

CHAPTER 6

GRADING AND DRAINAGE

6.0 GENERAL

6.1 SUBDIVISION GRADING

6.1.1 **Relative to development of lot house pads, the designer shall strive to achieve a grading certified elevation 18" below the proposed finished yard grade at the proposed building. Exceptions shall be approved by the City Engineer.**

6.1.2 All fill areas shall be compacted in one foot lifts. A soil-testing firm approved by the City, paid by the Developer, shall check compaction during the entire filling operation. At the end of the filling operation, the soil-testing firm shall submit a final report to the City Engineer indicating areas of structural fill **and proposed testing locations**. The grading contractor shall notify the soil testing firm to monitor/test structural fill areas. **The results of monitoring and testing shall be submitted to the City Engineer.**

6.1.3 All areas of structural fill greater than three and one-half (3-1/2) feet (not including topsoil) shall be shown as shaded areas on grading plan. Compaction reports will be required. See chart below.

**SIZING OF HOUSE PAD
PER ZONING DISTRICT**

DISTRICT	ZONING RESTRICTIONS		HOUSE PAD	
	<u>A</u> Width at 1. Building line 2. Less side yard set backs	<u>B</u> Depth lot size width	<u>C</u> WIDTH	<u>D</u> Depth
<u>R-1</u>	$\frac{200'}{140}$	$\frac{435'}{}$	$\frac{100}{}$	$\frac{80}{}$
<u>R-2</u>	$\frac{150'}{110}$	$\frac{267'}{}$	$\frac{80}{}$	$\frac{80}{}$
<u>R-3</u>	$\frac{100/110}{80/90}$	$\frac{200'}{}$	$\frac{60}{}$	$\frac{80}{}$
<u>R-3E</u>	$\frac{115/125}{85/95}$	$\frac{217.4'}{}$	$\frac{65}{}$	$\frac{80}{}$
<u>R-4</u>	$\frac{95/110}{75/90}$	$\frac{169'}{}$	$\frac{60}{}$	$\frac{80}{}$
<u>R-5</u>	$\frac{90/105}{70/85}$	$\frac{145'}{}$	$\frac{60}{}$	$\frac{80}{}$
<u>R-6</u>	$\frac{85/100}{65/80}$	$\frac{118'}{}$	$\frac{50}{}$	$\frac{70}{}$
<u>R-7</u>	$\frac{100}{80}$	$\frac{125'}{}$	$\frac{60}{}$	$\frac{80}{}$

- 6.1.4 All fill placed in the street right-of-way shall be engineered compacted fill. Compaction reports will be required. A full time geotechnical engineer shall be on site during the filling process. The standards to be followed are fill shall be computed at 90% modified proctor to 1 (one) foot below subgrade. The top 2 (two) feet shall be compacted to 95% modified proctor. Fill shall be placed and tested in no greater than **1 foot** lifts. Test shall be done in no greater than 100-foot intervals.
- 6.1.5 All organic material shall be removed and stockpiled prior to placing structural fill.
- 6.1.6 Soils compaction testing shall be done to these minimum standards. Lots having fill placed exceeding 3 ½ feet shall have a minimum of tests done at the four corners of the house pad shown on the grading plan. For street right-of-ways where fill exceeds one (1) foot from existing grade to proposed grade as shown on the plan, testing shall be done at 100 ft. intervals at street center line and curb lines within the pavement area.

6.2 EROSION CONTROL

- 6.2.1 All subdivision grading and erosion control shall conform to **City's Unified Development Ordinance and WDNR current Construction Site Technical Standards.**

The following standard practices typically apply to most sites:

Silt Fence	1056
Stone Tracking Pad	1057
Storm Drain Inlet	1060
[Protection for Construction Site]	
Ditch Checks	1062
Grading Practices for Erosion Control	1067
Dust Control	1068

All standard practices should be applied to site development and maintained in preserving land and water resources.

- 6.2.2 Erosion control shall conform to City of Franklin Ordinance Division 15-8.300. **For silt fence installation detail see Figure No. 20.**
- 6.2.3 An erosion control plan shall be submitted for construction projects and subdivision development. This plan shall be approved by the City Engineer.
- 6.2.4 The Developer shall be responsible for erosion control until all areas are stabilized by vegetative cover regardless of ownership. The standard for cover shall be 95%.

- 6.2.5 After the disturbed areas have been stabilized by revegetation, existing silt fence, hay bales, ditch check, etc. must be removed by the Developer's contractor and that area restored.

