



CITY OF OTSEGO

ENGINEERING MANUAL

March 1999

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Forward

In order to protect the public health, safety and welfare, it is necessary to establish standards for engineering in the City of Otsego.

This manual outlines specific requirements, materials and standards that will be incorporated into the preparation of plans and specifications for sanitary sewer, storm sewer, watermain, trails, street construction and other improvements within the City of Otsego.

Except as modified by specific City of Otsego requirements; sanitary sewer facilities and water works shall be designed to conform to the latest edition of the "10 State Standards" and shall be constructed in accordance with the latest edition of the City Engineers Association of Minnesota Standard Specifications, Street and road surface improvements shall be designed to the standards of the latest edition of the Minnesota Department of Transportation design manuals and shall be constructed in accordance with the latest edition of the Minnesota Department of Transportation Standard Specifications, all traffic control devices and signing shall conform to the latest edition of the Minnesota Manual on Uniform Traffic Control Devices, and all stormwater facilities/treatment shall be designed to conform to the latest edition of the Minnesota Pollution Control Agency Stormwater Manual and National Pollution Discharge Elimination System permits.

Development plans and public facilities construction plans shall conform to City of Otsego Ordinances and Comprehensive Plans. Related to engineering, comprehensive plans include the sanitary sewer system with associated trunk facilities for area service, the water distribution system with watermain oversizing, the surface water runoff control plan and the city transportation plan with designated collector streets. The City of Otsego has the authority to construct improvements as necessary conforming with City Comprehensive Planning with the costs of improvements allocated or assessed to properties for benefit.

Once the plat, plans and specifications and associated documents have been reviewed, approved and signed, the City will allow the developers, as defined in the Development Agreement, to proceed with the construction.

These standards are established as policy and as such may be subject to change by action of the City Council.

The City of Otsego Engineering Manual was approved by the City Council on March 22, 1999 in Resolution No. 99-15.

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GLOSSARY OF TERMS

AASHTO	American Association of State Highway and Transportation Office
ANSI	American National Standards Institute
ASTM	American Society of Testing and Materials
AWWA	American Water Works Association
CEAM	City Engineer's Association of Minnesota
CMP	Corrugated Metal Pipe
HDPE	High Density Polyethylene
DIP	Ductile Iron Pipe
Mn/DOT	Minnesota Department of Transportation
MN MUTCD	Minnesota Manual on Uniform Traffic Control Device
MPCA	Minnesota Pollution Control Agency
PID	Property Identification Number
PVC	Polyvinyl chloride
RCP	Reinforced Concrete Pipe
SDR	Strength to Diameter Ratio

ENGINEERING MANUAL

I. Engineering Requirements

As set forth in various sections of the City ordinances, developers of property within the City of Otsego are required to submit certain plans and specifications for review and approval by the City. These include such items as grading plans, drainage plans, topographic surveys, plats, street and utility plans and specifications. These plans and specifications shall be prepared by competent professionals.

The professional services required of the developer may include one or more of the following professionals: architect, land surveyor, planner, soils and civil engineer and testing service. The engineering services include not only preparation of plans and specifications, but field staking in order to assure the City that the completed project is in conformance with the approved plans and specifications. The City will provide inspection of the installation of the facilities at the developer's expense.

Within the development contract, the developer has a choice in determining how the required improvements will be handled. The developer can either construct and finance the improvements, or request that they be installed under a public improvement project and assessed against the property benefitting. Approval of the choice is a City Council matter.

If the developer chooses to install required public improvements within the development, the following procedures shall be followed:

1. The developer shall submit plans, specifications and copies of all design calculations to the City for review and approval. These plans are to be prepared by a registered professional civil engineer and shall be in accordance with City standards as outlined herein. The City comprehensive sanitary sewer, water, storm drainage and thoroughfare plans shall be adhered to in design considerations. All sanitary sewer and watermain testing shall be completed and copies of service ties submitted to the City prior to issuance of any building permits.
2. The developer shall submit erosion and sediment control plans along with a Storm Water Pollution Prevention Plan to the City for review and approval. No work is to begin until all erosion and sediment control methods are in place and approved by the City.
3. The developers shall furnish a separate Development Plan Lot Tabulations listing house type, garage floor elevations, and lowest opening elevation.

4. The developer will be responsible for not only plans and specifications preparation, but also for providing staking. All cut sheets shall be provided to the City Engineer or his representative within 24 hours. Resident inspection of said improvements to assure compliance with the approved plans shall be completed by the City.
5. Copies of all bids, change orders, etc. relating to the improvements shall be forwarded to the City Engineer.
6. The developer shall furnish to the City the list of selected contractors and subcontractors being considered for retention by the developer for any of the public improvements work in the development. The City has the right to reject any contractor or subcontractor deemed unacceptable to the City.
7. Any changes to the approved plans and specifications shall be approved by the City Engineer in writing before work is started. If the change affects the project letter of credit by increasing the cost, the letter of credit shall be increased before the work can begin.
8. The developer will hold a preconstruction meeting at the City Public Works Department Facility prior to start of any work on the development. The City staff and City Engineer along with the contractor and subcontractors, developer's engineer, utility companies and other interested parties must be invited to the meeting. The developer will be responsible for drafting pre-construction meeting minutes. The said minutes shall be submitted to the City Engineer for review, then distributed by the developer to all parties whom were in attendance at the meeting.
9. The developer shall retain an independent testing service to perform the required tests of materials. Copies of tests will be directed to the City Engineer. The cost of this service will be the responsibility of the developer. The City shall be notified 24 hours in advance of all scheduled tests so its representatives can be present at the time tests are made. The required tests include sanitary sewer, watermain, storm sewer, street subgrade, sidewalk and bike path subgrade, base course, wear course, and curb and gutter.
10. Initial City Acceptance:

Upon completion of all the work required, the developer must schedule a walk-thru. The developer, his contractor, the City maintenance department, City utility department, and the City Engineer or his representative must be invited. Written Initial City Acceptance of the completed work shall be made by the City Engineer, subject to the following:

- a. All site grading has been completed (with exception to individual lot grading) and approved.
- b. All streets have been completed including all required curb, final bituminous wear course, sidewalk, bituminous paths, and all utility casting adjustments have been made and approved.
- c. All public utilities have been completed, all required testing has passed and utilities have been approved.
- d. The developer or the developer's engineer must submit written certification to the City Engineer stating that all public improvements have been completed in accordance with the approved plans and specifications.
- e. The developer's engineer shall provide the City with a complete set of full size electronic "as-built" plans, Adobe (.Pdf) or AutoCAD (.Dwg) files are acceptable, for the City records as outlined in this manual. These as-builts shall be submitted within 30 days after the completion of the improvements, and before any security is released.
- f. The developer's surveyor shall provide the City with written certification that all corners of lots (iron monuments) have been placed.

Upon the initial acceptance by the City, the warranty period, as described below and/or in the Developer's Agreement, shall commence.

11. All work shall be initially accepted as defined above before building permits will be issued. Before the final payment is made to the contractor by the developer, the City Engineer shall be satisfied that all work is satisfactorily completed in accordance with the approved plans and specifications.
12. A Certificate of Survey signed by a Professional Land Surveyor for each individual lot will be required to verify lot corner elevations, swales, emergency overflow elevations, and house low floor and lowest opening elevations. Sufficient number shots (every 25' minimum in critical areas such as along lot lines or swales) shall be provided to accurately represent the final grades. Said survey shall be submitted to the City Building Department for review and approval prior to the Certificate of Occupancy being issued. An as-built Certificate of Survey shall be provided and reviewed by the City Engineer prior to returning of the grading escrow.

13. Warranty Period – If within the time prescribed by law, by the contract documents and/or the Developer’s Agreement if any of the work is found to be unacceptable, the developer shall correct it promptly unless the City has previously accepted the work. The developer shall give prompt notice after discovery of any unacceptable conditions to the contractor responsible for the project work.

Unless otherwise noted in the contract documents, the following requirements shall apply:

- a. The developer shall guarantee all work relating to utilities, appurtenances, material and equipment furnished by him for a period of one year from the date of Initial written City Acceptance of the work or project. The utilities will not be accepted prior to placement of the wearing course being constructed.
- b. The developer shall guarantee all work relating to street construction including concrete curb and gutter, materials and equipment furnished by him for a period of one year from the date of written acceptance of the work or project, unless the wearing course is placed during the same construction season as the base course. In those instances, the contractor shall guarantee all work including street construction, concrete curb and gutter, material and equipment furnished by him for a period of two years from the date of written acceptance of the work or project. The streets will not be accepted prior to the wearing course being constructed.
- c. The developer shall provide a warranty letter of credit. The amount of the letter of credit will be determined by the City engineer based on the cost of imported manufactured materials delivered to the project.

14. Final City Acceptance:

No more than 30 day prior to the conclusion of the warranty period and before the improvements may be finally accepted by the City, the developer must schedule a walk-thru. The developer, his contractor, the City maintenance department, City utility department, and the City Engineer or his representative must be invited. Upon Final Acceptance by the City and conclusion of the warranty period, the City will assume responsibility for the public improvements. All inspection costs are the responsibility of the Developer

15. After all public improvements have been completed, properly inspected as specified above, and an acceptable maintenance guarantee provided, the

project will be accepted by the City and the Warranty Letter of Credit may be released.

II. Erosion Control Policy

1. Required Erosion Control Plan. Prior to commencing any earth disturbing activity in a subdivision, the subdivider shall prepare and submit to the City Engineer an erosion control plan for approval by the City Engineer. The plan shall be approved if it complies with the City's zoning ordinance, the City's subdivision ordinance, and the requirements contained herein. The developer must also prepare and submit to the City Engineer a Stormwater Pollution Prevention Plan (SWPPP).

2. Required Control Measures. The control measures shall conform to the latest edition of MPCA's NPDES "Application for General Stormwater Permit for Construction Activity" (MN R100001) requirements and as specified herein;
 - a. The plan shall be suited to the topography and soils so as to create the least erosion potential.

 - b. The land shall be developed in increments of workable size on which adequate controls of erosion and siltation can be provided and maintained during the construction period. Grading operations and other land disturbing operations shall be staged so that the area being developed is not exposed for long periods of time without stabilization.

 - c. Temporary vegetation and/or mulching shall be used to protect the areas exposed during the development per the time frames as required by the permit.

 - d. Permanent vegetation and structures shall be installed per the time frames as required by the permit. If grading is not completed until after the planting season has expired, temporary erosion control measures, including dormant seeding and mulching, shall be implemented.

 - e. Sediment basins (debris basins, desilting basins, or silt traps) shall be installed and maintained to remove sediment from runoff waters from the land undergoing development. Storm sewer inlets shall be provided with debris guards and microsilt basins to trap sediment and avoid possible damage from blockage. The silt shall be removed when necessary. If sediment/siltation measures taken are not adequate and result in downstream sediment, the developer

shall be responsible for cleaning out or dredging downstream storm sewers and ponds as necessary.

- f. Before grading is commenced, all control measures as shown on the approved plan shall be installed.
- g. Immediately after curb and gutter has been placed, cured, and backfilled, approved erosion control measures shall be installed directly behind the curb.
- h. Erosion control practices shall comply with the Minnesota Pollution Control Agency Best Management Practices.
- i. The subdivider shall be responsible for cleaning and maintenance of the storm sewer system (including ponds, pipes, catch basins, culverts, and swales) within the subdivision and the adjacent off-site storm sewer system that receives storm water from the subdivision. The subdivider shall follow all instructions it receives from the City concerning the cleaning and maintenance of the storm sewer system. The subdivider's obligations under this paragraph shall end one (1) year after the public improvements in the subdivision have been accepted by the City.
- j. The subdivider shall be responsible for cleaning all streets in the subdivision and adjacent to the subdivision from sediment and debris from the subdivision for a period of one (1) year from when the streets have been completed and accepted by the City.
- k. A temporary concrete washout area is required. These temporary washout areas must not allow any liquid concrete, including rinse water from concrete-chutes and washing of concrete tools, to contact the bare ground. The waste material must be disposed of off-site in a MPCA-approved manner. A concrete washout sign must be installed at each temporary washout facility.
- l. Infiltration basins shall be provided to treat the water quality volume as required by the NPDES permit. In area where infiltration is not possible as described in the NPDES permit Part III (typically Hydraulic "D" type soils or higher risk DWSMA areas), other volume reducing methods shall be provided to treat the water quality volume. If infiltration is not possible the reasoning shall be described in the SWPPP Narrative and all alternative volume reducing methods being used shall be described.

3. Financial Guarantee

- a. A portion of the Developer's letter of credit required by the Developer's agreement (\$3,000/net Ac) shall include a guarantee of compliance with erosion control measures, and shall be furnished upon approval of the Developer's Agreement before work is commenced. The financial guarantee shall remain in place (\$250/Lot or \$1,000/net Ac) until all the subdivider's obligations under the erosion control plan have been satisfied.
- b. If the City draws upon the financial guarantee, the subdivider shall within ten (10) days of the draw, deposit with the City additional security of the same type and amount that the City has drawn. No further inspections will be conducted, no new building permits will be issued, and all work must stop within the development until the cash deposit for erosion control is restored to the predraw balance.

4. Enforcement.

- a. The City may issue a stop work order halting all development work and building construction for noncompliance with the erosion control plan.
- b. The City may draw down the posted financial guarantee and perform any work necessary to achieve compliance with the erosion control plan. The City will endeavor to give the subdivider advance notice of such action.

III. City Standard Plans

In order for the City to have standardized construction and as-built plans, the guidelines listed below shall be followed:

1. General Requirements:

- a. The Developers must consider the requirements for plans found in the subdivision ordinance and street construction standards attached herein.
- b. Incorporated in the set of plans shall be a sheet indicating the entire project, with corresponding sheet numbers on each separate sheet and index. All construction or phase limits shall be clearly depicted.
- c. All sheets shall be 22" x 34".
- d. Scale Horizontal Scale 1" = 50'
Vertical Scale 1" = 5'

(unless otherwise approved by the City engineer)

- e. General Details
 - i. North arrow
 - ii. Scale
 - iii. Date of preparation
 - iv. Proposed name of the subdivision in which the roadway and utilities are to be constructed.
 - v. Proposed name of all streets
 - vi. Name of the plan preparer, Engineer, Surveyor and Owner
 - vii. Seal or signature of the preparer and Registered Engineer
 - viii. Roadway, sanitary sewer, watermain and storm sewer plan and profile shall be drawn at a scale of 1" = 50' horizontal and 1" = 5' vertical.
 - ix. Roadway cross-sections shall be drawn at a scale of 1" = 10' horizontal and 1" = 5' vertical.
- f. Where possible, all utilities shall be shown in the following approximate locations:
 - i. Sanitary Sewer - on centerline of street right-of-way
 - ii. Watermain - ten feet north and east of centerline
 - iii. Storm Sewer - ten feet south and west of centerline
- g. All detail drawings shall be on a separate sheet and referenced to the proper sheet.
- h. The profile shall be directly below the plan with the stationing aligned as closely as practical. Stationing shall be shown on the plan view as well as the profile.
- i. All parcels shall be properly labeled with lot and block numbers and plat name, or P.I.D. in unplatted areas. Developed parcels shall have their address shown on the plan. Bearings and distances for all existing roadway centerlines and right-of-ways described above shall be shown.
- j. All match-line breaks shall be clean with reference points clearly marked. All plans which are broken by a matchline shall be on the same or consecutive sheets.
- k. Proposed and existing utilities shall be shown in both plan and profile, stationing and labeled as existing.

- l. Approximate locations of gas, electric, telephone and cable lines shall be shown.
- m. Right of way and pavement or curb and gutter alignment data shall be shown. Right of way shall be rounded at intersections (min 10' radius) to allow for utility installation.
- n. Benchmarks shall be placed on all sheets. (N.G.V.D. 1929 Adj.)
- o. All hydrants are to be at required height (see Standard Plate 203) after lawns, boulevards, etc. are finished (sod, seed, etc.) This will be the developer's responsibility.
- p. All dead end streets serving more than 1 lot shall have a minimum 40' radii temporary cul-de-sac with 4" bituminous curb unless approved by the City Engineer. A temporary easement shall cover the temporary cul-de-sac beyond the platted right of way. (See Standard Plate 108A)

2. Specific Requirements:

- a. Stationing of sanitary sewer wyes shall be indicated "S" in front of the stationing.
- b. All sanitary sewer services shall be drawn on the plan to the constructed length and the length noted. Indicate if jacked.
- c. If the sanitary sewer wye only is constructed, it shall be noted as "Wye Only" after stationing.
- d. The invert elevation of all sanitary sewer services shall be shown on the plans. If risers are installed, the height of each shall be indicated on the plans and also drawn on the profile, along with the height of each riser.
- e. All manholes shall be numbered on both plan and profile.
- f. All hydrants, gate valves and tees shall be stationed on the bottom of the profile.
- g. All water corporation stops shall be indicated by a "W" in front of its stationing.
- h. All water services shall be drawn to constructed length and the length noted if other than 10 feet in back of the property line. Indicate if service is jacked.

- i. The size and type of materials of all sanitary sewer and water services shall be noted on the plans.
- j. On combination sewer and water projects, water services may be placed in the same trench with sanitary sewer services three feet downstream from and 18" above the sanitary services. Locations will be noted on the plans with an "S & W" in front of the stationing.
- k. All sewer and watermain shall be shown in the profile with the appropriate information such as size, material, grades, invert elevations, etc.
- l. All elevations shall be based on N.G.V.D. 1929 Adj. datum.
- m. All hydrants and sanitary manholes (gravity and forcemain) within the water table shall be identified in the plans. The hydrants are to be marked with a metal strip, nozzle painted black and their drain holes are to be plugged.
- n. Lots located in clay soils shall have draitile extended to if they are more than one lot away from a storm sewer structure. The draitile is to serve as a means of promoting drainage along lot lines and as a connection point for homes sump pump systems. All rear yard draitile shall be solid PVC with cleanouts located at any bend and at the end of the line.
- o. The plans shall depict a temporary concrete washout area. A sign must be placed at each temporary washout facility. A detail of the concrete washout area containment device is required.
- p. All street vertical and horizontal curves shall be designed in accordance with MnDOT Standards or as approved within Appendix D of this Engineering Manual.

3. As-Built Requirements:

- a. All as-built plans shall be provided in the form of a complete set (including detail sheets) of full size "as-built" electronic plans. Adobe (.Pdf) or AutoCAD (.Dwg) files are acceptable, All unnecessary construction information removed (contours, trees, shrubs, fences, etc.).
- b. As-built grading on all ponding areas, drainage swales, ditches and emergency overflows are required. Plans shall indicate as-built ground elevations (spot shots) superimposed upon the approved

grading plan. Also, the normal water elevation, high water elevation, and the acre feet of storage (if different from proposed plan) for each ponding area along with the final storm sewer plans.

- c. All “as-built” plans shall be certified by the design engineer.
- d. All water valves shall be located with at least two permanent field ties, using the following priority:
 - i. Fire hydrants
 - ii. Manholes
 - iii. Catch basins, if curb and gutter is in
 - iv. Buildings or other permanent structures
 - v. Power poles, trees, other semipermanent items
 - vi. Stationing from hydrants, manholes, catch basins, if over 100’
 - vii. Back of curb only when used with station in (f.) above
- e. All services shall be tied with at least two ties, using the following priority:
 - i. The served structure with address noted
 - ii. Neighboring structures with address noted
 - iii. Fire hydrants
 - iv. Manholes, catch basins, if curb and gutter is in
 - v. Other permanent structures (bridges, telephone boxes, electrical boxes, etc.)
 - vi. Power poles, trees, other semipermanent items
 - vii. Stationing from hydrant, manhole, catch basins – these may be used with back of curb distance only as last possible means.
- f. Show all contractor’s name on the as-builts. At a minimum the general or prime contractor shall be listed and any subcontractors performing paving, concrete, aggregate base, utility, and grading work shall be listed.
- g. Show where fabric has been placed or correction to pavement section has been made in the streets on the plan portion of the as-builts.
- h. Benchmarks shall be referenced on each sheet (i.e. Top Nut Hydrant).

- i. As-built elevations shall be established using conventional methods (non G.P.S.) with an accuracy of $\pm 0.05'$. All elevations shall be based on N.G.V.D. 1929 Adj. datum.
- j. All as-built plans shall include as-built pipe grades, invert elevations, rim elevations, and pipe lengths shown. All planned information shall be crossed out/struck-thru and the as-built information written next to it.
- k. Construction or phase limits shall be clearly indicated.
- l. Lot and block numbers shall agree with final plat.

IV. City Standard Materials

In order to standardize certain construction materials and assure quality construction, we have adopted the following:

1. Sanitary Sewer pipe and service line materials:
 - a. Plastic pipe shall be smooth wall polyvinyl chloride (PVC) and shall conform with ASTM D 3034 for the size and strength requirements shown on the plans. Minimum pipe strength shall be SDR 35. All joints shall be elastomeric gasketed.
 - b. Ductile iron sewer pipe shall be Class 50 and shall meet ANSI specifications A-21.51.
 - c. All connections between existing and new sanitary sewer or service pipe shall be made with factory manufactured flexible couplings, Fernco or equivalent, specially designed and sized for sanitary sewer connections.
 - d. All PVC sanitary sewer service pipe and fittings, including PVC wyes, shall be SDR 26 minimum pipe strength.
 - e. All forcemain air valves shall be Val-Matic or approved equal. A back-flushing kit shall be supplied with each air valve.
2. Storm Sewer and Drainage Pipe:
 - a. All storm sewer pipe within any street right-of-way shall be reinforced concrete pipe of the class as shown on the plans. Pipe shall meet Mn/DOT 3236 Specification. Joints shall be flexible watertight meeting ASTM C-361.

- b. Storm sewer pipe on private property or on easements not used for vehicle traffic may be corrugated high density polyethylene (HDPE) pipe.

Corrugated high density polyethylene (HDPE) pipe and fittings shall meet the requirements of Mn/DOT specification 2503 (Corrugated Polyethylene Pipe Sewer).

- c. Articulated concrete block or cable concrete conforming to Mn/DOT 3604, or Flexamat as manufactured by Motz Enterprises, Inc. or approved equal is required at all storm sewer discharge pipes and pond overflows. Selected material shall be sized to withstand a minimum of 24 psf shear stress and 19 fps velocity. Fabric blanket conforming to Mn/DOT 3733 (e.g. Mirafi 500 or 800) is required under all options.
- d. Wood fiber blanket is required at all inlets. (See Mn/DOT Standard Plate No. 9102D) All wood fiber blankets shall be fastened to the ground using plastic staples or wood stakes. Metal staples will not be allowed.
- e. All flared end sections 24" and larger shall be fitted with trash guards.
- f. Minimum size for storm sewer shall be 15" diameter, or equivalent. However, 12" diameter pipe will be allowed for catchbasin leads and on skimmer structure inlet pipes if necessary (to control discharge rate).
- g. Drintile pipe shall be perforated Thermoplastic Pipe or Corrugated Polyethylene Drainage Tubing conforming to Mn/DOT 3245 or 3278 respectively, and shall be installed per Mn/DOT 2502 unless approved by City Engineer.
- h. The last 3 pipe joints at all RC flared end sections on storm sewer pipe and all RC Pipe culvert pipe joints shall be "tied".

3. Metal Sewer Frames and Castings – 2621.2B:

- a. Castings for sanitary sewer manholes shall be Hamilton Kent Lifespan System, Neenah R-1642 or approved equal. All castings shall have a concealed pickhole, a neoprene gasket and groove for watertight application. The words "Sanitary Sewer" shall be imprinted on the cover. Waterproof castings where required shall be Hamilton Kent Lifespan System, or Neenah R-1755-F2, or approved equal.

- b. Castings for storm manholes and catchbasin shall be in accordance with the standard plates and schedule of structures. Unless otherwise specified, castings shall be equivalent to Neenah R-1733 for manhole and R-3067 for catch basins.
- c. Castings for surmountable catchbasin curb shall be Neenah R-3501 TB, or approved equal. Yard inlet castings shall be Neenah R-4342, or approved equal
- d. All frames for sanitary and forcemain manholes and all storm sewer manholes within paved areas shall be sealed with manufacture recommended adhesive to the top of the concrete structure or adjustment ring(s) and bolted directly to the top of the concrete structure using 316 stainless steel nuts, bolts and/or threaded rods.
- e. Final grade adjustments may be made by adding rings and raising the frame or with metal casting inserts per the manufactures' requirements.

4. Manhole and Catchbasin Structure:

- a. Manhole and catchbasin structures shall be in accordance with applicable Mn/DOT standard plates or standard plates as shown in the plans. All manholes and covers shall be reinforced for traffic loadings.
- b. Manholes or catchbasins identified on the plans as slab top shall be constructed from pipe manufactured to ASTM C-76 Standards. Minimum Class 3 strengths.
- c. Manholes identified on the plans as box structures shall be constructed from precast reinforced concrete box sections conforming to ASTM C-789 placed on end. Wall thickness and reinforcement shall be in accordance with ASTM C-789 Table 1 for box section under earth dead load and HS-20 live load conditions. Base and cover slabs shall have thickness and reinforcement to meet Mn/DOT HS-20 traffic loadings.
- d. All manhole and catchbasin structures with builds greater than 4.0 feet from casting to invert shall have steps. Maximum distance from top of casting to first step is 2 feet.
- e. All manholes that are located in green areas shall be marked with a steel marker post. All manholes that are located within a gravel road shall be adjusted to 1' below the surface and shall be marked

with an offset steel marker post that is located within the right-of-way.

- f. Storm structure adjustment rings shall be HDPE “plastic” rings if the structure is within bituminous or concrete rings if within curb and gutter and green spaces. Concrete rings shall be encased in concrete per MnDOT Std Plate 4026A. When using concrete ring a maximum of 1” of grout may be used. Shims for leveling shall be concrete or metal only.
- g. Sanitary sewer and forcemain structure adjustment rings shall be HDPE “plastic” rings. All frames and rings shall be sealed with manufacture recommended adhesive and bolted directly to the top of the concrete structure using all 316 stainless steel nuts, bolts, or threaded rods.
- h. Manhole Sealing

All existing and proposed sanitary sewer manholes shall be watertight and receive a watertight frame and casting system. All forcemain manholes and all gravity sanitary sewer manholes within green spaces or within the 100 yr HWL area shall receive a waterproof frame and casting system. All chimney areas (i.e. adjustment rings) shall be externally sealed. If locking “plastic” adjustment rings are used a chimney seal is not required by the City; if concrete adjustment rings are used the chimney area shall be internally sealed. All joints 3’ above the water table and below shall be sealed. All seals shall be installed per the manufactures specifications.

- i. Standard Frame and Casting System

- 1. The standard watertight frame and casting system shall consist of Neenah R-1642 system with cast iron frame, solid cast iron lid, cast iron extension ring, and HDPE "plastic" adjustment rings or;
- 2. Hamilton Kent, Life Span system with an elastomeric frame, elastomeric extension ring, elastomeric adjustment risers, and cast iron locking lid. Lid shall have (3) locking cam lugs, or approved equal.

- ii. Waterproof Frame and Casting System

- 1. The waterproof frame and casting system shall consist of Neenah R-1755-F2 system with cast iron frame, solid

cast iron lid, & inner lid. Though not typical if necessary HDPE "plastic" adjustment rings shall be used with external chimney seals. The insert extension rings are not allowed for final casting adjustments with these frames and castings or;

2. Hamilton Kent, Life Span system with an elastomeric frame, elastomeric extension ring, elastomeric adjustment risers, and cast iron locking lid. Lid shall have (3) locking cam lugs, or approved equal. equal

iii. Sanitary Sewer Manhole Chimney Seal

1. External chimney seal shall consist of an external EPDM flexible rubber sleeve and a non-hardening butyl mastic adhesive. (Manufacturer: Sealing Systems, Inc., External Infi-Shield Gator Wrap)
2. Internal chimney seal shall consist of a rubber sleeve, interlocking extension and stainless steel expansion bands with no welded attachments. The seal shall extend onto the casting and the cone section a minimum of 2". (Manufacturer: Cretex Specialty Products, Chimney Seal)
 - a. The sleeve and extension shall be double or triple pleated and shall be extruded or molded from a high-grade rubber compound, ASTM C923, with a minimum 1500 psi tensile strength, maximum 18 percent compression set and a hardness (durometer) of 48 ± 5 .
 - b. Expansion bands shall be 16 gauge stainless steel, ASTM A240, Type 304. The bands shall have a minimum width of 1 inch and a minimum adjustable range of 2 diameter inches. All hardware/accessories shall be stainless steel, ASTM A276, TYPE 304.

iv. Sanitary Sewer Manhole Joint Seal

1. Internal joint seal (Existing Manholes only) shall consist of a flexible internal rubber sleeve, stainless steel restraining hoop, and stainless steel expansion bands. For use on manhole joints subject to 14 ft of external water pressure head or less. (Manufacturer: Cretex Specialty Products, Internal Manhole Joint Seal)

2. External joint seal (New Manholes) shall consist of an external EPDM flexible rubber sleeve and a non-hardening butyl mastic adhesive. For use on manhole joints subject to 30 ft of external water pressure head or less. (Manufacturer: Sealing Systems, Inc., External Infi-Shield Gator Wrap)

5. Watermain and Appurtenances:

Materials shall conform to the Standard Specifications and to the following:

- a. Watermain shall be slip joint or mechanical joint ductile iron pipe conforming to AWWA Standards and shall be Class 52 with size as noted on the plans. All pipe shall be coated on the exterior and the interior shall be cement mortar lined. Joints shall conform to AWWA C111. Fittings shall be compact type conforming to AWWA C 153.
- b. Bends shall be 45 degrees or less. Any deflection greater than 45 degrees shall be made with multiple bend sections.
- c. Valves 12" and larger shall be butterfly valves, AWWA C504, Mueller Line Seal or approved equal. Valves smaller than 12" in size shall be resilient wedge valves, Mueller A 2360 Series, American-Darling Series 2500 or approved equal conforming to AWWA C509 standards. All valves shall be installed on-line with accompanying valve boxes. All valves shall close in a clockwise direction. All valves shall be epoxy coated as per AWWA C550.

Valve boxes shall be three piece adjustable screw type boxes, nominal 60" to 90" extension, with a 5 ¼" shaft diameter. All valve boxes must be true and plumb. Each valve box will be tested for plumbness using a section of 4" PVC pipe. Valve boxes shall be provided with extension suitable for the design location and a minimum 6-inch available adjustment after final setting. The word "Water" shall be imprinted on each lid.

All valves shall be fitted with extension stems to bring the operating nut to be 2' from the surface.

All valves located in green areas shall be marked with a steel marker post. The marker post shall be offset 2'

- d. Hydrants shall be Waterous Pacer WB 67 with a 5 ¼ inch seat diameter. Hydrants shall have a traffic flange with 22" break off section. A stainless steel spring mounted fully wrapped fiberglass locator rod shall be attached to each hydrant. All hydrants within the water table must be plugged. These hydrants shall be identified with a metal strip and nozzle painted black.
- e. All water service will be minimum 1-inch. All copper service pipe shall be Type K.
- f. Corporation stops for 1" through 2" services shall be Mueller 300 Ball Type or Ford FB Series Ballcorp. All services shall be wet tapped. Curb stops for 1" through 2" service shall be Ford Ball Valve B22 Series or Mueller Oriseal and shall be a Minneapolis pattern valve with thread top. Curb box shall be Minneapolis base, sized to fit the curb stop. Boxes shall have a one and one-quarter (1 ¼) inch upper section and shall be furnished with a stationary rod 66" in length. Boxes shall have a minimum twelve-inch (12") adjustment to eight feet (8') when fully extended. All curb boxes located beneath driveways, shall have Ford Series A lid covers placed over the riser. (See Standard Plate 207)
- g. Water services larger than 2-inch shall be constructed with pipe, fittings, valves and boxes as specified for Ductile Iron Pipe installation.
- h. Water meter shall be obtained at City Hall with payment of established fee, and installed in accordance with directions.
- i. All water service valves shall rest on a 4" thick, 8" x 12" solid concrete block.
- j. All nuts, bolts, and rodding shall be high-strength, low-alloy steel and shall be coated with a ceramic-filled, baked on fluorocarbon resin (i.e. Cor-Blue Bolts) or shall be ASTM F 593 316 Stainless Steel in compliance with ANSI/AWWA C111/A21.11. Anti-seize bolt/nut coating or spray/paste compound shall be used on all stainless steel bolting operations.
- k. Irrigation Services
 - i. When irrigation line is connected to a 12" watermain or greater install a 4" tee and 4" gate valve to help isolate the irrigation line from the main. A 4" cap with a 2" corporation shall be installed for the irrigation service.

- ii. All irrigation lines connecting to a 10" watermain or less shall be 2" or less and wet tapped. These lines shall meet all the requirements above for services a curb stop for shutoff isolation purposes.
- iii. Irrigation service shall be equipped with a ¼ turn ball valve, metering equipment, and backflow preventer, Water meter shall be obtained at City Hall with payment of established fee, and installed in accordance with directions.
- iv. Above ground equipment shall be completely enclosed by a metal or other approved structure and shall be level and mounted a concrete pad.
- v. All irrigation services shall have a rain or moisture sensor.

6. Street Material:

All materials shall be in conformance with latest Edition of the Minnesota Department of Transportation Standard Specifications for Construction, or as modified herein in and Appendix D.

