



# City of Oconomowoc

## Specifications

Roadway Construction  
Common Work Results for Utilities  
Water Utility Distribution Piping  
Sanitary Sewerage  
Storm Drainage  
Warranty  
Exhibits  
Ordinances & Checklists  
Emergency Action Plan  
Appendices

April 2005  
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**ROADWAY CONSTRUCTION**



## ROADWAY CONSTRUCTION

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Earthwork.
- B. Base course.
- C. Pavement and surface course.
- D. Incidental construction:
  - 1. Curb and gutter.
  - 2. Sidewalks.
  - 3. Curb ramps.
  - 4. Drive approaches, and driveways.
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  - 7. Drainage facilities.
  - 8. Traffic control.
  - 9. Guardrail.
  - 10. Retaining walls.
  - 11. Restoration.
  - 12. Traffic Signals.

#### 1.02 SUBMITTALS

- A. Sieve analyses from State-certified laboratory.
- B. Mix design. Submit before paving:
  - 1. Asphaltic concrete pavement. Follow State Specification 460.2.7.
  - 2. Portland cement concrete curb and gutter, pavement, driveway, and sidewalk.
  - 3. High-early-strength concrete pavement. Follow State Specification 415.2.1.
- C. Wisconsin DOT-verified hot mix asphalt (HMA) pavement mix design for each pavement classification specified. Design for each specified ESAL designation per WisDOT Construction and Materials Manual 8-66. Submit at least 7 days before paving.
- D. Base compaction test reports.
- E. Subbase compaction test reports.
- F. Paving mix delivery tickets.
  - 1. Asphaltic materials:
    - a. Furnish ticket before placing material.
    - b. Display on ticket:
      - 1) Project.
      - 2) Date.
      - 3) Time.
      - 4) Ticket number.
      - 5) Type of mix.
      - 6) Gross weight.
      - 7) Tare weight.
      - 8) Net weight.
      - 9) Job total.

2. Concrete:
  - a. Furnish tickets after delivery.
  - b. Display on ticket:
    - 1) Project.
    - 2) Date.
    - 3) Time.
    - 4) Ticket number.
    - 5) Class of concrete.
    - 6) Grade of concrete.
    - 7) Cement Weight.
    - 8) Fly Ash type and weight.
    - 9) Fine aggregate weight.
    - 10) Coarse aggregate weight.
    - 11) Gallons of water.
    - 12) Time water was added.
    - 13) Additives.

G. Base course delivery tickets that display:

1. Project.
2. Date.
3. Ticket number.
4. Type of material.
5. Gross weight.
6. Tare weight.
7. Net weight.
8. Job total.

H. Written concrete cylinder compression test results.

I. Quality control plan including:

1. Documentation of lab qualification under Wisconsin DOT Lab Qualification Program.
2. Certification of lab technicians to a minimum level of HMA Tech 1 under the State Highway Technician Certification Program.

J. Documentation showing permits have been obtained from all Regulatory Agencies having jurisdiction over the work.

1.03 REFERENCES

- A. ASTM D698 - Standard Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
- B. American Association of State Highway and Transportation Officials (AASHTO):
  1. AASHTO T22 - Standard Method for Compressive Strength of Cylindrical Concrete Specimens.
  2. AASHTO T23 - Standard Method of Test for Making and Curing Concrete Test Specimens in the Field.
  3. AASHTO T52 - Standard method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method.
- C. State Specifications: Standard Specifications for Highway and Structure Construction, State of Wisconsin Department of Transportation, latest edition.

1.04 REGULATORY REQUIREMENTS

- A. Pay for local, county or state permits for Work on right-of-ways. Damage to pavements and to all property, public and private, due to this Work shall be repaired or replaced at City direction to same condition before construction by Contractor.
- B. Contact City of Oconomowoc Department of Public Works for Erosion Control Permit prior to the start of any land disturbing activities.

1.05 QUALITY MANAGEMENT PROGRAM

- A. As a condition of acceptance, arrange, conduct, and pay for tests necessary to demonstrate satisfactory compliance with Specifications. Make adjustments at the plant necessary to meet requirements of Specifications including the instructions.
- B. Lab testing:
  - 1. Test material from the plant at least once a day.
  - 2. Meet the following parameters:
    - a. Air voids (VA): Follow State Specifications 460.2.8.3.1.6 and follow State Specification - Additional Special Provision 460.2.1 issued under ASP-6.
    - b. Voids in the mineral aggregate (VMA): Follow State Specifications Table 460-1.
    - c. Gradations: Job mix formula (JMF) Follow Paragraph 1 of State Specification - Additional Special Provision 460.2.8.2.1.5 issued under ASP-6.
- C. Density Testing:
  - 1. Testing shall be completed at a minimum every 300 feet per lane per layer of asphalt placed. First test location shall be selected to test density of the first 40 tons placed for each lane for each layer. Each testing location shall include at least three tests:
    - a. One at 1 foot from pavement edge.
    - b. One at center of driving lane.
    - c. One at 1 foot from roadway centerline.
  - 2. Use nuclear method.
  - 3. Use the Maximum Specific Gravity running average of 4 from the specified mix design.
  - 4. Locations will be at City's request.
- D. Results and reports:
  - 1. Make field adjustments to keep material within specified tolerances. If test results fall out of tolerance, increase testing frequency until material is within specification.
  - 2. Submit test reports within 48 hours to City.
- E. Follow State Specifications 460.2.8.2.

PART 2 - PRODUCTS

2.01 EMBANKMENTS

- A. Follow State Specifications 207. Do not use logs, stumps, brush, perishable material, frozen material or humus-bearing materials. No large stones or lumps within 18 inches of the surface within a one-to-one slope distance of the edge of shoulder.

- 2.02 EXCAVATION BELOW SUBGRADE (EBS) BACKFILL
  - A. Breaker run: State Specification 311 and 312.2 with a maximum particle size 3 inches.
  - B. Geotextile subgrade stabilization material: Follow State Specification 645, Type SAS.
  - C. Geogrid subgrade reinforcement: Tensar TX160.
- 2.03 BASE COURSE
  - A. Follow State Specifications 305. Use 1-1/4 inch and 3/4 inch crushed limestone.
    - 1. See Exhibit PAV 02-04.
- 2.04 ASPHALTIC CONCRETE PAVEMENT
  - A. Follow State Specifications 460.2.7. Submit mix design.
  - B. Binder course (Lower and Intermediate Layers): Follow State Specification 460.2 and:
    - 1. 3LT 58-28 S.
    - 2. Maximum recycled content: Follow State Specifications 460.2.5.
  - C. Surface course (Upper Layer): Follow State Specification 460.2 and:
    - 1. 5LT 58-28 S.
    - 2. Maximum recycled material content: Follow State Specifications 460.2.5.
  - D. Tack coat: Follow State Specification 455.2.5 Asphaltic material CSS-1h.
  - E. Pavement Additive:
    - 1. ACE Fiber (wax treated Aramid Fiber) by Breakthrough Technologies, LLC
    - 2. Dosage rate of 4.2 ounces per ton of asphalt mix, not to exceed 7 ounces per ton of asphalt mix.
- 2.05 CONCRETE PAVEMENT
  - A. Follow State Specification 415.
  - B. Concrete: Follow State Specifications 501 with:
    - 1. Slump:
      - a. Slip-formed: 2.5 inches or less.
      - b. Non-slip-formed: 4 inches or less.
    - 2. Compressive strength: 3500 pounds per square inch minimum.
  - C. Steel reinforcement: Follow State Specifications 505 and:
    - 1. Deformed tie bars:
      - a. Grade: 60.
      - b. Length: 2 feet.
      - c. Size: No. 4.
      - d. Epoxy coated.
    - 2. Metal chairs: Stainless steel.
    - 3. Dowel bars. Follow State Specifications 505.2.6.2. Smooth and:
      - a. Grade: 40.
      - b. Length: 3 feet.
      - c. Size: No. 4.
      - d. Epoxy coated.
    - 4. Joint sealant: Hot poured elastic.

## 2.06 INCIDENTAL CONSTRUCTION

- A. Concrete curb and gutter:
  - 1. Follow State Specifications 601.
  - 2. Do not add calcium chloride.
  - 3. Reinforcement for commercial curb and gutter:
    - a. 2 epoxy coated #5 bars.
    - b. State Specification 505.2.4.
    - c. Follow Exhibits PAV-05, PAV-09, PAV-10.
  - 4. Dowel bars:
    - a. 2 #5 18-inch long smooth epoxy coated dowel bars with bond breaker.
    - b. Located at all expansion joints.
    - c. State Specification 505.2.6.2.
    - d. Follow Exhibits PAV-09, PAV-10.
  
- B. Concrete sidewalks, ramps, islands:
  - 1. Follow State Specifications 602.
  - 2. Do not add calcium chloride.
  
- C. Curb ramps.
  - 1. Detectable warning field: Manufactured by Neenah Foundry, cast iron, no color. Follow Exhibit PAV-01.
  - 2. Follow State Specifications 602.
  
- D. Drive approaches, and driveways.
  - 1. Concrete:
    - a. Follow State Specifications 501.
    - b. Do not add calcium chloride.
  - 2. Asphaltic concrete: Follow specifications for surface course under ASPHALTIC CONCRETE PAVEMENT in this Section.
  
- E. Pavement marking: Follow State Specifications 646 and:
  - 1. Latex or Epoxy: Follow State Specification 646.3.1.
  - 2. Glass beads: Follow State Specifications 646.2.2.
  - 3. Temporary pavement marking: Follow State Specifications 649.
  
- F. Drainage facilities:
  - 1. Culvert pipe.
    - a. Reinforced concrete: Follow State Specifications 522.
    - b. Corrugated steel: Follow State Specifications 521.
    - c. Reinforced Concrete Horizontal Elliptical: Follow State Specifications 523.
  - 2. Bedding: 3/8-inch clear stone chips.
  - 3. Backfill: 3/4-inch crushed limestone.
  - 4. Apron endwalls: Same as pipe material.
  
- G. Traffic Control: Follow State Specifications 643.
  
- H. Guardrail: Follow State Specifications 614.
  
- I. Retaining Wall: Follow State Specifications 504.
  
- J. Traffic Signals:
  - 1. State Specifications 658.
  - 2. Preemption Devices may be required by City Fire Department.
  - 3. Pedestrian signal timer countdown displays.

- K. Restoration:
  - 1. Topsoil: State Specifications 625.
  - 2. Seed: State Specifications 630 mixture no. 40.
  - 3. Sod: State Specifications 631.
    - a. Sod a 6-foot wide area on all lots with shared rear lot lines after utility installation (3-feet on each side of lot line).
  - 4. Fertilizer: State Specifications 629.2.1.2, Type A.
  - 5. Mulch: State Specifications 627. Do not use wood chips.

## 2.07 SOURCE QUALITY CONTROL

- A. Asphaltic paving materials scale: Follow State Specification 450.3.1.1.1.
- B. Concrete paving materials scale: Follow State Specification 501.3.4.5.2.
- C. Base course materials scale: Follow State Specifications 109.1.4.

## PART 3 - EXECUTION

### 3.01 EARTHWORK

- A. Clearing and Grubbing:
  - 1. Follow State Specifications 201.
  - 2. City Staff has first right of refusal for all clearing and grubbing within public right-of-way. Contact City Director of Public Works to coordinate work.
  - 3. Cut wood to maximum 3 foot lengths, stack outside of right-of-way for land owner use. Remove wood not claimed by landowner.
- B. Removing old culverts and bridges. Follow State Specifications 203.3.
- C. Removing miscellaneous structures. Follow State Specifications 204.3 for:
  - 1. Curb and gutter.
  - 2. Asphaltic concrete pavement.
  - 3. Sidewalk.
  - 4. Guardrail.
  - 5. Other structures. Remove manholes, inlets, tanks, wells, buildings to 3 feet below existing or finished grade, whichever is lower.
- D. Roadway and drainage excavation. Follow State Specifications 205.3 for:
  - 1. Common excavation.
  - 2. Rock excavation.
  - 3. Marsh excavation.
  - 4. Stone piles or stone fences.
  - 5. Excavation below subgrade.
- E. Embankment: Follow State Specifications 207.3.
  - 1. Maximum layer thickness: 8 inches.
  - 2. Compaction: Standard.
    - a. 95 percent of maximum density determined by ASTM D698 (Standard Proctor).
    - b. Allow City to inspect prepared subgrade and to witness proof roll test by fully loaded dump truck. Reconstruct where deflection is greater than 1/2 inch.
- F. Preparation of roadway foundation: Follow State Specifications 211.3.

### 3.02 BASE COURSE

- A. Crushed aggregate base course: Follow State Specifications 301 and 305.
  - 1. Compaction: Standard compaction.
    - a. 95 percent of maximum density determined by Modified Proctor.
    - b. Allow City to inspect prepared base course and to witness proof roll test by a fully loaded dump truck. Reconstruct where deflection is greater than 1/2 inch.
  - 2. Allowable deviation from design grade: 1/2 inch
  - 3. Utility structures: Set to finish course elevation (except catch basins and water valve boxes).
  - 4. Layer thickness:
    - a. Commercial: 12" crushed limestone (T.B.).
      - 1. 8" 1-1/4 inch limestone (T.B.).
      - 2. 4" 3/4" crushed limestone (T.B.).
    - b. Residential: 10" crushed limestone (T.B.).
      - 1. 7" 1-1/4 inch crushed limestone (T.B.).
      - 2. 3" 3/4 inch crushed limestone (T.B.).

### 3.03 PAVEMENT AND SURFACE COURSES

- A. Tack coat: Follow State Specification 455.3.2.
  - 1. Apply between each layer of asphaltic concrete.
  - 2. Allow to cure before paving.
- B. Mill butt joints: Mill and dispose of 1-1/2 inches of existing pavement at locations directed by City. Minimum width 3 feet.
- C. Asphaltic concrete pavement: Follow State Specifications 450, 460 and 465.
  - 1. Maximum variations:
    - a. 1/8 inch across a 5 foot straight edge.
    - b. Thickness: Within 1/4 inch of design.
    - c. Finish elevation: Within 1/4 inch of design.
  - 2. Temperatures:
    - a. Delivered binder course: 225 degrees Fahrenheit minimum.
    - b. Delivered surface course: 250 degrees Fahrenheit minimum.
    - c. Asphaltic concrete at placement: Between 235 and 330 degrees Fahrenheit.
    - d. Air temperature: Follow State Specifications 450.3.2.1.
    - e. Subgrade: Above 32 degrees Fahrenheit.
  - 3. Layer thickness:
    - a. Commercial/Industrial:
      - 1. 3-1/4 inches binder (ramp curb flanges and manholes 10 foot radius until surface course placement, ramp should be placed as part of binder course).
      - 2. 1 3/4 inches surface (mill ramps and curb flanges).
    - b. Residential:
      - 1. 2-1/2 inches binder (ramp curb flanges and manholes 10 foot radius until surface course placement, ramp should be placed as part of binder course).
      - 2. 1-1/2 inches surface (mill ramps and curb flanges).
  - 4. Compaction: Follow State Specifications 460.3.3 Maximum Density Method.
  - 5. Saw cut, excavate and remove unstable binder course, base course and subgrade materials. Replace removed materials. Clean binder pavement by sweeping or flushing before applying surface pavement.
  - 6. Pavement Additive: Ace Fiber supplied by Brock White Construction Materials. Follow manufacturer's instructions for proper mixing and placement.

NOTE: Asphalt pavement mix may vary. Verify with DPW/Engineering Department.

7. Allow City to inspect binder course before applying surface course.
8. Joints: All longitudinal joints shall be hot seams.

### 3.04. CONCRETE PAVEMENT

- A. Follow State Specification 415 and 501.
- B. Placement delays.
  1. If less than 30 minutes: Cover unfinished end with wet burlap.
  2. If greater than 30 minutes: Install construction joint.
  3. If concrete attains initial set: Install construction joint.
  4. If finishing equipment breaks down: Discontinue placement.
  5. If finishing and curing operations cannot be kept within their time sequence: Discontinue placement.
- C. Maximum delivery time:
  1. Below 60 degrees Fahrenheit: 1-1/2 hours.
  2. Above 60 degrees Fahrenheit: 1 hour.
  3. Begins with addition of water to cement or cement to aggregates. Time ends when completely discharged.
  4. Extend time above 60 degrees Fahrenheit to 1-1/2 hours with approved retarder.
- D. Joints.
  1. Saw cut joints to prevent surface shrinkage cracks.
    - a. Longitudinal: Saw cut joints within 36 hours after placing concrete.
    - b. Transverse: Saw cut joints by approximately midnight of the same day of the concrete pour.
  2. Spacing: 10 feet minimum and as shown on Drawings.
  3. Width: 1/4 inch.
  4. Depth: Pavement thickness/3.
  5. Tie bars: 3 feet on center placed at mid depth of slab. Follow details on Drawings.
  6. Dowel bars: 1 foot on center placed at mid depth of slab. Follow details on Drawings.
- E. Curing: Apply impervious coating. Follow State Specification 415.3.12
- F. Cold weather concreting.
  1. Do not place below 35 degrees Fahrenheit.
  2. Do not place on frozen grade.
  3. Cover completed Work: Follow State Specifications 415.3.15.2.
- G. Testing:
  1. Follow State Specifications 501.3.10.
  2. Perform slump test. Follow State Specifications 501.3.7.1
  3. Measure air entrainment: Follow State Specifications 501.3.2.4.2, AASHTO T152.
  3. Cast 6 inch diameter by 12 inch high compression strength cylinders.
  4. Cast 3 test cylinders for every 100 cubic yards placed.
  5. Allow City to observe field testing.
  6. Test cylinders in lab:
    - a. 1 at 7 days.
    - b. 2 at 28 days.
    - c. Follow State Specifications 501, AASHTO T22 and T23.
- H. Opening to traffic: Permitted when design compressive strength achieved by lab test samples and with Engineer's approval.

### 3.05 INCIDENTAL CONSTRUCTION

- A. Concrete curb and gutter: Follow State Specification 601.3.
  - 1. Joints.
    - a. Construct expansion joints at:
      - 1) 3 feet from inlets or catch basins.
      - 2) End of curves.
      - 3) 150 feet maximum intervals.
    - b. Construct contraction joints at 10 feet spacing.
      - 1) Minimum spacing: 6 feet.
      - 2) Maximum spacing: 20 feet.
      - 3) Match abutting concrete joints.
      - 4) Depth: Minimum 2 inches.
  - 2. Curing:
    - a. Apply impervious coating within one hour of placement.
    - b. Coat all sides of curb including exposed surface after forms removed.
    - c. Apply two coats in perpendicular directions.
  - 3. Follow Exhibit PAV-05.
  - 4. Stamp face of curb and gutter with "W" over water service location and "S" over sanitary lateral location.
  - 5. Backfill with clean fill. No large stones, roots, debris, or organic materials.
  - 6. Stone base: 4-inches of 3/4-inch crushed limestone.
- B. Sidewalks: Follow State Specifications 602.3.
  - 1. Joints.
    - a. Provide expansion joints abutting existing construction and structures with 1/2 inch expansion joint filler.
    - b. Provide contraction joints at spacing equal to width of walk and:
      - 1) Minimum 3 feet.
      - 2) Maximum 12 feet.
      - 3) Depth: Minimum 1 inch.
      - 4) Width: Approximately 1/8 inch.
  - 2. Curb ramps: Follow State Specifications 602.3.
    - a. Ramps to be staked by Design-Engineer.
  - 3. Curing:
    - a. Follow State Specifications 415.3.12.
    - b. Apply impervious coating within one hour of placement.
    - c. Coat all sides of sidewalk including exposed surface after forms removed.
    - d. Apply two coats in perpendicular directions.
  - 4. Steps: Follow State Specifications 602.3.4.
  - 5. Width: 5 foot (6 foot in front of City owned property). Thickness: 4 inches (6 inches in drives).
  - 7. Stone base:
    - a. Thickness: 4 inches of 3/4" crushed limestone.
    - b. Width: 5 foot (6 foot in front of City owned property).
  - 8. Follow Exhibit PAV-08.
- C. Concrete drive approaches: Follow State Specifications 415.
  - 1. Joints.
    - a. Expansion Joints abutting curb or walk: Use 1/2-inch expansion joint filler.
    - b. Contraction Joints: Locate at midpoint of drive, perpendicular to curb.
      - 1) Minimum spacing 6 feet.
      - 2) Maximum spacing 12 feet.

2. Curing.
    - a. Follow State Specifications 415.3.12.
    - b. Apply impervious coating within one hour of placement.
    - c. Coat all sides of concrete drive approach including exposed surface after forms removed.
    - d. Apply two coats in perpendicular directions.
  3. Stone base: 4-inches of 3/4 inch crushed limestone.
  4. Layer Thickness: 6-inches.
- D. Asphaltic concrete drive approaches.
1. Follow PAVEMENT AND SURFACE COURSES in this Section.
  2. Layer thickness: 3-inches.
  3. Surface course.
  4. Surface gradation: 5LT, 9.5mm.
  5. Stone base: 3-inches of 3/4-inch crushed limestone on 3-inches of 1 1/4-inch crushed limestone.
- E. Pavement sawing. Follow State Specifications 690.3. Cut depth: Full pavement thickness.
- F. Pavement marking: Follow State Specifications 646.3.
1. Apply same day on pavements open to traffic: State Specifications 646.3.1.
  2. Pavement surface temperature:
    - a. Painted: Above 35 degrees Fahrenheit.
    - b. Epoxy: Above 50 degrees Fahrenheit.
  3. Provide clean pavement to ensure proper bonding.
  4. Provide temporary centerline marking at 50 foot interval between paving operations and application of final pavement marking.
  5. Temporary pavement marking: Follow State Specification 649.3 and Drawings.
- G. Drainage facilities:
1. Pipe culverts:
    - a. Follow State Specification 520.3, except Section 520.3.1.
    - b. Bedding: Provide 6 inches of 3/4 inch crushed stone chips below pipe.
  2. Private entrance and temporary culverts. Provide 6 inches of 3/8 inch crushed stone chips below pipe.
  3. Backfill with:
    - a. 3/4 inch crushed limestone.
  4. Consolidate backfill by: Mechanical compaction.
  5. Minimum ditch slope: 1.0%.
  6. Apron endwalls:
    - a. Material: Same as pipe.
- H. Signs: Follow State Specifications 637.3.
1. Relocating signs: Follow State Specifications 638.3.2.
  2. End of roadway marker spacing. Posts 5-foot on center across road width, sign mounting height 4-feet from finished grade to bottom of sign.
    - a. Install signs at dead end streets before issuance of building permits.
- I. Traffic control: Follow State Specification 643.3.
1. Warning lights: Type A.
- J. Guardrail: Follow State Specification 614.3.
- K. Retaining walls: Follow State Specifications 504.3.

END OF SECTION

## **COMMON WORK RESULTS FOR UTILITIES**



## COMMON WORK RESULTS FOR UTILITIES

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Bedding, cover and backfill.
- B. Location aids.
- C. Insulation.
- D. Polyethylene film wrap.
- E. Connections between dissimilar pipes.
- F. Excavation in pavement.
- G. Excess excavated material.
- H. Trench surface restoration.
- I. Pipelines located greater than 4 feet from buildings or reservoir structures.

#### 1.02 RELATED SECTIONS

- A. Water Utility Distribution Piping.
- B. Sanitary Sewerage.
- C. Storm Drainage.
- D. Roadway Construction.

#### 1.03 SUBMITTALS

- A. Mechanical trench compaction reports.
- B. Documentation showing permits have been obtained from Regulatory Agencies for excess material disposal sites.

#### 1.04 REGULATORY REQUIREMENTS

- A. Contact City of Oconomowoc Engineering Department for a Road Opening Permit before starting underground work; 262-569-2189.
- B. Contact City of Oconomowoc department of Public Works for Erosion Control Permit before starting any construction.

### PART 2 - PRODUCTS

#### 2.01 UTILITY PIPE AND APPURTENANCE MATERIALS

- A. Follow Water Utility Distribution Piping.

B. Follow Sanitary Sewerage.

C. Follow Storm Drainage.

## 2.02 BEDDING AND COVER MATERIALS

A. Crushed limestone chips: Follow SWS 8.43.2.

B. Sand: Follow SWS 8.43.2 Table 35.

C. Around and over Underground Facilities: Follow respective owner's requirements.

D. Cover: Same material as bedding.

## 2.03 BACKFILL

A. Granular: Follow SWS 8.43.4.

B. Spoil: Follow SWS 8.43.5.

C. Aggregate slurry: Follow SWS 8.43.8.

D. Crushed road gravel: State Specifications 305.2, 3/4-inch crushed road gravel, gradation No. 2.

## 2.04 LOCATION AIDS

A. Warning tape:

1. "TERRA TAPE EXTRA STRENGTH 540" by Reed Industries, Inc. or "Shieldtec", by Empire Level Manufacturing Corporation.
2. Tape shall read:
  - a. Water: "CAUTION: WATER LINE BURIED BELOW".
  - b. Sanitary:
    - 1) Gravity: "CAUTION - SANITARY LINE BURIED BELOW".
    - 2) Sanitary pressure sewer or force main: "CAUTION - BURIED PRESSURE SEWAGE FORCE MAIN".
  - c. Storm: "CAUTION - BURIED STORM LINE DRAIN".
3. Color: Follow State Statutes 182.0175 and American National Standards Institute (ANSI) Uniform Color Code:
  - a. Water: Blue.
  - b. Sanitary: Green.
  - c. Storm: Green.
  - d. Non-potable water: Blue.
4. Width: 3 inches.

B. Detector wire:

1. Follow SWS 2.11.0.
2. For open-cut: Direct-burial-rated insulated AWG #10 copper conductor.
3. For trenchless installation:
  - a. Aircraft cable, nylon-coated stainless-steel, 3/8-inch diameter.
4. Splices: Follow SWS Drawing File No. 24B. Use plastic heat shrink coating kit or 3M splice kit per Oconomowoc Utilities.
5. Color:
  - a. Water: Blue.
  - b. Sanitary: Green.

- c. Storm: Brown.
    - d. Non-potable water: Purple.
  - 6. Anodes: 1-pound magnesium.
- C. Location boxes for tracer wire access.
  - 1. Water buried: Follow Exhibit LA-03.
    - a. Valvco, Inc. / Snakepit.
    - b. Cover: Marked "WATER" to match buried pipeline.
    - c. Hardwood blocking.
  - 2. Sewer, force main buried: Follow Exhibit LA-02.
    - a. Top section valve box, size DD, 26-inch length.
    - b. Cover: Marked "SEWER".
    - c. Hardwood blocking.
  - 3. On buildings:
    - a. Weather-proof electrical box.
    - b. Marked "SEWER" or "WATER" to match buried pipeline.
- D. Marking post:
  - 1. Water:
    - a. Rhino Marking Post: Rhino TriView Flex TM Posts, BLUE (Water) (USA Blue Book Stock #70450).
    - b. Standard Legend Decals Marked: "WATER PIPELINE" (USA Blue Book #72455).
  - 2. Sanitary:
    - a. Provide green fiberglass post 4-foot high for manholes in easements (USA Blue Book #70457).

## 2.05 SURFACE RESTORATION

- A. Pavement restoration in areas which will not be reconstructed, follow Exhibits PAV02-04:
  - 1. Asphalt pavement SWS 2.7.3.
    - a. Residential: 4-inch total pavement: 2 1/2-inch Binder, 1 1/2-inch surface.
    - b. Industrial: 5-inch total pavement: 3 1/2-inch Binder, 1 1/2-inch surface.
  - 2. Concrete pavement: SWS 2.7.3.
    - a. Residential and commercial: replace in kind.
      - 1. Do not use Calcium Chloride.
  - 3. Stone Base
    - a. Residential: 10-inches of total depth.
      - 1. Lower: 7-inches 1 1/4-inch gradation.
      - 2. Top: 3-inches 3/4-inch gradation.
    - b. Commercial 12-inches of Limestone total depth.
      - 1. Lower: 8-inches 1 1/4-inch gradation.
      - 2. Top: 4-inches 3/4-inch gradation.
- B. Lawn restoration: SWS 2.7.4 Type C.
- C. Curb and gutter restoration: Follow SWS 2.7.3. Do not add calcium chloride.
  - 1. Follow Exhibit PAV-05 of City of Oconomowoc Specifications.
- D. Concrete sidewalk:
  - 1. Follow Exhibit PAV-08.
  - 2. SWS 2.7.3.

2.06 INSULATION

- A. Follow SWS 8.50.0.
- B. Water main less than 6-feet follow Exhibit WM-05.

PART 3 - EXECUTION

3.01 CONNECTING DISSIMILAR PIPE MATERIALS

- A. Follow pipe manufacturers' recommendations and design details.

3.02 EXCAVATION IN PAVEMENT

- A. Pavement sawing: Initially saw concrete or asphalt pavements or concrete bases full depth. Saw, cut with spades, or use another approved method before removing pavement.
- B. Sealed surface pavement: Cut evenly along excavation edges before removal to avoid excess removal or ragged, uneven edges.
- C. Utility trench cut locations: Follow SWS File No. 1 Drawing.
- D. Bridging: Furnish and install trench bridging over open trenches crossing roadways when requested by City. Use steel plates, composite timber construction, or prefabricated structural steel members. Do not fabricate structural steel bridging on job Site. Design to support HS-20 wheel loading. Secure installed bridging against shifting. Do not leave bridging in roadway during winter months without City's approval.

3.03 UTILITY PIPE AND APPURTENANCE INSTALLATION

- A. Follow Water Utility Distribution Piping.
- B. Follow Sanitary Sewerage.
- C. Follow Storm Drainage.

3.04 LOCATION AIDS

- A. Warning tape: Place 24 inches below finished grade for:
  - 1. All force mains.
  - 2. All water mains and services.
  - 3. All sanitary sewers and laterals.
  - 4. All pressure sewers and laterals.
  - 5. All storm sewers, sump lines, and laterals.
- B. Detector wire:
  - 1. Place maximum 6 inches directly above.
    - a. All force mains.
    - b. All water mains and services.
    - c. All sanitary sewers and laterals.
    - d. All pressure sewers and laterals.
    - e. All storm sewers, sump lines and laterals.
  - 2. Do not splice between location boxes without City's approval except at laterals and services.

3. Anodes:
  - a. Place a minimum 1 foot to the side of main or service.
  - b. Place at end of main or service where detector wire end is buried.
  
- C. Install location boxes at:
  1. Water mains.
    - a. Every hydrant.
    - b. 600 feet maximum intervals.
    - c. Locate 6-inches behind hydrant, between hydrant and sidewalk.
  2. Sewers, laterals, and sump lines.
    - a. 600 feet maximum intervals.
    - b. Every third lot.
      - 1) On same side of street as water main.
      - 2) At lot line.
    - c. Sanitary, storm wires can be placed in same location box.
  
- D. Demonstrate continuity of detector wires to City.
  1. Provide a temporary above-ground wire between adjacent location boxes. Connect ohm meter in a series loop with detector wire and above-ground wire. Circuit resistance shall not exceed 5 ohms.
  2. Water main shall be tested with 300 amps AC or DC for 15 minutes. Replace and retest sections failing test.
  
- E. Test locating. Contact Owner to locate all utilities.
  1. After completion of continuity test.
  2. Before acceptance for use.
  
- F. Marking post:
  1. Install per manufacturer's procedures.
  2. Water main:
    - a. Install every 300 feet for water main located outside of roadway.
    - b. At every fitting.
    - c. As directed by City.
  3. Sanitary sewer and storm sewer:
    - a. Install at every structure located outside of roadway.
    - b. As directed by City.
  
- 3.05 INSULATION
  - A. Follow SWS 4.17.2 and SWS Drawing File No. 48 when requested by City or when depth of cover is less than 4-1/2 feet over sanitary sewer or force main.
  - B. Water main and water services: Follow Exhibit WM-05 when depth of cover is less than 6-feet.
  
- 3.06 BEDDING AND COVER
  - A. Follow SWS 3.2.6(b) Class B.
  
- 3.07 TRENCH BACKFILLING AND CONSOLIDATION
  - A. Material:
    1. In existing pavement areas, which will not be reconstructed from 5 feet behind back of curb or edge of pavement in paved areas and driveways:
      - a. Aggregate slurry.
      - b. Top 12-inches 1-1/4-inch, crushed limestone.

2. In future pavement areas, from 5 feet behind back of curb or edge of pavement in paved areas and driveways – granular.
3. Other areas: Spoil will be allowed only with written approval by City.
4. Around and over Underground Facilities: Follow respective owner's requirements.

B. Consolidation:

1. Mechanically compact trench backfill. Follow SWS 2.6.14(b).

### 3.08 SURFACE RESTORATION

A. Pavement restoration in areas which will not be reconstructed, follow Exhibits PAV02-04:

1. Asphalt pavement SWS 2.7.3.
  - a. Residential: 4-inch total pavement: 2 1/2-inch Binder, 1 1/2-inch surface.
  - b. Industrial: 5-inch total pavement: 3 1/2-inch Binder, 1 1/2-inch surface.
2. Concrete pavement: SWS 2.7.3.
  - a. Residential and commercial: replace in kind.
    1. Do not use Calcium Chloride.
3. Stone Base
  - a. Residential: 10-inches of total depth.
    1. Lower: 7-inches 1 1/4-inch gradation.
    2. Top: 3-inches 3/4-inch gradation.
  - b. Commercial 12-inches of Limestone total depth.
    1. Lower: 8-inches 1 1/4-inch gradation.
    2. Top: 4-inches 3/4-inch gradation.

B. Lawn restoration: SWS 2.7.4 Type C.

C. Curb and gutter restoration: Follow SWS 2.7.3. Do not add calcium chloride.

1. Follow Exhibit PAV-05 of City of Oconomowoc Specifications.

D. Concrete sidewalk:

1. Follow Exhibit PAV-08.
2. SWS 27.3.

### 3.09 CLEANUP

A. Clean dirt and construction material from haul roads:

1. At end of each working day.
2. As needed during the day to avoid creating hazards or complaints.
3. As requested by City.

END OF SECTION

**WATER UTILITY DISTRIBUTION PIPING**



## WATER UTILITY DISTRIBUTION PIPING

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Water mains, control and distribution appurtenances.

#### 1.02 RELATED SECTIONS

- A. Common Work Results for Utilities.

#### 1.03 REFERENCES

- A. Wisconsin Administrative Code Chapters:
  - 1. NR 105 - Surface Water Quality Criteria and Secondary Values for Toxic Substances.
  - 2. NR 106 - Procedures for Calculating Water Quality Based Effluent Limitations for Point Source Discharges to Surface Waters.
  - 3. NR 811 – Requirements for the Operation and Design of Community Water Systems.
- B. ASTM C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.
- C. American Water Works Association (AWWA):
  - 1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
  - 2. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
  - 3. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
  - 4. AWWA C151 - Ductile-Iron Pipe Centrifugally Cast.
  - 5. AWWA C502 - Dry Barrel Fire Hydrants.
  - 6. AWWA C504 - Rubber Seated Butterfly Valves.
  - 7. AWWA C509 - Resilient Seated Gate Valves for Water Supply Service.
  - 8. AWWA C550 - Protective Interior Coatings for Valves and Hydrants.
  - 9. AWWA C600 - Installation of Ductile Iron Water Main
  - 9. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 4 In. Through 12 In. for Water Distribution.
  - 10. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 14 In. Through 48 In.
- D. (SWS) Standard Specifications for Sewer and Water Construction in Wisconsin. Latest Edition.
- E. (State Specifications) Standard Specifications for Highway and Structure Construction, State of Wisconsin Department of Transportation. Latest Edition.

#### 1.04 SUBMITTALS

- A. Water main safe sample test reports.
- B. Water main pressure test reports.

#### 1.05 REGULATORY REQUIREMENTS

- A. Contact City of Oconomowoc Engineering Department for a Road Opening Permit before starting underground work, 262-569-2189.

- B. Contact City of Oconomowoc Department of Public Works for Erosion Control Permit before starting any construction.
- C. Contact City of Oconomowoc Water Department for water main design and installation above 918MSL elevation.
- D. All water main shall be designed and installed on a looped system.
- E. Hydrant spacing shall not exceed 500-feet along water main.
- F. No more than 7 customers are allowed on a dead-end water.
- G. No more than 13 customers between main line valves.

## PART 2 - PRODUCTS

### 2.01 LEAD REDUCTION

- A. Products and parts thereof with wetted surfaces in contact with drinking water shall meet or exceed the requirements of Public Law 111-380-Reduction of Lead in Drinking Water Act, which is an amendment to the Safe Drinking Water Act.

### 2.02 WATER MAIN PIPE AND APPURTENANCES

- A. Pipe, 2-inch and larger shall be ductile iron:
  1. AWWA C-151, thickness Class 52 with cement lining.
  2. Tyton-gasketed joint pipe.
  3. Cable bond connectors.
  4. SWS 8.18.0.
  5. Minimum 18-foot length.
  6. Exterior Zinc coating per ISO 8179 may be required at City direction, based upon exposure to corrosive soils.
  
- B. Valves, 2 through 16-inches in diameter:
  1. Resilient seat gate valve.
  2. AWWA C-515 including:
    - a. Nonrising stem.
    - b. Restrained mechanical joints.
    - c. Actuator: 2-inch square operating nut.
    - d. Opens counterclockwise.
    - e. Stem seals: O-ring.
    - f. Epoxy interior and exterior coating per ANSI/AWWA C550.
    - g. SWS 8.27.0.
    - h. Include mega-lugs.
    - i. All bolts to be stainless steel.
  3. M&H Valve Company 4067-01.
  4. Waterous.
  5. Mueller Company.
  
- C. Valve boxes:
  1. Cast iron 3-piece assembly, size DD, cover marked "WATER", "Milwaukee Style" with concealed pick holes.
  2. Threaded base with notched top for adjustment.
  3. Manufacturers: Tyler 6860.
  4. SWS 8.29.0.
  5. Valve box adaptors: Adaptors, Inc. - #6 base adaptor.
  6. Use round base for 8-inch and smaller valves.
  7. Use oval base for 10-inch and larger valves.

