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## 4 STORM SYSTEM

### 4.1 SPECIFICATIONS

All labor and material provided under this contract shall be governed by the latest edition and all amendments thereto of the Standard Specifications for Sewer and Water Construction in Wisconsin (SWS) and State of Wisconsin Department of Transportation Standard Specifications for Road and Bridge Construction, unless otherwise specified in these Specifications, whichever is more restrictive. A full-time inspector is required to be at the project site to observe pipe unloading, inspect construction materials, and observe and document the construction of storm sewers and laterals. THESE STANDARDS SHALL APPLY TO ALL PUBLIC STORM SEWERS. Any and all modifications to these Specifications must be approved by the City Engineer.

Design shall follow SWS Specifications, Milwaukee Metropolitan Sewerage District (MMSD) Rules, City of New Berlin Municipal Code 275-55.1 and be designed in accordance with the Rational Method or TR-55 Method. For private property in new development, if Department of Commerce procedures are used, the designer shall verify that off-site flows meet all of the requirements of the Rational Method or TR-55 Method. Design shall also conform to the following:

#### 4.1.1 STORM SEWER PIPE

##### 4.1.1.1 MATERIALS

- 4.1.1.1.1 All storm sewers shall be constructed with a minimum Class III reinforced concrete pipe per SWS, Section 8.6.0 or as approved by City Engineer
- *Reinforced Concrete Pipe – ASTM C76*
  - *Horizontal Elliptical Reinforced Concrete Pipe – ASTM C507.*
  - *Joints for concrete storm sewer pipe shall have rubber gaskets conforming to SWS, Section 8.41.2.*

##### 4.1.1.2 DESIGN STANDARDS

- 4.1.1.2.1 Minimum size: 12”
- 4.1.1.2.2 Location:
- *In streets and easements: 10 feet west or south of the sanitary sewer.*
- 4.1.1.2.3 Pipe cover:
- *3 feet minimum from finish design grade to outside top of storm sewer.*
- 4.1.1.2.4 Storm sewers with diameters greater than 24” equivalent, daylighting in ditches shall have safety grates, meeting design standards, installed at the upstream and downstream ends.



- 4.1.1.2.5 Mainline and conveyance storm sewer design storm: 25-yr.; Storm sewers may not be surcharged in a 25-yr. or less design storm condition. Surge condition is defined as to the crown of pipe (full pipe flow - no pressure).
- 4.1.1.2.6 Minimum slope shall be 0.2% and achieve minimum velocity = 2.0 feet per second when pipe is flowing half-full or full. City Engineer may waive the 0.2% minimum slope for runs of pipe longer than 400 feet. City Engineer may limit maximum velocities.
- 4.1.1.2.7 Complete sewer design calculations are required with submittals, including Drainage Areas Map.
- 4.1.1.2.8 Storm sewer shall be required in public Rights-of-Way in new developments where the depth of proposed ditches exceed 3 feet as measured from the edge of pavement.

#### **4.1.2 STORM LATERALS (From main to lot line)**

##### **4.1.2.1 MATERIALS**

- 4.1.2.1.1 Unless otherwise specified, All pipe used for storm laterals shall be:
- *Class III concrete sewer pipe; or*
  - *PVC (SDR 26) pipe*

##### **4.1.2.2 DESIGN STANDARDS**

- 4.1.2.2.1 Minimum size in ROW/easement areas shall be 6" diameter.
- 4.1.2.2.2 The minimum slope on laterals shall be 1/8" per foot.
- 4.1.2.2.3 The maximum slope on laterals shall be 1/2" per foot.
- 4.1.2.2.4 Minimum cover for storm sewer laterals in paved areas shall be 12" as measured from the top of the pipe to the top of the subgrade.
- 4.1.2.2.5 A clay dam across the trench shall be constructed adjacent to pavement low points with all storm sewer laterals.
- 4.1.2.2.6 Connection of laterals to storm sewer shall be subject to following:
- *Location of invert of new lateral may be permitted a maximum of 12" above spring line of outlet sewer, or use outside drop inlet per SWS for main sewers.*
  - *Hole - Core drill only. Deliver "cut-out" to the Construction Inspector.*
  - *Connection Device - Kor-N-Seal boot, or pre-approved equal with stainless steel snap-in ring.*



