, and the proposal is found acceptable, this department shall issue a permit.

The following are required as part of the proposal:

1. Design of the on-site storage facility
2. The size of the tank(s) and all proposed alarms
3. Written description of how the storing, transporting and disposing of sewage will be accomplished
4. A contingency plan to be followed should a break down occur
5. Contracts of agreements necessary to assure the continuity of a satisfactory operation
6. Completed forms of MDEQ Water Resources Commission application for pump and haul

XII. Proposed Multiple Splits

Regardless of the number of splits proposed, the developer is encouraged to consult with the WCEHD before final plans are prepared. This preliminary free consultation will examine the potential utilization of the site for on-site sewage and groundwater supply systems. The Division will make initial recommendations utilizing the following:

- Examination of existing available records
 - Soil maps
- Well information of surrounding homes
- Municipal sewer and water plans
 - Other available records

A. Proposed Parcel Splits (less than one acre)

All parcel splits resulting in development sites that are less than 1 acre in size shall be approved under MDEQ Administrative Rules (R560.401 to R560.428) of on-site water supply and sewage disposal for Land Divisions and Subdivisions.

B. Proposed Parcel Splits of Five (5) or more Parcels (each is less than 5 acres in size)

The following items are required as part of the initial submittal prior to conducting a site visit:

- ❑ A site plan that shows the proposed parcel layout and individual lot area
- ❑ Legal description of the property and parcel ID number
- ❑ Clear, legible contour lines with either 1 ft or 2 ft increments shall be submitted to this office if the site exhibits severe topographical changes
- ❑ All streams, drains and ponds that are contained on or within 50 ft of the proposed development are to be shown on the plans
- ❑ All easement and utility lines are to be shown on the plans
- ❑ The 100-year flood plain of streams, if any, must be shown on the plans
- ❑ Any existing wells, septic tanks and/or drainfields must be shown on the plans
- ❑ Completed application along with the applicable fees for soil evaluation
- ❑ Location of any proposed roads or driveways
- ❑ Location of any known contaminated sites within 800 ft from proposed splits

B.1. Soil Evaluation

Call the WCEHD to schedule a site visit to determine soils suitability of the proposed splits. It is the responsibility of the engineer/surveyor to accurately locate all soil test pits on subsequent plans given to this office for approval. It is the responsibility of the owner/developer to hire an excavating contractor to dig the test pits.

B.2. Grading of Drainfield Areas

If the drainfield area is to be located on slopes in excess of 6%, it is the responsibility of the developer to have engineering plans showing the proposed grading of each drainfield area. The grading plan must be reviewed and approved by this office prior to commencing the work. In some instances, it may be required to have the grading completed and certified by the engineer prior to issuing a sewage permit on the property.

B.3. Test Well Requirements

To ensure that a proper groundwater supply in terms of quantity and quality is available, a minimum of one test well must be drilled.

B.3.1. Number of Test Wells

The number of test wells required is dependent on the number of parcel splits proposed. The table below summarizes the number of test wells required:

NUMBER OF PARCELS	NUMBER OF TEST WELLS
5-10	1
11-20	2
21 and up	3

B.3.2. Test Well Development

1. The test well shall be a minimum of 4 inches in inside diameter
2. An accurate well log describing the formation and related information as required under Act 368 must be submitted to the WCEHD for review and approval
3. The well should be drilled to a minimum depth of 50 ft with a 10 ft protective clay layer above the aquifer being utilized. The clay layer shall extend at least 25 ft from ground surface. If a protected aquifer cannot be obtained as described above, then the well must be drilled to a minimum of 100 ft in depth, with 50 ft of well screen submergence below the static water level

B.3.3. Pump Test

The well shall be pumped until clear. A pumping test shall be made with the pumping rate and the pumping level noted. A minimum of a 4-hour pump test is required with a minimum yield of 10 GPM. A drawdown and recovery table must be submitted to this office by the well driller. All test wells must be drilled by a State of Michigan registered well drilling contractor.

A recommended schedule for drawdown measurements from the start of pumping is:

- a. Every minute for the first 10 minutes
- b. Every 2 minutes from 10-20 minutes
- c. Every 5 minutes from 20-30 minutes
- d. Every 15 minutes from 30-60 minutes
- e. Every 30 minutes from 60-180 minutes
- f. Every 60 minutes from 180 minutes to the end of the test

A recommended schedule for recovery is:

- a. Every 2 minutes for the first 10 minutes
- b. Every 5 minutes from 10-30 minutes
- c. Every 15 minutes from 30-90 minutes
- d. Every 30 minutes for the next 2 hours
- e. Every 60 minutes through the end of the test

B.3.4. Water Samples

In general, all test wells shall be tested for partial chemical analysis upon completion. If the development is located in an area where other tests are warranted, then those samples shall be collected as outlined in the permit condition sheet for the test well. The following parameters are defined as partial chemical analysis:

Parameter	MCL
Chloride	250 mg/L
Fluoride	4.0 mg/L
Hardness	<200 mg/L
Iron	0.3 mg/L
Nitrate	10 mg/L
Nitrite	1.0 mg/L
Sulfate	250 mg/L
Specific Conductance	850 mmhos
Arsenic	0.05 mg/L

C. Unconfined Aquifers and Drainfields

If the test well(s) or available water well records show that a protected aquifer does not exist, a certified hydro-geologist or a professional engineer shall complete an area study of all wells within 500 ft from the proposed development. Such a study will evaluate the following:

- The impact of the proposed development on the groundwater supply
- The general and local direction of the groundwater flow
- Proposed isolation distances based upon groundwater flow direction

Upon completion of such study, a written report shall be submitted to this office for review and approval/denial.

D. Final Approval

A final approval letter for each individual proposed parcel will be issued when the following are completed:

1. Soils are investigated and approved by a representative from this office
2. Groundwater information and samples are submitted to this office as outlined above
3. A legal description and a certified survey for the parcel(s) in question shall be prepared by a Registered Land Surveyor and submitted to this office
4. A plan showing the location of the test holes, along with a soil log describing the formation encountered, must be submitted to this office
5. An overall grading plan of both the site and the drainfield areas, if required, shall be submitted to this office for review and approval
6. If other work, such as well studies and seasonal high water table evaluations are required, they shall be completed in accordance with existing established guidelines prior to issuance of the WCEHD letter

XIII PUMP SYSTEMS FOR ON-SITE SEWAGE DRAINFIELDS

A. Introduction

A pump system (a pump and a dosing chamber) is used to elevate treated septic tank effluent to a drainfield. A pump system is required when:

1. The invert elevation of the drainfield prohibits gravity flow from the septic tank(s) at a 1% slope
2. The amount of effluent is greater than 2,000 gallons per day (GPD)
3. Standard and experimental alternative on-site sewage systems
4. A pressure distribution network is utilized
5. Excessive distance from tank(s) and drainfield, with undulating terrain in between

B. Pump System Components

A pump system is composed of the following:

1. A pump chamber
2. A pump with on/off/alarm floats
3. Control panel
4. A force main

C. Pump Chamber Design

Pump chambers are usually precast concrete tanks that store pre-treated septic tank effluent for timely discharge to a drainfield. The pump chamber must:

1. Be water-tight to a level above any possible seasonal groundwater. Leak testing may be required
2. Be set so that the seasonal high water table is below the pump-off level. This will prevent the chamber from floating out of position due to the hydrostatic pressure on the nearly empty chamber
3. The internal volume of the pump chamber must be sufficient to provide the daily design flow volume, dead space below the pump inlet for sludge accumulation, and sufficient depth to provide full time pump submergence, when required. An additional emergency storage volume of at least 100% of the daily flow design is also required (may include volume to flood capacity in both the pump tank and the septic tanks). Reductions in pump chamber volume may be considered when “ Duplex” pumps are used
4. Have an audio and visual alarm
5. Use an effluent filter at the outlet of the last septic tank
6. Have mercury float or magnetic level control switches only. The switches should withstand the humid and corrosive atmosphere inside the tank(s). Pump failures can usually be traced to switch failures resulting in pump burn-out, so high quality switches are good investments
7. Have the alarm switch on a separate circuit from the pump switches
8. Have a union provided for easy removal of the pump from the force main. The union must be at an elevation that the pump can be removed without entering the manhole or pump chamber
9. All electrical connections shall be made in accordance with applicable Electrical Code
10. All pump chambers must be equipped with a twenty-four (24) inch minimum diameter, watertight riser with a secured lid that extends to the ground surface. Lids must be equipped with an airtight gasket to eliminate nuisance odors. Riser must be constructed to facilitate easy access to the tank and removal of the pump without entering the tank
11. An event counter for the purpose of flow measurements and trouble shooting

All commercial and alternative pumped on-site sewage systems shall be equipped with a pump event counter. A pump run time meter may be required if a timed dose mechanism is employed.

D. Pumps

Pump selection is based on the wastewater characteristics, the desired discharge rate, and the pumping head. The pump size is determined from pump performance curves provided by the manufacturer. Selection

is based on the flow rate needed and the pumping head. The specific application determines the flow rate needed. The pumping head is calculated by adding the elevation difference (static head) between the drainfield invert and pump-off level in the dosing chamber to the friction losses incurred in the discharge pipe. This is called the total dynamic head or TDH. Velocity head ($V^2/2g$) can be neglected in most applications. Pumps must be set on concrete blocks to avoid pumping solids. Pumps must be kept submerged at all times.

Pumps must be easily installed so that they can be easily removed and/or replaced from the ground surface.

If any portion of the pump fittings or transport line is at a higher elevation than the drainfield, the system must be equipped with an air vacuum release valve to avoid siphoning.

If a check valve is used in the system, a vent hole should be installed upstream from the check valve so the pump volute is kept filled with effluent. This will prevent pump cavitation.

E. Force Main

The force main is typically 1½ inch to 2-inch diameter, Schedule 40 PVC plastic pipe or HDPE 100. The force main must be set at least 42 inches below ground surface to protect the line from freezing. If the force main is not buried below frost line, the pipe must be drained between doses. Sloping the discharge pipe back to the dosing chamber and eliminating the check valve at the pump may do this. In this manner, the pipe is able to drain back into the dosing chamber through a weep hole in the pump discharge line inside the pump chamber. The dosing volume must be sized to account for this backflow.

Check valves will be required when dual pumps are utilized to keep the effluent from being pumped through the non-activated pump, as well as to keep from pumping the volume of sewage left in the force main after the pump is shut off.

F. Design Steps and Procedures

1. Determine field size
2. Determine total length of drainfield tiles including footer and header in linear feet (LF)
3. Convert the total LF to gallons (see Table I). This is the field capacity
4. The liquid volume between pump-on and pump-off is the dose volume.
Dose the field between:
 - a. 65%–100% of field capacity when utilizing a 4 inch drainfield tile
 - b. Five (5) to ten (10) times the pipe capacity when utilizing a pressure distribution network

5. Set alarm 0.25 to 0.5 ft above pump–on level
6. Determine the storage capacity above alarm level
7. Determine the TDH. TDH = friction losses + elevation head
8. Determine proper pump size using performance curves or nomograph
9. Determine dose time in minutes

Dose time =
$$\frac{\text{Gallons (field capacity+force main volume if sewage is to drain back via a weep hole)}}{\text{GPM (pump spec.)}}$$

Dose must take 20 minutes or less.

G. Determining Equivalent Length (Le)

Fittings:

45° bend	k = 0.6	# of bends	x 0.6	=	_____
90° bend	k = 0.9	# of bends	x 0.9	=	_____
check valve	k = 3.0	# of valves	x 3.00	=	_____
ball/gate valve	k = 0.20	# of valves	x 0.20	=	_____
exit loss	k = 1.0	# exits	x 1.00	=	_____
Entrance loss	k = 0.5	# entrances	x 0.5	=	_____
Flow increaser	k = 1.0	# of increasers	x 1.0	=	_____
Flow decreaser	k = 1.0	# of decreasers	x 1.0	=	_____

$Le = \text{equivalent length} = K_t d/f$

Where: $K_t =$ sum of all K_t values
 $d =$ diameter of force main (ft)
 $f =$ friction coefficient

Pipe Type	Pipe Diameter (inches)	Pipe Diameter (ft)	F
PVC	1.0	.083	0.042
PVC	1.25	.104	0.039
PVC	1.5	.125	0.037
PVC	2.0	.167	0.033
PVC	2.5	.208	0.031
PVC	3.0	.250	0.029

Total length of force main = $Le +$ length of force main from pump chamber to drainfield.

H. Using Nomograph

1. Assume a flow rate (GPM)
2. Select the pipe size (inside diameter) of the force main
3. Place a straight-line edge on these two points
4. The points at which the straight line intersects the head loss line and the velocity line give these two values under the given conditions
5. Nomograph reading x total length of force main /100
6. TDH = Number 5 above + static head
7. Plot this point (i.e., 1 and 6 on performance curve)
8. If point #7 intersects performance curve, this will yield the operating point. This is the number of gallons per minute pumped against a given head
9. If point #7 does not intersect pump performance curve, assume a new flow rate and repeat steps 2–7 until point intersects performance curve. This point is called the operating point

I. Using Hazen–Williams equation

In lieu of using the above nomograph, the designer may choose to use the following equation to calculate head losses:

$$\text{Head Loss: } HL = \frac{0.000995 * L * Q^{1.85}}{d^{4.87}}$$

Where:

HL	=	Head loss in feet
Q	=	Discharge in GPM
L	=	Force main length in feet
d	=	Force main diameter in inches

XIV. TYPES OF SEWAGE DISPOSAL SYSTEMS

A. Conventional On-Site Sewage Disposal Systems: A conventional on-site sewage system consists of a septic tank and gravity flow or pump/pressure distribution to a gravel-filled drainfield. These systems meet WCEHD standards for sizing criteria. Engineering involvement is not required except in instances where site conditions dictate extensive grading and or a pumping station. Current conventional systems in Washtenaw County include the standard bed, the built- up and the deep-cut drainfields.

A.1. Standard Bed Drainfield

The standard bed drainfield is the typical installation when three (3) ft of permeable soil is found within the upper 10 ft of the soil horizon. Either a gravity fed system or a pump may be utilized to distribute effluent into the drainfield.

A.2. Built-Up Drainfield

A.2.1. Theory

A 2 ft layer of permeable soil above the high water table is necessary to provide an aerobic (oxygen rich) environment in the drainfield. This aerobic condition yields a longer life for the drainfield and better treatment of sewage before sewage reaches the groundwater. Artificially building up or elevating the drainfield can provide a portion of this 2 ft aerobic zone where it does not occur naturally. However, existing natural soil must ultimately accept the sewage and therefore must be permeable.

A.2.2. Criteria for Site Evaluation

- a. The presence of a suitable formation of permeable soil (at least a 3 ft thickness) shall be determined by test borings
- b. There must be at least 12 inches of naturally existing soil above highest indicated groundwater (as determined by mottling or observation). This may include the topsoil if it is sandy topsoil. If the 12 inches of naturally existing soil is impermeable then the fill around the edge of the drainfield must be at least a 4 ft width of this same material
- c. If the sandy material is saturated, then it shall be determined as to whether the water is perched or confined

A.2.3. Construction Requirements - see diagram (Appendix III)

- a. The size of the drainfield shall be determined by soil type and average quantity of daily sewage flow
- b. Unless a pump system is utilized, the septic tanks shall be required to be set prior to issuing the health permit to insure construction of the drainfield at the proper elevation
- c. The bottom of the excavation shall be clean and free of any traces of heavy soil or surface wash. The interface between the natural permeable soil and sand backfill shall be uncompacted and friable prior to commencing backfilling
- d. Any filling which is necessary to bring the field to the proper elevation shall be done with a sand meeting the sand fill specification as stated in section XVI, A
- e. A standard drainfield shall then be constructed on top of the sand fill and shall meet all other requirements of a standard drainfield
- f. The bottom of the drainfield pipe shall be set as specified on the drawing for a Built-up Drainfield
- g. Arrangements shall be made with the WCEHD for an excavation inspection and drainfield installation inspection prior to covering
- h. Loam sand to sandy loam soil cover shall be placed over the top of the drainfield to a depth of 12 - 24 inches and shall extend 4-8 ft

beyond the edge of the drainfield. The edge of this embankment of fill shall be sloped to the natural grade at a slope not to exceed 1 ft vertical to 4 ft horizontal. If clay is used for constructing the embankment, then 4 ft of clay fill is required beyond the edge of the drainfield. If a sandy material is used for the berm, then 8 ft of sand fill is required beyond the edge of the drainfield

- i. The finish grade shall be crowned to reduce precipitation infiltrating into the field area

A.3. Deep Excavation Drainfields

A.3.1. Theory

Where suitable soil for construction of a standard drainfield cannot be found in the top 10 feet of soil, there may be dry porous sand or gravel soil at greater depths, which can be developed by excavation and backfilling for disposal of septic effluent.

A.3.2. Criteria for Site Evaluation

- a. The presence of a suitable formation of permeable soil (at least a 2 ft thickness of dry, loose, coarse sand and gravel) shall be determined from test borings or excavations. Permeable soil that is finer in size would require a minimum of a 3 ft layer
- b. If it is determined that the excavation will penetrate to an aquifer that is being used as a source of drinking water, increased isolation distances may be necessary between wells and drainfields or it may not be possible to use the aquifer for a drainfield. A hydro-geologic study shall be conducted to determine the effect of the sewage system on the groundwater supply. If it is determined that there is a hydraulic connection between the formation used for the disposal of sewage and the aquifer, the following shall be maintained:
 - Increase horizontal isolation distance between the well and the drainfield area to a minimum of 150 ft
 - Construct water supply wells in a deeper protected aquifer
 - The well must be installed upgradient from the sewage system. A gradient study will be required to determine the local direction of the groundwater flow
 - A minimum of 50 ft vertical isolation distance shall be maintained between the static water level and top of the well screen
- c. If the permeable material is saturated then it must be determined if the water is perched or confined. If the water is perched then the site shall not be approved for a drainfield. Monitoring tubes shall be set to determine the static water level in each of the tubes to determine the groundwater gradient. This type of waste requires

engineering involvement (**See Appendix VI on how to install groundwater-monitoring tubes**)

A.3.3. Construction Requirements – see diagram (Appendix IV)

- a. The size of the field shall be determined by soil type at the bottom of the excavation and average quantity of daily sewage flow
- b. The sides of the excavation shall be vertical for six feet and then slope to the bottom with a slope of no flatter than 1-foot vertical to 10-foot horizontal. The area of the bottom of the excavation shall be no less than $\frac{1}{2}$ the area of the top of the excavation or 800 square feet, whichever is greater
- c. T- trench excavation is acceptable. See Appendix IV
- d. The bottom of the excavation shall be clean and free of any traces of surface wash. The interface between the natural sand formation and fill sand must be uncompacted and friable prior to filling
- e. The open excavation should be protected from surface runoff to prevent the washing of silt and debris into the hole if it rains. If “smearing”, compaction or silting does occur, the soil face in the excavation shall be raked or loosened before the sand fill is added
- f. Arrangements shall be made with the WCEHD for an inspection after the excavation is completed and prior to backfilling
- g. The finish grade shall be crowned to divert surface water away

Generally formations that are greater than 20 ft below grade are not acceptable. The Public Health Engineer or Department Director may make certain exceptions following an administrative review

B. Standard Alternative On-Site Sewage Systems: are systems that have established WCEHD design criteria and are only allowed when site conditions does not permit the installation of a conventional system. Engineering involvement is required. Examples of these systems are the Modified Fill Type Drainfield (MFTDF) and the Sand Filter System (SFS). SFS design criteria can be found under a separate design manual.

B.1. Modified Fill Type Drainfields

B.1.1. Theory

Clay loam on certain slopes, when given enough area, can be "modified" to provide absorption of filtered sewage effluent.

B.1.2. Background

In the early 1970's, evaluations were conducted on sixty (60) sewage systems constructed over approximately 14 inches of existing sandy loam soil on slopes varying from 2%-16%. Twenty percent (20%) of the systems were failing at the time of evaluation. Those that failed were on slopes of 5% or less, or greater than 15%. Based on that evaluation, the criteria for fill-type drainfields were developed.

In 1976, an experimental sewage system was constructed following the fill-type criteria, but modifying the soil preparation. The modification was the mixing of 8 inches of sand into 6 inches of clay loam topsoil. That installation was evaluated for five (5) years. The results led to the specifications for a modified fill-type drainfield design. The WCHCBA/PHAC approved this type of field in 1981 for standard use in Washtenaw County. The following criteria detail the conditions of the approval by the WCHCBA/PHAC for installation of these systems.

B.1.3. Criteria for Site Suitability

- a. A continuous slope between 6%-15% is required. The slope shall extend a minimum of 50 ft beyond the proposed top of slope. The width of the slope parallel to the contour shall be a minimum of 120 ft. This area is necessary for expansion of the drainfield and to control seepage. An alternative is for the slope to be 150 ft continuously down the hill and a minimum of 300 ft parallel to the slope. This would allow for expansion of the drainfield area to be parallel to the slope and next to the original drainfield
- b. All uphill surface drainage shall be controlled so that all uphill surface drainage is directed off and around the prepared sand fill area
- c. 14 inches of existing sandy loam soil on slopes between 6-15% shall be required

B.1.4. Review Procedure

- a. A plan showing existing grade elevations of the drainfield area, developed by a Registered Professional Engineer, is to be submitted to WCEHD. Elevations shall be sufficient to describe the 6%-15% area. Elevations shall be provided at least every 50 ft down the hill and 50 ft across the hill
- b. If it is the judgment of the design engineer that the site meets the elevation criteria, the owner or his/her legal representative will submit a completed application along with the applicable fees
- c. The engineer or the owner shall schedule a site visit with WCEHD staff. The purpose of the site visit is to check site conformance with the criteria. Other features will be reviewed during this site visit related to house location, drainage, neighboring properties, etc. It is important that the four corners of

the proposed system be clearly staked prior to the WCEHD visit. We recommend that all requests for site visits be scheduled at least two weeks in advance of the desired date

- d. Following a site evaluation, an approval or denial letter is sent. An approval letter will state any specific conditions and restrictions of the property in question
- e. When construction of the house and drainfield is desired, detailed plans of the site, sewage system, survey, and property use restriction must be submitted. A generic form of the property use agreement may be found in Appendix VII
- f. When the plans conform to the requirements, and the property use restriction is recorded with the Register of Deeds, the sewage permit can be issued

B.1.5. Construction Requirements – see diagram (Appendix V)

- a. Soil shall be prepared by thoroughly mixing 8 inches of sand that meets the WCEHD sand fill specification with 6 inches of existing topsoil by plowing, discing, or use of a spring-tooth drag. Furrows must be parallel to the contour of the slope. This soil preparation can be only done at times of the year when the soil is dry and friable typically during the months of June through September. Soil preparation must be done under the supervision of the engineer. The engineer is to determine that the area to be prepared is in the right location; that the soil preparation conditions are suitable; that the equipment can efficiently complete the job; and to verify that the mixing meets the criteria
- b. Soil preparation must be beneath the drainfield and at least 50 ft downhill from the proposed drainfield pipe on the downhill side. The width of the prepared area must extend 10 ft from the uphill pipe and 20 ft from the header and footer
- c. Care must be taken to prevent equipment or anything else from compacting the prepared soil. The prepared soil area shall be backfilled with sand meeting the WCEHD sand fill specification. Sand shall be placed to provide a level area for the drainfield and stone. Sand shall also be placed so that the final grade above the end of the stone extends downhill 20 ft parallel to the slope, and then at a maximum slope of a 4 horizontal to 1 vertical slope to meet the existing ground (see typical cross-section in Appendix V)
- d. Uphill surface drainage must be diverted completely around the drainfield and soil preparation area
- e. A pressure distribution network is highly recommended
- f. A pump system is required. Siphons are not acceptable for use as a dosing mechanism
- g. A metering device is required to measure the sewage flow. Wastewater quantities are not to exceed the design rate. Readings are to be recorded monthly and submitted annually to

- WCEHD for three (3) years. An alternative is to use event counter in the pump control panel
- h. A property use restriction must be recorded which identifies the design rate for the sewage system and also stipulates any special features of the system (low-flow toilets, restriction on garbage grinders, etc)
 - i. The drainfield must meet all the requirements of a standard drainfield. The bottom of the stone is to be a minimum of 1 ft above the existing ground directly under the uphill drainfield pipe
 - j. Final cover over the drainfield and sand mound shall be a sandy loam or loamy sand soil
 - k. The finish grade of the drainfield shall be crowned to shed precipitation
 - l. The design engineer must supervise construction. Upon completion of construction, the engineer shall submit written certification that the construction has been done in accordance with the approved plans
 - m. A Registered Professional Engineer must sign and seal all engineering plans

B.1.6. Installation

Since MFTDF's are usually constructed on sites with very limiting soil and site conditions, good construction techniques are essential if a MFTDF is to function properly and provide many years of trouble-free operation. The following procedures shall be adhered to when constructing a properly designed MFTDF.

The soil is too wet to plow if a soil sample taken from the plow depth forms a ribbon (e.g., 1/8-inch diameter) when rolled between the palms. If it crumbles, plowing may proceed. This pre-tillage investigation is essential to prevent possible system failure. Construction must not take place if soil is too wet. Seepage may occur between the MFTDF and the soil surface if surface preparation is done poorly or if the soil is too wet during the tillage operation.

Plow the area within the MFTDF perimeter 9-12 inches deep and parallel to the contour of the slope using a moldboard or chisel plow. Do not use a single-bottom moldboard plow because the trace wheel will compact the soil at the bottom of each furrow. Each furrow slice should be thrown up-slope. If a chisel plow is used, make two passes. On sites that cannot be plowed (e.g., wooded areas with stumps) roughen the surface to a depth of 9-12 inches with the backhoe teeth. Rototilling unplowed areas is not allowed recommended because of potential damage to the soil structure, but it may be used in granular soils such as sands.

If construction must be temporarily discontinued, cover the plowed area with at least 8 inches of sand-fill material or a temporary removable cover so that the plowed area is not exposed to rainfall. This prevents compaction and sealing. If left uncovered during a rainfall, another pass with the plow after the soil dries will be necessary.

B.1.7. Covering

Place a barrier material over the drainfield stone. Suitable materials can be synthetic filter fabric or 2-4 inches of marsh hay or straw. The stone must be covered with permeable material to keep backfill soil from filtering down into the stone.

Cover the bed and sand fill with at least 6 inches of fine textured subsoil such as sandy loam.

Finally, place 2-3 inches of good quality topsoil over the entire surface to provide a good medium for grass or similar vegetation, and to increase surface drainage away from the mound.

Sow seed or lay sod over the MFTDF using grasses adapted to the area. Shrubs can be planted around the base and up the sideslopes. Plantings on the downslope side should be somewhat moisture tolerant since this area may be rather moist during early spring. Plantings on top of the fill, on the other hand, should be drought tolerant since the upper portion of the MFTDF can become quite dry during the summer.

C. Experimental Alternative On- Site Sewage Systems: are systems that do not have WCEHD design criteria. Typically these systems are approved on existing homes with a failed septic system where a conventional system cannot be installed. Engineering involvement, system monitoring and maintenance are all required. Approval of experimental systems on new homes requires a variance from the WCHCAB/PHAC.

Further information regarding experimental alternative on-site sewage systems will be published in the near future.

XV. BACKFILL SAND AND STONE SPECIFICATIONS

Where backfill sand is required, one of the following specifications shall be met:

A. Backfill Sand Specifications

1. MDSH&T 2 NS sand
2. MDSH&T Class I granular material
3. See table below

Passing number 4 sieve in Percent	90-100 %
Passing number 60 sieve in Percent	0-50 %
Passing number 100 sieve in Percent	0-20 %
Passing number 200 sieve in Percent (Including loss by washing)	0-5 %

B. Stone Specification

The stone used in drainfield construction shall be 6-A and meet the following specifications:

Passing the 1½ inch sieve in Percent	100 %
Passing the 1 inch sieve in Percent	95 % - 100 %
Passing the ½ inch sieve in Percent	30 % - 50 %
Passing the # 4 sieve in Percent	0 % - 8 %
Loss by wash in Percent	0

XVI. INSPECTIONS

An excavation inspection by the WCEHD or the project engineer (if specified in the permit condition sheet) shall be required on all fields.

Other inspections shall be conducted by the WCEHD as stipulated in Section 6:1 of the Washtenaw County Regulations for the Disposal of Sewage of Human Excreta.

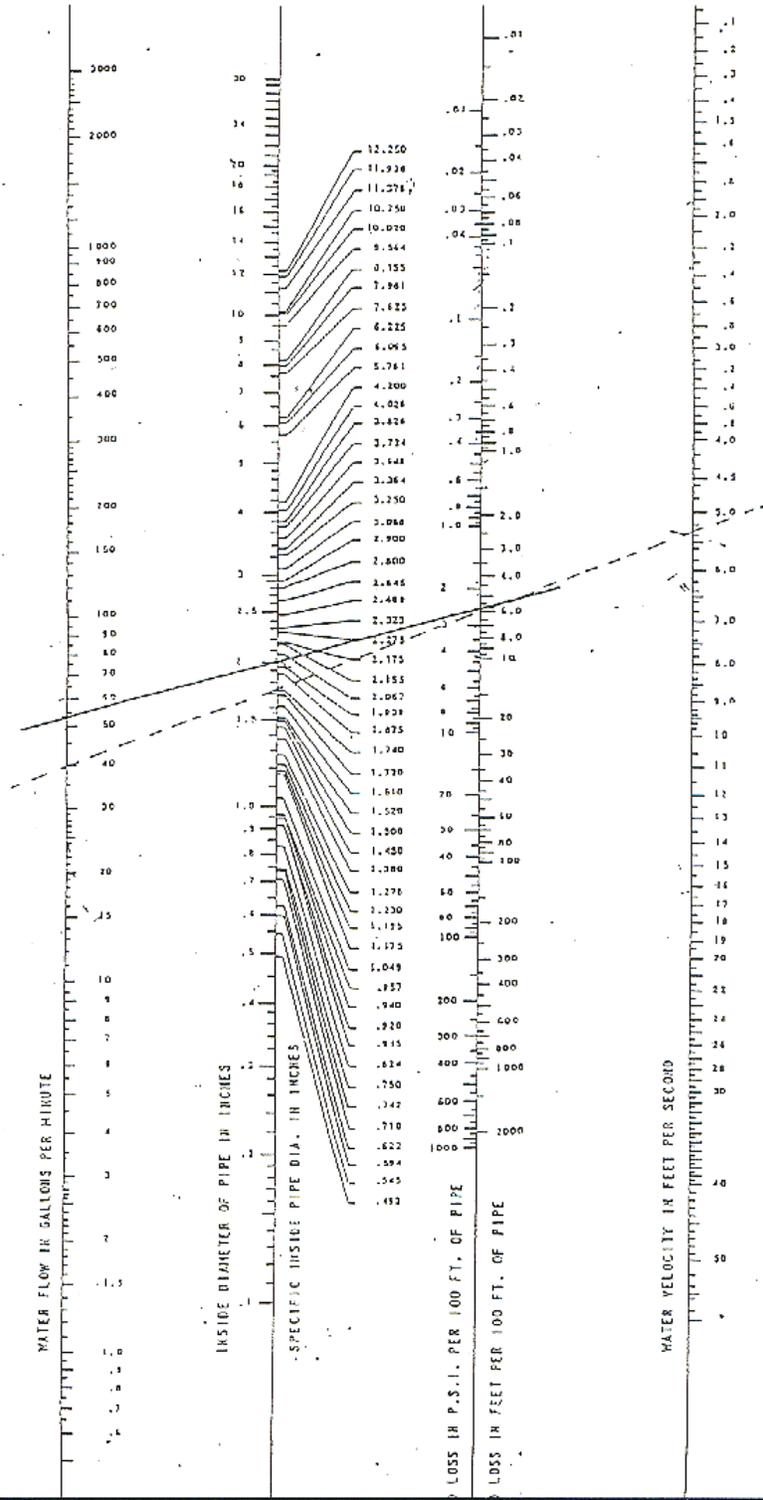
APPENDIX I: Capacities of Various Pipes

Pipe Capacities in Gallons per 100 ft of Pipe Length

Diameter of pipe in inches	SDR-26 PVC	SDR-21 PVC	SCH. 40 PVC
1 1/4	9.57	9.13	7.76
1 1/2	12.55	11.97	10.57
2	19.64	18.77	17.44
2 1/2	28.65	27.68	24.91
3	42.55	40.92	38.39
4	70.39	67.47	66.12
6	152.6	146.23	150.0
8	258.0	248.11	

APPENDIX II: Hazen-Williams Nomograph

FRICITION LOSS CHARACTERISTICS OF WATER FLOW THROUGH RIGID PLASTIC PIPE



THE VALUES ON THIS GRAPH ARE BASED ON THE WILLIAMS AND WATERS FORMULA:

$$h_f = 4.73 \left(\frac{L}{100} \right) \frac{Q^{1.85}}{C^{1.49} D^{4.76}}$$

WHERE:
 h_f = FRICTION HEAD IN FEET OF WATER PER 100 FEET
 Q = INSIDE DIAMETER OF PIPE IN INCHES
 L = LENGTH OF PIPE IN FEET
 C = CONSTANT FOR INSIDE ROUGHNESS OF THE PIPE

EXAMPLE:

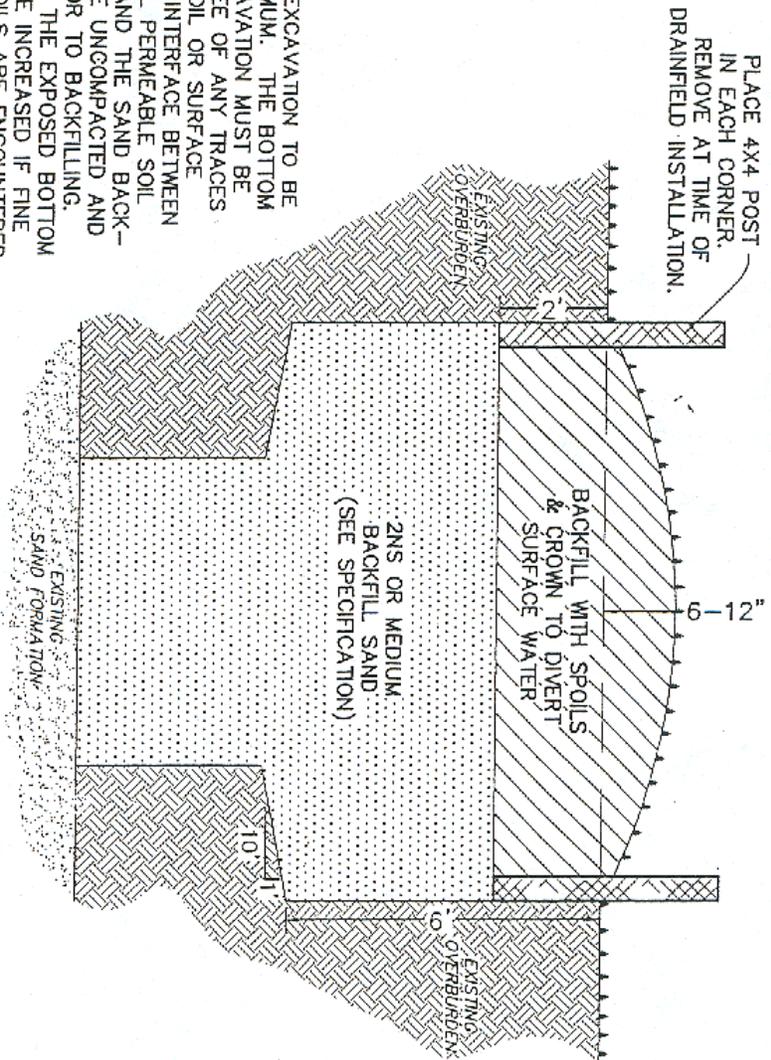
- 15" SCHEDULE 40 PIPE (I.D. = 14.70")
- 90 G.P.M. PER HOUR SERVICE
- HEAD 2.6 PSI (OR 6 FT.) FROM THE HEAD-LOSS LINE
- HEAD 5.38 FT. PER SEC. FROM THE VELOCITY LINE

HOW TO USE THIS NOMOGRAPH:

- 1) SELECT THE DESIRED PIPE SIZE (INSIDE DIAMETER)
- 2) DETERMINE THE AMOUNT OF WATER TO FLOW THROUGH THE PIPE
- 3) PLACE A STRAIGHT-EDGE ON THESE TWO POINTS
- 4) THE POINTS AT WHICH THE STRAIGHT-EDGE INTERSECTS THE HEAD-LOSS LINE AND THE VELOCITY LINE GIVE THESE TWO VALUES UNDER THE GIVEN CONDITIONS.

