

**FRENCHTOWN CHARTER TOWNSHIP
FLOOD CONTROL DEVICES ENGINEERING DESIGN STANDARDS ORDINANCE
Ord. No. 208; Date of Adoption: September 11, 2007**

An Ordinance to establish design specifications, standards and requirements for the construction, installation and repair of Flood Control Devices as required by the Frenchtown Charter Township Flood Control Device Ordinance.

THE CHARTER TOWNSHIP OF FRENCHTOWN HEREBY ORDAINS:

Section 1. Intent, Purpose, Short Title and Interpretation.

1. This Ordinance is intended to provide detailed specifications for the design and construction of Dikes, Advanced Measures Barriers, Clay Berms, Seawalls and any other Flood Control Devices in the Township and shall be known as the Frenchtown Charter Township Flood Control Devices Engineering Design Standards Ordinance.

2. The provisions of this Ordinance shall be held to be the minimum requirements adopted for the promotion and preservation of the public health, safety and general welfare of the Township. These regulations are not intended to repeal, abrogate, annul, conflict or in any manner interfere with existing regulations or laws except that these regulations shall prevail in cases where they impose a greater restriction than is provided by other regulations or law. These regulations are subject to periodic review and revision as deemed necessary to remain current with standards set forth by the various review agencies.

3. This Ordinance shall apply to improvements where existing flood control measures are deemed to require maintenance and or replacement as stipulated within the Frenchtown Charter Township Flood Control Devices Ordinance as amended.

Section 2. Definitions.

1. "Advanced Measures Barrier" shall refer to the Detroit Beach Dikes, which are controlled by the U.S. Army Corps of Engineers and theof Frenchtown Charter Township.
2. "Army Corps" or "USACOE" shall mean United States Army Corps of Engineers and its agents and representatives.
3. "Building Official" shall mean the Building Official of Frenchtown Charter Township or his authorized representative.
4. "DNR" shall mean the Michigan Department of Natural Resources and its agents and representatives.
5. "Engineering Standards" shall mean the design and construction standards for the Flood Control Devices, as established in this document and as prepared by the Frenchtown Charter Township Resort District Authority Engineer.

6. "Flood Control Devices" shall include any structure whose primary purpose is to prevent or control erosion or prevent or control the inundation or flooding on property affected by waters or levels of the Great Lakes or their connecting waters and tributaries as affected by levels of the Great Lakes and shall include earthen and clay berms, advanced measures dikes, operation foresight dikes, seawalls, jetties, and other barriers of which the primary purpose is flood control and protection.
7. "IGLD" shall mean International Great Lakes Datum.
8. "MDEQ" shall mean the Michigan Department of Environmental Quality and its agents and representatives.
9. "MDOT" shall mean the 2003 Michigan Department of Transportation Construction Specifications.
10. "NOAA" shall mean National Oceanic and Atmospheric Administration.
11. "Property Owner" shall mean the owner or owners of record of the real property in the Township on which the Flood Control Device is located.
12. "Resort District Authority" shall mean the Resort District Authority of Frenchtown Charter Township.
13. "Resort District Engineer" shall mean the Frenchtown Charter Township Resort District Authority Engineer.
14. "Township" shall mean Frenchtown Charter Township in Monroe County, Michigan.
15. "Township Engineer" shall mean the Frenchtown Charter Township Engineer who shall be responsible to review all flood control device plans and documents on behalf of the Township, which shall include reviews required of the Frenchtown Charter Township Resort District Engineer.

Section 3. Permits and Approvals.

1. No existing Flood Control Device shall be altered, repaired, demolished, removed or new Flood Control Device constructed and installed without having prior written approval and receiving permits from the following officials and or agencies, as applicable. Certain types of rehabilitation or improvements to the Flood Control Device may not require a permit. The following is a list of offices and or agencies that may require permits and approvals. The owner is responsible to investigate and secure all required approvals prior to commencing construction.
 - a. Township Building Official
 - b. Township Engineer
 - c. Army Corps of Engineers
 - d. MDEQ
 - e. Monroe County Drain Commissioner, SESC

2. Upon completion of the Flood Control Device construction installation, the Property Owner's engineer shall submit the Engineer's Certificate as included in these specifications in Appendix A.