- *Any lateral that is connected into a manhole shall have a smooth concrete bench/channel placed to convey lateral flow into the storm sewer.*

- 4.1.2.2.7 Storm sewer lateral lines shall be designed to receive the storm water runoff from window wells, footing drains and sump pumps.
- 4.1.2.2.8 In areas with storm sewer, a storm sewer lateral shall be provided for each lot or building. The City Engineer may waive this requirement for lots that are adjacent to and drain to adjacent public drainage easements, wetlands or waters of the State.
- 4.1.2.2.9 Sump discharges for all buildings shall be located at the front of building (facing street). City Engineer may waive this requirement for lots that are adjacent to and drain directly to public drainage easements, wetlands or waters of the State.
- 4.1.2.2.10 Storm laterals shall be located to the right of sanitary sewer lateral when looking from the street.
- 4.1.2.2.11 Covers installed on lateral cleanouts shall not be bolted to the cleanout pipe.

**4.1.3 CULVERTS**

**4.1.3.1 MATERIALS**

- 4.1.3.1.1 Culverts shall be manufactured and installed in accordance with the requirements of the Standard Specifications for Highway and Bridge Construction in Wisconsin.
- 4.1.3.1.2 Damaged or rusted culvert pipes shall not be reused.

**4.1.3.2 DESIGN STANDARDS**

- 4.1.3.2.1 Culverts located in a Primary Storm Water Management System (PSMS) shall provide at least the 100-year level of protection for capacity and road overtopping.
- 4.1.3.2.2 Culverts located in a minor storm water management system shall be designed to safely convey surface water runoff from a 10-year storm event. Culverts may not be surcharged in a 10-year or less design storm condition. Surge condition is defined as to the crown of pipe (full pipe flow – no pressure).
- 4.1.3.2.3 Minimum size shall be 12” diameter for driveways and 15” for roadway cross culverts.
- 4.1.3.2.4 Minimum culvert lengths:

<i>&lt; 24” diameter</i>	<i>20 feet</i>
<i>24” – 30” diameter</i>	<i>22 feet</i>
<i>36” – 42” diameter</i>	<i>24 feet</i>
<i>48” and larger diameters</i>	<i>26 feet</i>



- 4.1.3.2.5 Culverts less than 24 feet in length shall consist of one piece of pipe.
- 4.1.3.2.6 All crossroad culverts shall be designed to provide a minimum of 12" of cover to the top of the pipe at the edge of the finished pavement of the road.
- 4.1.3.2.7 See Masonry Endwalls Section 4.1.4 or Flared End Sections Section 4.1.5 of these specifications for end treatment specifications.

#### **4.1.4 MASONRY ENDWALLS**

##### **4.1.4.1 MATERIALS**

- 4.1.4.1.1 Endwalls shall be:
  - *poured or pre-cast concrete; or*
  - *mortared stone; or*
  - *Other masonry material as approved by the City Engineer.*
- 4.1.4.1.2 Endwalls shall be manufactured and installed in accordance with the requirements of the Standard Specifications for Highway and Bridge Construction in Wisconsin.

##### **4.1.4.2 DESIGN STANDARDS**

- 4.1.4.2.1 In areas with less than 35 miles per hour posted speed limit, masonry endwalls shall be required to be installed on the ends of driveway culverts.
- 4.1.4.2.2 Endwalls shall be extended through the entire cross section of the ditch to prevent water infiltrating around the culvert.

#### **4.1.5 FLARED END SECTIONS**

##### **4.1.5.1 MATERIALS**

- 4.1.5.1.1 The end sections shall be manufactured and installed in accordance with the requirements of the WisDOT Standard Specifications, Section 521 or Section 522 as applicable.

##### **4.1.5.2 DESIGN STANDARDS**

- 4.1.5.2.1 In areas with greater than 35 miles per hour, flared end sections shall be required to be installed on the ends of driveway culvert.