- D. Valve stem extenders for mains greater than 8 feet of cover:
1. Securely attached to valve operator.
  2. Extend to 4 feet (plus or minus 3-inches) below finished grade.
  3. All sizes to be solid shaft.
  4. Epoxy-coated iron with stainless steel pins or bolt.
  5. Spacer ring at 3-inches below operating nut.
- E. Hydrant assembly:
1. AWWA C-502 and SWS 8.26.0:
    - a. Bury depth: 6 foot minimum.
    - b. Opens counterclockwise.
    - c. Break flange.
    - d. Bronze to bronze seat.
    - e. All hardware below grade to be stainless steel.
    - f. Hydrant leads require anchor tee with valve on tee and Mega-Lug restraints at other connections.
    - g. 5-1/4-inch minimum main valve opening, National Standard 2-1/2-inch hose nozzle and 4-1/2-inch pumper nozzle.
    - h. Painted: Pennsbury Paint No. 9032. Old Yeller.
    - i. Mechanical joint connection.
    - j. Barrel extensions: Same manufacturer as hydrants.
  2. Waterous WB-67 Pacer.
  3. Hydrant lead 6-inch ductile iron Class 52. Entire length of lead must be restrained.
  4. Marker flag:
    - a. "Hydra finder."
    - b. 5 feet long.
    - c. Fiberglass, red and white.
    - d. Spring loaded action.
  5. Anchoring devices:
    - a. Mechanical-joint anchoring-type hydrant tee.
    - b. EBBA Iron Megalug or Uni-Flange.
    - c. Strapping: See SWS 4.9.0.
  6. Sampling Station:
    - a. Eclipse No. 88
    - b. See Detail WM-06
    - c. Required in all new construction or as directed by Oconomowoc Water Utility
- F. Fittings: SWS 8.22.0.
1. Joints:
    - a. Buried: Mechanical and restrained.
    - b. In structures: Flanged.
  2. Pressure rating:
    - a. Full body: 250 PSI.
    - b. Compact: 350 PSI.
  3. Material:
    - a. Ductile iron:
      - 1) Class 52 wall thickness.
      - 2) Bituminous exterior coating per ANSI/AWWA C153.
      - 3) Cement lined and bituminous coated interior per ANSI/AWWA C104/A21.4.
      - 4) Cor-Blue tee bolts.
- G. Service lines, valves and fittings.
1. Lines, 2-inch and smaller:
    - a. Type K copper tubing.
    - b. Include saddles on 1 1/2-inch and larger - stainless steel-full band style:
      - 1). Smith-Blair Series 372 or equivalent.

- c. 1 1/4-inch services will allow use of a 1-inch tap by 1 1/4-inch outlet corporation stop.
- d. Resilient seat gate valve on services 2-inch and larger.
- 2. Corporation valves for copper:
  - a. Must withstand 150 PSI pressure test.
  - b. Use compression fittings.
  - c. Mueller H15008.
  - d. Ford F1001.
  - e. A.Y. McDonald 4701-22.
- 3. Curb valves for copper:
  - a. Must withstand 150 PSI pressure test.
  - b. Use compression fittings.
  - c. Mueller H15209.
  - d. Ford B44.
  - e. A.Y. McDonald 6100-22.
  - f. Size: 3/4-inch to 1-1/2-inch
- 4. Curb boxes:
  - a. Arch pattern.
  - b. Tyler Pipe 6500 series - screw type 100-F.
  - c. Adjustable from 6 feet to 8 feet.
- 5. Teflon tape on threaded joints.
- 6. For polyethylene on private side of lateral (curb stop to metering point) use stainless steel stiffeners.

- H. Tapping sleeves with gate valve 16-inch and under:
  - 1. Stainless steel, Smith Blair 662 or equivalent, with ductile iron flange, minimum length 12-inches.
  - 2. Must pass combined water and air test to 150 psi.
  - 3. Used only with written permission of Water Utility.

- I. Buttress concrete.
  - 1. Class F SWS 8.35.3.
  - 2. Use one of the following:
    - a. Ready-mixed.
    - b. Job site mixed above grade.

- J. Joint restraints:
  - 1. Strapping following SWS 4.9.0.
  - 2. EBAA Iron Megalug Series 1100.
  - 3. Uni-Flange Series 1400.
  - 4. Tough grip.

- K. Air release assemblies:
  - 1. In valve box: SWS 4.12.0.
  - 2. In vault: SWS 4.11.0 and 8.39.1, except provide HS20 load-rated flat top slab.

- L. Meters:
  - 1. Contact Oconomowoc Water Utility for meter type and specifications
  - 2. See Detail WM-07 for meters 2-inch and greater.
  - 3. Water Meter Horn Sizing:
    - a. 5/8-inch water meter fits #1 meter horn
    - b. 3/4-inch water meter fits #3 meter horn.
    - c. 1-inch water meter fits #4 meter horn.
  - 4. All water meter settings 1 1/2-inch and larger must be metallic
    - a. Plastic and PVC settings are not allowed.

## 2.03 INCIDENTAL CONSTRUCTION

- A. Follow Common Work Results for-Utilities for:

1. Bedding.
2. Cover.
3. Backfill.
4. Location aids.
5. Trenchless utilities.
6. Insulation.
7. Polyethylene film.
8. Surface restoration.

### PART 3 - EXECUTION

#### 3.01 WATER MAIN INSTALLATION

- A. Follow SWS Part IV except wet-tap service connections at normal operating system pressure and do not use polyethylene wrap.
- B. Bedding and cover: Sand. Use stone chips only for undercut areas. Follow SWS 4.3.3.
- C. Ductile iron: Provide electric continuity using strapping.
- D. Hydrants:
  1. Secure hydrant valves directly to main lines with anchor tee.
  2. Position to:
    - a. Provide minimum 6 foot cover over lead and 4-foot radius around barrel.
    - b. Set centerline of lowest hydrant outlet nozzle 24-inches above finish grade.
    - c. Provide 3 feet minimum separation from back-of-curb. Variances as approved by the Oconomowoc Water Utility.
    - d. Provide 4 feet unobstructed air space radius around barrel.
    - e. Set traffic 16-inch break flange at 2 to 4 inches above final grade.
  3. Install hydrant marking flag after final adjustments.
  4. Use strapping for hydrant leads longer than one length of pipe.
- E. Buttresses: SWS 4.3.13.
- F. Services:
  1. Design Engineer shall field stake new services' location and grade before installation.
  2. New services to be placed at the center of the buildable area of each lot.
  3. Extend water services 10 feet beyond right-of-way if requested by Electric Utility.
  4. Pressure test water services with water main.
  5. For 2-inch and smaller follow SWS Part V and:
    - a. Provide curb stop and box 1 foot outside at public right-of-way line. (1 foot off edge of sidewalk).
    - b. Provide 2 by 6-inch hardwood marker at curb box location from invert of service to 2 feet above finished grade for new services.
    - c. Provide tail piece. Follow SWS File No. 51.
    - d. Bury depth from finish grade: Minimum 6 feet. Maximum 6 1/2 feet.
    - e. Allow a minimum of 4-inches of adjustment in both directions from final grade for all stop boxes. Set stop box 6 feet above top of curb stop.
    - f. Curb stop boxes installed within the sidewalk shall be removed and reinstalled per direction of Water Utility.
  6. For 3-inch and larger follow SWS Part IV and V and:
    - a. Provide tee connection.
    - b. Anchor valve to tee with anchor tee or strapping.
    - c. Provide plug and buttress.
    - d. Provide 2 by 6-inch hardwood marker at end of service from invert of service to 2 feet above finished grade for new services.
  7. Do not use polyethylene wrap.

8. New Services are required for redevelopment, remodels, or as directed by Oconomowoc Water Utility at property owners expense. No Lead services are allowed.
9. Water services shall not be located in a driveway.
10. All water service locations shall be approved by the City of Oconomowoc Water Utility.
11. Stamp face of curb and gutter with "W" over water lateral location.

G. Pressure test: SWS 4.15.0 and 3.01 J.

H. Disinfect pipelines:

1. SWS 4.3.12 and SWS 4.16.0.
2. After successful pressure test, perform bacteriological water sampling and laboratory testing following SWS 4.16.0 with Wisconsin DNR certified independent laboratory.
3. See 3.01 J for additional requirements.

I. Water wasted from pipeline that may reach bodies of surface water may not contain any substances in concentrations that adversely affect the water as determined by the Wisconsin Administrative Code NR 105 and 106. For chlorine, no total residual chlorine may be measured in water being discharged to a surface water. Advise Utility of proposed discharge schedule to arrange DNR-required measurements.

J. Water main tests and connections:

1. Perform pressure test after mains and services have been constructed. A minimum 24-hour notice must be given before pressure testing. Demonstrate to Oconomowoc Water Utility that main line and hydrant valves in test area are open.
2. Make no physical connection to existing water main without a safe water sample(s) from new Work. Filling of mains for chlorination will be done using hydrants. City of Oconomowoc Water Utility personnel are the only authorized individuals to operate these hydrants.
3. Safe water samples will be taken at locations specified by the Oconomowoc Water Utility. One working day notice must be provided to Water Utility before taking samples. Oconomowoc Water Utility or authorized personnel must be present.
4. Oconomowoc Water Utility must receive copies of the test results before connecting the new water main to the existing system.
5. After connection has been made, check all valves with Water Utility personnel to verify they are opened or closed as required.
6. Contact Oconomowoc Water Utility at 262-569-3199 or fax to 262-569-2164.

K. Valves to be operated by Oconomowoc Water Utility only.

L. Valve boxes: Initially set valve box elevation to binder course elevation. After asphalt surface course paving, adjust top-of-box flush to 1/2-inch below final grade with appropriate adjusting ring.

M. For connections or repairs to existing pipe, install copper jumper wire to maintain continuity of existing system and to protect employees. Install copper jumper before any physical cut is made to water main or service line.

N. See Appendix B - Record Drawing Standards.

### 3.02 INCIDENTAL CONSTRUCTION

A. Follow Common Work Results for Utilities for:

1. Connecting dissimilar pipe materials.
2. Excavation in pavement.
3. Bedding.
4. Cover.

5. Backfill.
6. Location aids.
7. Insulation.
8. Polyethylene film.
9. Excess excavated material.
10. Surface restoration.

END OF SECTION

## **SANITARY SEWERAGE**



## SANITARY SEWERAGE

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Sanitary sewer mains, force mains and maintenance and collection appurtenances.

#### 1.02 RELATED SECTIONS

- A. Common Work Results for Utilities.

#### 1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  1. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
  2. ASTM C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
  3. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
  4. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
  5. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series).
  6. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
  7. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings.
  8. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
  9. ASTM D3034 - Standard Specification for Type PSM Poly(VinylChloride) (PVC) Sewer Pipe and Fittings.
  10. ASTM D3251 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
  11. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
  12. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings.
- B. American Association of State Highway and Transportation Officials (AASHTO):
  1. AASHTO M198 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
  2. AASHTO T99 - Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.
- C. United States Department of the Interior-Bureau of Reclamation. Standard Specifications for Reinforced Concrete Pressure Pipe.
- D. American Water Works Association (AWWA):
  1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
  2. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
  3. AWWA C151 - Ductile-Iron Pipe Centrifugally Cast.
  4. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 4 In. Through 12 In. for Water Distribution.
  5. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 14 In. Through 48 In.

- E. (SWS) Standard Specifications for Sewer and Water Construction in Wisconsin. Latest Edition.
- F. (Standard Specifications) Standard Specifications for Highway and Structure Construction, State of Wisconsin Department of Transportation. Latest Edition.

1.04 SUBMITTALS

- A. Provide to City "pump around" operation plan for sewer relays.
- B. Provide to City "flume" operation plan for sewer relays.
- C. Sanitary Manhole Shop Drawings

1.05 REGULATORY REQUIREMENTS

- A. Contact City of Oconomowoc Engineering Department for a Road Opening Permit before starting underground work, 262-569-2189.
- B. Contact City of Oconomowoc Department of Public Works for Erosion Control Permit before starting any construction.

PART 2 - PRODUCTS

2.01 GRAVITY SANITARY SEWER

- A. Pipe:
  - 1. Polyvinyl chloride and fittings solid wall:
    - a. 4-inch through 15-inch: Type PSM, ASTM D-3034, SDR 35.
    - b. 18-inch: Type PSM, ASTM F-679, 12454C.
    - c. SWS 8.3.0 and 8.10.0.
    - d. Depth: 0-12 feet: SDR35  
 >12-20 feet: SDR26  
 >20 feet: C900 or greater.
  - 2. Reinforced concrete:
    - a. Circular Pipe: ASTM C-76, wall thickness C, Class III-V.
    - b. Joints: Type R-4 air test gasket, ASTM C-361.
    - c. SWS 8.3.0 and 8.6.0.
    - d. XYPEX admixture may be required at City direction, based on anticipated exposure to hydrogensulfide.
- B. Pressure-rated pipe. If not shown on Drawings use one type from following:
  - 1. Polyvinyl chloride pipe:
    - a. 4 through 12 inch: Follow AWWA C900 SDR18 or less.
    - b. 14 through 20 inch: Follow AWWA C905 SDR 18 or less.
  - 2. Ductile iron:
    - a. AWWA thickness Class 52.
    - b. Tyton gasketed joint pipe.
    - c. Rubber gasketed.
    - d. Polyethylene film wrap: SWS 8.21.0.
  - 3. Fittings for PVC and ductile iron pipe shall follow SWS 8.22.0 and:
    - a. Joints:
      - 1) Buried: Mechanical.
      - 2) In structures: Flanged.
    - b. Pressure rating:
      - 1) Full body: 250 PSI.
      - 2) Compact: 350 PSI.

- c. Material:
      - 1) Ductile iron class 52 wall thickness.
      - 2) Bituminous exterior coating following ANSI/AWWA C110/A21.10.
      - 3) Cor-Blue tee bolts.
  - 4. Interior coating for ductile iron pipe and fittings:
    - a. Cement-lined and bituminous-coated following ANSI/AWWA C104/A21.4
- C. Bulkhead and Plug: SWS 3.2.25.
- D. Structures:
  - 1. Manholes: SWS 3.5.0. and 8.39.0.
  - 2. Adjusting Rings:
    - a. High Density Polyethylene(HDPE), use approved butyl sealant
    - b. LADTECH INC., or approved equal
    - c. Maximum height: 16 inches.
  - 3. Steps:
    - a. Follow SWS 3.5.4.(g).
    - b. Epoxy coated steel.
  - 3. Frame:
    - a. SWS File No. 14A.
    - b. Neenah 1550 heavy.
    - c. Follow Exhibit SAN-03.
  - 4. Cover: Self sealing, concealed pick hole, no vents. Follow Exhibit SAN 03 of "City of Oconomowoc Specifications".
    - a. Neenah 1050-5210
    - b. Marked "Sanitary".
    - c. Manhole adjusting rings (steel riser) not allowed.
  - 5. Bolt-down frame/cover: SWS File No. 32 except use Neenah 1916C. Use bolt down cover for manholes located on private property, outlots or as directed by City.
  - 6. Frame/chimney seal: Internal/External Adaptor Seal by Adaptor, Inc.
  - 7. Pipe to manhole connection: Follow SWS 3.5.7. up to 21-inch pipe.
  - 8. Pipe to manhole seal: 24-inches and larger, use NPC Contour Seal.
  - 9. Flat decks - HS20 loading.
  - 10. Mastic: Trowable Tremco-60.
  - 11. Provide one green fiberglass post 4 feet high for manholes in easements (part No. USA Bluebook 70457).
  - 12. XYPEX admixture may be required at City direction, based on anticipated exposure to hydrogensulfide.
  - 13. Invert Drops:
    - a. 0.1-foot across straight manholes
    - b. 0.2-foot across bend manholes
- E. Sampling or sampling/gauging manholes.
  - 1. All commercial/industrial sewers shall be installed with a sampling or sampling/gauging manhole.
  - 2. Type of structure required will be determined by City of Oconomowoc WWTF based on the type of facilities connected to the sewer.
  - 3. Sampling manhole:
    - a. Follow SWS 3.5.8. (42" diameter manhole).
    - b. Follow 2.02 D. for manhole requirements.
    - c. Follow Exhibit SAN-04 City of Oconomowoc Specifications for sampling configuration.
    - d. Flat deck: HS 20 loading.
    - e. XYPEX admixture may be required at City direction, based on anticipated exposure to hydrogensulfide.
  - 4. Sampling/gauging manhole:
    - a. Follow SWS 3.5.8.

- b. Follow 2.02D for manhole requirements.
- c. Frame: Neenah R-1740B or R-1916H.
- d. Cover: Self sealing, concealed pick hole no vents.
- e. Follow Exhibit SAN-05 City of Oconomowoc Specifications.
- f. XYPEX admixture may be required at City direction, based on anticipated exposure to hydrogensulfide.

F. Risers:

- 1. SWS 3.2.26.
- 2. For flexible-riser-to-flexible-main greater than 6 feet, or main greater than 16 feet deep, follow Exhibit SAN-02 "City of Oconomowoc Specifications".
- 3. Where design on new sanitary risers is necessary, the use of double risers if encouraged.

G. Laterals:

- 1. SWS 5.3.10 and 5.3.11 and same material as main.
- 2. Lateral size:
  - a. One and two family: 4-inch minimum.
  - b. Commercial and industrial: 6-inch minimum.
  - c. Three family or greater: Sized in accordance with the State plumbing code.
- 3. Test tee with plugs.
- 4. Connection to main: Wyes.
- 5. Adapt pressure rated pipe to SDR35 with manufactured (molded) fittings.

## 2.02 INCIDENTAL CONSTRUCTION

A. Follow Common Work Results for Utilities for:

- 1. Bedding.
- 2. Cover.
- 3. Backfill.
- 4. Location aids.
- 5. Trenchless utilities.
- 6. Insulation.
- 7. Polyethylene film.
- 8. Surface restoration.

## 2.03 SANITARY SEWER FORCE MAIN

A. Pipe. If not shown on Drawings, use one type from following:

- 1. PVC, with integral elastomeric bell-and-spigot joints, with the following:
  - a. AWWA C-900 for 6 through 12-inch diameter. Class 150 pressure pipe with DR 18 or less. SWS 8.51.0.
  - b. AWWA C-905 for 14 through 36-inch diameter. CIOD pressure pipe rated 235 PSI with DR18 or less. SWS 8.51.0.
  - c. ASTM D-2241 with Plastics Pipe Institute hydrostatic design stress of 200 PSI and SDR of 26 or less.
- 2. Ductile iron:
  - a. SWS 8.18.0.
  - b. AWWA thickness Class 52 with cement lining.
  - c. AWWA thickness Class 52 with polyethylene lining.
  - d. Bell and spigot push-on joint SWS 8.18.2.
  - e. Polyethylene film wrap: SWS 8.21.0.
- 3. Polyethylene:
  - a. Material designation: PPI PE 3408.
  - b. Material classification: Type III, Class C, Category 5, Grade P34.
  - c. Cell classification: 345434C per ASTM D3350.
  - d. Pressure class: As approved by City ENGINEER..

- B. Fittings for ductile iron:
1. Joints:
    - a. Buried: Mechanical.
    - b. In structures: Flanged.
  2. Pressure Rating:
    - a. Full body: 250 PSI.
    - b. Compact: 350 PSI.
  3. Material:
    - a. Ductile iron:
      - 1) Class 52 wall thickness.
      - 2) Bituminous exterior coating per ANSI/AWWA C110/A21.10.
      - 3) Cement lined and bituminous coated interior per ANSI/AWWA C104/A21.4.
      - 4) Buried: Cor-Blue tee bolts. Exposed: Stainless steel.
- C. Restrained joints:
1. Strapping following SWS 4.9.0.
  2. EBAA Iron Megalug.
  3. All Star Pipe Products Allgrip.
- D. Fittings for polyethylene pipe:
1. ASTM D3261.
  2. Pressure class:
    - a. Molded fittings: Match pipe.
    - b. Fabricated fittings: Increase pressure rating one class.
  3. Butt fused or flanged.
  4. Exposed: Molded flange adaptor with ductile iron or stainless steel backup ring and stainless steel bolts.
  5. Buried: Molded mechanical restrained joint adaptor with stainless steel internal stiffener and ductile iron or stainless steel backup ring with Cor-Ten hardware.
- E. Valves: DeZurik Series 100 plug style.
- F. Valve boxes:
1. Cast iron 3-piece assembly, size DD, cover marked "sewer".
  2. Threaded base with notched top for adjustment.
  3. Manufacturers: Tyler 6860, Sigma VB630DD, Star VB DHD DW.
  4. SWS 8.29.0.
  5. Valve box adaptors: Adaptors, Inc.
- G. Valve stem extenders:
1. Securely attached to valve operator.
  2. Extend to 4 feet (plus or minus 3-inches) below finished grade.
  3. For 6 feet and longer provide solid shaft.
  4. Epoxy coated iron with stainless steel pins or bolts.
  5. Spacer ring at 3-inch below operating nut.
- H. Structures:
1. Valve manholes: SWS 3.5.0 and 8.39.0.
  2. Manholes: SWS 3.5.0. and 8.39.0.
  3. Steps: Follow SWS 3.5.4.(g).
  4. Frame: Neenah 1550-0002 Oconomowoc Standard.
  5. Cover:
    - a. Self sealing, concealed pick hole, no vents.
    - b. Follow Exhibit SAN-03 of City of Oconomowoc Specifications.
    - c. Neenah 1050-5210
    - d. Marked "Sanitary".
    - e. Manhole adjusting rings (steel riser) not allowed.

6. Bolt-down frame/cover: SWS File No. 32 except use Neenah 1916C. Use bolt down cover for manholes located on private property, outlots or as directed by City.
7. Internal rubber sleeves: Cretex Specialty Products or NPC Flex Rib.
8. Pipe to manhole connection: Follow SWS 3.5.7. up to 21-inch pipe.
9. Pipe to manhole seal: 24-inches and larger, use NPC Contour Seal.
10. Flat decks - HS20 loading.
11. Mastic: Trowable Tremco-60.
12. XYPEX admixture may be required at City direction, based on anticipated exposure to hydrogensulfide.
13. Provide one green fiberglass post 4' high for manholes in easements (part No. USA Bluebook 70457).

I. Air release assemblies:

1. Vault: SWS 4.11.0, except provide HS 20 load-rated flat top slab.
2. In valve box: SWS 4.12.0 except include:
  - a. Valve stem extenders.
  - b. Lid: Plan or "SEWER".
  - c. Drain stop:
    - 1) Female iron pipe inlet and flared copper outlet. Ford B21-333.
    - 2) A.Y. McDonald 6105 with A.Y. McDonald 4753 copper flare-by-male iron pipe thread.

### PART 3 - EXECUTION

#### 3.01 GRAVITY SANITARY SEWER INSTALLATION

- A. Before starting, bulkhead and/or plug the connection to existing sewer. Leave in place until new sewer has been cleaned and accepted. No break-in connects allowed. All connections shall be a water tight connection.
- B. Bedding and cover:
  1. Stone chips.
  2. Follow SWS 3.2.6(b) Class B.
- C. Follow SWS Part III.
- D. Structures:
  1. Do not locate steps over pipe wall penetrations. Follow SWS File No. 13.
  2. Wrap external surface of all joints below the water table with MAC wrap.
  3. Frame/chimney seal: Internal/External Adaptor Seal by Adaptor, Inc. Install per manufacturers instructions.
  4. Do not backplaster chimney interiors.
  5. Pour benches to springline.
  6. Fill void above manhole pipe boot with mastic and towel mortar in place.
  7. Set manhole rims to 0 to 1/4-inch below final finish grade.
  8. Do not use wood shims.
  9. Place 10-foot radius ramp around manholes when binder course is placed.
  10. Manhole Vacuum testing:
    - a. Test time of mercury drop from 10-inches to 9-inches.
    - b. Follow SWS 3.7.6.
    - c. Test before placing frame.
  11. Internal/External seal testing:
    - a. Test all internal seals prior to final completion.
    - b. Pour one gallon of dyed water into top of seal.
    - c. Seal must hold for minimum of one minute.
    - d. Retest until seal passes test.
    - e. Allow City to witness testing of seals.

12. Install adjusting rings per manufacturers specifications.
- E. Laterals. Follow SWS Part V and:
1. 1/4-inch per foot maximum slope. 1/8-inch per foot minimum slope. Follow SWS 5.3.5
  2. Provide 2 by 6-inch hardwood marker at end of lateral from invert of lateral to 2 feet above finish grade for new laterals.
  3. Provide test tee at right-of-way line.
  4. Stamp face of curb and gutter with "S" over sewer location.
  5. Engineer will stake laterals before construction.
  6. Maximum depth at property line shall be 12 feet to finish grade. Invert elevations shall be shown on the Drawings.
- F. Interceptor Connection:
1. All interceptor connections will be evaluated and accepted on a case-by-case basis.
  2. All connections must be approved in writing by the WTF prior to connection to system.
- G. Sanitary sewer repairs/relays:
1. Pump around Work zone.
  2. Do not allow sanitary flow to migrate through work zone, infiltrate into soils or be conveyed in any manner open to air or in contact with soil or groundwater.
  3. Submit a "pump around" operation plan to City for approval before starting construction. Include a detail of equipment to be used, location of equipment, hours of operation, and safeguards to assure proper operation, 24-hour emergency contact numbers.
  4. Submit a "flume" operation plan to the City for approval, prior to starting construction. Include a detail of equipment to be used, location of equipment, hours of operation, and safe guards to assure proper operation, 24-hour emergency contact numbers.
  5. Follow "pump around" plan during working hours. Follow "flume" plan during non-working hours.
  6. City may stop work if the construction activities deviate from the "pump around" and/or "flume" plans or if construction activities are not performed to the satisfaction of the City.
  7. Fernco couplings require stainless steel bands, nuts, clamps and housings.
- H. Pressure Test: SWS 3.7.3.
- I. Go-No-Go Test: SWS 3.2.6(i)4.
- J. Cleaning and televising of mains:
1. City shall be responsible for video recording of sanitary sewer upon completion of following items:
    - a. Manhole benches poured.
    - b. Surfacing restored.
    - c. Pipe work successfully tested.
  2. Cost of all video recording and cleaning of lines shall be the responsibility of Developer.
- 3.02 SANITARY SEWER FORCE MAIN INSTALLATION
- A. Follow SWS Part IV (Delete 4.3.12.).
- B. Bedding and cover: Stone chips.

- C. Pressure test:
  - 1. Follow SWS 4.15.2 except test at pipe pressure rating or 150 PSI, whichever is less.
  - 2. Before testing, repair or replace piping, valves, fittings, structures or other parts of system which have visible defects or leakage even if leakage or pressure loss may be below allowable limits.
- D. Manhole: Follow 3.01.D.
- E. Polyethylene:
  - 1. Butt-fuse joints following ASTM D2657 and manufacturer's recommendations.
  - 2. Connect to flanged pipe with molded flange adaptor with ductile iron backup ring.
  - 3. Install following ASTM D2321, SWS, and manufacturer's recommendations.
  - 4. Provide embedment material from 6-inches below pipe to 12-inches above top of pipe and compact to 85 percent Standard Proctor density (AASHTO T-99).
- F. Protect cut ends and bell fittings with factory-supplied, field-applied touchup coating.

### 3.03 INCIDENTAL CONSTRUCTION

- A. Follow Common Work Results for Utilities for:
  - 1. Connecting dissimilar pipe materials.
  - 2. Excavation in pavement.
  - 3. Bedding.
  - 4. Cover.
  - 5. Backfill.
  - 6. Location aids.
  - 7. Insulation.
  - 8. Polyethylene film.
  - 9. Excess excavated material.
  - 10. Surface Restoration.

END OF SECTION

## **STORM DRAINAGE**



## STORM DRAINAGE

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

A. Storm sewer and storm water facility mains, maintenance and collection appurtenances.

1. Shall be designed to be within a street right of way.
2. If approved by the City, any storm sewer and appurtenances located between 2 parcels must be centered in a 20-foot wide outlot.

B. Underdrains.

#### 1.02 RELATED SECTIONS

A. Common Work Results for Utilities.

#### 1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM C76 - Standard Specification for Reinforced concrete Culvert Storm Drain, and Sewer Pipe.
2. ASTM C361 - Standard Specifications for Reinforced Concrete Low-Head Pressure Pipe.
3. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
4. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
5. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
6. ASTM C506 - Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.
7. ASTM C507 - Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.
8. ASTM C698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort.
9. ASTM A760 - Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains.
10. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

B. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe.
2. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500- mm (12- to 60-in.) Diameter.
3. AASHTO Section 30 - Standard Specification for Highway Bridges, Division II, Section 30, Thermoplastic Pipe.
4. AASHTO M36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains.

- C. United States Department of the Interior - Bureau of Reclamation. Standard Specifications for Reinforced Concrete Pressure Pipe.
  - D. American Water works Association (AWWA):
    - 1. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated fittings 4 In. Through 12 In. for Water Distribution.
    - 2. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated fittings 14 In. Through 48 In.
  - E. (SWS) Standard Specifications for Sewer and Water Construction in Wisconsin. Latest Edition.
  - F. (Standard Specifications) Standard Specifications for Highway and Structure Construction, State of Wisconsin Department of Transportation. Latest Edition.
- 1.04 SUBMITTALS
- A. Buoyancy calculations for storm water mechanical separator.
- 1.05 REGULATORY REQUIREMENTS
- A. Contact City of Oconomowoc Engineering Department for a Road Opening Permit before starting underground work, 262-569-2189.
  - B. Contact City of Oconomowoc Department of Public Works for Erosion Control Permit before starting any construction.

## PART 2 - PRODUCTS

### 2.01 STORM SEWER

- A. Concrete Pipe:
  - 1. Reinforced concrete pipe (RCP): SWS 8.6.0.
  - 2. Reinforced concrete horizontal elliptical pipe: ASTM C-507 and SWS 8.6.0.
  - 3. Minimum Size: 15-inches or equivalent diameter unless approved by City Staff
- B. Structures:
  - 1. Manholes:
    - a. SWS 3.5.0 and 8.39.0.
    - b. Follow Exhibit STO-01 "City of Oconomowoc Specifications".
  - 2. Manhole frame and cover:
    - a. Follow Exhibit STO-01 "City of Oconomowoc Specifications".
    - b. Frame Neenah 1550-0002. Oconomowoc Standard.
    - c. Cover Neenah 1050-0071 Oconomowoc Standard. Lettered Storm.
    - d. Bolt-down frame/cover: SWS File No. 32 except use Neenah 1916C. Use bolt down cover for manholes located on private property, outlots or as directed by City.
  - 3. Catch basin:
    - a. SWS 3.6.0 for precast.
    - b. Follow Exhibit STO-03 "City of Oconomowoc Specifications".
    - c. Include 12-inch sump in catch basin without downstream treatment.
  - 4. Catch basin frame and cover:
    - a. Neenah 3067-R (use 3067-L if vaned grate required by direction of City).
  - 5. Field Inlet frame and beehive cover:
    - a. Neenah R-2561

6. Concrete block: State Specifications 519.2.2 (salt resistant pink block.).
7. Inlet and catch basin mortar: State Specifications 519.2.3.
8. Flat decks: HS20 Design Loading.
9. High Density Polyethylene Adjusting Rings for all structures, use approved butyl sealant.
10. Mastic: Tremco 60.
11. Mechanical separator: Stormceptor.

C. End sections:

1. State Specifications Sections 520 through 525 for apron endwalls and same material as pipe.
2. 15-inch pipe and larger:
  - a. Include trash rack. No inline grates allowed.
  - b. SWS 8.16.0.
  - c. Follow Exhibit STO-02 "City of Oconomowoc Specifications".

2.02 UNDERDRAINS

- A. Follow State Specifications 612.

2.03 INCIDENTAL CONSTRUCTION

- A. Follow Common Work Results for Utilities for:

1. Bedding.
2. Cover.
3. Backfill.
4. Location aids.
5. Insulation.
6. Polyethylene film.
7. Surface restoration.

PART 3 - EXECUTION

3.01 STORM SEWER INSTALLATION

- A. Follow SWS Part III.

- B. Bedding and cover:

1. Stone chips.

- C. Structures:

1. Manholes:
  - a. Set manhole frames to asphaltic finish grade after placement of curb and gutter and before asphalt placement.
  - b. Place 10 foot radius ramp around manholes when binder course is placed.
  - c. Coat exterior surface of chimney with trowelable mastic extending over chimney joints and frame.
  - d. Provide plastic wrap (minimum 4 mil.) around all mastic areas prior to backfilling.
  - e. Set casting flanges onto full bed of mortar. Do not use wood shims.
2. Catch basins:
  - a. Follow Exhibit STO-03 of "City of Oconomowoc Specifications".
  - b. Set catch basin at binder grade until surface course is placed (provide three feet of interim curb until final surface paving).

- c. Rings shall be High Density Polyethylene and sealed using manufacturer's approved butyl sealant following manufacturer's recommendations. Use polyethylene adjustment sleeve.
- d. A maximum 2-inches horizontal tolerance to match curb and gutter is allowed on catch basin structures.
- e. Provide a maximum 8-inches of vertical adjusting rings for catch basins.
- f. Do not use wood shims.

D. Sump lines:

- 1. Pitch to inlet or manhole.
- 2. Bedding and cover for PVC following SWS 3.2.6.i.

E. Mechanical separators.

- 1. Install units per manufacturer's recommendations.
- 2. Provide shop drawings and buoyancy calculations. Buoyancy calculations must take into account high groundwater conditions. Calculations should be stamped by a registered Professional Engineer licensed in the State of Wisconsin.
- 3. Installation of units shall include the necessary bypass structure and all connections.

3.02 UNDERDRAIN INSTALLATION

- A. Follow State Specifications 612.

3.03 INCIDENTAL CONSTRUCTION

A. Follow Common Work Results for Utilities for:

- 1. Connecting dissimilar pipe materials.
- 2. Excavation in pavement.
- 3. Bedding.
- 4. Cover.
- 5. Backfill.
- 6. Location aids.
- 7. Insulation.
- 8. Polyethylene film.
- 9. Excess excavated material.
- 10. Surface restoration.

END OF SECTION

## **WARRANTY**

## GUARANTEE/WARRANTY

The Contractor and/or Developer shall leave the entire project improvements for which he is responsible in good working order, and shall at his expense replace, repair, modify, and make good and acceptable all defective workmanship, and materials, per City Specifications, that may develop within one year after substantial completion of the work. Substantial completion shall begin once asphalt binder has been placed. Warranty provisions shall not bar any claims against Contractor or subcontractors for negligence.

## CORRECTION PERIOD

If within one year after the date of the substantial completion as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Developer's Agreement or by any specific provisions of the contract documents, any Work is found to be *defective*, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) correct such *defective* Work, or, if it has been rejected by the City, remove it from the site and replace it with Work that is not *defective*, and (ii) satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in any emergency where delay would cause serious risk of loss or damage, the City may have the *defective* Work corrected or the rejected Work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

Two to four months prior to the end of the one year correction period, a visual inspection of all work will be conducted with the Developer and Engineer or his representative to insure all work is in good order. Developer and/or Contractor shall arrange this inspection. **Correction period shall not expire until this inspection is completed and all items are satisfied.**

## **EXHIBITS**

## LIST OF EXHIBITS

### EROSION CONTROL

- EC-01 City of Oconomowoc Silt Fence Detail
- EC-02 City of Oconomowoc Erosion Bales Detail
- EC-03 City of Oconomowoc Inlet Protection A, B, C, and D Detail
- EC-04 City of Oconomowoc Manufactured Ditch Check & Perimeter Control Detail

### SANITARY

- SAN-01 City of Oconomowoc Typical Sanitary Sewer Manhole Detail
- SAN-02 City of Oconomowoc Riser Detail - Flexible Riser To Flexible Main Risers Greater Than 6 Feet In Height or Mains Greater than 16 Feet Deep
- SAN-03 City of Oconomowoc Sanitary Manhole Cover and Assembly Neenah (R-1550 Heavy)
- SAN-04 City of Oconomowoc Detail of Sampling Manhole
- SAN-05 City of Oconomowoc Details of Sampling and Gauging Manholes
- SAN-06 City of Oconomowoc Pump Station Control Panel Door Layout
- SAN-07 Manhole Vacuum Testing

### WATER

- WM-01 City of Oconomowoc Sampling Hydrant
- WM-02-1 City of Oconomowoc Hydrant Setting Detail (Urban Cross Section)
- WM-02-2 City of Oconomowoc Hydrant Setting Detail (Rural Cross Section)
- WM-03 City of Oconomowoc Water Service Offset Detail
- WM-04 City of Oconomowoc Typical Water Main/Branch Service Offset
- WM-05 City of Oconomowoc Buried Piping Insulation Detail
- WM-06 City of Oconomowoc Sampling Station Detail
- WM-07 City of Oconomowoc Meter Test Port for Water Main

### STORM

- STO-01 City of Oconomowoc Storm Manhole
- STO-02 City of Oconomowoc Trash Rack
- STO-03 City of Oconomowoc Storm Catch Basin Detail
- STO-04 City of Oconomowoc Field Inlet Detail (24 inches or larger)
- STO-05 City of Oconomowoc Concrete Invert Detail
- STO-06 City of Oconomowoc Inlet Adjustment

### LOCATION AIDS

LA-01	Tracer Wire Layout Detail
LA-02	Detection Wire and Location Box for Force Main, Sanitary Sewer, and Laterals
LA-03	Detection Wire and Location Box for Water Main and Water Services
LA-04	Detection Wire and Location Box for Building Services and Laterals

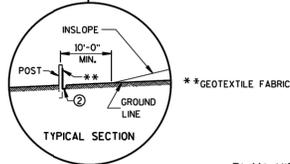
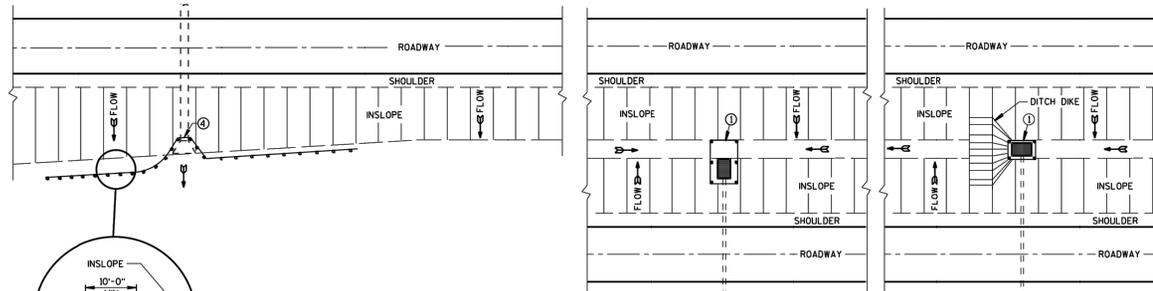
### PAVEMENT

PAV-01	City of Oconomowoc Curb Ramp Detail
PAV-02	City of Oconomowoc Typical Boulevard Detail – 100' ROW
PAV-03	City of Oconomowoc Typical Commercial/Industrial Road Cross Section
PAV-04	City of Oconomowoc Typical Collector Road for Residential Areas
PAV-05	City of Oconomowoc Typical Road for Residential Areas
PAV-06	City of Oconomowoc Typical Curb & Gutter Detail
PAV-07	City of Oconomowoc Type 1 Driveway Detail (Commercial)
PAV-08	City of Oconomowoc Type 1 Driveway Detail (Residential)
PAV-09	City of Oconomowoc Typical Sidewalk Detail
PAV-10	City of Oconomowoc Single Catch Basin – Reinforced Concrete Curb Detail
PAV-11	City of Oconomowoc Reinforced Concrete Curb Expansion Joint Detail
PAV-12	City of Oconomowoc Typical Cul-De-Sac and Offset Bulb Detail

### UTILITY EASEMENTS

UT-01	City of Oconomowoc Typical Utility Easement
UT-02	City of Oconomowoc Typical Utility Placement for Residential Districts- Detail
UT-03	City of Oconomowoc Typical Utility Placement for Commercial/Industrial Districts- 80-Foot ROW Detail

**8E9: Silt Fence**



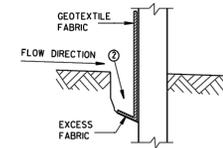
PLAN VIEW  
 TYPICAL APPLICATION OF SILT FENCE

SITUATION 1 SITUATION 2  
 PLAN VIEW  
 SILT FENCE AT MEDIAN SURFACE DRAINS

**GENERAL NOTES**

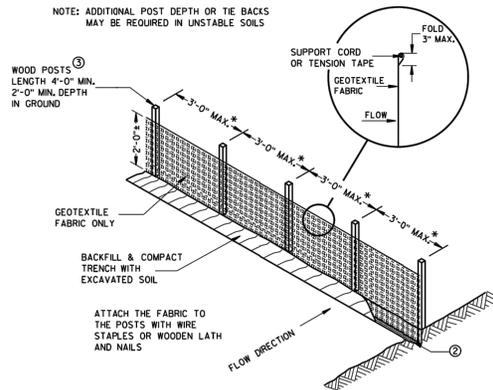
DETAILS OF CONSTRUCTION NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND APPLICABLE SPECIAL PROVISIONS.