Section 4. Plan Format.

General Requirements

1. A general plan having a scale not exceeding 1" = 30' shall be provided, showing the total parcel and indicating the location of all improvements shown in the detailed plans. Superimposed on this general plan shall be one (1) foot contours of the area, including the area at least 25 feet outside of the development parcel. Street names, lot lines and parcel numbers shall be shown on all plans.

2. Plans submitted shall be on 24 inch by 36 inch white prints having blue or black lines, and shall be neatly and accurately prepared. The plan sheets shall have a maximum horizontal scale of 1" = 30'. The maximum vertical scale for profile views is to be 1" = 5'.

3. Separate plan sheets are required (as a minimum) for:

- a. Title sheet indicating the location of the site, parcel legal description, property owner and adjacent property owner names, addresses and telephone numbers.
- b. General plan of the existing site and geometrics including sufficient detail to appropriately show the type and extent of existing flood control device on the property and adjacent properties
- c. Site plan of the proposed improvements
- d. Demolition and Improvement details, sections and profiles
- e. Existing and proposed site grading
- f. Soil erosion and sedimentation control plan

4. Elevations shall be on IGLD datum. A minimum of one (1) permanent benchmark for the work shall be indicated on the plans. The benchmark shall be located on the site such that construction activities shall not destroy the designated site benchmark.

5. All plans submitted shall bear the signature and seal of the professional engineer responsible for the design, who shall be licensed in the State of Michigan, unless otherwise waived by the Township. Examples of plans not requiring an engineer's seal would include minor rehabilitation and non-structural improvements.

6. Complete plans with required executed application forms shall be submitted and all required review fees paid to the Township (deleted "Building Official") prior to scheduling the plan review. A minimum of two (2) complete sets of plans shall be submitted with the application form.

Section 5. Flood Control Devices.

1. The following are suggested and acceptable types of Flood Control Devices that may be considered to meet the provisions of the Frenchtown Charter Township

Flood Control Device Ordinance as amended. The type of flood control device selected shall take into consideration the existing type of flood control devices on adjacent property, the device must provide a structural and water tight connection with the existing adjacent flood control devices, the current and or established high water elevation, the potential wave run-up effects on the structure, turbulent flow conditions, ice conditions, whether the structure is to accommodate boat davits, patio areas and or stepped terrace features for aesthetics and/or Property Owner access to the water.

- a. Earthen clay berm
- b. Reinforced concrete dike
- c. Steel sheet piling dike
- d. Precast reinforced concrete panel dike
- e. Stepped terrace and/or patio dike
- f. Boat Davit
- g. Other types of structures deemed acceptable by the USACOE for Great Lakes Flood Control and as approved by Frenchtown Charter Township.

Section 6. Minimum Design Requirements for Flood Control Devices.

1. Flood Control Device Top Elevation: All Flood Control Devices shall be designed and installed to provide the established minimum top flood control elevation as stipulated in the Frenchtown Charter Township Flood Control Device Ordinance as amended.

2. Design High Water Elevation: The designer must investigate with the USACE, NOAA and or any other agency involved with Great Lakes water level analysis whether new studies and or new criteria have been established to require higher Design High Water Elevations for the flood control device as established in item 1 of this article. The elevations stated in item 1 of this article must be used as the minimum criteria for establishing the top elevation of a Flood Control Devices.