APPENDIX IV: Deep Excavation Drainfield

BOTTOM OF EXCAVATION TO BE 800 SF MINIMUM. THE BOTTOM OF THE EXCAVATION MUST BE CLEAN & FREE OF ANY TRACES OF HEAVY SOIL OR SURFACE WASH. THE INTERFACE BETWEEN THE NATURAL PERMEABLE SOIL FORMATION AND THE SAND BACK-FILL MUST BE UNCOMPACTED AND FRIABLE PRIOR TO BACKFILLING. THE SIZE OF THE EXPOSED BOTTOM AREA MAY BE INCREASED IF FINE TEXTURED SOILS ARE ENCOUNTERED.

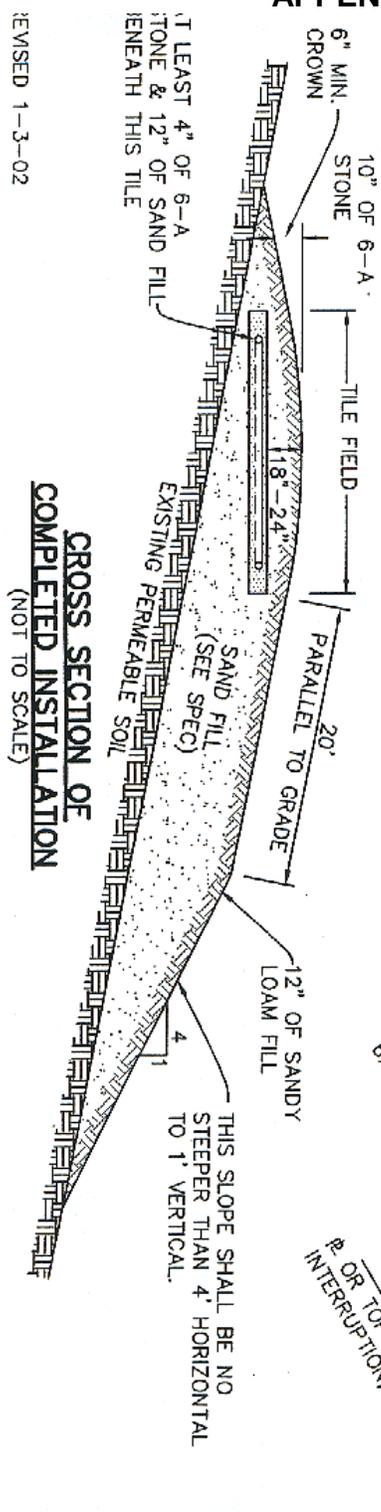


PRE-EXCAVATED DEEP EXCAVATION
DRAINFIELD (SUBDIVISION,
SITE CONDOMINIUM, P.U.D.)
 (NO SCALE)

FILL TYPE DISPOSAL FIELD

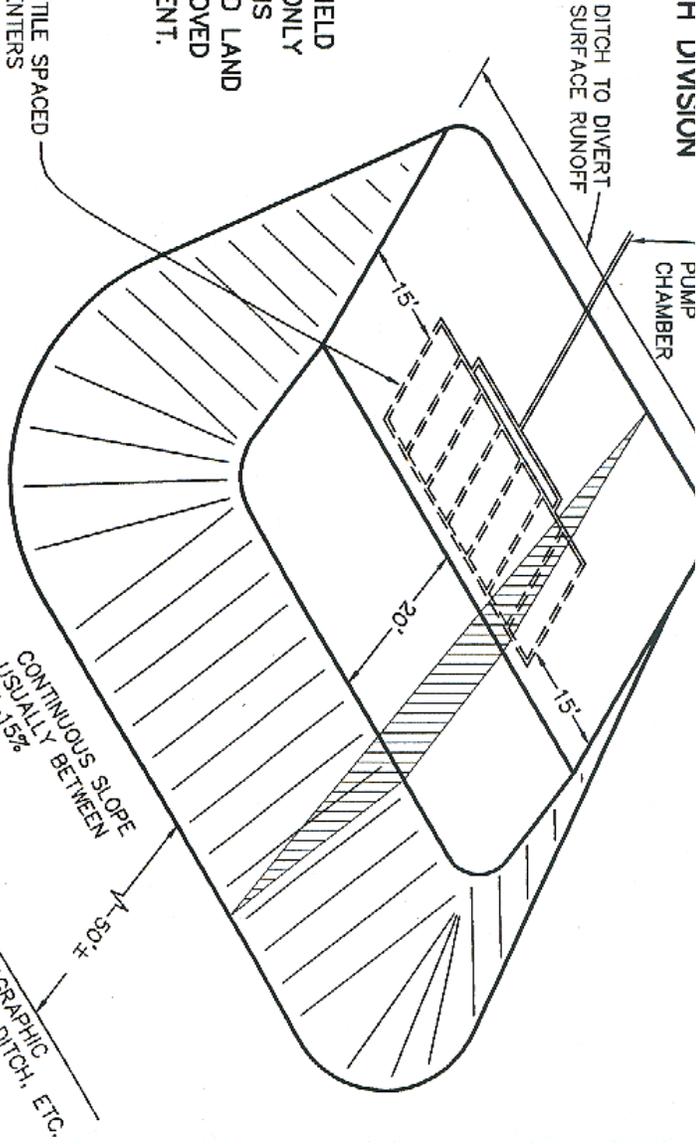
NOTICE:
 THIS TYPE OF DISPOSAL FIELD SHALL BE CONSTRUCTED ONLY UNDER CERTAIN CONDITIONS OF SOIL, TOPOGRAPHY AND LAND AREA AS SHALL BE APPROVED BY THE HEALTH DEPARTMENT.

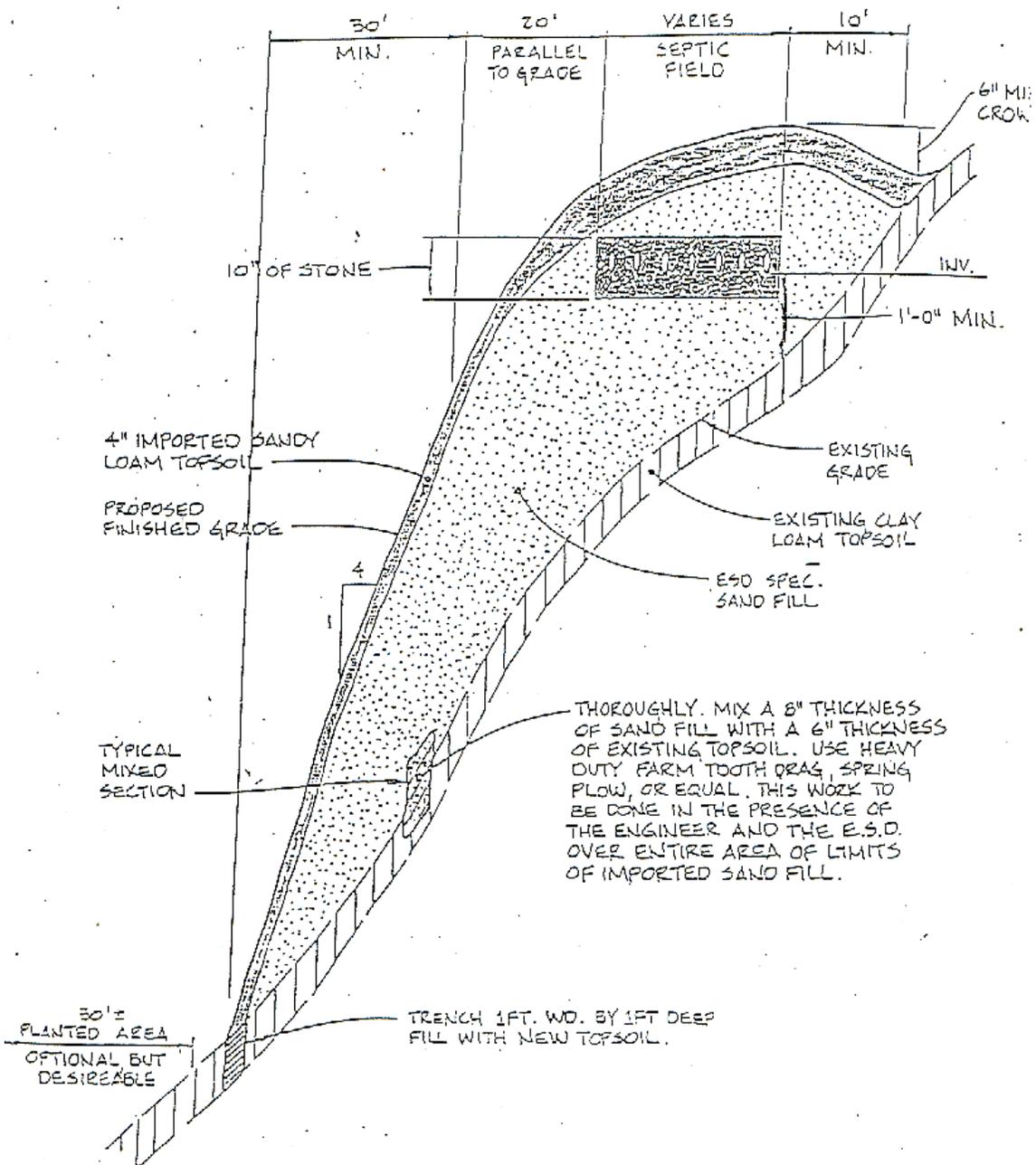
4" DRAINTILE SPACED 4' ON CENTERS



CROSS SECTION OF COMPLETED INSTALLATION
 (NOT TO SCALE)

REVISED 1-3-02

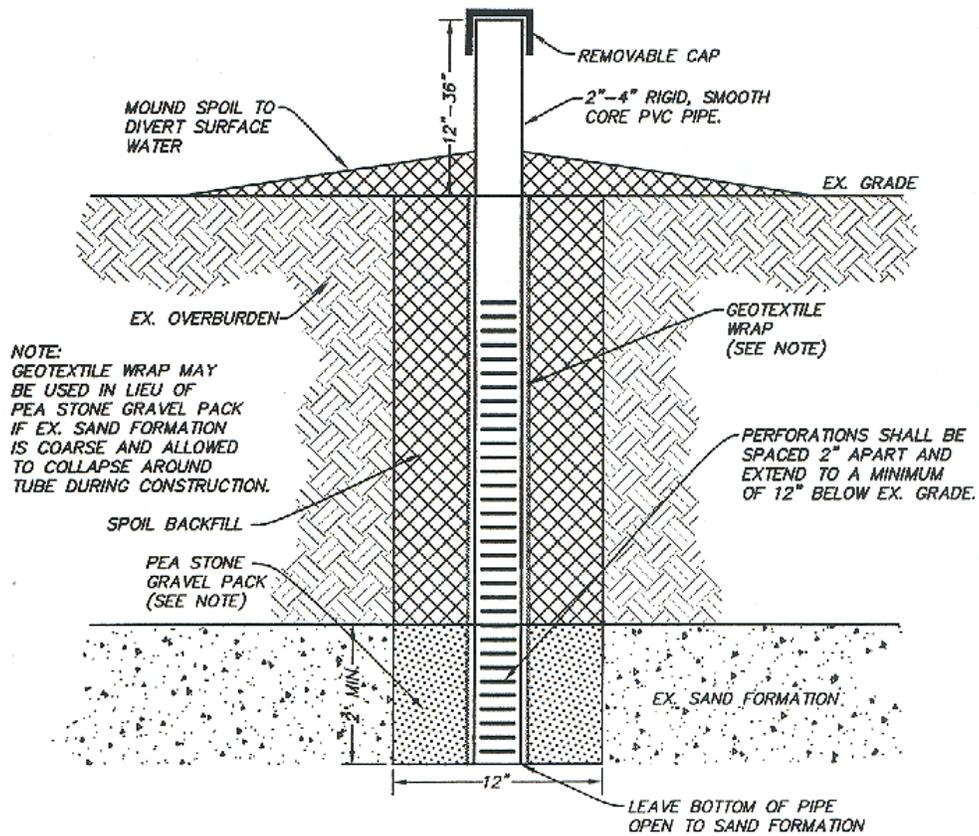




TYPICAL SECTION FOR MODIFIED
FILL TYPE DISPOSAL FIELD

(NOT TO SCALE)

APPENDIX VI: Groundwater Monitoring Tubes



GROUNDWATER MONITORING TUBE DETAIL

(NO SCALE)

APPENDIX VII: Generic Deed Restriction

**AGREEMENT AND PROPERTY USE RESTRICTIONS
FOR SEPTIC TANK SEWAGE DISPOSAL PERMIT**

THIS INDENTURE, made this _____ day of _____, 20_____, by and between _____ and _____, _____, whose residence is _____, Michigan, _____, hereinafter called "Owner(s)", and the WASHTENAW COUNTY ENVIRONMENTAL HEALTH DIVISION, having its principal place of business at 4101 Washtenaw Avenue, Ann Arbor, Michigan 48107.

WITNESSETH:

WHEREAS, _____ is/are the Owner(s) in fee simple of the following described property located in _____ Township, Washtenaw County, Michigan.

Legal Description

The above-described premises contain _____ acres, more or less.

WHEREAS, the Owner(s) has/have an application for a sewage disposal system on the property described above; and

WHEREAS, an investigation has been made of the land area and proposed use of said property; and

WHEREAS, the Washtenaw County Health Officer is of the opinion that the available land is not suitable for a permit for a conventional septic tank drainfield system necessary to serve a building on a year-round basis; and

WHEREAS, said Owner(s) have indicated his/her/their desire to construct an experimental septic system to serve a _____ bedroom, _____ bathroom house

NOW, THEREFORE, in consideration of the covenants and agreements and restrictions contained in this Agreement, the parties mutually agree as follows:

1. That the Owner(s) agree to install an (experimental/alternative/modified fill type etc.) septic system as designed by _____, Professional Engineer, and as described in his/her engineering plan and report titled "
_____".

2. That the design engineer oversees the installation, construction, and monitoring of the system for a period of four (4) years after installation of the system.

3. That the design engineer submits an annual report to the Washtenaw County Environmental Health Division which indicates the measurement of water use, observation of the system during February or March of each year by _____, a professional engineer, and report on the system and how it is functioning.

4. That all construction complies with the sewage permit which the Washtenaw County Environmental Health Division will issue and complies with the approved plan and sewage system design as submitted by _____ and approved by the Environmental Health Division.

5. Owner(s) waive all claims he/she/they may have against the Washtenaw County Environmental Health Division which may arise as a result of Owner's installation and use of the experimental septic system.

6. The house size shall not exceed _____ bedroom(s), _____ bathroom(s).

7. At the end of four (4) years, the design engineer or his/her representative shall prepare recommendations on the sewage system design, operation, and maintenance. This report will be submitted to the Washtenaw County Environmental Health Division to determine if the system can be accepted as a standard sewage system.

8. In the event of a sewage disposal failure, as determined by the Washtenaw County Environmental Health Division, Owners shall either:

- a. Immediately eliminate any health hazard created on the premises or on any neighboring properties;
- b. Vacate the property until the soil in the vicinity of the sewage system has dried and a new septic disposal system is built and approved by the Environmental Health Division, or a court determination is made that the sewage disposal system is adequate; or
- c. Construct the modified fill-type drainfield as approved to be the back-up system for the experimental sand filter system.

9. This Agreement and any required permits, together with the covenants and restrictions, shall run with the land, and shall bind, and inure to the benefit of the heirs, executors, administrators, devisees, successors, legal representatives, and assigns of

the respective parties to whom the whole or any part of the land so made subject to said permit shall at any time become or belong. Any violation of the restrictions and covenants contained in this Agreement shall void any required permits.

10. Failure of the Washtenaw County Environmental Health Division to enforce any covenant or restriction contained in this Agreement shall not be construed as a waiver of any further breach of same covenant or restriction in the future.

11. This Agreement and any amendments hereto shall be recorded by the Owner(s) within three (3) calendar days from the date of this Agreement with the Washtenaw County Register of Deeds.

12. This Agreement shall be modified only upon written approval of the Washtenaw County Environmental Health Division.

WITNESSES:

Owner

Owner

STATE OF MICHIGAN

COUNTY OF WASHTENAW

On this day of _____, 200____, before me a Notary Public, appeared _____ who being duly sworn stated that the above statements are true to the best of their knowledge and belief.

Notary Public, Michigan

My Commission Expires: _____, 200_____

IN WITNESS WHEREOF, the parties hereto have executed this document on the day and year first written above.

STATE OF MICHIGAN

COUNTY OF WASHTENAW

WITNESSES:

WASHTENAW COUNTY
ENVIRONMENTAL HEALTH DIVISION

On this _____ day of _____, 200_____, before me a Notary Public appeared _____ who being duly sworn stated that the above statements are true to the best of his/her knowledge and belief.

Notary Public, Michigan

My Commission Expires: _____, 200_____

When recorded, please return to:

Majed Ghussaini, P.E.
Public Health Engineer
Washtenaw County Environmental Health Division
705 North Zeeb Road
Ann Arbor, MI 48107-8645

APPENDIX VIII: Determining Elevations

DETERMINATION OF TANK FIRST ELEVATION

THE FOLLOWING INFORMATION MUST BE KNOWN TO CALCULATE SEPTIC TANK INVERT ELEVATIONS:

1. EXISTING GRADE ELEVATIONS AT THE TESTPIITS IN THE PROPOSED DRAINFIELD AREA.
2. THE MINIMUM INVERT OF THE DRAINFIELD AS DICTATED BY THE SEASONAL HIGH WATER TABLE (SHWT) AND/OR SOIL CONDITIONS.
3. LENGTH OF THE SEWER LINE BETWEEN THE LAST SEPTIC TANK AND THE DRAINFIELD.

- FALL FROM THE BUILDING TO THE FIRST SEPTIC TANK = $1/4"$ PER FOOT = 2%
 -- FALL FROM THE SECOND SEPTIC TANK TO THE DRAINFIELD = $1/8"$ PER FOOT = 1%

THE FOLLOWING FORMULAS ARE USED TO COMPUTE THE ELEVATIONS REQUIRED IN WHICH A SEWAGE DISPOSAL SYSTEM CAN FUNCTION PROPERLY USING MINIMUM FALL.

$$E = 0.01L_1 + F$$

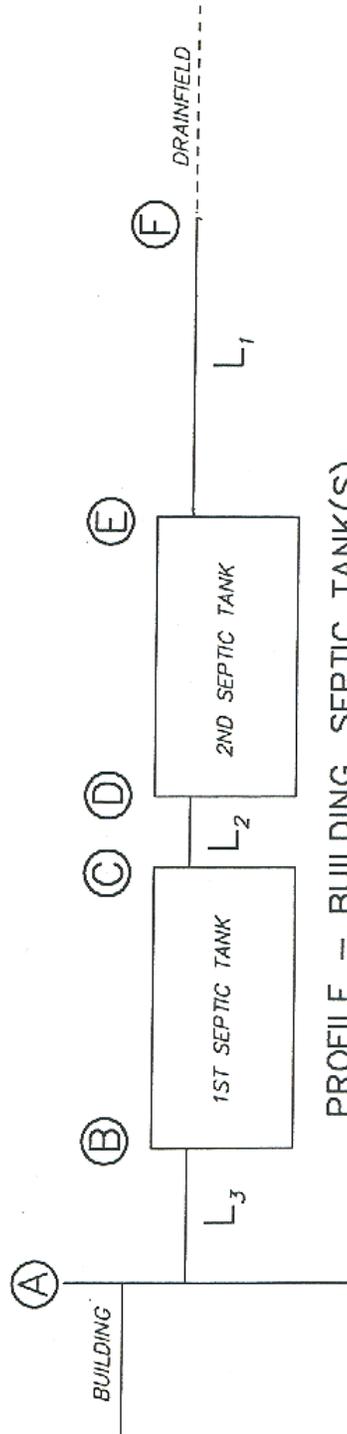
$$D = E + 0.25$$

$$C = 0.01L_2 + D$$

$$B = C + .025$$

$$A = 0.02L_3 + B$$

- (A) INVERT OF SEWER LINE AT HOUSE
- (B) INLET INVERT OF 1ST SEPTIC TANK
- (C) OUTLET INVERT OF 1ST SEPTIC TANK
- (D) INLET INVERT OF 2ND SEPTIC TANK
- (E) OUTLET INVERT OF 2ND SEPTIC TANK
- (F) INVERT OF DRAINFIELD HEADER
- L₁ DISTANCE BETWEEN (F) & (E)
- L₂ DISTANCE BETWEEN (D) & (C)
- L₃ DISTANCE BETWEEN (B) & (A)



PROFILE - BUILDING, SEPTIC TANK(S),
DRAINFIELD SYSTEM

APPENDIX IX: PUMP DESIGN DATA SHEET

Design Data Sheet for Pumped Sewage Systems

Owner Name: _____
Site Address: _____
Township: _____
Section #: _____

Note: Submittal of this Data Sheet must be accompanied with an accurate, scaled plot plan, which includes a local benchmark identified on the plan.

1) System Sizing

- # of Bedrooms: _____
- # of Bathrooms: _____

2) Elevations

- invert elevation at outlet of 1st septic tank: _____
- invert elevation at outlet of 2nd septic tank: _____
- invert elevation at inlet of pump chamber: _____
- invert elevation of proposed drainfield (header elevation): _____

3) Friction Head Calculations

- diameter of force main: _____ length of force main in ft: _____
- # of Check Valves: _____
- #of 90 degrees Bends: _____
- # of 45 degrees Bends : _____
- other valve assemblies (please specify): _____
- specify type of force main piping material: _____
(Sch. 40 or approved equal)

4) Pump Chamber

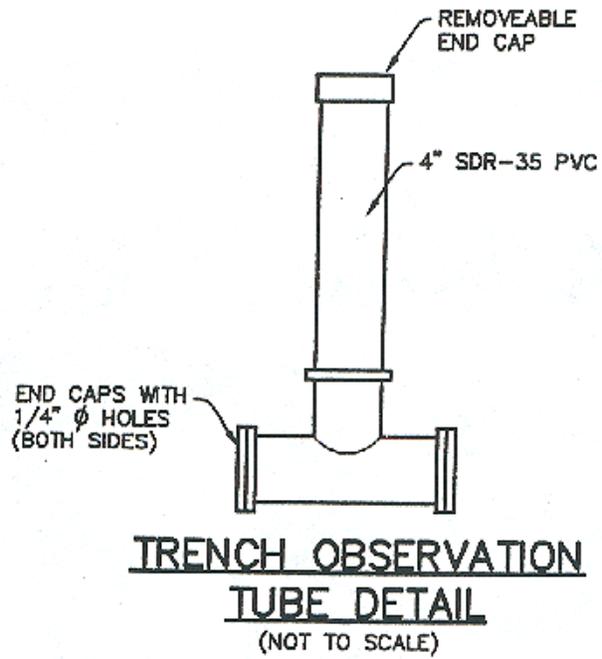
- manufacturer/supplier: _____
- telephone number: () _____
- gallons/inch: _____
- * *provide a pump chamber shop drawing/schematic showing all interior dimensions*
- * *all systems must have access risers above finish grade over pump*

5) Effluent Filter

- manufacturer/supplier: _____
- telephone number: () _____
- model: _____
- * *filter must have an access riser above finish grade*

Note: The information provided above is assumed to be accurate, however, the Washtenaw County Environmental Health Division is not responsible for the accuracy of the information submitted on this form, nor errors that may occur due to reliance upon this information.

Appendix X: Drainfield Observation Port Details



APPENDIX IX

Water Well Construction Code Part 127

**PUBLIC HEALTH CODE (EXCERPTS)
STATUTE**

Act 368 of 1978

AN ACT to protect and promote the public health; to codify, revise, consolidate, classify, and add to the laws relating to public health; to provide for the prevention and control of diseases and disabilities; to provide for the classification, administration, regulation, financing, and maintenance of personal, environmental, and other health services and activities; to create or continue, and prescribe the powers and duties of, departments, boards, commissions, councils, committees, task forces, and other agencies; to prescribe the powers and duties of governmental entities and officials; to regulate occupations, facilities, and agencies affecting the public health; to promote the efficient and economical delivery of health care services, to provide for the appropriate utilization of health care facilities and services, and to provide for the closure of hospitals or consolidation of hospitals or services; to provide for the collection and use of data and information; to provide for the transfer of property; to provide certain immunity from liability; to provide for penalties and remedies; and to repeal certain acts and parts of acts.

History: 1978, Act 368, Eff. Sept. 30, 1978.

The People of the State of Michigan enact:

PART 127. WATER SUPPLY AND SEWER SYSTEMS

333.12701 Definitions used in 333.12701 to 333.12715.

Sec. 12701.(1) As used in sections 12701 to 12715:

(a) "Person" means a person as defined in section 1106 or a governmental entity.

(b) "Pump" means a mechanical equipment or device used to remove water from a well.

(c) "Pump installer" means a person who is qualified to engage in the installation, removal, alternation, or repair of water well pumping equipment in connection with a water well.

(d) "Well" means an opening in the surface of the earth for the purpose of removing fresh water or a test well, recharge well, waste disposal well, or a well used temporarily for dewatering purposes during construction.

(2) In addition, article 1 contains general definitions and principles of construction applicable to all articles in this code.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12703 Applicability of 333.12701 to 333.12715.

Sec. 12703.(1) Sections 12701 to 12715 shall not apply to:

(a) A well, pump, or other equipment used temporarily for dewatering purposes during construction when the well is not more than 2 inches in diameter and not more than 25 feet in total depth below the natural ground surface or is used in the relief of artesian pressure at hydroelectric projects or is used with the drilling of oil or gas wells.

(b) A brine, test, storage, or disposal well regulated pursuant to Act No.

315 of the Public Acts of 1969, being sections 319.211 to 319.236 of the Michigan Compiled Laws.

(2) Sections 12701 to 12715 shall not prevent a person from constructing a well or installing a pump on property owned or leased by the person which is intended for use only in a single family house which is that person's permanent residence, or intended for use only for farming purposes on that person's farm, and where the waters to be produced are not intended for use by the public or in any residence other than his or her own. The person shall submit the drilling record required by section 12707 and comply with the rules and construction code promulgated under section 12714.

(3) Sections 12701 to 12715 shall not restrict a master plumber licensed under Act No. 266 of the Public Acts of 1929, as amended, being section 338.901 to 338.917 of the Michigan Compiled Laws, from engaging in the licensee's legally recognized trade. A licensed master plumber may perform the work of a pump installer prescribed in sections 12701 to 12715 or rules and construction code promulgated under section 12714 without a certificate of registration as a pump installer.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12704 Certificate of registration as well drilling contractor, pump installer, water well drilling contractor, or dewatering well pump installer; application; fees; exemption.

Sec. 12704.(1) Before engaging in the business of well drilling or pump installing, a person shall obtain a certificate of registration annually as a well drilling contractor or pump installer, using an application prepared by the department.

(2) Before engaging in the business of constructing dewatering wells or installing dewatering well pumps, a person shall obtain a certificate of registration annually as a water well drilling contractor limited to the construction of dewatering wells or as a dewatering well pump installer, using an application prepared by the department.

(3) The applicant shall pay a registration fee with the application. The initial registration fee and the annual renewal registration fee for a well drilling contractor is \$40.00 and for a pump installer is \$25.00. A well drilling contractor shall pay an additional annual fee of \$10.00 for each additional drilling machine. A registered well drilling contractor may do any of the work of a pump installer without payment of the fee for a pump installer.

(4) A county, city, village, township, or other governmental unit engaged in well drilling or pump installing shall be registered under sections 12701 to 12715, but shall be exempt from paying the registration fees if the drilling or installing is done by regular employees of, and with equipment owned by, the governmental unit and the work is on wells or pumps intended for use by the governmental unit.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12705 Certificate of registration; issuance; nontransferable; expiration;

Section 12705. (1) The department shall issue certificates of registration to well drilling contractors and pump installers who meet the requirements of sections 12701 to 12715.

(2) A certificate of registration is not transferable and expires on April 30 of each year. After July 1 of each year a certificate of registration may be

renewed only upon application for renewal and payment of a fee of 50% of the basic registration fee in addition to the regular registration fee.

(3) A new applicant for a certificate of registration shall be examined in accordance with the rules and construction code promulgated under section 12714. The advisory board created by section 12711 shall determine and advise the department as to the eligibility of a well drilling contractor or pump installer for registration. A well drilling contractor or pump installer which is a firm, partnership, or corporation shall designate at least 1 partner, officer, or responsible full-time employee to take the examination on its behalf.

(4) The department, upon application and payment of the prescribed fees, may issue a certificate of registration as a well drilling contractor or a pump installer to a person who holds a similar certificate of registration in another state or a foreign country, if the requirements for the registration of a well drilling contractor and pump installer under which the certificate of registration was issued do not conflict with this part, are of a standard not lower than that specified by the rules and construction code promulgated under section 12714, and if equal reciprocal privileges are granted to a registrant of this state.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12706 Numbers, seal, and words to be placed on well drilling machine.

Sec. 12706. A well drilling contractor shall place the registration number, including the county code number for the business location, in figures not less than 2 inches high in a conspicuous location on both sides of the contractor's well drilling machine. A seal furnished by the department designating the year the certificate of registration was issued or renewed and the words "Michigan registered water well drilling contractor" shall be affixed directly adjacent to the registration number.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12707 Record required; contents; copies; forms; sufficiency of record for

Sec. 12707. Not later than 60 days after the completion of a well, a well drilling contractor shall provide the owner with a copy and the department, or local health department, with 2 copies of a record indicating the well owner's name, location of the well, well depth, geologic materials and thicknesses of materials penetrated, amount of casing, static water levels, and any other information which may be required by the rules and construction code promulgated under section 12714. The department or local health department shall sent 1 copy of the record to the director of the department of natural resources not later than 30 days after its receipt from the well drilling contractor. Standard forms for the record shall be provided by the department or the contractor's forms may be used if approved by the department. A record for a drive point well where no earth materials are removed from the well bore is sufficient if the owner's name, well location, depth, casing static water level, and screen data are stated.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12708 Entering and inspecting installation.

Sec. 12708. The department or local health department may enter and inspect, at reasonable hours, an installation on public or private property for the development or abandonment of ground water supplies.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12709 Inspection of violation; order; notice of suspension of certificate of registration; petition for hearing; revocation of certificate of registration.

Sec. 12709. (1) When the department or local health department determines that there are reasonable grounds to believe there has been a violation of section 12701 to 12715 or a rule or the construction code promulgated under section 12714, the department or the local health department shall investigate the violation. If the department or local health department establishes that a violation has been committed, the department or the local health department shall order the responsible person to make the proper corrections.

(2) When the department finds that the holder of a certificate of registration has engaged in a practice in violation of sections 12701 to 12715 or a rule, construction code, or order issued pursuant to those sections, the department may give written notice to the holder of the certificate of registration that the certificate of registration is suspended. A person who receives notice from the department that his or her certificate of registration is suspended, upon request, shall be granted a hearing before the department or an authorized representative of the department. If a petition for a hearing is not filed within 30 days after the day on which the certificate of registration was suspended, the certificate of registration is automatically revoked.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12711 Advisory board; creation; appointment and qualifications of members.

Sec. 12711. An advisory board of 9 members is created in the department composed of the following: 5 members who are residents of this state registered under section 12701 to 12715, at least 4 of whom are well drilling contractors, and who shall be appointed by the governor with the advice and consent of the senate; an employee of the bureau of environmental and occupational health of the department, and a representative of a local health department, each to be appointed by the director; an employee of the geological survey section of the department of natural resources appointed by the director of the department of natural resources; and an employee of the water resources commission. Of 4 well drilling contractors 1 shall be from each of 4 geographic regions:

(a) Region 1: The Upper Peninsula

(b) Region 2: That part of the Lower peninsula bordered on the south by Oceana, Newaygo, Mecosta, Isabella, Midland, and Bay counties and the area north of those counties.

(c) Region 3: the area bordered on the north and west by Huron, Tuscola, Saginaw, Shiawassee, Livingston, Washtenaw, and Lenawee counties and the area south and east of those counties.

(d) Region 4: The area bordered on the east and north by Hillsdale, Jackson, Ingham, Clinton, Gratiot, Montcalm, Kent, and Muskegon counties and the area south and west of those counties.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12712 Advisory board; terms of members; vacancies.

Sec. 12712. Each member of the advisory board shall be appointed for a 3-year term. The terms of the 5 members registered under sections 12701 to

12715 shall alternate so that not more than 2 are appointed each year, except that of the first appointees, 1 shall be appointed for 1 year and 2 each shall be appointed for 2 and 3 years. The terms of the members representing the department of natural resources, the water resources commission, and the local health department shall alternate so that only 1 is appointed each year, except that of the first appointees 1 member shall be appointed for 1 year, 1 for 2 years, and 1 for 3 years. Vacancies shall be filled by appointment for the balance of the unexpired terms by the representative officials designated in section 12711.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12713 Advisory board; election of chairperson; secretary; number of meetings; quorum; conducting business at public meeting; notice of meeting; compensation and expenses.

Sec. 12713. (1) The members of the advisory board, as soon as appointed, shall organize and elect from their number a chairperson. Thereafter, annually when new members are appointed to the board, a chairperson shall be elected at the next board meeting. The member from the department shall be the secretary of the board.

(2) The board shall hold not less than 1 meeting each year for the purpose of examining candidates for registration. Additional meetings may be called by the chairperson or director as may be reasonably necessary to carry out sections 12701 to 12715. Five members shall constitute a quorum. The business which the advisory board may perform shall be conducted at a public meeting of the advisory board held in compliance with Act No. 267 of the Public Acts of 1976, as amended, being sections 15.261 to 15.275 of the Michigan Compiled Laws. Public notice of the time, date, and place of the meeting shall be given in the manner required by Act No. 267 of the Public Acts of 1976, as amended.

(3) The per diem compensation of the members of the advisory board registered under sections 12701 to 12715 shall be established annually by the legislature. Expenses shall be reimbursed pursuant to section 1216.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12714 Rules and construction code.

Sec. 12714. The department, with the advise of the advisory board, shall promulgate rules and a construction code reasonably necessary to implement sections 12701 to 12715. The rules and construction code shall include provisions for qualifications and examination of well drilling contractors and pump installers, standards for the construction and installation of developments of ground water supplies, dewatering wells, abandonment of wells and dewatering wells, and for the administration of sections 12701 to 12715.

History: 1978, Act 368, Eff. Sept. 30, 1978.

333.12715 Violation as misdemeanor; penalties; prosecution.

Sec. 12715. (1) Except as provided in subsection (2), a person who violates sections 12701 to 12714, a rule or the construction code promulgated under section 12714, or an order issued by the department or local health department under sections 12701 to 12714 is guilty of a misdemeanor.

(2) A member of the advisory board who intentionally violates section

12713(2) shall be subject to the penalties prescribed in Act No. 267 of the Public Acts of 1976, as amended.

(3) The attorney general or local prosecuting attorney shall be responsible for prosecuting a person who violates sections 12701 to 12715.

History: 1978, Act 368, Eff. Sept. 30, 1978.

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WELL CONSTRUCTION CODE ADMINISTRATIVE RULES

Filed with the Secretary of State on April 5, 1994.

These rules take effect 15 days after filing with the Secretary of State

(By authority conferred on the department of public health by sections 33 and 63 of Act No. 306 of the Public Acts of 1969, as amended, and section 12714 of Act No. 368 of the Public Acts of 1978, as amended, being "24.233, 24.263, and 333.12714 of the Michigan Compiled Laws)

PART 1. WELL CONSTRUCTION CODE

R 325.1601 Definitions; A.

R 325.1601a Definitions; B.

R 325.1602 Definitions; C, D.

R 325.1603 Definitions; G to M.

R 325.1603a Definitions; N, O.

R 325.1604 Definitions; P.

R 325.1605 Definitions; R to T.

R 325.1606 Definitions; W, Y.

R 325.1607 Terms defined in the act.

R 325.1608 Authorized activities.

R 325.1610 Adoption of standards and specifications.

R 325.1611 Application of rules to existing water supplies.

R 325.1612 Compliance with regulations and local codes.

R 325.1613 Deviations from minimum standards.

R 325.1621 Location and construction of wells generally.

R 325.1622 Wells; distances from contamination sources.

R 325.1624 Wells; relation to buildings and access for maintenance.

R 325.1625 Wells; areas subject to flooding.

R 325.1626 Construction of wells; steel casing.

R 325.1627 Construction of wells; steel casing and types of joints.

R 325.1631a Construction of wells; PVC casing dimensions.

R 325.1631b Construction of wells; PVC casing material standards.