- ① HORIZONTAL BRACE REQUIRED WITH 2" X 4" WOODEN FRAME OR EQUIVALENT AT TOP OF POSTS.
- ② FOR MANUAL INSTALLATIONS THE TRENCH SHALL BE A MINIMUM OF 4" WIDE & 6" DEEP TO BURY AND ANCHOR THE GEOTEXTILE FABRIC, FOLD MATERIAL TO FIT TRENCH AND BACKFILL & COMPACT TRENCH WITH EXCAVATED SOIL.
- ③ WOOD POSTS SHALL BE A MINIMUM SIZE OF 1 1/4" X 1 1/4" OF OAK OR HICKORY.
- ④ SILT FENCE TO EXTEND ACROSS THE TOP OF THE PIPE.
- ⑤ CONSTRUCT SILT FENCE FROM A CONTINUOUS ROLL IF POSSIBLE BY CUTTING LENGTHS TO AVOID JOINTS; IF A JOINT IS NECESSARY USE ONE OF THE FOLLOWING TWO METHODS: A) OVERLAP THE END POSTS AND TWIST, OR ROTATE, AT LEAST 180 DEGREES; B) HOOK THE END OF EACH SILT FENCE LENGTH.



TRENCH DETAIL

6



SILT FENCE

NOTE: ADDITIONAL POST DEPTH OR TIE BACKS MAY BE REQUIRED IN UNSTABLE SOILS

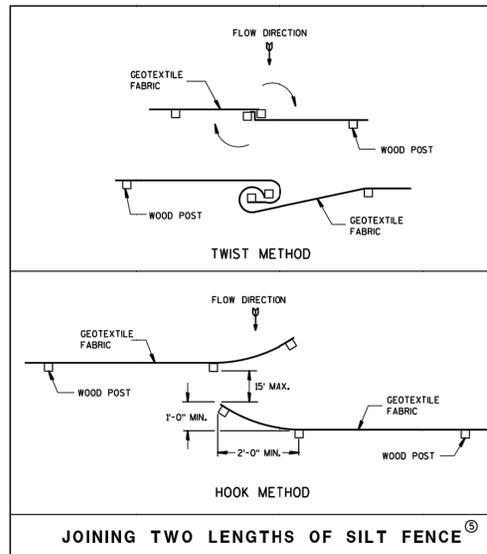
WOOD POSTS ③  
 LENGTH 4'-0" MIN.  
 2'-0" MIN. DEPTH  
 IN GROUND

GEOTEXTILE  
 FABRIC ONLY

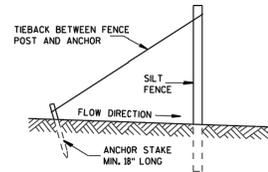
BACKFILL & COMPACT  
 TRENCH WITH  
 EXCAVATED SOIL

ATTACH THE FABRIC TO  
 THE POSTS WITH WIRE  
 STAPLES OR WOODEN LATH  
 AND NAILS

\* NOTE: 8'-0" POST SPACING ALLOWED IF A  
 WOVEN GEOTEXTILE FABRIC IS USED.



JOINING TWO LENGTHS OF SILT FENCE ⑤



SILT FENCE TIE BACK  
 (WHEN REQUIRED BY THE ENGINEER)

6

S.D.D. 8 E 9-6

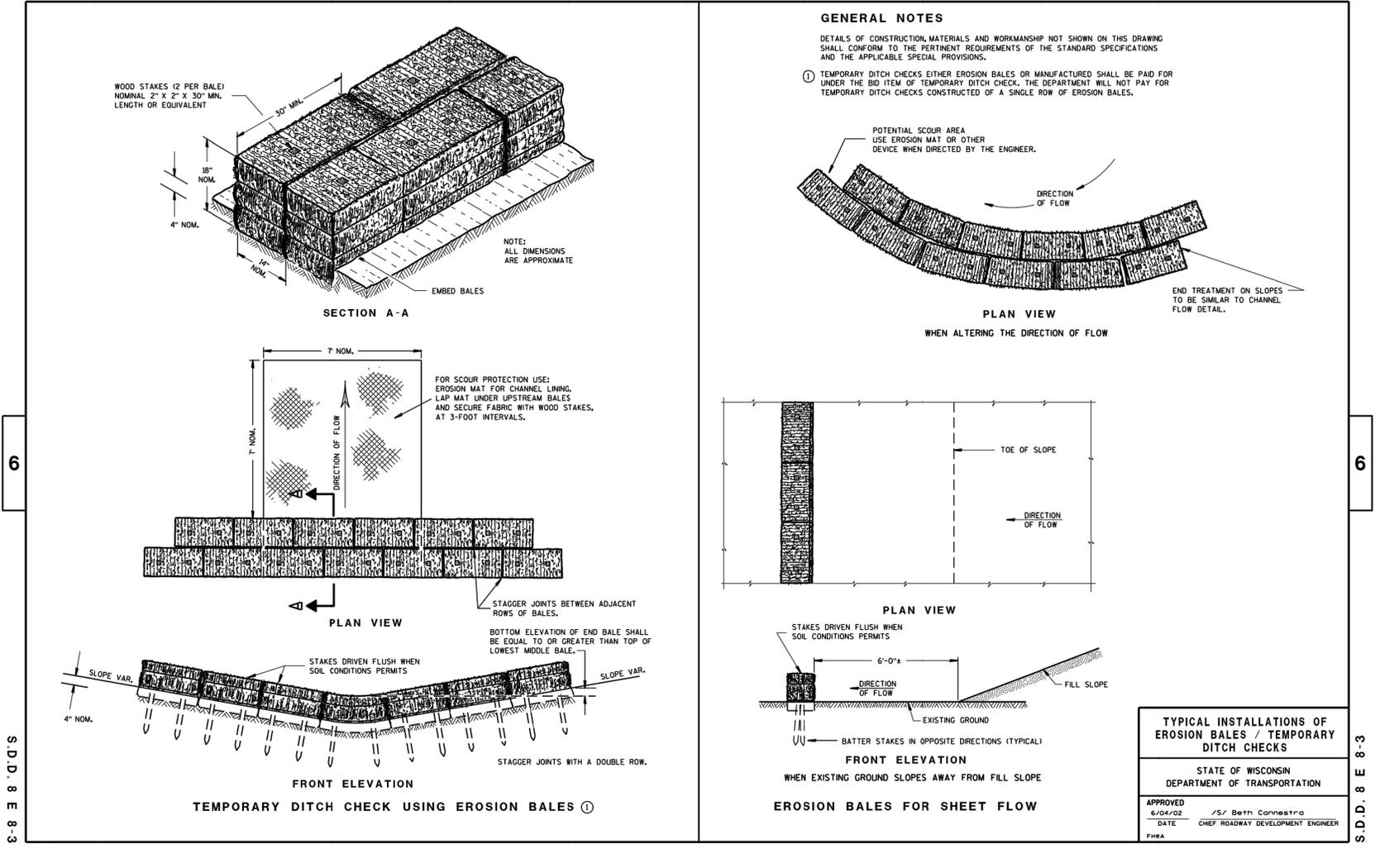
S.D.D. 8 E 9-6

<b>SILT FENCE</b>	
STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION	
APPROVED 4-29-05 DATE	/s/ Beth Conestra CHEF ROADWAY DEVELOPMENT ENGINEER FHWA

**SILT FENCE DETAIL**

NO SCALE

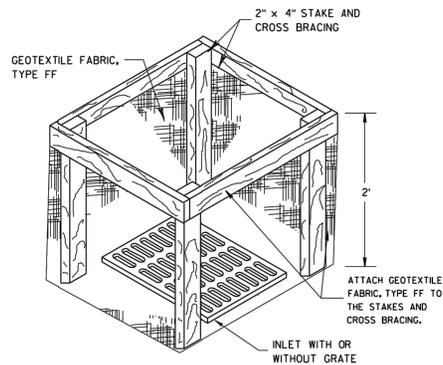
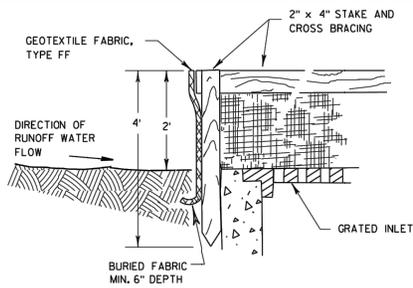
**8E8: Typical Installations of Erosion Bales/Temporary Ditch Checks**



**EROSION BALES DETAIL**

NO SCALE

## 8E10: Inlet Protection Type A, B, C and D



**INLET PROTECTION, TYPE A**

### GENERAL NOTES

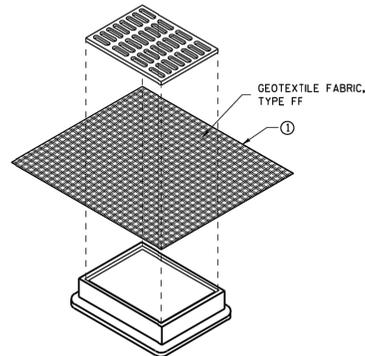
INLET PROTECTION DEVICES SHALL BE MAINTAINED OR REPLACED AT THE DIRECTION OF THE ENGINEER.

MANUFACTURED ALTERNATIVES APPROVED AND LISTED ON THE DEPARTMENT'S EROSION CONTROL PRODUCT ACCEPTABILITY LIST MAY BE SUBSTITUTED.

WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED ON THE GEOTEXTILE FABRIC DOES NOT FALL INTO THE INLET, ANY MATERIAL FALLING INTO THE INLET SHALL BE REMOVED IMMEDIATELY.

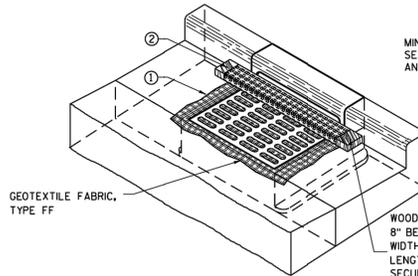
- ① FINISHED SIZE, INCLUDING FLAP POCKETS WHERE REQUIRED, SHALL EXTEND A MINIMUM OF 10" AROUND THE PERIMETER TO FACILITATE MAINTENANCE OR REMOVAL.
- ② FOR INLET PROTECTION, TYPE C (WITH CURB BOX), AN ADDITIONAL 18" OF FABRIC IS WRAPPED AROUND THE WOOD AND SECURED WITH STAPLES. THE WOOD SHALL NOT BLOCK THE ENTIRE HEIGHT OF THE CURB BOX OPENING.
- ③ FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2X4.

S.D.D. 8 E 10-2



**INLET PROTECTION, TYPE B (WITHOUT CURB BOX)**

(CAN BE INSTALLED IN ANY INLET WITHOUT A CURB BOX)



**INLET PROTECTION, TYPE C (WITH CURB BOX)**

### INSTALLATION NOTES

#### TYPE B & C

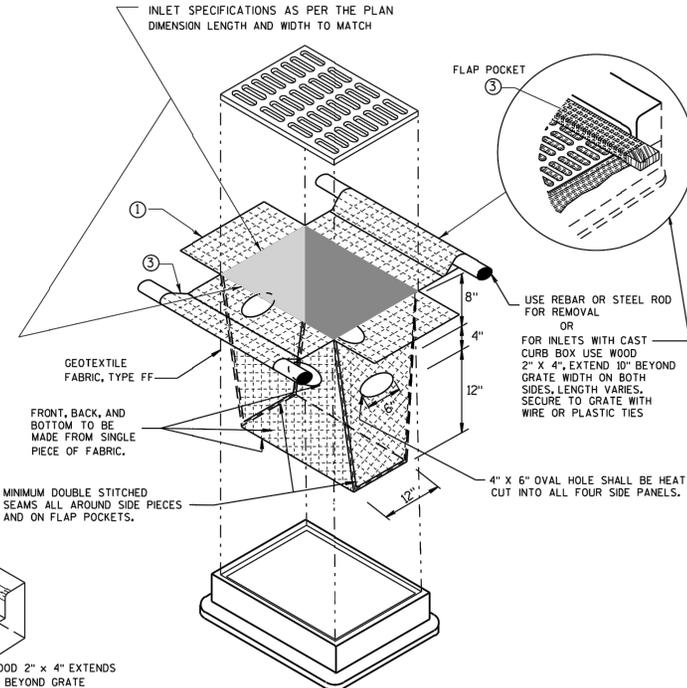
TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE. THE CONTRACTOR SHALL DEMONSTRATE A METHOD OF MAINTENANCE, USING A SEWN FLAP, HAND HOLDS OR OTHER METHOD TO PREVENT ACCUMULATED SEDIMENT FROM ENTERING THE INLET.

#### TYPE D

DO NOT INSTALL INLET PROTECTION TYPE D IN INLETS SHALLOWER THAN 30", MEASURED FROM THE BOTTOM OF THE INLET TO THE TOP OF THE GRATE.

TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE.

THE INSTALLED BAG SHALL HAVE A MINIMUM SIDE CLEARANCE, BETWEEN THE INLET WALLS AND THE BAG, MEASURED AT THE BOTTOM OF THE OVERFLOW HOLES, OF 3". WHERE NECESSARY THE CONTRACTOR SHALL CINCH THE BAG, USING PLASTIC ZIP TIES, TO ACHIEVE THE 3" CLEARANCE. THE TIES SHALL BE PLACED AT A MAXIMUM OF 4" FROM THE BOTTOM OF THE BAG.



**INLET PROTECTION, TYPE D**

(CAN BE INSTALLED IN ANY INLET TYPE WITH OR WITHOUT A CURB BOX AS PER NOTE ②)

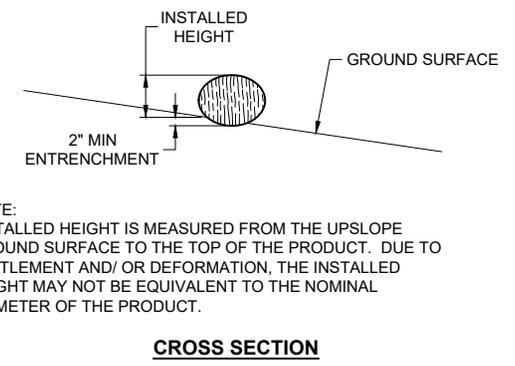
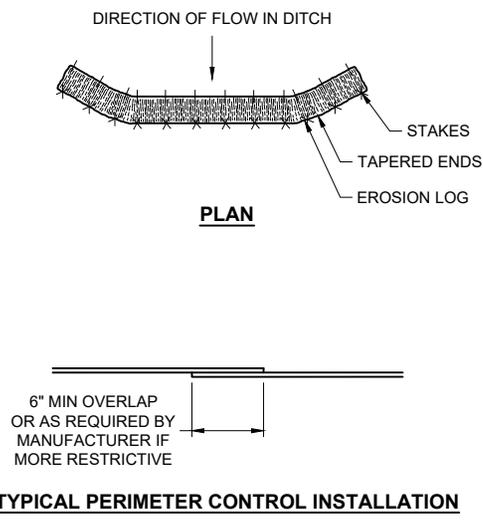
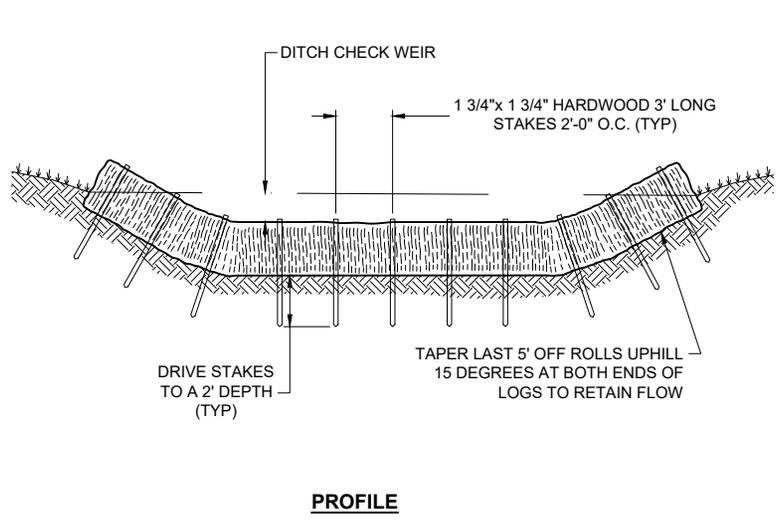
**USE TYPE D INLET PROTECTION, UNLESS OTHERWISE APPROVED BY THE CITY STAFF**

<b>INLET PROTECTION TYPE A, B, C, AND D</b>	
STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION	
APPROVED 10-16-02 DATE	/s/ Beth Connestra CHIEF ROADWAY DEVELOPMENT ENGINEER
FHWA	

S.D.D. 8 E 10-2

# INLET PROTECTION A, B, C, & D DETAIL

NO SCALE



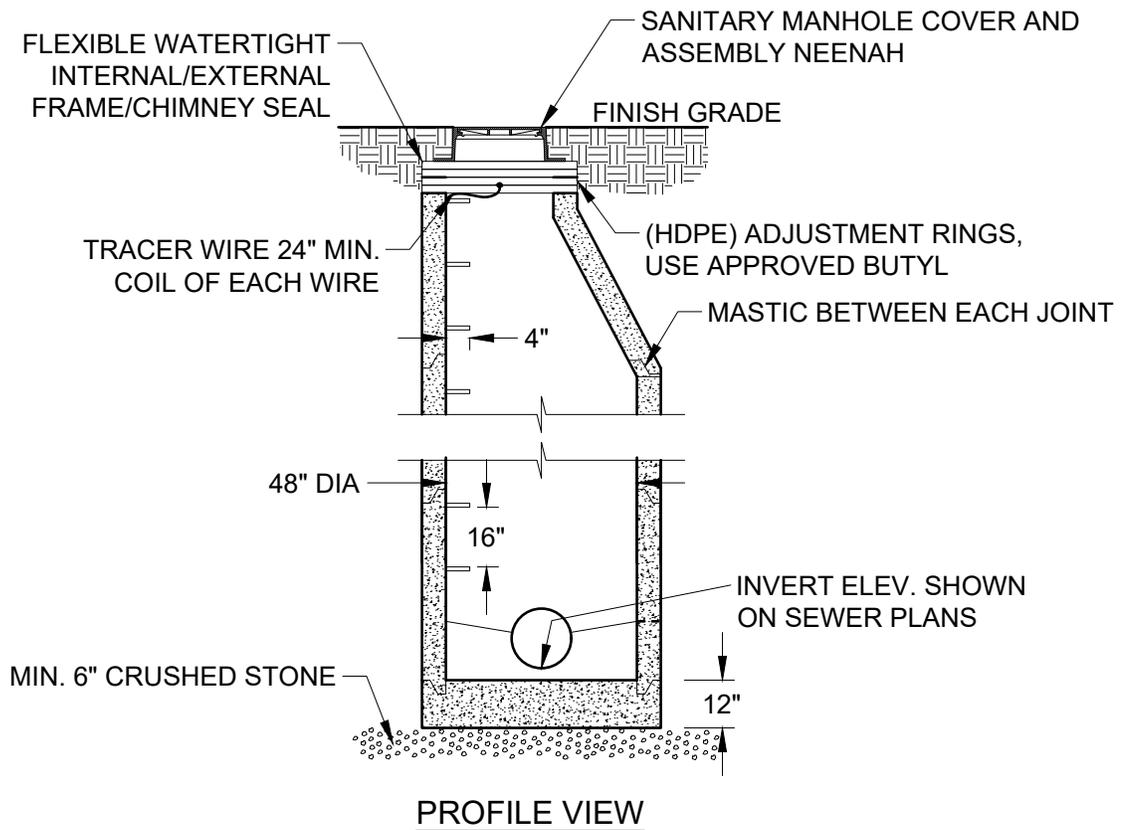
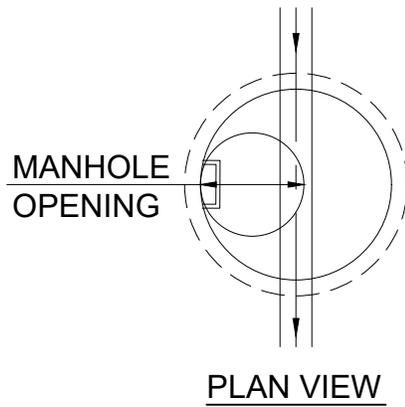
NOTE:  
 INSTALLED HEIGHT IS MEASURED FROM THE UPSLOPE GROUND SURFACE TO THE TOP OF THE PRODUCT. DUE TO SETTLEMENT AND/ OR DEFORMATION, THE INSTALLED HEIGHT MAY NOT BE EQUIVALENT TO THE NOMINAL DIAMETER OF THE PRODUCT.

NOTE:  
 DITCH CHECK SHALL BE INSTALLED SO THAT THE ENDS OF THE CHECK ARE HIGHER IN ELEVATION THAN THE MIDDLE IN ORDER TO FORM A WEIR.

**MANUFACTURED DITCH CHECK AND PERIMETER CONTROL DETAIL**

EC-DITCH-07 16

NO SCALE



NOTES:

1. TRACER WIRE TO BE BROUGHT INTO MANHOLE BETWEEN ADJUSTING RINGS. MINIMUM OF 24" TRACER WIRE TO BE COILED HUNG ON STEP IN MANHOLE
2. MANHOLE OPENING TO BE LOCATED OVER STEPS.
3. MANHOLE STEPS SHALL NOT BE LOCATED OVER SEWER.

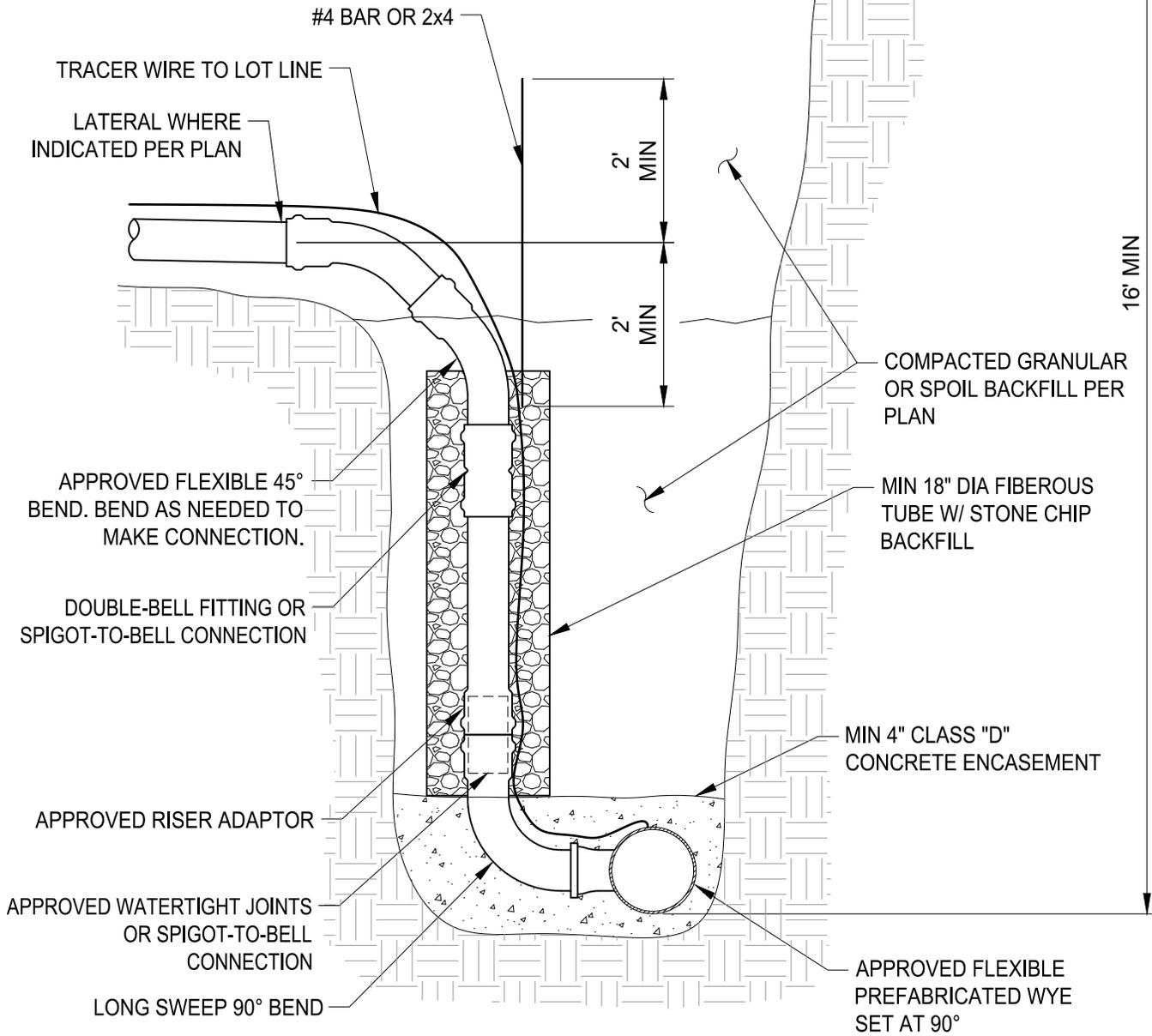
## TYPICAL SANITARY SEWER MANHOLE DETAIL

Sanitary MH typ opening offset 1

NO SCALE

### EXHIBIT SAN-01

Feb 14, 2019 3:30pm  
 R:\RawMaterials\Drawings\library\CLIENT 47\Z-006--SAN-02\_Riser Detail--Flexible Riser to Flexible Sewer Main.dwg Model  
 IMAGES: G:\SHT\RMGrphic.jpg;  
 XREFS: R:\RawMaterials\Drawings\library\CLIENT 47\Flexible Riser Detail.dwg; G:\SHT\Drawing\_Cells\DC2X4.DWG



**NOTES:**

1. FOR FLEXIBLE RISER TO FLEXIBLE MAINS GREATER THAN 6 FT HIGH OR MAINS GREATER THAN 16 FT DEEP
2. FOR FUTURE CONNECTION, END COMPACTED GRANULAR BACKFILL AT UPPER END OF 45° BEND AND PLUG BEND WITH WATER TIGHT STOPPER
3. IN ADDITION TO APPROVED RISER ADAPTOR, A SHORT NIPPLE WITH PROVIDED BELL TO BELL CONTACT COULD ALSO BE APPLICABLE.
4. WYE TO BE PLACED IN DIRECTION OF MAIN FLOW.

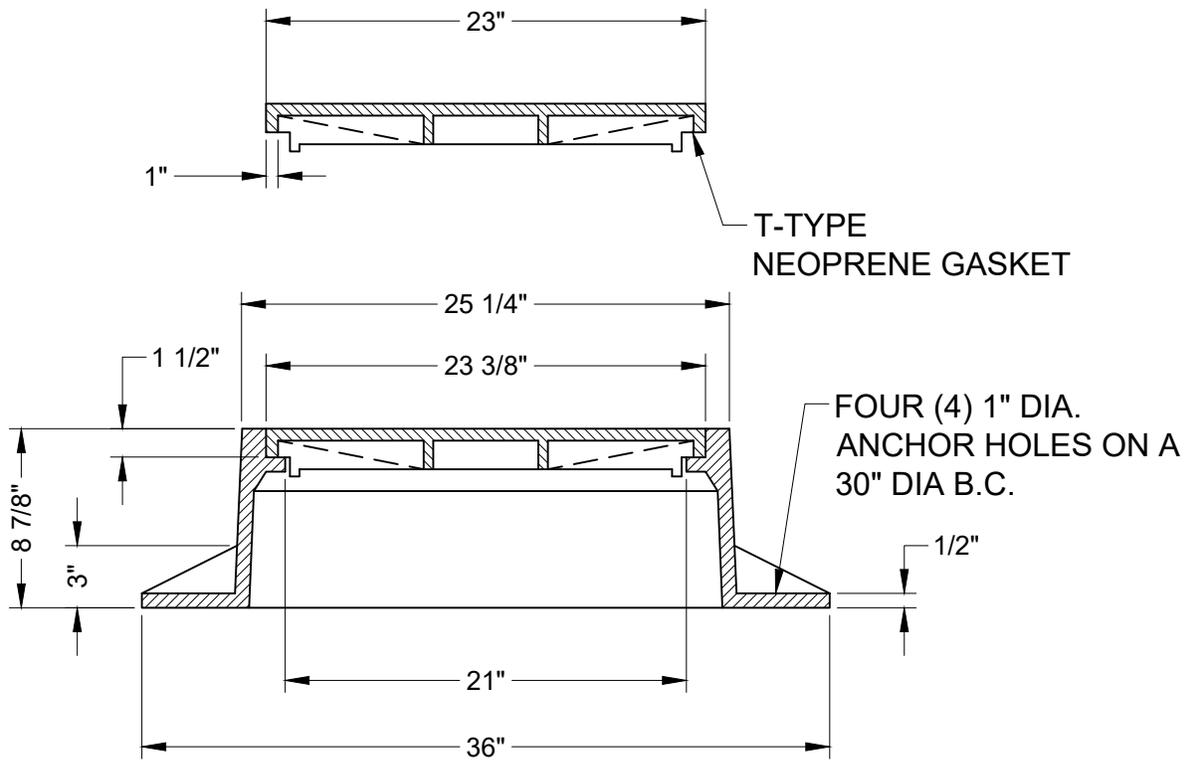
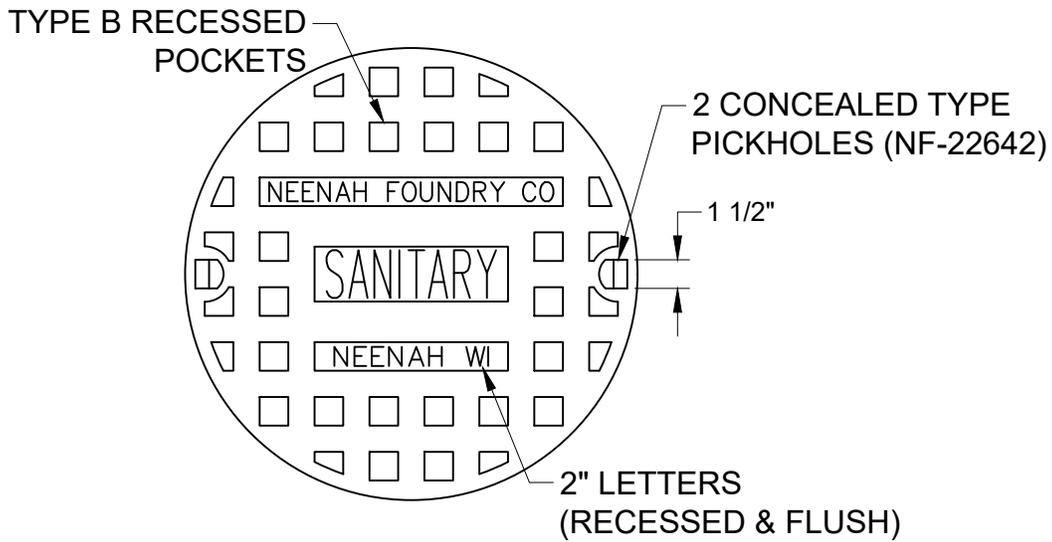
**FLEXIBLE RISER TO FLEXIBLE SEWER MAIN**

NO SCALE

SAN-RISER-01 2

**EXHIBIT SAN-02**

Feb 14, 2019 3:33pm  
R:\RawMaterials\Drawings\library\CLIENT 47\Z-007-SAN-03\_Sanitary Manhole Cover and Assembly Neenah-R-1550.dwg Model  
IMAGES: G:\SHT\RM\Grphic.jpg  
XREFS: .\Sanitary MH cover.dwg



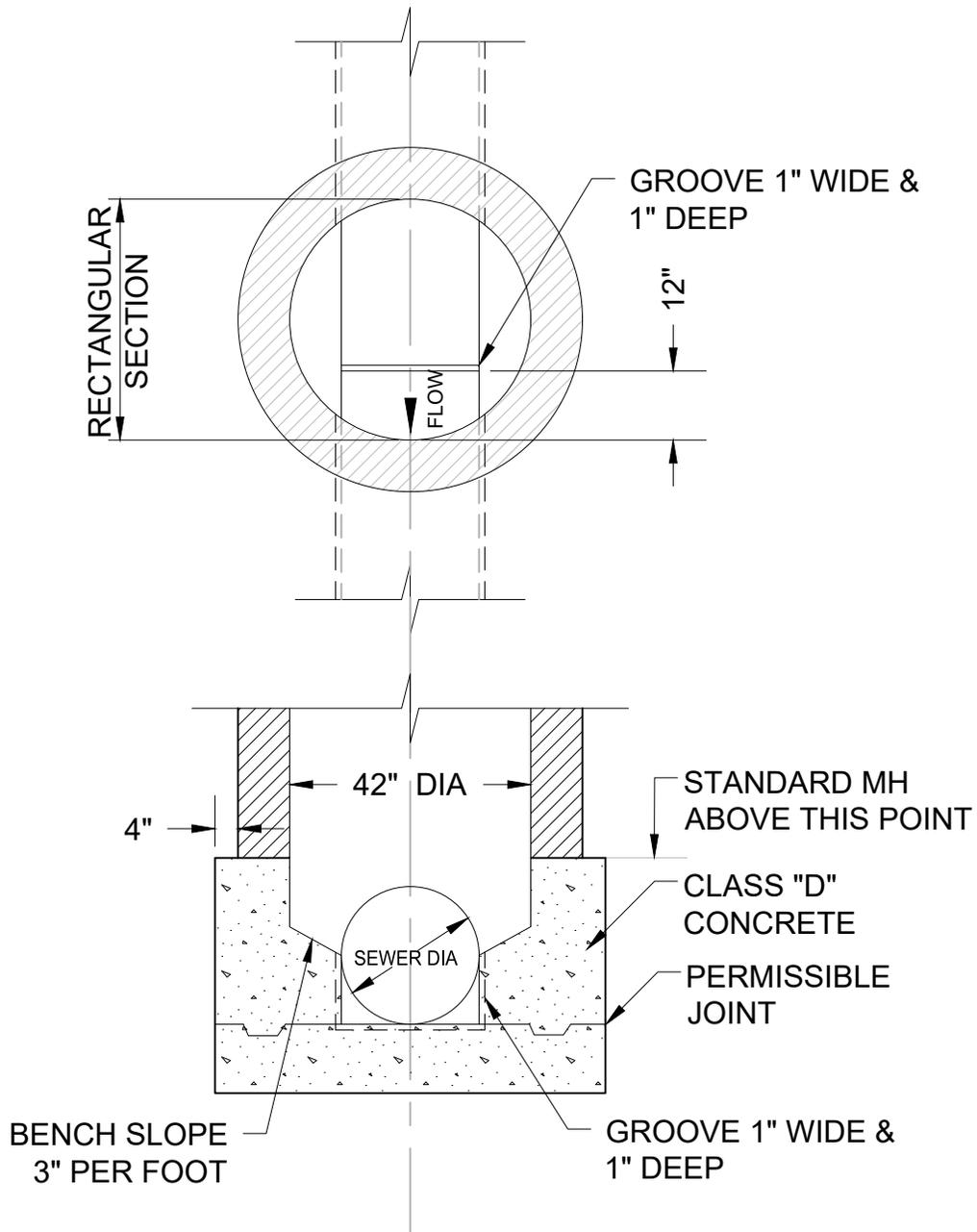
NOTE: FRAME AND COVER APPROXIMATE WEIGHT 315 POUNDS

# SANITARY MANHOLE COVER AND ASSEMBLY NEENAH (R-1550-002 HEAVY FRAME & 1050-5210 COVER)

Sanitary-Storm MH cover 1

NO SCALE

EXHIBIT SAN-03



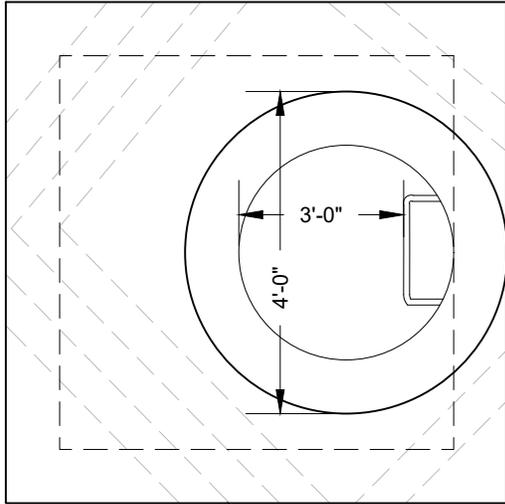
# DETAIL OF SAMPLING MANHOLE

Sampling MH 1

NO SCALE

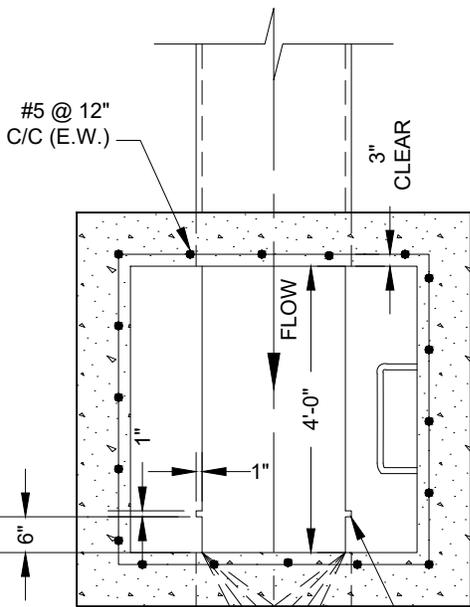
## EXHIBIT SAN-04

**TOP SLAB**



# 6 EACH CORNER  
BOTTOM FACE

**SECTION A-A**



6" MONOLITHIC  
CONC COLLAR

SEWER MAIN/  
LATERAL

GROOVE 1" WIDE &  
1" DEEP IN SIDES  
OF BENCH

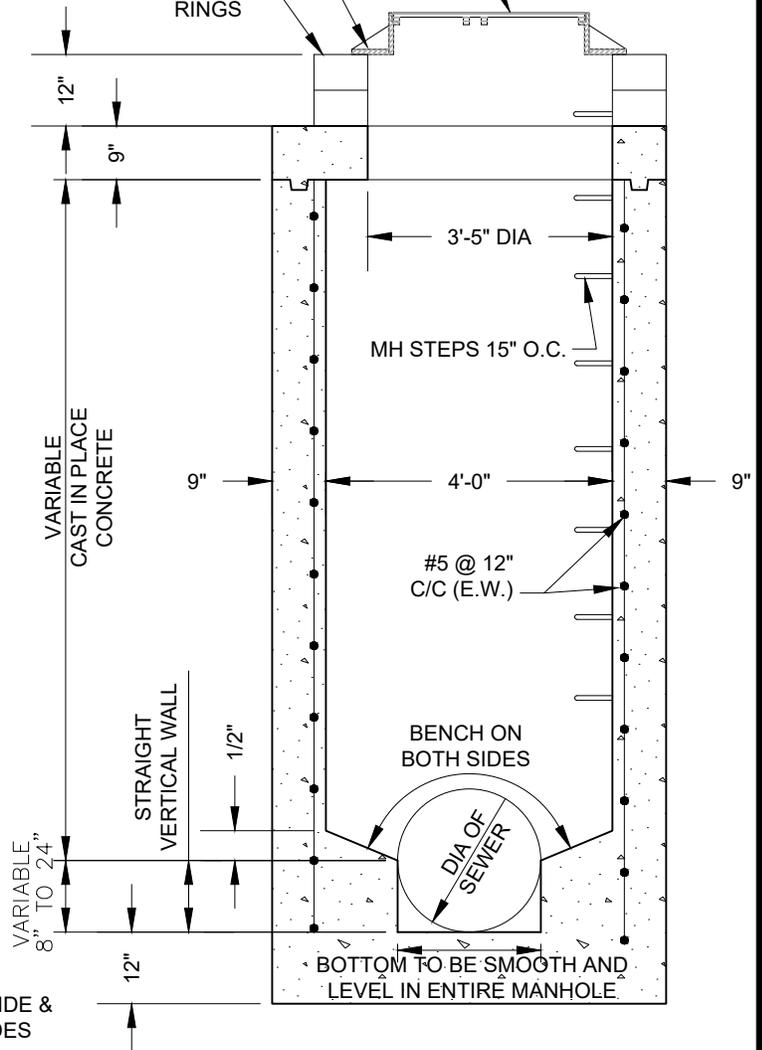
9" TRANSITION FROM SQUARE MANHOLE  
INVERT TO SEWER MAIN/ LATERAL

- NOTES:
1. 4'-0" I.D. PRECAST MAY BE SUBSTITUTED FOR SAMPLING MH'S ON BUILDING LATERAL
  2. 4'-0" I.D. MONOLITHIC MAY BE SUBSTITUTED FOR GAUGING MH'S ON MUNICIPAL SEWERS.
  3. DISCHARGE OUTLET TO BE SQUARE AT MANHOLE WALL HEIGHT & WIDTH TO BE SAME AS DIAMETER OF SEWER

NEENAH R-1740B OR R-1916H  
OR EQUAL, FRAME AND COVER

PROVIDE INTERNAL/  
EXTERNAL WATERTIGHT  
FRAME/CHIMNEY SEAL

ADJUSTING  
RINGS



VARIABLE  
CAST IN PLACE  
CONCRETE

MH STEPS 15" O.C.