3. Wave Overtopping: To minimize the potential of a Flood Control Device from being overtopped is to add a design wave to the Design Water Elevation. The top elevations as established by the Flood Control Device Ordinance as amended and item 1 of this article have taken into consideration Design High Water Elevations and wave overtopping as established through May 2007. New Flood Control Devices proposed must evaluate whether there is any change that would require higher structure elevation requirements due to the Design High Water elevation and wave overtopping. Wave overtopping factors that will need to be evaluated may include but not necessarily be limited to the following:

- a. Design High Water Elevation established by the USACOE and NOAA
- b. "Hindcast Wave Information for the Great Lakes: Lake Erie" USACOE , 1991
- c. Wind velocity, duration and direction
- d. Growth, propagation & decay energy
- e. Return period
- f. Depth of water at the flood control device location

4. Existing Soil Conditions and Depth of Rock: Appropriate analysis shall be provided to establish the type and classification of soils currently on the site and whether those

soils will be adequate to support the proposed Flood Control Structure. The investigation shall also establish whether the soils will prevent the passage of water under the flood control device from the lake or tributary such that the proposed Flood Control Structure could be undermined and be subject to destruction or fail to perform as a Flood Control Structure.

The soil condition investigation must also include a sufficient number of rock bores and or cores to establish the depth to rock at the Flood Control Device location. The design of the Flood Control Device must indicate that there is adequate soil depth to anchor the structure or show if required how the structure will be anchored into the rock surface.

5. Scour Toe Protection: Evaluation of scour caused by turbulent waters and or wave action at the toe of the Flood Control Device must be provided in the structure design analysis. Wherever scour will be present, the Flood Control Device shall be provided adequate scour and toe protection. Scour and Toe Protection may include the use of quarry stone, concrete armor units, concrete blocks, embedded toes, geotextile filter cloth, riprap, other suitable materials and or any combination of the preceding materials. Such scour and toe protection shall be provided in accordance with recommended standards and practices as established by the USACOE for Great Lakes applications.

6. Wave Deflectors: At locations where wave action is anticipated, the designer shall evaluate the need to provide a method for the wave to be deflected back towards the lake surface to minimize the affects of the waves cascading over the top of the Flood Control Device. Such devices may include the use of an angular or beveled deflector plate near the top of the flood control structure or provide a suitable structure top width and slope to collect the cascading water from the wave that will sheet drain back to the lake.

7. Tie-Backs and Anchorage: All Flood Control Devices shall be evaluated for the need to provide additional anchorage for the device to maintain its structure integrity for the purpose intended. Use of Tie-backs and or other forms of structural anchorage as established within the USACOE standards and practices for Flood Control Devices shall be included in the structural design.

8. Drainage Analysis: Within the design of the Flood Control Device, appropriate hydraulic analysis shall be provided to collect subsurface as well as surface drainage water from the Flood Control Device and from around any dwelling structures on the site. The collected drainage waters shall be routed by means of surface sheet drainage and or storm tile systems and discharged to the nearest available storm sewer system with adequate capacity to handle the storm water flow. Storm sewers, under drains and or storm drainage from the site shall be provided in accordance with the Frenchtown Charter Township Engineering Design Standards Ordinance as amended.

9. Grading, Soil Erosion, and Sedimentation: Plans shall be in conformance with current requirements of the Monroe County Drain Commissioner's Office and provisions of the State of Michigan "Soil Erosion and Sedimentation Control Act," Part 91 of Public Acts 451 of 1994, as amended. Permits shall be obtained from the Monroe County Drain Commissioner's office prior to being issued the permit from the Township Building Official.

The provisions of the Frenchtown Charter Township Engineering Design Standards Ordinance as amended relating to Grading, Soil Erosion, and Sedimentation Control shall be applicable under this provision.

10. Turf Surfaces: All earth surfaces that will not be covered with an approved erosion control device or hard surface shall be provided an appropriate grass turf surface in accordance with current MDOT Standards.

11. Earthen Clay Berm Dike: Earthen clay berm dikes may be considered for locations needing flood protection from non-turbulent waters associated with backwater and tributary areas of the Great Lakes. Earthen clay berms shall be constructed of naturally occurring clay soil. The clay soil shall be placed in lifts not exceeding 9" non-compacted depth and compacted to meet or exceed 90% compaction of maximum dry density as determined by the modified proctor test, or 95% of maximum dry density as determined by the standard proctor method, as well as the moisture content limit of optimum or greater. The method of compaction shall be as called out on the plans by the design engineer.