## 4.1.6 DITCHES

### 4.1.6.1 DESIGN STANDARDS

#### 4.1.6.1.1 Slopes.

##### 4.1.6.1.1.1 Grassed Invert

- 1½% minimum
- 4% maximum

##### 4.1.6.1.1.2 Concrete Invert:

- Greater than 4% or less than 1½%.
- 10 % maximum, 0.7% minimum.
- Invert shall be placed on a minimum of 3" of crushed aggregate base course.
- Place sod within the initial 1½ feet of ditch side slopes adjacent to the concrete invert.
- 2-ft. minimum width, v-bottom
- V-bottom formed by 4H:1V sloped top surface
- Minimum concrete thickness: 6"

##### 4.1.6.1.1.3 Alternative methods may be used after approval of the City Engineer is obtained.

#### 4.1.6.1.2 Foreslope: 4H:1V maximum.

#### 4.1.6.1.3 Backslope: 4H:1V maximum.

#### 4.1.6.1.4 The minimum ditch depth shall be 12" below the shoulder point at roadway high points. Other ditch locations shall have a minimum depth of 20" below the shoulder point and be graded to accommodate a properly sized driveway culvert.

#### 4.1.6.1.5 Adopt and administer the WDNR Technical Standards 1053, 1058, and 1059 for erosion control. All roadside ditches shall be covered with a minimum of 4" of topsoil, and either seeded, fertilized and matted or sodded. Sod placement shall be required on longitudinal slopes greater than 4%.

#### 4.1.6.1.6 If the back slope of a ditch extends beyond the right-of-way, drainage easements shall be required adjacent to the street right-of-way at a uniform distance from the road centerline, as approved by the City Engineer.

#### 4.1.6.1.7 Turf reinforcement may be used as a substitute for concrete invert in ditches with slopes between 4% - 5%. City Engineer must pre-approve turf reinforcement type.



## 4.1.7 STORM MANHOLE & JUNCTION CHAMBERS

### 4.1.7.1 MATERIALS

4.1.7.1.1 All storm manholes shall be pre-cast concrete with integral base, with pre-cast flattops (slab or deck) with an opening for the casting.

4.1.7.1.2 The manholes shall be sized as follows:

Downstream Pipe O.D.*	Minimum Manhole I.D.
27" or less	42"
28" – 30"	48"
31" – 36"	60"
37" – 42"	72"
> 42"	Special Design Requiring City Engineer Approval
*O.D. is the largest horizontal outside pipe dimension	

4.1.7.1.3 Where field conditions allow, the manhole shall be constructed with an offset cone.

4.1.7.1.4 All chimney joints, including the frame-chimney joint, and all barrel & cone section lifting holes shall be sealed with a cementitious grout with a struck joint. Grout shall be premixed, non-metallic, high-strength, non-shrink, Pennegrout® by IPA Systems, or approved equal, which meets requirements of ASTM C-1-91 and C-827 as well as CRD C-588 and C-621. When mixed to a mortar or "plastic" consistency, the grout shall have a minimum 1-day and 28-day compressive strength of 6,000 and 9,000 psi, respectively. Dry stacking of riser rings or flat decks shall not be permitted. They shall be laid in a bed of grout as described above.

4.1.7.1.5 Steps meeting the requirements of SWS, Section 6.40.1 shall be installed in all manholes or junction chambers deeper than 4', from floor to rim.

4.1.7.1.6 Drop pipes or other energy-dissipating structures shall be provided for all sewers entering a manhole with their invert at an elevation more than 24" above the invert of the sewer leaving the manhole.

## 4.1.8 CATCH BASINS

### 4.1.8.1 MATERIALS

4.1.8.1.1 Shall consist of masonry, pre-cast or monolithic construction in accordance with Chapter 3.6.1 and File No. 25 or 26 of SWS. All catch basins shall be designed and constructed to allow easy access for maintenance and cleaning.

4.1.8.1.2 Steps meeting the requirements of SWS shall be installed in all catch basins deeper than 4', from floor to rim.