6.3 DITCH GRADING

- 6.3.1 All natural grass ditches shall have a minimum flow line gradient of 1% and a maximum of 5%. Less than 1% or greater than 5% requires special design considerations and approval of City Engineer.
- 6.3.2 Landscaping of ditches with a flow line gradient between 1% and 3% requires topsoil and seed restoration; between 3% and 5% requires sod/staked or stabilized by erosion control matting; greater than 5% requires conduit.
- 6.3.3 Roadside ditches shall be a minimum of 24 inches deep and a maximum of 36 inches deep as referenced from the centerline elevation of the finished road. Ditches greater than 36 inches deep shall be piped.
- 6.3.4 All crossroad culverts shall be designed to provide a minimum of 14 inches of cover as referenced from the centerline elevation of the finished road to the top of the pipe.
- 6.3.5 Side slopes of roadside ditches shall be graded no steeper than one foot of rise to four foot horizontally (4:1).
- Back slopes of roadside ditches and side slopes of all other ditches shall be graded no steeper than 1 foot of rise to 3 foot horizontally (3:1). A 4:1 back slope is preferred.
- 6.3.6 Back slopes and side slopes 4:1 or **3:1 maximum** for roadside ditches shall be covered by erosion control matting.
- 6.3.7 Off road drainageways affecting the buildable area of any lot or greater than 36" deep between homesites shall be piped.
- 6.3.8 All existing ditches fronting on existing roadways or existing drainageways within developments shall be regraded to conform to these specifications.

6.4 STORM SEWER

- 6.4.1 All materials and installations shall conform to the **most recent edition of** Standard Specifications for Sewer and Water Construction **in Wisconsin** and are subject to the City Engineer's approval.

Storm sewer shall be designed to necessary class of pipe and bedding. Storm sewer typically shall be

bedded in 3/8 or 3/4 inch (for pipe larger than 18") crushed stone chips as described in 10.11.2 to 2 feet above the top of pipe and backfilled with 1 1/4 TB as described in 10.11.3 of these specifications.

- 6.4.2 Manholes and inlets shall be designed and constructed to allow easy access for maintenance and cleaning.
- 6.4.3 Endwalls, flared end sections or junction structures shall be required at all crossroad culverts and piped installed through or between homesites. Riprap on fabric shall be required at outfalls.
- 6.4.4 All precast manhole barrel joints and all chimney sections shall be mortared and smoothed off inside and outside.
- 6.4.5 Inlets shall be of precast design in accordance with Figure No. 16. Concrete block inlets will only be allowed with written permission of the City Engineer or shown as an exception on the approved construction drawing. **Inlet with a sump (catch basin) is not permitted.**
- 6.4.6 When an inlet is within a driveway, a curbless casting R-3290-A with Type A will be required or equivalent roll type inlet frame, grate, curb box.
- 6.4.7 The inlets are to be set three inches plus or minus 1/4" low prior to the curb and gutter construction. This will allow for the addition of a two-inch adjusting ring and the necessary mortar and mastic. No brick adjustments will be allowed. This construction should allow for the curb and gutter construction with a curb machine. Type "M" mortar shall be used per Section 8.37.0 of Standard Specifications.

At time of final lift of asphalt trowelable mastic shall be used between the top adjusting ring and the inlet frame. The mastic shall cover the entire top of the adjusting ring with a 1/2 inch thickness.

- 6.4.8 The final setting of the inlet frame and grate shall be completed with the construction of the curb and gutter. With this method, no tuckpointing beneath the frame should be required.

In addition to the above, the staking for inlet construction will be consistent and will be done as follows:

- 1. Two offset stakes, each 10 feet from the centerline of inlet, will indicate the face of curb and/or inlet box and the inside back of the inlet.

2. One offset stake will be set 5' back of the face of curb and/or inlet box and will be on the centerline of the inlet perpendicular to the curb and gutter.
3. It will be the responsibility of the storm sewer contractor to protect these stakes to ensure proper construction.
4. Inlets constructed with improper alignment (See 2.3.2 Q) will be unacceptable and will have to be removed and reconstructed.

To set the frame and grate to conform to the slope of the gutter line (final inch) a **heavy duty** grate, high early strength concrete, Quickrete 5000 or equal shall be used.

A leveling course shall be established with a uniform lay of quick crete. Wood shims for this adjustment will not be allowed.