The soil properties which will be confirmed for clay to be used in Flood Control Device construction are soil classification by the Unified Soil Classification System (ASTM D2487-83), Atterberg limits (ASTM D4318-84), natural moisture content (ASTM D2216-80), and the modified proctor moisture-density relation (ASTM D1557-78) or standard proctor moisture density relationship (ASTM D698-78). Further, remolded permeability less than 1×10^{-7} centimeters per second at 90% of the modified proctor or 95% of the standard proctor maximum dry density shall be confirmed.

Prior to placement of the clay material, the subgrade shall be tested to confirm that the base material is equal to or greater than the requirements of the clay dike material. Any subgrade material found unsuitable shall be removed and replaced with acceptable clay material and or installation of seepage / permeability dams as specified by the design engineer.

The surfaces of clay earth berms shall be provided suitable protective measures to protect against soil erosion and sedimentation. The measures shall be as designed by the engineer to protect the surface against any anticipated condition that could affect the structure. The protective measures may include any one or a combination of grass turf, sod, riprap, geotextile fabric, cobble stone, embedded toe protection, armored surfaces, quarry stone, and or other approved materials.

12. Stepped Terrace and Patio Dikes: Stepped Terrace dikes are flood control dikes, which contain step terrace levels leading from the top of the structure to the water surface. The stepped terrace levels shall be an integral part of the dike structure without causing any weakness to the overall strength and purpose of the dike and shall have watertight joints. The terrace surfaces shall be sloped to surface drain toward the lake. The top of the dike including the step system shall be provided and maintained at the top elevations as specified in Section 1 of this Article.

A patio dike is a flood control device that is provided a wide platform surface suitable for recreational and or leisure uses of the Property Owner. This platform elevation may be placed at the top elevation of the flood control device or at an intermediate level lower than the top structure elevation. The platform surface shall be sloped to drain to the lake. The top of the flood

control device shall be provided and maintained at the top elevations as specified in Section 1 of this Article.

13. Boat Davit: Boat or marine davit system shall be installed integral to the flood control device being provided. The davit system must be installed in accordance with the manufacturers and design engineer's plans and specifications. The davit system plans and specification shall be included as a part of the Flood Control Device plans and specifications.

14. Steel Sheet Piling: Steel sheet piling shall be interlocking panels and have a section modulus as specified by the design engineer. The design of the structure shall take into consideration subsoil characteristics, foundation and footing requirements, watertight joints, need to anchor such structures into rock (if required), fill material to be placed landside of the structure, toe protection and wave action. The design engineer shall call out on the plans the method of cutting off and driving the panels. The sheet piling shall be provided with a top cap, which may be a welded in place structural steel channel section or a formed and poured in place reinforced concrete cap. The depth that the pilings are driven into the soil shall be adequate to support the sheet pile dike and the fill material placed landside of the dike. Where required the sheet piling shall be furnished with tie-backs and or anchor bracing buried into fill material placed landside of the structure to provide additional structural support. Fill placed behind the sheet piling shall be clay material as specified in item 11 of this article. If turbulent water conditions such as wave action are anticipated, the designer shall provide toe protection within the design of the sheet piling dike. The top of the sheet piling shall meet the elevation requirements as stipulated in item 1 of this article.

15. Reinforced Concrete Dike: Reinforced concrete dike structures shall be as called on the plans by the design engineer. The design of the structure shall take into consideration subsoil characteristics, foundation and footing requirements, watertight joints, need to anchor such structures into rock (if required), fill material to be placed landside of the structure, toe protection and wave action. The top elevation of these structures shall be in accordance with item 1 of this article.