#5 @ 12"  
C/C (E.W.)

BENCH ON  
BOTH SIDES

DIA OF  
SEWER

BOTTOM TO BE SMOOTH AND  
LEVEL IN ENTIRE MANHOLE

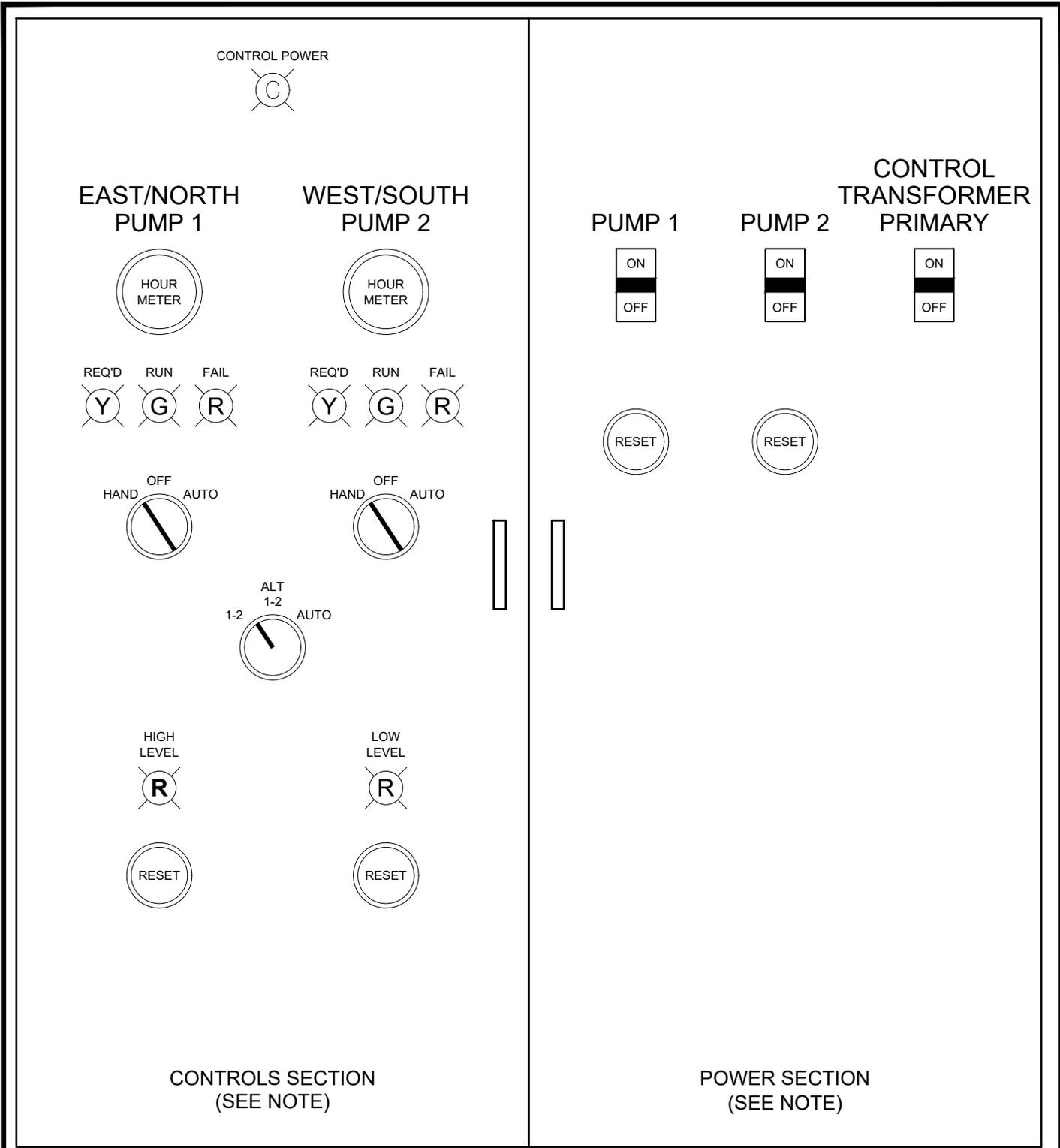
**DETAIL OF SAMPLING  
AND GAUGING MANHOLE**

Sampling and gauging MH 1

NO SCALE

**EXHIBIT SAN-05**

Feb 14, 2019 3:34pm  
 R:\RawMaterials\Drawings\library\CLIENT 47Z-010-SAN-06\_Pump Station Control Panel Door Layout.DWG Model  
 IMAGES:  
 XREFS: R:\RawMaterials\Drawings\library\CLIENT 47\Pump Station Control Panel Door Layout.dwg



**NOTE:**  
 PROVIDE BARRIER INSIDE CONTROL PANEL TO SEPERATE  
 CONTROLS AND POWER SECTION

# PUMP STATION CONTROL PANEL DOOR LAYOUT

Pump Station Control Panel Door Layout 1

NO SCALE

## EXHIBIT SAN-06

SANITARY MANHOLES SHALL BE TESTED FOR LEAKAGE BY THE USE VACUUM TESTING EQUIPMENT. THE TESTING SHALL CONFORM TO THE FOLLOWING:

ISOLATE THE MANHOLE TO BE TESTED BY PLUGGING THE INLET AND OUTLET PIPES WITH AN INFLATABLE STOPPER OR OTHER SUITABLE TEST PLUGS. THE PLUGS SHALL BE SECURELY BRACED TO AVOID THE PLUGS FROM BEING DRAWN INTO THE MANHOLE. PLUG LIFT HOLES WITH A NON-SHRINK GROUT.

VACUUM TEST EQUIPMENT SHALL BE PLACED AT THE INSIDE OF THE TOP CONE SECTION, IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. INFLATE THE SEAL TO 40 PSI TO EFFECT A SEAL BETWEEN THE BASE AND THE MANHOLE. RUN VACUUM PUMP UNTIL A VACUUM OF 10 INCHES OF MERCURY IS OBTAINED.

WITH VACUUM PUMP SHUT OFF AND THE VALVE ON THE VACUUM LINE OF THE TEST HEAD CLOSED, MEASURE THE TIME FOR THE VACUUM TO DROP TO 9 INCHES OF MERCURY. THE MANHOLE TEST IS ACCEPTABLE IF THE TIME EXCEEDS THE VALUES LISTED IN THE TABLE BELOW.

IF THE TEST FAILS, REPAIR OR SEAL THE MANHOLE USING NON-SHRINK GROUT OR OTHER MATERIALS THAT ARE APPROVED. RETEST UNTIL AN ACCEPTABLE TEST IS OBTAINED.

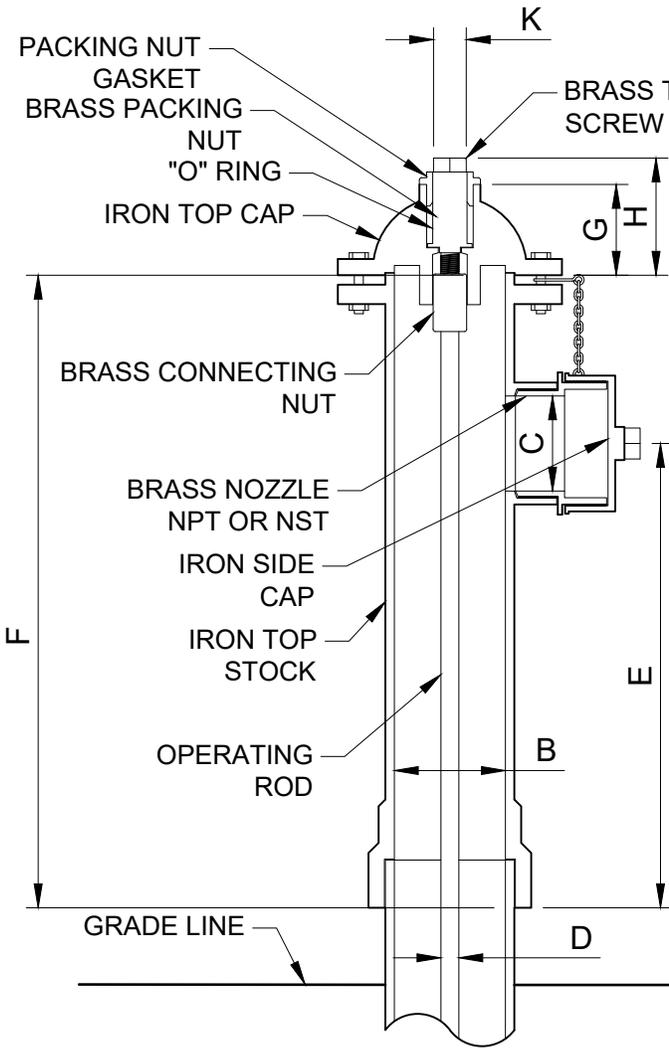
<b>MINIMUM TEST TIMES IN SECONDS FOR VARIOUS MANHOLE DIAMETERS</b>				
<b>DEPTH (FT.)</b>	<b>DIAMETER (IN.)</b>			
	42	48	60	72
8	17	20	26	33
10	21	25	33	41
12	25	30	39	49
14	30	35	45	57
16	34	40	52	67
18	38	45	59	73
20	42	50	65	81
22	46	55	72	89
24	51	59	78	97
26	55	64	85	105
28	59	69	91	113
30	63	74	98	121

## **MANHOLE VACUUM TESTING**

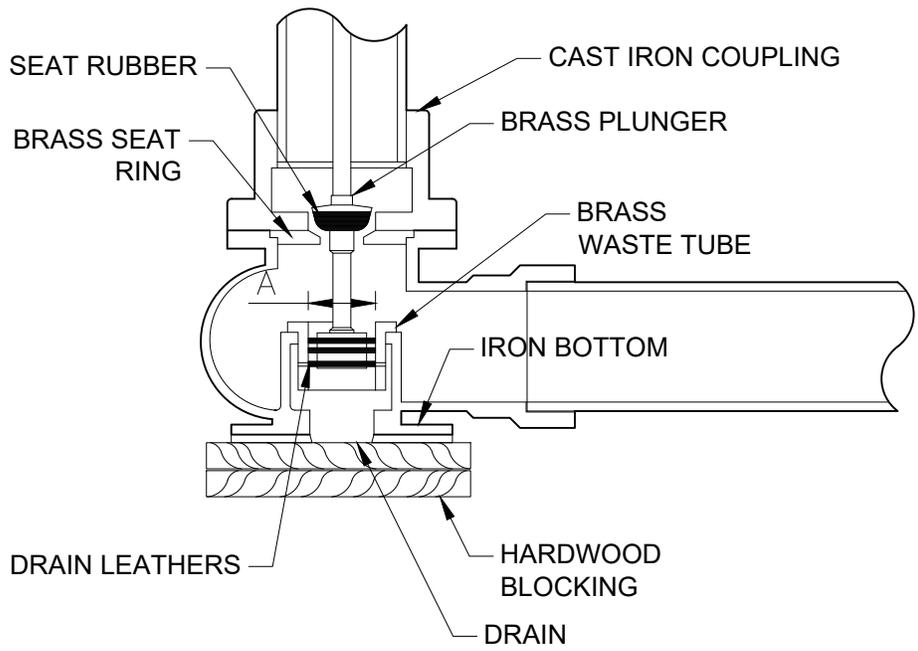
Manhole Vacuum Testing 1

NO SCALE

### **EXHIBIT SAN-07**



A	DIAMETER OF VALVE OPENING	1 1/2"	2 3/16"
B	DIAMETER OF STAND PIPE	2"	3"
C	INSIDE DIAMETER OF NOSE NOZZLE	1 3/16"	1 15/16"
D	OUTSIDE DIAMETER OF OPERATING ROD	1"	1"
E	BOTTOM OF TOP STOCK TO OUTLET	13 3/4"	12"
F	HEIGHT OF TOP STOCK	18 3/4"	18"
G	HEIGHT OF TOP CAP	2"	2 3/4"
H	BOTTOM OF TOP CAP TO TOP OPERATING SCREW	3 3/4"	4"
J	HEIGHT OF BOTTOM INLET CONNECTION	6"	6 1/2"
K	SIZE AND SHAPE OF TOP SCREW NUT	5/8" □	1 1/2" ◡

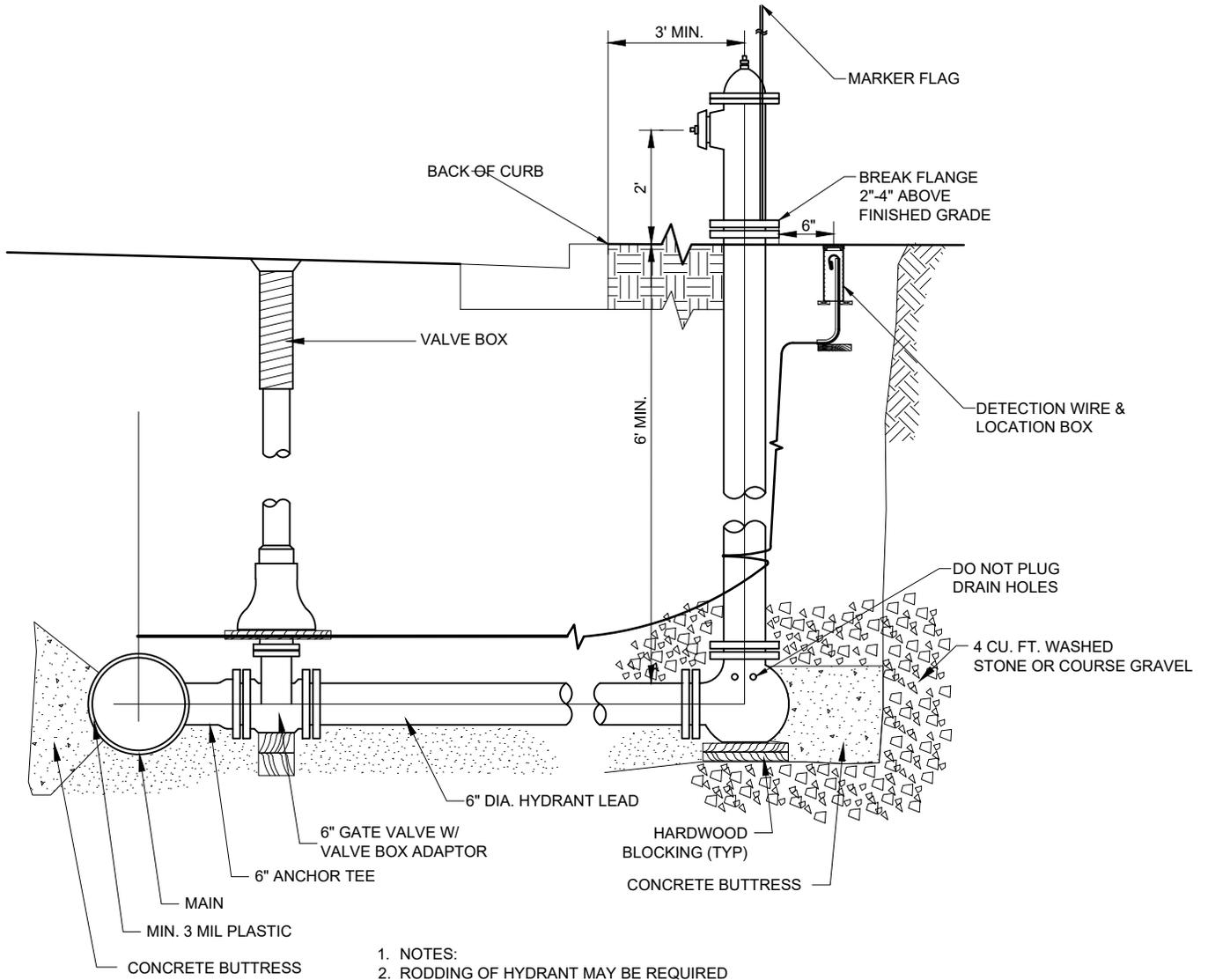


# SAMPLING HYDRANT

NO SCALE

Sampling Hydrant 32

## EXHIBIT WM-01



1. NOTES:
2. RODDING OF HYDRANT MAY BE REQUIRED IF SOILS ARE UNSUITABLE.
3. HYDRANT LEADS GREATER THAN ONE PIPE LENGTH MUST BE RESTRAINED.
4. NO HYDRANT SHALL BE INSTALLED ON TAPPING TEE.

## HYDRANT SETTING DETAIL (URBAN CROSS SECTION)

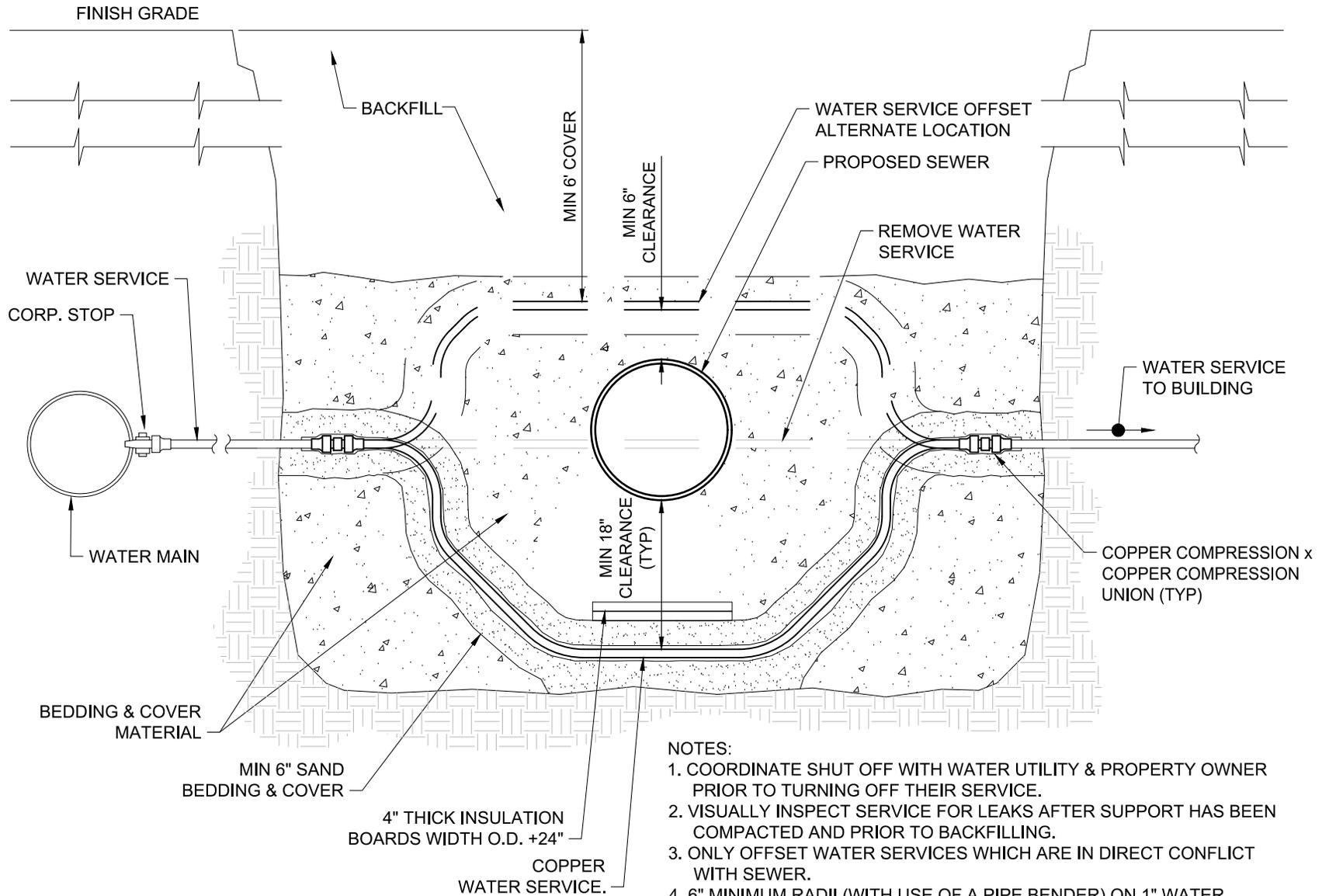
WT-HYD-04

8

NO SCALE

### EXHIBIT WM-02-1





- NOTES:
1. COORDINATE SHUT OFF WITH WATER UTILITY & PROPERTY OWNER PRIOR TO TURNING OFF THEIR SERVICE.
  2. VISUALLY INSPECT SERVICE FOR LEAKS AFTER SUPPORT HAS BEEN COMPACTED AND PRIOR TO BACKFILLING.
  3. ONLY OFFSET WATER SERVICES WHICH ARE IN DIRECT CONFLICT WITH SEWER.
  4. 6" MINIMUM RADII (WITH USE OF A PIPE BENDER) ON 1" WATER SERVICE

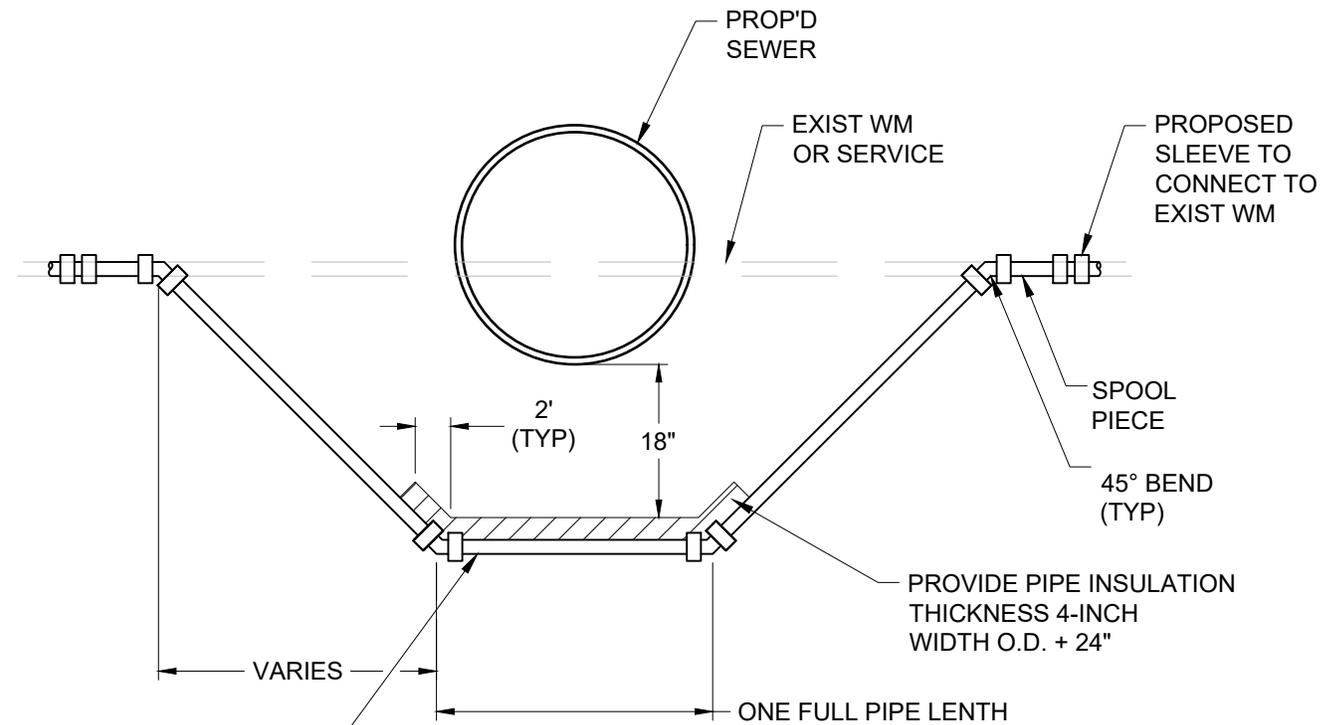
# WATER SERVICE OFFSET

WT-LAT-04

12

NO SCALE

## EXHIBIT WM-03



OFFSET TO A MIN. OF 18" BELOW SEWER (BOTTOM OF SEWER TO TOP OF WATERMAIN)

**NOTE:**

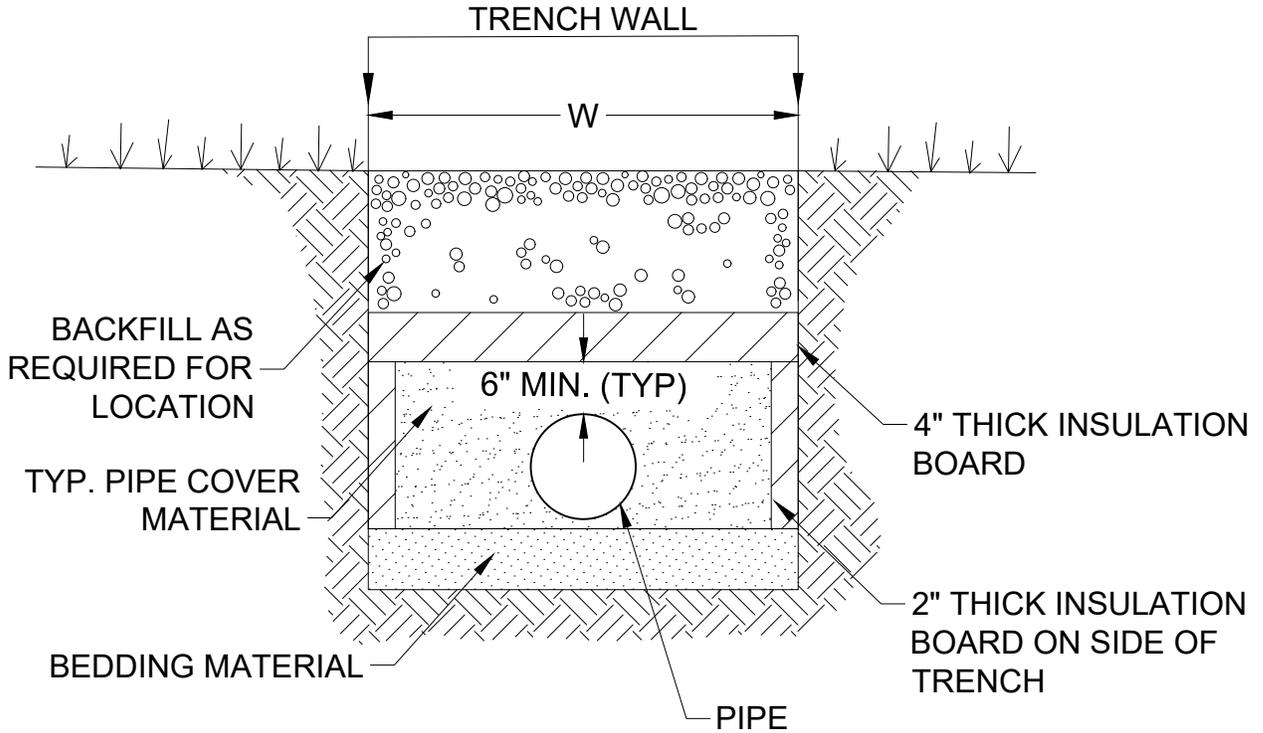
1. COORDINATE WATER MAIN SHUT OFFS WITH WATER UTILITY PRIOR TO TURNING OFF WATER MAIN.
2. WATER SERVICE OFFSETS TO BE COORDINATED WITH PROPERTY OWNER PRIOR TO SHUT OFF.
3. ALL JOINTS TO BE RESTRAINED ACCORDING TO PLANS.

**TYPICAL WATER MAIN/ SERVICE OFFSET**

NO SCALE

WT-LAT-05 12

**EXHIBIT WM-04**



**NOTES:**

1. INSULATION MUST BE REINSTALLED AFTER WATER SERVICE CONNECTION
2. INSULATION BOARD SEAMS MUST BE STAGGERED
3. AT 6.0. SIDE INSULATION MAY BE OMITTED.

DEPTH OF COVER (FT.)	WIDTH "W" (FT.)
2.0	9.0
2.5	8.0
3.0	7.0
3.5	6.0
4.0	5.0
4.5	4.0
5.0	3.0
5.5	3.0
6.0	3.0

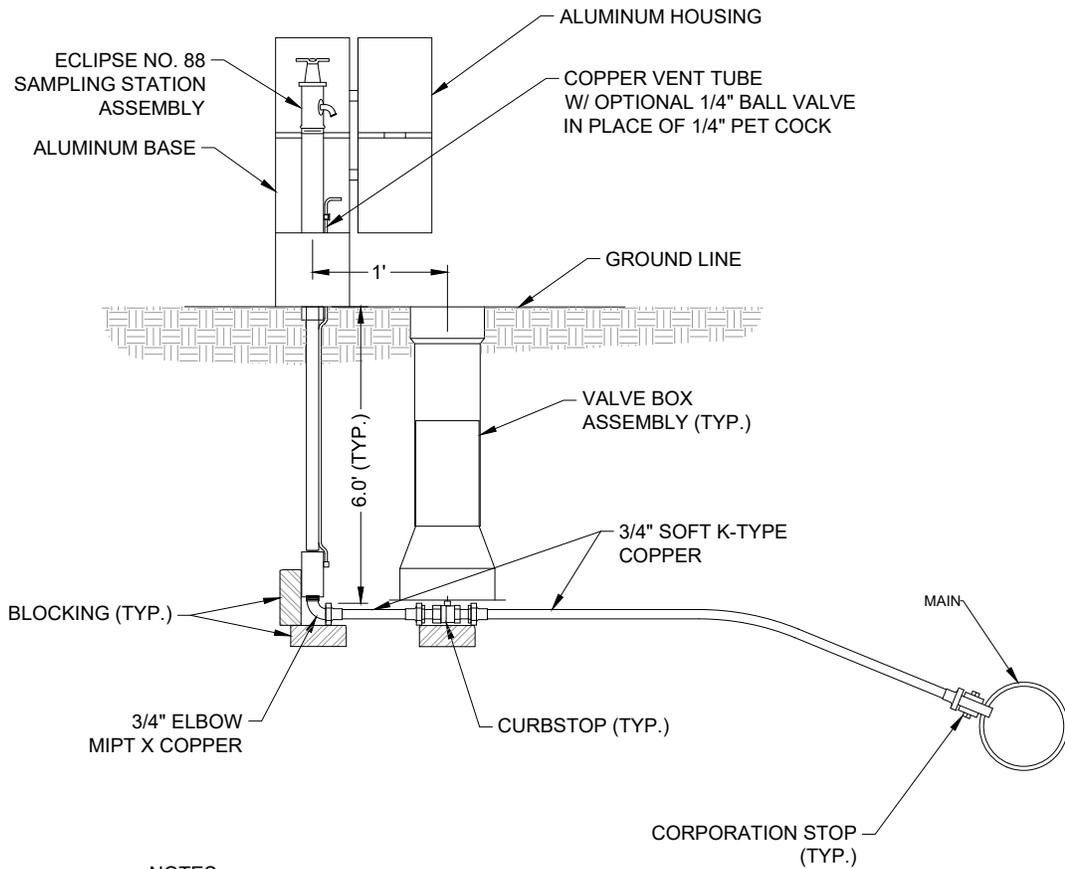
**BURIED PIPING INSULATION DETAIL**

NO SCALE

UT-TRENCH-03

32

**EXHIBIT WM-05**



**NOTES:**

SAMPLE STATIONS SHALL BE 6.0' BURY, WITH A 3/4" FIP INLET, AND A (3/4" HOSE OR UNTHREADED) NOZZLE.

ALL STATIONS SHALL BE ENCLOSE A LOCKABLE, NON-REMOVABLE, ALUMINUM-CAST HOUSING.

WHEN OPENED, THE STATION SHALL REQUIRE NO KEY FOR OPERATION, AND THE WATER WILL FLOW IN AN ALL BRASS WATERWAY.

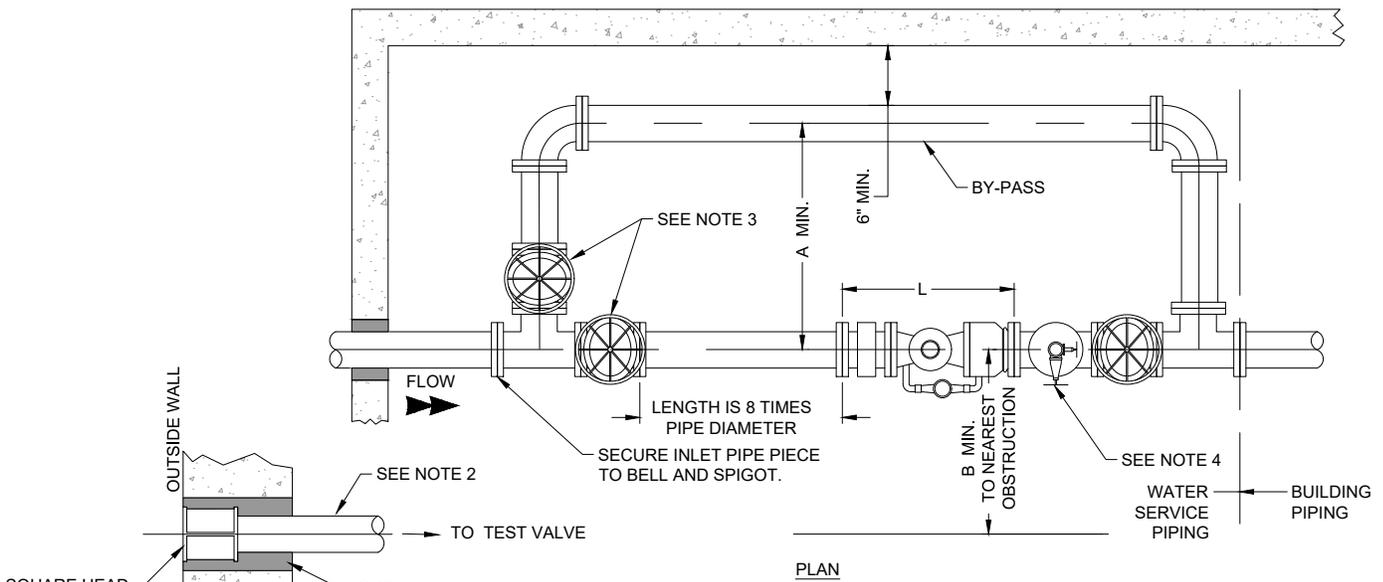
ALL WORKING PARTS WILL ALSO BE OF BRASS AND BE REMOVABLE FROM ABOVE GROUND WITH NO DIGGING, EXRIOR PIPING SHALL BE GALVANIZED STEEL (BRASS PIPE ALSO AVAILABLE).

A COPPER VENT TUBE WILL ENABLE EACH STATION TO BE PUMPED FREE OF STANDING WATER TO PREVENT FREEZING AND TO MINIMIZE BACTERIA GROWTH.

ECLIPSE NO. 88 SAMPLING STATION SHALL BE MANUFACTURED BY KUPFERLE FOUNDRY, ST. LOUIS, MO 63102.

# SAMPLING STATION

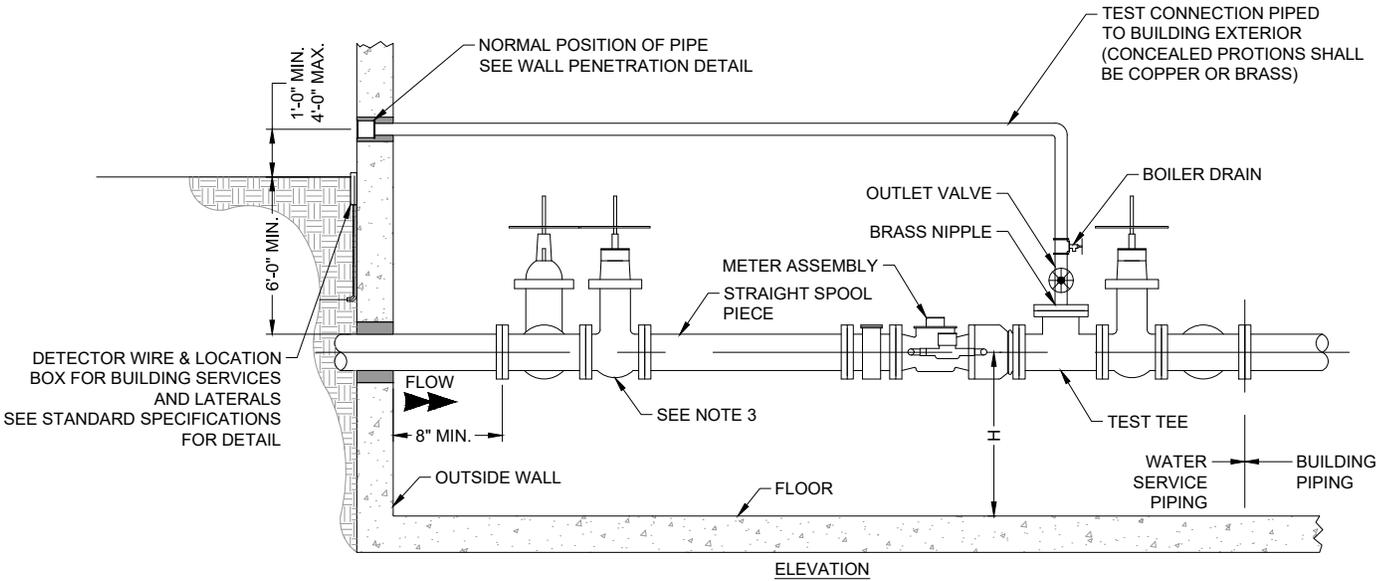
NO SCALE



WALL PENETRATION DETAIL

NOTES:

- MATERIALS:  
A. PIPE - BRASS OR TYPE K COPPER  
B. PLUG - BRASS
- CONCEALED PIPE SHALL BE SAME SIZE AS TEST VALVE.