4.1.8.1.3 Size (minimum).

- *Rectangular 24" x 36" (Internal Dimensions).*
- *Round 48" ID.*
- *Manhole inlets - Allowed only in cases where an angle point in the storm sewer occurs under the curb line. (These shall be avoided whenever possible.)*

4.1.8.1.4 A continuous 4" diameter perforated, corrugated polyethylene drain pipe, meeting the requirements of AASHTO Designation: M-252, shall be installed under the curb and gutters and extend 50 feet in either direction from storm water catch basins located at low points. For catch basins in other locations, the 50-ft length of drainage pipe shall be connected only to the upstream side.

4.1.8.1.5 Where underdrain pipe is specified, a 4" diameter hole shall be cored in opposite sides of each catch basin located at low points to allow the connection of 4" diameter perforated, corrugated polyethylene underdrain pipe. Catch basins located in other locations shall have a 4" diameter hole cored in the upstream side to allow the connection of 4" diameter underdrain pipe. The holes must be cored at an elevation that is below the subgrade elevation to allow for positive drainage and proper placement of the underdrain.

4.1.8.1.6 All chimney joints, including the frame-chimney joint, and all barrel & cone section lifting holes shall be sealed with a cementitious grout bed with a struck joint. Grout shall be premixed, non-metallic, high-strength, non-shrink, Pennegrout® by IPA Systems, or approved equal, which meets requirements of ASTM C-1-91 and C-827 as well as CRD C-588 and C-621. When mixed to a mortar or "plastic" consistency, the grout shall have a minimum 1-day and 28-day compressive strength of 6,000 and 9,000 psi, respectively.

#### **4.1.8.2 DESIGN STANDARDS**

4.1.8.2.1 Inlet capacity design storm: 25-yr. storm event. In a 25-yr. storm event, the maximum spread of ponded storm water shall be 8 feet as measured from the face of curb.

4.1.8.2.2 Inlet capacity design storm: 50-yr. storm event for areas with no overland flow relief. In roadways, storm water ponding shall not exceed 6" on paved parking areas and 4" at the centerline in a 100-yr. storm event.

4.1.8.2.3 At low points, curb pan shall be pitched a ½ inch five feet on both sides of catch basins.



4.1.8.2.4 Where only front yard drainage flows to the curb, maximum separation or run to a catch basin is 300 feet unless in the opinion of the City Engineer a lesser distance is required. Where the collective drainage from more than one lot discharges over the curb at a single point, a catch basin shall be required at the lot line extended

#### **4.1.9 FIELD INLETS**

##### **4.1.9.1 MATERIALS**

- 4.1.9.1.1 Shall consist of masonry, pre-cast or monolithic construction in accordance with Chapter 3.6.3 and File No. 28 or 29 of SWS.
- 4.1.9.1.2 Inlets shall be designed and constructed to allow easy access for maintenance and cleaning.
- 4.1.9.1.3 All chimney joints, including the frame-chimney joint, and all barrel & cone section lifting holes shall be sealed with a cementitious grout bed with a struck joint. Grout shall be premixed, non-metallic, high-strength, non-shrink, Pennegrout® by IPA Systems, or approved equal, which meets requirements of ASTM C-1-91 and C-827 as well as CRD C-588 and C-621. When mixed to a mortar or “plastic” consistency, the grout shall have a minimum 1-day and 28-day compressive strength of 6,000 and 9,000 psi, respectively.

##### **4.1.9.2 DESIGN STANDARDS**

- 4.1.9.2.1 Inlet capacity design storm: 25-yr. storm event. In a 25-yr. storm event, the maximum spread of ponded storm water shall be 8 feet as measured from the face of curb.
- 4.1.9.2.2 Inlet capacity design storm: 50-yr. storm event for areas with no overland flow relief. In roadways, storm water ponding shall not exceed 6” on paved parking areas and 4” at the centerline in a 100-yr. storm event.

#### **4.1.10 ROAD UNDERDRAINS**

##### **4.1.10.1 MATERIALS**

- 4.1.10.1.1 Underdrain systems shall be installed under curb and gutters to collect water and convey it to catch basins.
- 4.1.10.1.2 The underdrain system shall be constructed with:
- *4” diameter perforated, corrugated polyethylene drainage pipe meeting the requirements of AASHTO Designation: M-252.*
  - *Pipe perforations may be holes or slots and may be in 3 or 4 lines spaced around the circumference of the pipe at 120° or 90° respectively.*



4.1.10.1.3 The trench shall be backfilled with open graded  $\frac{3}{4}$ " crushed stone.

4.1.10.1.4 Geotextile fabric, as specified in Section 612.2.8 of the Standard Specifications, shall be used to line the underdrain trench before the drainage pipe is installed and backfilled. Enough fabric must be provided as to cover the sides and bottom of the trench and overlap across the top of the trench by a minimum of 4 inches.