16. Precast Reinforced Concrete Panel Dike: Precast reinforced concrete panel dikes shall be as called out on the plans by the design engineer. The anchor post (soldier piles) shall be adequately anchored and designed to hold the panels in place and to withstand all anticipated conditions that will affect the dike structure. The designer shall clearly detail and specify the method of installation of the soldier piles. Where necessary such posts may require anchorage into rock, which shall be clearly detailed on the plans. The design of the structure shall take into consideration subsoil characteristics, foundation and footings, watertight joints, fill material to be placed landside of the structure, toe protection and wave action. The top of these structures shall be in accordance with item 1 of this article.

Section 7. Material Specifications.

Unless specifically required by these specifications and or the approved construction plans, all materials used in the construction of a Flood Control Device shall be in accordance with the current MDOT Standard Specifications for Construction.

1. The minimum grade of concrete used in the construction of a Flood Control Structure shall be MDOT Grade S2, 6-sack cement content having a compressive strength of 3500 PSI in 28 days.
2. Steel Sheet Piling shall be furnished with the section modulus as required by the design engineer and called out on the plans. The design engineer shall also call out the method of installation on the plans.
3. Tie-backs and or structure anchors shall be as specified on the plans by the design engineer and shall be of corrosion resistant materials.
4. Reinforcing steel used within any element of a Flood Control Device shall meet MDOT standards, requirements and shall be epoxy coated.

Section 8. Construction Observation.

1. All required improvements shall be observed by the Township Engineer for compliance with the plans and specifications.
2. The property owner shall pay the cost of all reviews and observations. An escrow account, as set forth by the Township, shall be established with the Township to cover these costs.
3. The Property Owner or contractor shall notify the Township Engineer a minimum of three (3) working days prior the start of construction activities.

Section 9. Violations and Penalty.

Any person or persons, firm or corporation who shall violate any of the provisions of this Ordinance shall, upon conviction thereof before a court of competent jurisdiction, be guilty of a misdemeanor and subject to a fine of not more than Five Hundred Dollars (\$500.00) plus the costs of prosecution restitution or to imprisonment in the County Jail for a period not to exceed ninety (90) days, or to both such fine and imprisonment. Each day such violation continues shall be deemed a separate offense. The imposition of sentence shall not exempt the offender from compliance with the requirements of this Ordinance. Further, the Township may also seek equitable relief as necessary to abate or enjoin the violation of the Ordinance in a court of competent jurisdiction.

Section 10. Repeal.

All Ordinances in conflict with this Ordinance are, to the extent of such conflict, hereby repealed.

Section 11. Severability.

This Ordinance and the various parts, sentences, paragraphs, sections, subsections, phrases and clauses thereof are declared to be severable and if any of them are adjudged unconstitutional or invalid, it is hereby provided that the remainder of the Ordinance shall not be affected.

Section 12. Effective Date.

This Ordinance shall become effective thirty (30) days after adoption and publication in a newspaper having general circulation in Frenchtown Charter Township, Monroe County, Michigan.

APPENDIX A

Certificate of Construction Completion
Flood Control Device Certification

Date: _____

Frenchtown Charter Township: Building Permit #: _____

Property Owner Name: _____

Property Location: _____

I hereby certify that the construction of the Flood Control Device located at _____
_____ is complete. All improvements have been
installed in accordance with construction plans approved by the Frenchtown Charter Township
Engineer and Building Official and comply with Building Permit No. _____ as issued by
the Frenchtown Charter Township Building Official. It is further certified that the as constructed
finish top elevation of the Flood Control Structure is _____IGLD (1985).

Signed: _____
Professional Engineer/Surveyor Licensed in the State of Michigan *

Note: The engineer's/surveyor's certificate must be stamped with the appropriate seal. The
certificate submitted must be the original.

Please Return the Certificate to:

Frenchtown Charter Township
Building Department
2744 Vivian Road
Monroe, Michigan 48162

* A Professional Surveyor may sign the elevation certificate providing no structural
improvements were made to the existing dike.

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