7. Tracer Wire:

- a. Tracer Wire (direct bury), when required, shall be minimum #14 AWG Copper Clad Steel wire or minimum #14 AWG solid Copper wire with 30 mil high molecular weight polyethylene insulation.
- b. Tracer Wire (directional boring), when required, shall be (3) three #12 or #10 AWG Copper Clad Steel wires.

V. Testing Requirements

Materials shall be sampled and tested in accordance to the Mn/DOT Schedule of Material Control, except for as modified below. Utility systems shall be tested in accordance with the Standard Specifications for Watermain, Service Lines, Sanitary Sewer and Storm Sewer as published by the City Engineer Association of Minnesota. The City Engineer shall be notified 24 hours in advance of the specific test.

1. Pipe Trench Compaction:

- a. Standard Proctor Density (ASTM D-698-78): Proctor samples will be obtained within the utility trenches for each type of soil encountered in construction.

- b. Density Test Nuclear (ASTM D-2922): 1 test per lift of backfill, 1 test every 500 feet of pipe installed at various depths, minimum 1 test daily when backfilling.
 - c. Sand-Cone Method (ASTM D-1556): The City Engineer may at his or her discretion, order density tests by the sand cone method.
2. Embankment Compaction:
- a. Standard Proctor Density (ASTM D-698-78): 1 test per source of material.
 - b. Density Test Nuclear (ASTM D-2922): 1 test per lift of embankment, 1 test every 500 feet of roadway fill, minimum 1 test daily when constructing embankment.
 - c. Density Test Sand-Cone Method (ASTM D-1556): The City Engineer may, at his or her discretion, order density tests by the sand cone method.
 - d. Test Rolling: Roadway subgrades shall be test rolled prior to placing aggregate base. In areas where the roadway subgrade consists of a “clean” sandy material a test roll may be waived if approved by the City Engineer. If the test roll is waived on the subgrade it will be required on the aggregate base prior to paving.
3. Class 3 or 4 Aggregate:
- a. Standard Proctor Density (ASTM D-698-78): 1 test per source of material.
 - b. Gradation Test: 1 test per source of material.
 - c. Density Test Nuclear (ASTM D-2922): 1 test per lift of embankment, 1 test every 500 feet of roadway fill, minimum 1 test daily when constructing embankment.
 - d. Density Test Sand-Cone method (ASTM D-1556): The City Engineer may, at his or her discretion, order density tests by the sand cone method.
4. Street Base Aggregate:
- a. Standard Proctor Density (ASTM D-698-78): 1 test per source of aggregate base.

- b. Gradation Test (ASTM D-422): 1 test per source of aggregate base, 1 test per 1000 tons of aggregate placed, minimum 1 test daily when placing aggregate base.
 - c. Density Test (Nuclear ASTM D-2922): 1 test per 500 feet of roadway. Where CL7 Aggregate is being used the City Engineer may, at his or her discretion, order density tests by the MnDOT Modified Dynamic Cone penetrometer (DCP) method.
 - d. Test Rolling: As required by City or project specifications.
5. Bituminous Tests:
- a. General: Bituminous tests are to be conducted by an independent testing laboratory. One core will be taken for every 500 tons placed, or a minimum of 3 per job. Bituminous cores shall be tested for in-place density and thickness.
 - b. Modified-Rice Densities and Field Densities (ASTM D-1559)
 - c. Thickness: All cores shall be measured for in-place thickness.
6. Concrete Tests:
- a. General: When molding cylinders for strength tests, three cylinders are to be made according to ASTM C-31. One additional cylinder shall be molded when it is anticipated that surrounding air temperatures will fall below 40° Fahrenheit. Said cylinder shall be cured on site.
 - b. Compressive Strength (ASTM C-39): 1 set of 3 for every 1000 l.f. of curb and gutter constructed or 1 set of 3 for every 100 cubic yards of concrete placed or a minimum 1 set of 3 daily when pouring concrete.
 - c. Percent Air Test (ASTM C-231): 1 test for every 1000 l.f. of curb and gutter constructed or 1 test for every 100 cubic yards of concrete placed or a minimum 1 test daily when pouring concrete.
 - d. Slump Test (ASTM C-143): 1 test for every 1000 l.f. of curb and gutter constructed or 1 test for every 100 cubic yards of concrete placed or a minimum 1 test daily when pouring concrete.

7. Sidewalk and Bike Path Tests:

- a. Quality Compaction (Visual Inspection) Method (Mn/DOT 2105.3.F2) shall be used to compact and inspect the subgrade and aggregate materials. A roll test may be required at the Engineers discretion to aid with the visual inspection.
- b. Bituminous testing shall be in accordance with Section V.5. "Bituminous Tests".
- c. Concrete testing shall be in accordance with Section V.6 "Concrete Tests".

8. Watermain Tests:

Test all segments of the watermain installed.

- a. Watermain Pressure Test (CEAM 2611.3. G)
 - i. Follows installation of all mainline pipe, services and hydrants, and pre-testing by Contractor.
 - ii. Witnessed by Project Representative.
- b. Electrical Conductivity Test (CEAM 2611.3.F)
 - i. Performed on all iron pipe watermains within 7 days of satisfactory completion of the pressure test.
 - ii. Witnessed by Project Representatives.
 - iii. Correction to any fire hydrants shall be made at the break off flange to avoid possible damage to internal parts.
 - v. The test shall be a minimum of 350 amps for 5 minutes
- c. Watermain Bacteriologic Quality Test (AWWA C-651)
 - i. Performed in the completed watermain after final flushing and before being placed in service. Two passing tests are required. One immediately after flushing and a second after a minimum of 24 hours later.
 - ii. Test samples shall be taken from a minimum of 20% of the hydrants or 1 per 2500 LF or watermain, whichever is greater.

- ii. Samples taken in presence of Project Representative.

9. Sanitary Sewer Test:

Test all segments of sanitary sewer installed.

a. Sanitary Sewer Air Test (CEAM 2621.F2)

- i. Follows completion of all mainline pipe, service pipe and manhole installations.
- ii. Witness by Project Representative.

b. Sanitary Sewer Mandrel Test (CEAM 2521.G)

- i. Follows completion of all mainline pipe installations by a minimum of 30 days.
- ii. Witnessed by Project Representative.

c. Televising of Sanitary Sewer

- i. Follows completion of all mainline pipe, service pipe and manhole installations.
- ii. Follows completion of Flushing/Clearing of system.
- ii. Witnessed by Project Representative.
- iv. A complete report (two copies) and a DVD or CD shall be submitted to the City Engineer. The televising must be completed when the pipe is clean and debris free. Reports showing dirty or sediment laden pipe will not be accepted.

d. Sanitary Sewer Infiltration Test

- i. All sanitary sewer pipe placed within the groundwater table must also be tested for infiltration.
- ii. Infiltration tests shall be applied to single reaches of pipe (manhole to manhole).
- iii. For pipes 8" through 15" in diameter, infiltration into the system (including manholes) not to exceed to 50 gallons per mile of sewer pipe per inch of inside diameter per 24 hours.

For all pipes larger than 15" in diameter, infiltration into the system (including manholes) shall not exceed 100 gallons per mile per inch of inside diameter of the sewer pipe per 24 hours. In no case shall the infiltration rate exceed 3,000 gallons per mile per 24 hours.

- iv. Infiltration test shall be preformed as a 4-day test and shall be monitored by the project representative.

10. Forcemain Test:

a. Forcemain Pressure Test (CEAM 2611.36)

- i. Forcemain shall be tested in accordance with CEAM 2611.3.G "Hydrostatic Testing of Water Mains", except that forcemains shall be subject to a hydrostatic pressure equal to twice that of the operation pressure, but in no case less than 100 pounds per square inch.
- ii. Witnessed by a Project Representative.

11. Tracer Wire:

- i. Performed on all tracer wire within 7 days of satisfactory completion of the all other required testing on the associated utility.
- ii. Witnessed by Project Representatives.

VI. Construction Requirements

1. Sanitary Sewer, Watermain, and Storm Sewer:

Work shall conform to the latest edition of the Standard Utility Specifications as published by the City Engineers Association of Minnesota, consisting of Part I – Standard Specifications for Watermain and Service Line Installation, Specification 2611; Part II – Standard Specifications for Sanitary Sewer and Storm Sewer Installation, Specifications 2621, except as herein modified.

- b. During street construction, measures shall be taken to prevent sand, class 5 and other materials from entering manholes.
- c. All sanitary sewer spills shall be handled in accordance with the City's Standard Operating Procedure as prepared by Hakanson Anderson Associates, dated March 2007, and the City's Spill

Response Plan as prepared by Hakanson Anderson Associates, dated May 2007.

2. Storm Sewer:

Pipe sewers shall be installed in accordance with CEAM 2621 and MnDOT 2501, except as modified herein.

3. Casting Adjustments:

All utility castings shall be adjusted as follows:

a. Sewer Manhole:

All sanitary and storm sewer manhole castings shall be in place during the laying of the wear course. The castings shall be adjusted before the mat is laid and shall be not less than one-quarter inch (1/4") or more than three-eighths inch (3/8") below finished grade. Cast iron adjustment rings will be allowed to make the final adjustment prior to wear course paving. Paving must be completed within 48 hours of making the adjustment. Castings must be protected during the placement of the bituminous course(s) so that the casting covers do not have contact with the bituminous material.

b. Storm Sewer:

Storm sewer inlet castings shall be adjusted to be 2" inches below finished gutter line.

c. Water Valve Boxes:

All water valve boxes shall be adjusted prior to wear course paving to one-half inch (1/2") below finished grade. Only screw-type adjustments are allowed. All valve boxes must be constructed such that they are true and plumb. All valve boxes will be tested for plumbness using a section of 4" PVC pipe.

d. Grouting Adjusting Rings:

Whenever adjustment rings are provided, the contractor shall grout rings, place the castings and remove all excess grout on the inside and outside of the manhole by wiping smooth with a gloved hand or similar instrument.

4. Streets:

Street construction work and materials shall be in accordance with the latest edition of the Minnesota Department of Transportation Standard Specifications for Construction, or except as herein modified :

Common excavation and embankment – Mn/DOT 2105

Common excavation and embankment density or compaction requirements. Roadway embankment shall be compacted by the method described as “Specified Density” as outlined in Mn/DOT Section 2105.3 Paragraph F1.

Aggregate Base Mn/DOT 2211 with compaction by the specified density method.

Plant mixed bituminous non-wear – Mn/DOT 2360.

Tack coat shall conform to Mn/DOT 2357

Plant mixed bituminous wear – Mn/DOT 2360.

Concrete curbing Mn/DOT 2531 using B618 or Otsego Standard Plate 704.

Concrete curing and protection – Mn/DOT 2531.3G

Street(s) shall be constructed in accordance with typical sections shown on City Standard Plates and detailed in Appendix D.

The final wear course shall not be constructed until at least one construction season after the base construction is completed and shall be delayed one more construction season if at least 75% build out is not achieved. However, the final wear course shall not be delayed for a period longer than two years after the base course is paved, regardless of build out; in which case, the developer shall provide an escrow for fog sealing the streets in the event the final wear course is placed prior to 75% build out.

Before excess common excavation, borrow or other materials from projects are deposited or mined on private property, a grading, fill or mining permit is required by the City, plus permission in writing from the property owner.

5. Sidewalks and Bike Paths:

- a. All sidewalk and bike path subgrade and aggregate base material shall be compacted using a tamping roller or vibratory roller in accordance to Mn/DOT 2105.3.f.2 and approved by the Engineer.

6. Cold Weather Construction

a. Excavation (includes utility trenches)

- i. When excavating, frozen dirt chunks should be separated from non-frozen dirt. Frozen chunks shall not be placed back in utility trenches or within the street subgrade.
- ii. All excavations and utility trenches shall be backfilled each day to avoid creating more frozen chunks overnight and to provide sufficient cover over utilities in case a storm shuts down construction for an extended period of time.

b. Sanitary Sewer, Watermain, and Storm Sewer:

- i. No frozen chunks in backfill.
- ii. All manholes and valves shall be adjusted to the current finished grade for access throughout the winter.
- iii. Concrete doghouses, inverts, and grout between adjustment rings (where allowed) shall not be allowed to freeze within the first 72 hours. If streets are not to be finished prior to winter shut-down, all concrete work except outside doghouses around pipes and grout between adjustment rings may be finished in the spring
- iv. Minimum cover shall be provided over all sanitary and water lines, including forcemain, hydrants, services and all stubs. If no traffic is allowed over the pipe 6' is sufficient for the winter otherwise in traffic areas a minimum of 7.5' is required. Special attention may be needed at the end of cul-de-sacs and where future streets are sub-cut and utilities are installed.
- v. All testing requirements shall be fulfilled prior to issuing building permits.

c. Streets (including concrete curb and gutter)

- i. No frozen material shall be placed in the street subgrade or aggregate base.
- ii. New (unfrozen) material may be placed on a previous fully compacted layer frozen layer.
- iii. Curb and pavement cannot be placed on frozen ground. The temperature shall be 36° and rising at time of placement. Contractors may choose to place and compact extra material over the area and peel off the frozen material just prior to placing curb or paving. This frozen material shall not be used in the aggregate base. Subgrade/aggregate base still needs to be tolerated prior placing curb/pavement.
- iv. A cold weather plan for placing concrete in cold weather shall be submitted to engineer. Measures shall be taken to the concrete does not freeze within the first 72 hours of placement. A method to monitor maximum low temperatures in multiple places on the concrete under cold weather protection shall be addressed. If a section of curb is suspected of freezing, the concrete can be core drilled in place and tested. Any frozen concrete shall be removed and replaced.
- v. Concrete samples shall cure overnight in same conditions as concrete (i.e. under poly or under blankets, etc).
- vi. High early curb (adding calcium chloride) is allowed.
- vii. No vibratory actions near fresh concrete it reaches 3000 psi.
- viii. Pavement shall not be placed on frozen ground.
- ix. Wear Course paving is not allowed in the metro area after November 1st (MnDOT 2360.3.A.4) or when temperatures are below 32° (MnDOT 2360.3.D.2.c)

d. Erosion Control

- i. Seeding and/or mulching are less effective once the ground is frozen. Special attention regarding perimeter control should be give and seed/mulch shall be placed as soon as possible the next spring. Dormant seeding on snow works acceptable. Ultimately the contractor/developer will be responsible for vegetation establishment and compliance with NPDES permit.

- ii. If silt fence is damaged and cannot be repaired due to frozen ground, bio-rolls or rock logs are an acceptable alternative.
- iii. Inlet protection (i.e. Wimco's) shall be removed from catch basins after the ground has frozen. They shall be reinstalled in the spring.

VII. Storm Water Treatment

All stormwater facilities/treatment shall be designed to conform to the latest edition of the Minnesota Pollution Control Agency Stormwater Manual and National Pollution Discharge Elimination System permit, except as herein modified.

1. Storm water conveyance, storage and treatment systems shall be designed in accordance with the City of Otsego's policy on stormwater drainage as outlined in Appendix C. Typical basin construction and outlet structures are shown on the City Standard Plates in Appendix A.
2. Infiltration areas shall be designed in accordance with the latest edition of the Minnesota Pollution Control Agency's Stormwater Manual except as herein modified.

VIII. Lift Stations

1. All lift stations shall be designed in accordance with the City of Otsego's policy on Lift Station Design for Developers (See Appendix E).

IX. Signage, Striping and Lighting

All traffic control devices and signing shall conform to the latest edition of the Minnesota Manual on Uniform Traffic Control Devices except as herein modified.

1. All signage, striping and lighting shall conform with the City of Otsego's Standard Specifications for Signage, Striping and Lighting (See Appendix F).

X. Miscellaneous

1. Proper notification of improvements shall be given by the developer or the developer's engineer to the responsible governmental agencies, watershed districts, etc. affected by said construction. All necessary permits shall be obtained prior to commencing any work. All special requirements of the responsible agencies shall be complied with.

2. The developer's contractor shall furnish, erect and maintain signs and barricades as provided in Mn/DOT 1710 "Barricades and Signs" under the General Conditions to protect the public. The City Engineer shall be notified 24 hours prior to the proposed partial blockage or closure of any street or public right-of-way. No street or public right-of-way shall be closed without the proper approval of the City Engineer. The Developer contractor will be responsible for notifying appropriate agencies of the blockage or closure (i.e. police, fire department, school transportation company, etc.)
3. It is the responsibility of the developer's contractor to protect and leave undisturbed those markers or monuments set for the subdivision of land.
4. The developer and/or his contractor shall immediately repair or replace at his own expense any defective workmanship or material of which he is notified during the construction period, or within the warranty period following the date of initial acceptance of the work, regardless of the approval and acceptance of the work.
5. A plan for the routing of construction traffic shall be submitted to the City Engineer for his approval. City streets that are utilized for access or egress to the construction site shall be kept free of dirt and other debris resulting from said construction. Adequate control of dust shall be maintained by the developer's contractor.
6. The City will require the contractor to submit a list of materials and respective suppliers as well as all tests of materials.
7. If any material or labor supplied by the contractor or developer is rejected by the City Engineer or his designated representative as defective or unsuitable, then such rejected material shall be promptly removed, disposed of off the job site, and replaced with approved material.
8. All street right-of-ways shall be cleared and grubbed to full width except as specifically directed.
9. The standard ten (10) foot utility and drainage easement adjacent to the street right-of-way shall be cleared and grubbed for the placement of utilities except as specifically directed.
10. Work shall not commence before 7:00 a.m. nor extend beyond 7:00 p.m. Monday through Friday. On Saturdays, the hours will be from 8:00 a.m. to 6:00 p.m. No work is to be done on Sundays without prior written authorization. Hours and days of work may be modified based on need.

11. Mailboxes shall be located in clusters in all new urban subdivisions. The locations of the mailbox cluster areas shall be shown on the plan. The side of the street that the clusters are located on shall be determined by the local mail carrier/United States Postal office.
12. Driveway slopes shall be no greater than 10%.

APPENDIX A

APPENDIX A

- SERIES 0 FEDERAL, STATE OR COUNTY
- SERIES 1 PAVEMENT
 - 100 Local Residential Rural Street Section – 9 Ton
 - 101 Local Residential (Pre 2003) Urban Street Section – 9 Ton
 - 102 Local Commercial/Industrial Rural Street Section – 10 Ton
 - 103 MSA Collector Urban Street Section – 10 Ton
 - 105 Rural Mailbox Location
 - 106 Urban Mailbox Location
 - 107 Residential Cul-De-Sac Rural Section
 - 108 Residential Cul-De-Sac Urban Section
 - 108A Temporary Cul-De-Sac Urban Section
 - 109 Typical Driveway
 - 110 Local Residential PUD Private Street – 9 Ton
 - 111 Private Commercial/Industrial Urban Street Section – 10 Ton
 - 112 Local Residential Urban Street Section – 9 Ton
 - 113 Industrial Collector Urban Street Section – 10 Ton
 - 114 Local Industrial Urban Street Section – 10 Ton
 - 115 Local Commercial Urban Street Section – 10 Ton
- SERIES 2 WATER SYSTEM AND APPURTENANCES
 - 200 Water Service Detail (2" and Less)
 - 201 Water Service Detail (Greater than 2")
 - 202 Thrust Block Detail
 - 202a Watermain Concrete Blocking Quantities
 - 203 Pacer Traffic Flange Hydrant
 - 204 Hydrant & Hydrant Gate Valve Detail
 - 205 Typical Resilient Wedge Valve & Box Installation – 10" & under Watermain
 - 206 Typical Butterfly Valve & Box Installation – 12" & over Watermain
 - 207 Curb Box Lid Cover (For installations in DW)
 - 208 Seepage Pit Detail
- SERIES 3 SANITARY SEWER & APPURTENANCES
 - 300 Sanitary Sewer Standard Manhole
 - 301 Typical Water Tight seals
 - 302 Shallow Sanitary Main Service Connection
 - 303 Deep Sanitary Main Service Connection
 - 304 Insulation for Water & Sanitary Sewer Pipe & Services
 - 305 Standard Drop Manhole
 - 306 Pipe Jacking Detail
 - 307 Waterproof Manhole Casting and Anchorage
 - 308 Internal Chimney Seal
 - 309 Manhole Adjustment Rings
 - 310 External Chimney Seal
 - 312 Forcemain Air/Vacuum Valve
 - 313 Forcemain Cleanout
 - 314 Manhole Joint Seal
- SERIES 4 STORM SEWER APPURTENANCES
 - 400 Slab-Top Manhole
 - 401 Storm Sewer Standard Manhole

- 402 Skimmer Structure
- 403 Skimmer Structures with Weir
- 404 Typical Treatment Pond
- 405 48" Diameter Shallow Depth Catch Basin
- 406 Standard Storm Manhole – Catch Basin
- 407 Plate Style Grate for 48" Dia. Outlet Structure
- 408 Standard Storm Manhole – Yard Inlet
- 409 27" Precast Catch Basin Yard Inlet
- 410 2" x 3' Catch Basin
- 411 Transverse Permeable Aggregate Base (P.A.B.) Drain
- 412 Longitudinal Permeable Aggregate Base (P.A.B.) Drain
- 413 Rear Yard Draitile Detail
- 414 Storm Manhole Adjustment Rings

- MnDOT 4003 30" Precast Catch Basin
- MnDOT 4180 Manhole or Catch Basin Step

SERIES 5 EROSION CONTROL & LAND APPURTENANCES

- 500 Articulated Concrete Block at R.C.P. Outlet
- 501 Silt Fence Installation
- 502 Wood Fiber Blanket Installation
- 503 Straw/Hay Bale Barrier Placement
- 504 Straw Bale Drop Inlet Sediment Filter
- 505 Rock Construction Entrance
- 506 Silt Saver
- 507 Drop Inlet Protection
- 508 Silt Sock

SERIES 6 WALLS OR MISCELLANEOUS STRUCTURES

SERIES 7 CURB & GUTTER AND SIDEWALK

- 701 Pedestrian Curb Ramp
- 702 Typical Cross Gutter
- 703 Curb Transition (B624) at Catch Basins
- 704 Surmountable Concrete Curb & Gutter
- 705 Curb Transition (B618) at Catch Basins
- 706 Typical Drop Curb – Bike Trail
- 707 Typical Section – Bike Trail
- 708 Concrete Approach Nose Detail

- Mn/DOT 7036 Pedestrian Curb Ramp
- Mn/DOT 7100 Concrete Curb & Gutter (B618)

SERIES 8 SIGNAGE, STRIPING AND LIGHTING

- 800 Lateral Offset and Vertical Clearance Requirements for Type "C" & "D" Signs
- 801 Type "C" & "D" Sign Post Installation Detail
- 802A A-Frame and Stringer Bracing Detail
- 802B A-Frame and Stringer Bracing Detail
- 803 Marker Post Installation
- 804 Wetland Buffer Sign
- 805 Stop Sign and Street Name Sign Detail
- 806 Temporary Cul-de-sac Sign

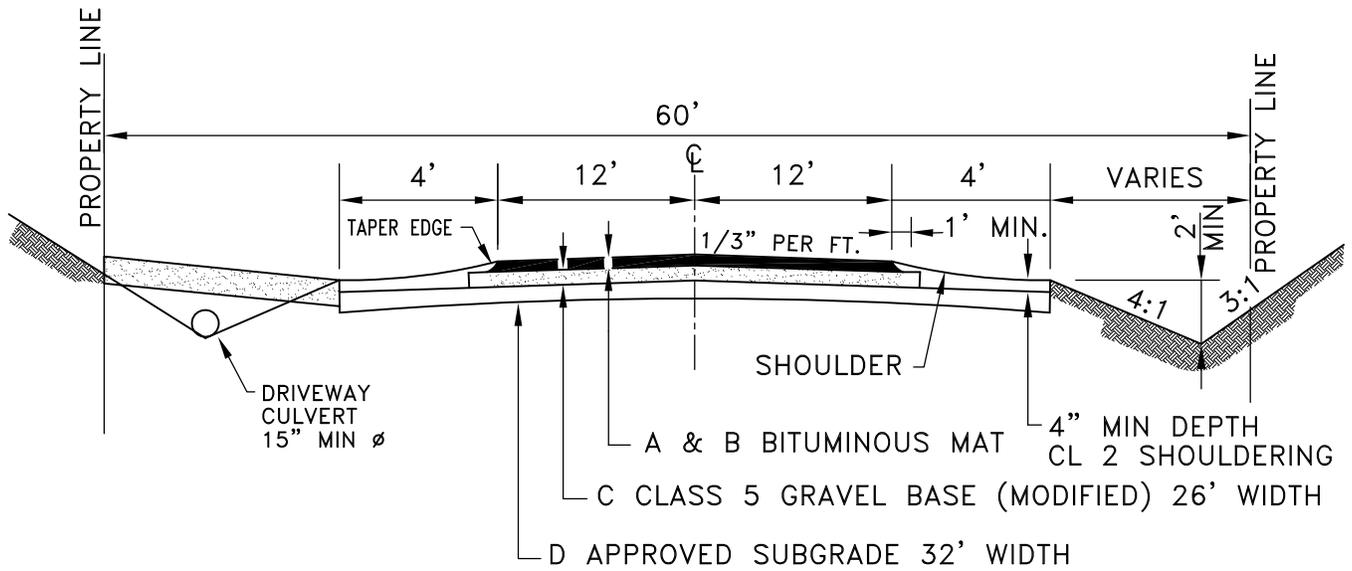
- 807 Lighting Unit Type I
- 808 Lighting Unit Type II
- 809 Lighting Unit Type I Foundation
- 810 Lighting Unit Type II Foundation

MnDOT 8002 Permanent Barricade

SERIES 9 MISCELLANEOUS

- 900 Location of Public Utilities
- 901 Mail Box Support

Mn/DOT 9102D Turf Establishment Areas (At Pipe Culvert Ends)



LEGEND					
AASHTP	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR	NON-WEAR	CLASS 5 OR 6	CLASS 3 OR 4
		2350 LVWE45030B	2350 LVNW35030B	3138 C*	3138 D*
A-3	(R-70 ≤ 90,000)	** 1 1/2"	** 2"	** 5"	-
A-4	(R-20 ≤ 90,000)	1 1/2"	2"	5"	-
A-6	(R-15 ≤ 90,000)	1 1/2"	2"	5"	12"
A-7	(R-10 ≤ 90,000)	1 1/2"	2"	6"	18"
	(R-5 ≤ 90,000)	1 1/2"	2"	6"	24"

* SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

NOTES:

R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

**LOCAL RESIDENTIAL
RURAL STREET SECTION - 9 TON**

NO SCALE

Mar 19, 2013 - 8:59am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-100.dwg

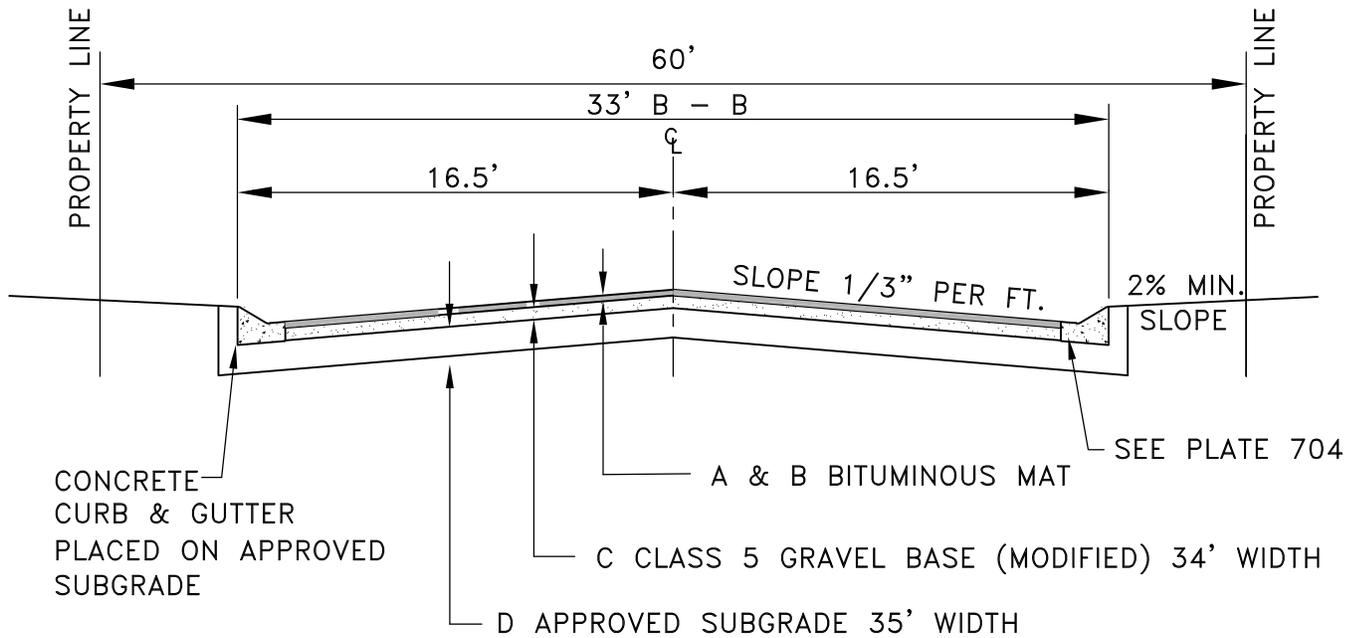
APPROVED

REVISED
5-10-07



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
100



LEGEND					
AASHTP	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2350 LVWE45030B	NON-WEAR 2350 LVNW35030B	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 1 1/2"	** 2"	** 5"	-
A-4	(R-20 ≤ 90,000)	1 1/2"	2"	5"	-
A-6	(R-15 ≤ 90,000)	1 1/2"	2"	5"	6"
A-7	(R-10 ≤ 90,000)	1 1/2"	2"	6"	7"
	(R-5 ≤ 90,000)	1 1/2"	2"	6"	18"

* SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

NOTES:

R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

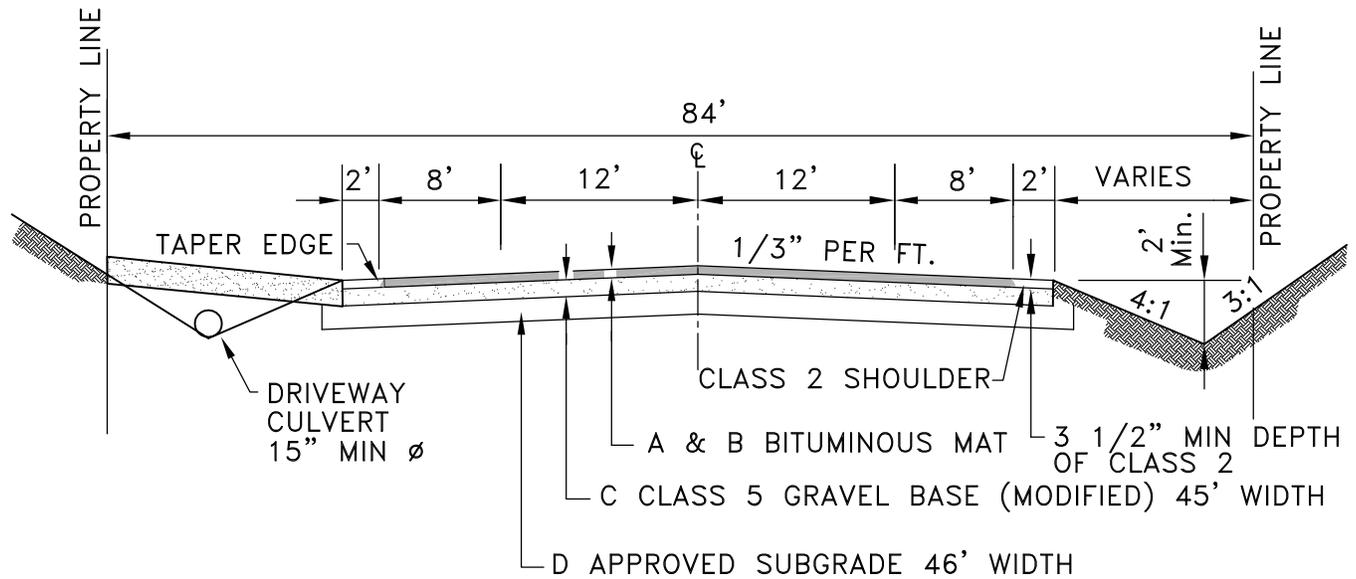
SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

**LOCAL RESIDENTIAL (PRE 2003)
URBAN STREET SECTION - 9 TON**

NO SCALE

Mar 19, 2013 - 9:00am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-101.dwg

APPROVED	 CITY OF <i>Otsego</i> MINNESOTA	STANDARD PLATE NO. 101
REVISED 5-10-07		



LEGEND					
AASHTP	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2350 LVWE45030B	NON-WEAR 2350 LVNW35030B	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 1 1/2"	** 2"	** 5"	-
A-4	(R-20 ≤ 90,000)	1 1/2"	2"	5"	-
A-6	(R-15 ≤ 90,000)	1 1/2"	2"	5"	12"
A-7	(R-10 ≤ 90,000)	1 1/2"	2"	6"	18"
	(R-5 ≤ 90,000)	1 1/2"	2"	6"	24"

* SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

NOTE:

R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

**LOCAL COMMERCIAL/INDUSTRIAL
RURAL STREET SECTION - 10 TON**

NO SCALE

Mar 19, 2013 - 9:04am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-102.dwg