TYPICAL METER SETTING - 2" AND GREATER

NOTES:

- MATERIALS:  
A. TEST CONNECTION: TYPE L COPPER OR THREADED GALVANIZED  
B. BY-PASS PIPING: FLANGED GALVANIZED, FLANGED DUCTILE IRON, OR 2", 3", OR 4" TYPE L COPPER  
C. ALL OTHER: FLANGED GALVANIZED OR FLANGED DUCTILE IRON  
IF METER SIZE IS SMALLER THAN PIPE SIZE, REDUCTION SHALL BE MADE WITH A REDUCING TEE OR CONCENTRIC REDUCERS. ANY SPOOL PIECE USED SHALL BE AT LEAST 3" LONG BETWEEN FLANGES.
- PROVIDE AMPLE RIGID SUPPORT UNDER PIPING AND AROUND METER

- SUCH THAT THE ENTIRE SETTING IS STRUCTURALLY STABLE WITH THE METER REMOVED, MINIMALLY AT THE FOLLOWING LOCATIONS: AT THE MID-POINT OF THE STRAIGHT SPOOL PIECE BEFORE THE METER, UNDER THE OUTLET VALVE, AND AT EACH END BEND IN THE BY-PASS PIPING. ADDITIONAL LOCATIONS MAY BE NECESSARY TO ACHIEVE STRUCTURAL STABILITY.
- BY-PASS MAY BE PLACED OVERHEAD, A MAXIMUM OF 5' FROM THE METER CENTERLINE TO THE BY-PASS CENTERLINE.
- METER ASSEMBLY SHALL IMMEDIATELY FOLLOW THE STRAIGHT SPOOL PIECE, THE TEST TEE SHALL IMMEDIATELY FOLLOW THE METER, AND THE OUTLET VALVE SHALL IMMEDIATELY FOLLOW THE TEST TEE.
- ALL VALVES TO BE BALL VALVES OR GATE VALVES.

SOURCE: OCONOMOWOC UTILITIES

METER	BY-PASS	TEST VALVE	A	B	L	H
2"	2"	2"	36"	36"	17"	12"-24"
3"	3"	2"	36"	36"	24"	12"-24"
4"	4"	2"	36"	42"	29"	12"-24"
6"	6"	3"	42"	48"	36"	15"-24"
8"	8"	3"	42"	48"	42"	18"-24"

# METER TEST PORT FOR WATER MAIN

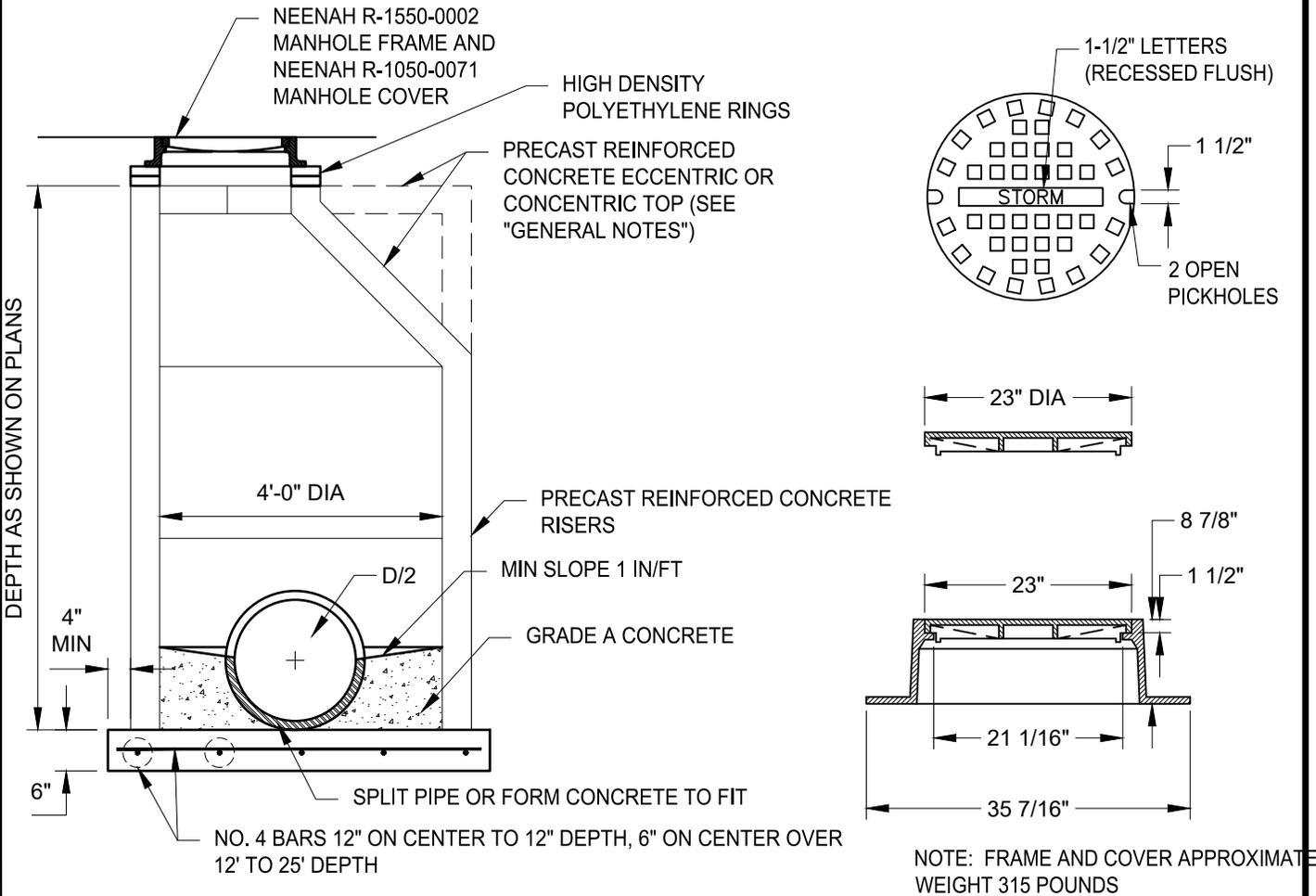
Meter Test Port for Water Main 32

NO SCALE

## EXHIBIT WM-07

**STORM MANHOLE NOTES**

1. DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.
2. DETAILED DRAWINGS FOR THE PROPOSED ALTERNATE DESIGNS FOR UNDERGROUND DRAINAGE STRUCTURES SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PROVIDING THAT SUCH ALTERNATE DESIGNS MAKE PROVISION FOR EQUIVALENT CAPACITY AND STRENGTH.
3. ALL DRAINAGE STRUCTURES ARE DESIGNATED ON THE PLANS AS "MANHOLES 1-C", "CATCH BASINS 1-B", INLETS 3-H, ETC. THE FIRST DIGIT DESIGNATES THE MASONRY PORTION OF THE STRUCTURE, AND THE FOLLOWING LETTER DESIGNATES THE TYPE OF COVER TO BE USED TO COMPRISE THE COMPLETE UNIT.
4. PRECAST REINFORCED BASES SHALL BE PLACED ON A BED OF MATERIAL AT LEAST 6 INCHES IN DEPTH, WHICH MEETS THE REQUIREMENTS OF GRANULAR BACKFILL. THIS BEDDING SHALL BE COMPACTED AND PROVIDE UNIFORM SUPPORT FOR THE ENTIRE AREA OF THE BASE.
5. PRECAST REINFORCED CONE TOPS (ECCENTRIC OR CONCENTRIC) MAY BE USED ON CONCRETE BLOCK STRUCTURES. THE CONE TOPS SHALL BE INSTALLED ON A BED OF MORTAR.
6. ECCENTRIC CONE TOPS MAY BE USED ON ALL STRUCTURES, AND CONCENTRIC CONE TOPS SHALL BE USED ONLY ON STRUCTURES 5 FEET OR LESS IN DEPTH, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
7. STEPS CONFORMING TO AASHTO M 199 SHALL BE INSTALLED IN ALL STRUCTURES OVER 5 FEET IN DEPTH.
8. SOLID ALUMINUM STEPS SHALL HAVE A MINIMUM CROSS SECTIONAL DIMENSION OF 0.75 INCH, ALUMINUM SURFACES TO BE EMBEDDED IN CONCRETE SHALL BE GIVEN ONE COAT OF SUITABLE QUALITY PAINT, SUCH AS ZINC CHROMATE PRIMER CONFORMING TO FEDERAL SPECIFICATION TT-P-645 OR EQUIVALENT.
9. ALL BAR STEEL REINFORCEMENT SHALL BE EMBEDDED 2 INCHES CLEAR UNLESS OTHERWISE SHOWN OR NOTED.
10. PRECAST REINFORCED CONCRETE RISERS MAY BE PLACED WITH TONGUE UP OR DOWN.
11. ALL PRECAST INLET UNITS AND MANHOLES SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF AASHTO DESIGNATION M 199.

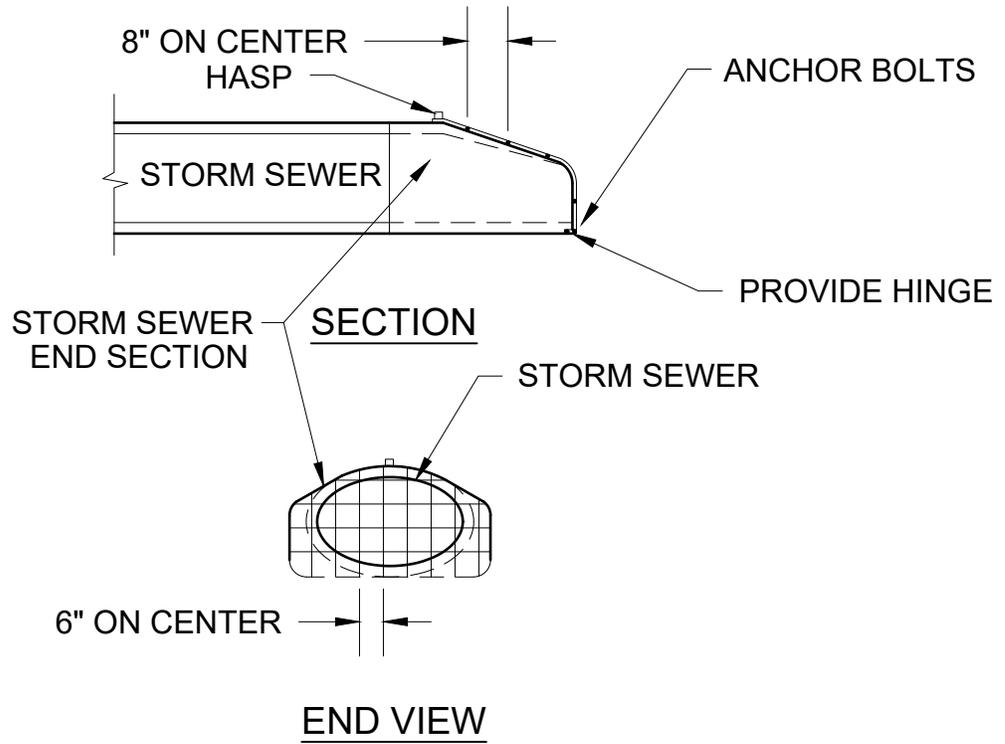


**STORM MANHOLE, STORM MANHOLE  
COVER AND ASSEMBLY NEENAH (R-1550 HEAVY)**

NO SCALE

CGDTSTOMH 1

**EXHIBIT STO-01**



NOTES:

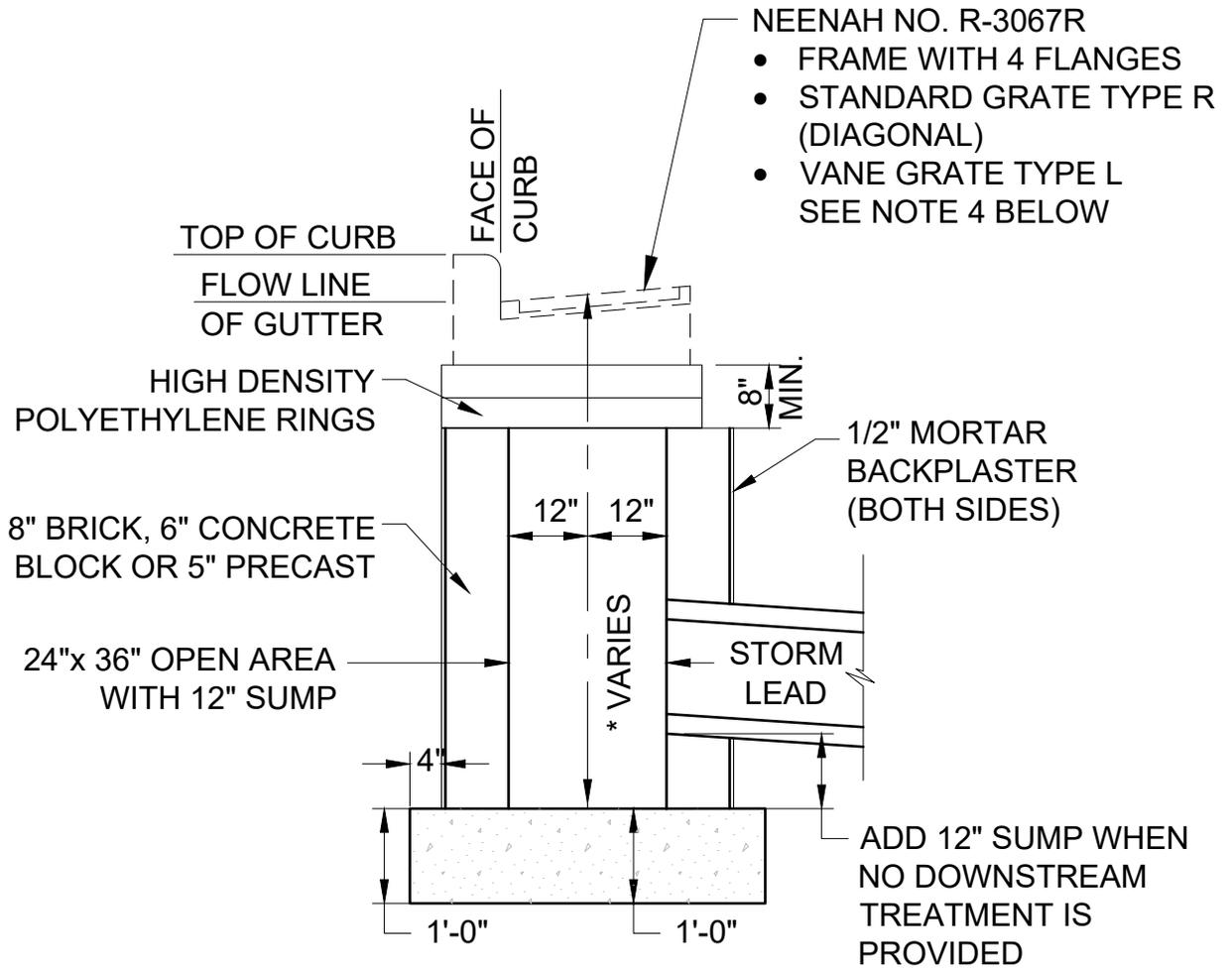
1. 15 INCH PIPE AND LARGER REQUIRE A TRASH RACK.
2. TRASH RACK BARS TO BE BLACK STEEL
3. PAINT WITH HIGH ZINC COATING AFTER FABRICATION.
4. PLANT FIT TRASH RACK CONFIGURATION TO FIT RELATIVE END SECTION.
5. NO INLINE GRATES.

# TRASH RACK

Trash Rack 1

NO SCALE

## EXHIBIT STO-02



**NOTES:**

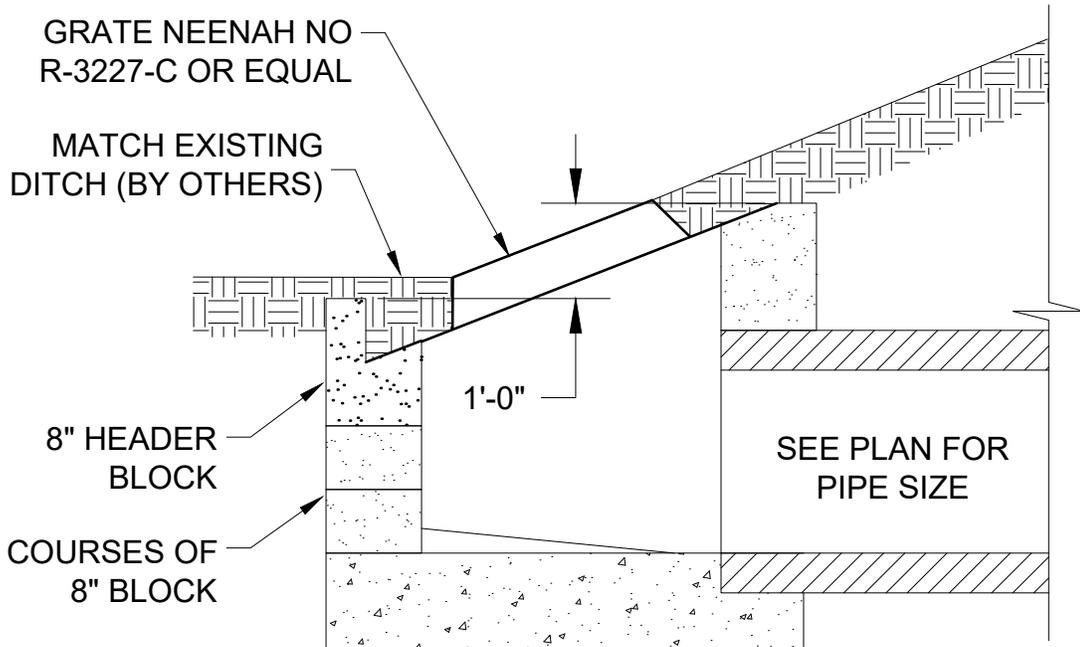
1. HIGH DENSITY POLYETHYLENE RINGS SHALL BE SEALED UTILIZING AN APPROVED BUTYL SEALANT PER MANUFACTURER'S RECOMMENDATIONS. NO WOOD SHIMS ALLOWED. USE POLYETHYLENE ADJUSTMENT SLEEVE.
2. INLET TO BE PROTECTED WITH GEOTEXTILE FABRIC BETWEEN THE GRATE AND FRAME. PROTECTIONS TO REMAIN IN PLACE UNTIL SITE VEGETATION IS ESTABLISHED.
3. INTERIM CATCH BASIN INSTALLATION REQUIRED UNTIL FINAL LIFT OF ASPHALT IS PLACED.
4. CITY WILL DETERMINE WHERE A VANE GRATE WILL BE USED WITHIN ANY NEW DEVELOPMENT

**STORM CATCH BASIN**

NO SCALE

Storm Catch Basin 1

**EXHIBIT STO-03**

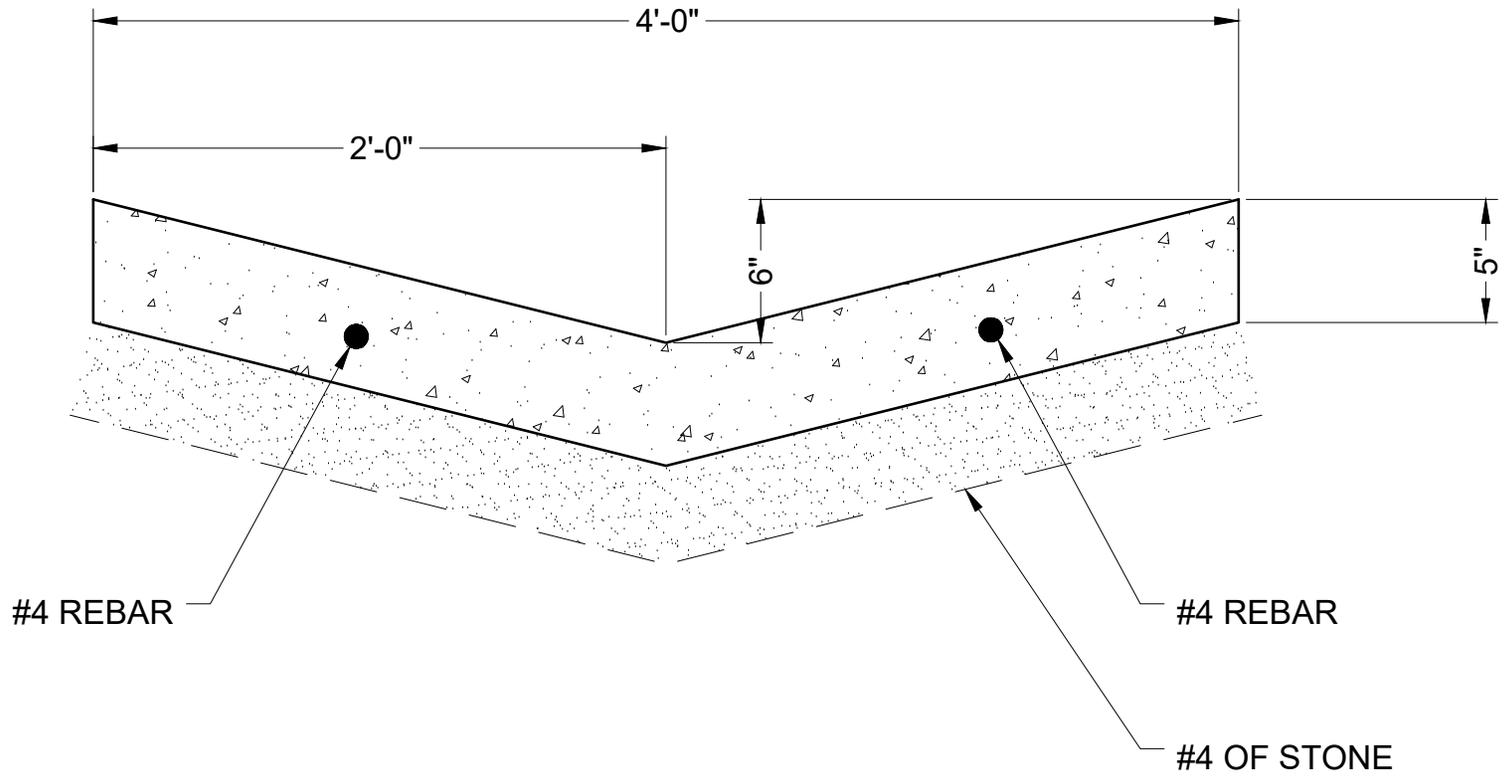


INLET TO BE PROTECTED WITH GEOTEXTILE FABRIC BETWEEN THE GRATE AND FRAME. PROTECTION TO REMAIN IN PLACE UNTIL SITE VEGETATION IS ESTABLISHED.

## **FIELD INLET (24" OR LARGER)**

NO SCALE

Field Inlet 1

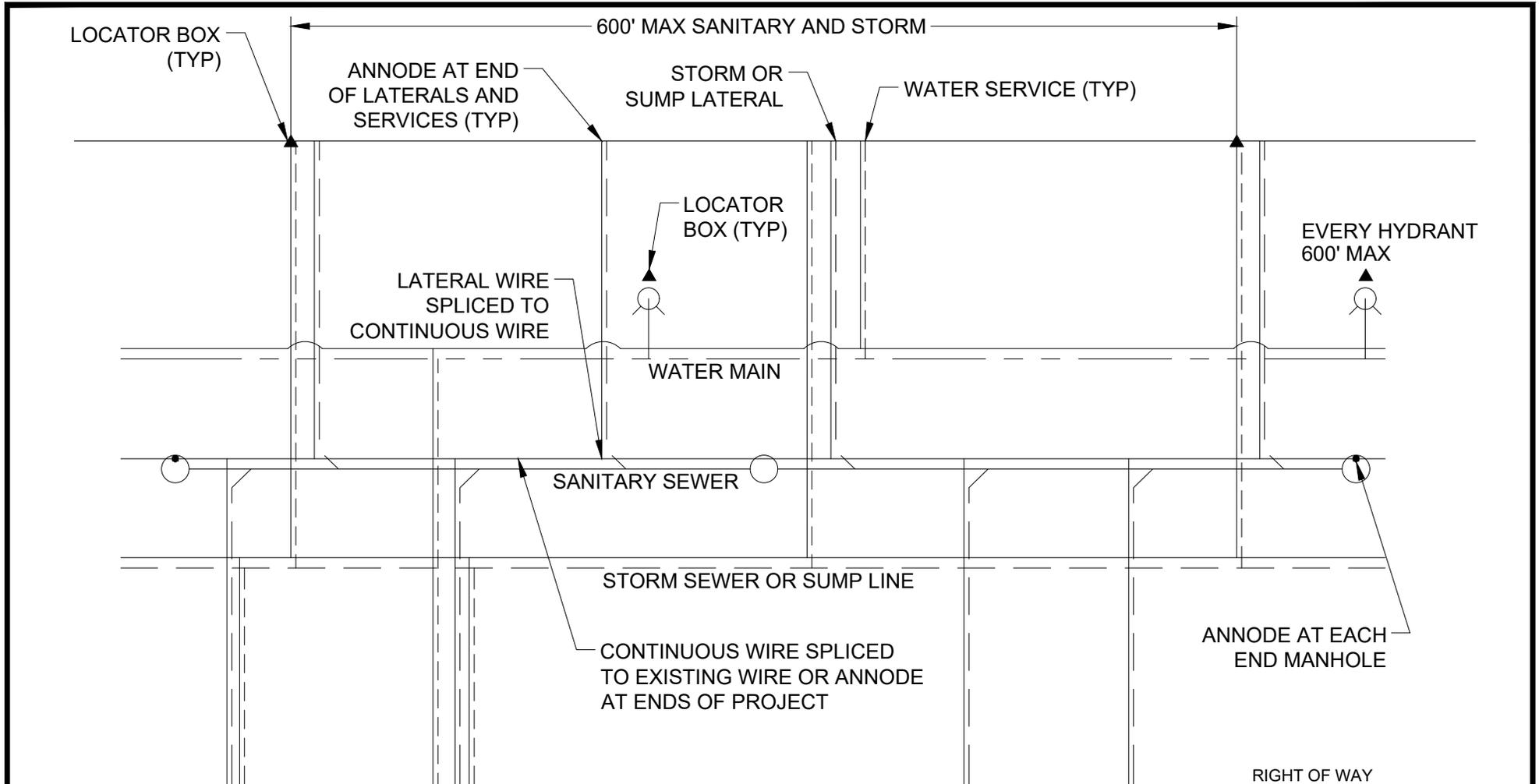


# **REINFORCED CONCRETE INVERT**

NO SCALE

Concrete Invert 1

**EXHIBIT STO-05**



NOTE:

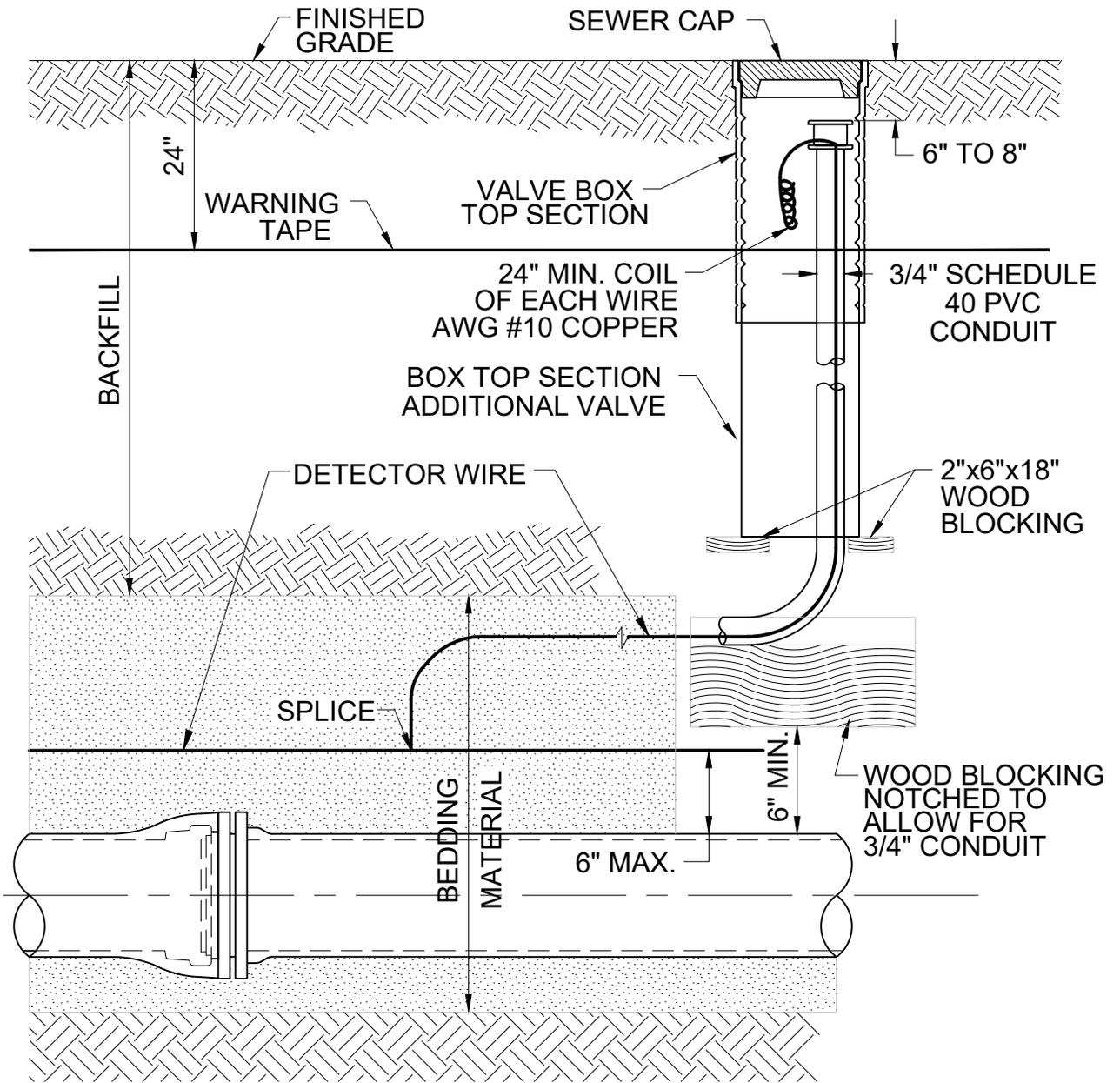
1. SANITARY AND STORM WIRES CAN BE PLACED IN SAME BOX
2. SANITARY AND STORM LOCATOR BOX TO BE LOCATED ON RIGHT-OF-WAY LINE AND ON THE SAME SIDE OF THE STREET AS THE WATER LOCATOR BOXES.
3. TRACER WIRE TO BE AWG #10 COPPER WM-BLUE, SANITARY-GREEN, STORM-BROWN.

# CITY OF OCONOMOWOC TRACER WIRE LAYOUT

Tracer Wire Layout 1

NO SCALE

## EXHIBIT LA-01



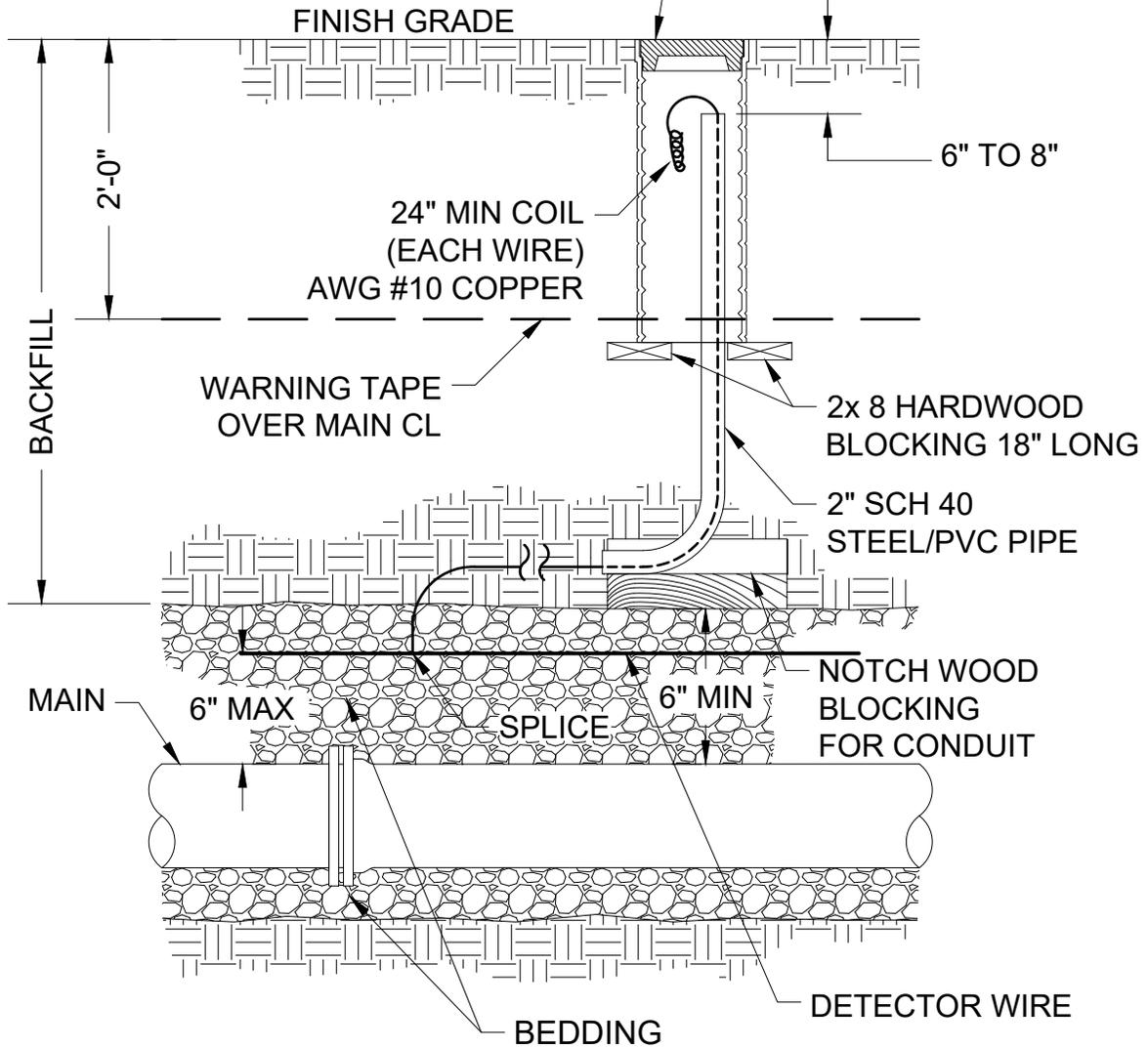
# DETECTION WIRE & LOCATION BOX FOR FORCE MAIN SANITARY SEWER AND LATERALS

Detector wire & location box for force main 1

NO SCALE

CONTRACTOR TO CONNECT  
TRACER WIRE TO TERMINAL  
BOLTS ON LOCATOR BOX CAP

TRACER WIRE  
ACCESS BOX



# DETECTION WIRE & LOCATION BOX FOR WATER MAIN

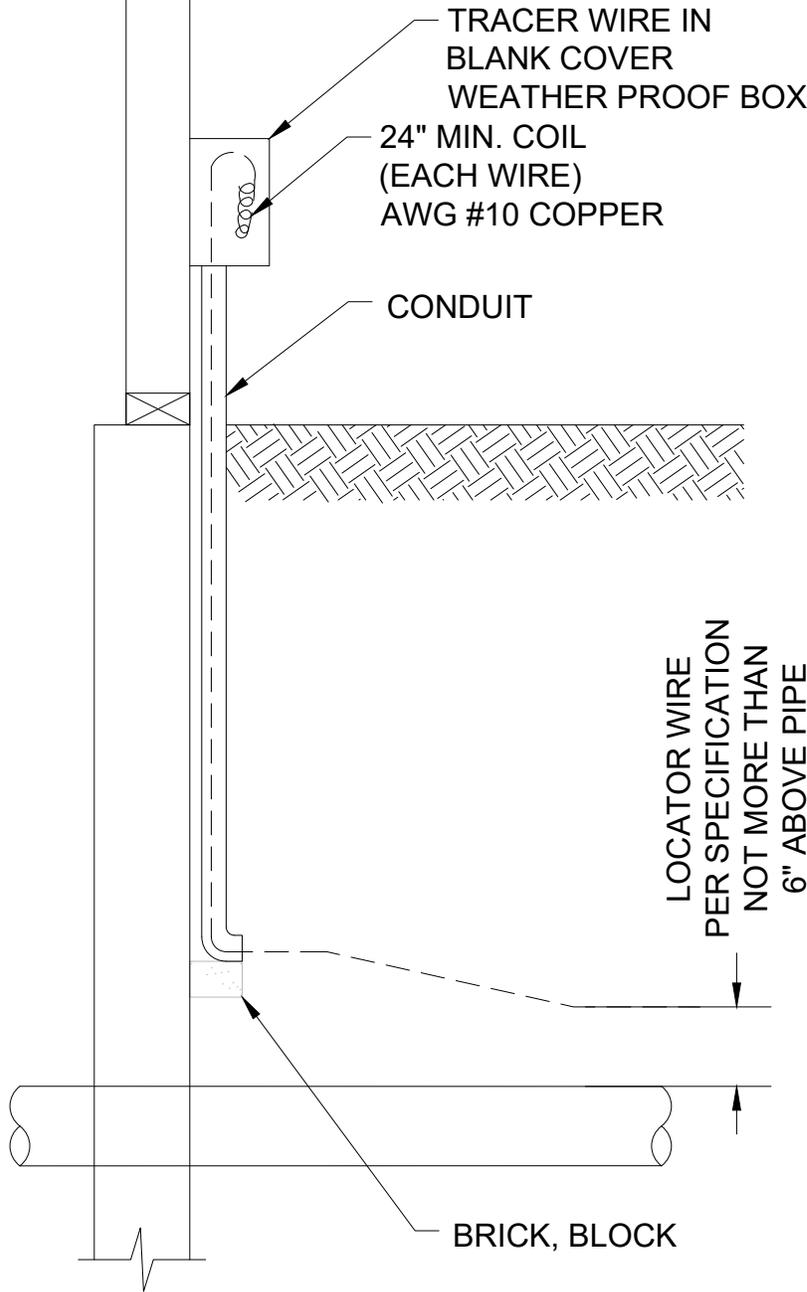
Detector wire & location box for water main 1