#### **4.1.10.2 DESIGN STANDARDS**

4.1.10.2.1 The 4" drainage pipe shall be laid in an 8" deep by 8" wide trench with flat bottom with square sides as shown in the Figure 7 of the Details. The trench, constructed at an elevation lower than the base course, shall extend 50 feet in either direction from a storm water catch basin located at the low point of the road, aligned with the proposed centerline of the flange of the curb and gutter. For catch basins in other locations, the 50' drainage pipe shall be connected only to the upstream side.

4.1.10.2.2 The drainage pipe shall be connected to catch basins in cored holes and grouted in-place in the cored holes. The end of drainage pipe opposite the catch basin shall be capped with a cap suitable for installing on the drainage pipe.

#### **4.1.11 BEHIND CURB COLLECTORS**

##### **4.1.11.1 MATERIALS**

4.1.11.1.1 All behind the curb collector systems shall be constructed with minimum 6" diameter PVC (SDR 35) pipe.

4.1.11.1.2 The clean out shall consist of a standard pre-cast 24" x 36" box inlet with a Neenah R-1878-B7L frame and lid as shown in Figure 15 of the Details.

##### **4.1.11.2 DESIGN STANDARDS**

4.1.11.2.1 Connected to sump pump drainage lines in lieu of storm sewer.

- *36" from flow line to surface.*
- *1 % minimum grade.*
- *300-ft. maximum run to outlet.*
- *Maximum run of 250 feet in curvilinear street.*
- *Maximum of 4 lots contributing area.*

4.1.11.2.2 Behind the curb collector systems shall be installed 2' behind the curb at cul-de-sacs and hill crests where storm sewers are not located.

4.1.11.2.3 The collector pipe shall be connected to the nearest catch basin.

4.1.11.2.4 A clean out shall be installed at the upstream end of the collector system.



4.1.11.2.5 Sump lines for lots not served by the storm sewer shall be connected to the PVC collector pipe by a wye or tee fitting.

4.1.11.2.6 Tracer wire installation is required on all behind the curb collector pipe.

#### **4.1.12 FRAMES, GRATES AND LIDS**

##### **4.1.12.1 MATERIALS**

4.1.12.1.1 Vertical curb catch basin frames and grates shall be Neenah R-3228-BD, or equal as pre-approved by the City Engineer.

4.1.12.1.2 Mountable curb catch basin frames and grates shall be Neenah R-3501-R, or equal as pre-approved by the City Engineer. (Add a flat frame and grate for driveway curb head reductions)

4.1.12.1.3 Field inlet frames and grates shall be Neenah R-3210-A, or equal as pre-approved by the City Engineer. A Neenah R-2560-E1 or R-2561 series beehive grate shall be used where required by the City.

4.1.12.1.4 Manhole frames and grates in field inlet applications shall be Neenah R-2577-1, or equal as pre-approved by the City Engineer.

4.1.12.1.5 Manhole frames and lids in pavement applications shall be Neenah R-1661, or equal as pre-approved by the City Engineer. Covers shall have machined bearing surface and will be permitted to have eight (8) vent holes.

4.1.12.1.6 A pipe grate with maximum opening size of 6" shall be installed on storm sewer inlets 18" or larger. Grate shall be hot-dipped galvanized after fabrication or be constructed of corrosion resistant material approved by City Engineer.

#### **4.1.13 FRAME ADJUSTMENTS**

##### **4.1.13.1 MATERIALS**

4.1.13.1.1 All frame/casting adjusting rings for manholes, catch basins and inlets shall be:

- *Reinforced concrete rings having 26-inch I.D., or*
- *Pro-Ring™ by Cretex, or*
- *approved equal*

4.1.13.1.2 The minimum for a chimney section shall be the height associated with the proper placement of one 2" adjusting ring. The maximum height of adjusting rings above the cone or slab top is 16 inches as measured from the top of cone or slab top. If more than 16 inches of adjusting rings are needed to set the casting to finished grade, then an additional barrel section shall be installed on the manhole.