R 325.1631c Construction of wells; PVC well casing joints.

R 325.1631d Construction of wells; examination of pipe.

R 325.1632 Construction of wells; casing diameter, depth, termination, and installation procedures.

R 325.1632a Construction of wells; driven well points.

R 325.1633 Rescinded.

R 325.1633a Construction of wells; grouting.

R 325.1634 Rescinded.

R 325.1634a Construction of wells; grouting rotary-bored or augered wells

R 325.1635 Construction of wells; grouting driven casing wells.

R 325.1636 Rescinded.

R 325.1637 Construction of bedrock wells.

R 325.1637a Verification of well grouting.

R 325.1638 Construction of flowing artesian wells.

R 325.1639 Construction of wells; well screens; lead packers, lead plugs, lead wool and certain drilling fluids prohibited; requirements for steel pipe used as screen riser pipes, blanks, or tailpipes; well pumping rate; temporary capping; well alignment; drilling water; requirements when using chlorine or other well rehabilitation chemicals .

R 325.1640 Certification of water well components.

R 325.1641 Abovegrade well casing connections.

R 325.1642 Belowground well casing connections.

R 325.1651 Construction of room housing pumping equipment or well casing; location of pump or pumping equipment in single- family dwelling permitted;

access required for repair and maintenance of water supply system components.

[R 325.1652](#) Rescinded.

[R 325.1653](#) Pump construction, installation, design, and maintenance.

[R 325.1653a](#) Pump installation; hand pumps.

[R 325.1654](#) Pump installation; water suction lines.

[R 325.1655](#) Pump installation; water service lines.

[R 325.1656](#) Pump installation; pressure tanks.

[R 325.1656a](#) Pump installation; venting of gases.

[R 325.1657](#) Pump installation; vents.

[R 325.1657a](#) Pump installation; well caps and seals.

[R 325.1658](#) Pump installation; sampling faucets.

[R 325.1661](#) Disinfection of well and pumping equipment.

[R 325.1662](#) Abandoned wells and dry holes; persons responsible for plugging; removal of debris and obstructions; wells taken out of service when municipal water is installed.

[R 325.1663](#) Abandoned wells and dry holes; plugging method.

[R 325.1664](#) Abandonment of wells; plugging materials.

[R 325.1665](#) Plugging of dug wells and crock wells.

[R 325.1666](#) Rescinded.

[R 325.1667](#) Plugging wells drilled by person other than property owner or registered well drilling contractor.

[R 325.1668](#) Order to plug abandoned well or dry hole.

[R 325.1669](#) Owner and contractor responsibility for plugging abandoned wells

[R 325.1670](#) Temporarily abandoned wells.

[R 325.1671](#) Rescinded.

[R 325.1672](#) Storage reservoirs.

[R 325.1673](#) Provision of notice of health hazard to person using contaminated water supply

[R 325.1674](#) Other water sources.

[R 325.1674a](#) Water supply cross-connections.

[R 325.1675](#) Well records.

[R 325.1676](#) Pump installation records.

PART 2. DRILLING CONTRACTORS' AND PUMP INSTALLERS' REGISTRATION

[R 325.1701](#) Qualifications.

[R 325.1701a](#) Proof of work experience.

[R 325.1702](#) Grandfather clause.

[R 325.1703](#) Submission of applications.

[R 325.1704](#) Advisory board's evaluation of applicants.

[R 325.1705](#) Rescinded.

[R 325.1705a](#) Out-of-state applicants.

[R 325.1706](#) Examinations.

[R 325.1707](#) Denial of applications.

[R 325.1707a](#) Suspension or revocation of certificate; denial of renewal application.

[R 325.1708](#) Initial certificate; nontransferability; content; renewal certificate; content; notice of change in applicant information; notice of loss of registered contractor representative.

[R 325.1709](#) Reinstatement of expired and revoked certificates.

[R 325.1711](#) Public representations and advertising.

PART 3. DRILLING MACHINES AND SERVICE VEHICLES

[R 325.1721](#) Well drilling machine registration.

[R 325.1722](#) Identification on well drilling machines and service vehicles.

PART 1. WELL CONSTRUCTION CODE

R 325.1601 Definitions; A.

Rule 101. (1) "Abandoned water well" means any of the following:

- (a) A well which has its use permanently discontinued.
 - (b) A well which is in such disrepair that its continued use for the purpose of obtaining groundwater is impractical.
 - (c) A well which has been left uncompleted.
 - (d) A well which is a threat to groundwater resources.
 - (e) A well which is or may be a health or safety hazard.
- (2) "Act" means Part 127 of Act No. 368 of the Public Acts of 1978, as amended, being "333.12701 to 333.12715 of the Michigan Compiled Laws.
- (3) "Annular space" means the space between 2 cylindrical objects, 1 of which surrounds the other, such as the space between a borehole wall and a permanent casing or between a temporary casing and a permanent casing.
- (4) "Approved basement" means a basement which has walls and a floor that are constructed of concrete or its equivalent, which is reasonably watertight, which is properly drained, and which is in ordinary daily use.
- (5) "Aquifer" means a subsurface water-bearing geologic material that transmits water in sufficient quantities to supply a well.

R 325.1601a Definitions; B.

Rule 101a. (1) "Basement offset" means a below grade well room or pump room which has walls and a floor that are constructed of concrete or its equivalent, which is reasonably watertight, and which is attached directly to, and drained into, an approved basement in a manner that provides access for the maintenance of water supply system components.

(2) "Bedrock" means consolidated and continuous geologic material, such as limestone, dolomite, shale, sandstone, basalt, or granite.

(3) "Bentonite" means a plastic, colloidal clay which has an extensive ability to absorb fresh water and swell in volume and which is composed predominantly of the mineral montmorillonite.

(4) "Bentonite chips" means bentonite that is crushed to an approximate size range of 3/8 to 3/4 of an inch.

(5) "Bentonite grout" means a slurry which consists of bentonite and water and which has a high solids concentration and a minimum density that meets specifications approved by the department. A slurry of drilling fluid bentonite and water or drilled cuttings, either singularly or in combination, is not bentonite grout.

(6) "Bentonite pellets" means bentonite that has been processed into pellet or tablet form with a diameter of 1/4 to 1/2 of an inch.

R 325.1602 Definitions; C, D.

Rule 102. (1) "Casing" means an impervious durable pipe that is placed in a well to prevent the walls from caving and to prevent surface drainage, undesirable water, gas, or other fluids, from entering the well.

(2) "Coliform group" means all of the aerobic and facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria that ferment lactose with gas formation within 48 hours at 35 degrees Celsius.

(3) "Concrete grout" means a mixture of cement, sand, and water in the proportion of 1 bag of cement (94 pounds), an equal volume (1 cubic foot) of dry sand or gravel aggregate, and not more than 6 gallons of clean water.

(4) "Confining layer" means geologic material which has a low hydraulic conductivity, which is 5 feet or more in thickness, and which impedes or prevents vertical groundwater movement.

(5) "Contaminant" means a biological, chemical, physical, or radiological constituent in water that is or may become injurious to the public health, safety, or welfare.

(6) "Date of completion" means the date on which the installation of the pump or pumping equipment was completed, the date on which well drilling was completed if a pump or pumping equipment will not be installed or will be installed by a person other than the well drilling contractor, or the date on which the water supply system is placed into service after the collection of water samples pursuant to the provisions of R 325.1661.

- (7) "Department" means the state department of public health.
- (8) "Dewatering well contractor" means an individual, partnership, or corporation which is qualified to engage in dewatering well construction and dewatering well pump installation and which constructs or installs dewatering wells, plugs abandoned dewatering wells, or supervises such work.
- (9) "Dewatering well pump installer" means an individual, partnership, or corporation which is qualified to engage in installing and operating dewatering pumps and which installs and operates dewatering pumps or supervises such work.
- (10) "Director" means the director of the department or an authorized representative.
- (11) "Drilling fluid bentonite" means bentonite that is processed into a powdered form for use as a viscosifier and filtrate reducer in drilling operations.
- (12) "Dry hole" means an open borehole or cased borehole that does not produce water in sufficient quantity for the intended use.

R 325.1603 Definitions; G to M.

- Rule 103.** (1) "Geologic material" means all materials that are penetrated in drilling a well.
- (2) "Granular bentonite" means bentonite that has an approximate size range of 1/32 to 1/8 of an inch.
- (3) "Ground surface" means the intended or actual finished grade of the surface of the ground at the well site, which shall be consistent with the surrounding land surface.
- (4) "Groundwater" means the water in the zone of saturation that fills all of the pore spaces of the subsurface geologic material.
- (5) "Grout" means a material that has a low permeability, such as neat cement, bentonite grout, bentonite chips, bentonite pellets, granular bentonite, or other materials which have equivalent sealing properties and which are approved in writing by the department before use.
- (6) "Grouting" means the placement of grout into the annular space that surrounds a permanent casing for the purpose of sealing the annular space to prevent the entrance or migration of surface water, near surface water, and contaminants to the groundwater and to maintain the natural protection of aquifers.
- (7) "Health officer" means the administrative officer who is in charge of a full-time local health department or an authorized representative.
- (8) "Installation of pumps and pumping equipment" means the selection of, and procedure employed in the placement and preparation for operation of, pumps and pumping equipment, including any construction that is involved in making an entrance to the well and also means installing a pitless adapter, well cap, pump drop pipe, suction line, discharge line, water service line, or pressure tank.
- (9) "Liner pipe" means a permanent casing installed within another permanent casing or open borehole subsequent to initial construction of the well.
- (10) "Municipality" means a city, village, township, county, district, or other public body that is created by or pursuant to state law or any combination of such units acting cooperatively or jointly.

R 325.1603a Definitions; N, O.

- Rule 103a.** (1) "Neat cement" means a mixture of 1 bag of Portland cement (94 pounds) and not more than 6 gallons of fresh water. Drilling fluid bentonite that is not more than 5% by weight of cement and additional water that is not more than 0.6 gallons for each 1% of bentonite may be added to neat cement. Other additives and admixtures shall be approved by the department before use.
- (2) "Overburden" means unconsolidated geologic material, such as gravel, sand, silt, and clay, that overlies bedrock.

R 325.1604 Definitions; P.

- Rule 104.**(1) "Permanent casing" means durable, impervious pipe placed or driven into the borehole and left in place to maintain the well opening.
- (2) "Pitless adapter" means a device or assembly of parts which will permit water to pass through the wall of the well casing or extension thereof and which provides access to the well and to the parts of the water supply system within the well in a manner to

prevent the entrance of contaminants into the well and the water produced.

(3) "Potable water" means water which is free of contaminants in concentrations that may cause disease or harmful physiological effects and which is safe for human consumption.

(4) "Pressure tank" means a closed water and air storage container that modulates the water supply system pressure within a selected range.

(5) "Priming" means the filling of a pump with water and the action of starting the flow in a pump.

(6) "Pumping equipment " means equipment or materials that are used or intended to assist a pump in withdrawing groundwater from a well, including any of the following:

(a) Seals and other safeguards to protect the water from contamination.

(b) Associated fittings.

(c) Intake and discharge piping.

(d) Controls to provide sanitary water storage facilities and deliver water to a distribution piping system.

(7) "Pump room" means an enclosed structure which is either above ground surface or located within or attached to an approved basement and which houses a pump or pumping equipment.

(8) "Pumping water level" means the distance measured from the ground surface to the water surface in a well that is being pumped.

(9) "PVC" means polyvinyl chloride plastic.

R 325.1605 Definitions; R to T.

Rule 105. (1) "Recharge well," as used in section 12701 of the act, means a well used to discharge groundwater into an aquifer.

(2) "Static water level" means the distance measured from the ground surface to the water surface in a well that is neither being pumped nor under the influence of pumping.

(3) "Suction line" means a pipe or line that is connected to the inlet side of a pump or any pipe or line connected to a casing or pump which is or may be at less than atmospheric pressure (0 psig).

(4) "Sump" means a shallow excavation into the ground in which the side walls may be supported by material other than steel casing. Water may enter the sump by drainage over the ground or by seepage through the side walls and bottom.

(5) "Surface water" means water that rests or flows on the surface of the ground.

(6) "Temporarily abandoned well" means a well that is not in use, but intended by the owner to be used as a source of groundwater.

(7) "Temporary casing" means durable pipe placed or driven into a borehole to maintain an open annular space around the permanent casing during construction of a well.

(8) "Test well," as used in section 12701 of the act, means a well that is used to obtain information on groundwater quantity, quality, or aquifer characteristics for the purpose of designing or operating a water supply well.

R 325.1606 Definitions; W, Y.

Rule 106. (1) "Wastewater" means a liquid waste that includes any of the following:

(a) Human excreta.

(b) Wastes from a sink, lavatory, bathtub, shower, or laundry.

(c) Any other liquid waste of organic or chemical nature, either singularly or in combination.

(2) "Water supply system" means a well, pump, and pumping equipment.

(3) "Well," as defined in section 12701 of the act, also includes all of the following:

(a) "Water supply well," which means a well that is used to provide potable water for drinking or domestic purposes.

(b) "Irrigation well," which means a well that is used to provide water for plants, livestock, or other agricultural processes.

(c) "Heat exchange well," which means a well for the purpose of utilizing the geothermal properties of earth formations for heating or air conditioning.

(d) "Industrial well," which means a well that is used to supply water for

- industrial processes, fire protection, or similar nonpotable uses.
- (4) "Well drilling" means any of the following:
- (a) Constructing, reconstructing or repairing a well.
 - (b) Operating a well drilling machine.
 - (c) Installing or removing casing or a well screen.
 - (d) Well grouting.
 - (e) Well development.
 - (f) Well rehabilitation.
 - (g) Hydrofracturing.
 - (h) Chemical treatment of a well.
 - (i) Plugging abandoned wells.
- (5) "Well house" means an enclosed structure which is located above the ground surface and which houses a well or water supply system.
- (6) "Well log" or "water well record" means a record of information about a specific well as provided for in section 12707 of the act.
- (7) "Well seal" means a device to prevent the entrance of contaminants into the top of a well casing.
- (8) "Well used temporarily for dewatering," as used in section 12701 of the act, means a well that is used to lower the groundwater level temporarily at a construction site.
- (9) "Vent" means an outlet which is at the upper terminal of a well casing and which allows the equalization of air pressure in the well.

R 325.1607 Terms defined in the act.

Rule 107. The terms defined in the act have the same meanings when used in these rules.

R 325.1608 Authorized activities.

Rule 108. (1) A registered well drilling contractor may perform the well drilling activities that are set forth in R 325.1606(4) and pump installation activities that are set forth in R 325.1603(8).

(2) A registered pump installer may perform the pump installation activities that are set forth in R 325.1603(8), but shall not perform well drilling activities that are set forth in R 325.1606(4).

R 325.1610 Adoption of standards and specifications.

Rule 110. (1) These rules refer to the following standards and specifications of nationally recognized organizations or associations, which were in effect on October 1, 1993, and are adopted by reference in these rules:

(a) The following standards of the American society for testing and materials, which are available at a cost as of the time of adoption of these rules of \$12.00 each from the American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, Pennsylvania 19103:

(i) ASTM specification A 53-90b,
"Standard Specification for Pipe, Steel,
Black and Hot-Dipped, Zinc-Coated
Welded and Seamless."

(ii) ASTM specification A 106-91,
"Standard Specification For Seamless
Carbon Steel Pipe for High
Temperature Service."

(iii) ASTM specification A 589-89a,
"Standard Specification for Seamless
and Welded Carbon Steel Water-Well
Pipe."

(iv) ASTM specification F 480-90,
"Standard Specification for
Thermoplastic Water Well Casing Pipe
and Couplings Made in Standard

Dimension Ratios (SDR)."
(v) ASTM specification D 1785-91,
"Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80, and 120."
(vi) ASTM specification D 2239-89,
"Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter."
(vii) ASTM specification D 2241-89,
"Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)."
(viii) ASTM specification D 2662-89,
"Standard Specification for Polybutylene (PB) Plastic Pipe Based on Controlled Inside Diameter."
(ix) ASTM specification D 2666-89,
"Standard Specification for Polybutylene (PB) Plastic Tubing."
(x) ASTM specification D 2737-89,
"Standard Specification for Polyethylene (PE) Plastic Tubing."
(xi) ASTM specification C 150-89,
"Standard Specification for Portland Cement."

(b) American petroleum institute (API) specification 5L, 1990, "Specification for Line Pipe," which is available at a cost as of the time of adoption of these rules of \$8.00 each and the API "Specification for Materials and Testing for Well Cements," API specification 10, 1990, which is available at a cost as of the time of adoption of these rules of \$12.00 each. Both specifications may be obtained from the American Petroleum Institute, 1220 L Street, Northwest, Washington, DC 20005.
(c) American national standards institute (ANSI)/national sanitation foundation (NSF) "Standard Number 60 for Drinking Water Treatment Chemicals - Health Effects," 1988, and ANSI/NSF "Standard Number 61 for Drinking Water System Components - Health Effects," 1990, and ANSI/NSF "Standard Number 14 for Plastic Piping Components and Related Materials," 1989, which are available at a cost as of the time of adoption of these rules of \$45.00 each from the National Sanitation Foundation (NSF), 3475 Plymouth Road, P. O. Box 1468, Ann Arbor, Michigan 48106.

(2) The standards and specifications adopted by reference in subrule (1) of this rule are available for inspection and purchase at the office of the Michigan Department of Public Health, Bureau of Environmental and Occupational Health, Division of Water Supply, 3423 North Logan/Martin Luther King Jr. Blvd., P. O. Box 30195, Lansing, Michigan 48909.

R 325.1611 Application of rules to existing water supplies.

Rule 111. (1) When extensive changes or repairs are made to a water supply system that was constructed before the effective date of these amendatory rules, the changes or repairs shall be in compliance with the provisions of these rules unless a deviation is issued pursuant to the provisions of R 325.1613. Extensive changes include replacing the entire casing, removing a casing from the ground, or changing aquifers.

(2) Upgrading a water supply system to conform with these rules is not required when minor repairs to the system occur, such as any of the following:

- (a) Replacing a telescoped well screen.
- (b) Changing screen elevation.
- (c) Deepening or plugging back a bedrock well.
- (d) Installing a liner pipe.
- (e) Replacing a pump, controls, pump drop pipe, or pressure tank.
- (f) Chemical treatment of the well or well disinfection.

R 325.1612 Compliance with regulations and local codes.

Rule 112. A person who installs a well, pump, or pumping equipment shall comply with applicable laws, regulations, ordinances, and codes, including all of the following:

- (a) Act No. 399 of the Public Acts of 1976, as amended, being '325.1001 et seq. of the Michigan Compiled Laws. (safe drinking water act)
- (b) Act No. 266 of the Public Acts of 1929, as amended, being '338.901 et seq. of the Michigan Compiled Laws. (state plumbing code)
- (c) Act No. 154 of the Public Acts of 1974, as amended, being '408.1001 et seq. of the Michigan Compiled Laws. (occupational safety and health act)
- (d) Act No. 53 of the Public Acts of 1974, as amended, being '460.701 et seq. of the Michigan Compiled Laws. (utility damage prevention act)
- (e) Act No. 217 of the Public Acts of 1956, as amended, being '338.881 et seq. of the Michigan Compiled Laws. (electrical administrative act)
- (f) Act No. 331 of the Public Acts of 1976, as amended, being '445.901 et seq. of the Michigan Compiled Laws. (consumer protection act)
- (g) Any local code of a municipality which regulates the installation of a well, pump, or pumping equipment and which is not less restrictive than these rules. If a local board of health, in the discharge of its duties to protect the public health, deems it necessary to establish requirements that are more stringent than these rules, it shall do so and file a record of the requirements with the director. Well drilling contractors who drill wells in the counties that are affected by the more stringent requirements shall be notified, in writing, by the department or local health department not less than 5 days before the effective date of the modified requirements.

R 325.1613 Deviations from minimum standards.

Rule 113. (1) A health officer, in the discharge of his or her duty to protect the public health, may issue a deviation from the provisions of specific rules as provided for in this rule, if the spirit and intent of these rules are observed and the public health, safety, and welfare are assured.

(2) Rules or parts of rules, specific minimum standards, requirements, and conditions for which deviations may be permitted are as follows:

- (a) The provisions of R 325.1611(1) may be deviated from to permit a water service line to remain in a condition that is not in compliance with the provisions of these rules when extensive changes or repairs to a water supply system are made if the water service line is located beneath a permanent structure or pavement.
- (b) The provisions of R 325.1622 may be deviated from as follows:
 - (i) A well may be located closer than the specified minimum distance to a potential or known source of contamination if the dimensions of the property on which the well is to be located do not permit compliance with the specified minimum distances and if any of the following conditions exist:
 - (A) Hydrogeologic data indicate that the direction of groundwater flow at the contamination source is away from the well.

(B) The depth of the well and depth of grouting of the casing that is specified by a health officer as a condition of the deviation will provide equivalent protection of groundwater quality and the public health.

(C) The well is being constructed to replace an existing water supply well that is located on a site where a habitable structure exists.

(ii) A well may be required to be located more than the specified minimum distance from a potential or known source of contamination if the minimum specified distance will not protect groundwater quality or the public health due to local groundwater conditions, geology, or other factors.

(iii) A well may be located closer than the specified minimum distance, but not closer than 10 feet, to a pressurized sewer that meets all of the following requirements:

(A) The sewer pipe and joints have been pressure tested, after installation, to not less than 100 pounds per square inch and have been determined to be watertight.

(B) The sewer pipe and joints meet or exceed the standards of ASTM specification D 1785-91 or D 2241-89. The specifications are adopted by reference in R 325.1610.

(C) The sewer has a wall thickness that is equivalent to, or thicker than, schedule 40 or SDR 21.

(iv) A health officer may require a study of the

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(c) The provisions of R 325.1624(1)(a) may be deviated from to permit a well to be located closer than 3 feet to a building, pump room, or any projection thereof if all of the following conditions exist:

- (i) The well is replacing an abandoned well.
- (ii) The dimensions and features of the property on which the well is to be constructed do not permit location of the well to be in compliance with the specified minimum distance.
- (iii) Access for maintenance of the well is provided.

(d) The provisions of R 325.1632(3) may be deviated from to permit a well casing to extend less than 25 feet below the ground surface if the well will not be used to supply water to habitable structures or for human consumption and if both of the following conditions exist:

- (i) The well and water supply system are clearly and permanently identified as not being suitable for human consumption or body contact.
- (ii) The well and water supply system are separated from any potable water supply system on the premises.

(e) The provisions of R 325.1632(3) may be deviated from to permit a well casing to extend less than 25 feet below the ground surface if there is reason to believe that potable water of suitable quantity does not exist at a reasonable depth of more than 25 feet and if either of the following conditions exists:

- (i) The distance between the well and a potential or known source of contamination is increased pursuant to the provisions of subdivision (b)(ii) of this subrule.
- (ii) A confining layer is present above the aquifer that will be used by the shallow well.

(f) The provisions of R 325.1634a(1) may be deviated from to permit the length of casing to be grouted for rotary-bored or augered wells to be decreased if the well is more than 100 feet deep and if a confining layer is not penetrated.

(g) The provisions of R 325.1637 may be deviated from to require that a well casing extend more than 25 feet below the ground surface if there is reason to believe that nonpotable water is or may be present in the upper bedrock.

(h) The provisions of R 325.1638(2) may be deviated from to permit flowing well discharge if the well owner or the well owner's representative demonstrates any of the following:

- (i) Control of the flow is not practical.
- (ii) Control of the flow will likely result in the production of sand or turbidity in the water.
- (iii) The discharge is for a beneficial use.

(3) Deviations from the rules listed in subrule (2) of this rule shall be made, in writing, by a health officer and shall state the reasons for each deviation. A health officer may require special well construction features as a condition for the issuance of a deviation and may require well construction features that are more stringent than these rules when deemed necessary to protect the groundwater quality or the public health. Reasons for the issuance of a deviation or special well construction features as a condition for the issuance of a deviation by a health officer shall be based upon any of the following factors:

- (a) Site hydrogeology.
- (b) Site topography.
- (c) Site dimensions.
- (d) Soil Characteristics
- (e) Depth of well.
- (f) Type of well.
- (g) Well pumping rate.
- (h) Well drilling method.
- (i) Distance from contamination sources.
- (j) Presence of groundwater contamination.
- (k) Other similar factors.

R 325.1621 Location and construction of wells generally.

Rule 121. (1) All of the following provisions apply to well location:

- (a) A well shall be located with due consideration of all of the following:
 - (i) Lot size.
 - (ii) Hydrogeology.
 - (iii) Site topography.
 - (iv) Soil characteristics.
 - (v) Other factors that are necessary to implement the provisions of these rules.
- (b) A well shall be located so that the well and its surrounding area can be kept in a sanitary condition.
- (c) A well shall be located so that access to the well for maintenance is provided.
- (d) A well shall be located so that damage and personal injury do not result from contact with utilities during the construction or service of the well.

(2) A well shall be adequate in size, design, and development for the intended use giving due consideration to local groundwater conditions.

(3) All of the following provisions apply to well construction:

- (a) A well shall be constructed to maintain existing natural protection against the contamination of aquifers.
- (b) A well shall be constructed to exclude all known sources of contamination from the well.
- (c) A well shall be constructed, equipped, and operated to prevent unnecessary discharge from flowing wells.

R 325.1622 Wells; distances from contamination sources.

Rule 122. (1) A well that furnishes water for any beneficial use shall be located where it is not subject to contamination. Groundwater contaminant movement is influenced by the type of contaminant, groundwater flow direction and velocity, and other hydrogeologic, geologic, and geochemical factors. If available, hydrogeologic data shall

be used to select well location. Where possible, a well shall be located upgradient of a potential or known source of contamination. A well shall be located the maximum practical distance from a potential or known source of contamination. The following minimum horizontal distances shall be maintained when locating a well:

- (a) Eight hundred feet from either of the following:
 - (i) The active work area of a landfill, as defined in R 299.4101.
 - (ii) Land surface application of septage waste, as defined by section 2 of Act No. 181 of the Public Acts of 1986, being '325.312 of the Michigan Compiled Laws.
- (b) Three hundred feet from any of the following:
 - (i) Land application or subsurface injection of effluent or digested sludge from a municipal wastewater treatment facility.
 - (ii) Oil and gas wells.
 - (iii) Petroleum product processing or storage facilities.
 - (iv) Underground or abovegrade storage tank systems of not less than 1100 gallons which are regulated under Act No. 423 of the Public Acts of 1984, as amended, being '299.701 et. seq. of the Michigan Compiled Laws, when secondary containment as defined by Act No. 423 of the Public Acts of 1984, as amended, is not provided.
- (c) One hundred and fifty feet from a preparation or storage area for fertilizers, agricultural chemicals, or other chemicals that might contaminate the soil or groundwater.
- (d) Fifty feet from any of the following:
 - (i) A buried sewer, other than a sewer that is specified in subdivision (g) of this subrule.
 - (ii) A septic tank.
 - (iii) A subsurface disposal field.
 - (iv) A dry well.
 - (v) A sewage pump chamber.
 - (vi) A pressurized sewer.
 - (vii) A grease trap.
 - (viii) A seepage pit.
 - (ix) A cesspool.
 - (x) An animal or poultry yard.
 - (xi) An outhouse.
 - (xii) Any other wastewater handling or disposal unit or site of liquid wastes draining into the soil.
- (e) Fifty feet from underground or abovegrade storage tank systems which have a capacity of not less than 1,100 gallons, which are regulated pursuant to the provisions of Act No. 423 of the Public Acts of 1984, as amended, being '299.701 et seq. of the Michigan Compiled Laws, and which have secondary containment as defined in Act No. 423 of the Public Acts of 1984, as amended.
- (f) Fifty feet from underground or abovegrade storage tank systems which have a capacity of less than 1,100 gallons and which store motor or heating fuels for noncommercial purposes or consumptive use on the premises where the fuel is stored.
- (g) Ten feet from any of the following:
 - (i) A buried gravity-flow sewer that is constructed of service weight or heavier ductile-iron pipe with watertight joints, schedule 40 PVC plastic with

watertight joints, or other material and joints that are approved, in writing, by the director.

(ii) A sump, pit, or unfilled space that is below the ground surface, except for a crawl space.

(iii) A surface water body, such as a lake, pond, river, or stream.

(2) The health officer who is responsible for enforcement of this rule may deviate from the minimum isolation distances in this rule pursuant to the provisions of R 325.1613, either increasing or decreasing the minimum isolation distances for individual well installations.

(3) A well that serves a public water supply, as defined pursuant to the provisions of Act No. 399 of the Public Acts of 1976, as amended, being '325.1001 et seq. of the Michigan Compiled Laws, shall be isolated from contamination sources in accordance with requirements specified in R 325.10101 et seq.

(4) A well owner shall be responsible for maintaining the isolation distances that are specified in the provisions of R 325.1622 and R 325.1624 for property that is owned by the well owner.

R 325.1624 Wells; relation to buildings and access for maintenance.

Rule 124. (1) A well shall be located not less than 3 feet horizontally from a building, pump room, or any projection thereof, unless a deviation is issued pursuant to the provisions of R 325.1613.

(2) A well shall be accessible for cleaning, treatment, repair, testing, inspection, and other attention as may be necessary. A well owner shall maintain access to a well for a well drilling machine.

R 325.1625 Wells; areas subject to flooding.

Rule 125. (1) A well shall not be located in an area that is subject to flooding unless the well is protected as prescribed, in writing, by the health officer.

(2) A well owner shall grade the ground surface that is immediately adjacent to the well casing so surface water is diverted away from the well.

R 325.1626 Construction of wells; steel casing.

Rule 126. (1) Steel pipe that is used as permanent well casing shall be new pipe that is manufactured in compliance with the standards of ASTM specification A 53-90b, A 106-91, or A 589-89a or in compliance with the standards of API specification 5L-90. The specifications are adopted by reference in R 325.1610.

(2) Steel pipe that is used as permanent well casing shall be at least standard weight or schedule 40 through 10 inches inside diameter. Larger diameter pipe shall be at least standard weight. Weights and dimensions of standard weight or schedule 40 pipe are set forth in ASTM specification A 53-90b, A 106-91, and A 589-89a, API 5L-90 specification, and in table 1.

Table 1

**Steel Well Casing
Pipe Weights and Dimensions***

Nominal Pipe Size (Inches)	Wieght Weight/Schedule	Lbs. Plain End	Per Ft. Threaded/Couplings	Wall Thickness (Inches)	Outside Diameter (Inches)	Inside Diameter (Inches)
1 1/4	Std./40	2.27	2.30	.140	1.660	1.380
1 1/2	"	2.72	2.75	.145	1.900	1.610
2	"	3.65	3.75	.154	2.375	2.067
2 1/2	"	5.79	5.90	.203	2.875	2.468
3	"	7.58	7.70	.216	3.500	3.068
3 1/2	"	9.11	9.25	.226	4.000	3.548
4	"	10.79	11.00	.237	4.500	4.026

5	"	14.62	15.00	.258	5.563	5.047
6	"	18.97	19.45	.280	6.625	6.065
8	"	28.55	29.35	.322	8.625	7.981
10	"	40.48	41.85	.365	10.750	10.020
12	Std.	49.56	51.15	.375	12.750	12.000
14	"	54.57	57.00	.375	14.000	13.250
16	"	62.58	65.30	.375	16.000	15.250
18	"	70.59	73.00	.375	18.000	17.250
20	"	78.60	81.00	.375	20.000	19.250
24	"	94.62	-----	.375	24.000	23.250

* Dimensions and tolerances are listed in the specifications adopted in R 325.1610.

(3) Each length of steel pipe that is used as permanent well casing shall be legibly marked, by the manufacturer, with all of the following information:

- (a) The name of the manufacturer.
- (b) The kind of pipe (continuous welded, electric resistance welded, or seamless).
- (c) The weight or schedule.
- (d) The nominal or outside diameter.
- (e) The specification number.
- (f) The length.
- (g) The heat or lot number.

R 325.1627 Construction of wells; steel casing and types of joints.

Rule 127. (1) Steel pipe that is used as permanent well casing shall be watertight throughout its length and shall have threaded or welded joints.

(2) Couplings that are used on threaded steel casing shall be recessed or reamed and drifted couplings that are manufactured in compliance with the standards of ASTM specification A 589-89a or API specification 5L-90. The specifications are adopted by reference in R 325.1610. Couplings shall have a design, taper, and type of thread that is consistent with the thread of the pipe and threads shall not be exposed on the pipe.

(3) Welded joints shall be in compliance with the specifications of table 2 and provide a structurally sound and watertight joint. Pipe ends shall be free of oil, grease, heavy rust, paint, or other foreign materials, except for tightly adherent mill scale. The weld bead shall be chipped and brushed to remove slag and other extraneous materials between passes.

Table 2

Pipe Diameter (Inches)	Minimum Number passes
4	2
5	2
6	3
8	3
10 or larger	4

R 325.1631 Rescinded.

R 325.1631a Construction of wells; PVC casing dimensions.

Rule 131a. (1) PVC pipe that is used as permanent casing shall be new pipe that is manufactured in compliance with the standards of ASTM specification F 480-90, which is adopted by reference in R 325.1610.

- (2) PVC pipe that is used as permanent casing shall be SDR 21 or heavier. PVC pipe that is installed at depths of more than 200 feet shall be SDR 17 or heavier.
- (3) PVC pipe that is used as permanent well casing shall have an outside diameter and minimum wall thickness as specified in table 3. Dimensional standards for PVC pipe are specified in ASTM specification F 480-90.

Table 3

**DIAMETER AND WALL THICKNESS
OF PVC WELL CASING AND LINERS**

Nominal Pipe Size (Inches)		Outside Diameter (Inches)	Minimum Wall Thickness (Inches)	
			SDR 21	SDR17
2	Liner	2.375	.133	.140
3	Pipe	3.500	.167	.206
4	Only	4.500	.214	.265
5		5.563	.265	.327
6		6.625	.316	.390
8		8.625	.410	.508
10		10.75	.511	.632
12		12.750	.606	.750
14		14.00	.667	---
16		16.00	.762	---

R 325.1631b Construction of wells; PVC casing material standards.

Rule 131b. (1) PVC pipe that is used as permanent casing shall be new pipe that is in compliance with ASTM specification F 480-90, which is adopted by reference in R 325.1610.

(2) Each length of PVC pipe that is used as permanent well casing shall be legibly marked, by the manufacturer, with all of the following information:

- (a) The nominal pipe size.
- (b) The standard dimension ratio (SDR).
- (c) The type of plastic (PVC 1120 or PVC 1220).
- (d) The wording "well casing."
- (e) The impact classification (IC).
- (f) A designation that the pipe is in compliance with the provisions of ASTM specification F 480-90.
- (g) The manufacturer's name or trademark.
- (h) The manufacturer's code for resin manufacture.
- (i) The lot number and date of manufacture.
- (j) A certification mark that verifies that the pipe is in compliance with the provisions of ANSI/NSF standard 14.

(3) Casing pipe that is manufactured from thermoplastic materials other than PVC shall be in compliance with the provisions of ASTM specification F 480-90, which is adopted by reference in R 325.1610, and shall be used only with the written prior approval of the director.

R 325.1631c Construction of wells; PVC well casing joints.

Rule 131c. (1) PVC well casing joints shall be deep socket bell ends or couplings that

are manufactured in accordance with ASTM specification F 480-90, which is adopted by reference in R 325.1610.

(2) PVC casing fittings shall be legibly marked with all of the following information:

- (a) The nominal well casing pipe coupling size.
- (b) The type of plastic.
- (c) A designation that the fittings are in compliance with the provisions of ASTM specification F 480-90.
- (d) The manufacturer's name or trademark.
- (e) A certification mark that verifies that the fittings are in compliance with the provisions of ANSI/NSF standard 14.

(3) PVC well casing joints shall be formed utilizing a 2-step solvent cementing process that is consistent with the provisions of ASTM specification F 480-90. The pipe ends shall be free of burrs, dust, or moisture that might interfere with the solvent weld. A primer or welding solvent shall be used before cementing. The primer, welding solvent, and solvent cement shall be compatible with the pipe being coupled and the ambient temperature at the time of use and shall be in compliance with the provisions of R 325.1640.

(4) Screws or similar mechanical fasteners shall not be used for joining PVC well casing.

(5) PVC well casing joints which are not of a bell end configuration or are not made utilizing a 2-step solvent cementing process shall be approved, in writing, by the director before use.

R 325.1631d Construction of wells; examination of pipe.

Rule 131d. Pipe which is intended for water well use and which is sold within the state, regardless of specification designation, shall be subject to random examination by the director. Any lot of pipe that contains defective lengths or lengths which are not in compliance with the specifications required in these rules shall not be used in the construction of a well.