NO SCALE

Feb 14, 2019 3:49pm  
R:\RawMaterials\Drawings\library\CLIENT 47Z-027-LA-03\_Detection Wire & Location Box for Water Main.dwg Model  
IMAGES:  
XREFS: R:\RawMaterials\Drawings\library\CLIENT 47\Detector wire & location box for water main.dwg

EXHIBIT LA-03

NOTE: FOR CONSTRUCTION OUTSIDE OF PUBLIC RIGHT-OF-WAY FOLLOW DEPARTMENT OF COMMERCE RULES AND CONTACT CITY BUILDING INSPECTION DEPARTMENT FOR ADDITIONAL REQUIREMENTS



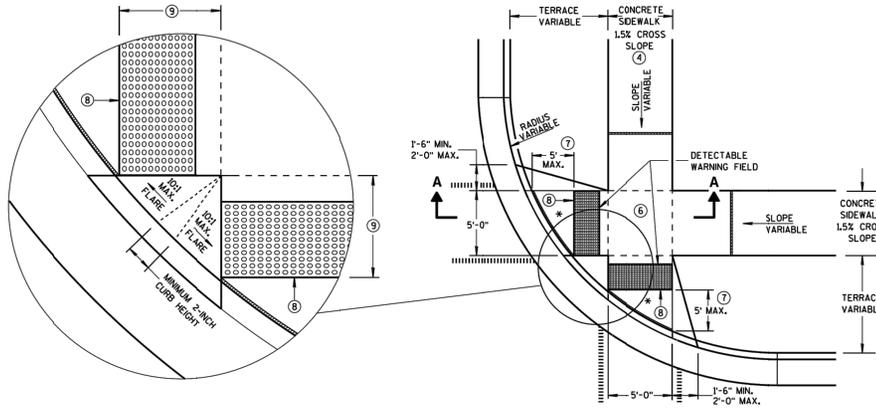
# DETECTION WIRE & LOCATION BOX FOR BUILDING SERVICES & LATERALS

Detection wire for laterals 1

NO SCALE

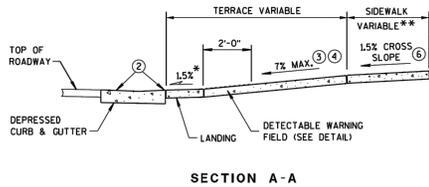
## EXHIBIT LA-04

8D5 sheet b: Curb Ramps Types 2 and 3



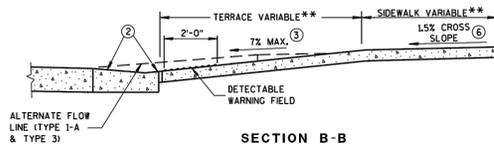
PLAN VIEW  
 TYPE 2 RAMP  
 (ON LINE WITH SIDEWALK)

\* MAXIMUM 2.0% SLOPE  
 IN ALL DIRECTIONS IN  
 FRONT OF GRADE BREAK

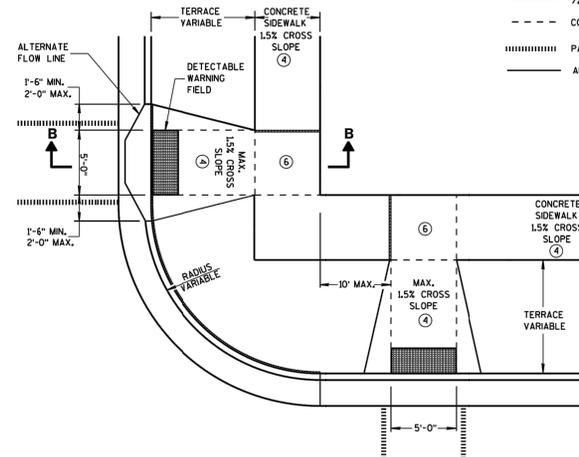


SECTION A-A

\*\* WIDTH SHOWN ELSEWHERE  
 IN THE PLANS



SECTION B-B



PLAN VIEW  
 TYPE 3 RAMP  
 (OUTSIDE OF CROSSWALK AREA)

LEGEND

- 1/2" EXPANSION JOINT-SIDEWALK
- - - CONTRACTION JOINT FIELD LOCATED
- ||||| PAVEMENT MARKING CROSSWALK (WHITE)
- ALTERNATIVE LAYOUT

GENERAL NOTES

1. DETECTABLE WARNING FIELDS THAT ARE INSTALLED AS A GROUP OR SIDE BY SIDE, SHALL BE FROM THE SAME MANUFACTURER.
2. GRADE CHANGE BETWEEN GUTTER FLAG SLOPE AND THE CURB RAMP SLOPE SHALL NOT EXCEED 1%. MAXIMUM GUTTER FLAG SLOPE IS 4%. PROVIDE LONGITUDINAL DRAINAGE AROUND CURB AND AWAY FROM CURB RAMP. NO VERTICAL LIPS OR DISCONTINUITIES GREATER THAN 1/4-INCH ARE ALLOWED. SLOPE OF CURB HEAD OPENING SHALL NOT EXCEED 7%.
3. ABSOLUTE MAXIMUM 12:1 (8.33%) CURB RAMP SLOPE IS ALLOWABLE WITH FLATTENED GUTTER FLAG SLOPE AND NOT TO EXCEED 1% GRADE CHANGE.
4. ±0.5% CONSTRUCTION TOLERANCE IN SIDEWALK CROSS SLOPE. THE SIDEWALK CROSS SLOPE SHALL NOT EXCEED 2% WITHOUT PRIOR APPROVAL FROM THE ENGINEER.
5. PROVIDE A LEVEL LANDING (MAXIMUM 2% SLOPE) IN ANY DIRECTION OF PEDESTRIAN TRAVEL. STANDARD LANDING SIZE IS 5 FEET X 5 FEET.
6. WHEN THIS DISTANCE EXCEEDS 5 FEET, STAGGER ADDITIONAL DETECTABLE WARNING PANEL FORWARD TO REDUCE THIS DISTANCE. PROVIDE MINIMUM 12-INCH ROW OVERLAP TO AVOID SIDESTEP OF DOME DETECTION. USE EQUAL-SIZE PANELS TO DEVELOP OVERLAPPING, STAGGERED ROWS. ALIGN DOMES BETWEEN OVERLAPPING ROWS AND IN DIRECTION OF PEDESTRIAN TRAVEL.
7. PROVIDE GRADE BREAK PERPENDICULAR TO DIRECTION OF WHEELCHAIR TRAVEL.
8. WHEN THIS DISTANCE IS LESS THAN 6'-0", IT MAY BE DIFFICULT TO ACHIEVE A 7% SLOPE OR FLATTER ALONG THE RAMP. REDUCE CURB HEIGHT IN TRIANGLE AREA TO ACHIEVE 7% SLOPE OR FLATTER ON RAMP. CONSTRUCT 2-INCH MINIMUM CURB HEIGHT BETWEEN 10:1 FLARES.

6

6

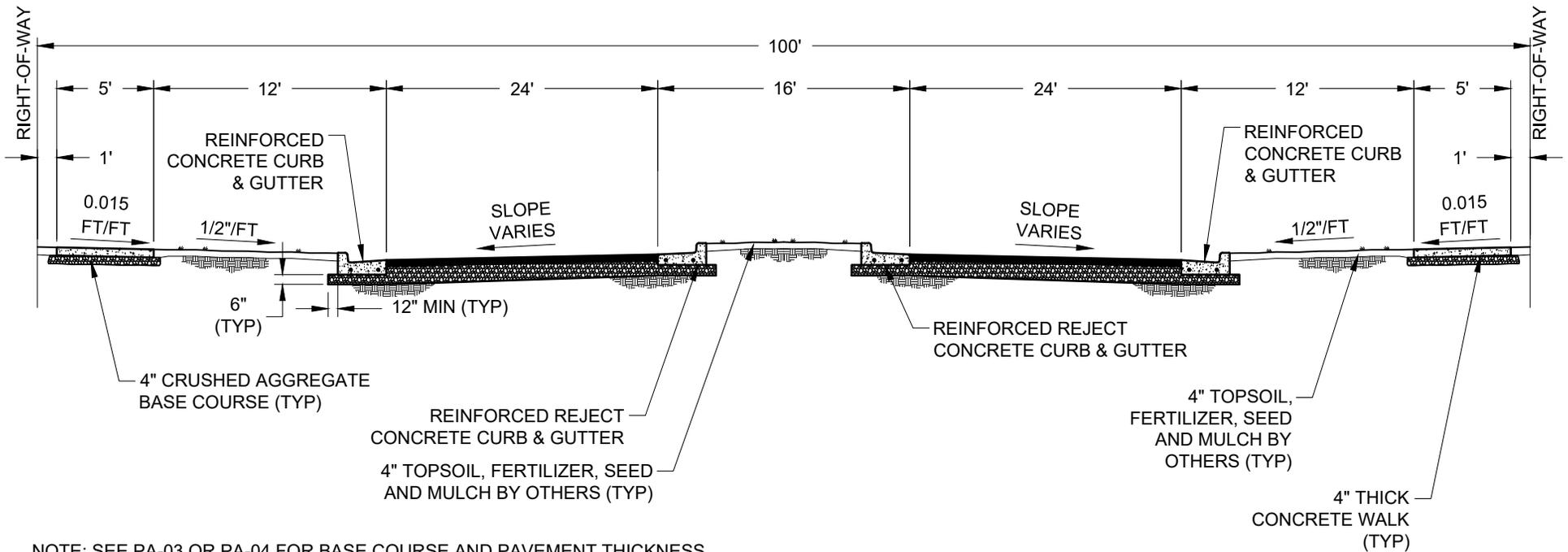
S.D.D. 8 D 5-18b

S.D.D. 8 D 5-18b

CURB RAMPS  
 TYPES 2 AND 3  
 STATE OF WISCONSIN  
 DEPARTMENT OF TRANSPORTATION

CURB RAMP DETAIL

NO SCALE

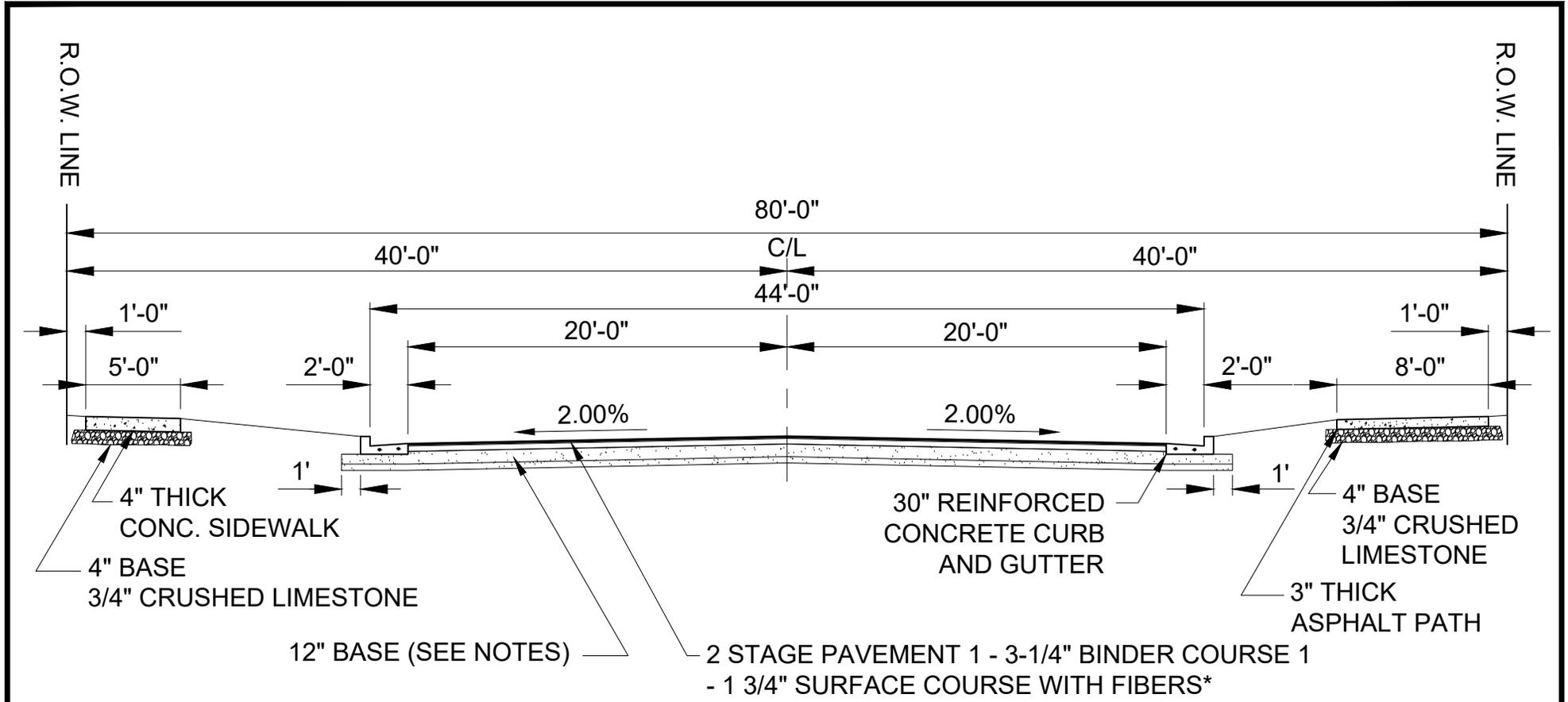


NOTE: SEE PA-03 OR PA-04 FOR BASE COURSE AND PAVEMENT THICKNESS

# TYPICAL BOULEVARD DETAIL - 100' ROW

Typical Boulevard - 100 ft ROW 96

NO SCALE



NOTE: 12" BASE-CONSISTING OF  
 TOP-4" OF 3/4" CRUSHED LIMESTONE  
 (TB) BOT-8" OF 1 1/4" CRUSHED LIMESTONE

CITY WILL DECIDE SIDEWALK AND/OR  
 PATH REQUIREMENTS

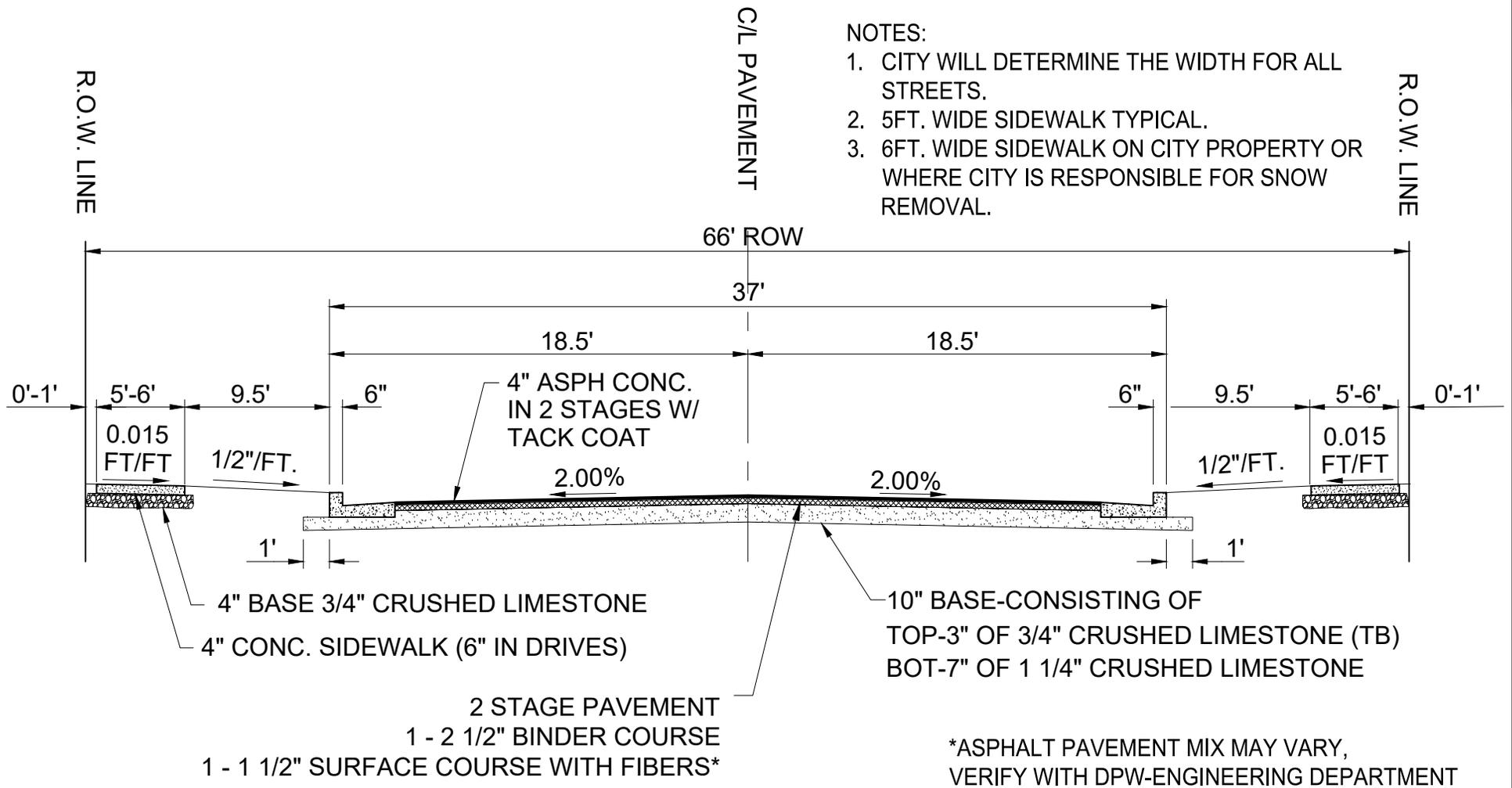
\*ASPHALT PAVEMENT MIX MAY VARY,  
 VERIFY WITH DPW-ENGINEERING DEPARTMENT

# TYPICAL COMMERCIAL/INDUSTRIAL ROAD CROSS-SECTION

Typical Commercial-Industrial road section 1

NO SCALE

## EXHIBIT PAV-03

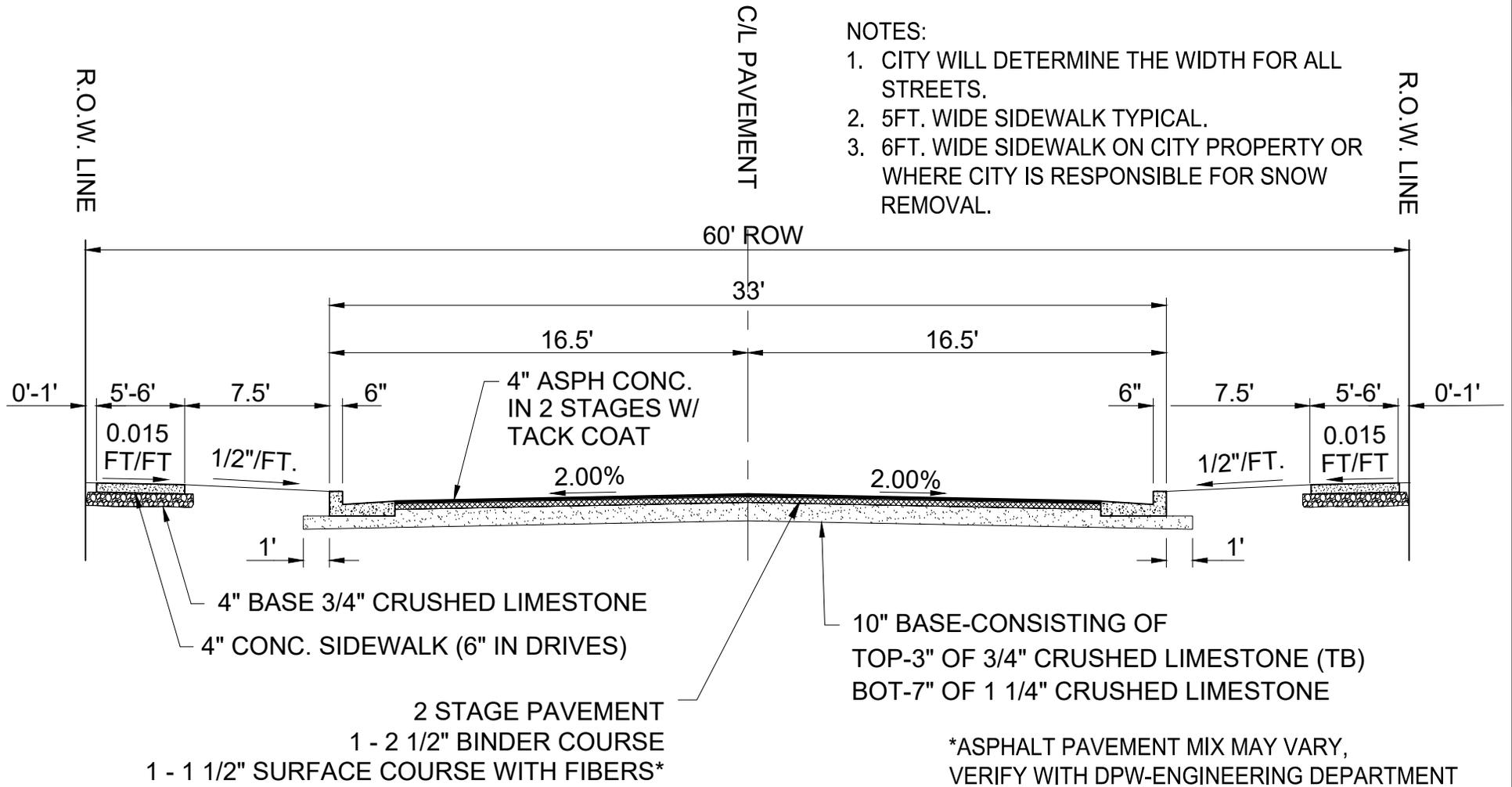


# TYPICAL COLLECTOR ROAD FOR RESIDENTIAL AREAS

NO SCALE

Typical Residential section 1

## EXHIBIT PAV-04 66 FOOT ROW

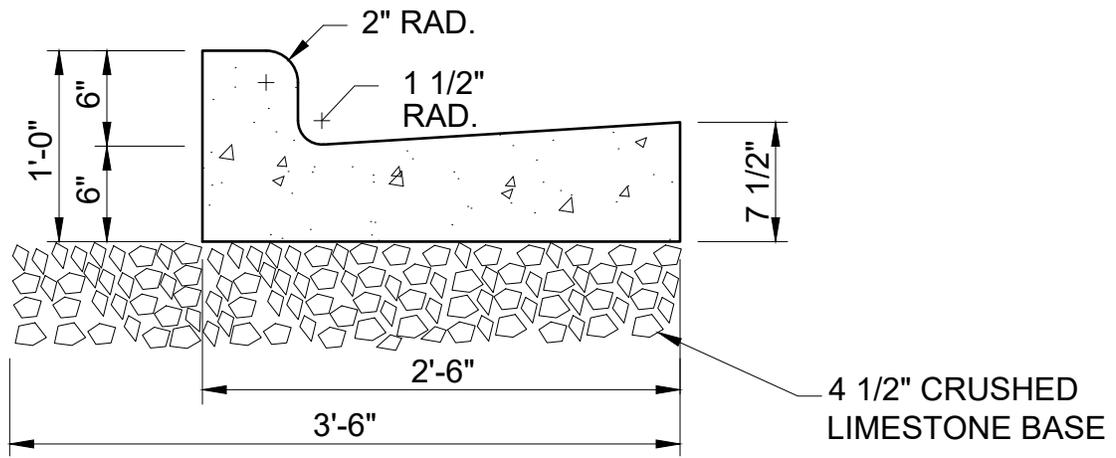


# TYPICAL ROAD FOR RESIDENTIAL AREAS

Typical Residential section 1

NO SCALE

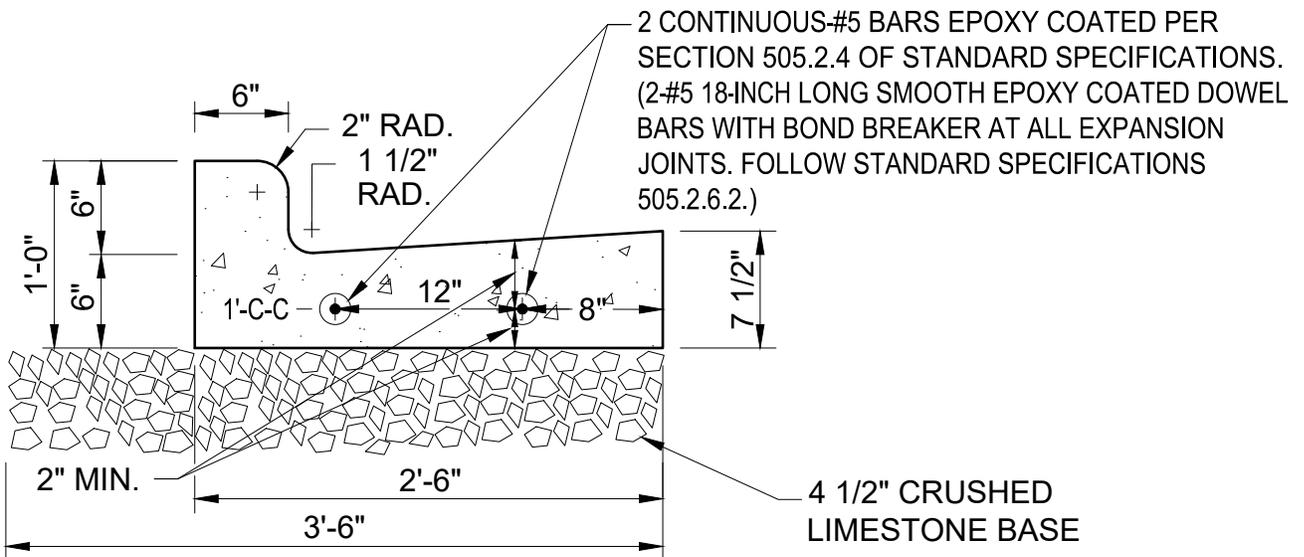
## EXHIBIT PAV-05 60 FOOT ROW



## TYPICAL VERTICAL FACE CURB (RESIDENTIAL)

Typical vertical face curb

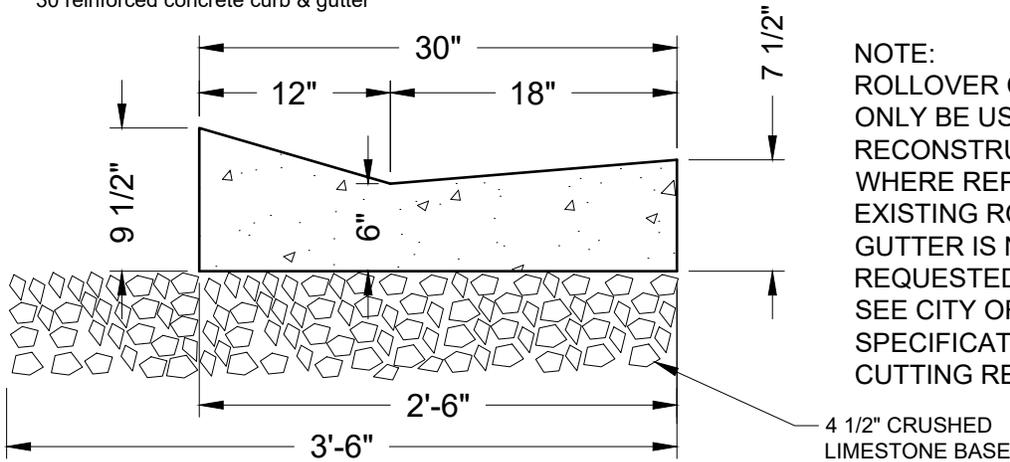
NO SCALE



## 30" REINFORCED CONCRETE CURB & GUTTER (COMMERCIAL)

30 reinforced concrete curb & gutter

NO SCALE

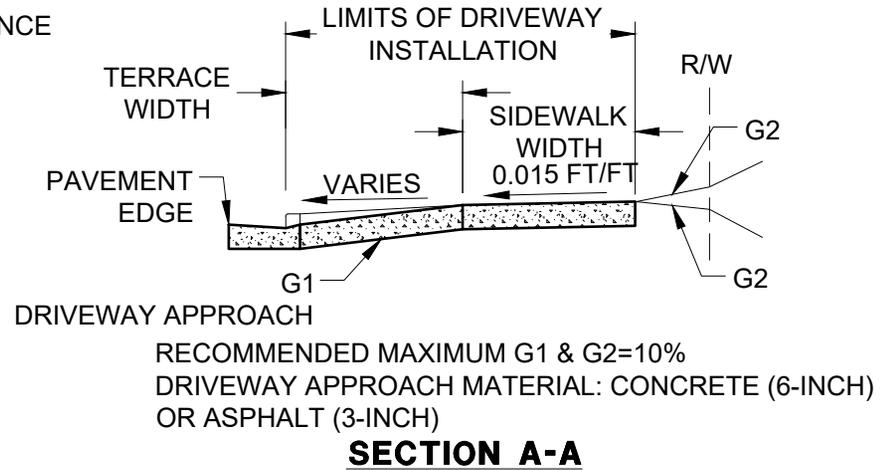
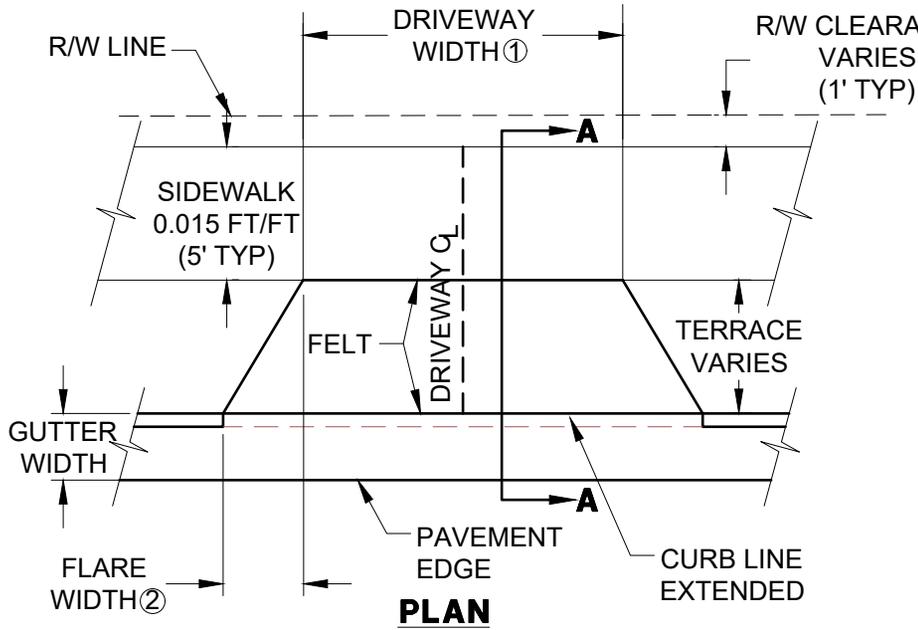


NOTE:  
 ROLLOVER CURB & GUTTER SHALL ONLY BE USED FOR RECONSTRUCTION PROJECTS WHERE REPLACEMENT OF EXISTING ROLLOVER CURB & GUTTER IS NECESSARY OR WHEN REQUESTED BY THE CITY SEE CITY OF OCONOMOWOC SPECIFICATIONS FOR CURB CUTTING REQUIREMENTS.

## TYPICAL 30" ROLLOVER CURB

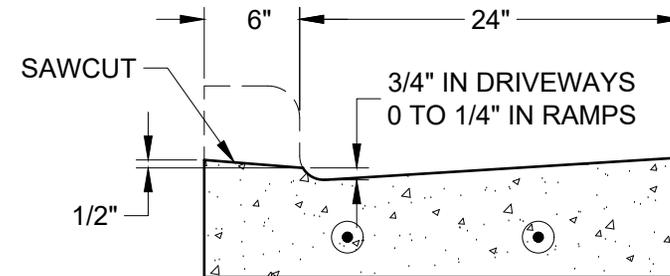
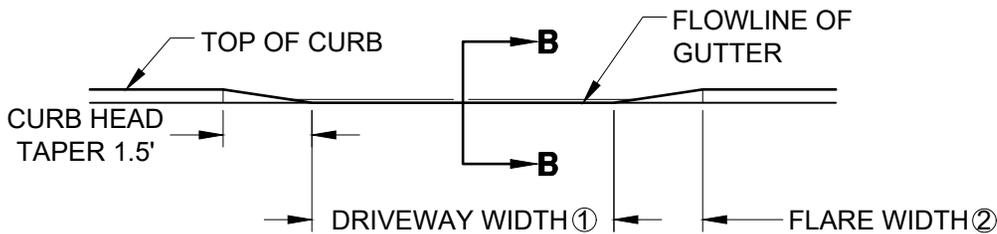
Typical 30 rollover curb 1

NO SCALE



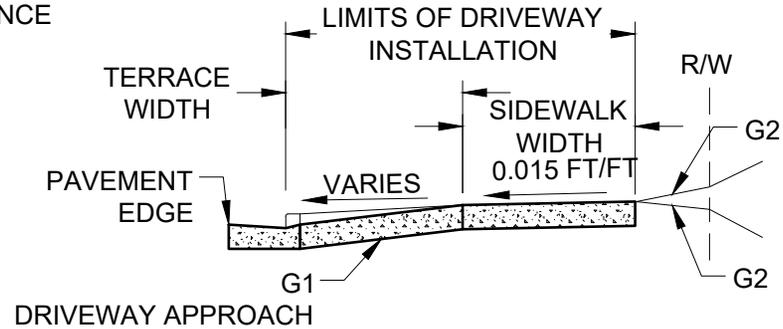
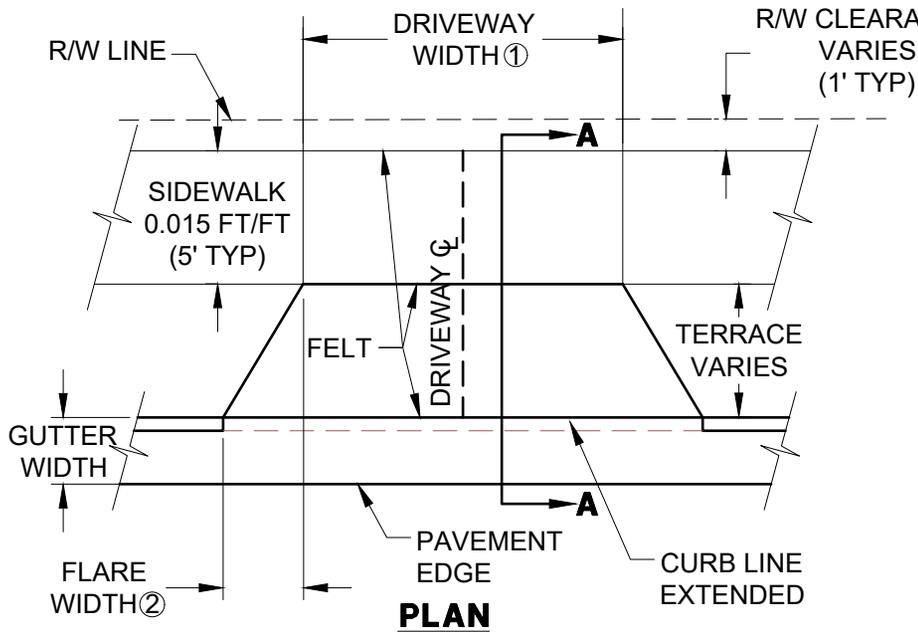
NOTE:  
 NO DRIVEWAY SHALL BE BUILT WITHIN 3 FEET OF THE PROPERTY LINE EXCEPT FOR EXISTING JOINT DRIVEWAYS SHARED BY TWO OWNERS.

- ① DRIVEWAY WIDTH:  
 32' MAX. WITHOUT A MEDIAN,  
 18' MIN. (MEASURED AT PROPERTY LINE)
- ② FLARE WIDTH:  
 3' MAX



**SECTION B-B**

# TYPE 1 DRIVEWAY DETAIL (COMMERCIAL)

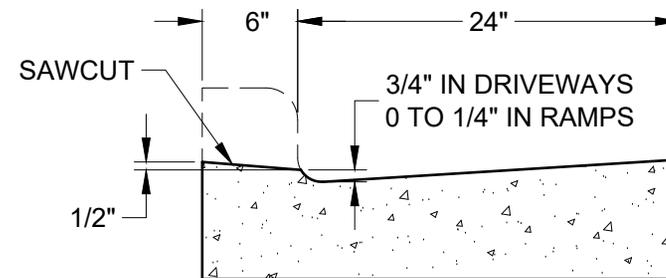
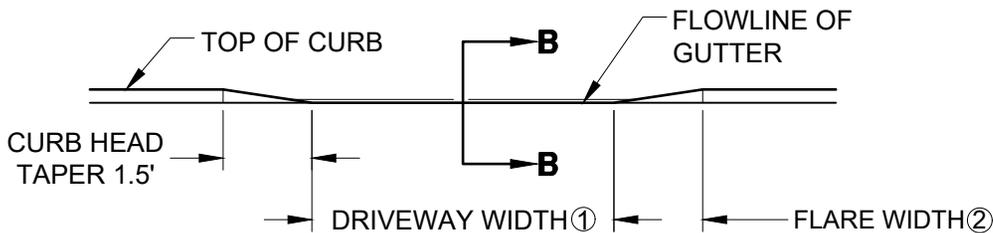


RECOMMENDED MAXIMUM G1 & G2=10%  
 DRIVEWAY APPROACH MATERIAL: CONCRETE (6-INCH OR ASPHALT (3-INCH))

**SECTION A-A**

NOTE:  
 NO DRIVEWAY SHALL BE BUILT WITHIN 3 FEET OF THE PROPERTY LINE EXCEPT FOR EXISTING JOINT DRIVEWAYS SHARED BY TWO OWNERS.