4.1.13.1.3 The minimum thickness of individual pre-cast concrete adjusting rings shall be a nominal 2". The maximum thickness shall be a nominal 4".

#### **4.1.14 SUMP PUMPS, DOWN SPOUTS, AND ROOF DRAINS**

##### **4.1.14.1 DESIGN STANDARDS**

4.1.14.1.1 Sump pumps shall be connected to a storm sewer system if one exists adjacent to the lot.

4.1.14.1.2 Down spouts and roof drains, if not buried, may be connected to a storm sewer or behind the curb collector pipe. If buried, they shall be connected to the storm sewer or behind the curb collector pipe.

4.1.14.1.3 If storm sewer is not provided or if a rural roadway section exists, then sump pumps shall be installed to receive and discharge ground water from footing drains.

4.1.14.1.4 Sump pumps, down spouts and roof drains shall discharge on the ground to the front of the lot so that:

- *Adjoining properties are not adversely affected.*
- *If no drainage easement exists along a side or rear lot line, the discharge point within the site, shall be at least 10' from the lot line.*
- *If a public open drainage easement exists adjacent to any lot, the discharge point for down spouts and/or roof drains may be discharged directly into the easement.*

#### **4.1.15 BEDDING/COVER/BACKFILL**

##### **4.1.15.1 MATERIALS**

4.1.15.1.1 Pipe Bedding/Cover: In accordance with SWS as follows -

- *Flexible wall pipe shall be Class "B" up to 12" above the top of pipe; 3/8" limestone chips.*
- *Rigid wall pipe with diameters equal to or less than 21" shall have 3/8" limestone chips up to 6" above the top of pipe.*
- *Rigid wall pipe with diameters greater than 21" shall have 3/4" limestone chips up to 6" above the top of pipe.*

4.1.15.1.2 Cover Material: In accordance with SWS, Section 8.43.3. No stone, rock or other similar material with a sieve size greater than 1" shall be permitted.

4.1.15.1.3 Granular Backfill: In accordance with SWS, Section 8.43.4. No stone, rock or other similar material with a sieve size greater than 3" shall be permitted.



4.1.15.1.4 Spoil Backfill: In accordance with SWS, Section 8.43.5. No stone, rock or other similar material with a sieve size greater than 3-inches shall be permitted. In areas where excavated material(s) are determined to be not acceptable, in the judgement of the City Engineer, then imported backfill material meeting the requirements of SWS will be required.

4.1.15.1.5 Slurry Backfill: Aggregate slurry in accordance with SWS, Section 8.43.8 and requirements of the City Engineer, or in accordance with street opening permit, when issued. In special cases, the City Engineer may direct the use of Sand Slurry consisting of 50 pounds of fly ash and a ½ bag of Portland cement per cubic yard of mix.

#### **4.1.15.2 DESIGN STANDARDS**

4.1.15.2.1 Backfill in accordance with all street opening permit(s), generally this will be aggregate slurry. All areas greater than 5 ft from a paved surface (and above a 45-degree intercept line) may receive suitable spoil backfill as provided herein.

#### **4.1.15.3 INSTALLATION**

4.1.15.3.1 Care shall be taken by the Contractor when backfilling to prevent any movement of the pipe from proper alignment and grade. Contractor is responsible for determining that the finished sewer remains at the required elevation and grade.

4.1.15.3.2 Mechanically compact all trench backfill per SWS, Section 2.614(b). The initial lift to be compacted shall have a 2' loose thickness. Each subsequent lift to be compacted shall have a maximum 18" loose thickness. Contractor shall place thinner lifts if the required compaction cannot be achieved.