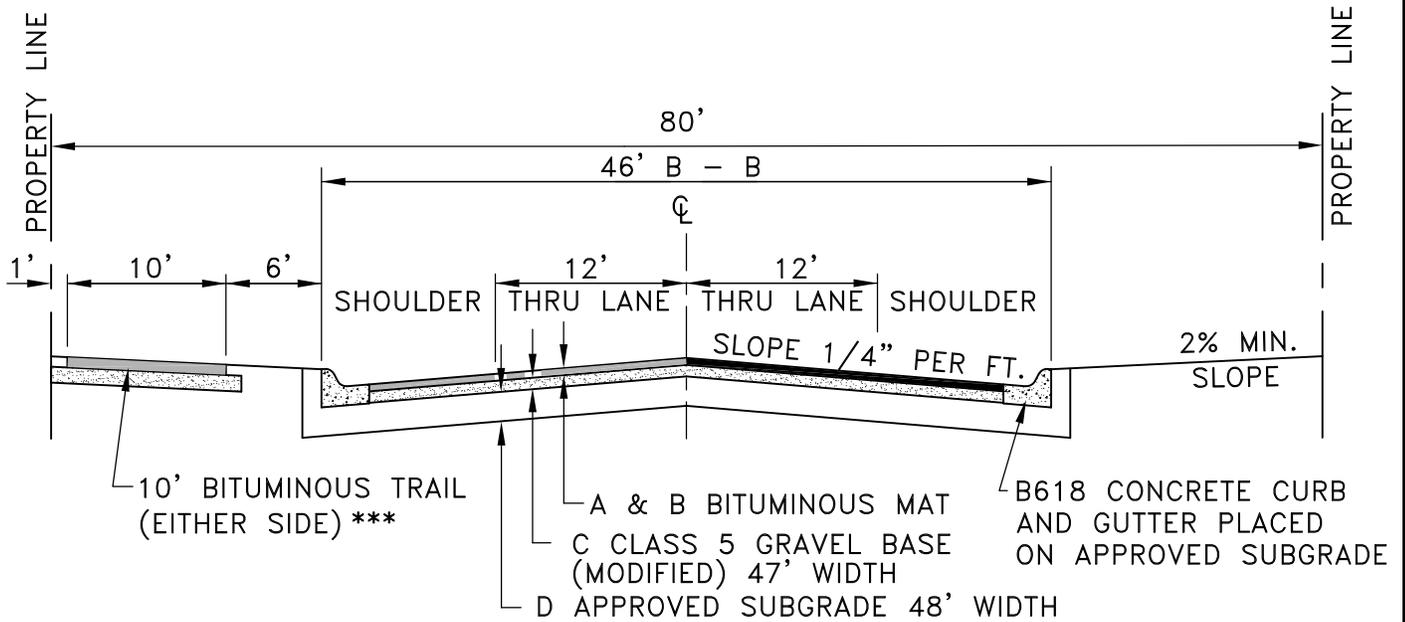
APPROVED

REVISED
5-10-07



**CITY OF
Otsego
MINNESOTA**

STANDARD PLATE NO.
102



LEGEND					
AASHTP	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR	NON-WEAR	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
		2350 LVWE45030B	2350 LVNW35030B		
A-3	(R-70 ≤ 90,000)	** 2"	** 2 1/2"	** 5"	-
A-4	(R-20 ≤ 90,000)	2"	2 1/2"	5"	-
A-6	(R-15 ≤ 90,000)	2"	2 1/2"	5"	12"
A-7	(R-10 ≤ 90,000)	2"	2 1/2"	6"	18"
	(R-5 ≤ 90,000)	2"	2 1/2"	6"	24"

- * SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER
- ** MINIMUM ALLOWABLE DESIGN THICKNESS
- *** SEE STANDARD DETAIL 707

NOTES:

R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

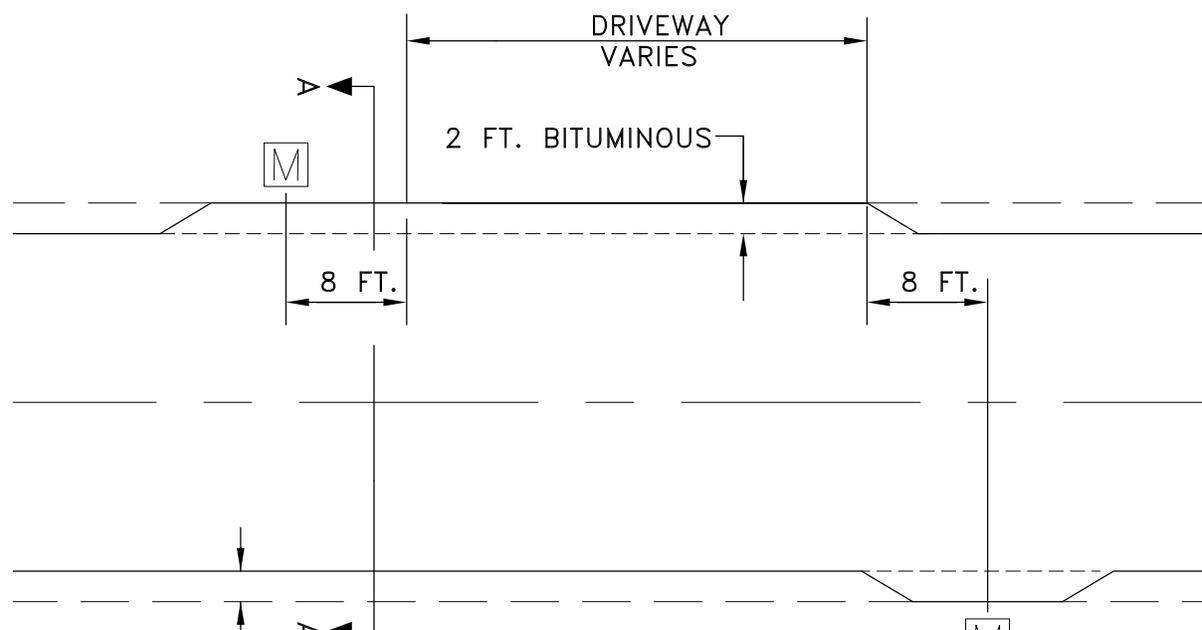
SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

MSA COLLECTOR
URBAN STREET SECTION - 10 TON

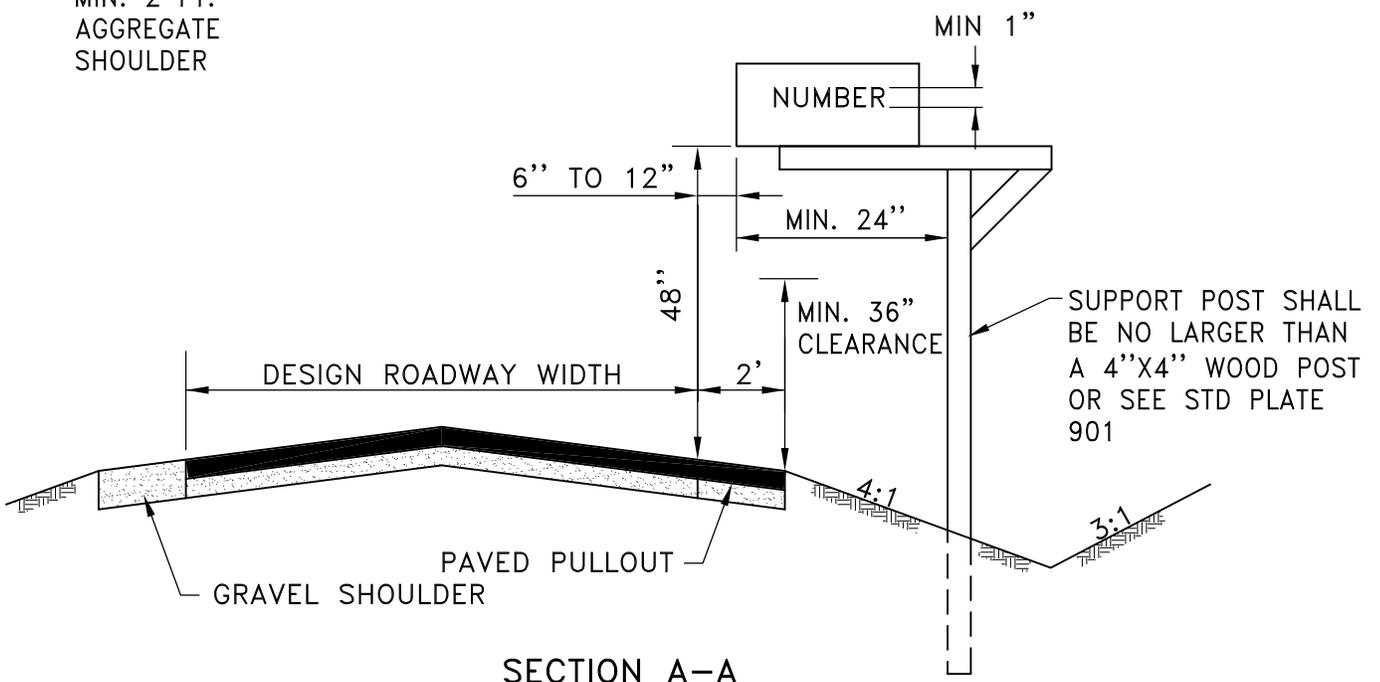
NO SCALE

Aug 10, 2015 - 7:37pm
K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-103.dwg

APPROVED		STANDARD PLATE NO. 103
REVISED 8-18-15		



MIN. 2 FT. AGGREGATE SHOULDER



SECTION A-A

NOTE:

1. SUPPORT POST SHALL BE NO LARGER THAN A 4"X4" WOOD POST OR 2" DIA. STEEL/ALUMINUM POST. SUPPORT POSTS SHALL BURIED 24" DEEP.
2. MAILBOXES AND NEWS RECEPTACLES SHALL BE POSTMASTER APPROVED.
3. A MINIMUM 36" CLEARANCE FROM THE GROUND MUST BE MAINTAINED FOR SNOW REMOVAL. CITY WILL NOT REPLACE DAMAGES CAUSED BY SNOW REMOVAL IF 36" OF CLEARANCE IS NOT PROVIDED.
4. FOR USE ALONG LOW SPEED ROUTES (35 MPH OR LESS, SEE STD PLATE 901 FOR HIGHER SPEED ROUTES).

RURAL MAILBOX (LOW SPEED)

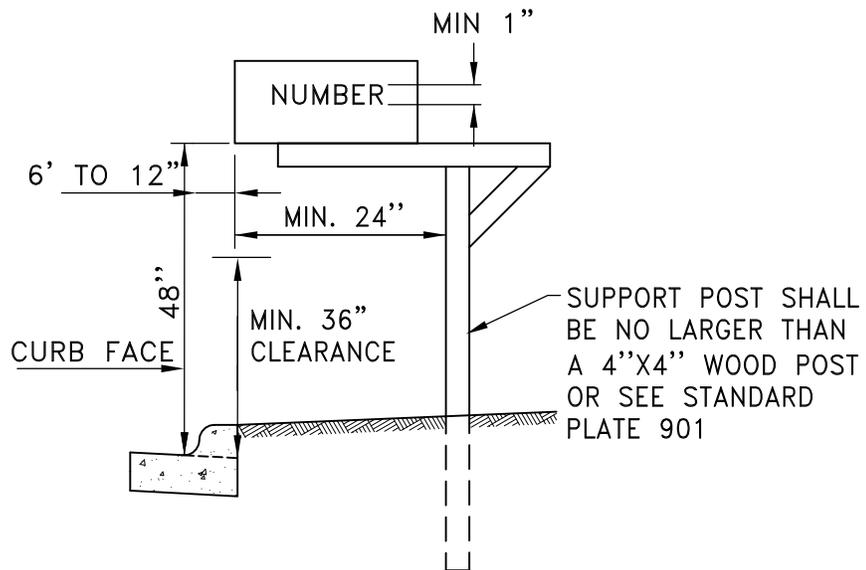
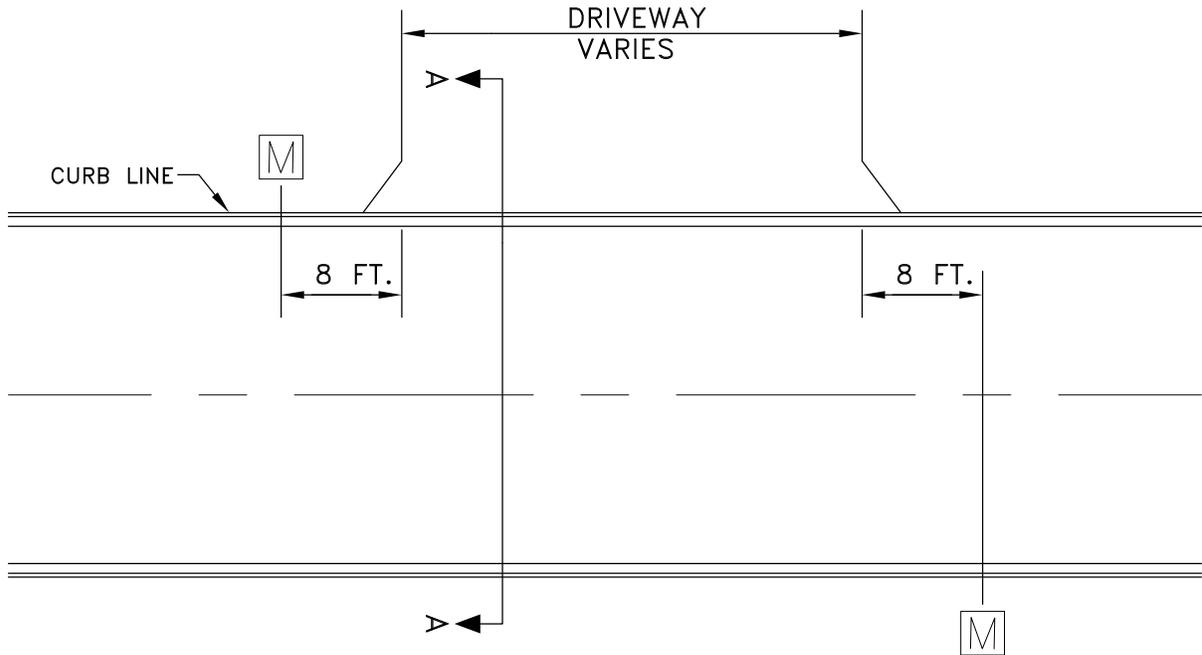
NO SCALE

Mar 28, 2013 - 10:02am
K:\cad_eng\Details\OTSEGO_REV13.dwg\STREETS\Strt-105.dwg

APPROVED
REVISED 3-19-13



STANDARD PLATE NO.
105



SECTION A-A

NOTE:

1. SUPPORT POST SHALL BE NO LARGER THAN A 4"X4" WOOD POST OR 2" DIA. STEEL/ALUMINUM POST. SUPPORT POSTS SHALL BURIED 24" DEEP.
2. MAILBOXES AND NEWS RECEPTACLES SHALL BE POSTMASTER APPROVED.
3. A MINIMUM 36" CLEARANCE FROM THE GROUND MUST BE MAINTAINED FOR SNOW REMOVAL. CITY WILL NOT REPLACE DAMAGES CAUSED BY SNOW REMOVAL IF 36" OF CLEARANCE IS NOT PROVIDED.
4. ALL MAILBOXES SHALL BE PLACED IN CLUSTERS IN NEW DEVELOPMENTS.
5. NO MAILBOXES SHALL BE PLACED IN CUL-DE-SACS.

URBAN MAIL BOX LOCATION

NO SCALE

Mar 28, 2013 - 10:05am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-106.dwg

APPROVED

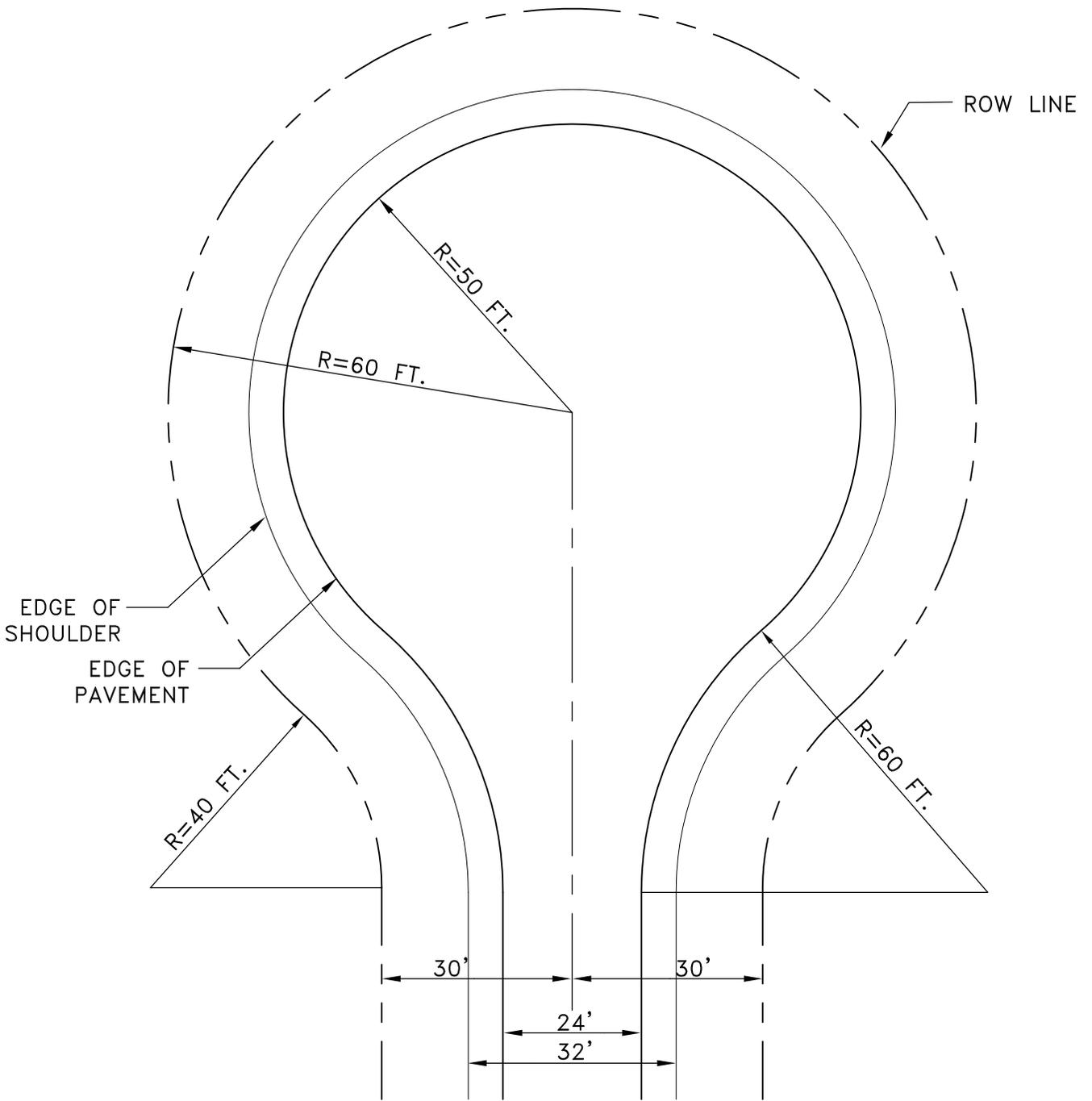
REVISED
3-19-13



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
106

Mar 19, 2013 - 9:11am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-107.dwg



RESIDENTIAL CUL DE SAC
RURAL SECTION
NO SCALE

APPROVED

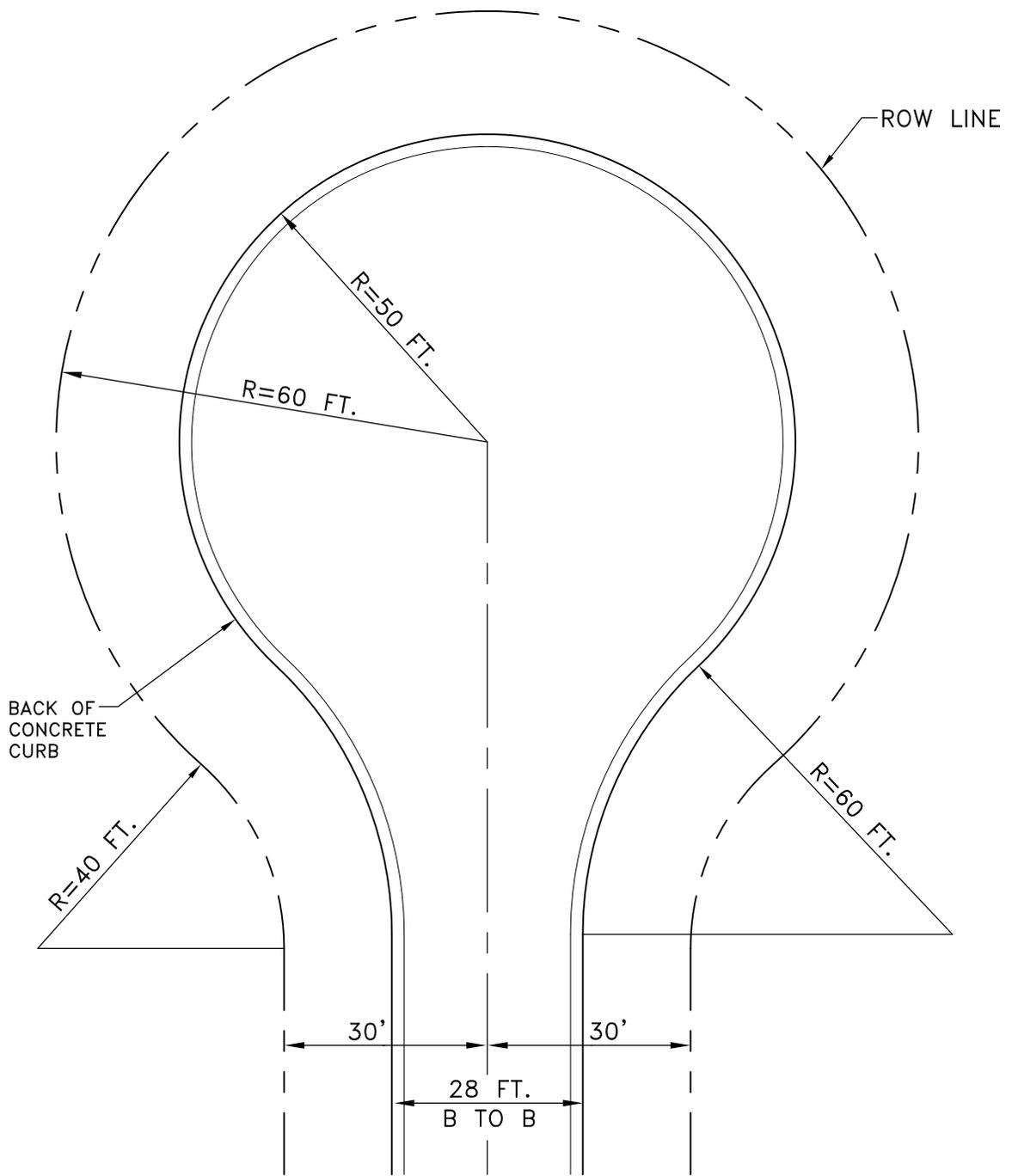
REVISED



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
107

Mar 19, 2013 - 9:12am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-108.dwg



RESIDENTIAL CUL DE SAC
URBAN SECTION
NO SCALE

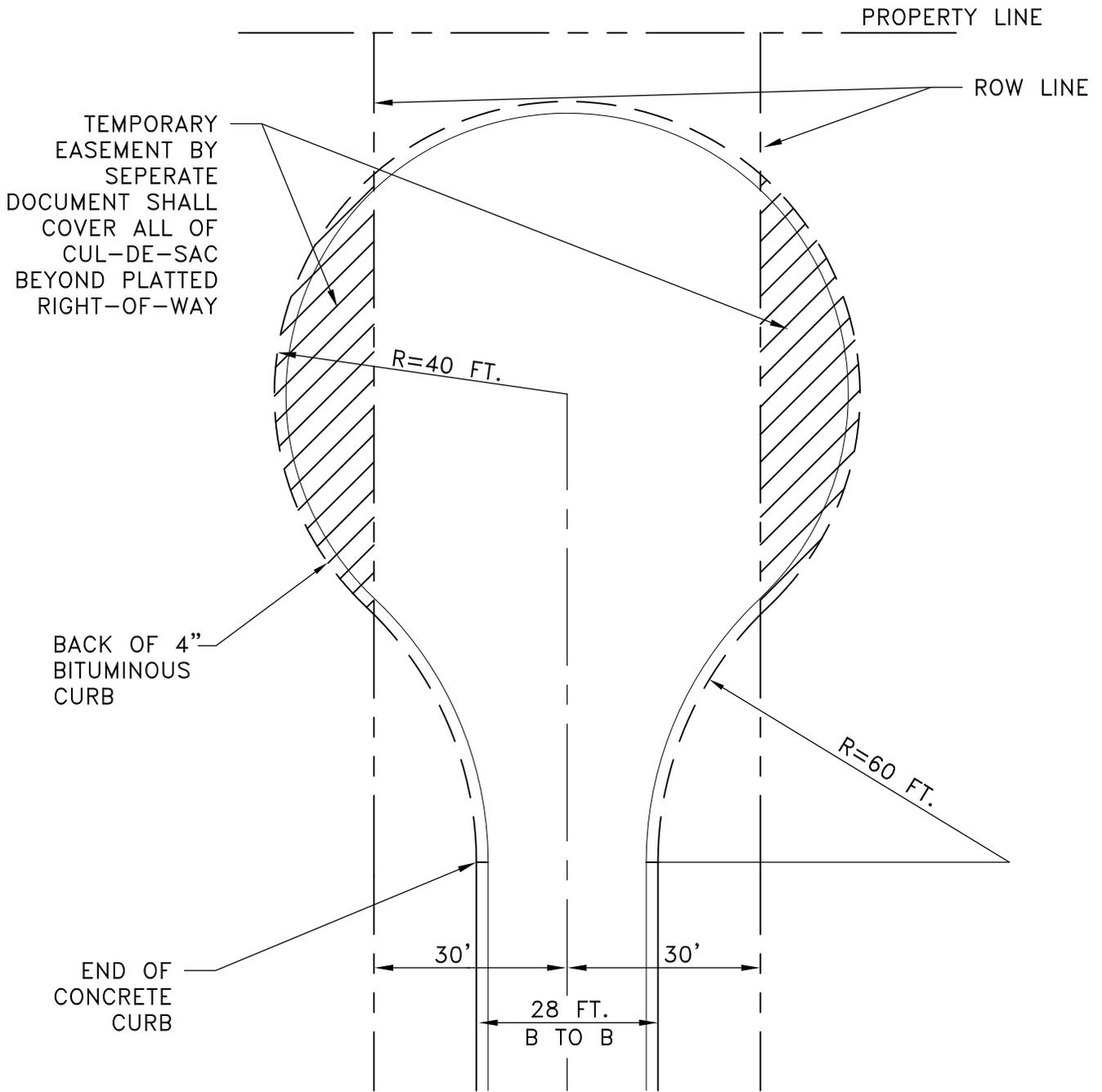
APPROVED

REVISED
5-10-07



CITY OF
Otsego
MINNESOTA

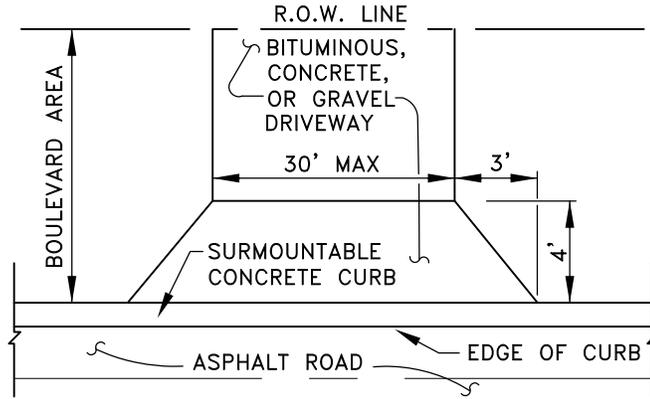
STANDARD PLATE NO.
108



**TEMPORARY CUL DE SAC
URBAN SECTION**
NO SCALE

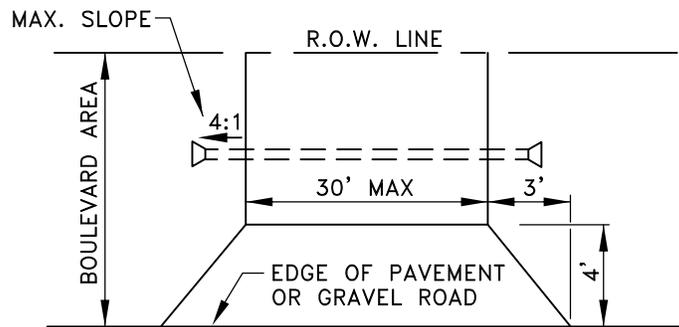
Aug 10, 2015 - 7:31pm
K:\cad_eng\Details\OTSEGO_REV15\Strt-108A.dwg

APPROVED	 CITY OF <i>Otsego</i> MINNESOTA	STANDARD PLATE NO. 108A
REVISED 8/18/15		

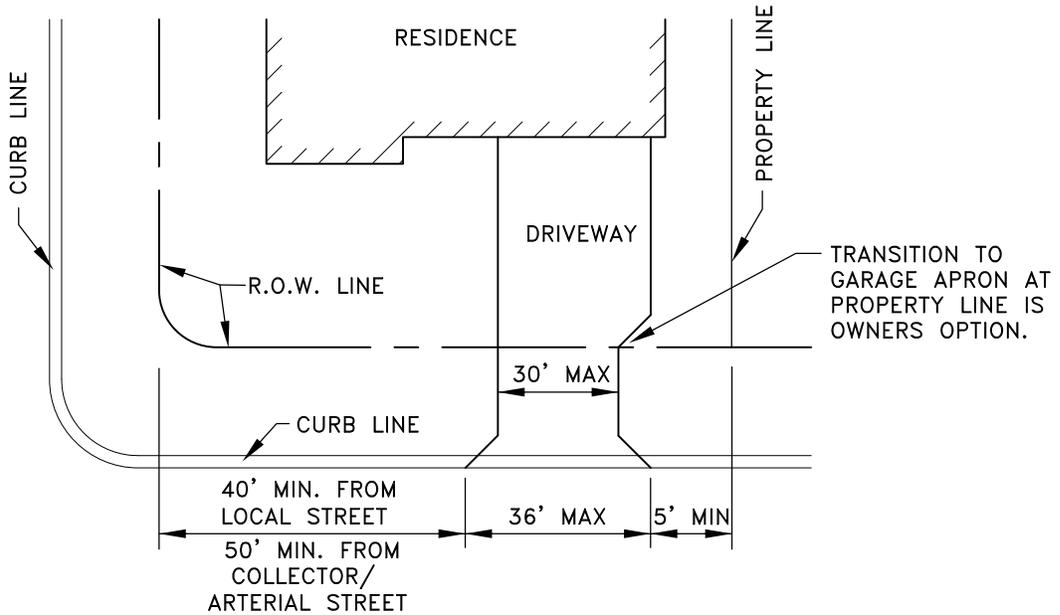


URBAN DRIVEWAY SECTION

NOTE:
 MAXIMUM DRIVEWAY WIDTH
 SHALL BE 24' WHEN LOCATED
 IN A CUL-DE-SAC BULB.