- ① DRIVEWAY WIDTH:  
 20' MAX., 10' MIN. (MEASURED AT PROPERTY LINE)
- ② FLARE WIDTH:  
 DESIRABLE MAX=2'  
 MAX=3'

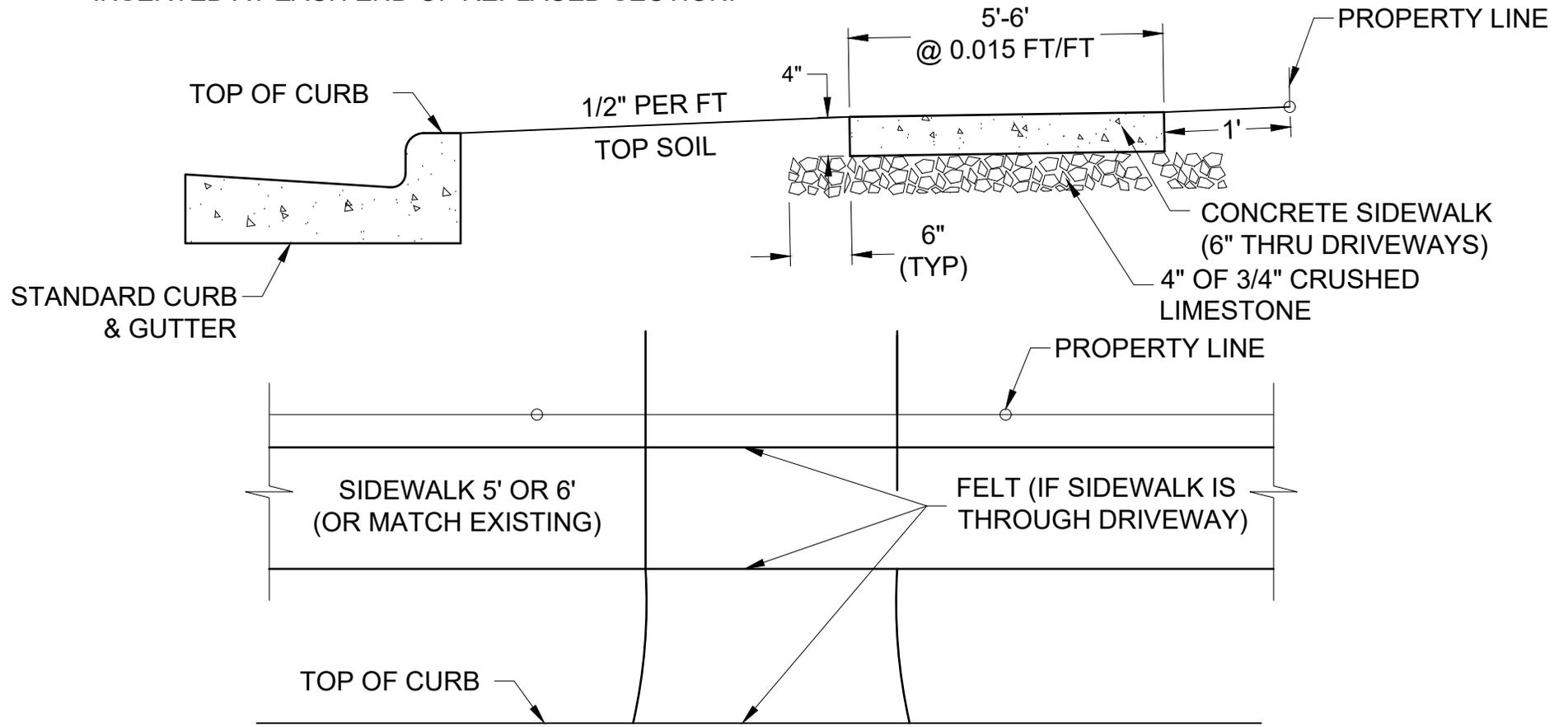


**SECTION B-B**

**TYPE 2 DRIVEWAY DETAIL (RESIDENTIAL)**

NOTES:

1. 6 BAG MIX.
2. EXPANSION JOINTS PLACED AT INTERVALS OF 50 FEET.
3. 5 FT. OR 6 FT. WIDE SIDEWALK DEPENDING ON LOCATION.
4. 6 FT. WIDE ON CITY PROPERTY OR WHERE CITY IS RESPONSIBLE FOR SNOW REMOVAL.
5. 4 INCH THICK CONCRETE THROUGHOUT. 6 INCH THICK AT DRIVEWAYS.
6. IF SIDEWALK IS REPLACED THROUGH DRIVEWAY, EXPANSION (FELT) SHOULD BE INSERTED AT EACH END OF REPLACED SECTION.

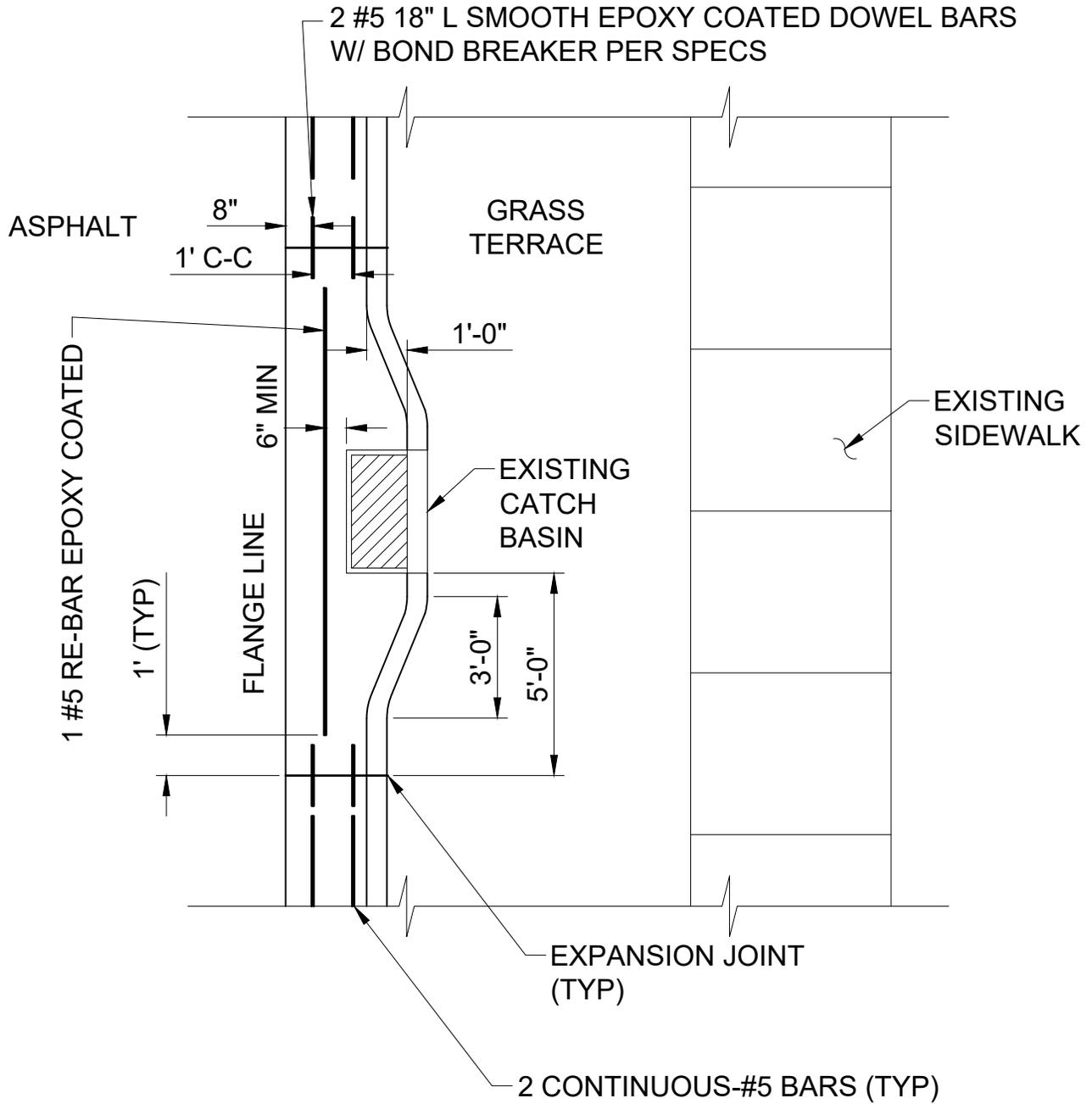


# TYPICAL SIDEWALK DETAIL

NO SCALE

Typical sidewalk detail 1

## EXHIBIT PAV-09

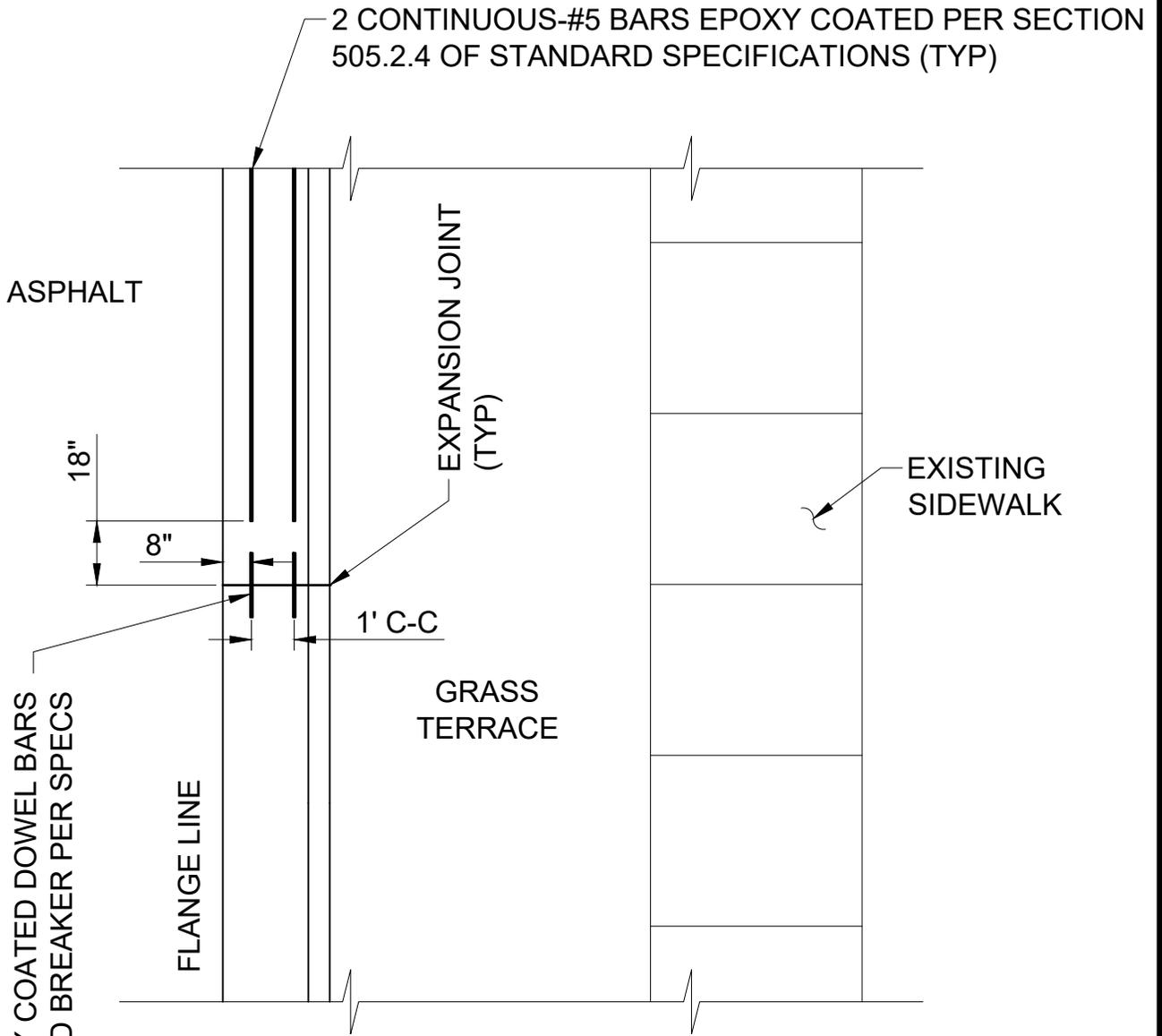


# SINGLE CATCH BASIN REINFORCED CONCRETE CURB DETAIL

NO SCALE

ogdtcbcm1 4

## EXHIBIT PAV-10



2 #5 18" L SMOOTH EPOXY COATED DOWEL BARS  
W/ BOND BREAKER PER SPECS

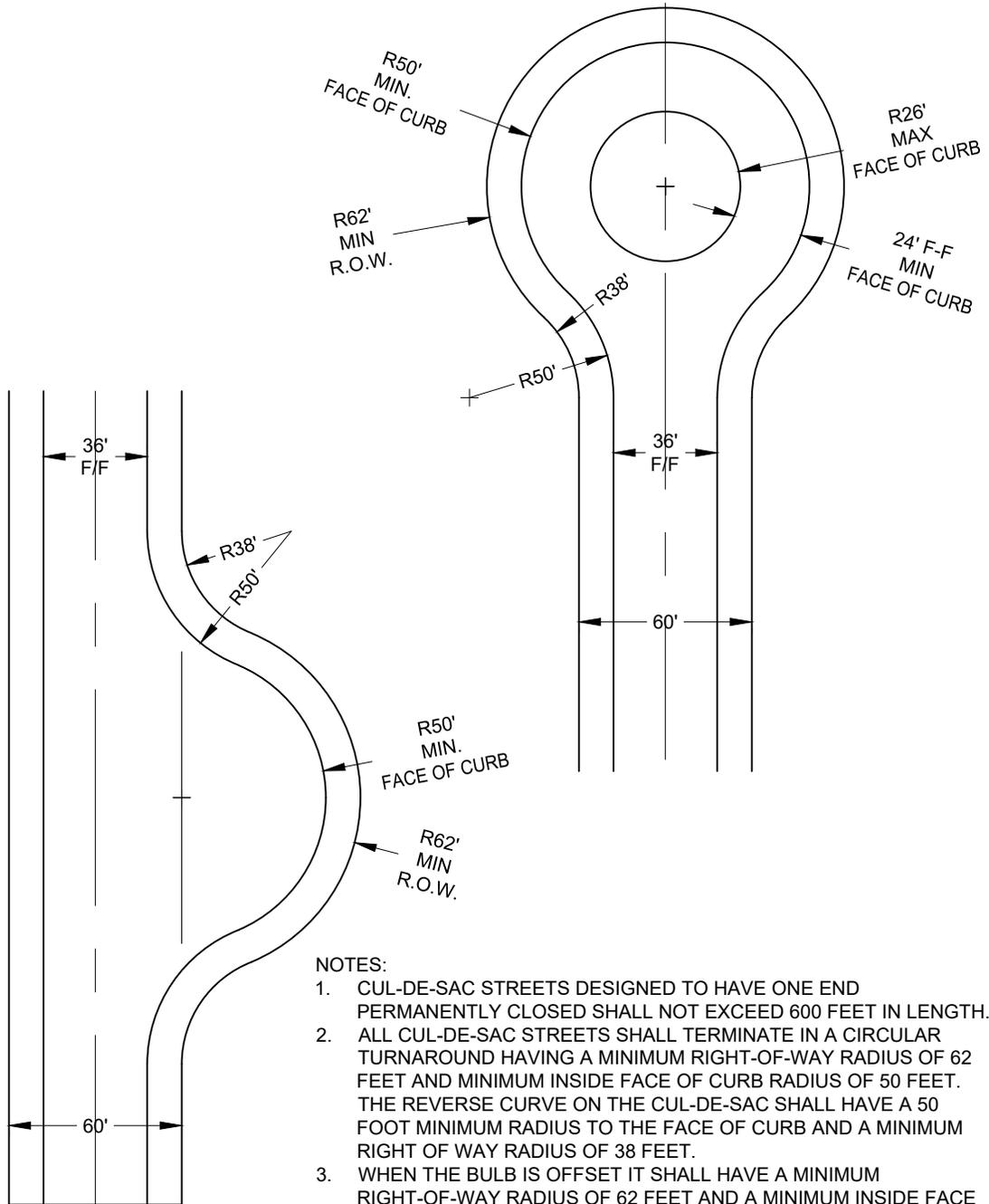
2 CONTINUOUS-#5 BARS EPOXY COATED PER SECTION  
505.2.4 OF STANDARD SPECIFICATIONS (TYP)

# CITY OF OCONOMOWOC REINFORCED CONCRETE CURB EXPANSION JOINT DETAIL

NO SCALE

cgdtcbcm2 4

## EXHIBIT PAV-11



**NOTES:**

1. CUL-DE-SAC STREETS DESIGNED TO HAVE ONE END PERMANENTLY CLOSED SHALL NOT EXCEED 600 FEET IN LENGTH.
2. ALL CUL-DE-SAC STREETS SHALL TERMINATE IN A CIRCULAR TURNAROUND HAVING A MINIMUM RIGHT-OF-WAY RADIUS OF 62 FEET AND MINIMUM INSIDE FACE OF CURB RADIUS OF 50 FEET. THE REVERSE CURVE ON THE CUL-DE-SAC SHALL HAVE A 50 FOOT MINIMUM RADIUS TO THE FACE OF CURB AND A MINIMUM RIGHT OF WAY RADIUS OF 38 FEET.
3. WHEN THE BULB IS OFFSET IT SHALL HAVE A MINIMUM RIGHT-OF-WAY RADIUS OF 62 FEET AND A MINIMUM INSIDE FACE OF CURB RADIUS OF 50 FEET. THE REVERSE CURVE ON AN OFFSET CUL-DE-SAC SHALL HAVE A 50 FOOT MINIMUM RADIUS TO THE FACE OF CURB AND A MINIMUM RIGHT OF WAY RADIUS OF 38 FEET.
4. CENTER ISLANDS SHALL HAVE A MAXIMUM INSIDE FACE OF CURB RADIUS OF 26 FEET.
5. CENTER ISLAND SHALL BE AN OUTLET.
6. CENTER ISLANDS ARE OPTIONAL.

# TYPICAL CUL-DE-SAC AND OFFSET BULB

NO SCALE

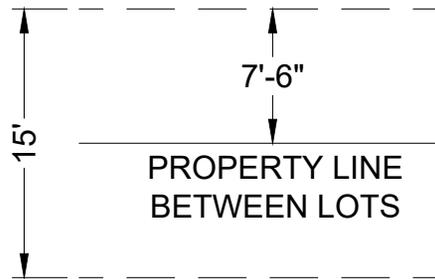
**EXHIBIT PAV-12**

Typical Cul-De-Sac and Offset Bulb

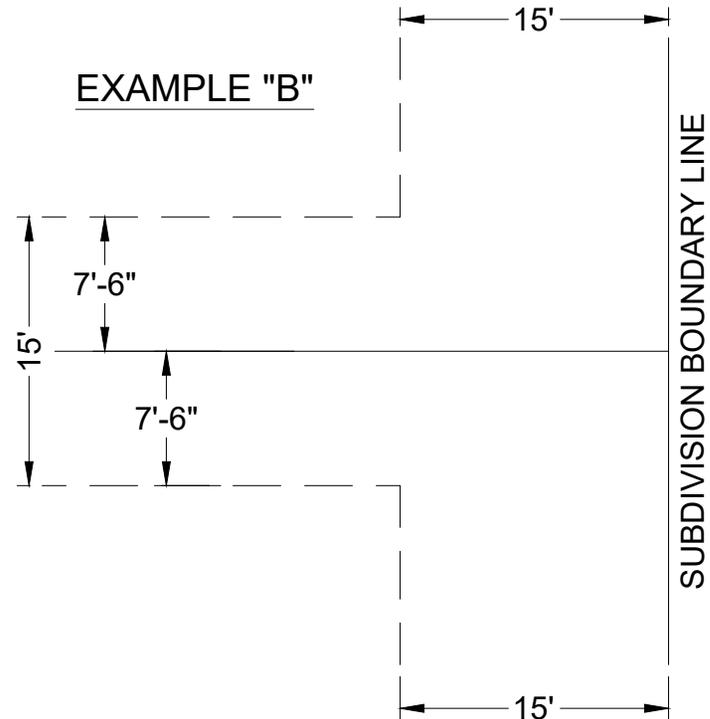
TYPICAL UTILITY EASEMENT FOR ALL  
LOTS UNLESS OTHERWISE NOTED

TO BE PLACED ON FINAL  
PLAT BEFORE APPROVAL

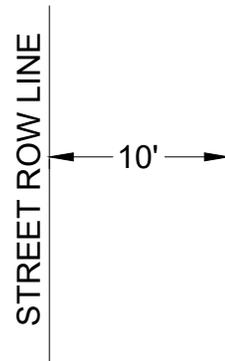
EXAMPLE "A"



EXAMPLE "B"



EXAMPLE "C"

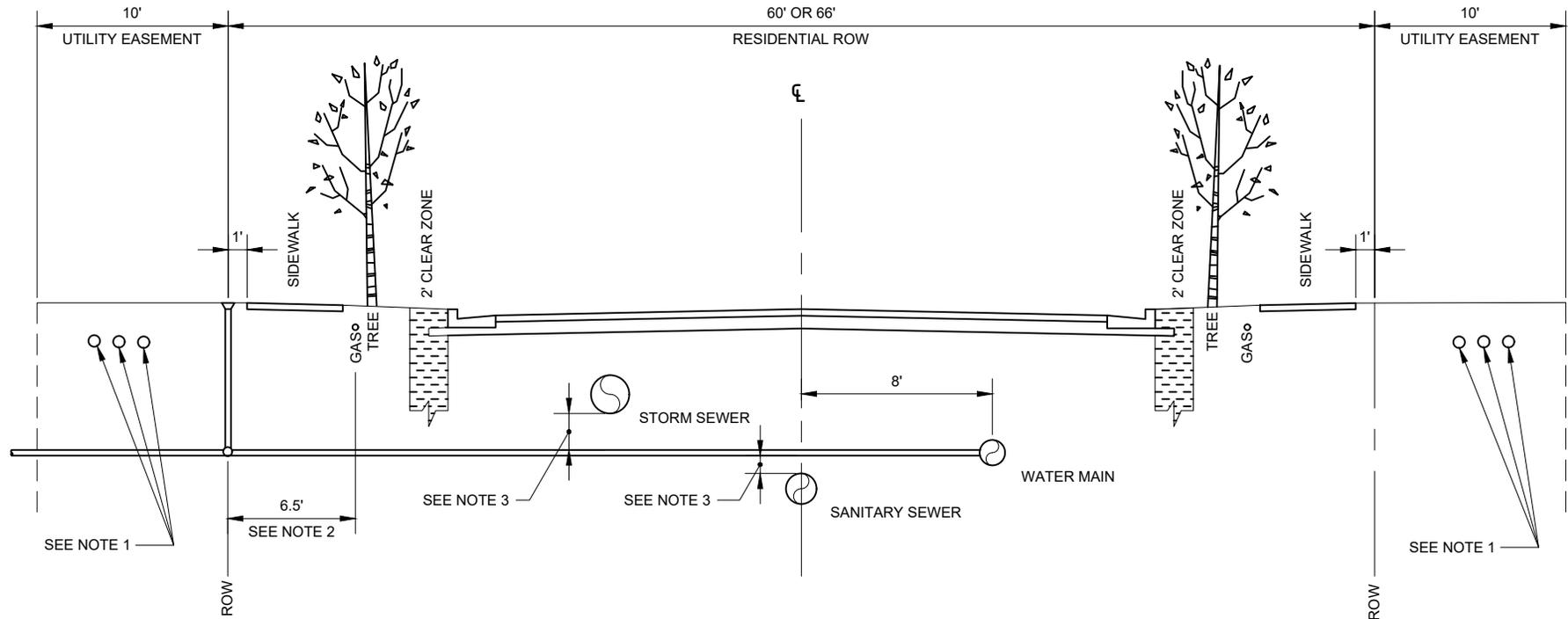


NOTE:

1. THIS IS INTENDED FOR ALL UTILITIES: ELECTRIC, PHONE, GAS, SANITARY, WATER, CABLE TV, STORM AND STORM WATER MANAGEMENT.
2. WHERE STORM WATER FACILITIES ARE DESIGNED BETWEEN TWO PARCELS (SIDE OR REAR) THEY SHALL BE CENTERED IN A 20 FOOT WIDE OUTLOT.

**TYPICAL UTILITY EASEMENT**

NO SCALE

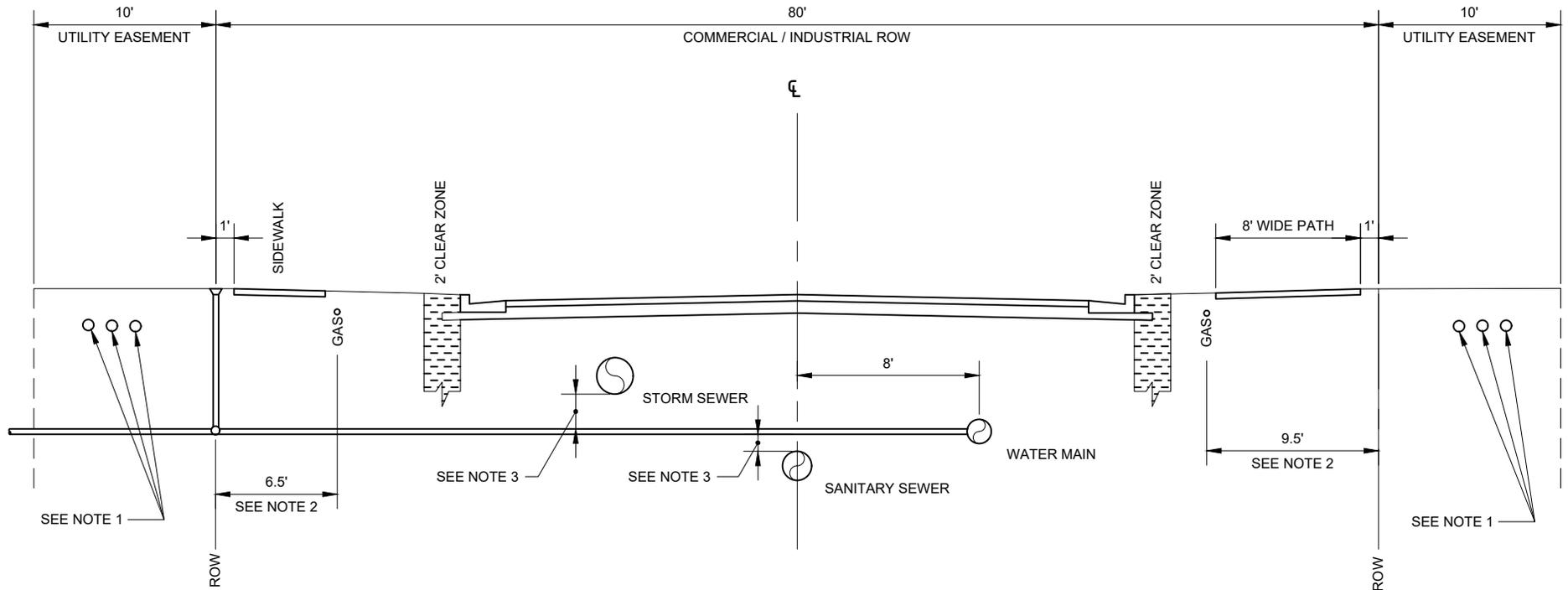


- NOTES:
1. LOCATION FOR ELECTRIC, CABLE TV, AND PHONE UTILITIES IN EITHER 10' UTILITY EASEMENT.
  2. 7.5' AT LOCATIONS WITH 6' WIDE SIDEWALK.
  3. WATER LATERAL SHALL BE INSTALLED 6" ABOVE OR 18" BELOW SANITARY SEWER AND STORM SEWER MINIMUM.

## TYPICAL UTILITY PLACEMENT FOR RESIDENTIAL DISTRICTS

NO SCALE

EXHIBIT UT-02



- NOTES:
1. LOCATION FOR ELECTRIC, CABLE TV, AND PHONE UTILITIES IN EITHER 10' UTILITY EASEMENT.
  2. 7.5' AT LOCATIONS WITH 6' WIDE SIDEWALK. 9.5' AT LOCATIONS WITH 8' WIDE PATH.
  3. WATER LATERAL SHALL BE INSTALLED 6" ABOVE OR 18" BELOW SANITARY SEWER AND STORM SEWER MINIMUM.

## TYPICAL UTILITY PLACEMENT FOR COMMERCIAL / INDUSTRIAL DISTRICTS - 80' ROW

NO SCALE

EXHIBIT UT-03

# Checklist #1

## Site Plan Map Requirements

**All items on this list are required for all Erosion Control and Storm Water Management Permit Applications.** Additional items must be shown on erosion control plans (see Checklist #2) and storm water management plans (see Checklist #3). A site plan map and supporting data of site conditions at a scale of 1 inch equals no more than 100 feet (unless otherwise noted) shall delineate or display the following applicable items.

The following existing and proposed site features must be provided for all permit applications. Items listed below must be shown on the site and within an appropriate distance in each direction of the site boundaries.

- 1. Development title, graphic scale and north arrow;
- 2. Property location description by public land survey system (1/4 section, section, township, range, county);
- 3. Location map (smaller scale) showing the site location within a public land survey section or subdivision, oriented the same as par. 4 below;
- 4. Ownership boundaries, bearings, lengths and other survey references that will accurately identify the site location for all land divisions;
- 5. Lot numbers and dimensions, including outlots for all land divisions;
- 6. Name and complete **contact information** for the applicant, landowner, developer and project engineer or planner;
- 7. Surveyor's certificate, signed, dated and sealed for all land divisions;
- 8. Sheet numbers and **revision dates** on every page;
- 9. Existing **site topography** at a contour interval not to exceed 2 feet, including **spot elevations** for physical features such as storm sewers (invert elevations), retaining walls, road and ditch centerlines and topographic high and low points;
- 10. Location and name, if applicable, of all lakes, streams, channels, ditches and other **water bodies** or areas of **channelized flow** on or adjacent to the site;
- 11. Location and name, if applicable, of all **wetlands** and identification of source of delineation. For final land divisions, these boundaries shall be field verified;
- 12. Boundaries of **shoreland zones** and the ordinary high water mark (OHWM) for any navigable water body. For final land divisions, the OHWM boundaries shall be field verified;
- 13. Boundaries and elevation of the **100-year floodplains, flood fringes and floodways**. For final land divisions, these boundaries and elevations shall be field verified.
- 14. Boundaries and soil symbol for each **soil mapping unit** and the identification of all **hydric soils** and defined by the USDA-Natural Resources Conservation Service;
- 15. Locations of all soil borings and **soil profile evaluations** with unique references to supplemental data report forms;
- 16. Location of **primary and secondary environmental corridors**, as defined by the Southeastern Wisconsin Regional Planning Commission. For final land divisions, these boundaries shall be field verified;
- 17. Location and description of **isolated natural area** boundaries as defined by the Southeastern Wisconsin Regional Planning Commission, **woodland areas**, as defined in the storm water ordinance and other **vegetative cover types**;
- 18. Location and descriptive notes for **existing and proposed structures** within 50 feet of the property boundaries and their proposed use, including, but not limited to, buildings and foundations, roads, parking areas, fence lines, access lanes, culverts (include size and type), above ground utilities and retaining walls;

- 19. Location and descriptive notes for other known **existing site features** including, but not limited to, rock outcrops or other karst features, tile drains, buried utilities, dumps, landfills, historical/cultural resources manure or other waste storage facilities;
- 20. Boundaries and descriptive notes for all applicable setbacks and for "**protective areas**" (see ordinance or Checklist #3 for more information);
- 21. Location and descriptive notes for any **existing or proposed easements**, right-of-ways, vision corners or other known site restrictions. Road right-of-ways and building setbacks shall be in compliance with all applicable administrative codes, adopted plans and ordinances;
- 22. Location and descriptive notes for **existing and proposed public dedications** of parcels or right-of-ways;
- 23. Location and descriptive notes for **preplanned building or waste disposal** sites, when limited by site features;
- 24. Location and documentation of any **existing well** and delineation of any applicable **regulatory setbacks**, in accordance with ch. NR 811 and 812 Wis. Admin. Code (ie 100 foot from infiltration basin, etc.)
- 25. Notes describing **source documents, date and measure of accuracy** for all applicable mapping features noted above;
- 26. Other site information that the Department of Public Works determines is necessary to administer this ordinance.

**\*NOTE:** *If necessary, items should be displayed on more than one map to ensure clarity. Each map must include proposed structures, setbacks, easements, right-of-ways, etc.*

## Checklist #2

### Erosion Control Plan Requirements (>1 Acre)

Under City ordinance, significant grading activity may trigger the need for a storm water permit for construction site erosion control. An erosion control plan is designed to protect downstream water resources and property owners from water pollution and other damage caused by sediment runoff from construction sites. Erosion control plans designed to meet the requirements of the City ordinance shall adhere to the following guiding principles:

- 1) Propose grading that best fits the terrain of the site, avoiding steep slopes, wetlands, floodplains and environmental corridors and applicable regulatory setbacks from these areas;
- 2) Minimize, through project phasing and construction sequencing, the time the disturbed soil surface is exposed to erosive forces;
- 3) Minimize soil compaction, the loss of trees and other natural vegetation and the size of the disturbed area at any one time;
- 4) Locate erosion control BMPs upstream from where runoff leaves the site or enters waters of the state and outside of wetlands, floodplains, primary or secondary environmental corridors or isolated natural areas;
- 5) Emphasize the use of BMPs that prevent soil detachment and transport over those aimed to reduce soil deposition (sedimentation) or repair erosion damage.

#### **Erosion Control Plans Must Include the Following:**

1. A **site map** in accordance with Checklist #1. Digital submittal required. All other map elements listed below shall be delineated and labeled at a scale of 1 inch equals no more than 100 feet, unless otherwise noted.
2. North arrow, graphic scale, draft date, name and **contact information** for project engineer or planner and designation of source documents for all map features;
3. Proposed site topography at contour intervals not to exceed two feet, proposed percent slope for all open channels and side slopes and all runoff **discharge points** from the site;
4. Proposed building envelopes and other **land area to be disturbed** and size in acres;
5. All **woodland areas**, those proposed to be lost or transplanted during construction and acres or numbers of each. For woodlands proposed to be lost, show individual trees larger than eight (8) inches in diameter that are located within twenty (20) feet of proposed grading boundaries;
6. Temporary **access drive** and specified surface material (3 to 6 inch clear or washed stone), minimum depth (minimum 12 inches) and minimum 50 feet long;
7. Temporary **flow diversion** devices for upslope or roof runoff until site is stabilized;
8. Temporary **sediment trapping devices** for site perimeter and inlets to culverts and storm drains;
9. Temporary settling basin or other BMP to be used for **site dewatering** during utility or other subsurface work;
10. Temporary **soil stockpile sites** indicating setbacks (minimum 25 feet) from channelized flow, nearby water resources or environmental corridors and the proposed erosion protection methods;
11. **Detailed drawings** and **cross sections** for any sediment traps, basins other major cut or fill areas showing side slopes and elevations;
12. Final **stabilization measures** for open channels and erosion protection for pipe and channel inlets, outlets and emergency spillways;
13. Location of **proposed utilities**, including standard cross-section for buried utilities, associated easements, labeling the type of utility and notes on erosion control and restoration plans;

- 14. Final **site stabilization** instructions for all disturbed areas, showing areas to be stabilized in acres, depth of applied topsoil (minimum 4 inches), seed types, rates and methodology, fertilizer, sod or erosion matting specifications, maintenance requirements until plants are well established, and other BMPs used to stabilize the site;
- 15. Detailed **construction notes** clearly explaining all necessary procedures to be followed to properly implement the plan including estimated starting date of grading, timing and sequence of construction or demolition, any construction stages or phases, utility installation, dewatering plans, refuse disposal, inspection requirements, and the installation, use and maintenance of BMPs in the plan;
- 16. Location of soil borings and **soil profile evaluations** with surface elevations and unique references to supplemental soil evaluations report forms. Also show estimated highest groundwater table depths, which may be shown on a separate map, with sufficient references to the proposed site plan.
- 17. Spill prevention and response procedures
- 18. Other items specified by the Department of Public Works as necessary to ensure compliance with the ordinance.

**Provide Supporting Information:**

- 1. Copies of the **WDNR Soil Loss & Sediment Discharge Calculation Tool** spreadsheet results.
- 2. A **narrative summary** of the erosion control plan used in #1 above, briefly:
  - a. Explaining the overall plan and any unique information that led to the selection of BMPs and how the plan meets the guiding principles above;
  - b. Identifying the input variables used in the Soil Loss spreadsheet;
  - c. Mapping the locations where the input variables were measured;
  - d. Identifying all areas evaluated to establish the representative worst case condition.
- 3. **Summary of design data** for any structural BMP such as sediment basins or sediment traps. A professional engineer, licensed in the State of Wisconsin, shall stamp and sign a statement approving all designs and certifying that they have read the requirements of this ordinance and that, to the best of their knowledge, the submitted plans comply with the requirements.
- 4. Open channel design and stabilization data to support the selected BMPs for stabilization.
- 5. **Soil profile evaluation reports** with unique references and elevations that match the map above.
- 6. Estimated time soil stockpiles will exist to support the selected BMPs for erosion control.
- 7. Documentation that proposed utility locations and installation scheduling has been coordinated with the affected utility companies.
- 8. Documentation of any other calculations used to demonstrate compliance with the performance standards in this section.
- 9. Identification of the **primary contacts** for:
  - a. Conducting erosion control **inspections** and how they will make the **inspection logs** available to the Department of Public Works.
  - b. Completing site grading and temporary **erosion control practices**.
  - c. Completing final **site restoration and stabilization**.

## **Summary of Erosion Control Plan Technical Requirements (Ordinance Excerpts)**

All erosion control plans shall by design, achieve to the maximum extent practicable, a runoff discharge of no more than 5 tons of sediment per acre per year from sheet and rill erosion during land disturbing activities, as compared with no sediment or erosion controls, until the site is stabilized.

Note: Soil loss prediction tools are available that can estimate the sediment load leaving the construction site under varying land and management conditions and the application of erosion control BMPs. An example of such a tool is the Universal Soil Loss Equation (USLE) published by the USDA-NRCS. The Wisconsin DNR has prepared a model based on the USLE, which may be used to demonstrate compliance with the above noted performance standard.

**Listed below are the specific minimum plan requirements that shall be addressed in erosion control plans to the maximum extent practicable.**

1. Access Drives and Tracking. Provide access drive(s) for construction vehicles that minimize tracking of soil off site using BMPs such as stone tracking pads, tire washing or grates. Minimize runoff and sediment from adjacent areas from flowing down or eroding access drive.
2. Diversion of Upslope Runoff. Divert excess runoff from upslope land, rooftops or other surfaces, if practicable, using BMP's such as earthen diversion berms, silt fence and downspout extenders. Prevent erosion of the flow path and the outlet.
3. Inlet Protection. Protect inlets to storm drains, culverts and other storm water conveyance systems from siltation until the site is stabilized.
4. Soil Stockpiles. Locate soil stockpiles away from channelized flow and no closer than 25 feet from roads, ditches, lakes, streams, ponds, wetlands or environmental corridors, unless otherwise approved by the DPW. Control sediment from soil stockpiles. Any soil stockpile that remains for more than 30 days shall be stabilized.
5. Cut and Fill Slopes. Minimize the length and steepness of proposed cut and fill slopes and stabilize them as soon as practicable.
6. Channel Flow. Trap sediment in channelized flow before discharge from the site using BMPs such as sediment traps and sediment basins. Complete final grading and stabilize open channels in accordance with City standards as soon as practicable, but in no event later than the first ground freeze or snow cover.
7. Outlet Protection. Protect outlets from erosion during site dewatering and storm water conveyance, including velocity dissipation at pipe outfalls or open channels entering or leaving a storm water management facility.
8. Overland Flow. Trap sediment in overland flow before discharge from the site using BMPs such as silt fence and vegetative filter strips.
9. Site Dewatering. Treat pumped water to remove sediment prior to discharge from the site, using BMPs such as sediment basins and portable sediment tanks.
10. Dust Control. Prevent excessive dust from leaving the construction site through construction phasing and timely stabilization or the use of BMPs such as site watering and mulch – especially with very dry or fine soils.
11. Topsoil Application. Save existing topsoil and reapply a minimum of 4 inches to all disturbed areas for final stabilization, unless otherwise approved by the DPW, such as for temporary seeding or storm water infiltration BMP's. If adequate topsoil does not exist on the site to meet this requirement, it shall be imported or a topsoil substitute such as compost may be used, upon approval by the DPW.
12. Waste Material. Recycle or properly dispose all waste and unused building materials in a timely manner. Control runoff from waste materials until they are removed or reused.
13. Sediment Cleanup. By the end of each workday, clean up all off-site sediment deposits or tracked soil that originated from the permitted site. Flushing shall not be allowed unless runoff is treated before discharge from the site.