R 325.1632 Construction of wells; casing diameter, depth, termination, and installation procedures.

Rule 132. (1) Steel pipe that is used as permanent casing shall have an inside diameter of not less than 2 inches, except as provided in R 325.1632a.

(2) PVC pipe that is used as permanent casing shall have an inside diameter of not less than 5 inches, except if the pipe is installed as liner pipe. PVC well casing shall be installed only in an oversized borehole without driving.

(3) A casing shall extend not less than 25 feet below, and terminate not less than 12 inches above, the ground surface. A well that has less than 26 feet of casing shall not be used without obtaining written approval from the health officer pursuant to the provisions of R 325.1613.

(4) The top 25 feet of a well casing shall not be used as a suction line unless the well casing is protected by a standard weight or heavier outer casing. The top of both casings shall be finished pursuant to the provisions of R 325.1641 and R 325.1643.

(5) A driven steel permanent casing shall be protected by a drive shoe.

(6) In a paved area, the health officer may approve, in writing, a casing termination of 2 inches or more above the ground surface if the area is not subject to flooding, if the connections and openings are threaded or welded and watertight, and if acceptable casing venting is provided.

R 325.1632a Construction of wells; driven well points.

Rule 132a. (1) Steel pipe that is used as permanent casing for a driven well point shall not be less than 1 1/4 inches inside diameter.

(2) A driven well point shall not be used as a water supply well without the written approval of the health officer.

R 325.1633 Rescinded.

R 325.1633a Construction of wells; grouting.

Rule 133a. (1) Shale traps, cementing baskets, packers, or other devices shall not be used to suspend grout above an open annular space. Excessive development, washing,

shoveling of cuttings, or other similar activities shall not be used to induce collapse of the borehole wall or to reduce the amount of open annular space surrounding a permanent casing.

(2) Neat cement or bentonite grout shall be placed through the permanent casing or a grout pipe from the bottom of the annular space upward to the ground surface in a continuous operation without interruption. The density of grout flowing from the annular space at the ground surface shall be the density of the grout being pumped in.

(3) A permanent casing shall be installed in a borehole that has a diameter of not less than 2 inches larger than the nominal size of the permanent casing, except as provided in subrule (4) of this rule and R 325.1635.

(4) When grout is placed through a grout pipe outside the permanent casing, the borehole diameter shall be not less than 2 7/8 inches larger than the nominal casing size.

(5) An annular space between a permanent casing and temporary casing shall be grouted during temporary casing removal by pumping neat cement or bentonite grout, or by pouring bentonite chips, bentonite pellets, or granular bentonite, into the annular space. Granular bentonite shall not be poured into an annular space that contains drilling fluid or water.

(6) Neat cement shall be allowed to set a minimum of 24 hours when standard type I, type Ia, or high-early type III cement is used. If bentonite is added to neat cement, the grout shall be allowed to set a minimum of 48 hours before drilling operations are resumed.

R 325.1634 Rescinded.

R 325.1634a Construction of wells; grouting rotary-bored or augered wells

Rule 134a. (1) A well that is constructed by rotary, auger, or other drilling method where the permanent casing is placed in an oversized borehole shall be grouted with neat cement or bentonite grout, pursuant to the provisions of R 325.1633a, the entire length of the casing. If a well screen is installed, the annular space shall be grouted from a point not more than 10 feet above the top of the well screen up to the ground surface.

(2) The depth of grouting may be decreased by the health officer pursuant to the provisions of R 325.1613(2)(f).

R 325.1635 Construction of wells; grouting driven casing wells.

Rule 135. A well that is constructed by cable tool, hollow rod, jetting, or other drilling method where the permanent casing is driven shall be grouted pursuant to either of the following provisions:

(a) Where temporary casing or oversized borehole is not used or where the temporary casing or oversized borehole is less than 25 feet in depth, dry granular bentonite shall be maintained around the permanent casing as it is being driven.

(b) By installing a temporary casing or oversized borehole not less than 3 inches larger than the nominal size of the permanent casing and extending not less than 25 feet below the established ground surface and grouting the annular space surrounding the permanent casing pursuant to the provisions of R 325.1633a.

R 325.1636 Rescinded.

R 325.1637 Construction of bedrock wells.

Rule 137. (1) Where bedrock is encountered within 25 feet of the ground surface, an oversized borehole shall be drilled and the permanent casing shall be grouted with neat cement for a minimum depth of 25 feet.

(2) In an area where a well can be developed only in fractured, jointed, or cavernous bedrock, the casing may terminate in the formation if there is not less than 25 feet of soil above the bedrock, if there is no record of the bedrock containing contaminated water, and if geologic conditions offer no natural direct surface or near surface water inlets into the bedrock aquifer. Where there is less overburden and deeper strata will not produce potable water, the well owner shall obtain written approval from the health officer for water treatment and well construction features that are necessary to provide a

safe supply.

(3) Hydraulic fracturing of bedrock is not permitted without the prior written approval of the health officer.

R 325.1637a Verification of well grouting.

Rule 137a. Where the department or health officer determines that any of the following conditions exist, the well drilling contractor may be required to excavate the well head for inspection:

- (a) A visible open annular space surrounding a well casing.
- (b) Failure to detect, using a soil probe, excavation, geophysical logging, or other methods, grout 2 feet or more below the water service line connection to the casing.
- (c) Placement of tracer dye around the casing at or near the ground surface with subsequent detection of the dye in the well water.
- (d) Receipt of a well log which indicates that the well has not been grouted or which lacks information or contains incomplete information pertaining to grouting of the well.

R 325.1638 Construction of flowing artesian wells.

Rule 138. (1) A well that is constructed in a location where flowing artesian conditions are encountered or are expected to occur shall be grouted to protect the artesian aquifer, prevent erosion of overlying geologic materials, and confine the flow to within the casing.

(2) Flowing well discharge control shall be provided to conserve groundwater and to prevent the loss of artesian head by preventing or reducing continuous discharges, unless a deviation is issued pursuant to the provisions of R 325.1613. Flow control shall consist of valved pipe connections, watertight pump connections, a receiving tank that is set at an altitude corresponding to that of the artesian head, a flowing well pitless adapter, a packer, or other method approved by the health officer. A flow discharge pipe, where installed, shall not be directly connected to a sewer or other source of contamination.

R 325.1639 Construction of wells; well screens; lead packers, lead plugs, lead wool and certain drilling fluids prohibited; requirements for steel pipe used as screen riser pipes, blanks, or tailpipes; well pumping rate; temporary capping; well alignment; drilling water; requirements when using chlorine or other well rehabilitation chemicals .

Rule 139. (1) A water supply well that is installed in unconsolidated sand and gravel aquifers shall ordinarily be fitted with a screen that has openings which are properly sized so that the aquifer can be properly developed to produce sand-free water at the pumping rate of the permanent pump. A well screen, where installed on a casing that is less than 4 inches inside diameter, shall be telescoped and removable, except for a driven well point that is installed pursuant to the provisions of R 325.1632a.

(2) Lead packers, lead plugs, or lead wool shall not be used as a well component.

(3) Drilling fluids or additives that contain guar gum or other biodegradable organic materials shall not be used during the drilling of a well.

(4) Steel pipe that is used as well screen riser pipes, blanks, or tailpipes shall be in compliance with the minimum weight, dimension, and material standards for well casing that are listed in the provisions of R 325.1626 and R 325.1627.

(5) A new, repaired, or reconditioned well shall be developed and pumped to waste at a pumping rate which equals or exceeds that of the permanent pump, until the water is as clear as is reasonably possible considering the groundwater conditions in the area. The permanent pump shall not be used to develop the well without the owner's consent.

(6) Temporary capping of a well until the pumping equipment is installed shall be provided to prevent contaminants from entering the well.

(7) A well shall be sufficiently straight and vertical to allow normal installation and operation of the pump.

(8) Water that is used for drilling purposes, other than water from the well itself, shall be potable water that contains a free chlorine residual of not less than 10 parts per million

at the time of use and shall be conveyed in containers that are clean and capable of being maintained in a clean condition. Surface water shall not be used for drilling purposes unless it is obtained from a municipal water supply system.

(9) When chlorine is placed into a water supply system pursuant to the provisions of R 325.1661 or when well rehabilitation chemicals are used, the well drilling contractor or pump installer shall provide notification to the well owner or building occupants or shall make the system inoperable during the treatment period.

R 325.1640 Certification of water well components.

Rule 140. (1) Water supply system components that are in contact with groundwater shall be free of materials that may adversely affect the aquifer or water pumped from the well and shall not support microbiological growth.

(2) After January 1, 1994, a person shall not use the following water well components unless they are in compliance with or surpass ANSI/NSF standard 14, 60, or 61, ASTM specification C 150, or section 10 of API specification 10, as adopted by reference in R 325.1610:

- (a) Drilling fluids, grouts, and casing sealing materials.
- (b) Additives to drilling fluids, grouts, and casing sealing materials.
- (c) Pipe joint compounds, thread cutting oils, gasket sealants, or coatings on steel pipe.
- (d) Solvent cements, primers, cleaners, or other compounds that are used with PVC pipe.
- (e) Bladders, diaphragms, coatings, or lining materials that are in contact with water in a pressure or storage tank.
- (f) Chemicals that are used for the development, maintenance, treatment, disinfection, or rehabilitation of a water well, except for sodium hypochlorite or calcium hypochlorite.

R 325.1641 Abovegrade well casing connections.

Rule 141. An abovegrade connection into the top or side of a well casing shall be not less than 12 inches above the ground surface and shall be constructed to exclude dirt or other foreign matter, through 1 or more of the following methods, as applicable:

- (a) A threaded connection.
- (b) A welded connection.
- (c) A rubber expansion sealer.
- (d) Bolted flanges with rubber gaskets.
- (e) A weathertight, vermin-proof well cap.
- (f) Extension of the casing at least 1 inch into the base of a power pump mounted on and sealed to a concrete pedestal.

R 325.1642 Belowground well casing connections.

Rule 142. (1) A connection to a well casing that is made below the ground, or less than 12 inches above the ground surface, shall be protected by approved threaded or welded joints or by an approved pitless adapter. A belowground connection shall not be submerged in water during installation.

(2) Clamp-on, saddle-style pitless adapters shall have both gaskets pressurized by water from the pump so that any water leakage will be from the pressure system outward. A pitless adapter shall provide complete clearance within the internal diameter of the casing and shall vent the casing if required by the provisions of R 325.1657. A person shall not install a pitless adapter that has not been approved, in writing, by the department.

R 325.1651 Construction of room housing pumping equipment or well casing; location of pump or pumping equipment in single-family dwelling permitted; access required for repair and maintenance of water supply system components.

Rule 151. (1) A room that houses pumping equipment or the top of a well casing shall be constructed above the ground surface; however, the room may be located below grade if it is a basement offset as defined in R 325.1601a(1).

(2) A pump or pumping equipment may be located within a crawl space beneath a single-family dwelling if the space does not accumulate water.

(3) A pump room, basement offset, crawl space, or well house shall provide access for maintenance or repair of the water supply system components.

R 325.1652 Rescinded.

R 325.1653 Pump construction, installation, design, and maintenance.

Rule 153. (1) A pump shall be constructed so that there are no unprotected openings into the interior of the pump or well casing.

(2) A power driven pump shall be attached to the casing or approved suction or discharge line by a watertight connection or shall have a base plate that is in compliance with the provisions of R 325.1641.

(3) A pump shall be designed, installed, and maintained so that priming is not required for ordinary use.

(4) Plastic pump drop pipe shall be in compliance with the material requirements for water service lines pursuant to the provisions of R 325.1655(2). Flexible or coiled plastic pipe, when used as submersible pump drop pipe, shall not have splices. Plastic pump drop pipe shall not be used with a packer-jet assembly.

(5) Submersible pump motor lubricants and vertical turbine shaft lubricants shall be USDA or FDA-approved food contact grade formulations.

R 325.1653a Pump installation; hand pumps.

Rule 153a. (1) A hand pump, hand pump head, hand pump stand, or similar device shall be constructed in accordance with the provisions of R 325.1653, shall provide for venting pursuant to the provisions of R 325.1657, and shall have a closed downward-directed spout and a sealed pump rod packing assembly.

(2) A hand pump shall be attached to a steel well casing or standpipe by sealed flange or other method approved by the department. The flange shall be not less than 6 inches above a concrete slab or the ground surface. An annular space between a standpipe and a well casing shall be sealed in accordance with the provisions of R 325.1641 or with materials listed in subrule (5) of R 325.1603.

(3) Where a well casing functions as a hand pump cylinder wall, the plunger shall be not less than 25 feet below the ground surface. A casing wall weep hole is not permitted.

R 325.1654 Pump installation; water suction lines.

Rule 154. (1) A water suction line shall be constructed of copper, galvanized steel, plastic pipe or other material that is approved, in writing, by the director.

(2) A water suction line that is outside the well casing shall be protected by utilizing 1 or more of the following methods:

(a) By fully exposing the line and by situating the line not less than 12 inches above the floor of an approved basement, basement offset, or pump room.

(b) By fully exposing the line above ground surface.

(c) By situating the line within an outer casing with the annular space filled with water from the system and maintained at system pressure.

(d) By surrounding the line by air space in a straight rigid conduit which does not have joints and which has positive drainage by gravity to the ground surface or to an approved basement, basement offset, or pump room, with the conduit directly connected to the well casing by a threaded or welded watertight joint. The openings into the casing shall be welded watertight or shall be sealed in accordance with the provisions of R 325.1641 to R 325.1643 and the total length of the suction line that is protected by the gravity drained conduit shall not be more than 20 feet.

R 325.1655 Pump installation; water service lines.

Rule 155. (1) The buried portion of a water service line between the well casing and the pressure tank in any installation shall be under positive pressure at all times. If a check valve is installed in the water line between the well casing and the pressure tank, the water line between the well casing and the check valve shall be in compliance with the requirements for a suction line pursuant to the provisions of R 325.1654.

(2) Plastic water service line material shall have a minimum rated working pressure of

160 pounds per square inch, shall be in compliance with ASTM specification D 2239-89, D 2737-89, D 2662-89, D 2666-89, D 1785-91, or D 2241-89, which specifications are adopted by reference in R 325.1610.

R 325.1656 Pump installation; pressure tanks.

Rule 156. (1) A pressure tank shall be installed in an approved pump room, well house, crawl space, basement offset, or basement.

(2) A totally buried pressure tank may be used if the manufacturer's unit has been approved, in writing, by the director as to its design, type of material, and specification for its installation.

(3) If a pump is capable of developing water pressures greater than the manufacturer's rated working pressure of the pressure tank, a pressure relief valve shall be installed near the pressure tank.

R 325.1656a Pump installation; venting of gases.

Rule 156a. Toxic or flammable gases that are present in the groundwater shall be vented from the water supply system. The vent shall discharge to the outside atmosphere where the gases will not be a hazard. A health officer or the department shall be consulted for proper identification or treatment of gases.

R 325.1657 Pump installation; vents.

Rule 157. (1) A casing vent shall be provided on all well caps and seals, except for those used on deep well, single pipe-packer jet installations, or on flowing wells where the flow rate is greater than the pumping rate of the permanent pump. A vent shall be screened, pointed downward, and terminate not less than 12 inches above the ground surface or above the floor of an approved basement, basement offset, or pump room, and at a point not less than 24 inches above any known flood level. Vents may be offset if they are in compliance with the provisions of this rule. Vents shall be in compliance with the minimum sizes listed in table 4.

Table 4

Minimum Well Casing Vent Sizes

Casing Inside Diameter (Inches)	Circular Vent Diameter (Inches)
2	1/4
4	1/2
5 or 6	3/4
8 or larger	1

(2) Vent screening shall be not less than 20-mesh per inch and not more than 30-mesh per inch screen. Screening shall not reduce the vent open area by more than 50%.

R 325.1657a Pump installation; well caps and seals.

Rule 157a. Well caps and seals shall be weathertight and vermin-proof, provide venting pursuant to the provisions of R 325.1657, and be tightly secured to the well casing.

R 325.1658 Pump installation; sampling faucets.

Rule 158. Provision shall be made for the collection of water samples by installing a downturned faucet, not less than 8 inches above the floor, in a convenient location at the pressure tank or as near to the well as possible.

R 325.1661 Disinfection of well and pumping equipment.

Rule 161. (1) After thoroughly pumping to waste pursuant to the provisions of R 325.1639(5), a well and pumping equipment shall be disinfected with chlorine that is applied to obtain a chlorine concentration and minimum contact period specified in table 5 in all parts of the water supply system before pumping the well to waste and flushing out the chlorine solution. A well drilling contractor or pump installer shall be responsible for chlorinating that portion of the water supply system on which work has been performed.

Table 5

**Minimum Chlorine Concentration and Contact Time
(Amount of Chlorine Added to 100 Gallons of Water)**

Chlorine Concentration (Parts per Million)	Gallons of 5.25% Sodium Hypochlorite (Liquid Bleach)	Pounds of Dry Calcium Hypochlorite (Granular)	Minimum Contact Time
100 ppm	1/4 gal	0.14 lbs	10 hr
250 ppm	1/2 gal	0.35 lbs	4 hr
500 ppm	1 gal	0.70 lbs	2 hr
1000 ppm	2 gal	1.40 lbs	1 hr

(2) Before placing a new, repaired, or reconditioned water supply system into service, and after all traces of chlorine have been flushed out, 1 or more water samples shall be collected from the sampling faucet. Organisms of the coliform group shall not be present in the sample or samples.

(3) The water supply owner shall be responsible for collecting the water sample or shall arrange for the owner's designated representative to collect the sample. The well drilling contractor or pump installer shall notify the water supply owner of the owner's responsibility for collecting the water sample.

(4) A well driller or pump installer is not required to redisinfect a well or pump as a result of water samples that are collected from a location other than the sampling faucet required pursuant to the provisions of R 325.1658.

R 325.1662 Abandoned wells and dry holes; persons responsible for plugging; removal of debris and obstructions; wells taken out of service when municipal water is installed.

Rule 162. (1) An abandoned well or dry hole shall be plugged by a well drilling contractor who is registered pursuant to the provisions of the act or by the well owner. An abandoned well that is located on property which has a well that serves the public or a residence other than the well owner's residence, shall be plugged by a registered well drilling contractor.

(2) A pump, a drop pipe, a packer, other equipment, debris, or obstructions shall be removed from the well, if possible, before plugging.

(3) A well that is abandoned when municipal water is installed shall be plugged pursuant to the provisions of these rules.

R 325.1663 Abandoned wells and dry holes; plugging method.

Rule 163. (1) An abandoned well or dry hole shall be plugged as follows:

(a) A well or dry hole that terminates in overburden shall be plugged by filling with any of the following materials:

- (i) Neat cement.
- (ii) Concrete grout.
- (iii) Bentonite chips.
- (iv) Bentonite pellets.
- (v) Bentonite grout.

(b) A section of a well or dry hole that is in bedrock shall be plugged by filling with neat cement or concrete grout from the bottom of the well or dry hole to not less than 20 feet above the top of the bedrock or to the ground surface. The section of the well from 20 feet above the bedrock to the ground surface shall be plugged in accordance with the provisions of subdivision (a) of this subrule.

(2) Gravel, sand, stone aggregate, or other materials that are acceptable to the department may be used for plugging that portion of a well that penetrates lost

circulation zones, such as gravel or cavernous, creviced, or fractured bedrock.

(3) The flow from an abandoned flowing well shall be stopped by plugging the well with neat cement or concrete grout.

(4) Abandoned wells that discharge subterranean gases shall be plugged with neat cement or concrete grout.

R 325.1664 Abandonment of wells; plugging materials.

Rule 164. Abandoned well or dry hole plugging materials shall be placed as follows:

(a) Bentonite chips or bentonite pellets shall be poured slowly into the top of the well or dry hole to prevent bridging in the casing or borehole. Fine bentonite particles that accumulate in the shipping container shall not be used. The plugging operation shall continue until the bentonite chips or bentonite pellets appear at the ground surface. Upon completion of the plugging operation, water shall be placed into the casing or borehole to promote expansion of the bentonite above the static water level.

(b) Neat cement, concrete grout, or bentonite grout shall be placed through a tremie pipe from the bottom of the well or dry hole to the ground surface.

(c) Other materials and methods may be used if the materials and methods proposed to be used will plug the abandoned well or dry hole to prevent them from acting as a channel for contamination or the escape of subterranean gases and if prior approval is given by a health officer.

R 325.1665 Plugging of dug wells and crock wells.

Rule 165. A large diameter dug well or crock well shall be plugged pursuant to the provisions of R 325.1663 and R 325.1664 or may be plugged as follows

(a) A layer of bentonite chips or bentonite pellets that is not less than 6 inches thick shall be placed at the bottom of the well. The remainder of the well shall be plugged by placing clean soil backfill in layers that are not more than 10 feet thick, with a layer of bentonite chips or bentonite pellets that is not less than 6 inches thick placed on top of each clean soil backfill layer. Dry granular bentonite may be used in place of, or in combination with, bentonite chips or bentonite pellets, and neat cement or concrete grout may be poured if the well has been dewatered before plugging.

(b) The uppermost section of concrete crock or tile or the upper 3 feet of stone, brick, or other curbing material that supports the well bore shall be removed. Before backfilling the well up to the ground surface, a layer of bentonite chips or bentonite pellets that is not less than 6 inches thick shall be placed.

R 325.1666 Rescinded.

R 325.1667 Plugging wells drilled by person other than property owner or registered well drilling contractor.

Rule 167. A well that was drilled by a person other than the property owner or by a person other than a well drilling contractor who is registered pursuant to the provisions of the act shall be abandoned and plugged pursuant to the provisions of these rules.

R 325.1668 Order to plug abandoned well or dry hole.

Rule 168. The department or a health officer may order a well owner or a registered well drilling contractor to plug an abandoned well or a dry hole.

R 325.1669 Owner and contractor responsibility for plugging abandoned wells

Rule 169. (1) A well owner shall be responsible for the plugging of an abandoned well, except as provided in a written contract between the owner and a registered well drilling contractor.

(2) If a health officer or the department determines that a registered well drilling contractor has improperly located or constructed a well, the well drilling contractor shall be responsible for plugging the well.

R 325.1670 Temporarily abandoned wells.

Rule 170. (1) A temporarily abandoned well shall be in compliance with the minimum construction and isolation distance requirements of these rules.

(2) A temporarily abandoned well shall be disconnected from any water distribution piping and shall have the top of the casing securely capped to prevent the entrance of surface water or foreign materials into the well and to prevent access to the well.

R 325.1671 Rescinded.

R 325.1672 Storage reservoirs.

Rule 172. If a storage reservoir is used in a water supply system, plans for the storage reservoir installation shall be submitted to the health officer and approval obtained before installation of the reservoir. A storage reservoir shall be constructed of materials approved by the department and shall be designed, operated, and maintained in a manner to prevent the entrance of contaminants. For the purposes of this rule, a storage reservoir does not include a pressure tank.

R 325.1673 Provision of notice of health hazard to person using contaminated water supply.

Rule 173. An owner or occupant who uses a contaminated water supply or a supply which, in the judgment of a health officer, represents a health hazard shall be notified, in writing, by the health officer of the health hazard.

R 325.1674 Other water sources.

Rule 174. If a water well cannot be constructed in compliance with the provisions of these rules due to hydrogeological limitations, a health officer may authorize the use of an alternate water source. Plans, specifications, and monitoring, operating, and maintenance procedures for the alternate water source shall be approved by the health officer.

R 325.1674a Water supply cross-connections.

Rule 174a. (1) A physical connection between a water supply that is in compliance with the requirements of these rules and another water supply that is not in compliance with the requirements of these rules is prohibited.

(2) A yard hydrant that has a buried stop-and-waste valve shall not be installed on a water service line or a branch of the service line. A stop-and-waste valve shall not drain into a well.

(3) A water supply system shall be designed, operated, and maintained in a manner that will prevent contamination from nonpotable liquids, solids, or gases from being introduced into the water supply or aquifer through cross-connections or any other piping connections to the water supply system.

R 325.1675 Well records.

Rule 175. (1) Within 60 days of the date of completion of a well, a well drilling contractor shall furnish the well owner with 1 copy and a health officer with 2 copies of a well log that contains the information required on the form furnished by the director. The health officer shall send 1 copy of the well log to the department of natural resources within 30 days after the health officer receives the copies of the well log. A well drilling contractor shall retain a copy of the well log.

(2) A well drilling contractor shall record the geologic material types and thicknesses penetrated on a record that is kept at the well construction site. The record shall be available for inspection during well construction.

(3) Within 60 days after plugging an abandoned well or dry hole, the person who performed the plugging operation shall provide the department or local health department with 2 copies of a report that sets forth all of the following information:

- (a) The well owner's name.
- (b) The location of the well.
- (c) The well depth.
- (d) The well diameter.
- (e) The plugging procedure.
- (f) The plugging material.
- (g) The amount of plugging material used.

Standard forms for the report shall be provided by the department. When an abandoned well is plugged where a replacement well will be or has been constructed, the plugging information may be recorded on the well log that is submitted for the replacement well. Information on several abandoned wells or dry holes within a single parcel may be submitted on a single well log form if the geologic materials and plugging methods are similar.

(4) A well log shall be signed by a registered well drilling contractor.

(5) Where a well drilling contractor fails to submit a well log within 60 days of the date of completion of a well or fails to maintain the drilling record pursuant to the provisions of subrule (2) of this rule, the department or health officer may require geophysical logging of the well to verify geologic materials and thicknesses of geologic materials penetrated.

R 325.1676 Pump installation records.

Rule 176. (1) Within 60 days of the date of completion of a pump installation upon a new well, a well drilling contractor or pump installer shall furnish the well owner with 1 copy and a health officer with 2 copies of a pump installation record that contains available information that is required on a form furnished by the director. The health officer shall send 1 copy of the record to the department of natural resources within 30 days after the health officer receives the copies of the pump record. A well drilling contractor or pump installer shall retain a copy of the pump record. All of the following data shall be provided on the form:

- (a) The type of pump installed (jet, submersible, reciprocating, hand-operated, or other type).
- (b) The pump capacity in gallons per minute.
- (c) The length of drop pipe.
- (d) The horsepower of the pump motor.
- (e) The pump model number.
- (f) The pump manufacturer's name.

(2) A pump record shall be signed by a registered well drilling contractor or by a registered pump installer.

PART 2. DRILLING CONTRACTORS' AND PUMP INSTALLERS' REGISTRATION

R 325.1701 Qualifications.

Rule 201. An applicant who is applying for registration pursuant to the provisions of the act shall meet all of the following requirements, as applicable:

- (a) Have not less than 2 years of well drilling experience and have completed not less than 20 wells for registration as a well drilling contractor or have not less than 2 years of pump installation experience and have completed not less than 20 pump installations for registration as a pump installer. Well drilling experience shall have been acquired under the supervision of an active Michigan registered well driller and pump installation experience shall have been acquired under the supervision of an active Michigan registered well driller or pump installer. The experience shall have been obtained within the past 5 years.
- (b) Be not less than 18 and have completed high school or submit proof of equivalent education. Up to 4 years of work experience may be substituted for equal years of education; however, this shall be in addition to the experience requirement in subdivision (a) of this rule.
- (c) Be of good moral character, as defined and determined pursuant to the provisions of Act No. 381 of the Public Acts of 1974, being '338.41 et seq. of the Michigan Compiled Laws.
- (d) Provide proof of work experience as required in R 325.1701a.

R 325.1701a Proof of work experience.

Rule 201a. (1) Proof of an applicant's work experience in the well drilling or pump installation field shall be documented by submitting all of the following to the department:

- (a) Well logs or pump records to demonstrate completion of not less

than 20 water wells by a well driller applicant and not less than 20 pump installations by a pump installer applicant. The records shall be true and accurate photocopies of those records initially submitted by the supervising contractor to satisfy the requirements of section 12707 of the act. The records shall demonstrate completion of work by the applicant over a period of not less than 2 years and not more than 5 years.

(b) A chronological work history, on a form furnished by the department, that documents all work performed in the well drilling or pump installation field. Before submitting the work history form to the department, an applicant shall submit the work history form for review to the local health department that has jurisdiction in the area in which the applicant has worked.

(c) Notarized reference letters, on a form provided by the department, from not less than 2 persons who are not related to the applicant and who can attest to the applicant's work experience and ability to perform the work of a well driller or pump installer. At least 1 reference letter shall be completed by a person who is registered pursuant to the act in the same category as the applicant.

(d) Any of the following which verifies that the applicant has acquired the minimum experience and which identifies the applicant's occupation as a well driller or pump installer and states the name of applicant's employer:

- (i) Federal W-2 income tax withholding forms or equivalent income tax filing forms.
- (ii) Paycheck stubs.
- (iii) Employers' payroll records.
- (iv) Workers' compensation insurance records.
- (v) Health insurance records.
- (vi) Any combination of the items listed in paragraphs (i) to (v) of this subdivision.

(2) Documentation of completion of an apprenticeship training program established by the Michigan well drillers association or a similar industry organization may be accepted in place of the proof of work experience that is required in subrule (1) of this rule, if the training program has been approved by the department and the advisory board created by the act.

R 325.1702 Grandfather clause.

Rule 202. A well driller or pump installer who filed a prequalification experience record with the director before May 1, 1967, may, upon application filed by April 30, 1994, be registered without meeting the educational qualifications and without taking the written examination, if the well driller or pump installer has been continuously employed in the water well trade.

R 325.1703 Submission of applications.

Rule 203. (1) An application for an initial or renewal registration shall be made to the department on the form prescribed and provided by the department.

(2) An application shall be accompanied by the fee prescribed by the act, which shall be in the form of a bank draft, check, or money order payable to the state of Michigan. An application filed without the prescribed fee shall not be reviewed by the department until the fee is paid.

(3) A renewal application shall be submitted by March 1 of each year to permit time for issuing the renewal certificate by May 1, as required by the act.

(4) The completed initial application, proof of work experience as required in R 325.1701a, and registration and examination fees as required in the act and these rules shall be submitted to the director not less than 60 days before the date of the examination. Failure to meet this time deadline shall result in the applicant being scheduled for the next examination.

(5) A person who operates a well drilling or pump installation business shall file a certificate of assumed name with the department.

R 325.1704 Advisory board's evaluation of applicants.

Rule 204. The advisory board that is created by the act shall carefully evaluate an applicant for registration and forward its advice to the director.

R 325.1705 Rescinded.

R 325.1705a Out-of-state applicants.

Rule 205a. An applicant who is not a resident of Michigan, but who is licensed or registered to engage in the business of well drilling or pump installing in the applicant's state of residence, is eligible for registration in Michigan if all of the following requirements are met:

- (a) The applicant submits to the department proof of current licensure or registration in the applicant's state of residence.
- (b) The applicant is in good standing in the state in which the applicant is licensed or registered.
- (c) The applicant meets the requirements of R 325.1701, R 325.1701a, and R 325.1703, with the following exceptions:
 - (i) A reference letter from a Michigan registered well driller or pump installer is not required. At least 1 reference letter from a well driller or pump installer who is licensed in the applicant's state of residence and who is not a relative of the applicant shall be submitted.
 - (ii) The chronological work history form shall be reviewed by the agency that is responsible for regulating water well construction in the applicant's state of residence.

R 325.1706 Examinations.

Rule 206. (1) After meeting the application requirements in these rules, an applicant shall satisfactorily complete an examination that is administered by the advisory board created by the act. The examination may be any combination of written, oral, or practical work.

(2) A candidate who fails to pass the examination may apply for reexamination after completing an industry training course that is approved by the department and the advisory board created in the act. A reexamination shall be granted upon payment of a fee of \$25.00.

(3) An applicant may inspect the examination in the office of the department during normal business hours within 60 days after the applicants are notified of examination results.

R 325.1707 Denial of applications.

Rule 207. (1) An initial application for registration may be denied for any of the following reasons:

- (a) Failure of the applicant to meet the work experience, education, and character qualifications of registration.
 - (b) Deliberately providing false or misleading information in the application package or failure to complete the application package.
 - (c) Offering payment to a person who is registered pursuant to the provisions of the act for completing a reference letter or an affidavit.
 - (d) Violation of sections 12701 to 12715 of the act, a rule or construction code promulgated pursuant to the act, or an order issued pursuant to the provisions of section 12709 of the act.
 - (e) Conviction in any civil or criminal proceeding or failure to comply with a judgement or order that is issued by the court in connection with any matter related to the conduct necessary to provide the services of a well drilling contractor or pump installer.
- (2) When an initial or renewal application for registration is denied, the department shall

give written notice of the denial to the applicant and shall state the reason for the denial. Within 30 days of the denial, the applicant may request reconsideration of the application at an informal conference and a contested case hearing before the director. A contested case hearing that is requested by the applicant shall be held pursuant to the provisions of the Act No. 306 of the Public Acts of 1969, as amended, being '24.201 et seq. of the Michigan Compiled Laws.

R 325.1707a Suspension or revocation of certificate; denial of renewal application.

Rule 207a. A certificate of registration may be suspended or revoked and an application for renewal of a certificate of registration may be denied for any of the reasons listed in R 325.1707 or for any of the following reasons:

- (a) Failure to complete the renewal application.
- (b) Violation of the stipulations contained in a consent agreement issued pursuant to the provisions of Act No. 306 of the Public Acts of 1969, as amended, being '24.201 et seq. of the Michigan Compiled Laws.
- (c) Conviction in any civil or criminal proceeding or failure to comply with a judgment or order that is issued by the court in connection with well drilling or pump installation activities.
- (d) Failure to pay civil monetary penalties that are assessed pursuant to the provisions of section 2262 or 2461 of the act.
- (e) Deliberately providing false or misleading information on a well log or in a reference letter or affidavit for another person who is applying for registration pursuant to the act, or accepting payment for completing a reference letter or affidavit.
- (f) Having obtained a certificate of registration through fraud or misrepresentation.
- (g) Aiding or abetting an unregistered person to evade the provisions of the act or these rules, allowing one's certificate of registration to be used by an unregistered person, or acting as an agent, partner, or associate of an unregistered person with the intent to evade the provisions of the act or these rules.
- (h) Failure to respond to a written inquiry from the department regarding a written complaint filed with the department against the registrant.

R 325.1708 Initial certificate; nontransferability; content; renewal certificate; content; notice of change in applicant information; notice of loss of registered contractor representative.

Rule 208. (1) The initial certificate that is issued to a registered well drilling contractor or registered pump installer is nontransferable, shall be suitable for framing, and shall contain all of the following information:

- (a) The name of the registrant.
- (b) The business name.
- (c) The date of issuance.
- (d) The expiration date.
- (e) The registration certificate number.
- (f) The signature of the director.

(2) A renewal certificate shall consist of a registration card, in duplicate, and shall contain all of the following information:

- (a) The name of the registrant.
- (b) The business name.
- (c) The expiration date
- (d) The registration certificate number.
- (e) The signature of the director.

One section of the card shall be kept with the original registration certificate and a copy shall be carried by the person who represents the registered contractor.

(3) Within 30 days of any changes in the information on the application that is submitted

to the department, a registrant shall inform the department of the changes.

(4) Within 10 days of the loss of the sole registered contractor representative, a firm, partnership, or corporation shall notify the department of the loss. The firm, partnership, or corporation may continue to engage in the business of well drilling or pump installation, if a qualified individual applies, within 30 days of the loss of the representative, to take the next scheduled registration examination on behalf of the firm, partnership, or corporation or if another registered contractor is employed within 30 days of the loss of the representative. If the applicant fails to successfully complete the examination or if a registered contractor is not employed, the firm, partnership, or corporation shall immediately cease operating in the well drilling or pump installation field.

R 325.1709 Reinstatement of expired and revoked certificates.

Rule 209. (1) A registration certificate that has expired for failure of the registrant to apply and pay renewal fees may be reinstated by the director as follows:

(a) If within 2 years of the date of expiration of the certificate, upon receipt of a renewal application, advice of the advisory board, and payment of renewal registration fees for each year during which registration had expired in accordance with the fee and penalty schedule set forth in the act.

(b) If after 2 years of the date of expiration of the certificate, upon successful completion of the examination in accordance with provisions of R 325.1701, R 325.1701a, R 325.1703, R 325.1705a, and R 325.1706.

(2) A holder of a certificate of registration that has been revoked in accordance with the act, after a waiting period of not less than 1 year after the registration certificate was revoked, may petition the director for a hearing for reinstatement of the registration certificate. The hearing shall be granted only upon a showing by the petitioner that reasonable grounds exist for the hearing. Reasonable grounds shall include correction of the conditions upon which the revocation was based and assurance that such conditions will not reoccur.