RURAL DRIVEWAY SECTION



TYPICAL DRIVEWAY SECTIONS

NO SCALE

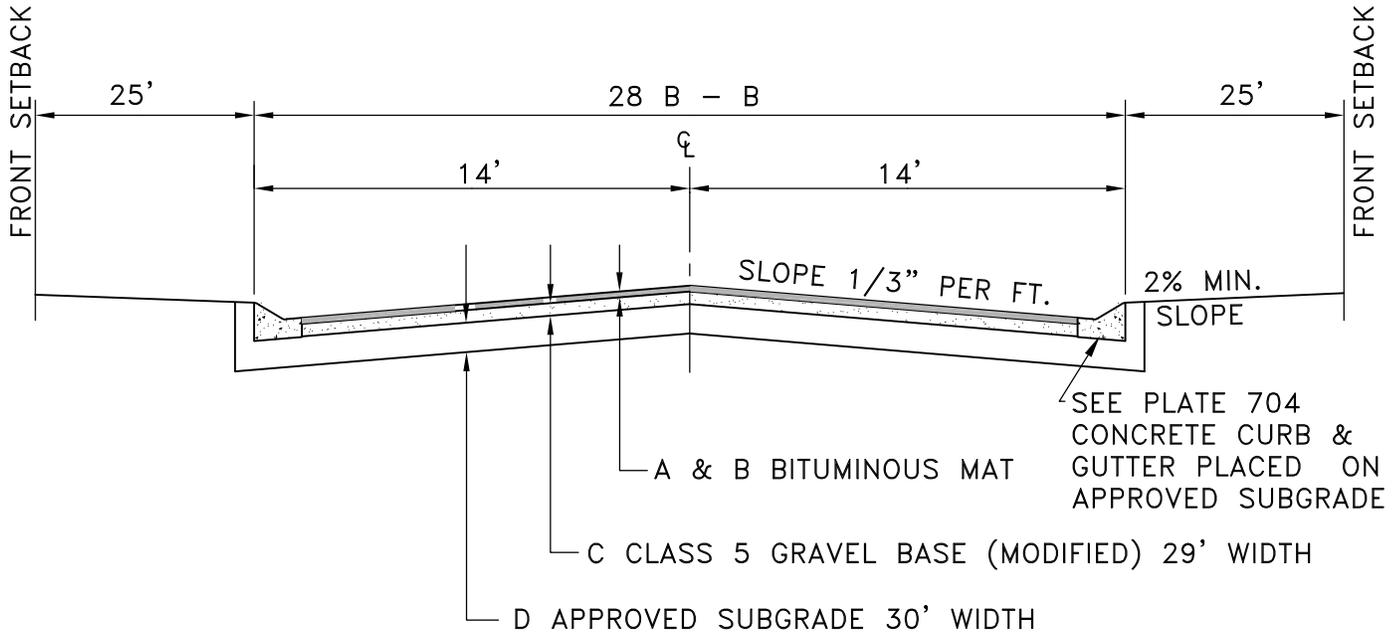
Mar 19, 2013 - 9:13am
 K:\cad_eng\Details\OTSEGO_REV13.dwg\STREETS\Strt-109.dwg

APPROVED

REVISED
 5-10-07



STANDARD PLATE NO.
 109



LEGEND					
AASHTP	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2350 LVWE45030B	NON-WEAR 2350 LVNW35030B	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 1 1/2"	** 2"	** 5"	-
A-4	(R-20 ≤ 90,000)	1 1/2"	2"	5"	-
A-6	(R-15 ≤ 90,000)	1 1/2"	2"	5"	12"
A-7	(R-10 ≤ 90,000)	1 1/2"	2"	6"	18"
	(R-5 ≤ 90,000)	1 1/2"	2"	6"	24"

- * SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER
- ** MINIMUM ALLOWABLE DESIGN THICKNESS

NOTES:

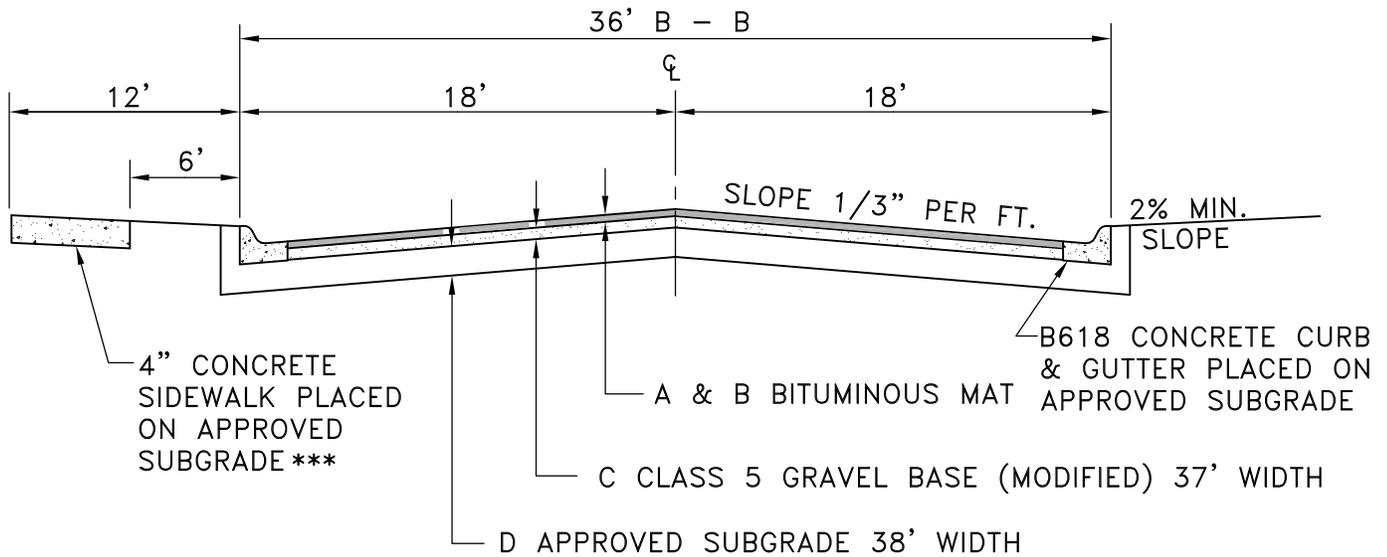
R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

**LOCAL RESIDENTIAL
PUD PRIVATE STREET - 9 TON
NO SCALE**

Mar 19, 2013 - 9:14am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-110.dwg

APPROVED		STANDARD PLATE NO. 110
REVISED 5-10-07		



LEGEND					
AASHTP	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2350 LVWE45030B	NON-WEAR 2350 LVNW35030B	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 1 1/2"	** 2"	** 5"	-
A-4	(R-20 ≤ 90,000)	1 1/2"	2"	5"	-
A-6	(R-15 ≤ 90,000)	1 1/2"	2"	5"	12"
A-7	(R-10 ≤ 90,000)	1 1/2"	2"	6"	18"
	(R-5 ≤ 90,000)	1 1/2"	2"	6"	24"

- * SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER
- ** MINIMUM ALLOWABLE DESIGN THICKNESS
- *** R VALUE OF LESS THAN 20 REQUIRES 4" GRAVEL BASE BENEATH CONCRETE SIDEWALK

NOTES: R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

**PRIVATE COMMERCIAL/INDUSTRIAL
URBAN STREET SECTION - 9 TON**

NO SCALE

Mar 19, 2013 - 9:16am
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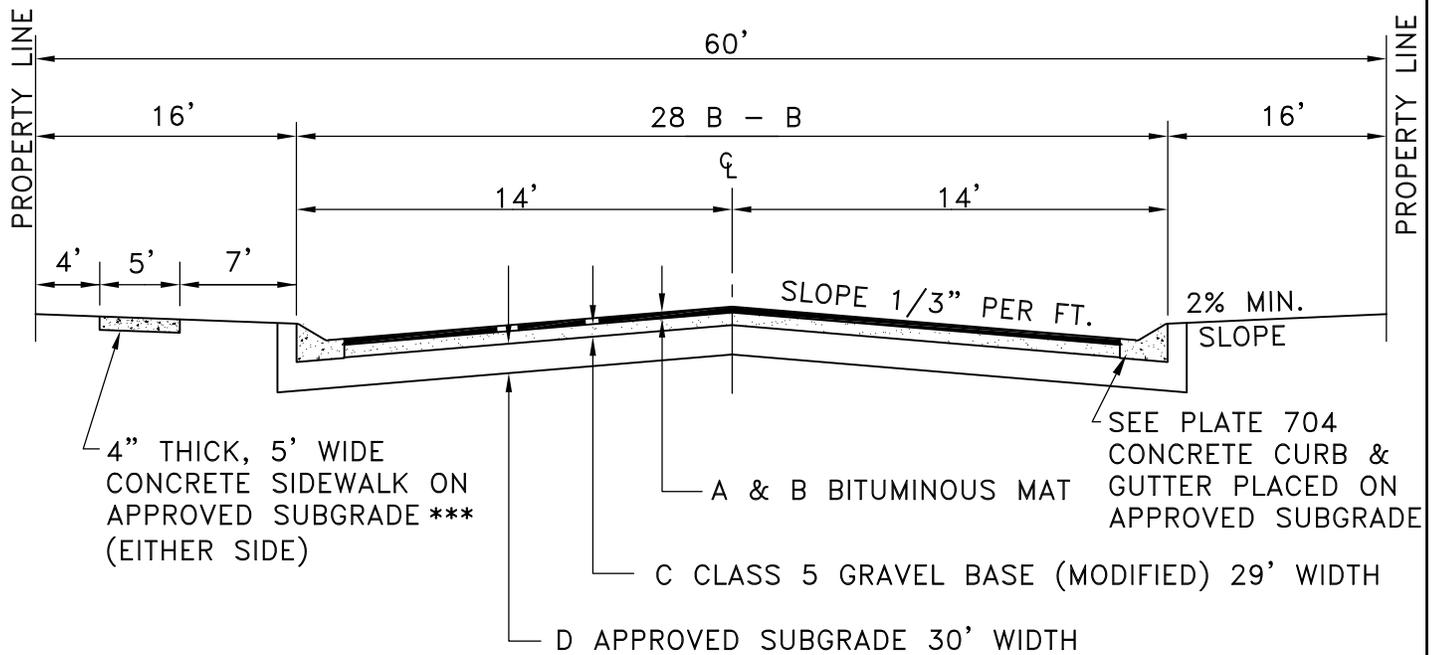
APPROVED

REVISED
3-19-13



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
111



LEGEND					
AASHTP	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2350 LVWE45030B	NON-WEAR 2350 LVNW35030B	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 1 1/2"	** 2"	** 5"	-
A-4	(R-20 ≤ 90,000)	1 1/2"	2"	5"	-
A-6	(R-15 ≤ 90,000)	1 1/2"	2"	5"	12"
A-7	(R-10 ≤ 90,000)	1 1/2"	2"	6"	18"
	(R-5 ≤ 90,000)	1 1/2"	2"	6"	24"

- * SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER
- ** MINIMUM ALLOWABLE DESIGN THICKNESS
- *** R VALUE OF LESS THAN 20 REQUIRES 4" GRAVEL BASE BENEATH CONCRETE SIDEWALK

NOTES:

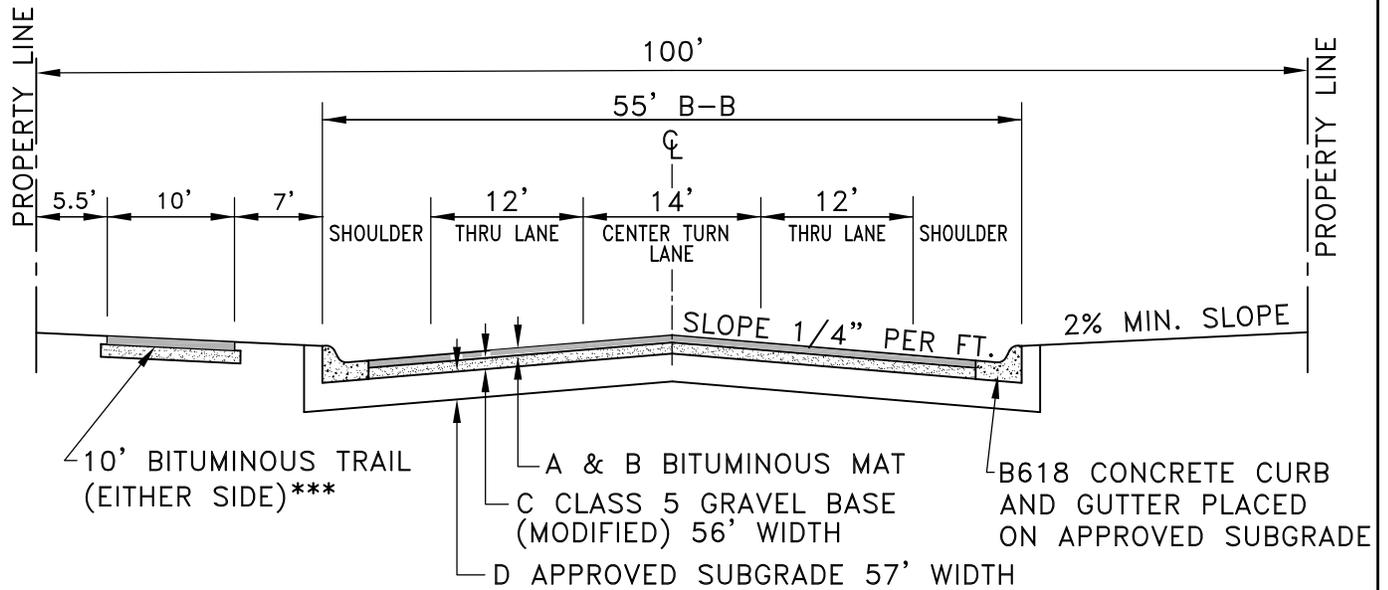
R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

**LOCAL RESIDENTIAL
URBAN STREET SECTION - 9 TON
NO SCALE**

Mar 19, 2013 - 9:30am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-112.dwg

APPROVED		STANDARD PLATE NO. 112
REVISED 5-10-07		



LEGEND					
AASHTP	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2350 LVWE45030B	NON-WEAR 2350 LVNW35030B	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 2"	** 2 1/2"	** 5"	-
A-4	(R-20 ≤ 90,000)	2"	2 1/2"	5"	-
A-6	(R-15 ≤ 90,000)	2"	2 1/2"	5"	12"
A-7	(R-10 ≤ 90,000)	2"	2 1/2"	6"	18"
	(R-5 ≤ 90,000)	2"	2 1/2"	6"	24"

- * SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER
- ** MINIMUM ALLOWABLE DESIGN THICKNESS
- *** SEE STANDARD DETAIL 707

NOTES:

R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

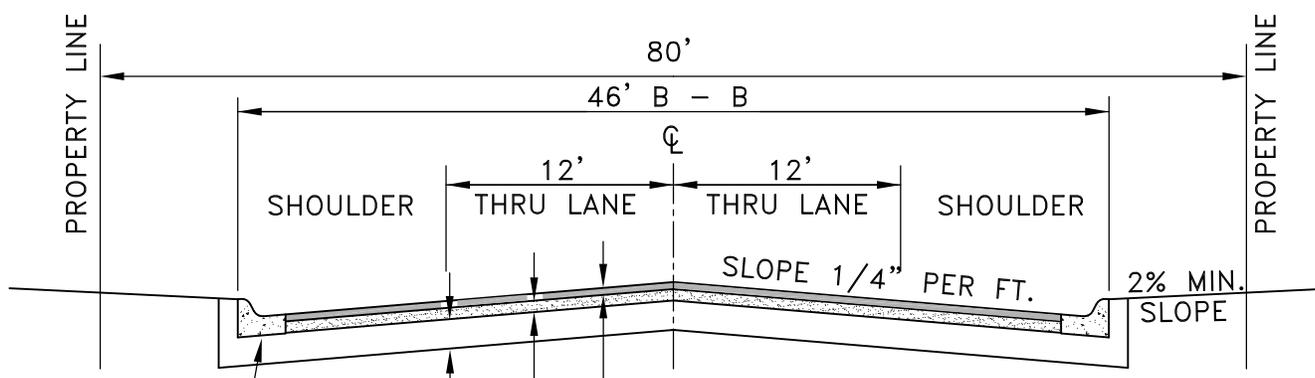
SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

**INDUSTRIAL COLLECTOR
URBAN STREET SECTION - 10 TON**

NO SCALE

Aug 10, 2015 - 7:35pm
K:\cad_eng\Details\OTSEGO_REV15\Strt-113.dwg

APPROVED		STANDARD PLATE NO. 113
REVISED 8-18-15		



B618 CONCRETE CURB & GUTTER PLACED ON APPROVED SUBGRADE

A & B BITUMINOUS MAT

C CLASS 5 GRAVEL BASE (MODIFIED) 47' WIDTH

D APPROVED SUBGRADE 48' WIDTH

LEGEND					
AASHTP	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR	NON-WEAR	CLASS 5 OR 6	CLASS 3 OR 4
		2350 LVWE45030B	2350 LVNW35030B		
A-3	(R-70 ≤ 90,000)	** 2"	** 2 1/2"	** 5"	-
A-4	(R-20 ≤ 90,000)	2"	2 1/2"	5"	-
A-6	(R-15 ≤ 90,000)	2"	2 1/2"	5"	12"
A-7	(R-10 ≤ 90,000)	2"	2 1/2"	6"	18"
	(R-5 ≤ 90,000)	2"	2 1/2"	6"	24"

* SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

NOTES:

R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

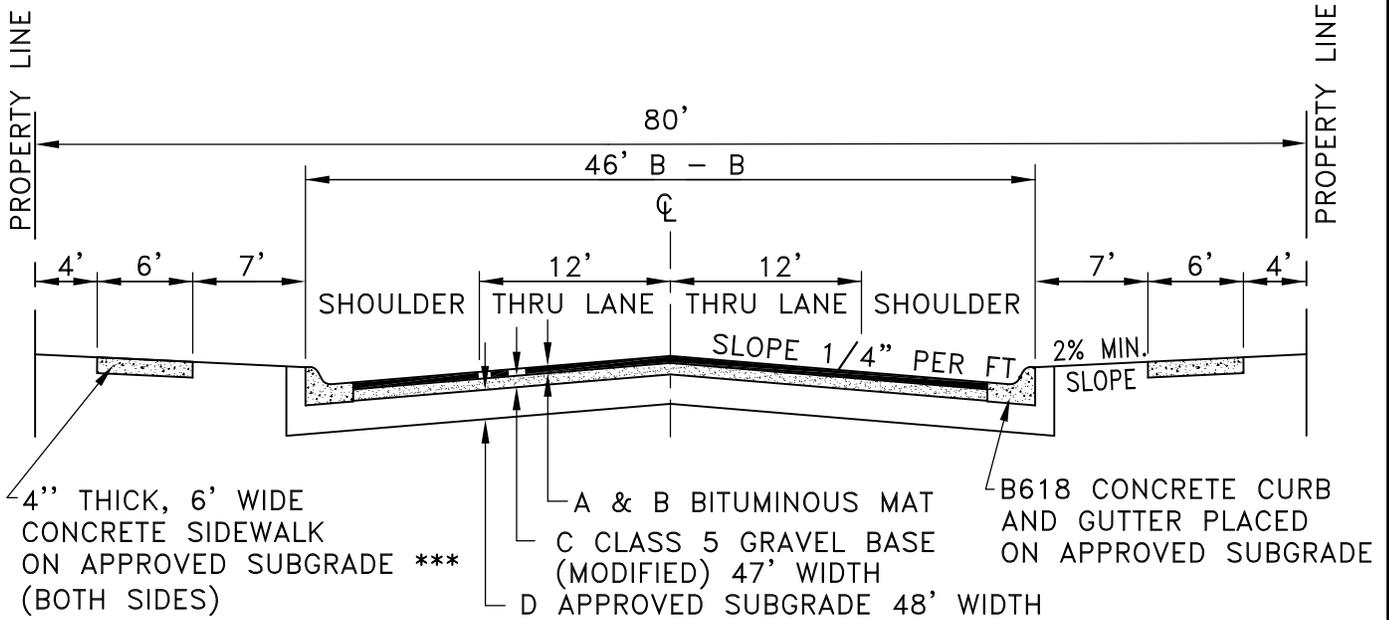
SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

**LOCAL INDUSTRIAL
URBAN STREET SECTION - 10 TON**

NO SCALE

Mar 19, 2013 - 9:38am K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-114.dwg

APPROVED		STANDARD PLATE NO. 114
REVISED 5-10-07		



LEGEND					
AASHTP	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR	NON-WEAR	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
		2350 LVWE45030B	2350 LVNW35030B		
A-3	(R-70 ≤ 90,000)	** 2"	** 2 1/2"	** 5"	-
A-4	(R-20 ≤ 90,000)	2"	2 1/2"	5"	-
A-6	(R-15 ≤ 90,000)	2"	2 1/2"	5"	12"
A-7	(R-10 ≤ 90,000)	2"	2 1/2"	6"	18"
	(R-5 ≤ 90,000)	2"	2 1/2"	6"	24"

- * SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER
- ** MINIMUM ALLOWABLE DESIGN THICKNESS
- *** R VALUE OF LESS THAN 20 REQUIRES 4" GRAVEL BASE BENEATH CONCRETE SIDEWALK

NOTES:

R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

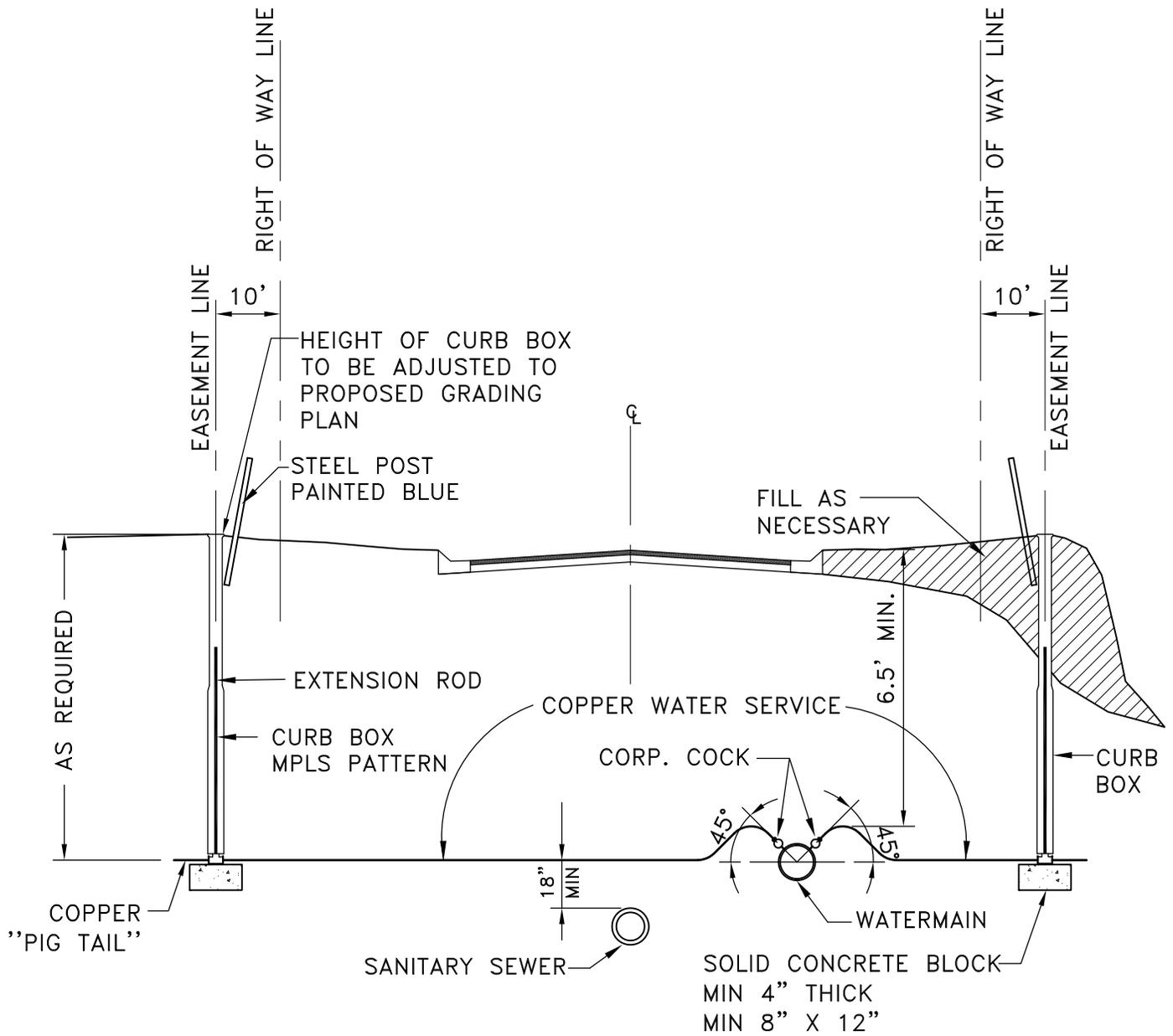
**LOCAL COMMERCIAL
URBAN STREET SECTION – 10 TON**

NO SCALE

Mar 19, 2013 - 9:39am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STREETS\Strt-115.dwg

APPROVED		STANDARD PLATE NO. 115
REVISED 5-10-07		

Mar 19, 2013 - 9:15am
 K:\cad_eng\Details\OTSEGO_REV13\dwg\WATER\W-200.dwg



NOTE:
 ALL CURB BOXES LOCATED WITHIN DRIVEWAYS
 SHALL HAVE FORD SERIES A LID COVERS
 PLACED OVER THE RISERS (SEE STD PLATE 207)

WATER SERVICE DETAIL
 NO SCALE

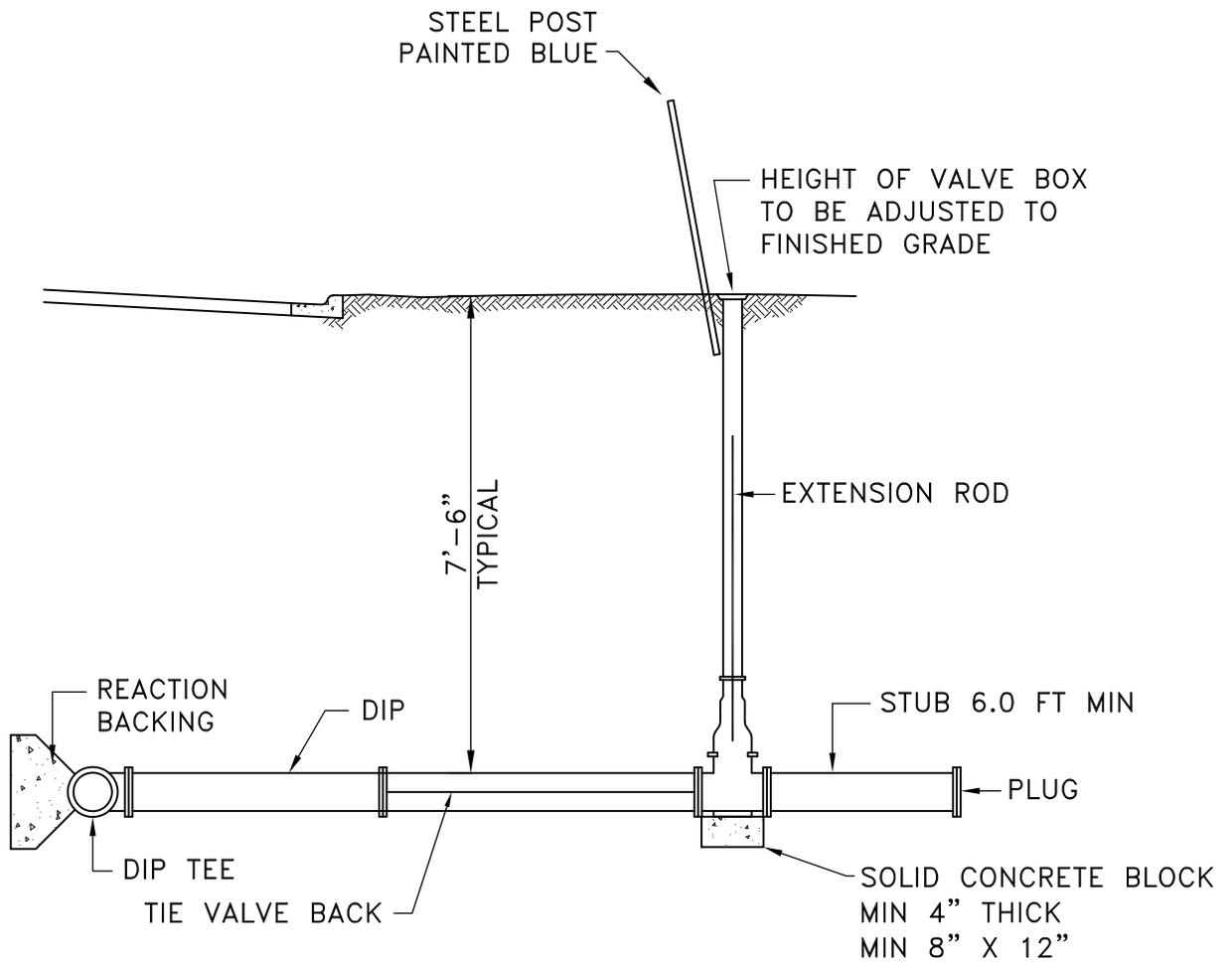
APPROVED

REVISED
 3-19-13



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
 200



VALVE LOCATION ON PROPERTY
 LINE WHERE POSSIBLE OR IN
 BOULEVARD. MIN. 2 FEET FROM
 WALK OR CURB

GREATER THAN 2" SERVICES
WATER SERVICE DETAIL
 NO SCALE

Mar 19, 2013 - 9:26am
 K:\cad_eng\Details\OTSEGO_REV13\dwg\WATER\W-201.dwg

APPROVED

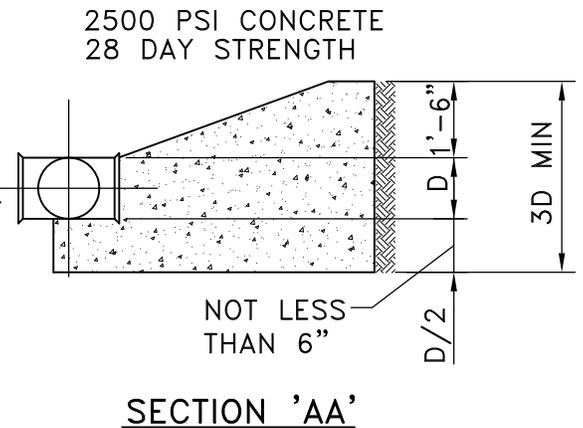
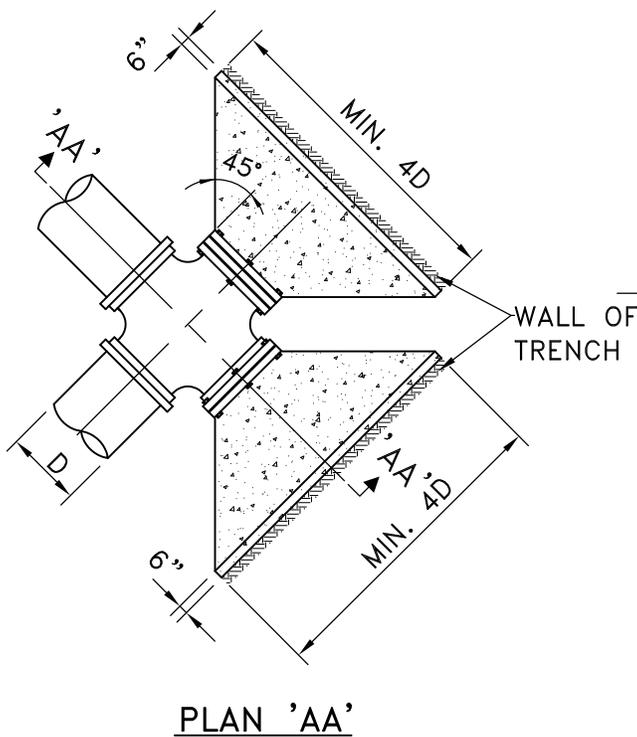
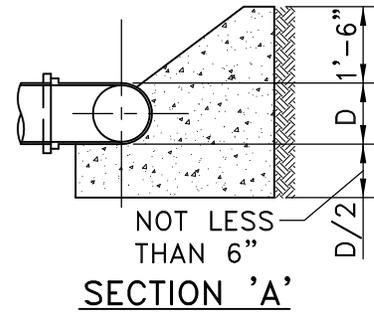
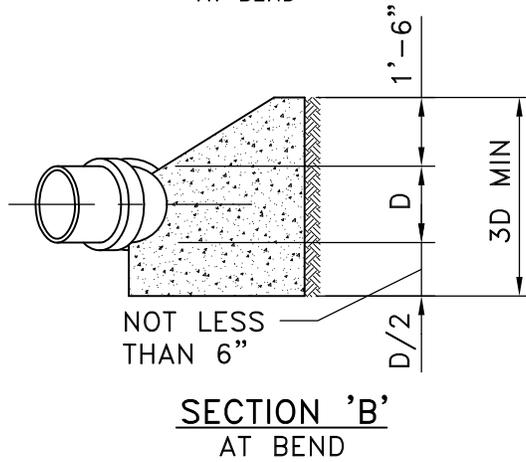
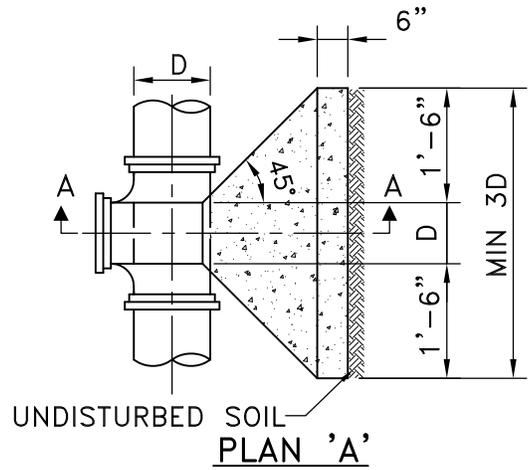
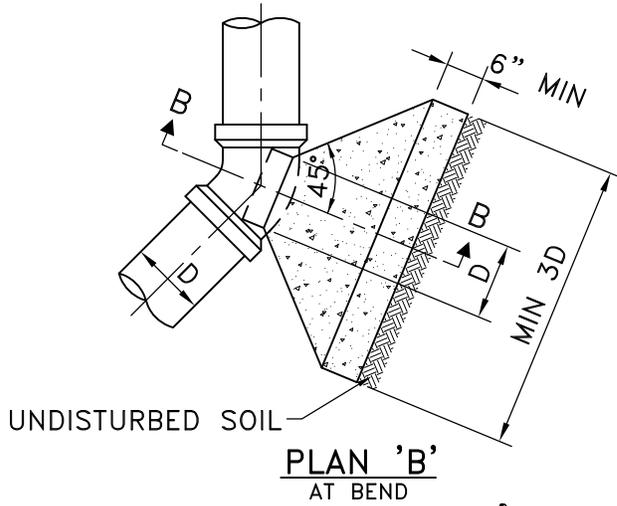
REVISED
 3-19-13



