

CHAPTER 3

Grading Standards

A. Introduction

A grading plan is an important element in preventing property damage, flooding, standing water, and erosion of embankment areas. The design engineer must consider the existing topography of the development and its relationship with adjacent properties. Proper grading eliminates costly corrective work such as retaining walls, re-grading operations, and unnecessary drainage systems, such as storm sewers, french drains, or swales.

In all cases, grading plans must ensure positive drainage and conform to the following standards.

B. Design Requirements

1. **All engineering plans shall be designed, prepared, stamped, and signed by a qualified, professional, and registered engineer in the State of Wisconsin.**
2. Minimum and Maximum Slopes
 - a. Yard drainage shall be 2% minimum to public drainage facilities.
 - b. All public drainage rear yard swales and roadside ditches shall have a minimum of a 1% swale gradient.
 - c. All rear and side yard swales shall be centered on property lines.
 - d. The maximum side slope of detention areas is 5:1.
 - e. The first 20' back from a residential house shall be graded to a maximum of 5%. The remaining rear yard shall have a maximum of 8%, except when the lot includes 5:1 approaches to detention/retention facilities. Only in extreme cases, with approval by the City Engineer, the last 10' may be graded to a 3:1 slope.
 - f. All side yard slopes shall be between 2% and 25% (4:1.)
 - g. The slope between the front edge of sidewalk and back of curb (terrace area) shall be a minimum 2%, maximum 4% (i.e., 1/4" to 1/2" per foot).
3. Maximum Allowed Ponding

When the storm sewer system has reached its capacity and a 24-hour, 100-year storm event occurs, the maximum allowable ponding shall be:

- a. 18" in a rear yards.
 - b. 9" in parking lots.
 - c. 9" in the gutter line of any street.
4. Grading operations must be coordinated with all private and public utility locations. The responsibility for coordination rests with the developer.
 5. All utility crossings, including culverts, shall have a minimum 12" cover from the top of the pipe to the subgrade.
 6. Drainage swales shall be provided along rear and side yards of proposed buildings or parcels.
 7. The minimum distance between a rear yard swale and a residential house is 25' (measured from the top of slope [break point]).
 8. The distance between a rear or side yard swale and an accessory building shall be 5' minimum (measured from the top of slope).
 9. The difference between the top of foundation elevation of a structure and the adjacent outside finished grade must be a minimum of 6" for residential, commercial, and industrial areas.
 10. Other design requirements may be applicable, such as retaining walls or terracing of the property, depending on the land plan and site topography. The City Engineer must approve each special design feature before its incorporation into the plans.
 11. All grading plans shall match existing grades at the property lines with a slope not to exceed 5:1, unless an approved grading plan or a proposed established street grade exists for the future development of adjacent properties, that indicates different elevations. The grading plan shall be consistent with all proposed established street grade plans on file with the City Engineer.
 12. All grading plans shall accommodate offsite drainage.
 13. All ROW's shall allow for emergency overflow in the case of large storm events or plugged inlet or storm systems.
 14. Berms
 - a. Maximum height 4' (unless approved by the City Engineer)

- b. Maximum slope 3:1
- c. Shall be constructed in a way not to impede or restrict surface water drainage. Gaps in the berms or culverts may be required to accommodate drainage.

C. Construction Requirements

1. All construction methods involved with the grading plan shall comply to Part II of the State Specifications.
2. After the engineering plans are approved and before beginning grading operations for a subdivision or parcel of land, a pre-construction meeting shall be held. The City Engineer shall be notified a minimum of one week in advance to arrange for appropriate pre-construction conferences and construction inspection. The meeting will not be held until any and all required bonds are posted and permits obtained.
3. All material classified as unsuitable for street construction must be removed from the proposed ROW area at the discretion of the Engineer. Typically, such items include organic material construction debris and boulders.
4. All mass grading operations of a subdivision or individual building parcel, as well as any road improvements, must be performed in accordance with the construction specifications or as outlined in the State Specifications. For areas in excess of one acre, a Notice of Intent shall be filed by the Developer to the State of Wisconsin and a copy sent to the City of Manitowoc.
5. Fill material placed in the existing or future public ROW shall be:
 - a. approved by the City Engineer prior to beginning earthwork.
 - b. compacted in layers not to exceed 12".
 - c. compacted to at least 95% of their maximum density within 6' of the final subgrade.
 - d. compacted to at least 90% of their maximum density below 6' or more from the final subgrade.
6. Compaction tests shall be:
 - a. performed on each layer.
 - b. determined based on the maximum density of all fill materials, determined by the modified proctor test method (ASTM Designation: D-1557 or AASHTO Designation: T-180.) The developer is responsible to plan ahead and obtain a proctor test so that grading work is not delayed.

- c. spaced to represent the fill area, not to exceed 200' along the ROW.
 - d. performed at the road centerline and edge lines for each location.
 - e. performed on all unstable subgrade areas.
7. All pertinent information shall be recorded for each test including but not limited to soil density (dry, bulk, and as percent of modified proctor), moisture (as percentage of bulk and dry density), type of test performed, test location, subgrade elevation at the test location, and soil type (description.) A copy of all field information shall be given to the City at the cost of the Owner.
8. If the City Engineer does not have a maximum density on file for the fill material, filling operations shall stop until:
- a. the maximum density of the material is determined by the modified proctor test, or
 - b. an interim maximum density value is approved by the City Engineer.
9. All cut areas shall have the top 6" compacted to 95% of the modified proctor density. The City Engineer may allow a proof roll instead of soil testing.
10. A soil testing firm, approved by the City and paid by the developer, shall check compaction during the entire filling operation.
11. All topsoil from any cut or fill areas shall be removed and stockpiled.
12. All organic material from any cut or fill areas within the ROW shall be removed.
13. Full-time inspection and testing shall be required when filling of 12" in depth or greater is required to bring ROW to subgrade elevations.
14. The site shall be graded to within 0.1' of the approved subgrade.