(3) The registration certificate shall be reinstated only upon the recommendation of the director and successful completion of the written examination specified in R 325.1706.

R 325.1711 Public representations and advertising.

Rule 211. (1) A person shall not cause any word or words to be used in any contract, business form, document, sign, display, or other advertising medium which indicate or imply that a person, firm, partnership, or corporation is engaging in the business of well drilling, as defined in R 325.1606, or in the installation of pumps and pumping equipment, as defined in R 325.1604, unless that person, firm, partnership, or corporation has obtained a certificate of registration from the department.

(2) A person who is registered pursuant to the provisions of section 12704 of the act shall not use, in any contract, business form, document, sign, display, or other advertising medium, a name other than the name that is filed with the department or a registration number other than the registration number that is issued by the department.

PART 3. DRILLING MACHINES AND SERVICE VEHICLES

R 325.1721 Well drilling machine registration.

Rule 221. (1) A drilling machine registration card shall be issued for each drilling machine that is registered by a well drilling contractor. The card shall be carried on the drilling machine at all times where it may be inspected at any reasonable hour upon a request by the department representative or a health officer. The card expires on April 30 each year.

(2) The registration card and duplicate seals that are furnished for a drilling machine are not transferrable. The card and seals shall be returned to the department when a drilling machine is sold, traded, or otherwise disposed of. A registration card and 2 new seals for a drilling machine that is sold, traded, or otherwise disposed of will be provided without cost upon receipt of the old card, the 2 old seals, and an application that requests authorization to operate a different drilling machine.

(3) Registration of a well drilling machine by the department does not exempt a person from any applicable federal, state, or local vehicle registration requirements or from payment of applicable road taxes, license plate fees, or vehicle registration fees.

R 325.1722 Identification on well drilling machines and service vehicles.

Rule 222. A person who is registered pursuant to the act shall place the registration number, including the county number for the business location, and the business name and address, in letters and numbers not less than 2 inches high, in a conspicuous location on both sides of each well drilling machine and service vehicle.

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APPENDIX X

Water Meter Sizing Worksheet and Flow Nomograph

DATA FOR SIZING METERS

Request By: _____

Address: _____ Phone: _____

Type unit to be served (Apt., etc.): _____ Tap From _____ St. Main

Customer to
Indicate the
of the
following

Total
Number
of
Streams

Total
Flow
G.P.M.

	Garden hose outlets			X 10 GPM =		Average Flow From Chart
	Kitchen sinks	X2		X 5 GPM =		
	Laundry tubs	X2		X 5 GPM =		
	Lavatory sinks	X2		X 2 ½ GPM =		
	Shower baths	X2		X 2 ½ GPM =		
	Tub baths	X2		X 5 GPM =		
	Water closets (tank type)			X 5 GPM =		
	Water urinals (flush valve)			X 10 GPM =		
	Water softeners			X 10 GPM =		
	Other water using fixtures (not flush valve type)			X GPM =		
				X GPM =		
	Flush valve type water Closets			X 30 GPM =		
	Direct Load Water Use					
	Air Conditioning Unit			X GPM per unit		
	Sprinkler Systems		Heads	X GPM per head		
	Irrigation Circuits		Leads	X GPM per lead		

Total Average Flow from Chart _____

Meter Size _____

Service Size _____

Superior Charter Township Utilities Standard
Fixture count worksheet for sizing water meters.

APPENDIX XI

Guidelines for Min. Water Main Size of Trunk-Lines

Guidelines for Minimum Water Main Size of Trunk-Lines

Geddes and Prospects Roads.....	16”
Mile Roads.....	12”
Local Roads.....	8”

Please note that larger sizes may be required based on Township review and the computer modeling.

APPENDIX XII

Unit Use Factor(s)

SANITARY SEWER UNIT ASSIGNMENT TABLE

TYPE OF USE	UNIT USE FACTORS
Single Family Residential	Base unit rate
Auto Dealers	1.00 unit + 0.20 unit per thousand square feet.
Auxiliary dining room (open not than 20 hours per week)	2.00 unit per thousand square feet
Bar - See Restaurant	
Barber Shops	1.00 unit + 0.10 unit per chair
Beauty Shops	1.00 unit + 0.50 unit per booth
Boarding House	0.20 unit per bed
Boarding Schools	0.20 unit per bed
Bowling Alleys	1.50 unit per thousand square feet of general building area plus restaurant, bar, etc. at their respective unit factors
Car Wash do-it-yourself (coin operated, 10 gal of less per car)	1.00 unit per stall
Car Wash mechanical (without conveyor over 10 gals per car)	10.00 unit per stall
Car Wash conventional (with conveyor)	10.00 unit per twenty feet of conveyor
Churches	0.40 unit thousand square feet
Cleaners	1.00 unit per thousand square feet plus 1.50 unit per press
Convalescent Homes or Assisted Living complexes	1.00 unit + 0.50 unit per bed
Convents	0.20 unit per bed
Country Clubs	1.50 unit per thousand square feet of general building area plus restaurant, bar, swimming pool areas, etc. at their respective unit factors
Drug Stores	1.00 unit per thousand square feet
Factories (exclusive of industrial waste)	0.75 unit per thousand square feet (industrial waste will be assigned such sanitary use factor units as shall be appropriate in each individual instance, upon petition to the Township for such assignment)
Fraternal Organizations	0.50 unit per thousand square feet of general building area plus restaurant, bar, swimming pool area, etc. at their respective unit factor.
Grocery Stores - Supermarkets	0.80 unit per thousand square feet
Hospitals	1.00 unit + 0.50 unit per bed
Hotels and Motels	1.00 unit + 0.25 unit per bedroom plus restaurant, bar, swimming pool areas, etc. at their respective unit factors
Laundry	0.50 unit per washer
Mobile Home Parks	Base unit rate per mobile space occupied or unoccupied

Multiple Family Residences	1.00 unit per unit
Office building	0.75 unit per thousand square feet
Public Institutes other than hospitals	0.75 unit per thousand square feet
Research Facility	0.75 unit per thousand square feet (Industrial wastes will be assigned such sanitary use factor units as shall be appropriate in each individual instance, upon petition to the Township for such assignment.)
Restaurants or Bars (dinner and/or drinks)	4.00 unit per thousand square feet
Schools without showers and/or pool	1.00 unit per classroom
Schools (shower and/or pool)	1.50 unit per classroom
Service Station	1.00 unit + 0.15 unit per pump
Snack Bars, Drive-ins, etc.	4.00 unit per thousand square feet
Stores (other than specifically listed)	0.35 unit per thousand square feet
Swimming pool (net area of pool- see Country clubs)	3.00 unit per thousand square feet
Theaters	1.00 unit + 0.01 unit per seat
Theaters - Drive In	1.00 unit + 0.20 unit per car
Warehouses	0.15 unit per thousand square feet

The fee per unit means one (1) unit factor times the base unit rate, other than single family residential. If only water is connected, the unit factor is one (1) times the unit factor for water systems charge. If only sewer is connected, the unit factor is one (1) times the unit factor for sewage systems charge.

In the case of a single family dwelling or any other single building, the trunk and transmission fees shall be paid prior to the application for a building permit.

An additional Trunk and Transmission fee will be collected when a commercial site requests a building addition permit, based on size and use.

APPENDIX XIII

Superior Township Telemetry Specifications

SUPERIOR TOWNSHIP TELEMETERY SPECIFICATION

INTERFACE EQUIPMENT

These specifications cover all signal interface equipment including telemetering, transmitting and transducing. The data pertaining to signal requirements and enclosures are given on the drawings.

TELEMETERING

For the purposes of this specification, the term "Telemetering" shall be limited to those methods of signal transmission using audio tone/radio modem via Motorola Moscad.

CONTROLLING DEVICES

EQUIPMENT AT THE REMOTE SITES

Equipment located at remote sites shall be mounted in a J.I.C. steel enclosure. Equipment contained in this common control cabinet shall consist of but not necessarily be limited to, the following: Motorola Moscad L, mounting racks, chassis, terminal strips, jumper wire, selector switches, fuses, relays, circuit boards, modem, panel heater with thermostat, etc., and all related instrumentation equipment required to make this a complete and operable system.

The Moscad hardware shall be equipped with battery back-up to accommodate at least eight (8) hours of uninterruptible service. The batteries shall be able to produce 12 VDC. Batteries shall be of the gel cell type complete with battery charger to maintain a constant charge on the battery.

The programmable controller shall be a Moscad of sufficient size to accommodate all digital inputs and outputs as well as analog inputs and outputs to make a complete and operable stand alone control system. Programmable controller shall be manufactured by Motorola.

The PLC "program" shall be furnished by the Owners' system integrator (U.I.S. Programmable Services 734-482-1450) at the station Contractor's expense.

The Hand Off Auto, Pump runs, etc. shall be displayed on the Owners' existing computer system. The screen shall display a graphic view of the overall picture of the remote sites with valve status, pressure, etc., and be provided by the owner's system integrator at lift station Contractor's expense.

Level transducer/transmitter (where required) shall be Keller PSI pressure transducer. They shall have a pressure range of 0-20 Ft and an output signal of 4-20mA DC. These instruments shall be mounted where shown on the drawings and connected to the common control panel as a Motorola input.

SERVICE AND START-UP

The lift station Contractor shall retain (at the Contractor's cost) the services of Moscad [SCADA] system integrator from which qualified technical service personnel and parts may be dispatched upon call.

The Contractor shall provide for: checking the system, starting up his equipment and instructing the Owner's personnel in the operation and maintenance of the system.

The time listed shall be exclusive of time spent on warranty items.

Where additional time is required by the owner, the Contractor shall include per diem charges for the service in his proposal.

Substitutions

References made in these specifications to specific manufacturers' products are intended to serve as a guide to type, construction and materials. Substitutions may be made only if the Engineer gives prior approval of shop drawings or descriptions of items wished to be substituted.

Except as specifically stated otherwise in this specification, any and all of the manufacturers herein listed for each of the listed products are approved. The manufacturers listed under the "Standardization" section of this specification shall be the only manufacturers allowed to supply the entire package.

RTU SPECIFICATIONS

1.0 GENERAL

The remote terminal unit (RTU) shall be an intelligent, modular unit capable of both data acquisition and local data processing. It shall monitor and control local equipment in a stand alone mode as well as being an intelligent mode in a distributed processing system. It shall be microprocessor based and

allow reconfiguration and optimization to occur via software only. To facilitate initial installation, maintenance and future expansion, all Input/Output (I/O) modules shall connect to the basic processor module by plugging them into a passive motherboard on the RTU rack.

A personal computer running a standard configuration program shall be used for program development and downloading (directly to the RTU or through the systems communication channels). Each RTU's database may be merged into a single Central Software System database to automate the system definition.

The RTU must be supplied with the number and type of I/O points as indicated elsewhere in the plans and specifications. Future expansion may be made by simply plugging in additional I/O modules to the I/O bus on the motherboard. Each RTU shall be supplied with the following minimum configuration:

- | | |
|-------------------------|-----------------------------|
| A. Motherboard | E. Power Supply |
| B. I/O Bus | F. Battery |
| C. Enclosure | G. I/O Modules as required |
| D. CPU Processor Module | H. Communications Interface |

2.0 COMMUNICATIONS

2.1 General

The RTU shall support the establishment of a sophisticated data communication network for SCADA applications utilizing a variety of radio or line communication links. Radio links shall include conventional (VHF and UHF), direct FM radio, trunked radio and microwave (analog and digital). Line links shall include private or leased lines and Public Service Telephone Network (PSTN) via dial-up modems. The RTU must be a true multi-port device and be able to communicate simultaneously with hierarchies above it (multiple central stations), with hierarchies parallel to it (RTU to RTU) and hierarchies below it (master/slave RTUs).

2.2 Data Protocol

Data communications shall utilize a secure, smart protocol designed in accordance with the Open System Interconnection (OSI) model as defined by the International Standards Organization (ISO). The protocol must facilitate communications between all stations in the system and support the following minimum features:

- * Multi-level access control to insure high levels of data privacy
- * Multiple logical sessions to allow simultaneous application execution
- * Packet oriented with high efficiency variable length messages
- * Ability to transfer complete programs and historical data from RTU to centrals or between RTUs
- * Support high data security techniques, frame synchronization, dynamically assigned CRC codes (32 bit) and other sophisticated recovery procedures

The protocol should allow flexible, efficient communications for transmission of data, complete programs, databases or other parameters. Complete configuration and diagnostic programs shall be transferable from/to the Central site or from RTU to RTU (full data upload/download capability).

Complete RTU/system debugging shall be allowed without visiting each remote site.

This fully distributed protocol shall allow for the most complex hierarchical system structures of multiple host computers and sub-master stations. Its detail structure, however, shall be transparent to the system user and allow him to concentrate upon the application.

2.3 Communication Methods

In addition to the traditional, simplistic master/slave polling configuration, the RTU shall operate in a number of more efficient contention formats required by point to multipoint networks. The RTU must be able to initiate data transmissions under these conditions:

Report by Exception Automatically transmit upon defined exception condition(s); analog, digital or any combination

Timed Transmission Automatically transmit data on programmed time interval

The RTU shall be equipped with channel monitoring circuitry to prevent transmission collisions.

2.4 Special Communication Requirements

In addition to the communication methods above, the RTU must also support the following special modes:

Shared Transceiver Mode (radio,	each RTU shall be able to share its communications transceiver wireline, etc.) with other RTUs
Store & Forward Repeater store	each RTU shall be able to receive information from other sites, it in memory and then transmit (relay) data to another site
Network Interface Node between	each RTU shall be able to function as an interconnection point between different communication systems; e.g., radio to line, different radio frequencies, etc.
Trunked Radio Interface system	each RTU shall be able to use a trunked radio communication system
Broadcast (Set Call) control command may where the sets	any change in RTU or system data, i.e., time synchronization, mode switching, setpoint value change, or area wide be automatically transmitted to a set of locations, defined may utilize any number of qualifications

2.5 Radio Communication Channels

The RTU shall be able to operate on all two-way FM radio frequencies: VHF (136-174 MHZ), UHF (402-430 and 450-470 MHZ), 800/900 MHZ conventional, 800/900 MHZ trunking, 900 MHZ Multiple Address, microwave, and digital radio communication systems and/or communication networks using FSK (Frequency Shift Keying), DFM (Direct Frequency Modulation) or DPSK (Dual Phase Shift Keying) type modulation. The RTU shall provide the intrinsic means to bridge any of the above communications systems and/or communication networks. Each RTU shall monitor the communication channel(s) to prevent transmission during a busy period. Channel priority assignments shall be available (both network and individually) to handle avalanche conditions. The RTUs are fixed equipment that transmit digital information over FM frequencies using either tones (FSK, F2 emission) or direct transmission of data (DFM, F1 emission). This area of radio operation is strictly governed by the FCC (Federal Communications Commission) and all units must meet the appropriate sections of Subpart J: 90.235 (secondary fixed tone signaling) and 90.238 (telemetry) as well as Subpart K 90.261 (fixed operation at 450-470 MHZ) and 90.267 (UHF frequency offset operation). The RTU need support the following minimum characteristics:

Operating Mode	Synchronous
Transmission Mode	Half duplex
Conventional Radio	Up to 9600 bps (900MHz MAS), up to 4800bps DFM, 1200 to 4800 bps (DFM), 2400bps (FSK), 1200bps (DPSK)
Trunked Radio	Up to 2400 bps (FSK), 1200bps (DPSK)

2.6 Wireline Communication Channels

The RTU shall support a number of communications options over traditional two or four-wire voice grade phone lines. The RTU shall have optionally available different internal modems to support point to point, party line as well as auto answer dial-up operation. General line characteristics required:

Operating Mode	Synchronous/Asynchronous
Transmission Mode	Half or full duplex
Baud Rate	1200/2400 dependent upon line
Output Impedance	600 ohm or high impedance (Z), balanced
Input Signal Level	0 dBm to -30 dBm

2.7 Serial Data Channels

The RTU shall also be able to communicate via a number of different serial interfaces. Communication to an external DCE device shall be supported for RS-232 and RS-485.

3.0 RTU HARDWARE MODULES

3.1 Basic Processor Module

The basic processor module (CPU) of the RTU shall be a real time process controller and support:

- * Bus communication with I/O modules
- * System memory allocation
- * Communication port control
- * System parameter/logic programming

3.1.1

The Central Processing Unit (CPU) shall be a high speed (minimum 16MHz clock rate), 32 bit CMOS microprocessor, Motorola 68302 or equivalent. This VLSI design must incorporate a separate coprocessor (embedded RISC chip) to handle all external communication tasks so as to not affect base CPU performance functions.

3.1.2

The CPU shall be equipped with a minimum of 704 kbyte on-board memory of different types.

- * EPROM for system programs
- * RAM for data and parameters
- * FLASH(EEPROM) for application programs

Total RTU memory must be expandable to a minimum of 2.5 Mbyte. Provision must be available to add a numerical co-processor (Motorola 68882) with true double precision floating point capabilities along with additional memory and support for trigonometric and transcendental functions.

3.1.3

The CPU module must incorporate a real-time clock (RTC) with battery backup for both RTC and module RAM. Large scale CMOS gate array technology must be used for minimum component count along with maximum performance and reliability. CPU features include:

- * Watch-Dog Timer (WDT)
- * Symbolic debugging support
- * Diagnostic LED indication
- * Power monitor for clean program start/stop

3.1.4

The CPU module must include at least the three built-in communication ports as listed below:

Port 1 RS-232 or RS-485, software controlled, full DCE/DTE operation to 9600 bps

Port 2 RS-232, full DCE/DTE, 9600bps, transient protected

Port 3 Configurable (Plug-In) communication module for radio, wireline, trunked radio, dial-up wireline, 600-9600 bps, dependent upon media

A separate communication interface module shall be available to support additional serial channels and a second radio, wireline or other external communication option.

3.2 Input/Output Modules

3.2.1 General

The RTU shall be capable of addressing variable I/O requirements by the addition of appropriate expansion modules. Each module shall communicate with the CPU module via a high speed (> 1 Mbps) data bus. Up to 44 modules shall be supported by a single CPU module; dual CPU configurations shall optionally be available. Each expansion module may be plugged into any empty slot on the I/O bus.

APPENDIX XIV

Superior Township Check Routing Form

PLANNING DEPARTMENT ROUTING FORM -
ENGINEERING #101-000-000-208-001

DATE: _____

CHECK AMOUNT: _____

PROJECT NAME: _____

CONTACT NAMES:

_____ Phone: _____

_____ Phone: _____

_____ Phone: _____

DESCRIPTION OF FEES

- _____ Engineering Review
- _____ Inspection Escrow
- _____ Pre-construction Meeting
- _____ Right of Way Permit
- _____ Open Space, Park and Detention Bond
- _____ Construction of Public Utilities Bond
- _____ Street Tree Security Escrow
- _____ Cash Security for Street Trees
- _____ Monument/Corner Markers
- _____ Maintenance and Guarantee Bond
- _____ Restoration Bond
- _____ Performance Guarantee Bond
- _____ Other:

Signature: _____

APPENDIX XV

Superior Township Application for Engineering Review Form

**CHARTER TOWNSHIP OF SUPERIOR
APPLICATION FOR ENGINEERING REVIEW**

DATE: _____

NAME OF DEVELOPMENT: _____

STPC#: _____

DEVELOPER'S NAME(S): _____

CONTACT PERSON: _____

ADDRESS: _____

PHONE: _____

FAX: _____

E-MAIL: _____

PROPOSED TOTAL PROJECT COST: _____

PROPOSED ENGINEERING REVIEW FEE: _____

(SEE REVERSE)

SIGNATURE: _____

I have received this project cost estimate and believe this is a reasonable estimate of the costs of this project, and approve this engineering fee.

Township Engineer's Signature: _____ Date: _____

APPLICANT:

Please submit this signed form with a check made out to The Charter Township of Superior. Submit in person or by mail to The Charter Township of Superior Treasurer. **Checks will not be accepted without this form signed by the Township Engineer.**

Charter Township of Superior, 3040 N. Prospect, Ypsilanti, Michigan 48198, P: (734) 482-6099

**THE CHARTER TOWNSHIP OF SUPERIOR
FEES PERTAINING TO ZONING ORDINANCE**

ENGINEERING REVIEW FEES

At the time of submittal of detailed construction plans, specifications, and detailed estimates of total costs of the proposed construction and improvements, the applicant shall pay to the Township Treasurer a fee for review equal to one and one-half percent (1 ½%) of the estimated total costs of construction and improvements, plus one dollar (\$1.00) per dwelling unit or, in the case of non-residential developments, one and one-half percent (1 ½%) of the estimated costs of construction and improvements, plus one dollar (\$1.00) 1500 square feet of the total building size. The estimates shall be provided by the applicant, and verified by the Township engineer, with the Township engineer retaining final authority to determine the total costs upon which the percentage shall be based. The fee shall be paid prior to the Township engineer's review of any part of the construction plans. In the event engineering review fees exceed the amount of the fee paid (above), additional hours shall be billed at the actual costs plus fifteen percent (15%) for administrative fees.

APPENDIX XVI

Superior Township Digital As-Built Drawing Requirements

**Charter Township of Superior
Standards
For submitting
Digital As-Built Drawings**



Prepared by Orchard, Hiltz & McCliment, Inc.

Revised May 2003

The following digital submission specifications are being provided as minimum requirements and guidelines for consultants and developers reference. Should you have any questions or comments please contact your community representative.

A. Digital format of CAD files

The acceptable digital format for as-built drawing files shall be in AutoCAD format according to the following specifications:

- AutoCAD version 12.0 or later
- DWG or DXF formats as defined in AutoCAD
- Layer naming (shown in Table A) is to remain unaltered
- All polygons must be closed
- Lines shall not be unnecessarily segmented
- Intersecting lines segments must have common end points

B. Layering scheme

Key mapping features shall be stored on unique CAD layers. Related text shall be included with each layer (i.e., storm pipes on a single layer and storm pipe annotation on a separate single layer). See “Table A” for layer names and descriptions. Submitted drawings will go through a quality check and the layers will be verified. Drawings found not to comply will be modified by the township, or the township representative to bring them in compliance with township layering standards. Any submittals requiring modification will result in an additional fee to the consultant/developer. Submittals needing substantial modifications will result in the rejection of the digital file.

C. Coordinate System

All drawings shall contain adequate geodetic reference to Michigan South State Plane NAD 83. Units must be described as being international feet.

Drawings will conform to having one of the following references:

- (a) A drawing will reference a section corner/quarter-corner with distance and bearing data relating this point to the site plan.
- (b) A minimum of two (2) drawing locations will be identified with NAD83 coordinates established by field survey techniques (i.e., GPS or total station). Geographic coordinates shall appear in the drawing as text of a readable size and shall be in either Michigan South State Plane NAD83 or Geographic coordinates of sufficient resolution to derive state-plane coordinates within 1/10 of a foot.

D. Media for delivery

File transfer media shall be one of three options:

- CDROM or CD-R
- IOMEGA Zip 100 disks
- Electronic (Internet) file transfer
- 3.5 floppy disk with PKZIP file compression (least preferred)

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CADD/GIS Standard Naming Convention

Description	Layer name
Annotations	
all chart lines and text*	a_chart
day stamp	a_daystamp
all legend lines*	a_legend
all location map lines and text*	a_locmap
match line	a_matchline
match line text	a_matchline_txt
north arrow	a_north
drawing notes in layout	a_note
graphic scale	a_scale
street name (major)	a_street_maj
street name (minor)	a_street_min
all titleblock lines*	a_tblk
*The colors and linetypes for these layers are set by property	

Description	Layer name
Utilities	
cable lines	e_cable
cable point	e_cable_pt
cable symbol	e_cable_sym
cable text	e_cable_txt
electric utility lines	e_elec
point layer for electric symbols	e_elec_pt
electric utility symbols	e_elec_sym
electric utility text	e_elec_txt
existing force main lines	e_fm
existing force main point	e_fm_pt
existing force main symbol	e_fm_sym
existing force main text	e_fm_txt
gas utility lines	e_gas
point layer for gas symbols	e_gas_pt
gas utility symbols	e_gas_sym
gas utility text	e_gas_txt
sanitary utility lines	e_san
point layer for sanitary symbols	e_san_pt
sanitary symbols	e_san_sym
sanitary utility text	e_san_txt
storm utility lines	e_stm

point layer for storm symbols	e_stm_pt
storm symbols	e_stm_sym
storm utility text	e_stm_txt
telephone lines	e_tel
point layer for telephone symbols	e_tel_pt
telephone symbols	e_tel_sym
telephone utility text	e_tel_txt
misc. utility lines	e_util
point layer for misc. utility symbols	e_util_pt
misc. utility symbols	e_util_sym
misc. utility text	e_util_txt
water main utility lines	e_wm
point layer for water main structure symbols	e_wm_pt
water main structure symbols	e_wm_sym
water main text	e_wm_txt
proposed cable lines	p_cable
proposed cable symbol	p_cable_sym
proposed cable text	p_cable_txt
proposed electric lines	p_elec
proposed electric symbol	p_elec_sym
proposed electric text	p_elec_txt
proposed force main	p_fm
proposed force main text	p_fm_txt
proposed gas lines	p_gas
proposed gas symbol	p_gas_sym
proposed gas text	p_gas_txt
proposed jack & bore	p_jbore
proposed jack & bore text	p_jbore_txt
proposed sanitary	p_san
proposed sanitary symbol	p_san_sym
proposed sanitary text	p_san_txt
proposed storm	p_stm
proposed storm text	p_stm_txt
proposed storm symbol	p_stm_sym
proposed structure text	p_*str_txt
proposed telephone lines	p_tel
proposed telephone symbol	p_tel_sym
proposed telephone text	p_tel_txt
proposed underdrain	p_udrain
proposed underdrain text	p_udrain_txt
proposed water main	p_wm
proposed water main symbol	p_wm_sym
proposed water main text	p_wm_txt
*insert the utility name here (stm, san, wm etc)	

Miscellaneous

existing dimensions	e_dim
layers to be frozen	freeze
hatch boundaries	hatch_bound
proposed building dimension	p_bldg_dim
proposed building	p_bldg
proposed building hatch	p_bldg_hatch
proposed building text	p_bldg_txt
proposed major contours	p_conmaj
proposed minor contours	p_conmin
proposed contour text	p_cont_txt
proposed dimensions	p_dim
point layer for proposed grades	p_grade_pt
proposed elevations	p_grade_txt
proposed grading limit line	p_gradlmt
proposed grading limit dimension	p_gradlmt_dim
proposed grading limit text	p_gradlmt_txt
proposed guardrail	p_grail
proposed parking lot text	p_park_txt
proposed signs	p_sign_sym
proposed tree symbol	p_tree_sym
proposed wall	p_wall
soil boring symbol	sb_sym
soil boring text	sb_txt
viewports	vp

Description**Layer name****Drainage**

drainage arrows	p_drain_sym
proposed ditch	p_ditch
proposed ditch text	p_ditch_txt
proposed drainage area text	p_drainage_txt
erosion control structures (inlet filter)	p_eroctrl_sym
erosion control text	p_eroctrl_txt
proposed silt fence	p_silt
drainage area boundaries	p_drainage

Description**Layer name****Profiles**

existing centerline of structures	e_prf_cl
-----------------------------------	----------

existing ground center	e_prf_grndc
existing ground center elevations	e_prf_grndc_txt
existing ground left	e_prf_grndl
existing ground left elevations	e_prf_grndl_txt
existing ground right	e_prf_grndr
existing ground right elevations	e_prf_grndr_txt
existing sanitary	e_prf_san
existing sanitary structure	e_prf_san_sym
existing sanitary text	e_prf_san_txt
existing storm	e_prf_stm
existing storm structure	e_prf_stm_sym
existing storm text	e_prf_stm_txt
existing text	e_prf_txt
existing water main	e_prf_wm
existing water main structures	e_prf_wm_sym
existing water main text	e_prf_wm_txt
proposed centerline of structures	p_prf_cl
proposed ditch text	p_prf_ditch_txt
proposed ditch, left	p_prf_ditchl
proposed ditch, right	p_prf_ditchr
proposed ground center	p_prf_grndc
proposed ground center text	p_prf_grndc_txt
proposed ground left	p_prf_grndl
proposed ground left text	p_prf_grndl_txt
proposed ground right	p_prf_grndr
proposed ground right text	p_prf_grndr_txt
proposed sanitary	p_prf_san
proposed sanitary structure	p_prf_san_sym
proposed sanitary text	p_prf_san_txt
proposed storm	p_prf_stm
proposed storm structure	p_prf_stm_sym
proposed storm text	p_prf_stm_txt
proposed structure labels	p_prf_str_txt
proposed text	p_prf_txt
proposed water main	p_prf_wm
proposed water main structure	p_prf_wm_sym
proposed water main text	p_prf_wm_txt
grid base	prf_base
grid elevations	prf_elev
profile grid lines	prf_grid
grid stations	prf_sta

Description

Layer name

Existing topography

building lines

e_bld

building hatch	e_bld_hatch
existing building point	e_bld_pt
building text	e_bld_txt
existing building dimension	e_bld_dim
road centerline	e_cl
existing centerline point	e_cl_pt
existing contours (major)	e_conmaj
existing contours (minor)	e_conmin
point layer for cultural symbols	e_cult_pt
cultural symbols (e.g. mailboxes)	e_cult_sym
auto offset text	e_cult_txt
existing culvert	e_culv
existing culvert point	e_culv_pt
existing culvert symbol	e_culv_sym
curb	e_curb
existing curb point	e_curb_pt
ditch centerline	e_ditch
existing ditch point	e_ditch_pt
driveways	e_dw
existing driveway point	e_dw_pt
edge of asphalt	e_eoa
existing asphalt hatch	e_eoa_hatch
existing edge of asphalt point	e_eoa_pt
existing edge of brick	e_eobr
existing edge of brick point	e_eobr_pt
existing brick hatch	e_eobr_hatch
edge of concrete	e_eoc
existing concrete hatch	e_eoc_hatch
existing edge of concrete point	e_eoc_pt
edge of gravel	e_eog
existing gravel hatch	e_eog_hatch
existing edge of gravel point	e_eog_pt
existing edge of other	e_eoo
existing edge of other hatch	e_eoo_hatch
existing edge of other point	e_eoo_pt
fence lines	e_fence
existing fence point	e_fence_pt
fence symbols	e_fence_sym
existing face of curb	e_foc
guardrail lines	e_grail
existing guardrail point	e_grail_pt
guardrail symbol	e_grail_sym
existing pavement marking	e_pm
point layer for rock symbols	e_rock_pt
rock symbol	e_rock_sym
existing railroad line	e_rr
existing railroad point	e_rr_pt
existing railroad symbol	e_rr_sym

road shoulder	e_shldr
road shoulder point	e_shldr_pt
shrub line	e_shrub
point layer for shrub symbols	e_shrub_pt
shrub symbols	e_shrub_sym
point layer for sign symbols	e_sign_pt
sign symbols	e_sign_sym
top and bottom of banks or slopes	e_topo
point layer for e_topo	e_topo_pt
annotations (e.g. conc., edge/asph. Etc.)	e_topo_txt
tree lines	e_tree
point layer for tree symbols	e_tree_pt
tree symbols	e_tree_sym
existing landscaping or planted areas	e_veg
existing vegetation point	e_veg_pt
sidewalk	e_walk
existing sidewalk hatch	e_walk_hatch
existing sidewalk point	e_walk_pt
wall	e_wall
existing wall text	e_wall_pt
existing wetland	e_wtlnd
existing wetland hatch	e_wtlnd_hatch
existing wetland point	e_wtlnd_pt
edge of water	e_wtr
existing water hatch	e_wtr_hatch
existing edge of water point	e_wtr_pt

Description

Layer name

Proposed design

proposed asphalt	p_eoa
proposed back of curb	p_boc
proposed road centerline	p_cl
proposed concrete	p_eoc
proposed face of curb	p_foc
proposed shoulder	p_eos
proposed walk	p_walk

Description

Layer name

Staging

proposed stage lines	p_stage
proposed staging dimensions	p_stage_dim
proposed staging hatch	p_stage_hatch

stage symbols (signs, arrows, barrels etc.)	p_stage_sym
proposed staging text	p_stage_txt
Note: for multiple stages add 1, 1a, 2, 2a etc	
I.e. p_stage1a p_stage2 etc.	

Description	Layer name
--------------------	-------------------

PMS

proposed pavement markings	p_pm
proposed pavement marking dimensions	p_pm_dim
proposed pavement marking symbols	p_pm_sym
proposed pavement marking text	p_pm_txt
proposed sign symbol	p_sign_sym
proposed sign text	p_sign_txt

Description	Layer name
--------------------	-------------------

Removal

proposed removal lines	p_rem
proposed removal hatch	p_rem_hatch
proposed removal symbols	p_rem_sym
proposed removal text	p_rem_txt

Description	Layer name
--------------------	-------------------

Details

existing or lightweight object lines	d_det_1
interior medium weight object lines	d_det_3
heavy object lines	d_det_5
detail center lines	d_det_cen
existing detail dimensions	d_det_edim
existing detail text	d_det_etxt
hidden object lines	d_det_hid
detail notes	d_det_notes
proposed detail dimensions	d_det_pdim
proposed detail text	d_det_ptxt
detail subtitle	d_det_sub
detail title	d_det_title
detail hatch	d_det_hatch
detail section lines	d_det_sec

Description**Survey**

aerial control points
aerial control text
point layer for benchmarks
benchmark symbols
benchmark text
existing boundary line
existing boundary dimension
existing boundary point
existing boundary symbol
existing boundary text
existing bridge line
existing bridge hatch
existing bridge point
control:traverse & benchmark lines
control:traverse & benchmark points
control:traverse & benchmarks symbols
control:traverse & benchmarks text
existing easement
existing easement dimensions
existing easement text
existing road easement
existing road easement dimension
existing road easement text
existing sanitary easement
existing sanitary easement dimension
existing sanitary easement text
existing storm easement
existing storm easement dimension
existing storm easement text
existing water easement
existing water easement dimension
existing water easement text
existing lots
existing lot dimension
existing lot text
point layer for monument symbols
monument symbols
monument text
existing property iron symbol
existing property iron text
section lines
existing row dimension
existing row text
section line text

Layer name

e_actrl
e_ctrl_txt
e_bm_pt
e_bm_sym
e_bm_txt
e_bndy
e_bndy_dim
e_bndy_pt
e_bndy_sym
e_bndy_txt
e_brg
e_brg_hatch
e_brg_pt
e_ctrl
e_ctrl_pt
e_ctrl_sym
e_ctrl_txt
e_esmt
e_esmt_dim
e_esmt_txt
e_esmtrd
e_esmtrd_dim
e_esmtrd_txt
e_esmts
e_esmts_dim
e_esmts_txt
e_esmtstm
e_esmtstm_dim
e_esmtstm_txt
e_esmtwm
e_esmtwm_dim
e_esmtwm_txt
e_lot
e_lot_dim
e_lot_txt
e_mon_pt
e_mon_sym
e_mon_txt
e_prir_sym
e_prir_txt
e_secline
e_row_dim
e_row_txt
e_secline_txt
e_row

existing row	e_setbk
existing setback line	e_setbk_dim
existing setback dimension	e_setbk_txt
existing setbk text	p_bndy
proposed boundary line	p_bndy_dim
proposed boundary dimension	p_bndy_txt
proposed boundary text	p_esmt
proposed easement	p_esmt_txt
proposed easement text	p_esmtgrad
proposed grading easement	p_esmtgrad_dim
proposed grading easement dimension	p_esmtgrad_txt
proposed grading easement text	p_esmtrd
proposed road easement	p_esmtrd_txt
proposed road easement text	p_esmtsan
proposed sanitary easement	p_esmtsan_txt
proposed sanitary easement text	p_esmtstm
proposed storm easement	p_esmtstm_txt
proposed storm easement text	p_esmttemgrad
proposed temporary grading easement	p_esmttemgrad_dim
proposed temp grading easement dimension	p_esmttemgrad_txt
proposed temp grading easement text	p_esmtwm
proposed water easement	p_esmtwm_txt
proposed water easement text	p_lot
proposed lot line	p_lot_dim
proposed lot dimension	p_lot_txt
proposed lot text	p_prir_sym
proposed property iron	p_prir_txt
proposed property iron text	p_row
proposed row	p_row_dim
proposed row dimension	p_row_txt
proposed row text	p_setbk
proposed setback	p_setbk_dim
proposed setback dimension	p_setbk_txt
proposed setback text	

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APPENDIX XVII

Superior Township As-Built Drawing Requirements



SUPERIOR RECORD DRAWING REQUIREMENT CHECKLIST

JOB NAME: _____ REVIEWED BY: _____

JOB NUMBER: _____ DATE REVIEWED: _____

NOTE: Tie down measurements and top of casting elevations to all utility structures or building corners will also be the responsibility of the engineer providing the record drawings.
The use of coordinates alone to locate structures is not acceptable.