- 6.4.9 Yard inlet shall be two (2) feet internal diameter. A beehive grate and frame, R 2564 Neenah or approved equal shall be used. See Figure No. 33.
- 6.4.10 **Curb and gutter** greater **in length** than 200 feet **with** slopes of three (3) percent or greater an inlet with directional grate in frame, Neenah R3246 shall be used. **The precast concrete inlet shall be sized accordingly to receive the frame.**
- 6.4.11 **All storm sewers and cross culverts that will be within the City of Franklin right-of-way shall be designed with the appropriate ASTM Class of reinforced concrete pipe (RCP). 10/21/20**

6.5 STORM SEWER LATERALS

- 6.5.1 All storm sewers constructed will include lateral lines if required by the development agreement. Laterals shall be designed to receive storm water runoff from roof drains, localized areaways, and sump pumps.
- 6.5.2 Laterals shall meet all the requirements of the storm sewer system as detailed in this chapter and have a minimum diameter of six (6) inches.
- 6.5.3 Laterals will be laid to one (1) foot of right of way line. Laterals can be "shelved" in the same trench with sanitary sewer and water service laterals.

Typically the storm lateral to lie to the right of the sanitary lateral (street to property).

6.6 DISCHARGE FROM SUMP PUMPS, DOWN SPOUTS, AND ROOF DRAINS FOR COMMERCIAL, INDUSTRIAL PROPERTIES

- a. Sump pumps, down spouts, and roof drains shall be connected, within a year, to a storm sewer system **as it is installed adjacent to a property.**
- b. If storm sewer is not available or if a rural section exists, then sump pumps shall be installed to discharge:
 - 1) To an open ditch located within the site, **and observing necessary set back(s).**
 - 2) Onto the ground within the building lot if:
 - a) The discharge point is at least 5' back from the front lot line, any side or rear lot lines.
 - b) An adequate swale exists to receive the flow.
 - c) Adjoining property is not adversely affected.

6.7 ON-SITE STORMWATER BASINS

6.7.1 **Developers** Design Engineer(s) shall investigate the need for stormwater controls for all development sites and shall contact the **City Planning and City Engineer's office of findings.**

6.7.2 Site Development Storm Water Management Plans

- (1) For all development subject to Section 13.10(2) of the Milwaukee Metropolitan Sewerage District rules the Developer shall submit site development storm water management plans to the City.
- (2) Site development Storm Water Management Plans shall include sufficient information to allow the City, then the District to evaluate compliance with District rules. The plan shall:
 - (a) describe the site, including maps showing relevant features;
 - (b) describe the proposed storm water conveyance system;
 - (c) provide data relevant to conveyance system analysis and design;

- (d) If the site will have a site-specific runoff management system then drawings, design details, design calculations and a technical analysis showing design compliance must be provided to the City for review and approval.
- (e) The storm water detention/retention basin may be required to incorporate guidelines which are included in the appendices.

6.8 EARTH BERMS

- 6.8.1 The bottom (toe) of an earth berm shall not be constructed closer than 4 (four) feet from any property line.
- 6.8.2 Berm height shall not exceed 6 (six) feet from adjacent ground level.
- 6.8.3 Side slopes on berms shall not exceed **4:1**.
- 6.8.4 Berm(s) shall not be constructed as to **impede or** obstruct drainage. Berms will not be allowed in existing or proposed drainage areas or swales.

6.9 Retaining Walls

- 6.9.1 For all retaining walls **higher** than 3 (three) feet proposed as part of development plans approved by a licensed professional engineer, a plan shall be submitted to the City Engineer for approval. The plan shall show the material of construction, wall ties, and location relative to property lines, structures, utilities, easements and wall height. **(See Figure No. 34 in the Appendix)** Plan shall be stamped and signed by a professional engineer.
- 6.9.2 Retaining walls shall be a minimum of 5 (five) feet from any lot line.
- 6.9.3 **If terracing is proposed, wall height shall not exceed 3(three) feet.** Terracing will be required for elevation changes greater than 3 feet. The distance between terrace walls shall be a minimum of 4 (four) feet.

A safety guard rail/fence shall be installed along the retaining wall of 3' in height or more.
- 6.9.4 The appearance of the retaining wall and wall materials shall be considered with respect to the view from the low side of the wall.

- 6.9.5 The long term durability and maintenance requirements of the retaining wall shall be considered. **Refer to 6.9.3.**
- 6.9.6 Retaining wall shall be designed in a manner that frost and hydrostatic pressure will not compromise the integrity of the wall.
- 6.9.7 Adequate safety features and precautions shall be incorporated into the retaining wall design to mitigate the hazard of the abrupt drop off created by the wall. **A fence (not less than 3' in height) is recommended to be installed and maintained.**
- 6.9.8 Retaining walls shall not interfere with the surface water drainage pattern or create disruption of the approved drainage or grading plan. Walls may not be constructed in drainage swales.
- 6.9.9 Retaining walls shall be designed and located in a manner that will not have a negative impact on abutting properties.