CITY OF
Otsego
 MINNESOTA

STANDARD PLATE NO.
 201

Mar 19, 2013 - 9:35am
 K:\cad_eng\Details\OTSEGO_REV13\dwg\WATER\W-202.dwg



COVER FITTING ENCASED
 IN CONCRETE WITH
 POLYETHYLENE OR
 BUILDING PAPER PRIOR
 TO POURING

APPROVED

REVISED



CITY OF
Otsego
 MINNESOTA

STANDARD PLATE NO.
 202

PIPE SIZE	TEE or PLUG	CROSS W/ 2 PLUGS (i.e. 90° BEND)	1/8 BEND (45° BEND) AND 1/16 BEND (22.5°)
6"	0.22 CuYds	0.15 CuYds	0.05 CuYds
8"	0.27 CuYds	0.29 CuYds	0.08 CuYds
10"	0.32 CuYds	0.48 CuYds	0.14 CuYds
12"	0.37 CuYds	0.73 CuYds	0.21 CuYds
16"	0.53 CuYds	1.73 CuYds	0.49 CuYds
20"	0.82 CuYds	3.36 CuYds	0.95 CuYds
24"	1.34 CuYds	5.77 CuYds	1.63 CuYds

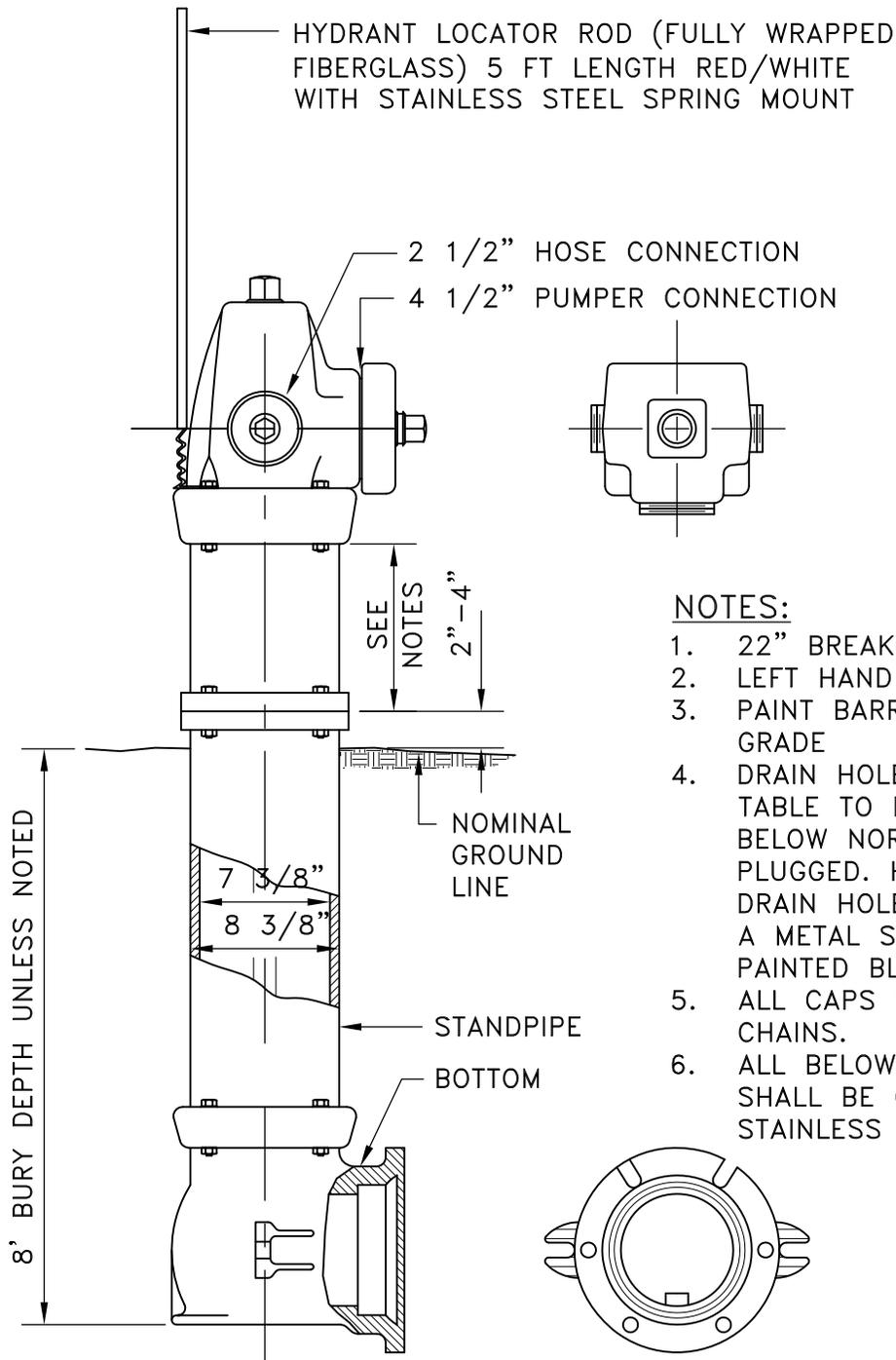
NOTE:

1. COVER FITTINGS ENCASED IN CONCRETE WITH POLYETHYLENE OR BUILDING PAPER PRIOR TO POURING.
2. CONCRETE BLOCKING SHALL BE POURED AGAINST FIRM, UNDISTURBED GROUND.
3. CONCRETE SHALL MEET THE REQUIREMENTS FOR GRADE B CONCRETE IN CONFORMANCE WITH Mn/DOT 2461.
4. ALL METAL PARTS OF TIE ROD OR STRAP TYPE RESTRAINTS SHALL BE GALVANIZED OR COATED WITH ASPHALTIC TYPE RUSTPROOFING.

WATERMAIN CONCRETE BLOCKING QUANTITIES

Mar 19, 2013 - 10:06am
 K:\cad_eng\Details\OTSEGO_REV13\dwg\WATER\W-202a.dwg

APPROVED		STANDARD PLATE NO. 202a
REVISED 3-19-13		



NOTES:

1. 22" BREAKOFF SECTION
2. LEFT HAND OPERATING NUT
3. PAINT BARREL SECTION RED TO GRADE
4. DRAIN HOLES ABOVE NORMAL WATER TABLE TO BE OPEN, DRAIN HOLES BELOW NORMAL WATER TABLE TO BE PLUGGED. HYDRANTS WITH PLUGGED DRAIN HOLES SHALL BE TAGGED WITH A METAL STRIP AND THE NOZZLE PAINTED BLACK
5. ALL CAPS SHALL BE FITTED WITH CHAINS.
6. ALL BELOW GROUND NUTS AND BOLTS SHALL BE CORE-BLUE OR 316 STAINLESS STEEL

PACER TRAFFIC FLANGE HYDRANT

(OR APPROVED EQUAL)
NO SCALE

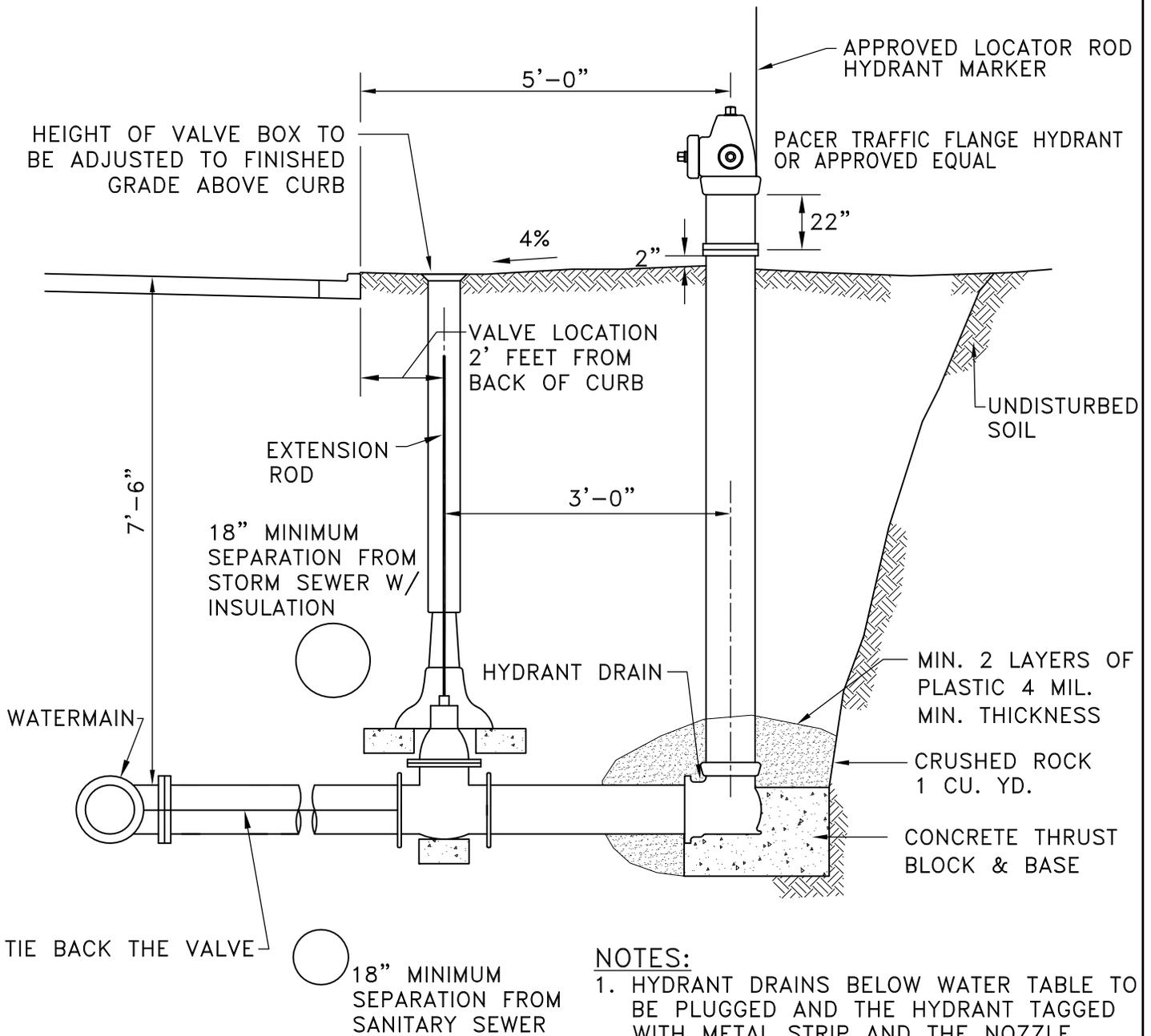
Aug 10, 2015 - 7:42pm
K:\cad_eng\Details\OTSEGO_REV15\W-203.dwg

APPROVED

REVISED
8-18-15



STANDARD PLATE NO.
203



- NOTES:**
1. HYDRANT DRAINS BELOW WATER TABLE TO BE PLUGGED AND THE HYDRANT TAGGED WITH METAL STRIP AND THE NOZZLE PAINTED BLACK.
 2. ALL BELOW GROUND NUTS, BOLTS, AND RODDING SHALL BE CORE-BLUE OR 316 STAINLESS STEEL.

HYDRANT AND VALVE INSTALLATION

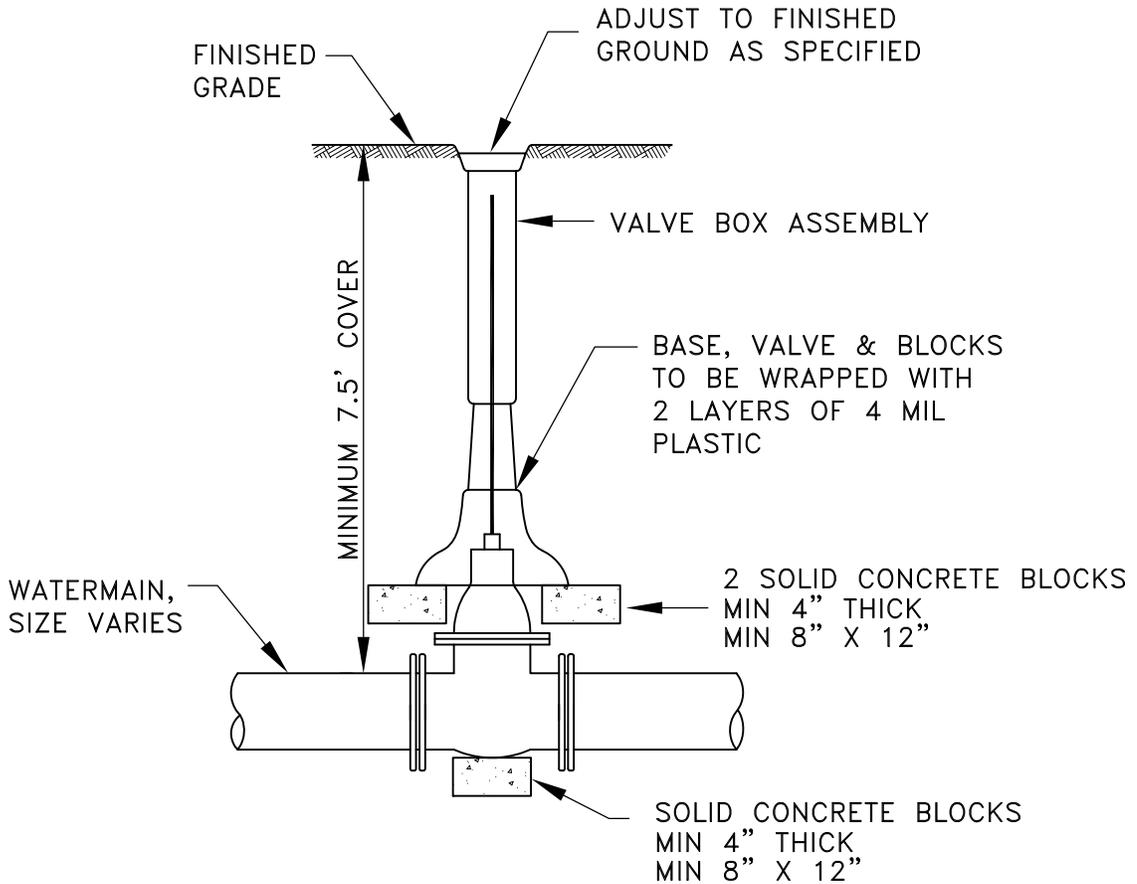
NO SCALE

Aug 10, 2015 - 7:49pm
K:\cad_eng\Details\OTSEGO_REV15\W-204.dwg

APPROVED
REVISED 8-15-15



STANDARD PLATE No.
204



NOTES:

1. ALL VALVES SHALL BE FITTED WITH EXTENSION STEMS. TO BRING THE OPERATING NUT TO BE 2' FROM THE SURFACE.
2. ALL BELOW GROUND NUTS, BOLTS, AND RODDING SHALL BE CORE-BLUE OR 316 STAINLESS STEEL.

**TYPICAL RESILIENT WEDGE
VALVE & BOX INSTALLATION
10" & UNDER WATERMAIN**

NO SCALE

Aug 10, 2015 - 7:52pm
K:\cad_eng\Details\OTSEGO_REV13\dwg\WATER\W-205.dwg

APPROVED

REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
205

ADJUST TO FINISHED
GROUND AS SPECIFIED

FINISHED GRADE

MINIMUM 7.5' COVER

VALVE BOX ASSEMBLY

2 SOLID CONCRETE BLOCKS
MIN 4" THICK
MIN 8" X 12"

SOLID CONCRETE BLOCK
MIN 4" THICK
MIN 8" X 12"

NOTES:

1. ALL VALVES SHALL BE FITTED WITH EXTENSION STEMS TO BRING THE OPERATING NUT TO BE 2' FROM THE SURFACE.
2. ALL BELOW GROUND NUTS, BOLTS, AND RODDING SHALL BE CORE-BLUE OR 316 STAINLESS STEEL

TYPICAL BUTTERFLY VALVE &
BOX INSTALLATION 12" &
OVER WATERMAIN

NO SCALE

Aug 10, 2015 - 7:57pm
K:\cad_eng\Details\OTSEGO_REV15\W-206.dwg

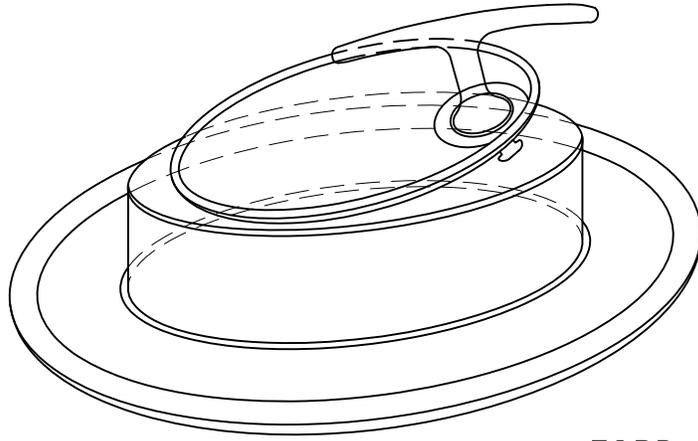
APPROVED

REVISED
8-15-15

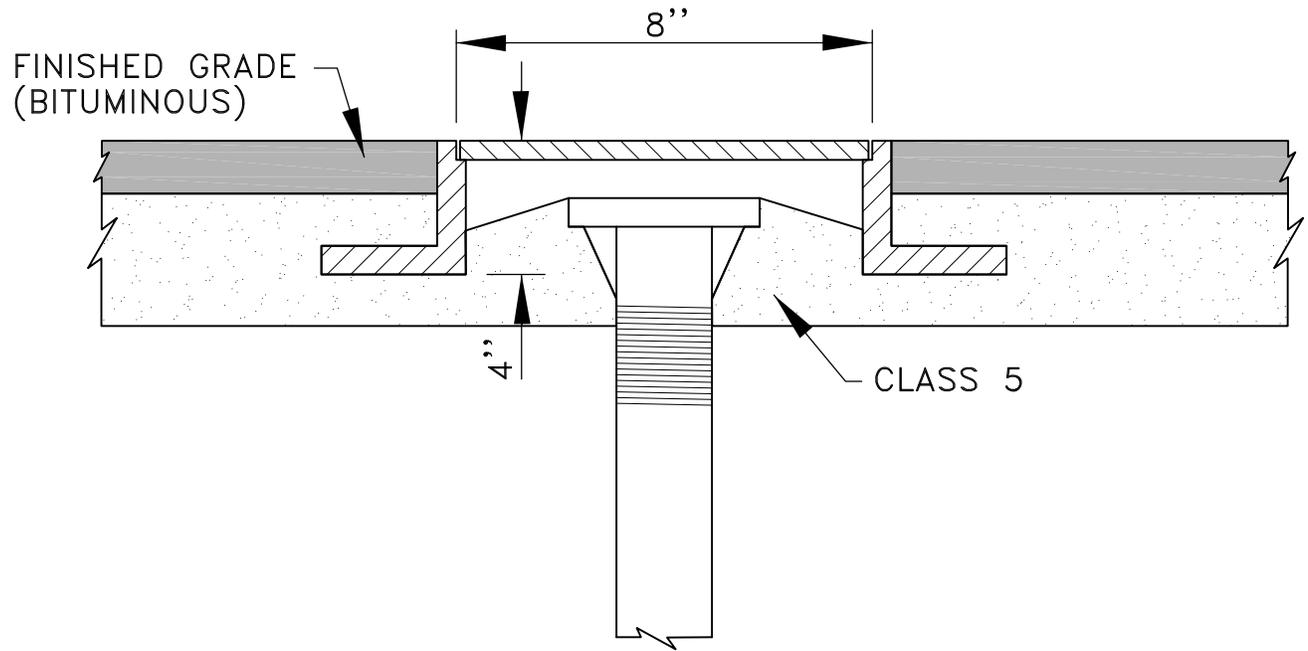


CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
206



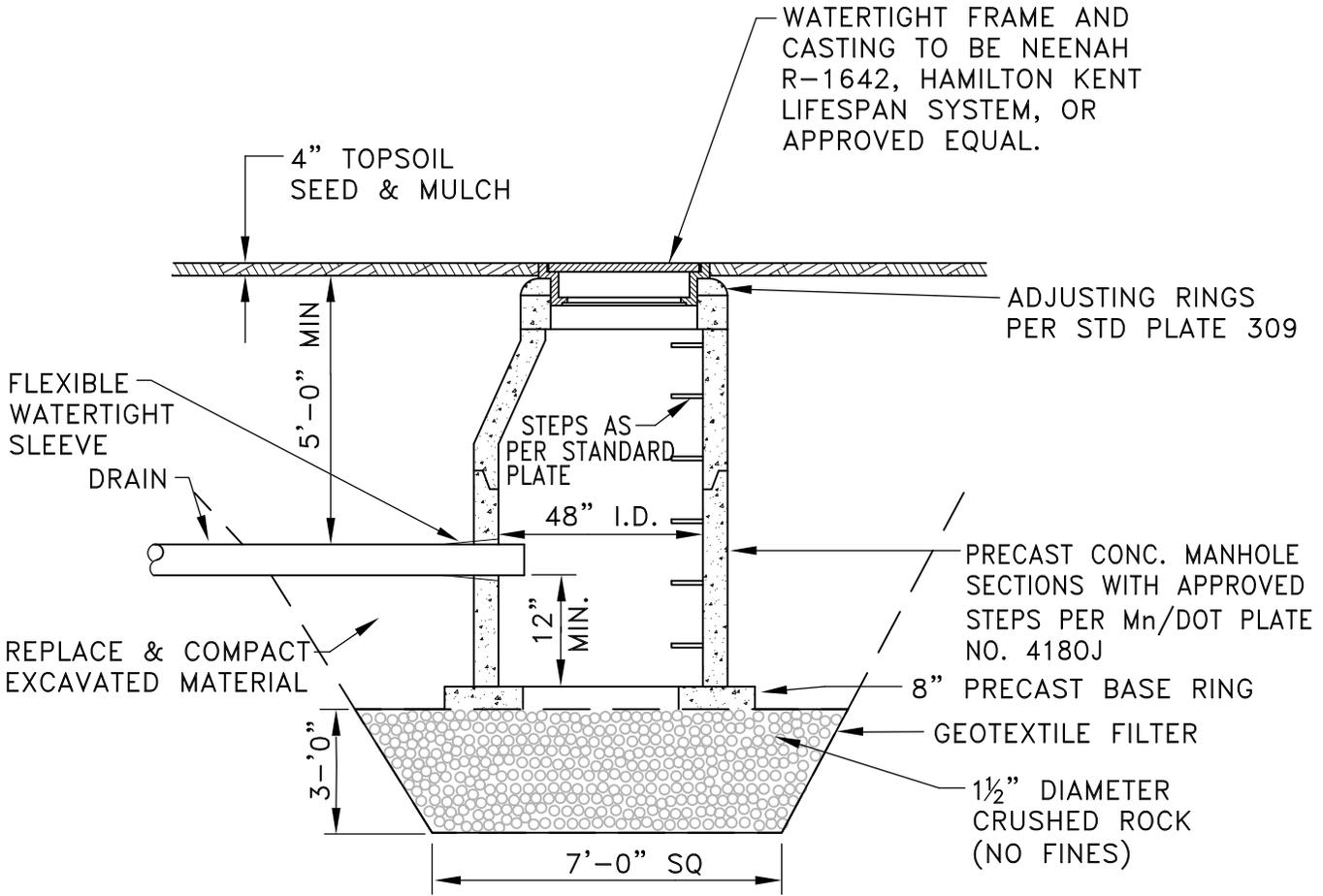
FORD SERIES A LID COVER



CURB STOP COVER FOR DRIVEWAY INSTALLATION
NO SCALE

Mar 19, 2013 - 10:26am
 K:\cad_eng\Details\OTSEGO_REV13\dwg\WATER\W-207.dwg

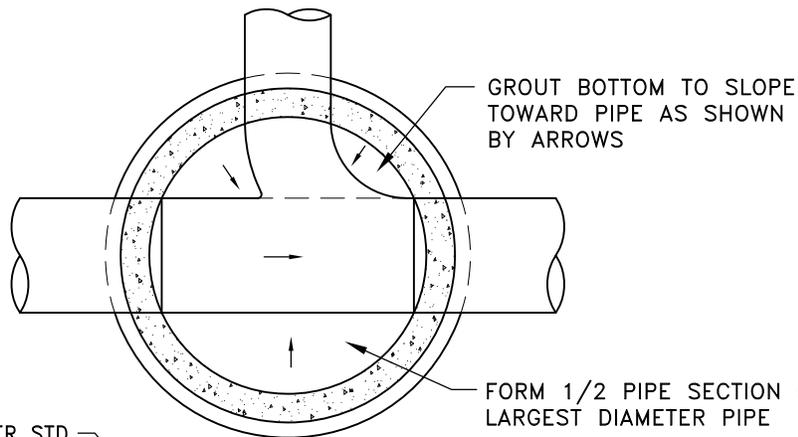
APPROVED	 CITY OF <i>Otsego</i> MINNESOTA	STANDARD PLATE NO. 207
REVISED 3-19-13		



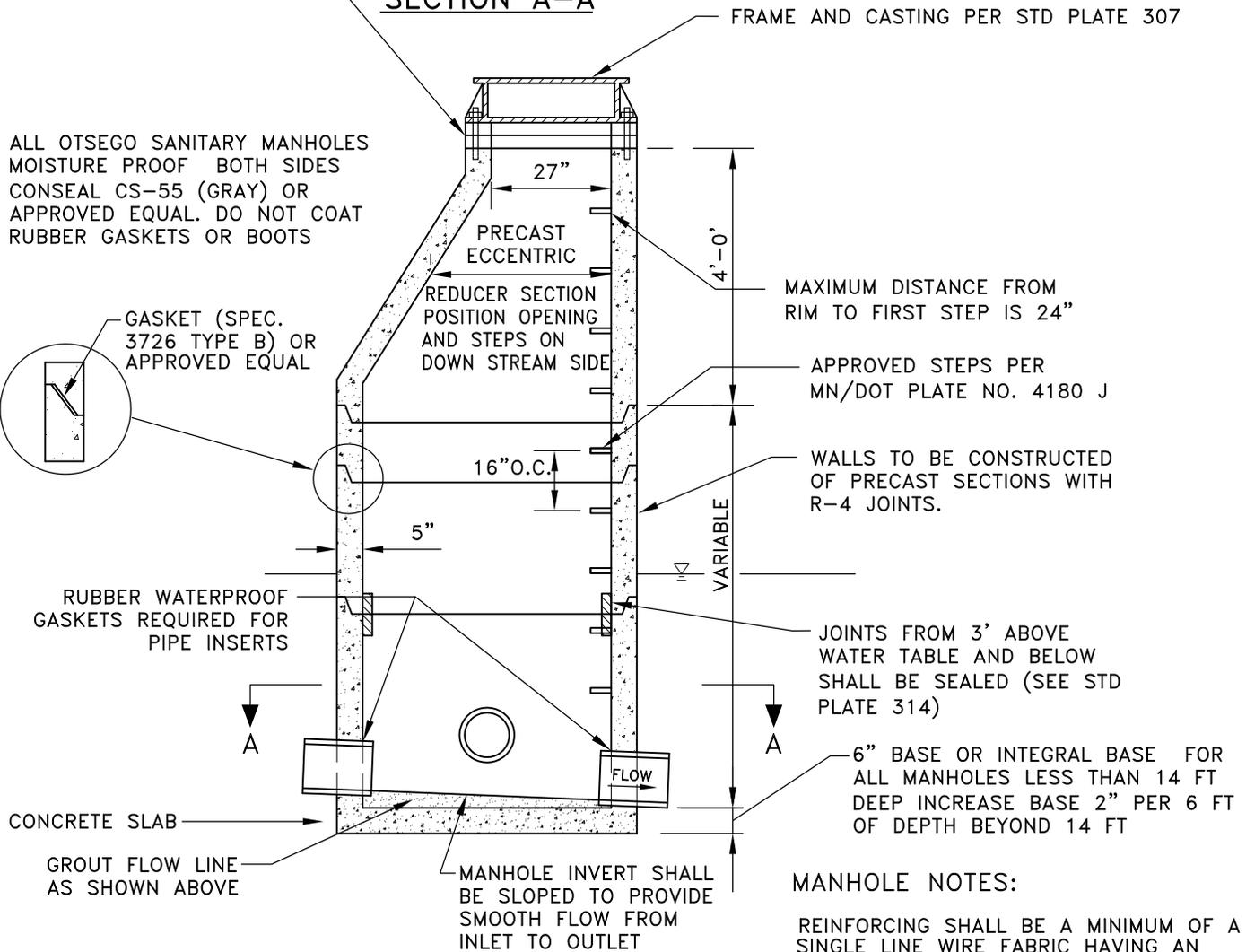
SEEPAGE PIT DETAIL
NO SCALE

Aug 10, 2015 - 8:19pm
K:\cad_eng\Details\OTSEGO_REV15\W-208.dwg

APPROVED		<p>STANDARD PLATE NO. 208</p>
REVIS 8-18-15		



SECTION A-A



ALL OTSEGO SANITARY MANHOLES MOISTURE PROOF BOTH SIDES CONSEAL CS-55 (GRAY) OR APPROVED EQUAL. DO NOT COAT RUBBER GASKETS OR BOOTS

MANHOLE NOTES:

REINFORCING SHALL BE A MINIMUM OF A SINGLE LINE WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FT. OF HEIGHT.

CASTING AND PRECAST RINGS ALTERNATE (WHEN REQUIRED) SHALL BE SET ON A FULL MORTAR BED.

SANITARY SEWER STANDARD MANHOLE

NO SCALE

Oct 09, 2015 - 11:12am
K:\cad_eng\Details\OTSEGO_REV15\Sat-300.dwg

APPROVED

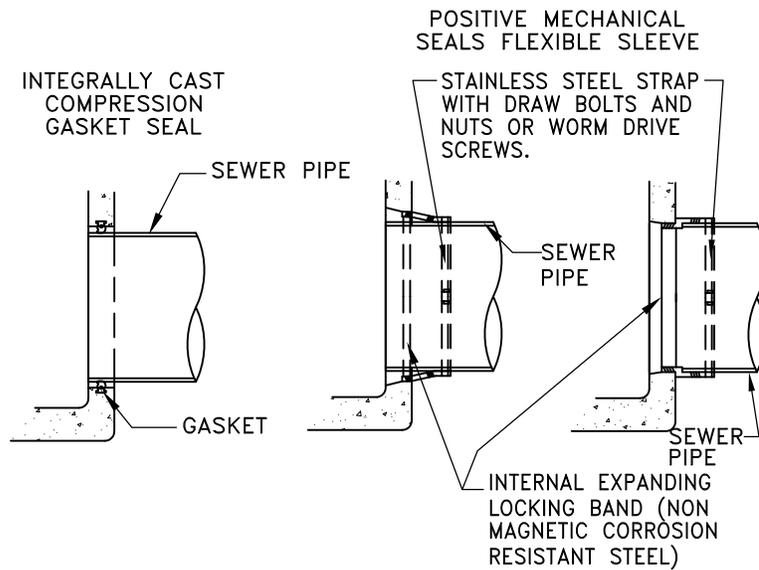
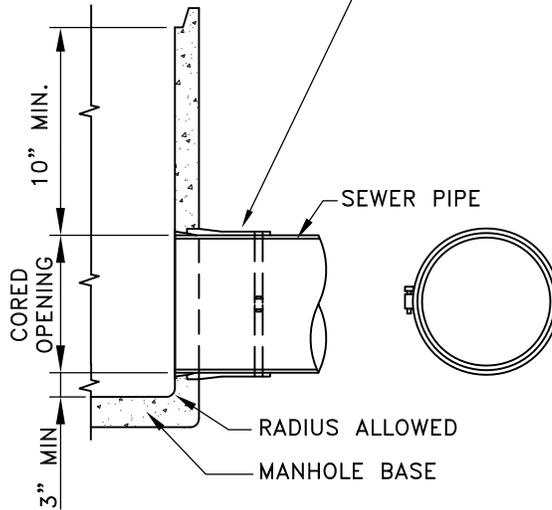
REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
300

WATER TIGHT SEAL APPROVED BY ENGINEER AND INSTALLED ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS. SEE TYPICALS BELOW.



SLEEVE NOTES:

FLEXIBLE SLEEVE SHALL BE NEOPRENE MATERIAL MEETING THE REQUIREMENTS OF ASTM C-443 OR AS APPROVED

FLEXIBLE SLEEVE DIMENSIONS SHALL CONFORM TO PRODUCERS STANDARDS.