#### **4.1.16 PIPE TO MANHOLE CONNECTIONS**

##### **4.1.16.1 MATERIALS**

4.1.16.1.1 In accordance with SWS, Section 3.5.7, except as modified below:

4.1.16.1.1.1 *Amend the last sentence of Section 3.5.7(a) by adding the following:*

- *“using boots or cast-in-place cementitious material.”*

4.1.16.1.1.2 *Delete the last paragraph of Section 3.5.7 (c) & replace with:*

- *“To maintain seal flexibility, the annular space between the pipe and manhole wall shall be plugged with flexible butyl rubber gasket material prior to pouring the manhole invert and bench in accordance with SWS, Section 6.41.6. When connecting pipe to existing pre-cast concrete manholes, core hole in manhole wall prior to installing pipe to manhole seal.”*



## 4.2 INSPECTION

### 4.2.1 SUBMITTALS AND SAMPLES

4.2.1.1 All materials and installations shall conform to SWS and are subject to the City Engineer's approval. All materials of each type or use shall be from a single manufacturer. Contractor shall submit for approval six (6) sets of material specifications, certification and testing results by manufacturer on EACH material item required on the Project.

### 4.2.2 ACCEPTANCE TESTING

#### 4.2.2.1 General

4.2.2.1.1 Installation shall be in accordance with SWS, and these specifications.

4.2.2.1.2 All storm sewer pipe shall be laid uniformly to line and grade. Noticeable variation from true alignment and grade will be considered, by the City, sufficient cause for rejection of the work. Care should be taken to insure that the entering pipe is forced tightly against the last pipe laid.

4.2.2.1.3 Storm sewer, storm sewer inlets, storm sewer catch basins, and lateral alignment shall be uniform in line and grade as measured from the inlet to the outlet of the pipe section. Vertical misalignment of greater than  $\frac{3}{4}$ " in a single pipe section or a crest in the pipe grade extending for more (longer) than one-and-one-half (1-1/2) sections of pipe shall be cause for rejection and correction by the Contractor at no cost to the City.

4.2.2.1.4 Manhole barrel joint(s) gasket material ("E-Z-Stik") shall be placed on the vertical slope of each joint and shall be of the size necessary to fill the annular space of the joint. Lifting holes shall be grouted with Pennegrout and struck smooth on the interior and exterior surfaces. Chimney joints shall be grouted with Pennegrout. The grout shall extend the full width of each grade ring and each joint shall be struck-off vertically, even with the inside and outside chimney surfaces.

4.2.2.1.5 Rim elevations for manholes located in paved areas shall be set  $\frac{3}{8}$ " –  $\frac{1}{2}$ " below the asphalt binder grade elevation. Ramping of manholes will not be allowed.

4.2.2.1.6 Final adjustments to raise rim elevations to  $\frac{1}{2}$ " below the grades shown on the final paving plans shall be made by installing adjusting rings as needed just prior to placement of the final lift of the pavement (surface course).



- 4.2.2.1.7 Catch basins shall be initially constructed to approximate  $\frac{3}{4}$ " below binder grade prior to the curb and gutter construction. When curb and gutter is constructed, the concrete curb and gutter shall be stopped 5 feet on either side of the inlet. At intersections, catch basins are to be constructed 5 feet from the end of radii (to side of inlet). Temporary curb and gutter in the 5-foot gap on either side of the inlet shall be constructed with asphalt transitioning from the final grades of the concrete curb and gutter to the grade of the grate set at binder grade.
- 4.2.2.1.8 At the time of placement of the final surface course of pavement, the temporary asphaltic curb and gutter shall be removed and the inlet frame shall be set to final grade by adding one 2" adjusting ring and applying Type "M" mortar per SWS, Section 6.37.1. The concrete curb and gutter shall be completed. No wood shims shall be left in place. With this method, tuck pointing beneath the frame should not be required.
- 4.2.2.1.9 Any catch basin out of horizontal alignment by more than 2 inches shall be reconstructed to match the curb and gutter.
- 4.2.2.1.10 Contractor shall furnish and place a temporary 2" x 6" stake at the end of each storm lateral.
- 4.2.2.1.11 Existing field tiles shall be connected to a storm sewer or have a positive outfall provided.
- 4.2.2.1.12 All storm sewers shall be free from debris, sedimentation, or garbage prior to City acceptance.
- 4.2.2.1.13 Downspout cleanouts and catch basins shall be inspected by the City prior to acceptance by the City.