14. Final Site Stabilization. All previous cropland areas where land-disturbing activities will not be occurring under the proposed grading plans, shall be stabilized within 30 days of permit issuance. Stabilize all other disturbed areas within 7 days of final grading and topsoil application. Large sites shall be treated in stages as final grading is completed in each stage. Any soil erosion that occurs after final grading or the application of stabilization measures must be repaired and the stabilization work redone.
15. Temporary Site Stabilization. Any disturbed site that remains inactive for greater than 7 days shall be stabilized with temporary stabilization measures such as soil treatment, temporary seeding or mulching. For purposes of this subsection, "inactive" means that no site grading, landscaping or utility work is occurring on the site and that precipitation events are not limiting these activities. Frozen soils do not exclude the site from this requirement.
16. Removal of Practices. Remove all temporary BMPs such as silt fences, ditch checks and sediment traps as soon as all disturbed areas have been stabilized.
17. Site Drainage. Site drainage plans shall comply with Checklist #3.
18. Stormwater BMP Data. When a Stormwater Permit involves the maintenance of the existing stormwater BMP, including the removal of accumulated sediment, the DPW may require additional support data such as before/after surveys, design and construction details, and oversight by a professional engineer licensed in Wisconsin.

## Checklist #3

### Storm Water Management Plan Requirements

Under City ordinance, additional impervious surfaces may trigger the need for a storm water management plan and permit. A storm water management plan is designed to protect downstream water resources and property owners from water pollution, flooding and other damage caused by urban runoff after a development is complete. Storm water management plans designed to meet the requirements of the City ordinance shall adhere to the following guiding principles:

- 1) Preserve natural watershed boundaries and drainage patterns;
- 2) Reserve adequately sized areas for storm water infiltration, detention and treatment early in the planning process;
- 3) Locate storm water BMPs upstream from where runoff leaves the site or enters waters of the state and outside of wetlands, floodplains, primary or secondary environmental corridors or isolated natural areas;
- 4) Minimize soil compaction and maintain pre-development groundwater recharge areas;
- 5) Minimize impervious surfaces and have them drain to vegetated areas for pollutant filtering and infiltration;
- 6) Emphasize vegetated swales, warm season and wetland plantings and low flow velocities for storm water conveyance, treatment and infiltration, especially for transportation related projects;
- 7) Allow for different storm water management strategies for cleaner runoff (i.e. roofs) versus more polluted runoff (i.e. streets and parking lots);
- 8) Provide for emergency overflow in all storm water BMP designs;
- 9) Distribute storm water bioretention and infiltration BMPs throughout the site plan for large developments.

#### **Storm Water Management Plan Must Include:**

1. A **site map** in accordance with Checklist #1. Digital submittal required.
2. **Drafting date** and **contact information** for the project engineer, with the engineer's stamp and date. All other mapping elements and scale consistent with the site plan map;
3. Delineation of existing and proposed watersheds, subwatersheds and major flow paths within the site and draining into the site from adjacent properties.
4. Location, type and preliminary design of proposed stormwater BMPs needed to comply with the ordinance.
5. Location and type of major stormwater conveyance systems proposed for the site.
6. Location of **existing and proposed storm water discharge points**;
7. Location and dimensions of proposed **drainage easements**.
8. Location of soil borings and **soil profile evaluations** with surface elevations and unique references to supplemental data sheets, as needed to determine feasibility of any proposed storm water BMP and to comply with applicable technical standards such as basement/groundwater separation requirements.
9. Location, dimensions and surfacing materials or soils data of proposed **access lanes** and delineations of easements needed to allow future maintenance of storm water BMP's. Minimum width of any access easement shall be 15 feet.

- 10. Support documentation including:
  - a. Preliminary **plan narrative** describing site drainage, ultimate receiving water body for offsite discharges, major site restrictions, and how the preliminary stormwater management plan will meet the requirements of the ordinance and other project objectives;
  - b. Summary of watershed, subwatershed and land use data in acres and the preliminary results of any hydrology calculations.
  - c. Soil profile evaluation data in accordance with BMP technical standards and basement/groundwater separation requirements.
  - d. Proposed ownership and maintenance responsibilities for all proposed stormwater BMPs

**Final Storm Water Management Plan Must Include (for Permit):**

- 1. A **site map** in accordance with Checklist #1. Digital submittal required.
- 2. **Drafting date** and **contact information** for the project engineer, with the engineer's stamp and date. All other mapping elements and scale consistent with the site plan map;
- 3. Location of **existing and proposed storm water discharge points**;
- 4. Delineation and labeling of all proposed impervious areas and accompanying area computations.
- 5. Final design drawings of all proposed stormwater BMPs with unique references to support documentation, prepared in accordance with minimum City standards and of sufficient clarity for those responsible for site grading, including :
  - a. Plan views showing the **location of proposed BMPs** in combination with the site plan map at a scale of 1 inch equals no more than 100 feet;
  - b. Additional **detail plan view** drawings at a scale of 1 inch equals no more than 40 lineal feet, showing proposed 2 foot contours and all critical design features and elevations;
  - c. One detailed **cross-section** and one profile of each BMP, drawn to scale, with locations shown on the plan view, and showing all critical design features, side slopes, structures, soil profiles and elevations, including seasonal high water table and existing grade;
  - d. Detailed drawings or **material specifications** for inlets or outlets.
- 6. Type, size, location and cross-sections of all pipes, open channels, grade stabilization structures and other proposed storm water **conveyance systems**, with unique references to support documentation.
- 7. Location and dimensions of proposed **drainage easements**.
- 8. Location, dimensions and surfacing materials or soils data of proposed **access lanes** and delineations of easements needed to allow future maintenance of storm water BMP's. Minimum width of any access easement shall be 15 feet.
- 9. Location, dimensions and surfacing materials or soils data of proposed **access lanes** and delineations of easements needed to allow future maintenance of storm water BMP's. Minimum width of any access easement shall be 15 feet.
- 10. Detailed **construction notes** explaining all necessary procedures to be followed to properly implement the plan, including planting and landscaping specifications, timing and sequencing of construction and any temporary measures needed to protect BMPs during the construction phase.
- 11. Detailed **construction inspection plan**, outlining the critical elements in the plan that need to be surveyed or inspected by a representative of the project engineer, or the City and the timing and notification requirements involved (identify who is responsible).
- 12. A final **maintenance agreement** in accordance with ordinance requirements.

13. Support documentation summarized in accordance with DPW standards, must include at least the following:
- a. A **narrative** summary of the storm water plan. (May combine with erosion control plan).
  - b. **Maps** of existing and proposed **watersheds**, subwatersheds, Tc/Tt flow paths, soil types, hydrologic soil groups, land uses/cover type and runoff curve numbers within the site and draining into the site from adjacent properties, with unique references to hydrology data summaries and the ultimate receiving water body(s) for off-site discharges.
  
  - c. Pre-development and post-development **hydrology** and pollutant loading (if applicable) **data** for each watershed, such as peak flows and runoff volumes, as needed to meet the requirements of the ordinance. All major assumptions used in developing the input parameters shall be clearly stated and cross-referenced to the maps.
  - d. **Impervious** surface maps and calculations of runoff volumes and effective infiltration areas.
  - e. **Hydraulic & hydrologic data summaries** for all existing and proposed pipes, channels, grade stabilization structures and other runoff conveyance systems, and the necessary documentation to demonstrate compliance with the site drainage requirements (see pg. 4).
  - f. **BMP design data** for each proposed BMP, showing how it complies with applicable technical standards and the requirements of the ordinance, following approved City format.
  - g. **Soil evaluation reports** with matching references to map features, location and elevations.
  - h. A cover sheet **stamped and signed by a professional engineer** registered in the State of Wisconsin indicating that all plans and supporting documentation have been reviewed and approved by the engineer and certifying that, to the best of their knowledge, the submitted plans comply with the requirements of the ordinance.
  - i. For sites where changes are proposed in storm water flow paths or where proposed storm water discharges may otherwise have a significant negative impact on downstream property owner(s), the City may require the applicant to submit written authorization or complete other legal arrangements with the affected property owner(s).

## Summary of Storm Water Management Plan Technical Requirements

Listed below is a brief summary of the specific storm water management planning requirements and performance standards that must be met on all sites to the “maximum extent practicable”. All requirements apply to each subwatershed or stormwater discharge point independently and cannot be averaged for the site. Runoff draining to a stormwater BMP from offsite must be accounted for hydraulically in any BMP design. It is highly recommended that the applicant meet with the City prior to preparing a site plan to determine the applicability of these requirements early in the planning process. Please note that this is only a summary. It is intended to be a general guide for the project engineer. For details on any of the items listed, see the ordinance.

1. Peak Discharge. Maintain pre-development peak discharge rates for the 1-year, 2-year, 10-year, and 100-year, 24-hour design storms, following City standards.
2. Total Suspended Solids. By design, each storm water management plan must meet the following post-development total suspended solids (TSS) reduction targets, based on average annual rainfalls, as compared to no runoff management controls:
  - A. For new land development, 80% TSS reduction;
  - B. For redevelopment, 40% TSS reduction of total suspended solids load from parking areas and roads;
3. Post-developed Infiltration Performance Standards

### Minimum Infiltration Volumes (%)

Percent Connected Impervious Surface	Description/Example land uses	Post-development Infiltration Volume	Maximum Effective Infiltration Area
Up to 40%	Description: Low imperviousness Example land uses: low density residential, parks, cemeteries	90% of pre-development	1% of Site
>40% up to 80%	Description: Medium Imperviousness Example land uses: Medium and high density residential, multi-family residential, industrial, institutional, office park	75% of pre-development	2% of Site
>80%	Description: High Imperviousness Example land uses: commercial strip malls, shopping centers, commercial downtowns	60% of pre-development	2% of site

-All infiltration volume percentages are based on average annual rainfall.

-To avoid downstream flooding and chronic wetness issues from stormwater discharges, the post-development infiltration volume for low density residential developments shall not be less than 25% of the 2-year, 24-hour storm.

**Note:** For details on definitions, pretreatment requirements, exclusions, exemptions, alternative uses of storm water, well setbacks, soil filtering requirements, groundwater protection, etc. - see the ordinance.

4. Protective Areas. A “protective area” is a vegetative buffer that must be maintained between a proposed impervious surface and the nearest water resource, measured from the “top of channel”. Storm water BMPs may be located in the area, but cannot encroach on wetlands, floodplains or environmental corridors. Minimum widths of protective areas are shown in the table below:

Site Description	Protective Area Min. Width
All Lakes and Streams (See County GIS System)	50 Lineal Feet
"Outstanding" and "Exceptional Resource Waters" Wetlands:	75 Lineal Feet
▪ Highly Susceptible.	50 Lineal Feet
▪ Less Susceptible.	75 Lineal Feet
	10 % of Average Wetland Width
Concentrated Flow Channels (>130 Acre Drainage)	10 Lineal Feet

5. Fueling and Vehicle Maintenance Areas. Must have BMPs designed, installed and maintained to reduce petroleum within runoff, such that the runoff that enters waters of the state contains no visible petroleum sheen.
  
6. Site Drainage.
  - A. *Drainage easements* must be recorded to preserve major storm water flow paths, specify maintenance responsibilities, restrict buildings/structures and prevent any grading, filling or other activities that obstruct flows.
  - B. *Site grading* must ensure positive flows away from all buildings, roads, driveways/septic systems, coordinate with general drainage patterns for the area, and minimize adverse impacts on adjacent properties.
  - C. *Street drainage* must prevent concentrated flows from crossing the traffic lanes. Design flow depths at the road centerline must not exceed 6 inches during the 100-year, 24-hour design storm (planned land use).
  - D. *Bridges and cross-culverts* must facilitate fish passage and prevent increased flooding or channel erosion upstream or downstream from the structure. All bridges and cross culverts on collector and arterial roadways shall be designed to convey the 100-year, 24-hour design storm. All bridges and cross culverts on local roadways shall be designed to convey the 10-year, 24-hour design storm while providing an overland flow path for the 100-year, 24-hour design storm. A floodplain analysis is required for all projects impacting a navigable waterway.
  - E. *Subsurface drainage.* To avoid property and other damages from groundwater, all buildings planned for human occupation on a regular basis shall meet all of the following:
    1. *Basement floor* surfaces must be built at least 1 foot above the highest groundwater table elevation as documented in the submitted soil evaluations in accordance with City standards. On sloped sites, basements may be allowed partially below the highest groundwater table only on the upslope side if the meet City drainage system standards for design, discharge, engineering oversight, and long-term maintenance. For these sites, the 1-foot groundwater separation will be enforced at the further downslope point of the basement.
    2. Avoid all hydric soils as much as possible.
    3. The DPW shall be notified of any drain tiles that are uncovered during construction, which the City may require to be restored or connected to other drainage systems.
    4. No discharge of groundwater from tile lines, sump pumps or other means shall be allowed onto another person's land or any public space without the written approval of the owner or unit of government.
  - F. *Open channels* must carry flows from a 100-year, 24-hour design storm. Side slopes shall be no steeper than 4h:1v and the longitudinal slope shall be no flatter than 1 percent.
  - G. *Storm sewers* shall be designed to convey the 10-year, 24-hour design storm while providing an overland flow path which does not impact structures for the 100-year, 24-hour design storm.
  - H. Changes to stormwater discharges. For sites where the DPW determines the post-development stormwater discharges may otherwise, have a significant negative impact on downstream property owner(s), the DPW may require the applicant to submit written authorization, record a drainage easement, or complete other legal arrangements with the affected property owner(s) prior to permit issuance.

- I. *Structure protection and safety.* Flows generated by the 100-year, 24-hour design storm under planned land use conditions may exceed the design capacity of conveyance system, but shall not come in contact with any buildings. For buildings designed for human occupation on a regular basis, the following additional requirements shall apply:
- The lowest elevation of the structure that is exposed to the ground surface must be at least 2 feet above the maximum water surface elevation produced by the 100-year, 24-hour design storm including flows through any BMP that may temporarily or permanently store water at a depth of greater than one (1) foot and;
  - The structure shall be setback at least 50 feet from any stormwater BMP that may temporarily or permanently store water at a depth of greater than one(1) foot, including any internally drained area with a significant contributing watershed and/or limited runoff storage capacity, as determined by the DPW. Setback distance shall be measured from the closest edge of water at the elevation produced by the 100-year 24-hour design storm. The DPW may exempt existing structures and structures with no basement from this requirement if the DPW determines other risks are minimal based on soil and site conditions.

**Note:** The DPW may establish more stringent requirements than those listed based on unique site conditions, such as sensitive water resources or downstream landowner impacts.

The DPW requires map items listed above to be submitted in digital form, if available.

**Action Plan for City of Oconomowoc**  
**Standard Operating Procedures for Project Improvements**  
**(\_\_\_Project Name Here\_\_\_)**  
**April 2019**

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## LISTING OF PARTIES INVOLVED ON PROJECT

**Municipality:** City of Oconomowoc  
**Primary Contact:** Director of Public Works – Mark Frye office 262.569.2184  
**Secondary Contact:** Assistant Director of Public Works – David Stoiser, P.E. office 262.569.2188  
Cell (262) 354-4065

**Engineer:**  
office

**Prime Contractor:**  
*(Insert prime contractor information and contact numbers)*

**Subcontractors:**  
*(List all subcontractors with contact numbers – including after hours contact numbers)*

**Utilities:**  
Gas Emergencies (WE Energies): 800.261.5325  
WE Energies Gas: Joe Dable office 414.944.5543  
cell 414.303.0310  
City of Oconomowoc Utilities: Joe Pickart office 262.569.3197  
City of Oconomowoc Water: Scott Osborn office 262.569.6421  
cell 414.940.7557  
City of Oconomowoc Sanitary Sewer: Kevin Freber office 262.569.2192  
cell 414.531.7006  
City of Oconomowoc Storm Sewer: Brian Steinke office 262.569.2191  
cell 920.723.1478  
AT & T Repair Hotline: 888.611.2344  
Charter Communications: Jeff Blank office 920.263.0025  
Canadian Pacific Railway One Call # 866.291.0741  
Manager Public Works: Ed Oom office 612.330.4553  
Time Warner Denny Gorsuch office 929.723.1887  
Tom Piontek office 414.277.4296  
24 hr # 800.644.8328

### **Wisconsin Department of Natural Resources (Contact if Discharging Water)**

Primary Contact:	Doug Zeihen, Conservation Warden	office	262.574.2161
Secondary Contacts:	Bryan Hartsook, Water Resources Engineer	office	262.574.2129
		cell	262.212.0263
	Geri Radermacher, Water Management Specialist	office	262.574.2137

### **Emergency Services**

Emergency Contact Numbers for Police and Fire:	911
Non-emergency Fire:	262.569.3223
Non-emergency Police:	262.567.4401

### **Goals of Plan**

1. Safely and efficiently complete the project.
2. Assure compliance with all applicable laws and regulations.
3. Install public confidence of all parties involved.
4. Set forth and communicate a chain of command and reporting responsibilities, including issuance of stop work orders.
5. Establish roles and responsibilities for parties involved.
6. Establish a team approach as it comes to unidentified utilities in the field.
7. Reinforce standard operating procedures with all contractors to ensure that everyone is operating under the same understanding and parameters.

### **Communications Concerning Utilities**

#### **Weekly Utility Meetings**

1. As the prime contractor, *(insert Contractor's name)* will ensure that regularly scheduled utility meetings occur. The utility meeting may be combined with the weekly contractor meetings, which are scheduled on Wednesdays at *(insert time and location)*.
2. The weekly utility meetings should discuss what challenges may be encountered by the various subcontractors and their foremen over the next week. It will be expected that each subcontractor and their foremen inform all workers of potential challenges or issues facing utilities on a daily bases.
3. Subcontractors are required to bring changes in the field and/or challenges to the attention of *(insert Contractor's name)*

### **Locating of Utilities**

#### **Digger's Hotline**

1. *(Insert Contractor's name)* will remind all subcontractors on the project that all excavation and underground work requires notification to Digger's Hotline prior to proceeding. Each subcontractor is required to keep their own active ticket.
2. Diggers Hotline Number: 800.242.8511

## **Railroad**

1. Prior to any work on the right-of-way Rogers Telecom, Inc. 877.459.2690 and Canadian Pacific Railway (CPR) cables must be located and CPR flagging protection arranged.
2. CPR is not a member of Digger's Hotline. Coordinate construction activities with a call to 866.291.0741 for railroad utility.
3. Four weeks prior to any work in close proximity within 10 feet of the fiber optic line, contact Mike Hartney, S&C Maintenance Services Coordination, at 403.319.6718 to notify him of the upcoming work, or John Stevens, (trackside) 403.319.7789.
4. Need railroad flagger whenever working within 24 feet of center line of railroad tracks.

## **Refreshing of Utility Markings**

1. Contractor and Subcontractors shall have a policy in which all locates are refreshed prior to expiration during ongoing work.
2. Refresh locate tickets every ten days. They may be called in again prior to the foregoing 10-day period if the marks get lost or are unclear.
3. All foremen will have copies of active tickets with phone numbers so they can refresh if any markings are no longer clear.
4. Contractor crews may also use white or pink paint to ensure markings are clear and noticeable.

## **Locating of New Utility Infrastructure**

1. *(Insert Contractor's name)* is responsible for locating new utility infrastructure being installed as part of this project until such infrastructure is accepted by the City.
2. Any parties performing any excavation work within the project area should also notify of such work when contacting Digger's Hotline.

**DESIGNATED POINT OF CONTACT PERSONNEL**  
**THIS INFORMATION IS NOT FOR PUBLIC DISTRIBUTION**

1. Contractor: *(insert Contractor's information and after hours contact numbers)*
  
2. City of Oconomowoc: Mark Frye, Director of Public Works
 

	office	262.569.2184
	cell	920.253.5203
	home	920.261.9709
David Stoiser, P.E. Assistant Director of Public Works	office	262.569.2188
	Cell	(262) 354-4065
Kevin Freber, Sanitary Sewer	office	262.569.2192
	cell	414.531.7006
Brian Steinke, Storm Sewer	office	262.569.2191
	cell	920.723.1478
	(after hours dispatch)	262.567.4401
Scott Osborn, Water Superintendent	office	262.569.6421
	cell	414.940.7557
Electrical Foremen	office	262.569.2196
	(after hours dispatch)	262.567.4401
  
3. *(insert Engineer's information and after hours contact numbers)*
  
4. WE Energies Gas Emergency 800.261.5325
 

	office	414.944.5543
Joe Dable, Customer Service Rep	cell	414.303.0310
  
5. Railroad Director Engineering Works: Dan Sabatka office 630.860.4430  
 (flagging) cell 612.209.7659  
 Manager Public Works: Ed Oom office 630.860.4975  
 (flagging)
  
6. AT&T Sheila Bonniwell office 262.970.8456
  
7. Charter Jeff Blank office 920.263.0025

## **COMMUNICATION PROTOCOL BETWEEN PRIME AND SUBCONTRACTORS**

### **1. Weekly Contractor Progress Meetings**

- a. *(Insert Contractor's name)* will hold weekly progress meetings every \_\_\_\_\_ at \_\_\_\_\_ for project participants.
- b. All subcontractors who will be working on the Project within a 2-week window will be required to send a representative to these meetings.
- c. General topics of discussion for weekly progress meetings will include (but not be limited to):
  - i. Safety
  - ii. Utilities
  - iii. Schedules

### **2. Impassable Roadway Notification**

- a. Subcontractors will be required to notify *(insert Contractor's name)* at the end of each workday of any project areas that they are working in that are impassable to emergency vehicles.
- b. *(Insert Contractor's name)* is then to notify the Police Dispatch at the end of every workday of any project areas that are impassable to emergency vehicles, even if it is located in a "closed to traffic" area.
  - i. Non-emergency Police Number: 262.567.4401

### **3. Phones and Contact Lists**

- a. The prime Contractor and its subcontractors will be required to have spare cell phones present at each work site. This is to ensure that each crew has a phone that is available to make emergency calls. The phones should also be fully charged at the beginning of each day.
- b. Contractor will also ensure that each subcontractor and work crew has an emergency contact list at its job site.
- c. Contractor shall ensure that each job site has laminated cards with the emergency contact numbers on them from WE Energies.

## **ROLES / RESPONSIBILITIES**

### **1. Prime Contractor**

- Communications with all subcontractors
- Oversight of subcontractors
- Each job site will have a designated foreman who is responsible for crew and installation infrastructure. Foreman also has full control of site and safety, and has authority to issue a stop work order if unsafe working conditions exist
- Project Superintendent also has ability to issue a stop work order to all crews or subcontractors

### **2. City**

Mark Frye, Director of Public Works

- Lead contact for City issues
- Approves any change order for storm and right-of-way infrastructure (sidewalk, curbs, storm sewer, etc.)
- Has authority to shut down job for any reason

Debra Tarnow, P.E., Assistant Director of Public Works

- Secondary project contract
- Has authority to shut down job for any reason

Joe Pickart, Utility Manager

- Ultimate decision making power for electric and water (Note: The City is the electrical supplier in the area of the project, not WeEnergies)
- Approves any change order for electric or water infrastructure
- Has authority to shut down job for any reason

Tom Steinbach, Wastewater Operations Manager

- Lead contact for sanitary sewer issues
- Approves any change order for sanitary sewer infrastructure
- Has authority to shut down job for any reason

Scott Osborn, Water Superintendent

- Lead contact for all water issues
- Has authority to shut down the job in relation to all utility personnel and infrastructure

Brian Steinke, DPW Supervisor

- Lead contact for all storm sewer issues
- Has authority to shut down job for any reason

Greg Randa / Mark Niggemeier, Electric Foremen

- Project Site Representative
- Has authority to shut down the job in relation to all utility personnel and infrastructure

Andy Galasinski, Water Foreman

- Project Site Representative
- Has authority to shut down the job in relation to all utility personnel and infrastructure

Water and Electric Crews

- Has authority to shut down the job in relation to all utility personnel and infrastructure

Electrical Inspector

- Will periodically do quality control inspections on electrical infrastructure placement

Dave Beguhn, Public Safety Director/Police Chief

- Responsible for the safety and protection of the community and everyone that is working on site
- Has authority to shut down job for any reason

Glenn Leidel, Deputy Chief

- Emergency Fire and EMS Services
- Has authority to shut down job for any reason

### **3. Construction Review**

Construction Review Personnel

- Determine if work is proceeding in accordance to plans and specifications
- Observe contractors: Removals, Streetscaping, Erosion Control, Traffic Control, Signing, Grading, and Storm Sewer Operations
- Reports to Project Engineer
- Will contact Project Engineer if observes Contractor is not following plans or specifications.
- Will contact the Foreman, the Project Engineer, and the Director of Public Works or the Engineering Operations Administrator if any safety issues are observed
- Will call 911 if life threatening safety issues are observed

Oconomowoc Utilities Personnel

- Determine if work is proceeding in accordance to plans and specifications
- Observe Contractors: Electrical, Sanitary Sewer, and Water Main Operations
- Reports to Joe Pickart, Oconomowoc Utilities
- Will contact Oconomowoc Utilities if observes Contractor is not following plans or specifications
- Will contact the Foreman, the Project Superintendent, the Project Engineer, and the Director of Public Works or the Engineering Operations Administrator if any safety issues are observed

### **4. WE Energies**

Joe Dable

Responsible for design of gas distributions in Waukesha County, including the Oconomowoc Area

## **PROTOCOL FOR HANDLING UTILITIES**

### **1. Protocol for Natural Gas Line Strikes and/or Pulling of Gas Line**

- a. Immediately stop work upon striking or pulling the gas line and/or noticing gas smell
- b. Call 911 immediately
- c. Call the utility contractor, WE Energies gas leak hotline immediately at 800.261.5325
- d. Finish securing the site
- e. Evacuate, if necessary

**\*\* Note:** Contractors are also required to immediately notify WE Energies if an inspection reveals that the transmission facility has been or may have been struck, damaged, dislocated or disrupted.

### **2. Protocol for Electrical Strikes**

- a. Immediately stop work upon striking an electrical utility
- b. Call 911 immediately
- c. Immediately call the City of Oconomowoc Electric Utility at 262.569.2196 or Police Dispatch at 262.567.4401 on weekends or if after 3:15 p.m. on weekdays
- d. Finish securing the site
- e. Evacuate, if necessary

### **3. Protocol for Other Utility Strikes**

- a. Secure the site
- b. Call 911 if an emergency situation exists and emergency vehicles and/or care may be needed
- c. Contact affected utility for repair
- d. Evacuate if necessary

### **4. Protocol for an Unknown/Unmarked Utility Infrastructure**

- a. Stop work immediately and account for all identified utilities of possible
- b. If the unmarked utility has been struck, follow the utility strike protocol set forth above
- c. Do not cause further disturbance of the unknown utility infrastructure
- d. Contact the appropriate point of contact person(s) for underground utilities to identify the nature and/or status of utility
- e. Contractors shall be advised that they will not be permitted to pull any unmarked gas lines; the lines must be cut after WE Energies designated representative has confirmed that it is safe to do so.

### **5. Protection of Existing Utilities**

- a. Be aware of existing utility shut-off valve locations
  - b. Do not damage, bury, or impede access to utility operations (i.e. fire hydrants, valves, and manholes)
    - a. Keep utility markers intact (e.g. plastic ID cards, flags and paint)
    - b. Notify appropriate utility of any disturbance and/or damage of utility markers or utility infrastructure
- Laminated cards summarizing the protocol for utility strikes will be prepared and distributed to all contractors on the project. (See Attachment 1 for summary protocol)

## **ATTACHMENT 1**

### **SUMMARY PROTOCOL FOR UTILITY STRIKES**

#### **PROTOCOL FOR NATURAL GAS LINE STRIKES**

- IMMEDIATELY STOP WORK UPON STRIKING/PULLING GAS LINE AND/OR NOTICING GAS SMELL
- CALL 911 IMMEDIATELY (FOR ALL STRIKES)
- CALL WE ENERGIES GAS LEAK HOTLINE IMMEDIATELY AT 800.261.5325
- SECURE THE SITE
- EVACUATE, IF NECESSARY

#### **PROTOCOL FOR ELECTRICAL STRIKES**

- IMMEDIATELY STOP WORK UPN STRIKING AN ELECTRICAL UTILITY
- CALL 911 IMMEDIATELY (FOR ALL STRIKES)
- CALL OCONOMOWOC UTILITIES AT 262.569.2196 OR 262.567.4401 ON WEEKENDS OR AFTER 3:15 PM
- SECURE THE SITE
- EVACUATE, IF NECESSARY

#### **PROTOCOL FOR OTHER UTILITY STRIKES**

- SECURE THE SITE
- CALL 911 IF AN EMERGENCY SITUATION EXISTS
- CONTACT AFFECTED UTILITY FOR REPAIR
- EVACUATE, IF NECESSARY

## APPENDIX A

### STORM WATER MANAGEMENT NOTES

#### TO BE PLACED ON FINAL PLAT BEFORE APPROVAL

- Surface water drainage areas may not be filled. Surface water drainage easements shall be maintained by the individual lot owners.
- Final grade for surface water drainage easements shall be maintained.
- No structure may be placed upon the surface water drainage easement areas.
- Fences installed will not retard surface water drainage. Fences may be placed in the drainage easement areas but are place at the risk of the owner.
- Landscaping shall be restricted to ground cover, shrubs and trees which will not retard surface water drainage. Shrubs and trees may be placed in the drainage easement areas but are place at the risk of the owner.
- If drainage easements are not adequately maintained, the City of Oconomowoc may levy the costs and expenses of such inspections, maintenance or repair related actions as a special charge against the property and collected as such in accordance with the procedures under s. 66.0627 Wis. Stats. of subch. VI of ch. 66 Wis. Stats.

## APPENDIX B

### RECORD DRAWING STANDARDS

#### A. Survey:

1. All utility features including, but not limited to, manholes, hydrants, valves, lateral ends, cleanouts, catch basins, end sections, curb stops, air releases, etc. shall be collected using an acceptable survey method. Oconomowoc Water Utility requires elevations shot on the top of the water main at critical locations such as tees, crosses, and changes in grade or alignment prior to backfilling and compaction.
2. Data Format:
  - a) All data shall be provided in Wisconsin State Plane Coordinates. (South Zone, NAD 87)
  - b) All vertical data shall be based on mean sea level, 1929 adjustment.
  - c) Point number, description and elevation for all surveyed features.
  - d) All elevations shall be to the nearest 0.01 foot.

#### B. Final As-Built Construction Plans Review and Submittal:

1. Submit a draft PDF of the asbuilt plans to the City for review following the record drawing requirements to the personnel listed below:

Public Works (grading, storm sewer, stormwater) – David Stoiser –  
[dstoiser@oconomowoc-wi.gov](mailto:dstoiser@oconomowoc-wi.gov)

Utility's (water utility/waste water/electric) - Lucas Caine – [lcaine@oconomowoc-wi.gov](mailto:lcaine@oconomowoc-wi.gov)

City Engineer (all utility's) - Stan Sugden – [ssugden@ruekert-mielke.com](mailto:ssugden@ruekert-mielke.com)

Once City Engineer approves the draft submit the following on a CD:

- a) Color plan/profile and overall plan map of each utility as an Adobe .pdf. Utilities may be on one sheet. See attached.

Storm as green

Sanitary as red

Water as cyan

- b) AutoCAD Civil 3D Drawings

- c) Public Works (storm sewer): One copy of the as-built street and storm sewer plans and profiles, water system with benchmarks, and grading plans along with utility system plan.
  - d) Water/Waste Water Utility: One paper copy and 1 CD containing Autocad files of the water and waste water plan and profile and of the project system plan.
  - e) Electric Utility: 1 CD containing Autocad files for the electric utility plans and profile and project system plan.
2. The developer will pay all costs associated with conversion of data into formats required by the City or its reviewing consulting engineer and for updating the City mapping system.
  3. All record drawings shall be drawn to a standard engineering scale of 1 inch = 50feet or greater.

C. Infrastructure Inventory:

Upon completion of asbuilt plans submit excel file that contains the quantities, unit costs and total cost of each utility. Submittal may be included on CD or sent via email to each respective utility and to the City Public Works Department:

1. Water Infrastructure Inventory shall include length and size of main, number and size of valves, number of hydrants, and length and size of water services
2. Sanitary Infrastructure Inventory shall include length and size of main, number of manholes, and number and size of valves.
3. Storm Sewer Infrastructure Inventory shall include length and size of mains and leads, number of catch basins and manholes.
4. Street Infrastructure Inventory should include the length of street miles as measured along the centerline.

D. Grading and Drainage Record Drawing:

After grading is complete, to verify conformance with the approved grading plan, a record drawing of final grading shall be submitted that includes the following:

1. Proposed and as-built spot elevations at all property corners, building pads, centerline of all lot lines and breakpoints to the nearest hundredth of a foot.
  - a) Pad grades shall be provided in order to verify each of the proposed pad grades shown on the construction drawings.
2. Spot elevations in side yard swales between lots to the nearest hundredth of a foot.

- a) Spot grades shall be provided in order to verify each of the proposed spot grades shown on the construction drawings.
  3. Flow line ditch elevations at every even station to the nearest hundredth of a foot.
  4. The difference between proposed and final elevations of all drainage ways must be within plus or minus 2 inches before City approval will be given.
  5. All ponds and other permanent storm water features shall be asbuilt upon completion. Spot elevations for all ponds and infiltration areas at 25-foot intervals, water surface elevations, emergency spillway, outfall, outfall structure elevations, pond bottom, and safety shelf. In addition, pond bottom elevations shall be obtained 2 years after acceptance of the asphalt surface course to verify sediment storage depths.
  6. Include water retention and detention ponds, any storm water control on residential lots (i.e. "rain gardens") and water quality ponds. Show length, width and elevations of berms, pond bottoms, spillways and safety shelves.
  7. Elevations shall be given in a minimum of a 25 feet grid, starting at the outside toe of the berms or for ponds at the point of influence of the pond's first declining elevation. A tighter grid may be required at the direction of the City DPW. Normal standards of grid elevations are considered with a deviation between 0.1 feet higher to 0.4 feet lower than grades given on the grading plan.
  8. Update contour lines to reflect as existing. Do so by blending surveyed created contour lines into proposed contour.
- E. Record Drawing Sheet Standards
1. Title Block shall include:
    - a) Name of municipality.
    - b) Subdivision name.
    - c) Labeled as record drawing.
    - d) Name of contractor.
    - e) Name of Engineer.
  2. Street names.
  3. Right-of-way lines.
  4. Sidewalk.
  5. Curb/gutter and pavement edges.

6. Lot lines, lot pipes at corners, lot numbers and addresses.
7. All easements, including dimensions and easement labels.
8. The benchmarks used on the project shall be indicated on the cover sheet and on each sheet where they appear.
9. North arrow and scale.
10. All plans shall be prepared on sheets measuring not less than 22" high by 34" wide, nor greater than 24" high by 36" wide. Plans shall show asbuilt plan and profile views

F. AutoCAD Drawing Standards

1. All sanitary sewer, water, and storm sewer features shall be drawn on a separate layer from existing features.
2. Layers shall be named such that the City can clearly identify the layer is an asbuilt layer and the features contained in the layer. Additional information about the following features shall be provided as specified below:
  - a) Sanitary Sewer:
    - i. Manholes, fittings, laterals, and mains shall be drawn on separate layers.
    - ii. Pipe inverts, pipe size, pipe material, pipe class and manufacturer shall be indicated.
    - iii. Percent grade, direction of flow and center-to-center length of pipe installed between manholes shall be indicated.
    - iv. Manhole rim elevation, size, casting manufacturer, model and cover numbers shall be indicated.
    - v. All laterals shall be shown with invert elevation at right-of-way line and length clearly shown.
    - vi. Dimensions between laterals and manholes shall be indicated. Locations of all fittings, including air releases, bends, caps, crosses, tees, vents, cleanouts, meter stations, isolation valves, and locator boxes should be identified.
  - b) Force Main:
    - i. Force mains and fittings shall be drawn on separate layers.
    - ii. Pipe size, pipe material, pipe class and manufacturer shall be indicated.

- iii. Location of all fittings including tees, crosses, reducers, air vents, valves, and bends shall be shown and suitably labeled for identification.
- c) Water:
- i. Hydrants, valves, fittings, curbstops, mains, service laterals, and hydrant laterals shall be drawn on separate layers.
  - ii. Pipe size, pipe material, pipe class and manufacturer shall be indicated.
  - iii. Location and elevation of fittings including tees, crosses, reducers, air vents, bends and lateral taps where changes in main grade or alignment occur shall be shown and suitably labeled for identification.
  - iv. Location of all curb stops shall be shown indicating size, length of service and depth of bury.
  - v. All valves shall be shown and identified with type, size, model and manufacturer.
  - vi. All hydrants shall be shown and identified with type, size, model, manufacturer and depth of bury. Main hydrant steamer elevations shall be provided.
  - vii. Benchmark elevations on the upper northwest hydrant flange bolt should be provided on the water main as-built system map. Hydrant benchmarks shall be taken after all hydrant adjustments are made and punch listing is complete.
- d) Storm Sewer:
- i. Inlets, manholes, nodes (e.g., junctions and fittings), mains, and outfalls shall be drawn on separate layers.
  - ii. Pipe invert, pipe size, pipe material, pipe class and manufacturer shall be indicated.
  - iii. Percent grade, direction of flow and center-to-center length of pipe installed between structures shall be indicated.
  - iv. Structure, rim/grate elevation, size, type, casting manufacturer, model and cover numbers of all manholes, inlets, catch basins and outlets shall be indicated.
  - v. Size, length and invert of all end sections shall be indicated.
3. Point features shall be drawn using AutoCAD points or blocks.
4. When using AutoCAD blocks, the insertion point of the block shall be positioned at the surveyed location of the feature.

G. Minimum Record Drawing System Plan Content:

1. Title block as described above.
2. Lot numbers.
3. North arrow and scale.
4. Street right-of-way and easement boundaries.
  - a) Provide street names and right-of-way widths.
  - b) Provide easement name and width. Provide only sanitary easements on sanitary system map and only water main easements on water supply system map, etc.
5. Structure rim elevations, invert elevations, pipe sizes, pipe types, pipe lengths water main labels on tees, crosses, bends, and valves, sewer lateral locations, sizes, lengths and pipe types, water service locations, sizes, lengths and pipe types. Hydrant benchmark elevations and locations. Water main distances between fittings.

END OF SECTION