TYPICAL WATER TIGHT SEALS

NO SCALE

Mar 19, 2013 - 11:05am
K:\cad_eng\Details\OTSEGO_REV13\dwg\SANITARY\Sat-301.dwg

APPROVED

REVISED
3-19-13



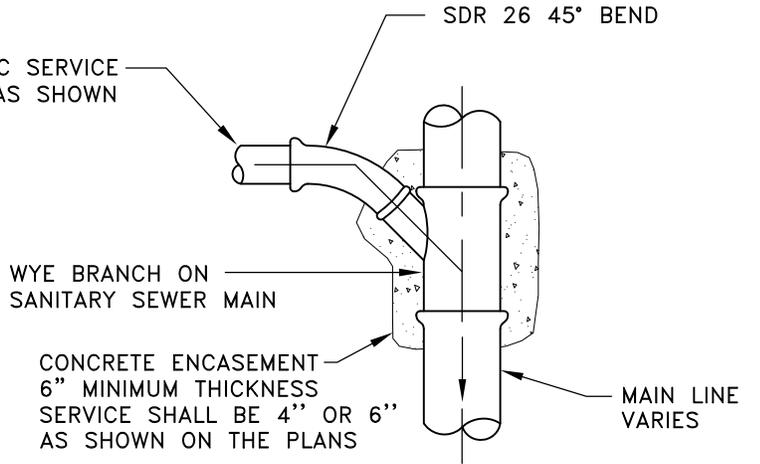
CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
301

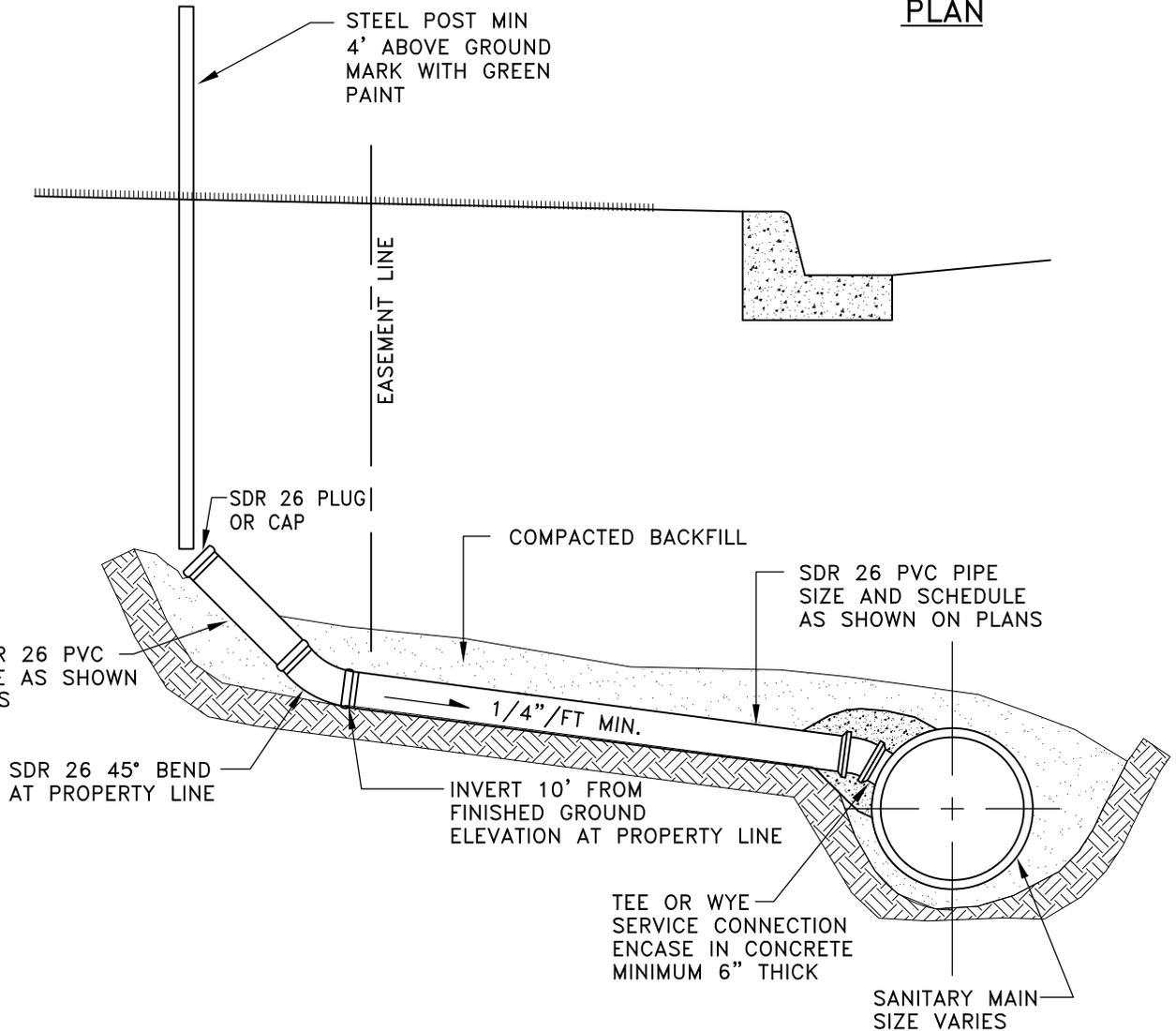
NOTE:

1. PLUGS/CAPS SHALL BE PUSH ON/IN FITTINGS WITH SNUG FIT ELASTOMERIC JOINTS.
2. TEMPORARY PLUGS/CAPS SHALL BE OF SAME MATERIAL AS THE PIPE WITH WATER TIGHT SEALS.

SDR 26 PVC SERVICE PIPE SIZE AS SHOWN ON PLANS



PLAN



SHALLOW SANITARY MAIN SERVICE CONNECTION

NO SCALE

Mar 19, 2013 - 11:11am K:\cad_eng\Details\OTSEGO_REV13\dwg\SANITARY\Sat-302.dwg

APPROVED

REVISED
3-19-13

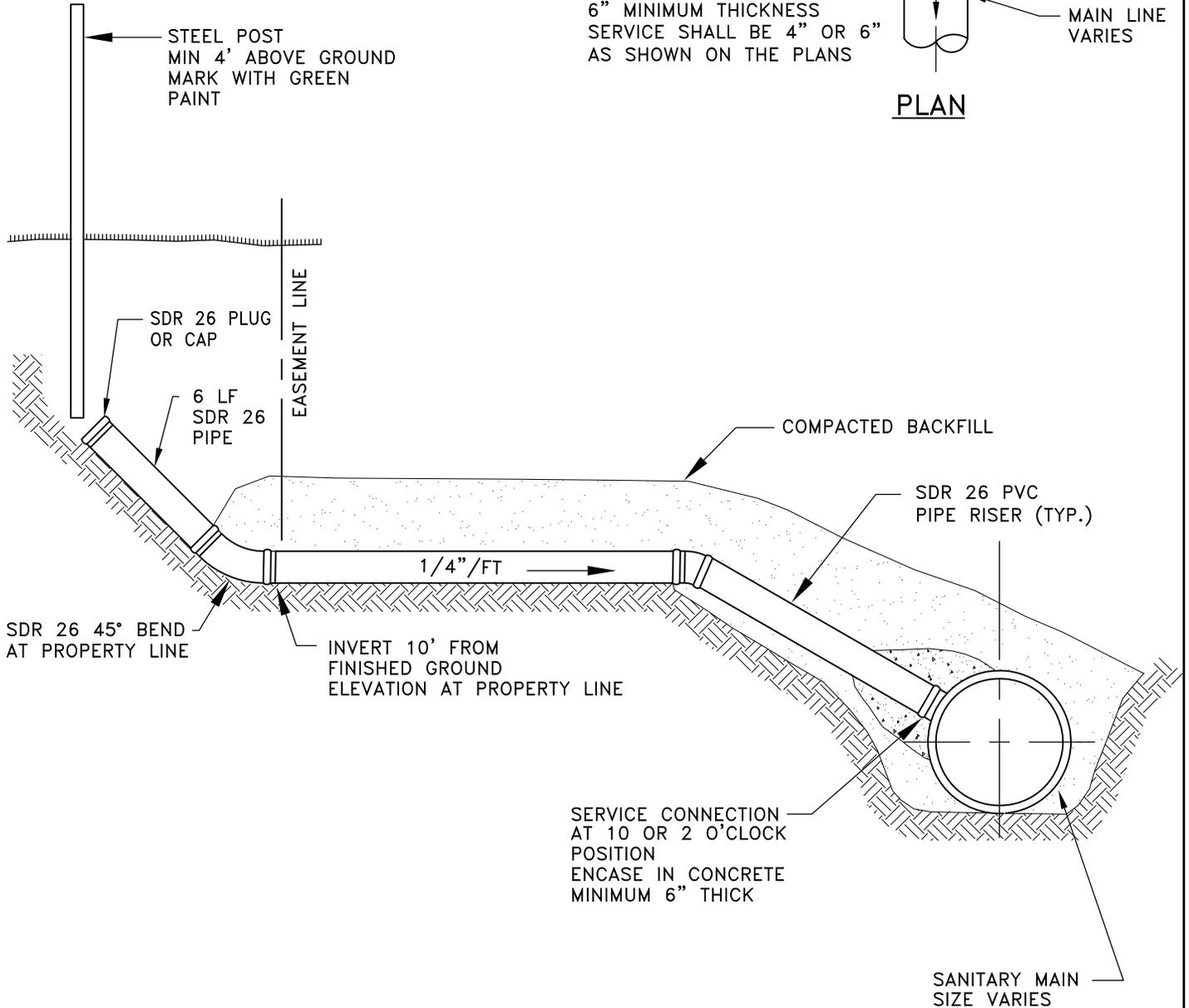
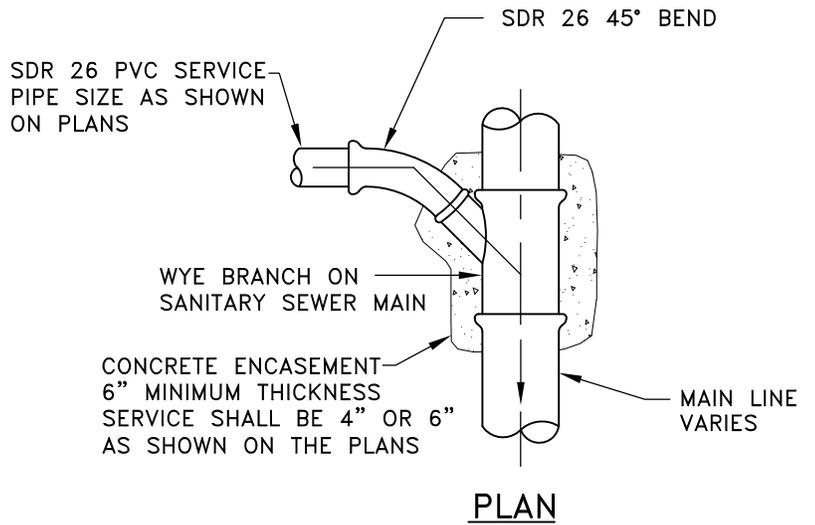


CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
302

NOTE:

1. PLUGS/CAPS SHALL BE PUSH ON/IN FITTINGS WITH SNUG FIT ELASTOMERIC JOINTS.
2. TEMPORARY PLUGS/CAPS SHALL BE OF SAME MATERIAL AS THE PIPE WITH WATER TIGHT SEALS.



**DEEP SANITARY MAIN
SERVICE CONNECTION**
NO SCALE

Mar 19, 2013 - 11:14am
K:\cad_eng\Details\OTSEGO_REV13.dwg\SANITARY\Sat-303.dwg

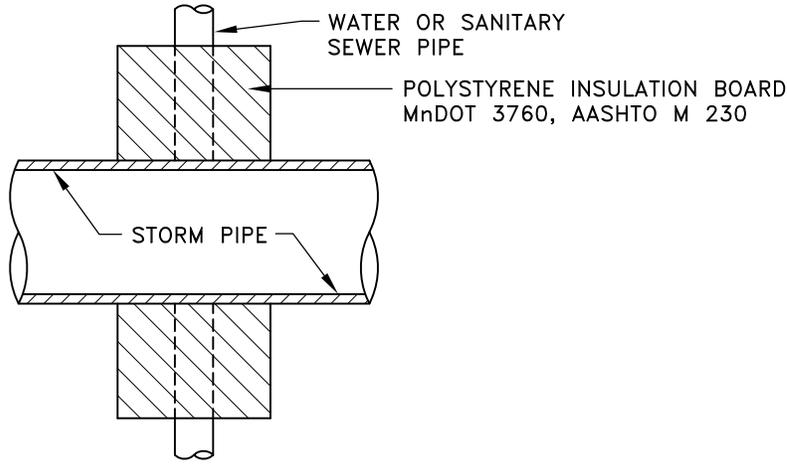
APPROVED
REVISED 3-19-13



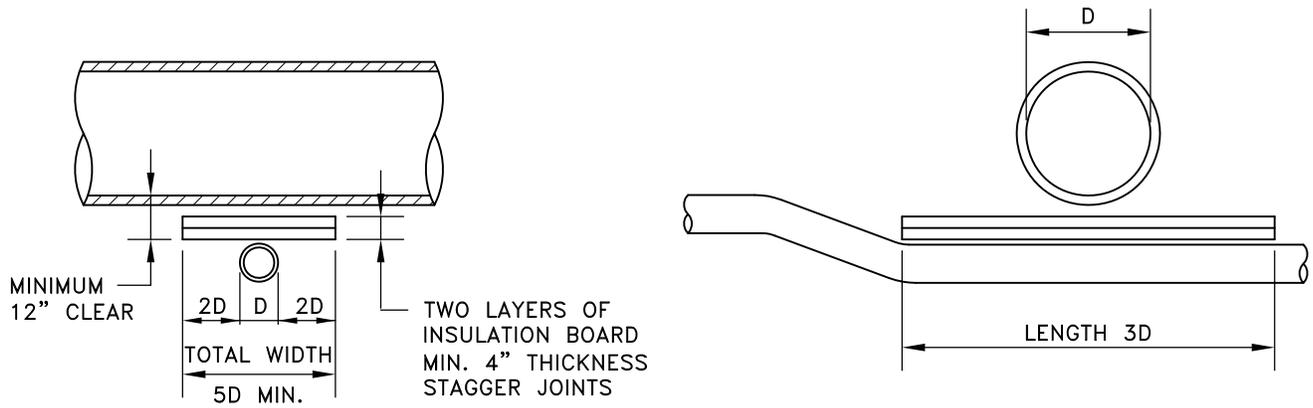
**CITY OF
Otsego
MINNESOTA**

STANDARD PLATE NO.
303

NOTE:
 INSULATE ALL WATER OR SANITARY SEWER PIPE
 CROSSINGS WITHIN 2' OF STORM SEWER PIPE



PLAN

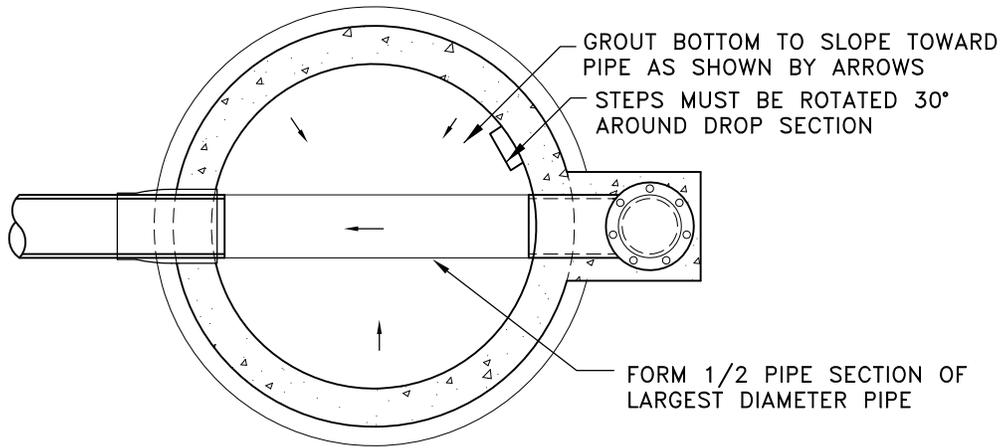


PROFILE

**INSULATION FOR WATER &
 SANITARY SEWER PIPE & SERVICES**
 NO SCALE

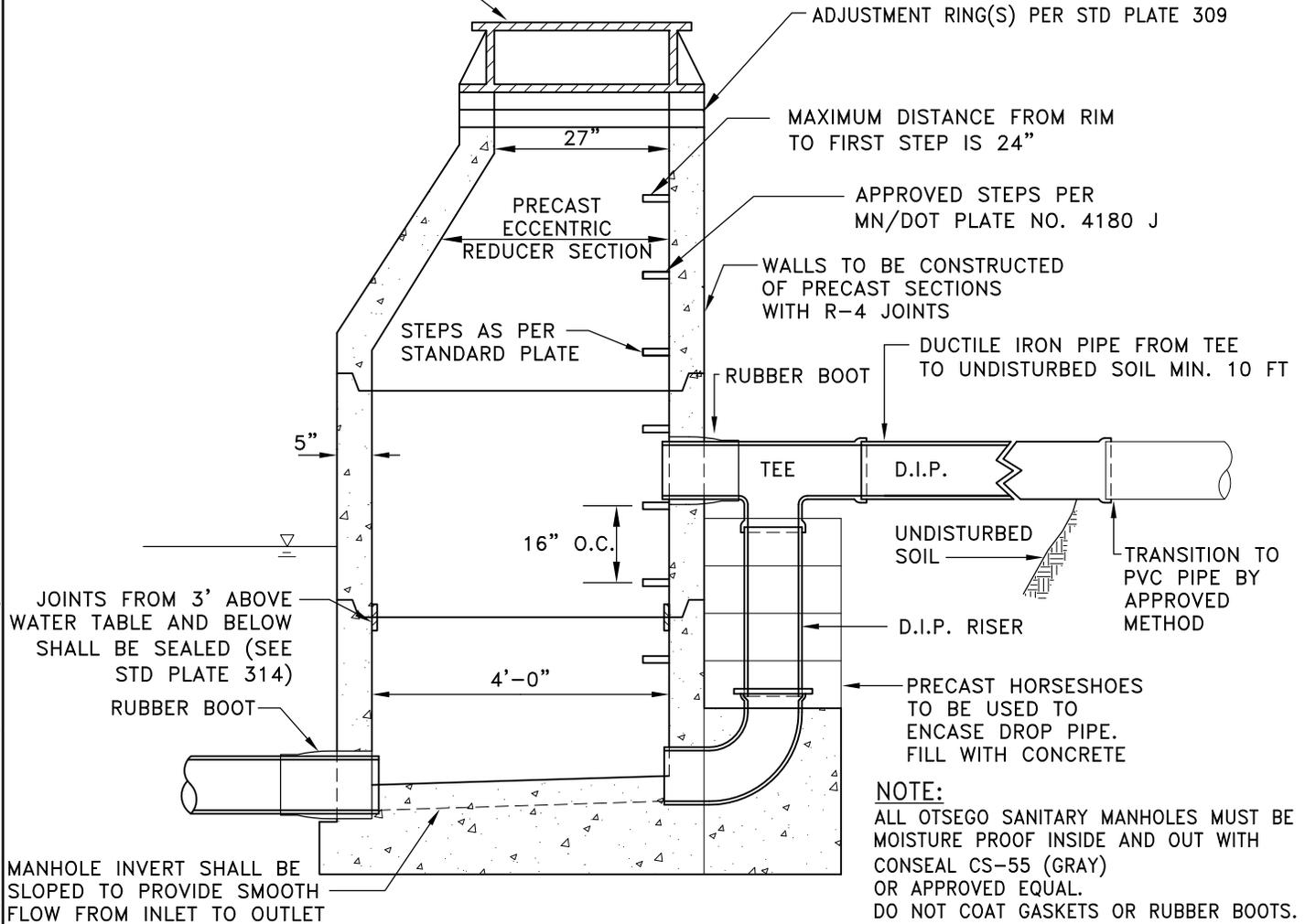
Mar 19, 2013 - 11:15am
 K:\cad_eng\Details\OTSEGO_REV13.dwg\SANITARY\Sat-304.dwg

APPROVED		STANDARD PLATE NO. 304
REVISED MARCH 2005		



PLAN VIEW

FRAME AND CASTING PER STD PLATE 307



JOINTS FROM 3' ABOVE WATER TABLE AND BELOW SHALL BE SEALED (SEE STD PLATE 314)
RUBBER BOOT

MANHOLE INVERT SHALL BE SLOPED TO PROVIDE SMOOTH FLOW FROM INLET TO OUTLET

NOTE:
ALL OTSEGO SANITARY MANHOLES MUST BE MOISTURE PROOF INSIDE AND OUT WITH CONSEAL CS-55 (GRAY) OR APPROVED EQUAL.
DO NOT COAT GASKETS OR RUBBER BOOTS.

STANDARD MONOLITHIC DROP MANHOLE

NO SCALE

Oct 09, 2015 - 11:11am
K:\cad_eng\Details\OTSEGO_REV15\Sat-305.dwg

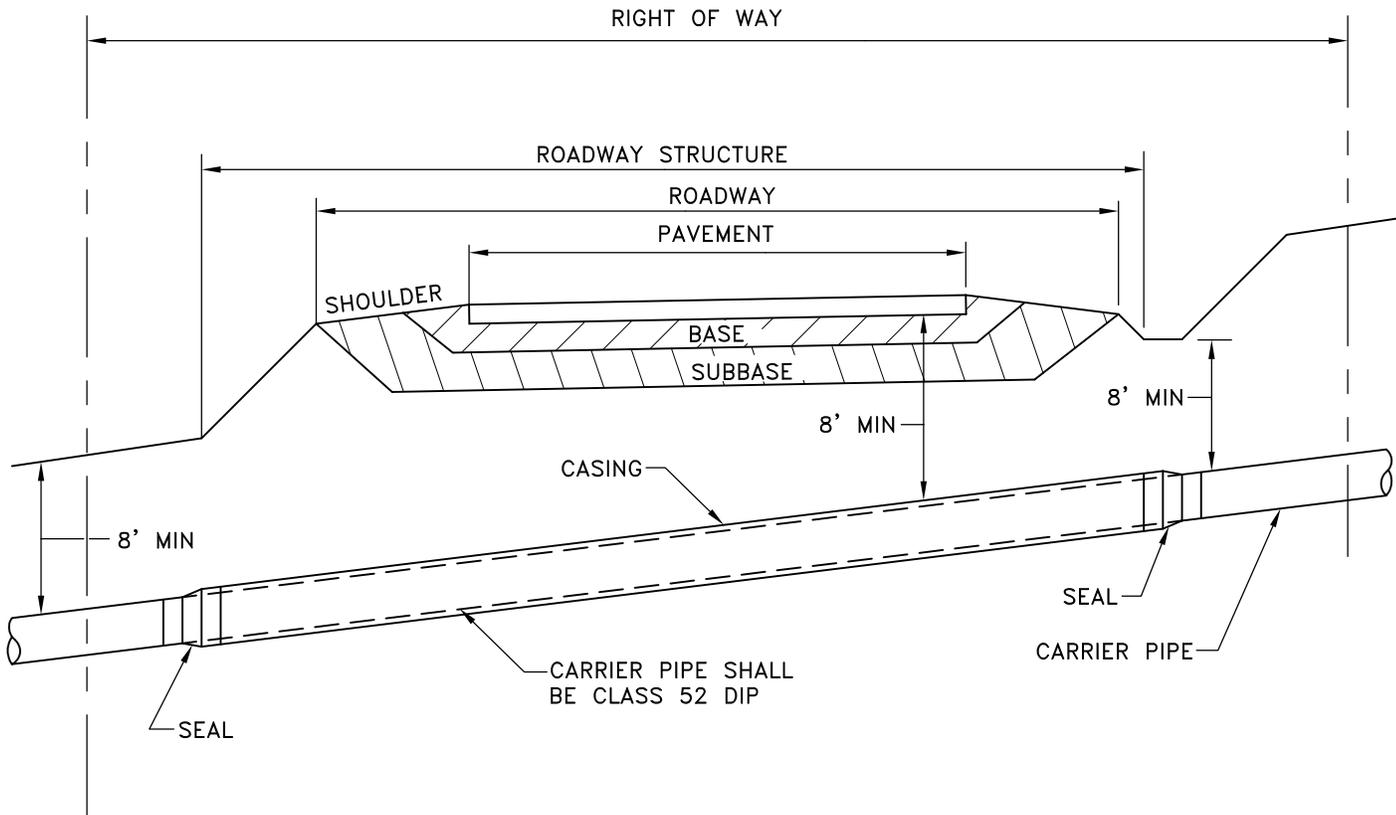
APPROVED

REVISED
8-18-15

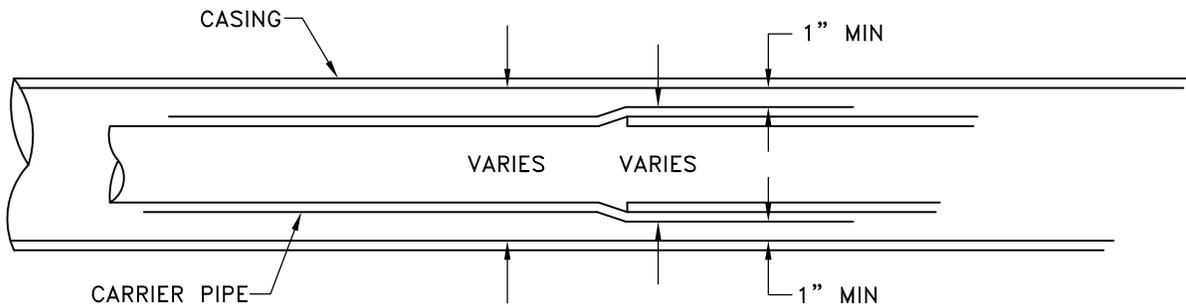


CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
305



CASING PIPE SHALL BE WELDED STEEL PIPE, NEW MATERIAL, WITH A MINIMUM YIELD STRENGTH OF 35,000 PSIG (POUNDS PER SQUARE INCH GAUGE). THE FOLLOWING MINIMUM WALL THICKNESS SHALL BE USED:



INSIDE DIAMETER OF CASING MIN 2" GREATER THEN OUTSIDE DIAMETER OF CARRIER.

PIPE JACKING DETAIL
NO SCALE

Mar 19, 2013 - 11:30am
K:\cad_eng\Details\OTSEGO_REV13.dwg\SANITARY\Sat-306.dwg

APPROVED

REVISED



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
306

NEENAH R-1642, HAMILTON KENT LIFESPAN SYSTEM, OR APPROVED EQUAL. WORDS "SANITARY SEWER" IMPRINTED ON COVER.

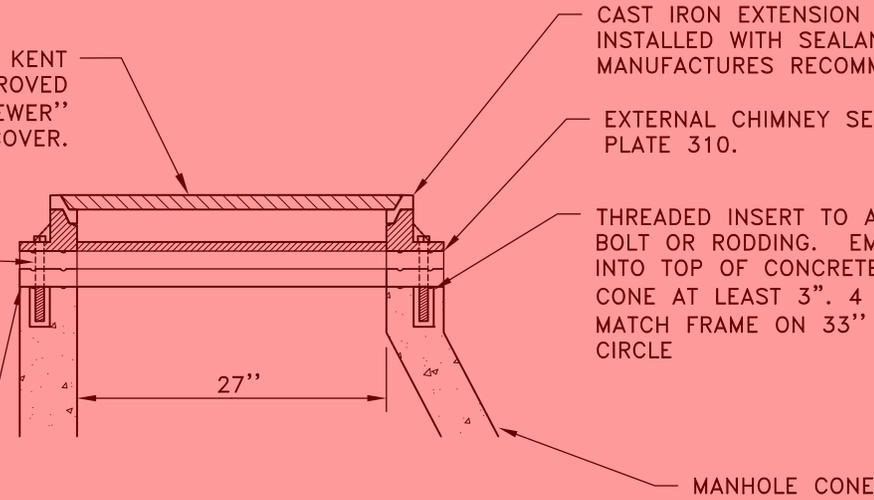
CAST IRON EXTENSION RING INSTALLED WITH SEALANT PER MANUFACTURERS RECOMMENDATIONS

EXTERNAL CHIMNEY SEAL PER STD PLATE 310.

THREADED INSERT TO ACCEPT 1/2" BOLT OR RODDING. EMBEDDED INTO TOP OF CONCRETE MANHOLE CONE AT LEAST 3". 4 EACH TO MATCH FRAME ON 33" BOLT CIRCLE

PLACE BUTYL SEALANT AROUND EACH ANCHOR BOLT IN EACH ADJUSTMENT RING.

ADJUSTING RING(S) PER STD PLATE 309. PLACE TWO 1/2" BEADS OF BUTYL SEALANT BETWEEN FIRST ADJUSTMENT RING AND CONCRETE STRUCTURE. ONE BEAD BETWEEN EACH SUBSEQUENT RING AND FRAME



STANDARD MANHOLE FRAME AND CASTING

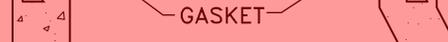
(ALL MANHOLES EXCEPT WHERE WATERPROOF FRAMES AND CASTINGS ARE REQUIRED)

NEENAH R-1755-F2, HAMILTON KENT LIFESPAN SYSTEM, OR EQUAL. WORDS "SANITARY SEWER" IMPRINTED ON OUTER COVER

INNER LID
EZ STICK MASTIC OR EQUAL
PLACE 2 BEADS

"U" IRON

THREADED INSERT TO ACCEPT 3/4" BOLT OR RODDING. EMBEDDED INTO TOP OF CONCRETE MANHOLE CONE ATLEAST 3". 4 EACH TO MATCH FRAME ON 34 1/4" BOLT CIRCLE



3/4" DIA. 316 STAINLESS STEEL BOLT 3 1/2" LONG.

WATERPROOF FRAME AND CASTING

(ALL FORCEMAIN MANHOLES, OR ANY MANHOLE WITHIN GREEN SPACES OR WITHING THE 100 YR HWL AREA)

NOTE:

1. ALL NUTS, BOLTS, THREADED INSERTS, AND RODDING SHALL BE 316 STAINLESS STEEL.
2. CLEAN ALL SURFACES TO REMOVE SCALE OR LOOSE IMPEDIMENTS BEFORE PLACING ANY MASTIC, SEALANT, OR INSTALLATION OF FRAME AND CASTING SYSTEM.
3. NEENAH R-1642 SYSTEM SHALL CONSIST OF CAST IRON FRAME, SOLID CAST IRON LID, CAST IRON EXTENSION RING AND HDPE "PLASTIC" ADJUSTMENT RINGS.
4. HAMILTON KENT, LIFESPAN SYSTEM SHALL CONSIST OF ELASTOMERIC FRAME, ELASTOMERIC EXTENSION RING, ELASTOMERIC ADJUSTMENT RISERS AND CAST IRON LID. LID SHALL HAVE (3) THREE LOCKING CAM LUGS. TIGHTEN TO 50 FT-LBS TORQUE.
2. NEENAH R-1755-F2 SYSTEM SHALL CONSIST OF CAST IRON FRAME, SOLID CAST IRON LID, & INNER LID. THOUGH NOT TYPICAL IF NECESSARY HDPE "PLASTIC" ADJUSTMENT RINGS SHALL BE USED. THE INSERT EXTENSION RINGS ARE NOT ALLOWED FOR FINAL CASTING ADJUSTMENTS WITH THESE FRAMES AND CASTINGS.

SANITARY MANHOLE FRAME AND CASTING

NO SCALE

Aug 11, 2015 - 1:59pm
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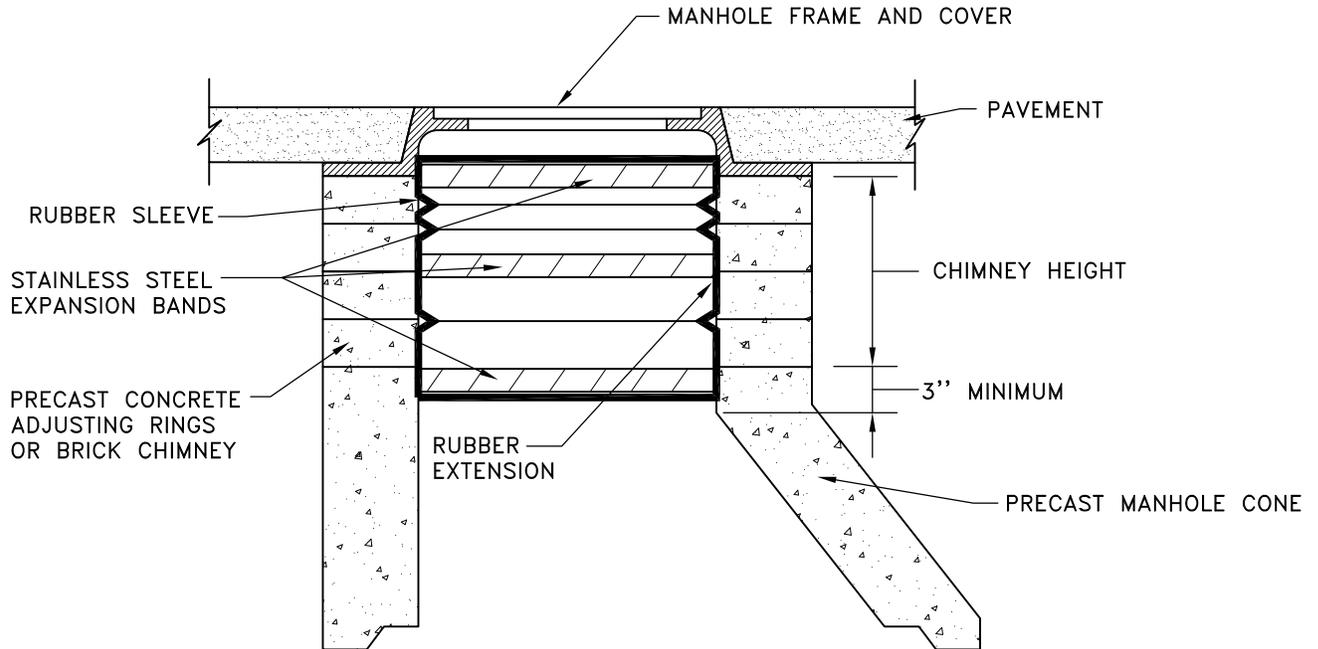
APPROVED

REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
307



NOTES:

1. THE ADJUSTMENT RINGS AND FRAME SHALL BE SEALED WITH AN 8.5" WIDE DOUBLE PLEATED, OR WIDE, A 10" WIDE TRIPLE PLEATED, INTERNAL CHIMNEY SEAL AS MANUFACTURED BY CRETEX SPECIALTY PRODUCTS. THE SAME EXPANSION BANDS AND EXTENTIONS ARE USED ON BOTH.
2. SEE CHIMNEY HEIGHT TABLE FOR SEAL AND EXTENSION COMBINATIONS NEEDED TO SPAN FROM THE FRAME TO THE TOP OF THE CONE ON MANHOLES WITH VARIOUS CHIMNEY HEIGHTS. FRAME OFFSETS OR DIAMETER DIFFERENTIALS WILL REDUCE THESE SPAN HEIGHTS.
3. THE TOP OF THE CONE MUST HAVE A MINIMUM 3" HIGH VERTICAL SURFACE THAT IS SMOOTH AND FREE OF ANY FORM OFFSETS OR EXCESSIVE HONEYCOMB. IF A 3" HIGH VERTICAL SURFACE IS NOT AVAILABLE DUE TO THE EXISTING CONFIGURATION OF THE EXISTING MANHOLE CONE, ONE MAY BE CREATED USING A CONE DISK FORM AND A NON SHRINK PATCHING MORTAR. PLANS FOR A FORM DISK CONE ARE AVAILABLE FROM CRETEX SPECIALTY PRODUCTS.