The Orchard, Hiltz & McCliment, Inc project number must be printed in the lower right hand corner of all plan sheets.

COVER SHEET			COMMENTS
A.	[NEED]	[O.K.]	Type & class of pipe & joint ("O" ring, slip, solvent weld, etc.) for all utilities
B.	[NEED]	[O.K.]	Permit numbers (County & MDEQ)
C.	[NEED]	[O.K.]	Manufacturer of pipe
D.	[NEED]	[O.K.]	Manufacturer of manhole
E.	[NEED]	[O.K.]	Manufacturer of hydrant
F.	[NEED]	[O.K.]	Basis of Design for Sewer Demands
G.	[NEED]	[O.K.]	Basis of Design for Water Demands

OVERALL UTILITY SHEET			COMMENTS
A.	[NEED]	[O.K.]	Pipe Diameters
B.	[NEED]	[O.K.]	Structure identification number

SANITARY SEWER			COMMENTS
I. PLAN VIEW			
<i>OHM USE ONLY</i>			
A.	[NEED]	[O.K.]	Lengths between manholes
B.	[NEED]	[O.K.]	Size of pipe
C.	[NEED]	[O.K.]	Lengths of casing pipe
D.	[NEED]	[O.K.]	Ties to manholes
E.	[NEED]	[O.K.]	Wye locations
F.	[NEED]	[O.K.]	Manhole numbering (sequential)
G.	[NEED]	[O.K.]	Show all sanitary sewer easements on plans
H.	[NEED]	[O.K.]	Provide sketch and legal description of sanitary sewer easements

II. PROFILE VIEW			
<i>OHM USE ONLY</i>			
A.	[NEED]	[O.K.]	Lengths between manholes
B.	[NEED]	[O.K.]	Size of pipe
C.	[NEED]	[O.K.]	Lengths of casing pipe
D.	[NEED]	[O.K.]	Depth of wye & riser
E.	[NEED]	[O.K.]	Invert grades
F.	[NEED]	[O.K.]	T/casting grades
G.	[NEED]	[O.K.]	Wye locations
H.	[NEED]	[O.K.]	Percent slope between manholes
I.	[NEED]	[O.K.]	Manhole numbering (sequential)
J.	[NEED]	[O.K.]	All utility crossings
K.	[NEED]	[O.K.]	Backfill areas graphically shown

STORM SEWER**COMMENTS****I. PLAN VIEW***OHM USE ONLY*

- | | | | |
|----|--------|--------|--|
| A. | [NEED] | [O.K.] | Lengths between manholes/catch basins/inlets |
| B. | [NEED] | [O.K.] | Size of pipe |
| C. | [NEED] | [O.K.] | Ties to manholes/catch basins/inlets |
| D. | [NEED] | [O.K.] | T/casting grades |
| E. | [NEED] | [O.K.] | Structure numbering (sequential) |
| F. | [NEED] | [O.K.] | Special structures (low head, 5' dia., 6' dia., 2' sump, etc.) |
| G. | [NEED] | [O.K.] | Show all easements for storm sewer |
| H. | [NEED] | [O.K.] | Provide sketch and legal description of storm sewer easements |

II. PROFILE VIEW*OHM USE ONLY*

- | | | | |
|----|--------|--------|---|
| A. | [NEED] | [O.K.] | Lengths between manholes |
| B. | [NEED] | [O.K.] | Size of pipe |
| C. | [NEED] | [O.K.] | Invert grades |
| D. | [NEED] | [O.K.] | T/casting grades |
| E. | [NEED] | [O.K.] | Structure numbering (sequential) |
| F. | [NEED] | [O.K.] | Percent slope between manholes (as-built) |
| G. | [NEED] | [O.K.] | All utility crossings |
| H. | [NEED] | [O.K.] | Special backfill areas graphically shown |

III. Detention Basin

- | | | | |
|----|--------|--------|--------------------------------------|
| A. | [NEED] | [O.K.] | Constructed Contours |
| B. | [NEED] | [O.K.] | Outlet Control Structure Information |
| C. | [NEED] | [O.K.] | Detention Calculations |

WATER MAIN**COMMENTS****I. PLAN VIEW***OHM USE ONLY*

- | | | | |
|----|--------|--------|--|
| A. | [NEED] | [O.K.] | Lengths between gate valve & wells, hydrants and fittings |
| B. | [NEED] | [O.K.] | Size of pipe |
| C. | [NEED] | [O.K.] | Ties to gate valve & wells, |
| D. | [NEED] | [O.K.] | Ties to stop boxes |
| E. | [NEED] | [O.K.] | Ties to building or offsets to pipe |
| F. | [NEED] | [O.K.] | Location of thrust blocks & types of restraints |
| G. | [NEED] | [O.K.] | Sequentially numbered G.V. & wells |
| H. | [NEED] | [O.K.] | Show all water main easements on plan |
| I. | [NEED] | [O.K.] | Provide sketch and legal description of water main easements |

WATER MAIN**COMMENTS****II. PROFILE VIEW (REQUIRED FOR PIPE 12" & LARGER)***OHM USE ONLY*

- | | | | |
|----|--------|--------|---|
| A. | [NEED] | [O.K.] | Lengths between grade changes |
| B. | [NEED] | [O.K.] | Size of pipe |
| C. | [NEED] | [O.K.] | Type and class of pipe |
| D. | [NEED] | [O.K.] | G.V.. & well location |
| E. | [NEED] | [O.K.] | Hydrant location (identify special structures such as blow off) |
| F. | [NEED] | [O.K.] | Air relief valves/blow off valve locations |
| G. | [NEED] | [O.K.] | Vertical bend locations |
| H. | [NEED] | [O.K.] | T/Casting grades |
| I. | [NEED] | [O.K.] | All utility crossings |
| J. | [NEED] | [O.K.] | Special backfill areas graphically shown |

 Revisions Needed No Revisions Needed

APPENDIX XVIII

Resolution to Regulate Storm Drain Catch Basins

**SUPERIOR CHARTER TOWNSHIP
WASHTENAW COUNTY, MICHIGAN
SEPTEMBER 18, 2006**

A RESOLUTION TO REGULATE STORM DRAIN CATCH BASINS

WHEREAS, the Charter Township of Superior Board realized many years ago, the importance of their role in helping preserve the environment for future generations; and

WHEREAS, the Charter Township of Superior Board has decided to continue their efforts by implementing new development requirements to help protect our rivers, lakes and streams; and

WHEREAS, in an effort to promote awareness and stress the importance of our waterways, all new developments (commercial, industrial, residential, and public) will be required to include the use of nonphosphorus fertilizer in association by-laws and require a permanent castiron message against illicit dumping on storm drain castings and manhole covers; and

WHEREAS, the catch basin and manhole cover mandatory lettering would be "Dump No Waste", "Drains to Rivers" and would include the "Fish Logo"; and

WHEREAS, under the Clean Water Act, any local municipality that demonstrated that any new construction educated the public on the dangers of pollutants in storm water would qualify for funds to solve drainage and storm sewer problems.

NOW, THEREFORE BE IT RESOLVED, that the Charter Township of Superior Board of Trustees, in an effort to help protect the rivers, lakes and streams authorizes the implementation of the storm drain catch basin requirements.

THE RESOLUTION WAS DECLARED ADOPTED.

CERTIFICATION

I, Kay Williams, the duly qualified Clerk of the Charter Township of Superior, Washtenaw County, Michigan, do hereby certify that the foregoing is a true and correct copy of a resolution adopted at a regular meeting of the Superior Charter Township Board held on September 18, 2006.

Kay Williams, Superior Charter Township Clerk

APPENDIX XIX

Emergency/Standby Power Systems

Emergency/Standby Power Systems
Superior Township

Part 1. GENERAL

1.01 Scope

- A. Provide complete factory assembled generator set equipment with digital (microprocessor-based) electronic generator set controls, digital governor, and digital voltage regulator.
- B. Provide factory test, startup by a supplier authorized by the equipment manufacturer(s), and on-site testing of the system.
- C. The generator set manufacturer shall warrant all equipment provided under this section, whether or not is manufactured by the generator set manufacturer, so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

1.02 Codes and Standards

- A. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of these standards.
 - 1. CSA 282, 1989 Emergency Electrical Power Supply for Buildings
 - 2. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 - 3. NFPA37 –
 - 4. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
 - 5. NFPA99 – Essential Electrical Systems for Health Care Facilities
 - 6. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.
- B. The generator set and supplied accessories shall meet the requirements of the following standards:
 - 1. NEMA MG1-1998 part 32. Alternator shall comply with the requirements of this standard.
 - 2. UL142 – Sub-base Tanks
 - 3. UL1236 – Battery Chargers
 - 4. UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed..
- C. The control system for the generator set shall comply with the following requirements.
 - 1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
 - 2. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
 - 3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
 - 4. FCC Part 15, Subpart B.
 - 5. IEC8528 part 4. Control Systems for Generator Sets
 - 6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
 - 7. UL508. The entire control system of the generator set shall be UL508 listed and labeled.
 - 8. UL1236 –Battery Chargers.

- D. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.03 Acceptable Manufacturers

Only approved bidders shall supply equipment provided under this contract. Equipment specifications for this project are based on generator sets manufactured by Cummins Power Generation with microprocessor-based controls. Equipment by other suppliers that meets the requirement of this specification is acceptable, if approved not less than 2 weeks before scheduled bid date. Proposals must include a line by line compliance statement based on this specification.

Part 2. PRODUCTS

2.01 Generator set

A. Ratings

1. The generator set rating and operating parameters shall be subject to approval of the Township and the Township Engineer.
2. The generator set rating shall be based on emergency/standby service.

B. Performance

1. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.5%.
3. The diesel engine-generator set shall accept a single step load of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.

The minimum motor starting capability shall be subject to approval of the Township and the Township Engineer. The generator set shall be capable of recovering to a minimum of 90% of rated no load voltage following the application of the specified kVA load at near zero power factor applied to the generator set. Maximum voltage dip on application of this load, considering both alternator performance and engine speed changes shall not exceed 25%.

4. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3rd order harmonics or their multiples. Telephone influence factor shall be less than 40.
5. The generator set shall be certified by the engine manufacturer to be suitable for use at the installed location and rating, and shall meet all applicable exhaust emission requirements at the time of commissioning.

C. Construction

1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.
2. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. All active control components shall be installed within a UL/NEMA 3R enclosure. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.

D. Connections

1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.

2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel.
3. Generator set control interfaces to other system components shall be made on a permanently labeled terminal block assembly. Labels describing connection point functions shall be provided.

2.02 Engine and Engine Equipment

The engine shall be diesel, 4 cycle, radiator and fan cooled. Minimum displacement volume and number of cylinders are subject to approval of the Township and the Township Engineer. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable. Engine accessories and features shall include:

- A. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed. The governing system shall include a programmable warm up at idle and cooldown at idle function. While operating in idle state, the control system shall disable the alternator excitation system.
- B. Skid-mounted radiator and cooling system rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at the alternator air inlet. Radiator fan shall be suitable for use in a system with 0.5 in H₂O restriction. Radiator shall be sized based on a core temperature that is 20F higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Radiator shall be provided with a duct adapter flange. The equipment manufacturer shall fill the cooling system with a 50/50-ethylene glycol/water mixture prior to shipping. Rotating parts shall be guarded against accidental contact.
- C. Electric starter(s) capable of three complete cranking cycles without overheating.
- D. Positive displacement, mechanical, full pressure, lubrication oil pump.
- E. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
- F. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Fuel cooler, suitable for operation of the generator set at full rated load in the ambient temperature specified shall be provided if required for operation due to the design of the engine and the installation.
- G. Replaceable dry element air cleaner with restriction indicator.
- H. Flexible supply and return fuel lines.
- I. Engine mounted battery charging alternator, 40-ampere minimum, and solid-state voltage regulator.
- J. Coolant heater
 1. Engine mounted, thermostatically controlled, coolant heater for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 listed and labeled.
 2. The coolant heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall provisions to isolate the heater for replacement of the heater element without draining the coolant from the generator set. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.
 3. The coolant heater shall be provided with a DC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system.
 4. The coolant heater shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 104F (40C) in a 40F (4C) ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.

- K. Provide vibration isolators, pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.
- L. Starting and Control Batteries shall be calcium/lead antimony type, 24 volt DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors. The batteries shall be capable of a minimum of three complete 15-second cranking cycles at 40F ambient temperature when fully charged.
- M. Provide exhaust silencer(s) for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. The mufflers shall be mounted inside enclosure. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards.
- N. A UL listed/CSA certified 10 amp voltage regulated battery charger shall be provided for each engine-generator set. The charger may be located in an automatic transfer switch, or may be wall mounted, at the discretion of the installer. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30VDC for remote indication of:
 - Loss of AC power - red light
 - Low battery voltage - red light
 - High battery voltage - red light
 - Power ON - green light (no relay contact)
 Charger shall include an Analog DC voltmeter and ammeter, 12 hour equalize charge timer, and AC and DC fuses.

2.03 AC Generator

- A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system and shall be UL1446 listed. Actual temperature rise measured by resistance method at full load shall not exceed 125 degrees Centigrade.
- B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.
- C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.
- D. The subtransient reactance of the alternator shall not exceed 12 percent, based on the standby rating of the generator set.

2.04 Generator set Control.

The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.

The control shall be mounted on the generator set, or may be mounted in a free-standing panel next to the generator set if adequate space and accessibility is available. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

The generator set mounted control shall include the following features and functions:

- A. Control Switches
 - 1. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or MANUAL position the generator set shall start, and accelerate to rated speed and voltage as

directed by the operator. A separate push-button to initiate starting is acceptable. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.

2. EMERGENCY STOP switch. Switch shall be Red "mushroom-head" push-button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
 3. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
 4. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.
- B. Generator Set AC Output Metering. The generator set shall be provided with a metering set including the following features and functions:
1. Digital metering set, 1% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three-phase voltages (line to neutral or line to line) simultaneously.
 2. Analog voltmeter, ammeter, frequency meter, power factor meter, and kilowatt (KW) meter. Voltmeter and ammeter shall display all three phases. Meter scales shall be color coded in the following fashion: green shall indicate normal operating condition, amber shall indicate operation in ranges that indicate potential failure, and red shall indicate failure impending. Metering accuracy shall be within 1% at rated output. Both analog and digital metering are required.
 3. The control system shall monitor the total load on the generator set, and maintain data logs of total operating hours at specific load levels ranging from 0 to 110% of rated load, in 10% increments. The control shall display hours of operation at less than 30% load and total hours of operation at more than 90% of rated load.
 4. The control system shall log total number of operating hours, total kWh, and total control on hours, as well as total values since reset.
- C. Generator Set Alarm and Status Display.
1. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. Functions indicated by the lamps shall include:
 - The control shall include five configurable alarm-indicating lamps. The lamps shall be field adjustable for any status, warning, or shutdown function monitored by the genset. They shall also be configurable for color, and control action (status, warning, or shutdown).
 - The control shall include green lamps to indicate that the generator set is running at rated frequency and voltage, and that a remote start signal has been received at the generator set. The running signal shall be based on actual sensed voltage and frequency on the output terminals of the generator set.
 - The control shall include a flashing red lamp to indicate that the control is not in automatic state, and red common shutdown lamp.
 - The control shall include an amber common warning indication lamp.
 2. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. All conditions indicated below for warning shall be field-configurable for shutdown. Conditions required to be annunciated shall include:
 - low oil pressure (warning)
 - low oil pressure (shutdown)
 - oil pressure sender failure (warning)
 - low coolant temperature (warning)
 - high coolant temperature (warning)
 - high coolant temperature (shutdown)
 - high oil temperature (warning)

- engine temperature sender failure (warning)
- low coolant level (warning)
- fail to crank (shutdown)
- fail to start/overcrank (shutdown)
- overspeed (shutdown)
- low DC voltage (warning)
- high DC voltage (warning)
- weak battery (warning)
- low fuel-daytank (warning)
- high AC voltage (shutdown)
- low AC voltage (shutdown)
- under frequency (shutdown)
- over current (warning)
- over current (shutdown)
- short circuit (shutdown)
- over load (warning)
- emergency stop (shutdown)
- (4) configurable conditions

3. Provisions shall be made for indication of four customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above-specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

D. Engine Status Monitoring.

1. The following information shall be available from a digital status panel on the generator set control:
 - engine oil pressure (psi or kPA)
 - engine coolant temperature (degrees F or C)
 - engine oil temperature (degrees F or C)
 - engine speed (rpm)
 - number of hours of operation (hours)
 - number of start attempts
 - battery voltage (DC volts)
2. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.

E. Engine Control Functions.

1. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15-second rest period between cranking periods.
2. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.
3. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.
4. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
5. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.

F. Alternator Control Functions:

1. The generator set shall include a full wave rectified automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase line to neutral RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristic shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.
2. Controls shall be provided to monitor the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.
3. Controls shall be provided to individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.
4. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
5. An AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.
6. The generator set shall be provided with a network communication module to allow LonMark compliant communication with the generator set control by remote devices. The control shall communicate all engine and alternator data, and allow starting and stopping of the generator set via the network in both test and emergency modes.
7. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25VDC or more than 32 VDC. During engine cranking (starter engaged), the low voltage limit shall be disabled, and DC voltage shall be monitored as load is applied to the battery, to detect impending battery failure or deteriorated battery condition.

G. Control Interfaces for Remote Monitoring:

1. The control system shall provide four programmable output relays. These relay outputs shall be configurable for any alarm, shutdown, or status condition monitored by the control. The relays shall be configured to indicate: (1) generator set operating at rated voltage and frequency, (2) common warning, (3) common shutdown, (4) load shed command.
2. A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.
3. A fused 10 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.
4. The control shall be provided with a direct serial communication link for the LonWorks communication network interface as described elsewhere in this specification and shown on the drawings.

H. The generator set shall be provided with a mounted main line circuit breaker, sized to carry the rated output current of the generator set. The circuit breaker shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided.

I. Outdoor Weather-Protective Enclosure

1. The generator set shall be provided with an outdoor enclosure, with the entire package listed under UL2200. The package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing. The total assembly of generator set, enclosure, and sub-base fuel tank (when used) shall be designed to be lifted into place using spreader bars. Housing shall provide ample airflow for generator set operation at rated load in an ambient temperature of 100F. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure.
2. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electrocoating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:

Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.

Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.

Crosshatch adhesion, per ASTM D3359-93, 4B-5B.

Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.

Salt Spray, per ASTM B117-90, 1000+ hours.

Humidity, per ASTM D2247-92, 1000+ hours.

Water Soak, per ASTM D2247-92, 1000+ hours.

3. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.
4. Enclosure shall be constructed of minimum 12 gauge steel for framework and 14 gauge steel for panels. All hardware and hinges shall be stainless steel.
5. A factory-mounted exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.
6. The enclosure shall include the following maintenance provisions:
 - Flexible coolant and lubricating oil drain lines, that extend to the exterior of the enclosure, with internal drain valves
 - External radiator fill provision.
7. The generator set shall be provided with a sound-attenuated housing which allows the generator set to operate at full rated load in an ambient temperature of up to 100F. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 71.8 dBA at any location 7 meters from the generator set in a free field environment.
8. The enclosure shall be insulated with non-hygroscopic materials.

Part 3. OPERATION

3.01 Sequence of Operation

- A. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control and a redundant signal over the required network connection.
- B. The generator set shall complete a time delay start period as programmed into the control.
- C. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:
 - D. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control system shall shut down and lock out the generator set, and indicate "fail to crank" shutdown.
 - E. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate "fail to start".
 - F. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.
 - G. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous state.
 - H. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.
 - I. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.
 - J. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

Part 4. OTHER REQUIREMENTS

4.01 Submittals

- A. Within 10 days after award of contract, provide six sets of the following information for review:
- Manufacturer's product literature and performance data, sufficient to verify compliance to specification requirements.
 - A paragraph by paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
 - Manufacturer's certification of prototype testing.
 - Manufacturer's published warranty documents.
 - Shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.
 - Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
 - Manufacturer's installation instructions.

4.02 Factory Testing

- A. The generator set manufacturer shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.
- B. Factory testing may be witnessed by the owner and consulting engineer. Costs for travel expenses will be the responsibility of the owner and consulting engineer. Supplier is responsible to provide two weeks notice for testing.
- C. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

4.03 Installation

- A. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- B. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- C. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
- D. Equipment shall be initially started and operated by representatives of the manufacturer.
- E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

4.04 On-Site Acceptance Test:

- A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness

the tests.

- B. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two hour full load test, and a one step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test
- C. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

4.05 Training

- A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

4.06 Service and support

- A. The manufacturer of the generator set shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.
- B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
- C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

4.07 Warranty

- A. The generator set and associated equipment shall be warranted for a period of not less than 5 years from the date of commissioning against defects in materials and workmanship.
- B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

Part 5. TRANSPORT TRAILER

5.01 Transport Trailer

- A. The transport trailer shall provide a safe operating platform for the generator system. The trailer design is to be specifically for this application and will allow safe towing with a properly sized tow vehicle at highway speeds as manufactured by Victory Industrial Products, Inc., Milford, Ohio.
- B. The trailer's gross vehicle weight rating shall be calculated to a minimum of 110% of the total wet weight of the trailer including the fuel tank, generator system, power cables and all on board equipment. All tires shall be mounted on white spoke wheels and rated for trailer service applications.
- C. The trailer main frame, rear bumper and tongue are to be constructed using fully welded rectangular steel tubing. The trailer deck will be diamond tread floor plate welded to the main frame. The full fenders will be constructed using diamond tread steel with steps on the front and rear. The fenders must be designed to support service personnel performing maintenance on the generator system.
- D. The trailer shall be equipped with an electric braking system. This system will be actuated by the towing vehicle. Brakes are to be on all wheels.
- E. The trailer shall be equipped with all applicable lighting and safety equipment required by federal and state(s) of operation, department of transportation requirements. All unit wiring will be routed through the rectangular tube main frame. The electrical connection to the tow vehicle will use a six pole plug. Supply the matching six pole vehicle receptacle loose for installation by the owner.

- F. The trailer shall be equipped with a built in fuel supply tank. The tank will be located beneath the trailer deck and be a separately manufactured component. The tank capacity shall be 250 gallons. The tank shall be equipped with a low level dry contact float switch, lockable anti-slosh fill cap, mechanical level gauge and supply and return ports sized to the generator specified.
- G. The trailer is to be painted using epoxy primer and two-part polyurethane enamel high gloss black.
- H. The unit shall be equipped with an output power voltage selector switch. The required voltages will be 277/480 3-phase and 120/240 3-phase. The 277/480 voltage will have an isolated output on the selector switch wired to a main breaker sized to the generator's output capacity. The 120/240 will use an output on the selector switch and use the same output breaker sized to the generator's output capacity. The switch is to be clearly labeled with the voltage selected and mounted in close proximity to the generator's controller and output breakers
- I. Include a pre wired 120/208/240 single phase main lug distribution panel with branch breakers wired to a minimum of four (4) 100 watt incandescent lights in vapor-tight fixtures with 3-way switches at each personnel door, one GFCI duplex receptacles, battery charger and the engine block heater. All wiring shall be routed in EMT conduit except where flexible conduit is required. All circuits must be individually grounded to the distribution panel via a grounding wire sized per NEC. Conduits or enclosure structure will not be an acceptable ground source
- J. Generator receptacles & Cables will be provided by the owner

March 2007

Engineering Standards For

Private Community Wastewater Systems

Superior Township, Michigan

A Guide for Wastewater Collection, Treatment, and Disposal Systems for Residential Developments in Superior Township



Superior Township

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Ypsilanti, Michigan 48198



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Abbreviations and Acronyms:

ASTM	American Society for Testing and Materials
BOD ₅	Biochemical Oxygen Demand (5 day test)
HDPE	High Density Polyethylene
HOA	Hand-Off-Auto
I&I	Inflow and Infiltration
MDEQ	Michigan Department of Environmental Quality
MDOT	Michigan Department of Transportation
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
PBF	Packed Bed Filter
PH	Negative Log (base 10) of Hydrogen Ion Concentration
PVC	Polyvinyl Chloride
REU	Residential Equivalent Unit
RSF	Recirculating Sand Filter
SDR	Standard Dimension Ratio
SSSAD	Sanitary Sewer Special Assessment District
STEP	Septic Tank, Effluent Pump
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TSS	Total Suspended Solids
UL	Underwriter's Laboratories
USGS	United States Geological Survey
WCDC	Washtenaw County Drain Commissioner
WCDPH	Washtenaw County Department of Public Health

Definitions

Applicant -

The party legally responsible for submittal of fees, plans, specifications, and other documents required by the Township. The Applicant may be the Landowner, SSSAD, or Association, depending on individual circumstances.

Home Owner's Association (HOA) -

A group of property owners within a residential development responsible for the costs of operating and maintaining the sanitary sewers, treatment and disposal system.

Sanitary Sewer Special Assessment District (SSSAD) -

This District is defined as the users of the Community On-Site Wastewater System for the development. In the event that the Home Owner's Association fails to perform their required function in operating and maintaining the system, the Township can elect to exercise the SAD to insure proper operation.

CRITERIA FOR SMALL COMMUNITY WASTEWATER SYSTEMS IN SUPERIOR TOWNSHIP, MICHIGAN

A. Purpose

These guidelines establish uniform standards for evaluating, selecting, constructing, and operating a small community wastewater system in Superior Township. A small community wastewater system refers to an independent system intended for the use of a limited number of residential users for collecting, transporting, treating and disposing of sanitary wastewater. The complete system includes all sewers, pump stations, headworks, treatment and disposal unit processes, and ancillary items. Note that only wastewater generated by a residential development is considered in these guidelines.

These guidelines provide details for site analysis, system selection, design, construction, operation and maintenance, and other details that make up a complete system. The checklists required for formal submittals (see Appendix A and B) to the Township are simple summaries of these guidelines and should be used as a guide for completeness of the application. The checklists must be filled in and attached to plans, specifications, and other documents that are submitted to the Township for review. Upon submittal, a brief review of all items will be made to determine if the application is administratively complete. Any deficient items will be returned to the applicant for revision and re-submittal.

All Township Ordinance and Engineering Standards must be adhered to in conjunction with the information within these Standards.

B. Application Process

Small community wastewater systems are created in a series of steps, starting with an application filed with the Township to establish a sanitary sewer special assessment district. The full description of the Application Process is found in the Township Ordinance. A formal agreement is finally executed with the Township to create the Sanitary Sewer Special Assessment District (SSSAD). In all cases, the HOA retains ownership and operating responsibilities for the treatment system.

In general, the Applicant will need to submit the application and have corresponding reviews performed by the appropriate agency, in addition to the Township review, as delineated by system capacity shown in Table 1 as follows:

Table 1. Application Submission Delineation

	System Size - gallons per day (gpd)	Governing Agency
Class I:	0 – 10,000	WCDPH
Class II:	10,000 - 20,000	WCDPH and MDEQ
Class III:	Greater than 20,000	MDEQ

C. New Technology Clause

Because of the advent of new wastewater technologies, the Township will review the approved types of wastewater treatment systems listed in this document periodically. New technologies will be evaluated by the Township for effectiveness and reliability and, if acceptable, may be added to the approved list. The list of approved systems may be amended at any time at the sole discretion of the Township (i.e. RSF's and PBF's).

D. Permits and Notification Requirements

These guidelines are intended to supplement existing rules and regulations pertaining to collection, treatment and disposal systems. All applicable provisions of local, state, and federal regulations shall be followed. The following documents are required from the agencies noted below prior to initiating construction:

1. Washtenaw County Department of Public Health (WCDPH)
 - i. Permit for the final disposal system and/or treatment system, as applicable.
2. MDEQ (Water Division)
 - i. Part 41 Construction Permit
3. MDEQ (Water Division) < 10,000 gal/day
 - i. Part 22 Notification (R323.2211 a)
4. MDEQ (Water Division) 10,000 - 20,000 gpd.
 - i. Part 22 Discharge Permit (R323.2216)
5. Washtenaw County Soil Erosion and Sedimentation Control
 - i. Soil Erosion Permit
6. Washtenaw County Department of Public Health
 - i. An application shall be submitted to the WCDPH for a site soils evaluation.
 - ii. The Applicant/Owner's design engineer and the WCDPH representative shall jointly evaluate the soils within the active and reserve areas of the proposed tile field. The number of test pits required will be relative to what is necessary to accurately access the overall disposal site. Soil suitability will be defined by reference from the MDEQ published document titled "Michigan Criteria for Subsurface Sewage Disposal" and/or subsequent guidelines provided by the MDEQ.

Copies of all applications and/or permits shall be provided to the Township. The Township reserves the right to impose additional restrictions on a site-specific basis in order to assure the adequacy of any portion of the system proposed.

E. Site Plan Submission Requirements

1. Provide a general location map showing the proposed treatment system and the development in relationship to prominent geographical features such as roads, rivers, lakes, and towns.
2. Provide an accurate legal description for the boundaries of the development and the treatment system site. The entire development and treatment system site must be topographically mapped with a maximum contour interval of two feet. The legal description and topographic map must be prepared under the direction of a licensed Professional Surveyor. The drawing must be accurate and to a scale of no more than 100 feet to one inch.
3. Show the location of soil borings or test pits and attach soil-boring logs. Indicate the general nature of subsurface soils in the development and treatment system areas, including depth to groundwater, permeable strata, and confining layers.
4. Show the major components of the proposed system on the drawing, including pump stations, tanks, treatment units, drainfields, buildings and other significant items.

5. Show the means of vehicle access to the treatment system. Provide at least one paved road with paved parking and turnaround area adequate for emergency and maintenance vehicles per Washtenaw County Road Commission Standards for Low Density Roads. Keep buried utilities a minimum of 10 feet from the edge of pavement and out of the 1:1 influence of the pavement.
6. Provide sufficient details on the drawing to illustrate the method of stormwater management, Show general flow arrows for the direction of stormwater runoff, and the points of discharge from the development.
7. The proposed treatment system must be isolated from surrounding utilities and structures. Show the locations of and distances from nearby wells, existing and future structures, drains, watermains, or other utilities. In general, the preferred buffer from any dwelling to the wastewater treatment component is 300 feet. Provide a minimum of 100 feet isolation from any portion of the treatment system, disposal area or pump station to any dwelling. The system must be located on a parcel of land not counted as developable area or encumbered by easements.
8. The wastewater system must be placed with adequate buffer space from adjacent properties to decrease process machinery noise levels and maximize odor dispersal. Describe how placement of the treatment and disposal system will minimize odor concerns with neighboring properties.
9. Show the locations of and distances to nearby surface water, wetlands, or floodplain. Provide a minimum isolation of 100 feet, or furnish documentation of compliance with appropriate permitting agencies. No treatment system may be located within the 100-year floodplain or wetlands.
10. Provide details of the screening to be provided around the treatment system, such as berming, trees, shrubs, fencing, etc.
11. Show or describe the proximity of the proposed treatment system to the nearest public sanitary sewer within 5 miles of the proposed development.
12. Show adjacent land use and zoning.
13. Describe the compatibility of the proposed development with local and county planning. In particular, discuss the impact of the development on the Township Master Plan for sanitary sewer service relative to current conditions and projections for 10 years and 15 years in the future.
14. Provide description and provisions for potential connection to the municipal sewer system. This is to ensure that if the private community system were to become inoperable, connection could potentially be made to the municipal system, if available.
15. Show the source of water supply and its isolation from the proposed treatment and disposal system. Indicate the general direction of groundwater flow.

F. Selection of Treatment System

1. Systems are to be designed in accordance with all Township, WCDPH, and MDEQ specifications and requirements.
2. Review of the submitted treatment system shall be performed by the Township's Engineer, the WCDPH, and/or the MDEQ (as applicable per Table 1).

- The system must be capable of achieving consistent levels of secondary treatment. Secondary treatment objectives include the following parameters, measured at the point of discharge of treated effluent:

Constituent	Concentration	Duration
BOD ₅	20 mg/l or less	(30 day average)
TSS	20 mg/l or less	(30 day average)
Total N	25 mg/l or less	(30 day average)
Total P	25 mg/l or less	(30 day average)
Mecury	Not Detectable	Not Averaged
PCB	Not Detectable	Not Averaged
pH	6-8	(30 day average)

- Design the wastewater system with ease of maintenance and operation in mind. The Township reserves the right to retain a qualified wastewater system operator, at the Applicant's expense, to review the plans and suggest modifications to the design, layout, or operation of the system.

Additional concepts and/or designs may be submitted to the Township for review. All review procedures will incorporate input from the Township, WCDPH and MDEQ.

G. Basic Design Criteria

General Requirements

- Design of the wastewater system shall be performed under the direct supervision of a qualified Professional Engineer licensed to practice in the State of Michigan. It is recommended that the engineer have experience in the design of on-site wastewater systems. Upon request of the Township, the Applicant's Engineer shall provide a list of similar projects with location, size, construction cost, contact names and telephone numbers that they have designed.
- Wastewater systems designed under these guidelines are meant only for wastewater characteristics of residential users. Typical values of raw wastewater to be used for calculating loads for treatment processes include the following:

Constituent	Concentration/Measurement
BOD ₅	250 mg/l ±
TSS	210 mg/l ±
Ammonia	25 mg/l ±
Total N	50 mg/l
Total Phosphorus	7 mg/l
Oil & Grease	90 mg/l
PH	6 to 8

3. In the absence of actual flow data, the design shall be based upon the definition of one Residential Equivalent Unit (REU) equaling a minimum of 350 gallons per day.
4. Design of systems shall be limited to a maximum of 20,000 gallons per day. Larger systems may be considered at the discretion of the Township.
6. Design the system for a service life of at least 20 years.
7. Design wastewater systems for expansion with minimum interruption of normal operation.
8. Design the wastewater system to permit ease of expansion and ultimate connection to a municipal sanitary sewer. Measures to accomplish this may include blind tees, plugs, stubs, and sleeves placed strategically to allow for future connection to a municipal system.
9. In order to keep the system operational during times of routine maintenance and/or repair, it is suggested that whenever possible, the treatment components be compartmentalized so as to allow for manual alternation of the said components.
10. All developable sites within the proposed development shall be designed with the ability to be connected to the community wastewater system, where applicable. The design engineer may submit a formal request for acceptance with a specified number of units excluded from connection. This request must be specific as to the reason why all sites cannot be connected (i.e. MDEQ or WCDPH requirement, etc.).
11. The minimum number of homes connected to a community wastewater system will be 20.
12. Prepare a basis of design showing flow calculations, dosing rates, pump and tank sizing, timer settings, and other key parameters. Include an estimate of the time available for operator response under high water alarm conditions.
13. Design piping to allow for flushing, draining, repairing, and other maintenance activities.
14. Provide adequate lifting and handling devices for heavy or awkward components of the system.
15. Provide gasketed aluminum access hatches to control odors. All access hatches to be rated to support truck load and to be Flygt Safety Grate Hatch or approved equal.
16. Where feasible, system to be designed to accommodate gravity flow piping in and around tanks, up to the distribution piping at the drainfield. Piping and appurtenance material to be as specified in the Township Engineering Standards.

17. Subsequent to a review of the overall data submitted, the Township or WCDPH may require the installation of groundwater observation wells around the disposal area. If the wells are required, the following criteria shall apply:
 - i. A minimum of three (3) wells shall be triangulated around the final disposal area with the exact locations jointly determined by the Applicant's design engineer and the WCDPH.
 - ii. The wells shall be a minimum of 2" diameter and properly screened at the depth of the receiving aquifer.
 - iii. Each well shall be equipped with a latchable and lockable cap.
 - iv. The WCDPH shall establish sampling frequency and parameters on a case-by-case basis.
18. Slope paved surfaces a minimum of 1% and a maximum of 3%.
19. Landscaped or grassed areas that require periodic mowing may be sloped up to a maximum of 1 vertical to 4 horizontal.
20. All elevations within the area of any component of the wastewater system shall be graded so as to promote runoff away from the system to a designated drainage area.
21. At the discretion of the Township or the WCDPH, the reserve drain field area may be required to be prepared in full or in a portion thereof. The extent of preparation shall be subject to the following items:
 - A. Future availability of public sewer.
 - B. Overall site grading and/or clearing.
 - C. Depth and accessibility of proposed excavation.
22. Install, inspect, and maintain all soil erosion and sedimentation control measures as required by Washtenaw County Soil Erosion and Sedimentation Control.
23. No construction or installation of systems may take place between November 1 and April 15 without written consent of the Township.
24. For all equipment, compact aggregates, soils, and backfill materials to at least 95% of their maximum unit weight as measured by Modified Proctor test. Compaction may be a minimum of 90% in non-critical areas.
25. Copies of all equipment warranties, O&M Manuals, shop drawings and test reports shall be provided to the Township

H. Components of the Treatment Process (refer to Figure 1. Process Flow Diagram)

1. Primary Treatment

- a. Each home site to have a Septic Tank. An Effluent Pump is required in the tank for non-gravity applications. The minimum tank size must be double compartmented and have a minimum total capacity of 1,500 gal. The compartments shall be separated by a baffle wall set at height per the manufacturer's specifications with the intent to achieve solid separation and collection in the first compartment.
- b. The Septic Tank to be Orenco Injection Molded Fiberglass Tank, or approved equal. Link Seal® or Kor-N-Seal® Boot fittings shall be utilized on all pipes entering or exiting the tank.
- c. For non-gravity applications, a properly sized, high head, single phase, effluent pump shall be placed within the second compartment of the tank.
- d. For the purpose of screening solids, an Orenco Biotube Pump Vault, or Township approved equal, is required to be installed in the second compartment of the STEP unit.