SEAL SELECTION TABLE

COMBINATIONS OF SEALS AND EXTENSIONS	TO SPAN CHIMNEY HEIGHT OF		
	W / STANDARD SEAL	W / WIDE SEAL	W / EXTRA WIDE SEAL
SEAL ONLY	0"-4.5"	2"-7.5"	OVER 6"-12"
SEAL + 7" EXTENSION	OVER 4.5"-10.5"	OVER 7.5"-13.5"	OVER 12"-18"
SEAL + 10" EXTENSION	OVER 10.5"-13"	OVER 13.5"-16"	OVER 18"-20.5'
SEAL + MULT. EXTENSION	OVER 13"	OVER 16"	OVER 20.5"

ADD 6" OF COVERAGE FOR EACH ADDITIONAL 7" EXTENSION
 ADD 8.5" OF COVERAGE FOR EACH ADDITIONAL 10" EXTENSION
 DIAMETER DIFFERENTIALS AND OFFSETS WILL REDUCE THESE COVERAGES

INTERNAL CHIMNEY SEAL

NO SCALE

Mar 19, 2013 - 2:57pm
K:\cad_eng\Details\OTSEGO_REV13\dwg\SANITARY\Sat-308.dwg

APPROVED

REVISED
3-19-13



CITY OF
Otsego
MINNESOTA

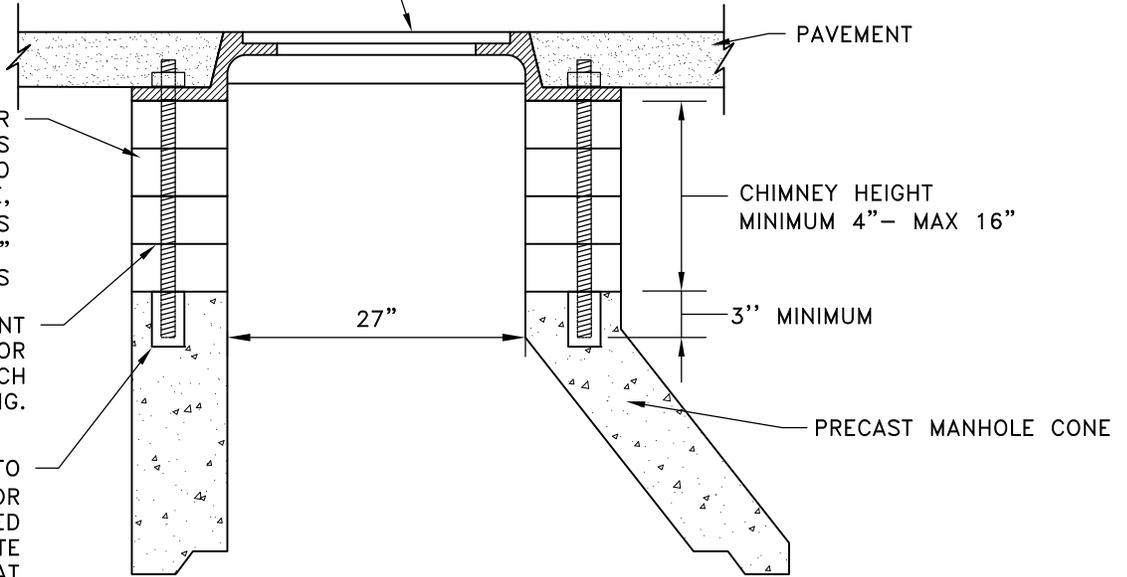
STANDARD PLATE NO.
308

MANHOLE FRAME AND CASTING PER
STD PLATE 307

MAX 4 RINGS. NUMBER
OF ADJUSTMENT RINGS
SHALL BE MINIMIZED TO
THE EXTENT POSSIBLE,
I.E. USE (2) 4" RINGS
INSTEAD OF (4) 2"
RINGS

PLACE BUTYL SEALANT
AROUND EACH ANCHOR
BOLT IN EACH
ADJUSTMENT RING.

THREADED INSERT TO
ACCEPT 1/2" BOLT OR
RODDING. EMBEDDED
INTO TOP OF CONCRETE
MANHOLE CONE AT
LEAST 3". 4 EACH TO
MATCH FRAME



NOTES:

1. ALL NUTS, BOLTS, THREADED INSERTS, AND RODDING SHALL BE 316 STAINLESS STEEL.
2. ADJUSTMENT RINGS SHALL BE HIGH DENSITY POLYETHYLENE RINGS AS MANUFACTURED BY LADTECH, INC OR APPROVED EQUAL.
3. ALL RINGS SHALL MEET OR EXCEED MnDOT HS-20 TRAFFIC LOADING.
4. AS DETERMINED BY THE CITY ENGINEER, PRECAST CONCRETE ADJUSTING RINGS OR BRICK CHIMNEY WILL BE ALLOWED FOR ADJUSTING EXISTING MANHOLES.
5. CLEAN ALL SURFACES TO REMOVE SCALE OR LOOSE IMPEDIMENTS BEFORE PLACING ANY MASTIC, SEALANT, OR INSTALLATION OF FRAME AND CASTING SYSTEM.
6. PLACE TWO 1/2" BEADS OF BUTYL SEALANT BETWEEN FIRST ADJUSTMENT RING AND CONCRETE STRUCTURE. ONE BEAD BETWEEN EACH SUBSEQUENT RING AND FRAME.

MANHOLE ADJUSTMENT RINGS

NO SCALE

Oct 09, 2015 - 11:10am
K:\cad_eng\Details\OTSEGO_REV15\Sat-309.dwg

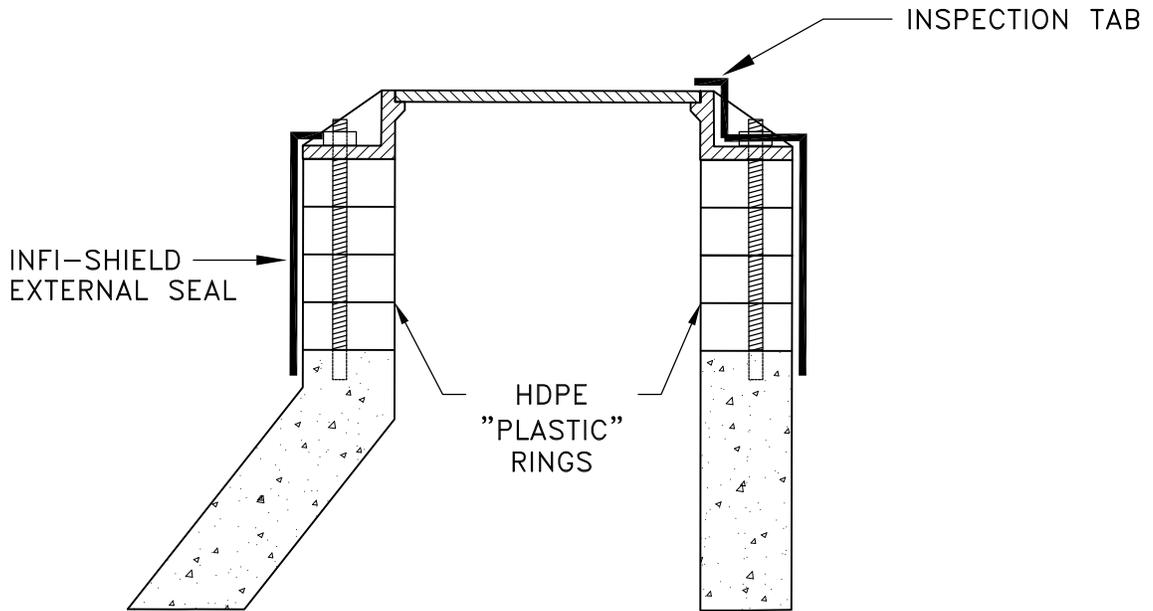
APPROVED

REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
309



NOTES:

1. THE ADJUSTMENT RINGS AND FRAME SHALL BE SEALED WITH AN EXTERNAL RUBBER SEALING SLEEVE, "INFI-SHIELD" AS MANUFACTURED BY SEALING SYSTEM, INC. OR APPROVED EQUAL.
2. THE SEAL SHALL BE MADE OF EPDM RUBBER WITH A MINIMUM THICKNESS OF 60 MILS AND SEALED WITH A NON-HARDENING BUTYL RUBBER MASTIC.

EXTERNAL CHIMNEY SEAL
NO SCALE

Oct 09, 2015 - 11:06am
K:\cad_eng\Details\OTSEGO_REV15\Sat-310.dwg

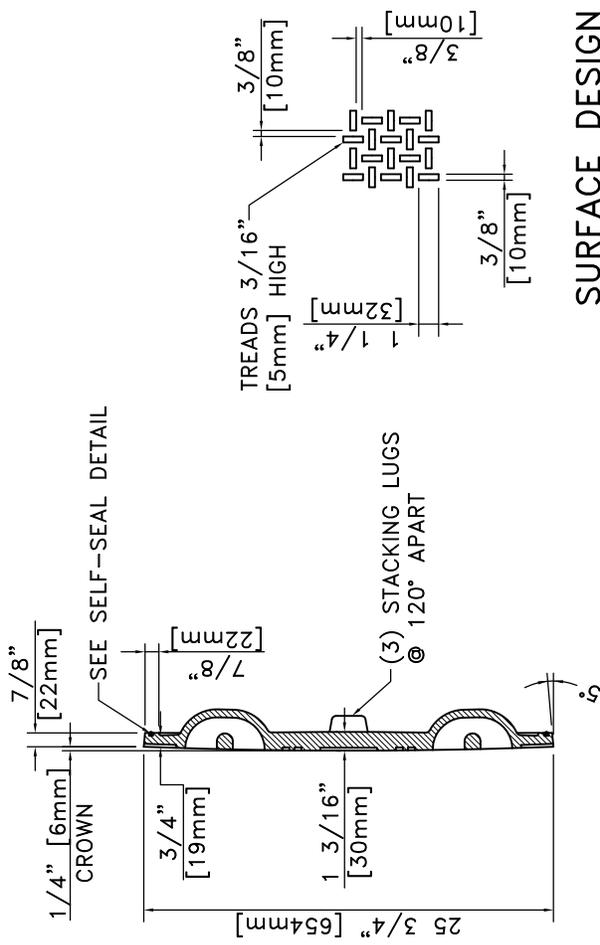
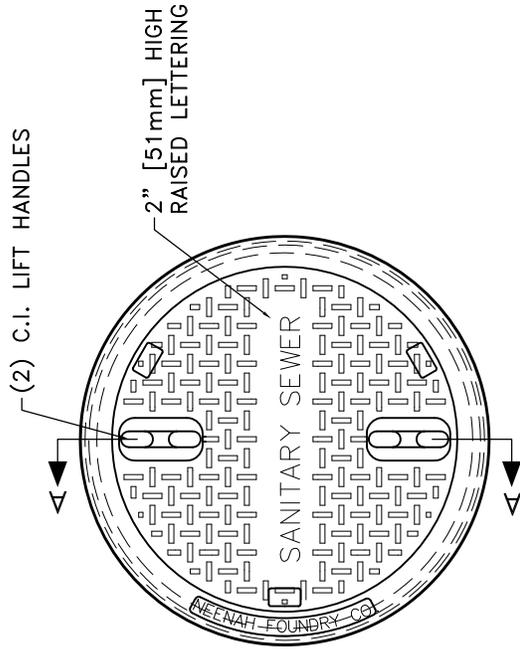
APPROVED	 <p style="font-size: 24pt; font-weight: bold; margin: 0;">Otsego</p> <p style="font-size: 10pt; font-weight: bold; margin: 0;">MINNESOTA</p>	<p style="font-size: 18pt; font-weight: bold; margin: 0;">STANDARD PLATE NO.</p> <p style="font-size: 24pt; font-weight: bold; margin: 0;">310</p>
REVISED 8-18-15		

APPROVED
 REVISED
 MARCH 2005



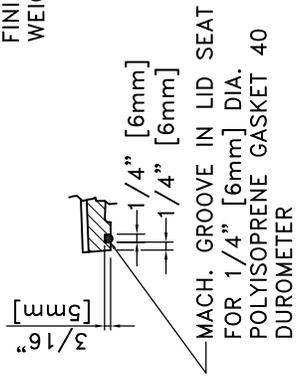
CITY OF
Otsego
 MINNESOTA

STANDARD PLATE NO.
 311

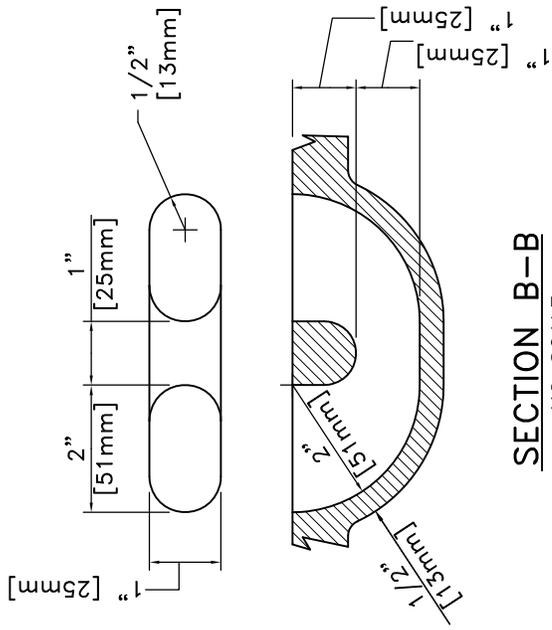


SURFACE DESIGN
 NO SCALE

NOTE:
 ALL DIMENSIONS SHOWN ARE IN ENGLISH AND [METRIC].
 MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B
 FINISH: NO PAINT
 WEIGHT: 122#

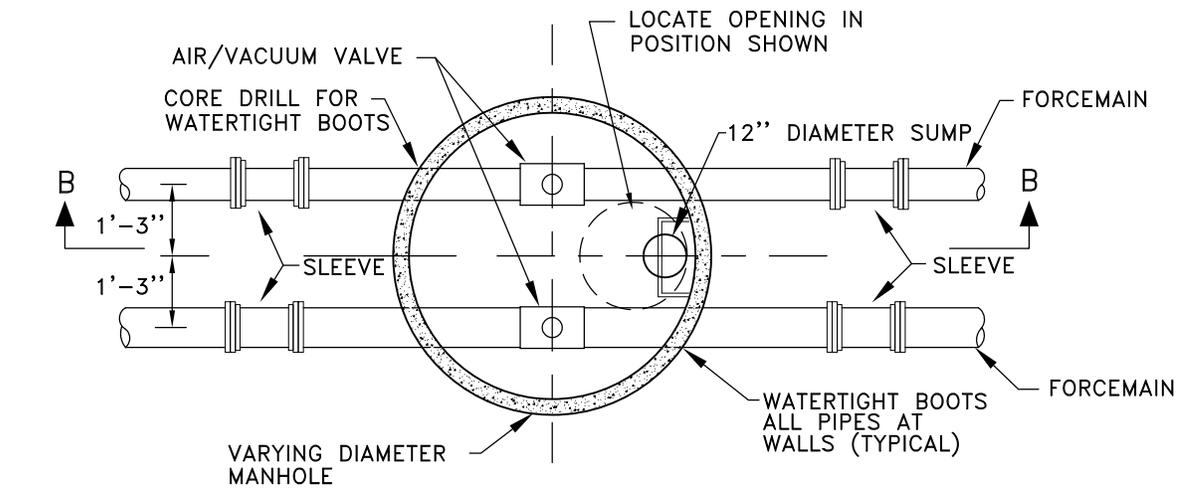


SELF-SEAL DETAIL
 NO SCALE

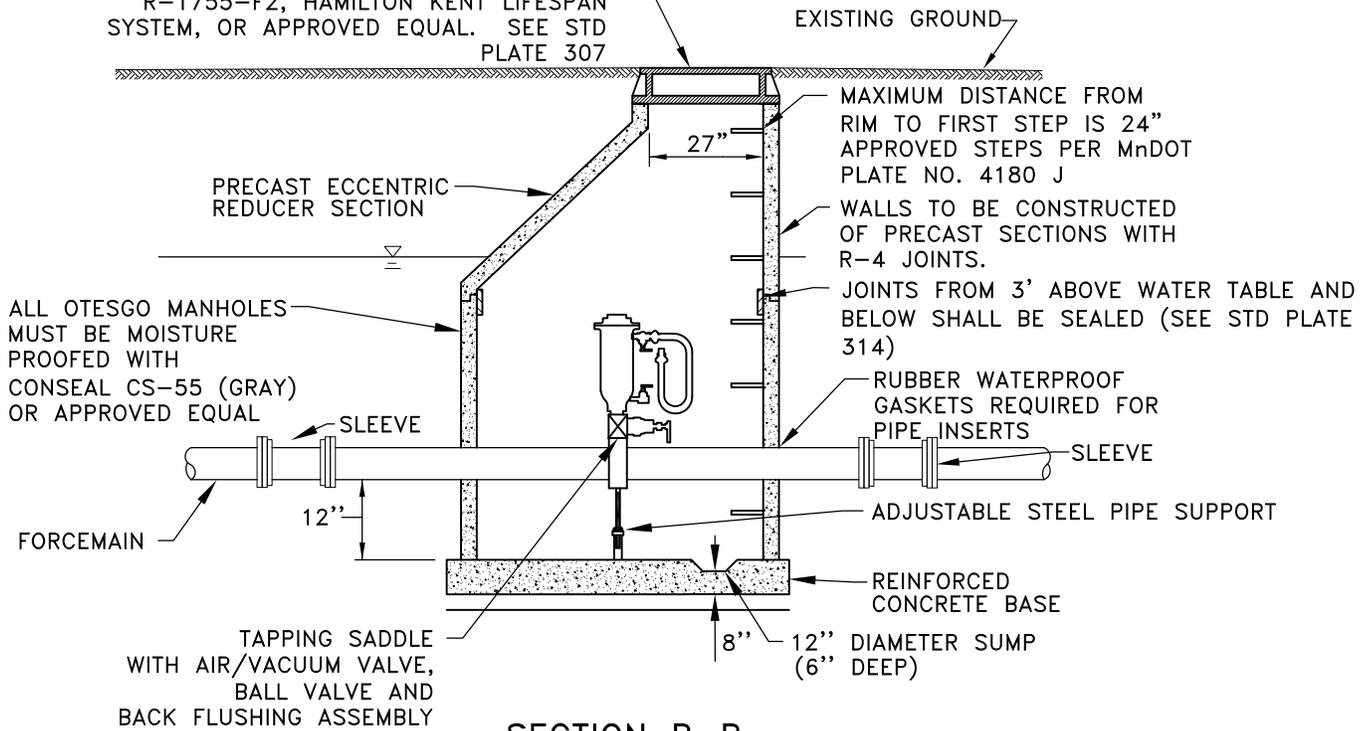


SECTION B-B
 NO SCALE

SCALE	DR.	DATE	REVISION	DATE	APP.	CHK.	TITLE
NTS	KMH	04-05-99					R-1733 PLATEN LID
NEENAH FOUNDRY COMPANY NEENAH WISCONSIN 54956							
NF-17335044B							



FRAME AND CASTING TO BE NEENAH R-1755-F2, HAMILTON KENT LIFESPAN SYSTEM, OR APPROVED EQUAL. SEE STD PLATE 307



NOTE:
ARRANGE PIPE JOINTS TO BE AT LEAST SIX FEET FROM CENTER OF MANHOLE.

FORCEMAIN AIR/VACUUM VALVE
NO SCALE

Aug 11, 2015 - 2:10pm
K:\cad_eng\Details\OTSEGO_REV15\Sat-312.dwg

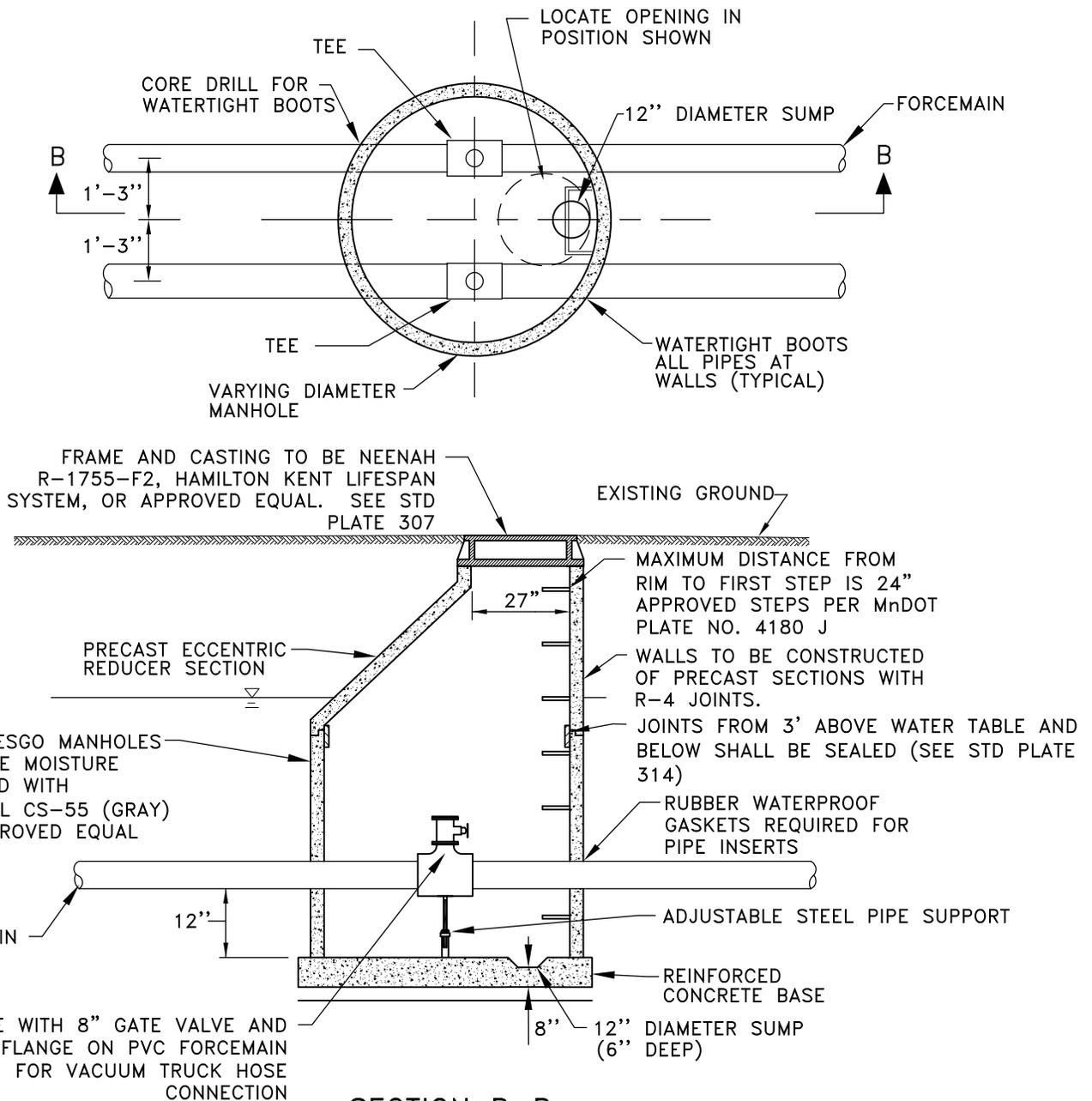
APPROVED

REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
312



SECTION B-B

NOTE:

1. ARRANGE PIPE JOINTS TO BE AT LEAST SIX FEET FROM CENTER OF MANHOLE
2. CLEAN OUTS ARE TYPICALLY LOCATED AT LOW POINTS IN FORCE MAIN AND WITH GAVE VALVES ON BOTH SIDES OF MANHOLE.

FORCEMAIN CLEANOUT

NO SCALE

Aug 11, 2015 - 2:11pm
K:\cad_eng\Details\OTSEGO_REV15\Sat-313.dwg

APPROVED

REVISED
8-18-15

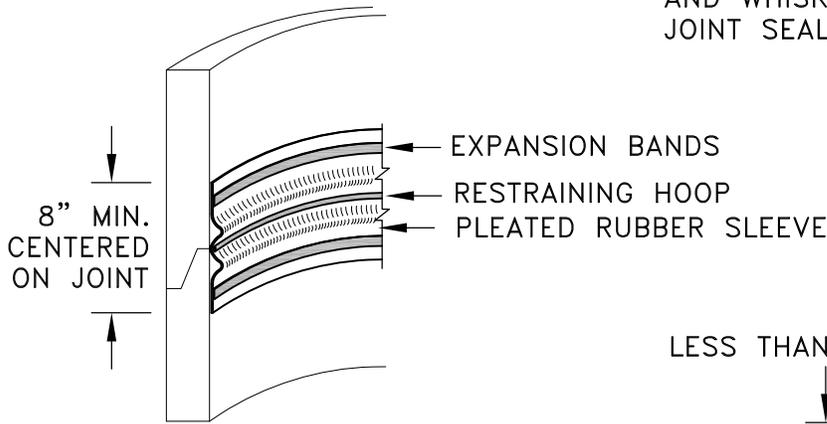


CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
313

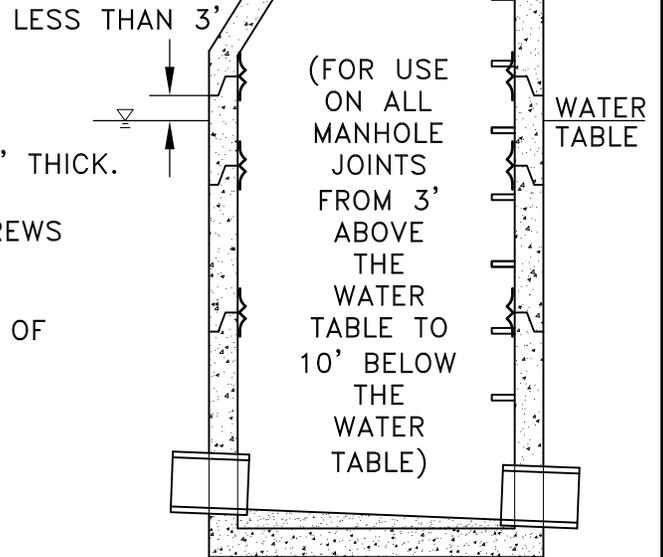
INTERNAL MANHOLE JOINT SEAL

ALL SEALS SHALL BE INSTALLED PER MANUFACTURES SPECIFICATIONS. CLEAN AREA AROUND JOINTS WITH WIRE BRUSH AND WHISK BROOM PRIOR TO PLACING JOINT SEALS.

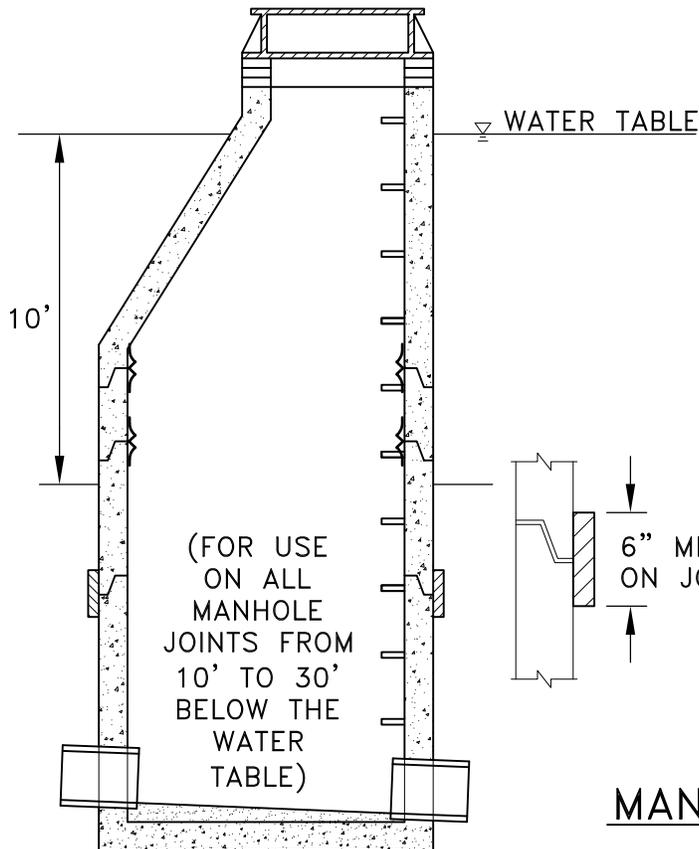


NOTES

1. RUBBER SLEEVE SHALL BE A MIN. OF 3/16" THICK.
2. 1 3/4" WIDE EXPANSION BANDS, 16 GAUGE STAINLESS STEEL. ALL NUTS, BOLTS OR SCREWS SHALL BE STAINLESS STEEL.
3. RESTRAINING HOOP SHALL BE 5/16" DIA. STAINLESS STEEL, PLACED BETWEEN PLEATS OF RUBBER SLEEVE.