- Handle extensions shall be provided so as to allow for filter maintenance without entering the manhole
- e. Watertight riser adaptors shall be integral to the tank construction and shall be flush with proposed final grade and properly secured so as to prevent unauthorized intrusion and shall be load rated for truck traffic.
 - f. Provide gasketed aluminum access hatches to control odors. All access hatches to be rated to support truck load and to be Flygt Safety Gate Hatch or approved equal. The contractor shall provide locks and keys.
 - g. Installation modifications may be required in order to assure that the tank is installed level from end to end (i.e. sand sub-base and compaction).
 - h. Leak test of the tank shall be required. The testing shall be conducted in accordance with American Society for Testing and Materials (ASTM) Standard C1227, Section 9.2 Testing for Leakage.
 - Sub-section 9.2.1 *Vacuum Testing* - Seal the empty tank and apply a vacuum to 2 inch or 50 mm of mercury. The tank is approved if 90% of vacuum is held for 2 minutes.
 - Sub-section 9.2.2 *Water-Pressure Testing* - Seal the tank, fill with water, and let stand for 24 hours. Refill the tank. The tank is approved if water level is held for 1 hour. In the event that a tank or chamber fails testing, repairs or replacement shall be required to the extent necessary to resolve the leading condition.
 - i. Home site Electrical Requirements
 - * Install all electrical components per National Electric Code (NEC) Requirements.
 - * The Homeowner is responsible to supply and finance power to the individual sewage pump unit.
 - * The Single Phase Simplex control panel shall include the following items:
 - Underwriter's Laboratory (UL) Listing
 - Hands Off Auto (HOA) Switch
 - Elapsed Time Meter
 - Audio/Visual Highwater alarm with push-silence auto reset
 - Circuit Breaker
 - Event Counter
 - SCADA System interface Monitoring System or approved equal, reference Township Engineering Standards for telemetry.
 - Panel to be located in direct visual contact with the pump chamber and 5' above the proposed ground surface.

2. Secondary Treatment

- a. Secondary Treatment Technologies
 - Rapid Sand Filters
See Appendix G-1 and G-2 for Details
 - Orenco "Advantex" units
 - Packed Bed Filters
See Appendix F for Details

b. Electrical Requirements for Secondary Treatment

- Install electrical wiring and components per the National Electric Code (NEC).
- Place electrical penetrations and entries into underground structures no deeper than necessary to allow access from the ground surface without the need for confined space entry procedures.
- Power to the wastewater system shall be supplied as an exclusive, separately metered service.
- Place control panels near the point of use, with a disconnect on the panel. Panels may be located inside the utility building if within reasonable proximity to the point of use.
- Mount panel on sturdy galvanized steel posts. Make wiring connections with gas-tight conduit entries, or use louvered, self-venting cabinet.
- Minimize the use of junction boxes inside structures by using extra length float switch cables.

3. Subsurface Drain Field and Reserve Subsurface Drain Field

- a. Design and construction standards shall be defined by reference from the following publications:
- "Michigan Criteria for Subsurface Sewage Disposal" (MDEQ)
 - Washtenaw County Sanitary Code (WCDPH)
- b. Pumped, pressure distribution systems shall be used for intermittently dosing the tile field. Dosing siphons are not allowed.
- c. The minimum residual operating head at the most remote orifice within the distribution laterals shall be 4' (5' - 6' preferred).
- d. A minimum of two tile field zones shall be provided. Each zone shall be alternately dosed.
- e. A minimum of one monitoring tube shall be placed in each zone of the proposed tile field. Refer to Appendix E detail M-2 for installation specifications.
- f. In general, trench construction is preferred over bed construction.
- g. The maximum acceptable application rate, for treated wastewater meeting the effluent standards listed in this document, will be 1.5 gal/sq ft/day unless otherwise approved by the Township.
- h. The Reserve Subsurface Drain Field area shall be graded so as to provide for no more than a 24" slope within the defined boundary.

4. Recirculation and Bypass

- a. Wastewater systems shall include the following general components:
- Recirculation and/or surge tanks
 - Options to by-pass certain components in order to accommodate the daily flows under conditions requiring service and/or repair.

5. Collection System

The following guidelines shall be adhered to for all collections systems under the jurisdiction of the Township. However, if another governing agency has more stringent guidelines, they must be adhered to. In no case shall less stringent guidelines be followed.

Gravity flow collection systems are preferred by the Township whenever feasible. If a pressure collection system is proposed, the applicant must submit adequate justification as to why a gravity system is not feasible. These will be reviewed on a case-by-case basis. Final approval is subject to the Township Board.

a. *Pipe and Appurtenance Material*

Reference Superior Township Engineering Standards for approved materials for gravity, pressure and low pressure sewers and associated appurtenances (valves, manhole structures, etc.).

b. *Lift Station Equipment and Installation*

Reference Superior Township Engineering Standards for approved equipment and materials.

c. *Infrastructure Inspection*

Reference Superior Township Engineering Standards for inspection requirements.

I. Delineation of Responsibilities

1. Contractor's Responsibilities

- a. Construction of the wastewater system shall be performed by a qualified contractor with verifiable experience in this type of work. Upon request of the Township, provide a list of similar projects with location, size, contact names and telephone numbers. Contractor shall be solely responsible for the methods, means, sequences and techniques used to complete the work as shown on approved plans and described in the specifications. The Township reserves the right to establish a prequalification process for contractors constructing these systems.
- b. Constructing the system in conformance with approved plans, specifications, and permits.
- c. Taking corrective action when notified of any deficiencies in installation, construction, or testing.
- d. Retaining a qualified electrician for final inspection and testing of electrical components.
- e. Scheduling and obtaining all necessary inspections from the Township Engineer, Township, and other applicable agencies..
- f. Notification to Design Engineer, Township Engineer, and Township about any potential field changes to the approved construction plans.

2. The Design Engineer's (Applicant's Engineer) Responsibilities

- a. Preparation of construction cost and the annual user fees.
- b. Preparing a detailed basis of design.
- c. Conducting a pre-construction meeting with all parties involved in the system installation.
- d. Inspecting and testing during construction.
- e. Reviewing shop drawings and materials specifications.
- f. Preparing an O&M manual.
- g. Preparing, certifying, and sealing record drawings of as-constructed locations of all improvements.
- h. Reporting any deviations from approved plans, specifications, or permit conditions.

- i. Submitting a plan for correcting deviations.
- j. Obtaining the Township approval for any field changes to the approved plans and specifications.
- k. Required submittals: Record Drawings, per the Township Engineering Standards.

3. The Applicant's Responsibilities

- a. Retaining the services of a qualified Professional Engineer.
- b. Making financial commitments for designing, approving, constructing, operating, and maintaining the system.
- c. Securing and recording easements or rights-of-way for the system in a form acceptable to the Township.
- d. Securing all necessary permits required by local, state, or federal regulations.
- e. Providing copies of all correspondence related to the establishment of the SSSAD to the Township.
- f. Providing maps and legal descriptions of the SSSAD.
- g. Providing evidence of disclosure in the legal documents (master deed, by-laws, deed restrictions) establishing the development.
- h. Executing an agreement with the Township to establish a special assessment district prior to any sale or encumbrance of property.
- i. Providing a Development Agreement associated with the development to be reviewed by the Township.
- j. Providing a Maintenance Agreement to be reviewed and approved by the Township.
- k. Posting a Performance surety for the construction cost of the system prior to construction.
- l. Posting a 2-year Maintenance and Guarantee surety for the construction cost of the system after the system has been constructed and accepted by the Township.
- m. Posting an escrow deposit for inspection and testing of the system by the Township or their authorized representative.
- n. Posting of other required sureties, for improvements specific to each development.
- o. Filing notice with the Township that all construction claims against the project have been paid in full.

J. Ongoing/Continued Inspection, Operation and Maintenance of Systems

The Township has limited resources to review, inspect, operate, maintain, and administer the various small community wastewater treatment systems. The Township will operate and maintain small wastewater treatment systems on behalf of the SSSAD as a service provider of last resort, but only where a clear benefit to the community can be shown, and only if designed, constructed, and approved according to these guidelines. Therefore, these guidelines have been developed in order to provide the most efficient use of Township personnel, equipment, and other resources. In so doing, these guidelines will streamline the process for review, approval, and construction of small community wastewater systems, resulting in less time and cost to the development and the Township.

The Township elects to reserve the right to perform these functions in conjunction with other governing agencies as applicable.

1. Inspection

- a. Applicant's engineer shall inspect construction and provide the Township with copies of daily inspection reports, test results, and all correspondence with contractor, landowner, and permitting agencies regarding system installation.
- b. Applicant's engineer shall be present at all times during construction and testing of the collection system, the treatment system, and the disposal area.
- c. The Township's Engineer will also be inspecting construction activities regarding the system installation per the Township Engineering Standards. The applicant will be required to furnish an escrow deposit for these services.
- d. The governing agency may also elect to inspect certain components of the system during construction. The applicant will need to post the appropriate escrow deposit per the agency's requirements.
- e. The Applicant Inspector's daily reports must include, at a minimum, observations for personnel and equipment on site, locations and description of work performed, quantities of material installed, tests performed, any deviations from plans or specifications, and weather conditions.
- e. The Applicant's Inspector must furnish satisfactory qualifications to the Township prior to construction regarding education, experience with similar work, and applicable certifications.
- f. The Applicant will provide a portable generator for testing the generator receptacle on the control panel, as part of final inspection. Contractor shall arrange for the panel supplier and electrician to be present at the test.
- g. Structures must be watertight and pass a leak test. Infiltration or exfiltration shall be less than 0.036 gallons per square foot of cross-section per foot of depth per day.
- h. A photographic record of activities shall also be kept and provided to the Township for reference purposes in digital format.
- i. Additional testing and/or inspection may be required, depending upon the complexity of the proposed treatment system. In those instances, an estimate of such additional fees will be prepared prior to construction for inclusion with the Escrow Deposit.

2. Operation & Maintenance (O&M) Requirements

- a. A comprehensive O&M Manual shall be prepared by a Licensed Professional Engineer, hired by the Applicant, as a guide for successful system operation. The manual will describe procedures for startup, operation, routine maintenance and inspection, and shutdown for each unit process within the wastewater system. Telephone numbers of appropriate emergency response personnel shall be listed. A monitoring system shall be described to check on system performance.
- b. Contents of the O&M manual must include the following:
 - General description of the intended operation of the system.
 - Startup procedures for pumps. All pumps shall be operated prior to acceptance.
 - Operating and maintenance procedures for the following topics:
 - Record keeping
 - Alarms (describe telemetry functions)
 - Routine maintenance - monthly, semi-annual, annual

- Confined Space Entry
 - Power failure
 - Pumps
 - Spare parts
 - Effluent Filters
 - Control panel wiring diagram
 - Sensors
 - Programmable timers
 - Autodialers
 - Activated carbon filters
 - Shop Drawings of engineer approved equipment
- c. Prepare a closure plan for decommissioning and dismantling the system if a public sewer connection becomes available.
- d. Prepare a list of spare parts to be furnished and stored at a location specified by the Township. Typical spare parts may include, but will not be limited to, the following items:
- Replacement effluent pump or recirculating pump
 - Replacement grinder pump core
 - Replacement submersible pump (final disposal pump)
 - Replacement float with cable
 - Replacement timer switches or relays
- e. Prepare a list of safety equipment required to properly operate and maintain the system.
- f. The Township will review the O&M manual for completeness and return it to applicant for any required revisions
- g. Record drawings of improvements must be filed. A Professional Engineer licensed to practice in the State of Michigan must certify these record drawings. Drawings shall show at least two separate dimensions to any individual STEP Unit system locating points of entry of sewer leads, and any bends, measured from permanently established reference points such as building corners, property corners, utility poles, etc. The Township may elect to hire an Engineer to prepare these drawings as specified in the Escrow Letter.
- h. Estimated User Charges:
- Tabulate costs for the following:
- Monthly inspection, sampling and testing
 - Annual pumping of tanks and sludge disposal
 - Submersible pump replacement. (5-year life)
 - Replacement of filter media and other consumables. (5-10 year life)
 - Minor repairs. (Minimum of 2% of construction cost)
 - Electric power. (Contact Township for estimate and input concerning on-site generator)
 - Telephone service telemetry. (Contact Township for estimate)
 - Miss Dig Contingency Fund for emergencies. (Minimum of 5% of construction cost)

Total costs shall be added together and divided by the total number of residences. Calculate both annual and quarterly estimated user charges. Financial calculations must include an estimated inflation rate and a sinking fund for capital costs for replacement of primary system components.

- i. The limits of responsibility for various parts of the system must be listed in the O&M manual as follows:
 - Responsibility of the *Homeowner*:
 - Piping from the house to the STEP Unit
 - Electric power to the control panel
 - Gravity sewer piping from the house to the property line (as applicable)
 - Payment of all applicable fees
 - Tank (if carelessly damaged by the homeowner)
 - Responsibility of the *Home Owner's Association (HOA)*:
 - Septic tank pump and control panel
 - Removal of sludge from septic tanks on a periodic basis
 - Individual sewer leads from the main sanitary sewer to the property line
 - Sanitary sewers (both pressure and gravity)
 - Pump stations
 - Treatment and disposal system
 - Electric power to pump stations, treatment and disposal system
 - For S.T.E.P. systems, refer to Appendix E drawing ST-1.
- j. Miscellaneous Operation and Maintenance Requirements
 - Applicant acknowledges that the Township is allowed reasonable access to the wastewater system site and to records pertaining to permitting, construction and operation of the system. Furthermore, the Township will have permission to sample, monitor and inspect treatment unit processes.
 - The wastewater system shall be located on a parcel dedicated to an exclusive use for wastewater treatment and disposal. Delineate the parcel on the appropriate plat or condominium documents. Show all easements necessary for operation and maintenance of the system, including access roads and sewers.
 - The HOA will retain ownership of the lands upon which the wastewater system is constructed. There shall be a public easement about the wastewater system connecting to a public road so as to provide Township access to the site.
 - The applicant shall record legal descriptions of the wastewater system site, appurtenant easements and rights-of-way prior to final acceptance of the system. Applicant is responsible for recording costs.

K. Miscellaneous

1. Site Accessories

- a. The Township may require a utility building at any wastewater treatment site. The building shall have minimum dimensions of 12' x 12' x 8' clear internal height. Provide a locking steel entry door with minimum width of 28 inches, and two keys for the Township. Floor shall be four inches thick, reinforced concrete. Install a photo-electrically controlled light on the

building exterior, and internal incandescent lighting with a minimum of 15 foot-candles. Architectural treatment of the building will be determined by the controlling Township's ordinances and Landowner's preferences, to allow the structure to blend in with the overall development.

- b. Provide fencing around the wastewater treatment system site with a minimum height of four feet and a locking gate at least 12' wide. Details of construction and materials for the fence are the Landowner's choice, but must be able to effectively restrict site access. The fence is required around the treatment area and utility building. Locks shall be keyed alike. Furnish two matching keys for the Township.
- c. Make provisions for water supply, electric power, telephone service, and natural gas or propane supply (if applicable). Water supply must be designed to be self-draining to prevent freezing.
 - Provide water under pressure of 30 to 40 psi for flushing, cleaning, and irrigation purposes at key locations around the treatment facility. Locking, self-draining yard hydrants are preferred
 - Potable water is not required, however, non-potable water must be clearly labeled to prevent human consumption.
- d. Provide a separate telephone service for each pump station and at the utility building for monitoring and emergency purposes.

2. General Requirements

- a. For paved access drives, reference the Washtenaw County Road Commissioner's Detail for Low Density Roads for standard widths, thicknesses and associated material compositions.
- b. Paint all exposed metal or wood.
- c. Use galvanized steel pipe and dielectric fittings between dissimilar metals to prevent corrosion. Sacrificial anodes or impressed voltage systems may not be used.
- d. Provide a bar chart showing the intended schedule for design, construction, testing, startup, and closeout of the proposed wastewater system.

Appendix A

CHECKLIST FOR DESIGN APPROVAL OF SMALL COMMUNITY WASTEWATER SYSTEMS

General Requirements

- Project is a small community wastewater system for residential development only.
- Copies of other local, state, or federal permits attached.
- Professional Engineer seal on all plans.

Site Evaluation

- Location map. Legal description of the development and the treatment system site.
- Topographic map to a scale of 1" = 100'.
- Location of soil borings and test pits.
- Depth to groundwater.
- Layout of proposed treatment system.
- Paved vehicle access drive per WCRC standards.
- Stormwater management method noted. Location and distance to wells, existing and future structures, drains, utility lines.
- Minimum buffer of 300' from any dwelling. Minimum of 100' isolation around point of discharge and pump stations.
- Location and distance to surface water, wetlands, or floodplain. Screening around treatment site.
- Proximity to other wastewater treatment or sewer systems.
- Adjacent land use and zoning.
- Statement regarding compatibility with local and county planning.

Design Criteria

- System is capable of reliable secondary treatment requirements.
- Design based on 350 gallons per capita per day (minimum).
- System designed for ease of expansion.
- Lifting and handling devices.
- Gasketed aluminum access hatches and Flygt safety grate.
- Screened vents with activated carbon filters.
- Manholes at 400' spacing,
- Cleanouts at 300' spacing.
- Air release valve at high points.
- No plastic valves.
- Straight runs for house leads, locator wire and disks are required; 6A stone bedding.

- Nearby well logs.
- Observation wells, groundwater sampling and testing, when required.
- Inspection ports.
- Vehicle access around disposal areas.
- Maximum of 16' depth in tanks.
- Buoyant forces considered in design (provide calculations).
- Sand backfill over pipe and around structures.
- Fencing and gate provided.
- Bituminous pavement 3" thick.

Miscellaneous

- Two (2) year irrevocable letter of credit for estimated construction cost.
- Bar chart for design, construction, testing, startup, closeout.
- Written acknowledgment of Township access to site and records.
- Written permission for Township to sample, monitor and inspect system.
- Acknowledgment of permit conditions regarding property rights, privileges, injury, personal rights, or regulations.
- System located on a parcel dedicated to exclusive use for wastewater treatment and disposal.
- Final inspection and walk-through with approval by Township.

Appendix B

CHECKLIST FOR CONSTRUCTION APPROVAL OF SMALL COMMUNITY WASTEWATER SYSTEMS

Construction Criteria

- Contractor's responsibilities acknowledged.
- Engineer's responsibilities acknowledged.
- Applicant's responsibilities acknowledged.
- Infiltration or exfiltration testing as specified.
- Testing of generator connection at panel.
- Leak tests for structures.
- 95% compaction by Modified Proctor test; 90% in non-critical areas.
- Concrete mix properties as specified.
- Soil erosion measures provided.
- Appropriate inspections conducted by agencies as required.

Operation and Maintenance (O&M) Requirements

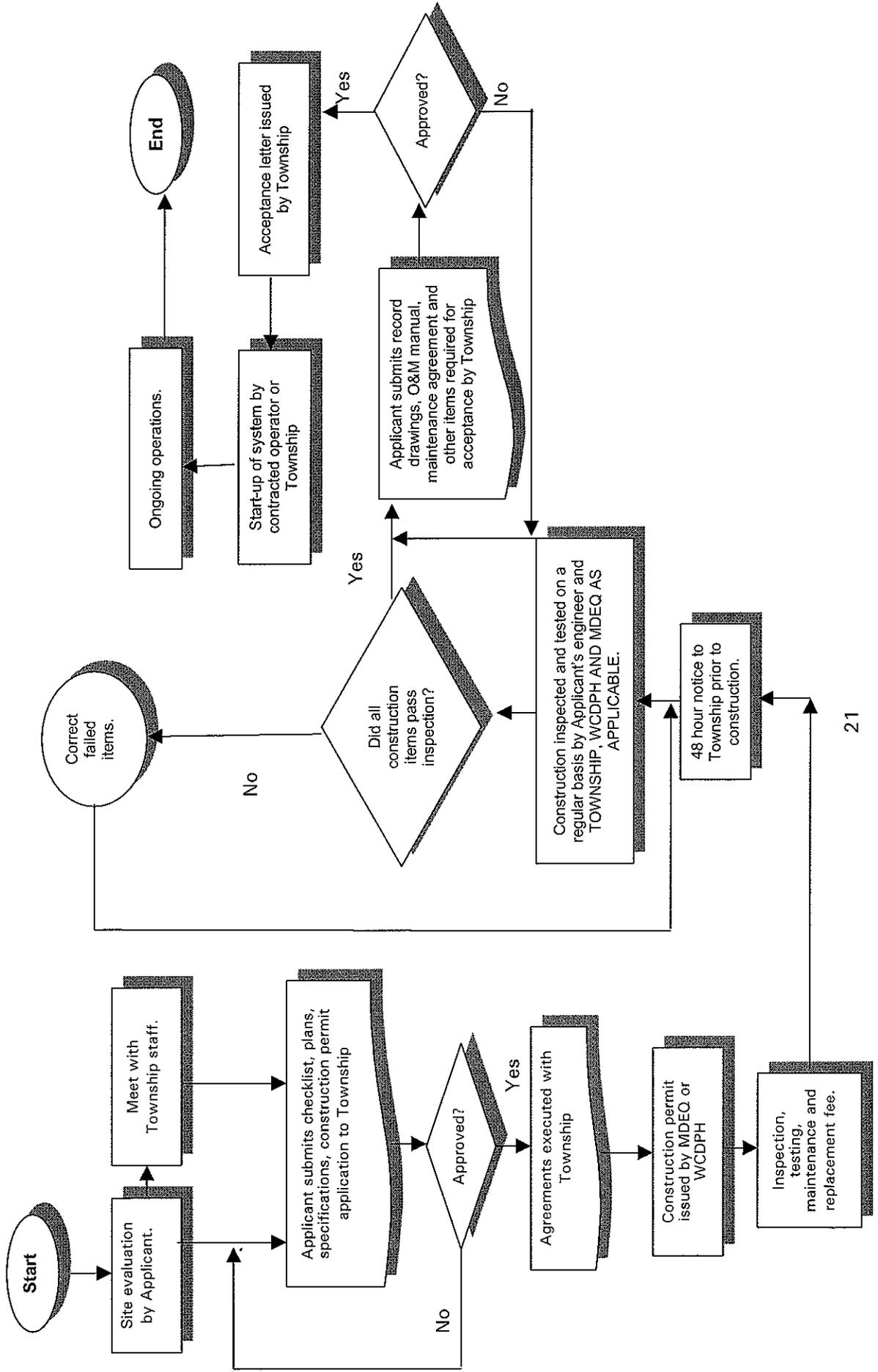
- Two (2) copies of O&M manual prepared.
- User charges calculated.
- Responsibilities of the homeowner acknowledged.
- Responsibilities of the system owner acknowledged.
- Closure plan prepared.
- Spare parts inventory.

Miscellaneous

- Irrevocable letter of credit for testing, inspection and replacement costs.
- Escrow Deposit for Construction Inspection
- Record drawings by licensed Professional Engineer.
- Easements and rights-of-way obtained in name of the SSSAD.
- Legal descriptions of wastewater system site, easements, and rights-of-way recorded.
- Show wastewater system site, easements, and rights-of-way on plat or condominium documents.
- Disclosure language included in master deed, by-laws, or deed restrictions.

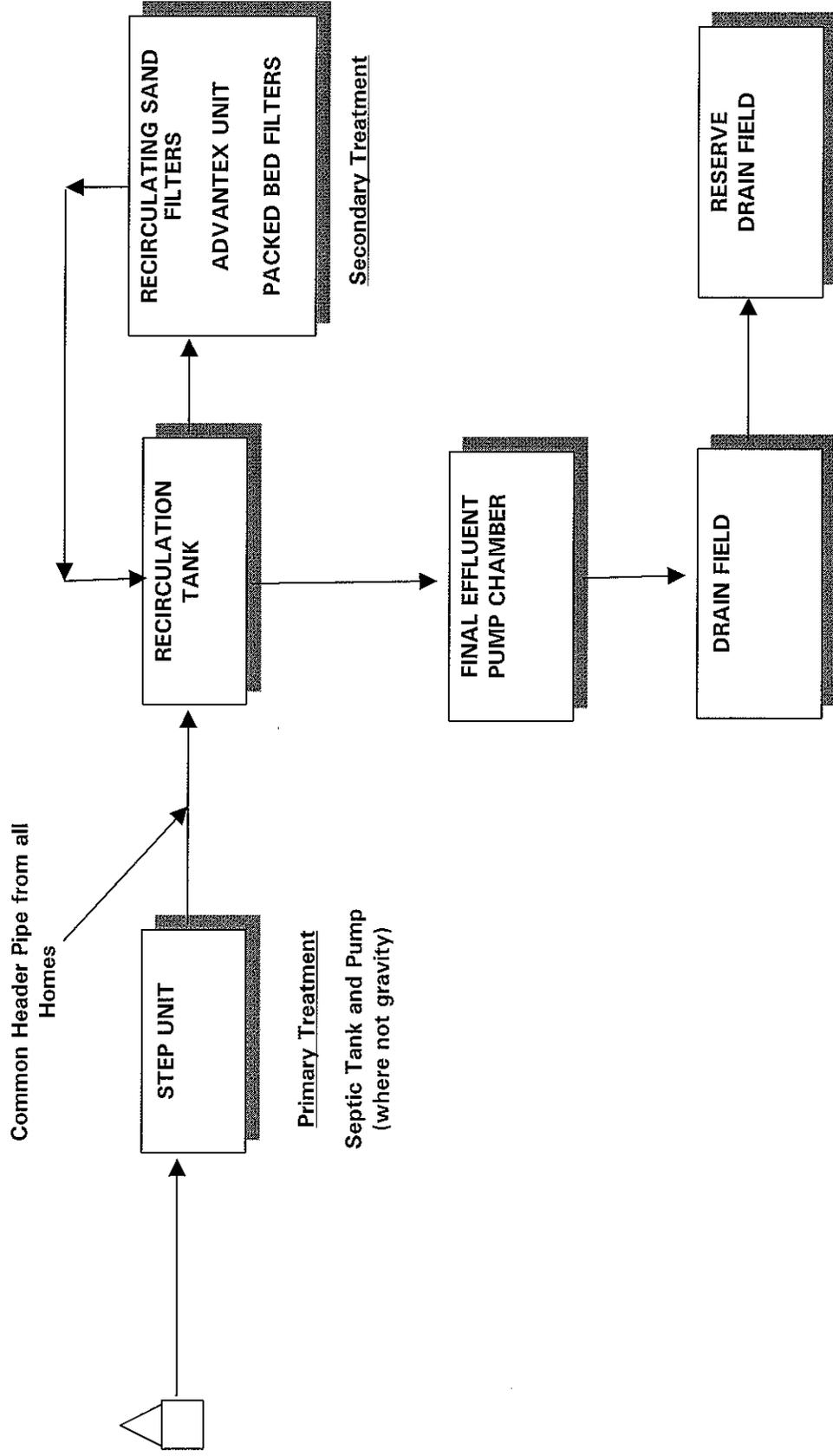
Appendix C

FLOWCHART OF APPROVAL PROCESS FOR SMALL COMMUNITY WASTEWATER SYSTEMS



Appendix D

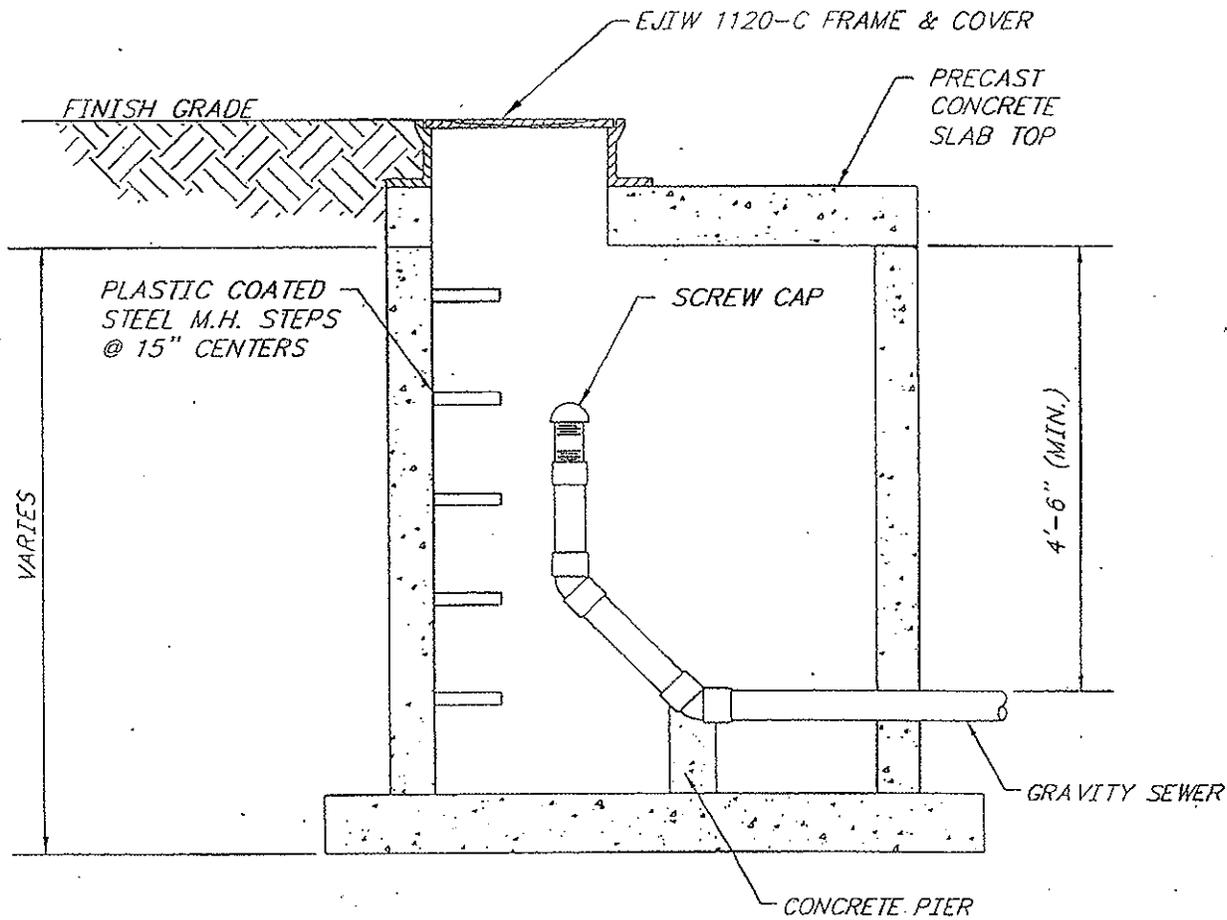
PROCESS FLOW DIAGRAM FOR TYPICAL ON-SITE WASTEWATER SYSTEMS



Appendix E

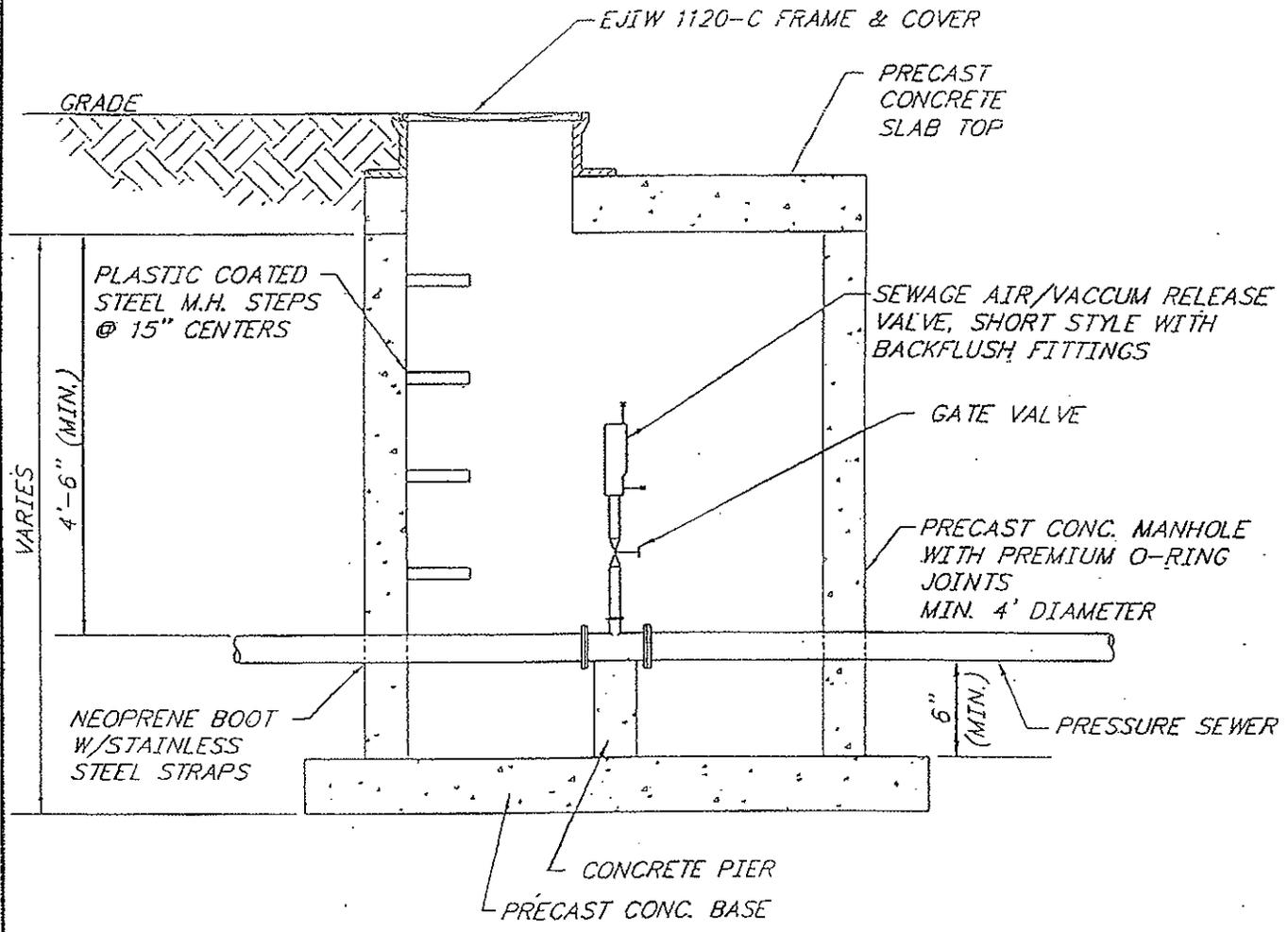
STANDARD DETAILS FOR SEWER SYSTEMS

Cleanout	SS-4
Air Relief Valve Manhole	PS-4
STEP Installation/Limits of Responsibility	ST-1
Simplex Control Panel	ST-2
Pressure Sewer Lead	ST-3
Monitoring Tube	M-2



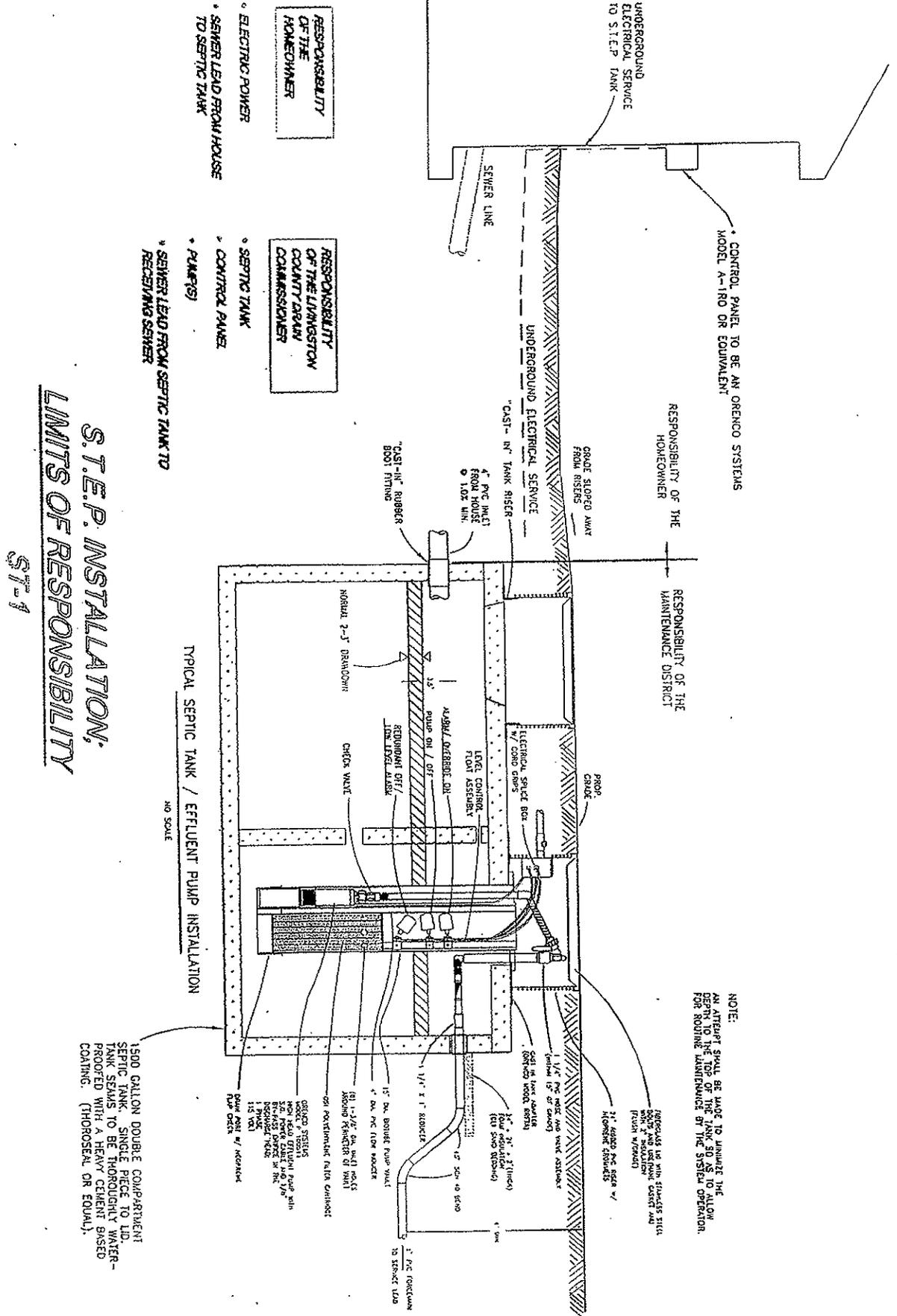
CLEANOUT
SS-4

WORKORDER NUMBER: 98245
ACAD FILE: SS4
PLOT SCALE: 1



AIR RELIEF VALVE MANHOLE
PS-4

WORKORDER NUMBER: 98245
 ACAD FILE: ps4
 PLOT SCALE: 1/4"



RESPONSIBILITY OF THE HOMEOWNER

- * ELECTRIC POWER
- * SEWER LEAD FROM HOUSE TO SEPTIC TANK

RESPONSIBILITY OF THE LIVINGSTON COUNTY COMMISSIONER

- * SEPTIC TANK
- * CONTROL PANEL
- * PUMPS
- * SEWER LEAD FROM SEPTIC TANK TO RECEIVING SEWER

CONTROL PANEL TO BE AN ORENCO SYSTEMS MODEL A-1100 OR EQUIVALENT

RESPONSIBILITY OF THE HOMEOWNER

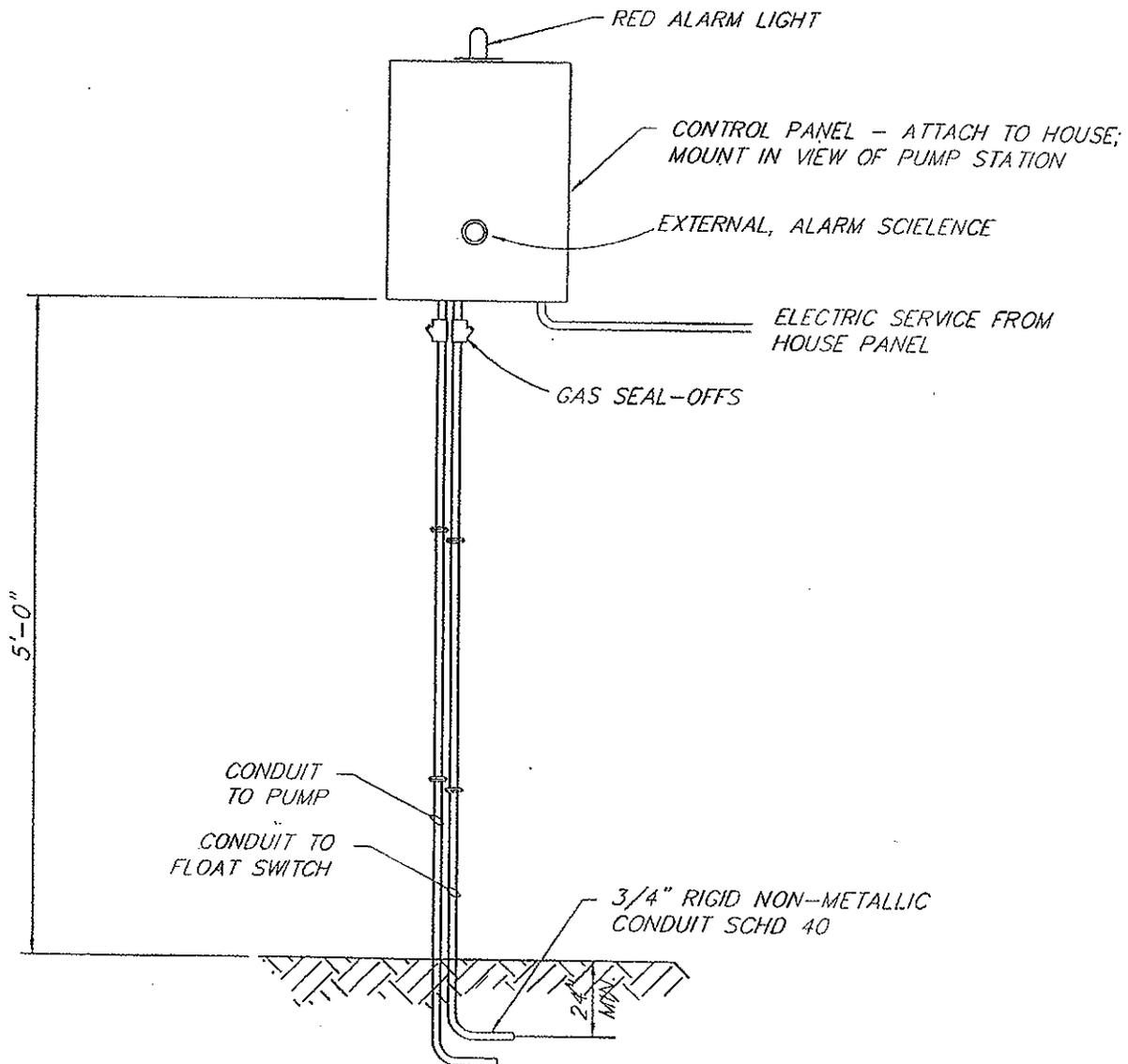
RESPONSIBILITY OF THE MAINTENANCE DISTRICT

S.T.E.P. INSTALLATION: LIMITS OF RESPONSIBILITY

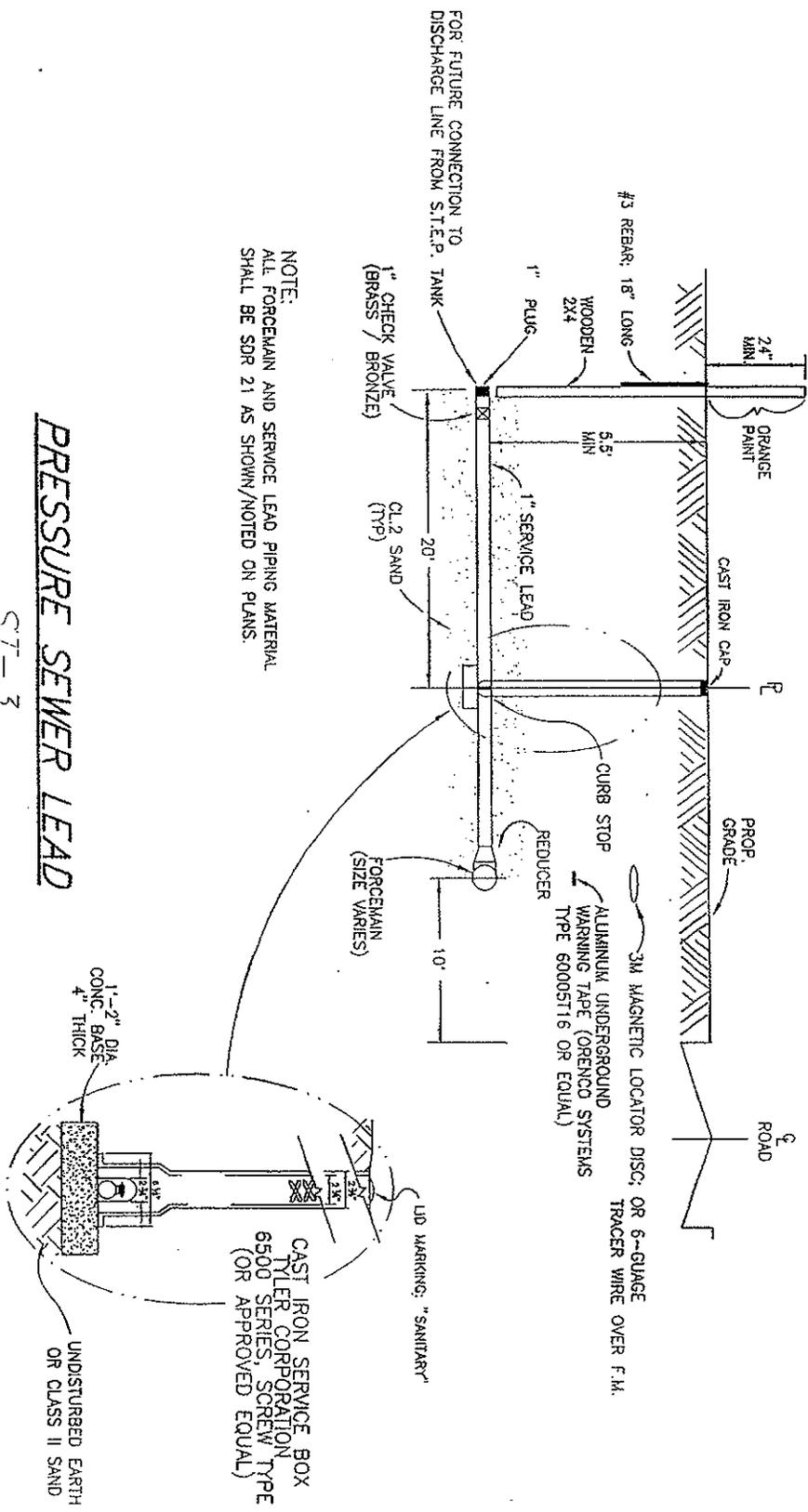
ST-1

NOTE:
AN ATTEMPT SHALL BE MADE TO UNBURIED THE TOP OF THE TANK SO AS TO OPERATOR FOR ROUTINE MAINTENANCE OF THE SYSTEM OPERATOR.

1500 GALLON DOUBLE COMPARTMENT SEPTIC TANK. SINGLE PIECE TO LID. TANK SEAMS TO BE THOROUGHLY WATER-PROOFED WITH A HEAVY CEMENT BASED COATING. (THOROSEAL OR EQUAL).



SIMPLEX CONTROL PANEL
ST-2

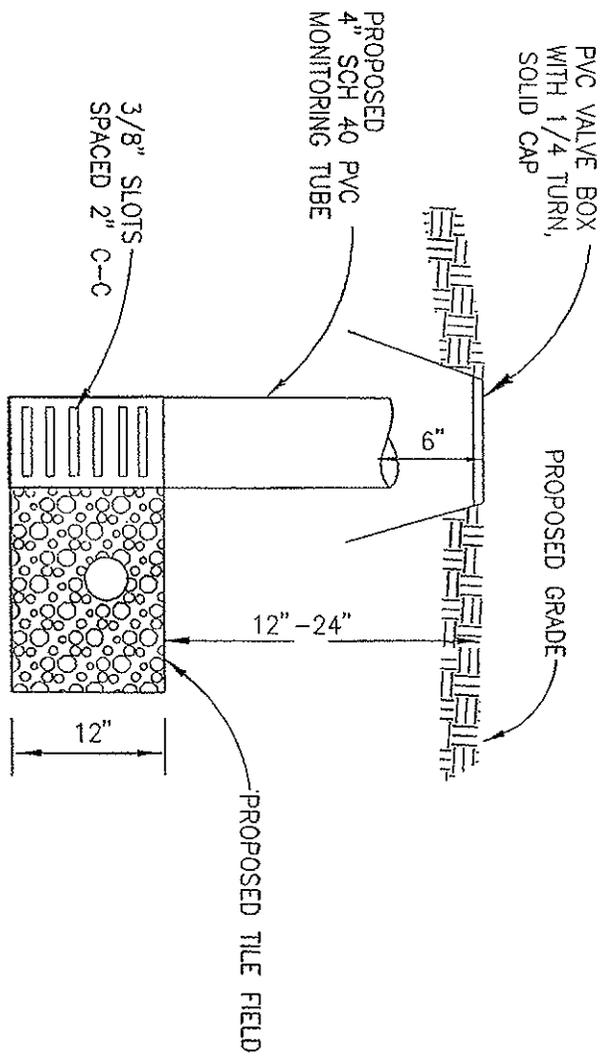


NOTE:
 ALL FORCEMAIN AND SERVICE LEAD PIPING MATERIAL
 SHALL BE SDR 21 AS SHOWN/NOTED ON PLANS.

PRESSURE SEWER LEAD

ST-3

NO SCALE



MONITORING TUBE DETAIL

M-2

Appendix F

PACKED BED FILTER CRITERIA

Introduction

Packed bed filters (PBF's) contain filter media, such as sand, gravel, peat, plastic, foam, or geotextile fabric, for the aerobic biological and physical treatment of wastewater constituents. PBF's come in different configurations and sizes, but incorporate the following common elements: a container for holding the filter medium, the filtering media, a distribution or dosing system for applying the wastewater to be treated to the filtering media, and an underdrain system for removing the treated wastewater. In respect to wastewater, pressure distribution and recirculating units are preferred over gravity and single-pass units. However, this can be evaluated subject to the type of unit proposed. Other alternative wastewater treatment technologies, such as aerobic treatment units may be evaluated on a case-by-case basis. Most PBF's are exclusively proprietary products representing a wide variety of designs, materials and methods of assembly. As such, there are no specific standards for the design of PBF's.

Note that PBF's are not stand-alone systems, but provide wastewater treatment prior to dispersal into a subsurface drain field system.

Wastewater Characteristics

The function of any wastewater system is directly related to the type and strength of the wastewater being received. Systems in this category should be designed to treat typical residential strength wastewater. Expected characteristics are noted on the following chart:

<u>Constituent</u>	<u>Typical Septic Tank Effluent Without Effluent Filter</u>	<u>Typical Septic Tank Effluent With Effluent Filter</u>
BOD ₅	150 – 250 mg/l	100 – 140 mg/l
TSS	40 – 140 g/l	20 – 55 mg/l
TN	50 – 90 mg/l	50 – 90 mg/l

Subsequent to treatment by the PBF, the expected effluent quality should have the following characteristics:

<u>Constituent</u>	<u>Expected PBF Effluent</u>
BOD ₅	<20 mg/l
TSS	< 20 mg/l
TN	<25 mg/l

Application Rates

The quality of the wastewater from the PBF will be directly proportional to the application rate allowed within the final disposal system. The application rate allowed will be evaluated on a performance-based standard. It will be relative to the data submitted on the following items:

- Effluent quality
- Soils type
- Ground water protection
- Soil structure

Input shall be obtained from the WCDPH and the MDEQ regarding final drain field sizing. Current MDEQ guidelines allow for a maximum application rate of 1.5 gal/sq.ft./day.

PBF Model and Size Selection

The PBF shall be sized and selected specific to the use and site proposed. Supporting data from the manufacturer shall be submitted regarding the specific unit as well as the expected effluent quality from that unit.

Access Ports

Ground level access ports shall be adequately sized and located to facilitate the following:

- A. Visual inspection and removal of mechanical or electrical components
- B. Removal of components that require periodic cleaning
- C. Collection of samples
- D. Removal and/or pumping of residual solids

A sampling port for the PBF effluent shall be provided. This port shall be designed, constructed and installed so as to provide easy access for collecting a "free fall" water sample.

Note: All access ports must be protected against unauthorized intrusion.

Alarm/Alert Condition

The PBF must contain mechanisms capable of detecting the failure of electrical and mechanical components as well as high liquid level conditions above the normal operating specifications.

The PBF must possess a mechanism capable of notifying the system operator of any irregularities noted by the sensing components, i.e. telemetry, etc.

Operation Manual

The design engineer must develop and submit a comprehensive maintenance manual for the entire wastewater system. This document shall include, at a minimum, the following items:

- A general overview of the system process
- An operation and maintenance section
- A trouble shooting and repair section
- An equipment list (manufacturer data, shop drawings, etc.)
- A proposed sampling schedule and the expect effluent quality parameters
- A list of user do's and don'ts

Appendix G-1

GENERAL DESIGN AND CONSTRUCTION CRITERIA FOR RECIRCULATING SAND FILTERS

A. Overview

A Recirculating Sand Filter (RSF) is a non-propriety, secondary wastewater treatment system. The intent of such a system is to reduce the organic load of the wastewater thereby substantially extending the life expectancy of the final disposal system and reducing the wastewater constituents dispersed into the groundwater.

The RSF shall be designed to treat residential wastewater with the following characteristics:

Constituent	STEP Unit Effluent
BOD ₅	150 – 250 mg/l
TSS	50 – 150 mg/l
TN	50 – 90 mg/l

The above-noted effluent strengths are what would typically be found in normal septic tank effluent.

B. Primary Treatment

Refer to Section J of this document concerning required volume and construction standards for STEP Units proposed prior to RSF.

C. Design and Construction Criteria

1. The maximum dose rate shall be 2.0 gal/orifice/dose and the maximum pump cycles/day limited to 300.
2. The proposed loading rate for the RSF is three to five (3-5) gallons/sq.ft./day.
3. The designed recirculation rate shall be between 3:1 and 5:1.
4. The recirculation tank volume should be greater than or equal to the estimated peak daily flow.
5. Accommodations to incorporate forced air from the bottom layers of media into the system shall be provided. Blowers shall be timer controlled with available adjustments from one minute to continuous run.
6. Forty-Eight (48") inch diameter manholes and gasketed aluminum hatches shall be provided over all internal tank components.
7. The support structure for the sand filter shall be constructed with half-inch (1/2") treated plywood and 2" x 4" framework. Nails, staples or other connectors shall be pointed away from the liner.
8. The outside perimeter of the support structure shall be backfilled with an approved sand media.

9. The typical sand filter cross section shall adhere to the following criteria:

	Layer Thickness	Layer Composition
Layer 1	8"	6A Stone
Layer 2	24"	Approved filter media
Layer 3	3"	Pea Stone
Layer 4	8"	6A Stone

10. A 4" slotted underdrain shall be installed within the bottom layer of 6A Stone. One-quarter (1 /4") inch slots 4' C-C. Pipe shall be SCH 40 or Class 125 PVC. The slots shall be placed at 10 o'clock and 2 o'clock on alternating pipe lengths.

11. The filter media shall meet the following specifications:

Sieve #	Sieve Size	Percent Passing
3/8"	9.52	100
4	4.76	70 – 100
8	2.38	5 – 78
16	1.19	0 – 4
30	0.59	0 – 2
50	0.3	0 – 1
100	0.15	0 –1

The effective size (D_{10}) shall be from 1.5 - 2.5 mm. The Uniformity Coefficient C_u , shall be between 1 and 3.

12. The pea stone shall meet the following specifications:

Sieve Size	Percent Passing
1/2"	94 – 100
3/8"	44 – 100
1/4"	16 – 100
4	6 – 74
8	1 – 32
16	0

Loss by wash, less than 1%.

13. The 6A Stone shall meet the following specifications:

<u>Sieve Size</u>	<u>Percent Passing</u>
1/2"	94 – 100
3/8"	44 – 100
1/4"	16 – 100
4	6 – 74

Loss by wash, less than 1 %.

Note: The engineer shall provide test results and written certification that the media meets the above-noted specifications prior to placement in the filter.

14. Liner shall be a one-piece flexible membrane, resistant to ultraviolet light, with properties equivalent to 30 mil PVC, or better. Boot, stainless steel clamps and adhesive for pipe penetrations shall be supplied by the liner manufacturer. Patches, seams, pipe penetrations and repairs shall be made with identical materials under dry conditions.

Material specifications for 30 mil PVC:

Tensile Strength	75 psi	ASTM D882
Elongation	350%	ASTM D882
Graves Tear	9.0 lb; 300 psi	ASTM D1004
Cold Impact	- 20°F	ASTM D1790
Dimensional Stability	5%	ASTM D1204
Volatility	0.70%	ASTM D1203
Density	1.2 g/cm	ASTM D1505

15. Bury liners completely for protection from weather and vandalism, including the top edge. Place liner on a prepared, uniformly graded sand sub-base. Sub-base shall be a minimum of three (3") inches of sand free of stones, earth, debris, roots or other materials that may damage the liner. Place liner only at ambient temperature range of 42° - 78°F. Avoid placement of liner in high winds.

16. The size of the recirculation tank shall be at least that of the estimated peak flow. Refer to Section K of this document for all applicable electrical requirements.

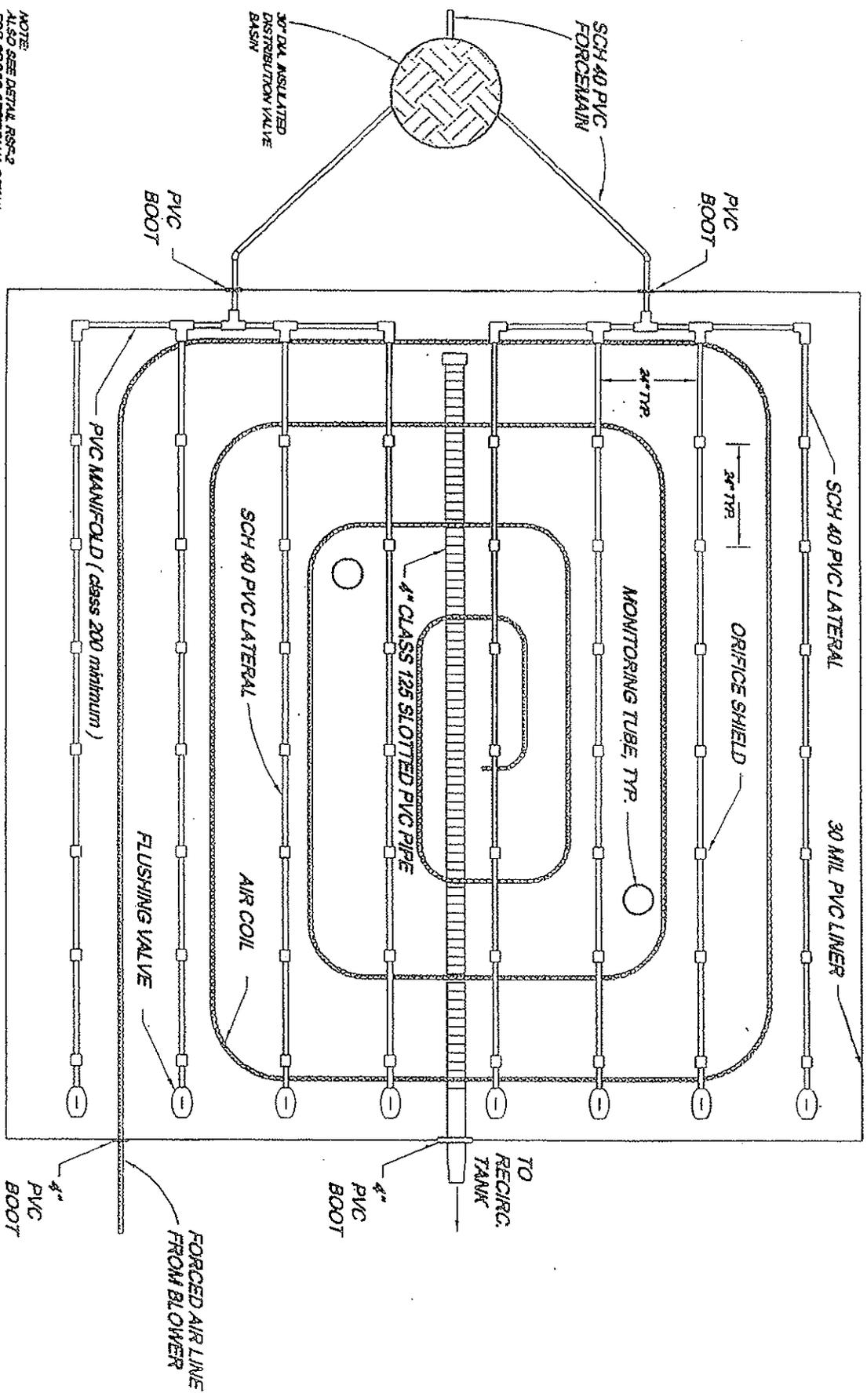
D. Miscellaneous

1. Float switches shall be used within the recirculating tank.
2. A PVC float tree shall be installed so as to be easily removable without entering the tank.
3. Should a pressure operated distributing valve be specified, it shall be designed so as to allow for gravity drainage on the downstream side of the valve.
 - A. Insulation around the valve shall be sealed from moisture so as to allow for easy maintenance.
 - B. Maximum pumping rate through a "Hydrotek Valve" shall be 60 gpm.
4. A minimum of two monitoring tubes shall be placed within the sand filter. One to the top of the filter media and one down to the liner.
5. A minimum of two (2) separate filters will be required with timed doses alternating to each section. This will allow for ease of maintenance without interruption in service.

APPENDIX G-2

DETAILS FOR RECIRCULATING SAND FILTERS

Recirculating Sand Filter - Plan	RSF-1
Recirculating Sand Filter - Section	RSF-2
Flow Splitter Valve	RSF-3
Monitoring Tubes	D-1
Flushing Valve	D-2



NOTE:
ALSO SEE DETAIL RSF-2
FOR CROSS-SECTIONAL DETAIL

RECIRCULATING SAND FILTER - PLAN

RSF

03027RSF

36" x 36" (MIN.) ALUMINUM HATCH (MODEL APS 150, U.S. FOUNDARY), OR EQUIV.

WATERTIGHT 4" DIA. CONCRETE RISER TO GRADE.

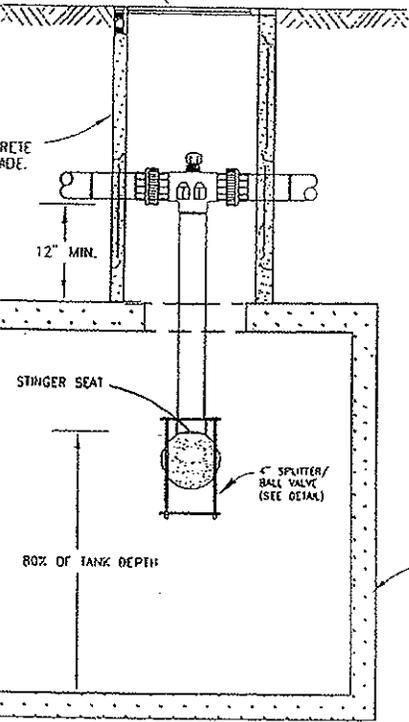
12" MIN.

STINGER SEAT

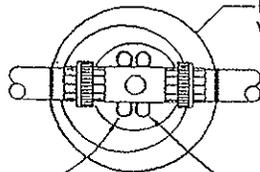
1" SPLITTER/
BALL VALVE
(SEE DETAIL)

80% OF TANK DEPTH

RECIRCULATION TANK



Recirculating Splitter Valve Top View



OVERFLOWS BACK TO RECIRC. TANK (TYP.)

1" OUTLETS (TYP.)

TOP VIEW

OVERFLOW TO PUMP CHAMBER

TO PUMP CHAMBER

4" UNION/QUICK DISCONNECT

FROM SAND FILTERS

BAFFLE PLATE W/OVERFLOW DRIFICE

1" OUTLETS (TYP.)

STINGER SEAT (FIELD CUT)

BUOY

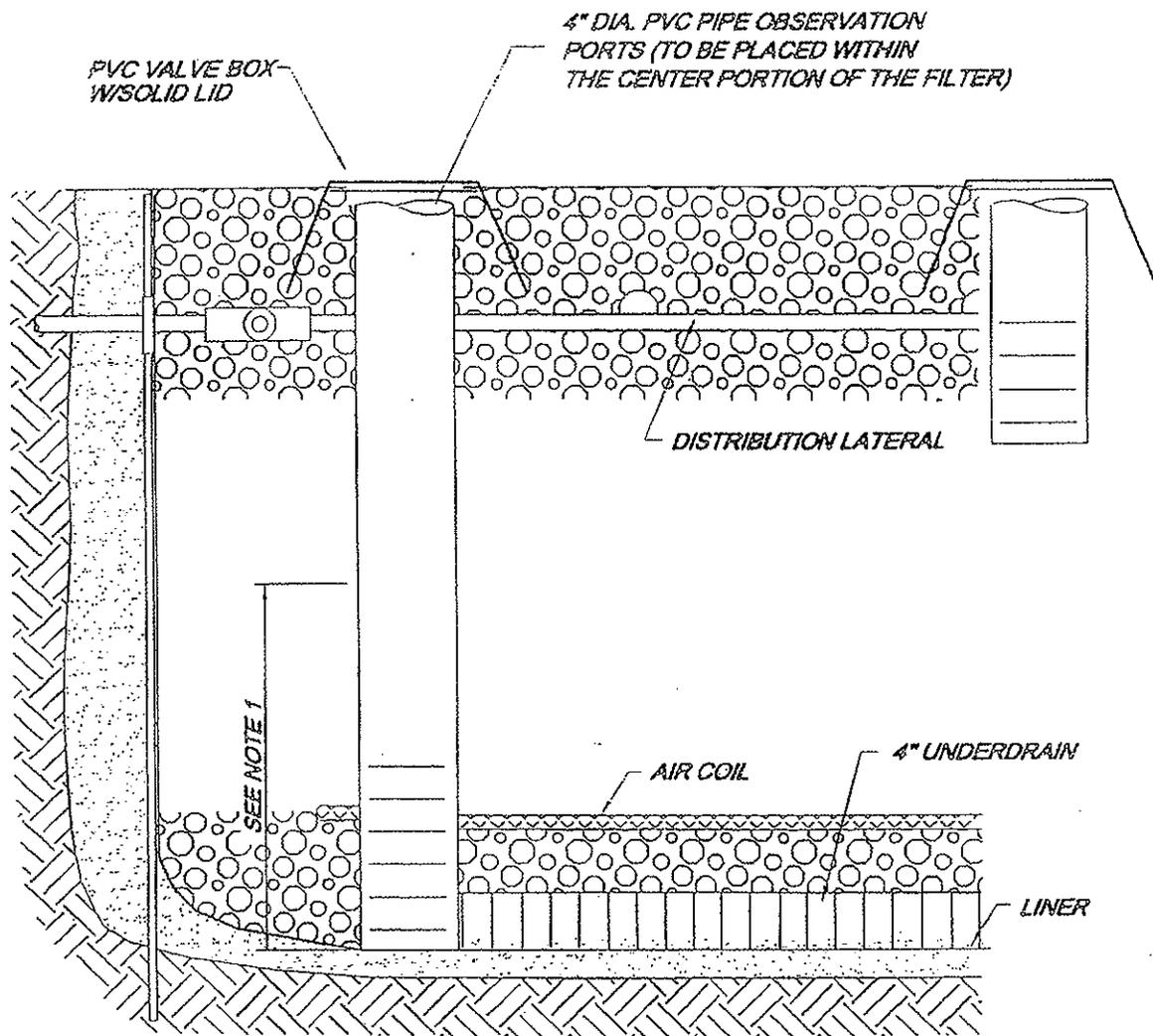
19"

15.7"

NOTE:
THE FLOW SPLITTER SHALL BE INSTALLED LEVEL FROM UNION TO UNION SO AS TO ALLOW FOR PROPER OVERFLOW WHEN BALL IS SEATED.

FRONT VIEW / FLOW SPLITTER

RSF-3

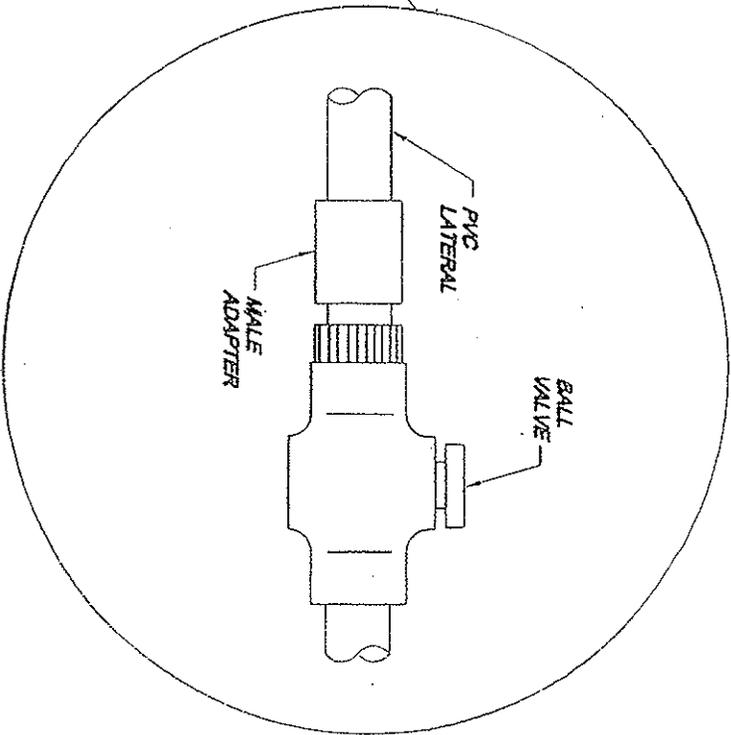
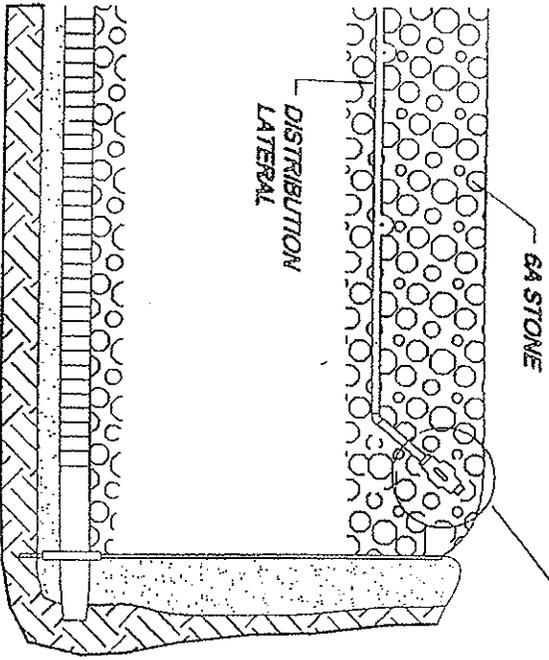


NOTE:

1. INSTALL OBSERVATION PORTS AT ALTERNATING DEPTHS;
JUST INTO THE FILTER MEDIA AND TO BOTTOM OF UNDERDRAIN.

MONITORING TUBES

D-1



TOP VIEW
FLUSHING VALVE

D-2