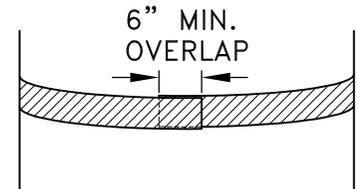


INFI-SHIELD EXTERNAL GATOR WRAP



NOTES

1. EPDM FLEXIBLE RUBBER SLEEVE - 30 MILS THICK
2. NON-HARDENING BUTYL MASTIC ADHESIVE - 30 MILS THICK



MANHOLE JOINT SEAL

NO SCALE

Mar 19, 2013 - 4:04pm
K:\cad_eng\Details\OTSEGO_REV13.dwg\SANITARY\Sat-314.dwg

APPROVED

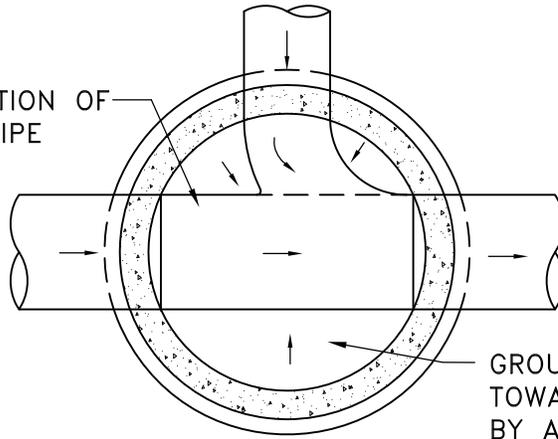
REVISED
3-19-13



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
314

FORM 1/2 PIPE SECTION OF
LARGEST DIAMETER PIPE

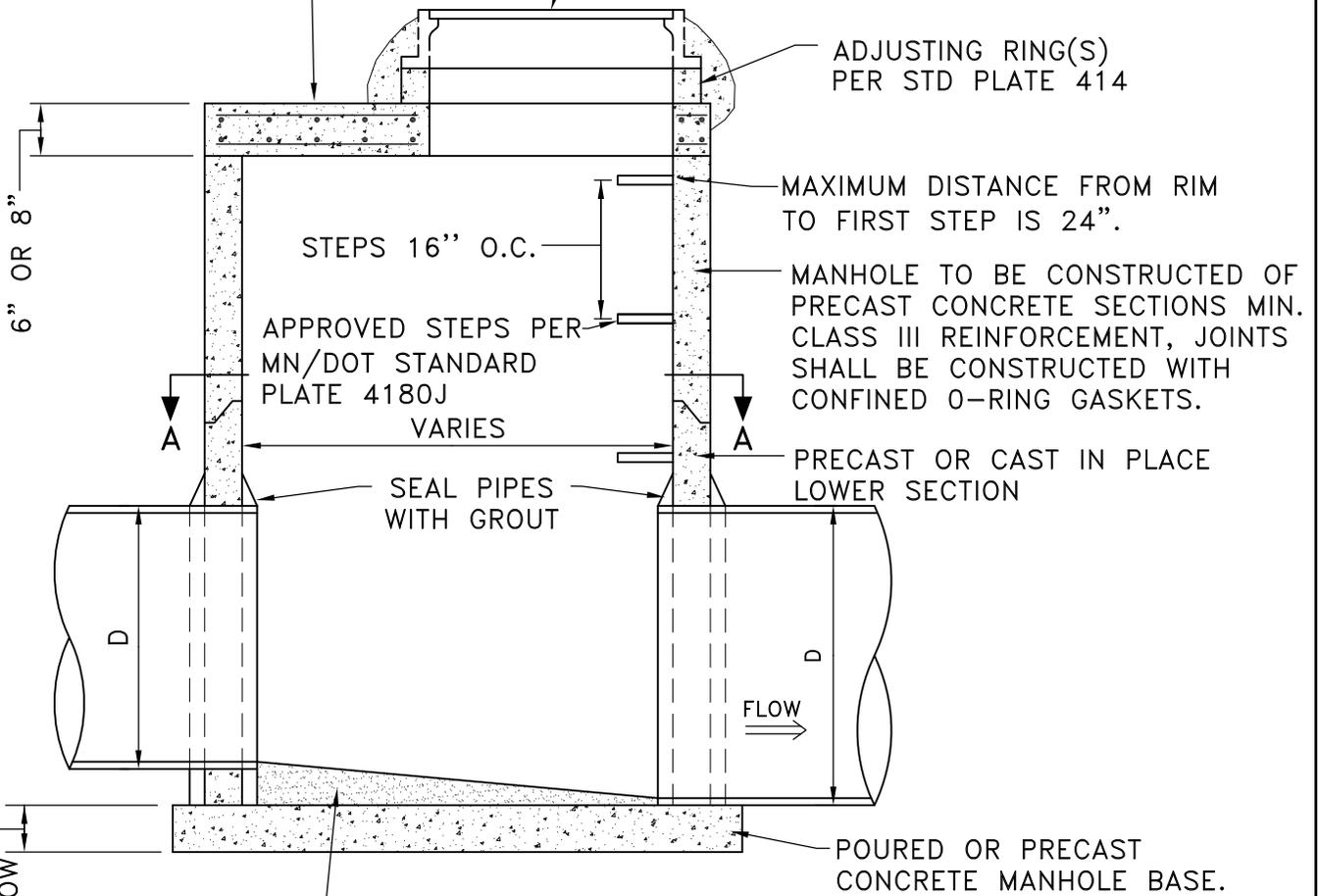


GROUT BOTTOM TO SLOPE
TOWARD PIPE AS SHOWN
BY ARROWS

SECTION A-A

MANHOLE COVER SHALL
BE TYPE II WITH 27"
ECCENTRIC OPENING.

FRAME & CASTING (SEE
MH & CB SCHEDULE).



ADJUSTING RING(S)
PER STD PLATE 414

MAXIMUM DISTANCE FROM RIM
TO FIRST STEP IS 24".

STEPS 16" O.C.

MANHOLE TO BE CONSTRUCTED OF
PRECAST CONCRETE SECTIONS MIN.
CLASS III REINFORCEMENT, JOINTS
SHALL BE CONSTRUCTED WITH
CONFINED O-RING GASKETS.

APPROVED STEPS PER
MN/DOT STANDARD
PLATE 4180J
VARIES

PRECAST OR CAST IN PLACE
LOWER SECTION

SEAL PIPES
WITH GROUT

POURED OR PRECAST
CONCRETE MANHOLE BASE.

MANHOLE INVERT SHALL BE
SLOPED TO PROVIDE SMOOTH
FLOW FROM INLET TO OUTLET.

SEE
BELOW

- BASE
- 6" - 12 ft DEEP
- 8" - 12 ft TO 20 ft DEEP
- 10" - OVER 20 ft DEEP

SLAB-TOP MANHOLE
(STORM SEWER)
NO SCALE

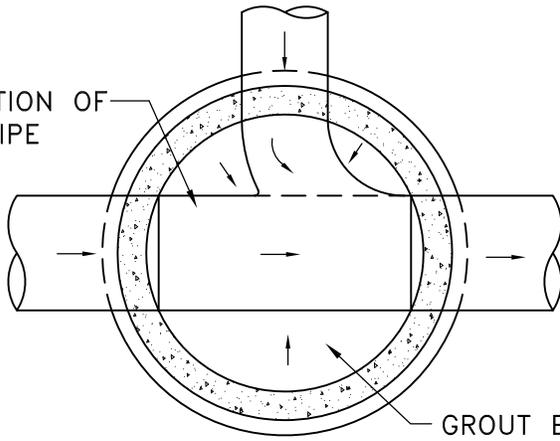
Aug 11, 2015 - 4:45pm
K:\cad_eng\Details\OTSEGO_REV15\Stm-400.dwg

APPROVED
REVISED 8-18-15



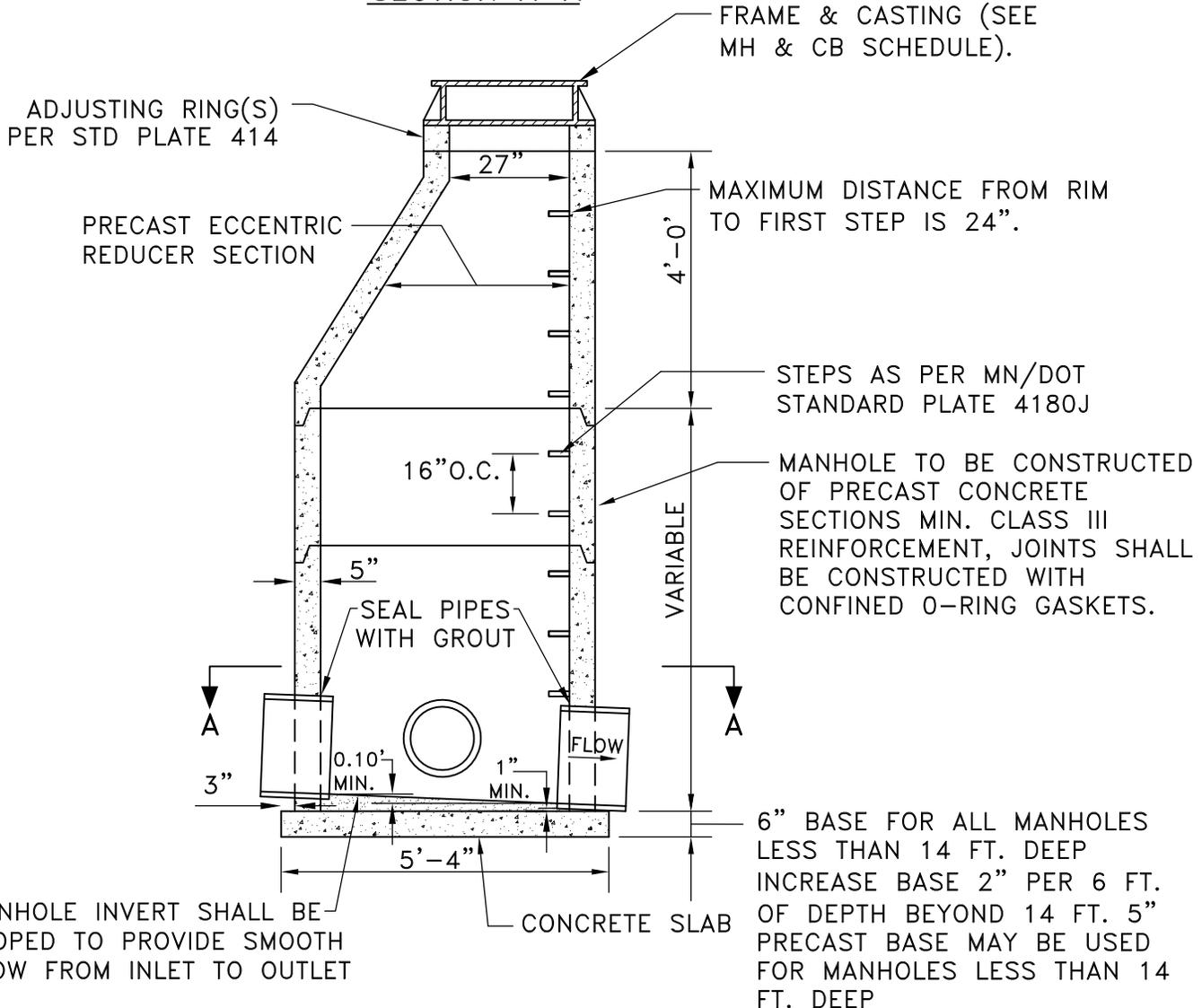
STANDARD PLATE NO.
400

FORM 1/2 PIPE SECTION OF LARGEST DIAMETER PIPE



GROUT BOTTOM TO SLOPE TOWARD PIPE AS SHOWN BY ARROWS

SECTION A-A

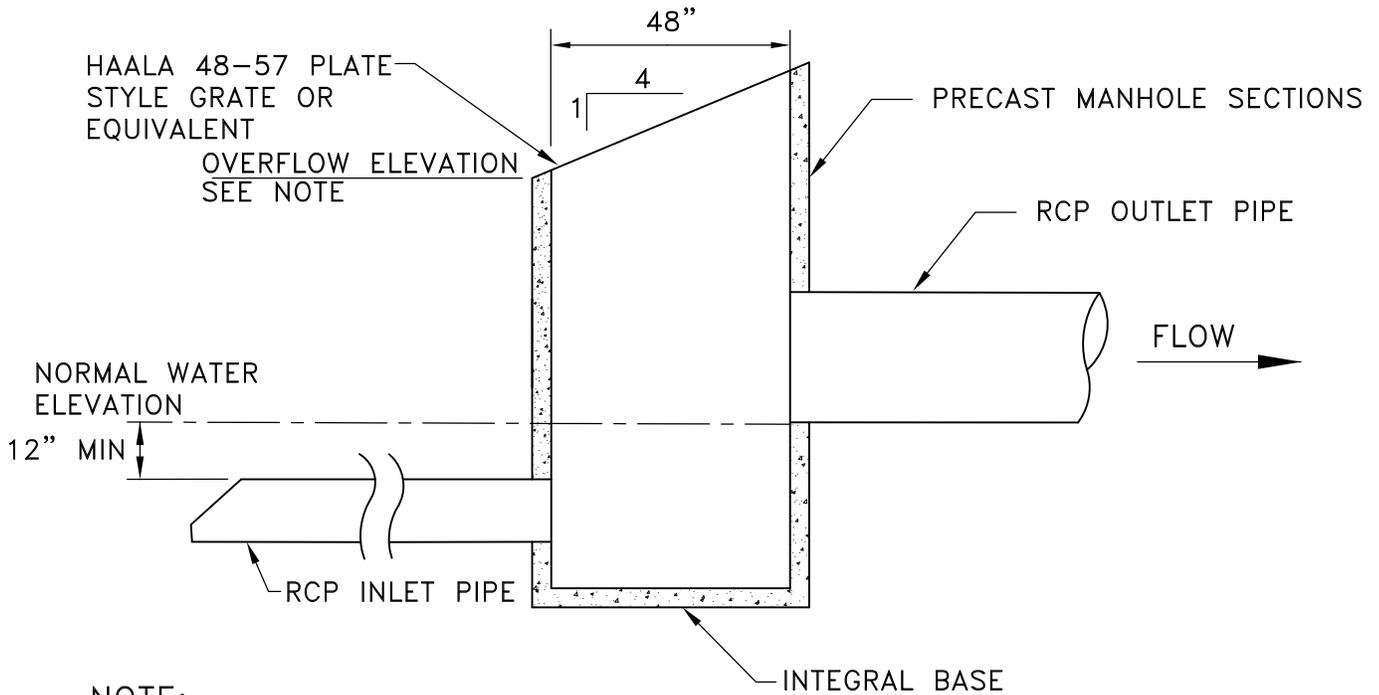


MANHOLE INVERT SHALL BE SLOPED TO PROVIDE SMOOTH FLOW FROM INLET TO OUTLET

STORM SEWER STANDARD MANHOLE
NO SCALE

Aug 11, 2015 - 5:02pm
K:\cad_eng\Details\OTSEGO_REV15\Stm-401.dwg

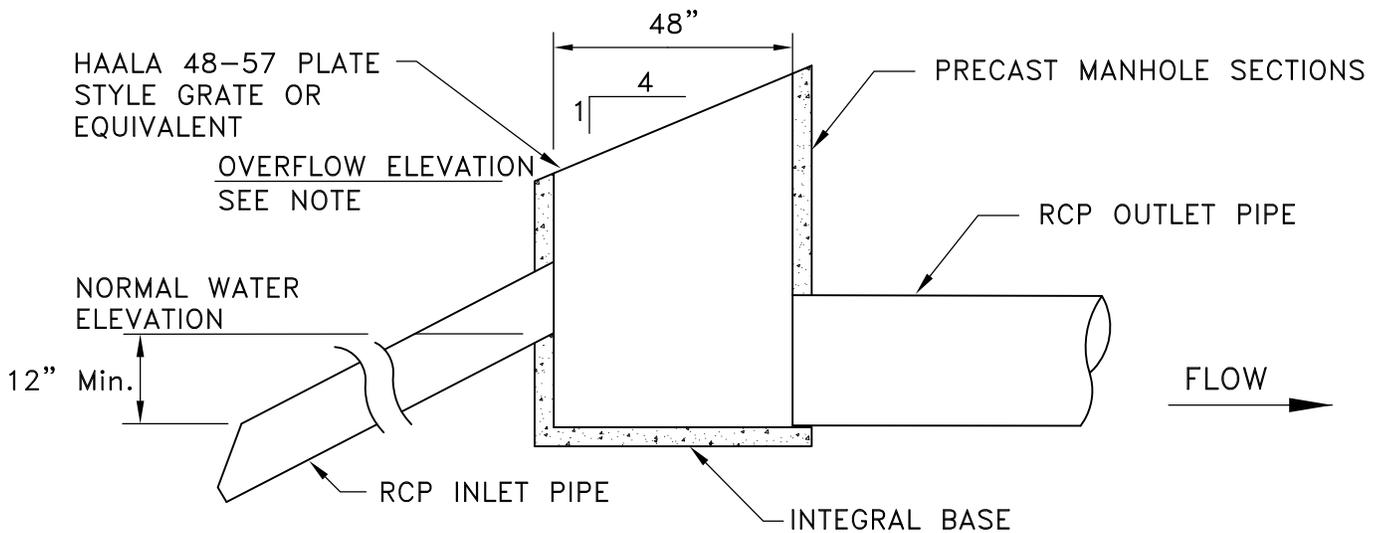
APPROVED		STANDARD PLATE NO. 401
REVISED 8-18-15		



NOTE:
 THE OVERFLOW ELEVATION SHALL BE AT OR ABOVE THE PEAK 2-YEAR STORM EVENT ELEVATION

SKIMMER STRUCTURE

NO SCALE



NOTE:
 THE OVERFLOW ELEVATION SHALL BE AT OR ABOVE THE PEAK 2-YEAR STORM EVENT ELEVATION, BUT NO HIGHER THAN THE 100-YEAR ELEVATION

SKIMMER STRUCTURE

NO SCALE

Mar 20, 2013 - 9:11am
 K:\cad_eng\Details\OTSEGO_REV13\dwg\STORM\Stm-402.dwg

APPROVED

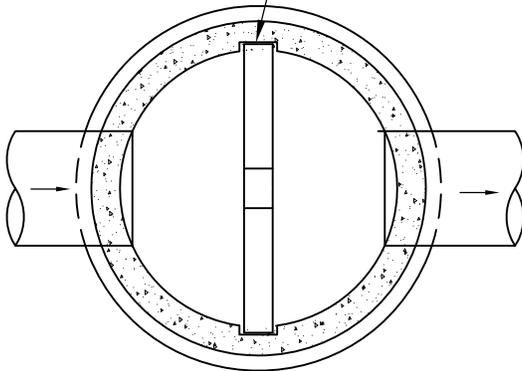
REVISED
 5-10-07



CITY OF
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MINNESOTA

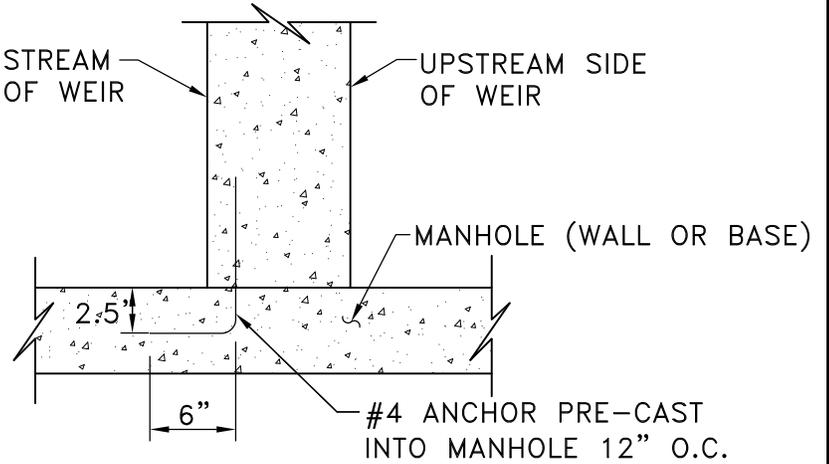
STANDARD PLATE NO.
 402

GROUT AROUND WEIR TO SEAL



DOWNSTREAM SIDE OF WEIR

UPSTREAM SIDE OF WEIR



NOTES:

1. THE FOLLOWING MAY BE USED AS AN ALTERNATIVE TO THE PRE-CAST ANCHORS: HVA ADHESIVE ANCHOR SYSTEM, WITH HVA ADHESIVE CAPSULES AND #5 REBAR, AS MANUFACTURED BY HILTI CORP OR APPROVED EQUAL.

2. REINFORCEMENT BARS IN WEIR NOT SHOWN.

WEIR REINFORCEMENT
@ WALL AND BASE

HAALA 48-57 PLATE
STYLE GRATE OR
EQUIVALENT

OVERFLOW ELEVATION
SEE NOTE

NORMAL WATER
ELEVATION

12" Min.

RCP INLET PIPE

SEE DETAIL FOR
WEIR REINFORCEMENT
@ WALL AND BASE.

48"

4

1

PRECAST MANHOLE SECTIONS

#4 REBAR
12" O.C. EW

RCP OUTLET PIPE

6"

FLOW

INTEGRAL BASE

NOTE:

THE OVERFLOW ELEVATION SHALL BE AT OR ABOVE THE PEAK 2-YEAR STORM EVENT ELEVATION, BUT NO HIGHER THAN THE 100 YEAR ELEVATION

SKIMMER STRUCTURE WITH WEIR

NO SCALE

Mar 20, 2013 - 9:14am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STORM\Stm-403.dwg

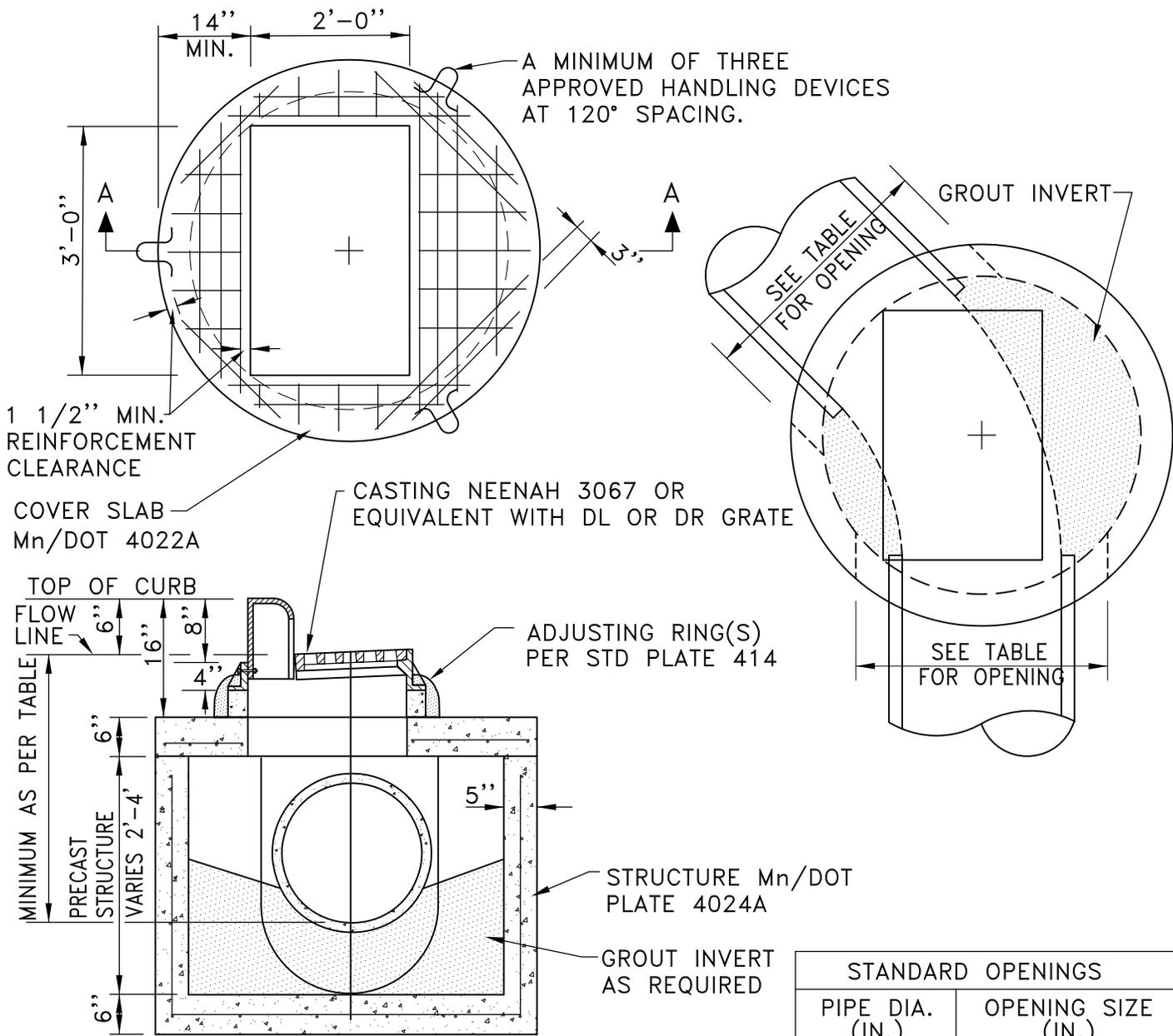
APPROVED

REVISED
FEB 2009



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
403



A MINIMUM OF THREE APPROVED HANDLING DEVICES AT 120° SPACING.

1 1/2" MIN. REINFORCEMENT CLEARANCE

COVER SLAB Mn/DOT 4022A

CASTING NEENAH 3067 OR EQUIVALENT WITH DL OR DR GRATE

TOP OF CURB

FLOW LINE

ADJUSTING RING(S) PER STD PLATE 414

MINIMUM AS PER TABLE

PRECAST STRUCTURE VARIES 2'-4"

STRUCTURE Mn/DOT PLATE 4024A

GROUT INVERT AS REQUIRED

SECTION A-A

STANDARD OPENINGS	
PIPE DIA. (IN.)	OPENING SIZE (IN.)
15	24
18	26
21	30
24	34

MINIMUM C.B. DEPTH - FLOW LINE TO INVERT		
PIPE DIA.	MIN. DEPTH	MINIMUM DEPTH WITH 2 RINGS
15	41 IN.	41 IN.
18	45 IN.	45 IN.
21	48 IN.	48 IN.
24	51 IN.	51 IN.

48 INCH DIAMETER SHALLOW DEPTH CATCH BASIN

MAXIMUM 24 INCH DIAMETER PIPE SIZE
NO SCALE

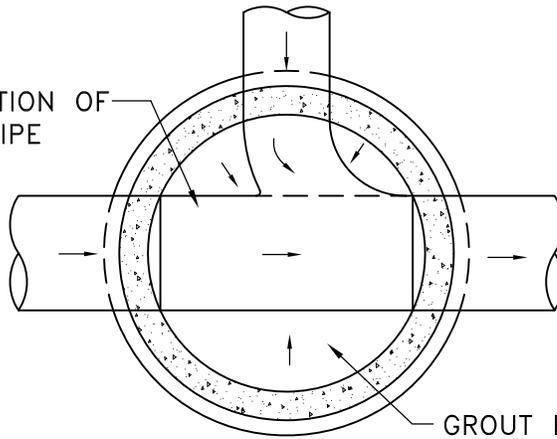
Aug 11, 2015 - 5:01pm K:\cad_eng\Details\OTSEGO_REV15\Stm-405.dwg

APPROVED
REVISED 8-18-15



STANDARD PLATE NO. 405

FORM 1/2 PIPE SECTION OF
LARGEST DIAMETER PIPE



SECTION A-A

CASTING NEENAH 3067
OR EQUIVALENT WITH
DL OR DR GRATE

ADJUSTING RING(S)
PER STD PLATE 414

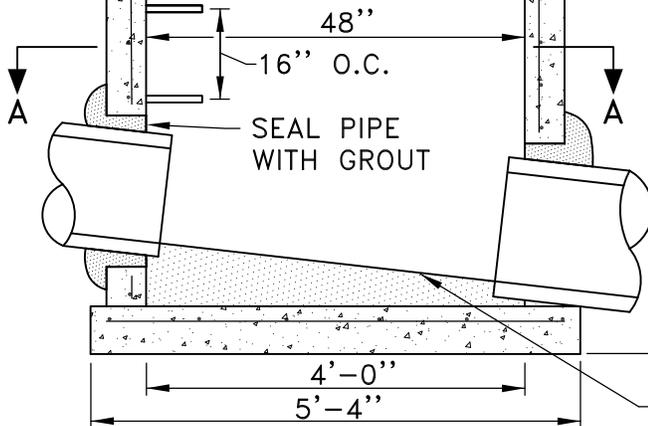
TOP OF CURB
FLOW LINE
6" MIN.
16" MIN.

COVER SLAB
Mn/DOT 4022A

MAXIMUM DISTANCE
FROM RIM TO
FIRST STEP IS 24"

STEPS AS PER
MN/DOT STANDARD
PLATE 4180J

PRECAST SEGMENTS AS
REQUIRED IN 1 FOOT
MULTIPLES



PRECAST LOWER SECTION
MINIMUM 36" HIGH MAXIMUM
48" HIGH Mn/DOT PLATE
4005L LOWER SECTION

MANHOLE INVERT SHALL BE
SLOPED TO PROVIDE SMOOTH
FLOW FORM INLET TO OUTLET.
(SEE SECTION A-A)

NOTES:

REINFORCING:
SINGLE LINE STEEL WIRE FABRIC
HAVING AN AREA OF NOT LESS THAN
0.12 SQ. IN. PER FOOT OF HEIGHT.

STANDARD STORM MANHOLE – CATCH BASIN

MINIMUM COVER FLOW LINE – TO TOP OF PIPE = 2 FEET

NO SCALE

Aug 11, 2015 - 5:01pm
K:\cad_eng\Details\OTSEGO_REV15\Stm-406.dwg

APPROVED

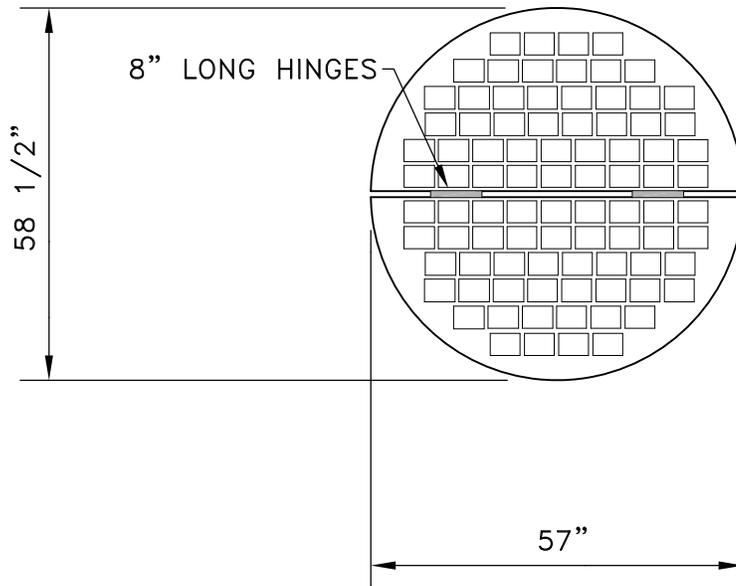
REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
406

GALVANIZED GRATE



TOP VIEW

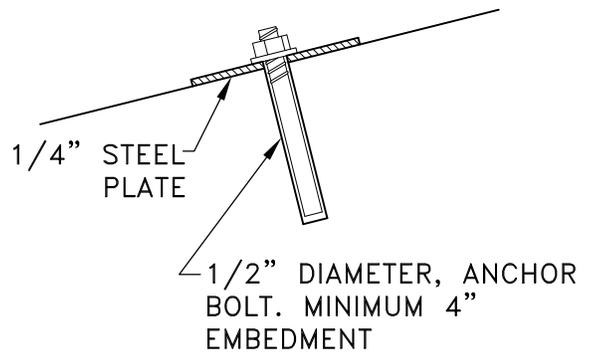
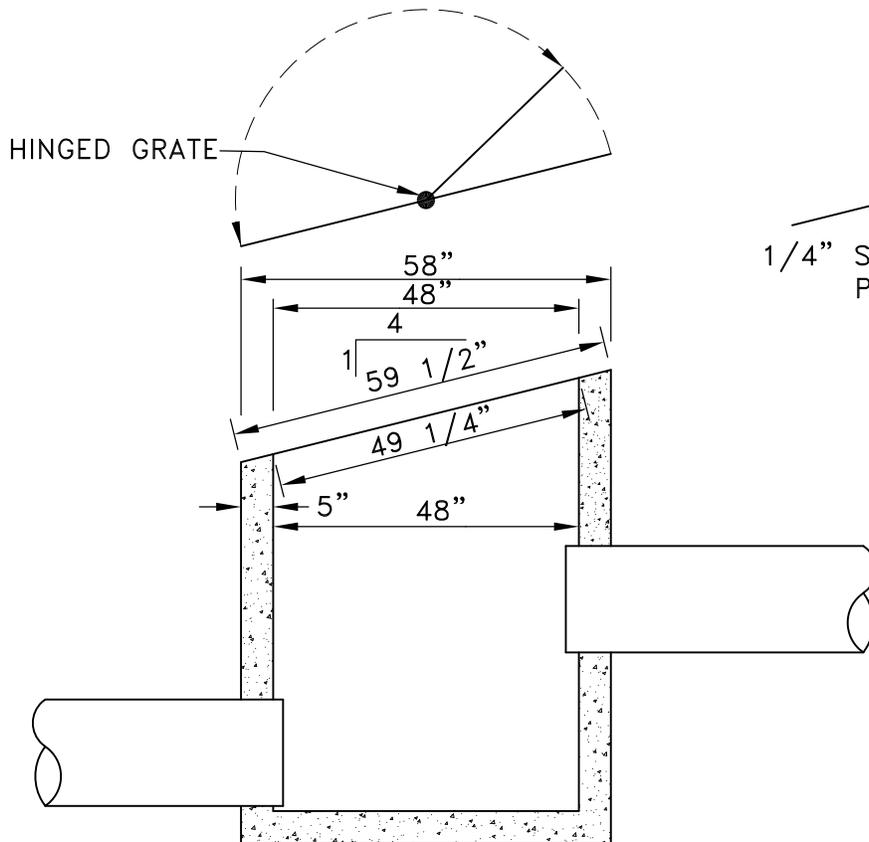


PLATE STYLE GRATE FOR 48" DIA. OUTLET STRUCTURE

NO SCALE

Mar 20, 2013 - 9:34am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STORM\Stm-407.dwg

APPROVED

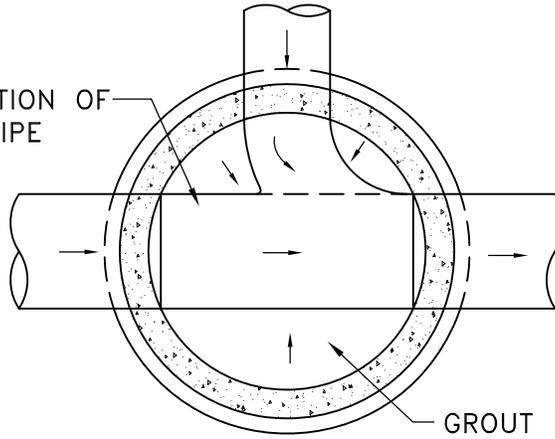
REVISED
5-10-07



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
407

FORM 1/2 PIPE SECTION OF
LARGEST DIAMETER PIPE



GROUT BOTTOM TO SLOPE
TOWARD PIPE AS SHOWN
BY ARROWS

SECTION A-A

CASTING NEENAH R-4342
OR EQUIVALENT STOOL
TYPE GRATE

ADJUSTING RING(S)
PER STD PLATE 414

COVER SLAB
Mn/DOT 4020J

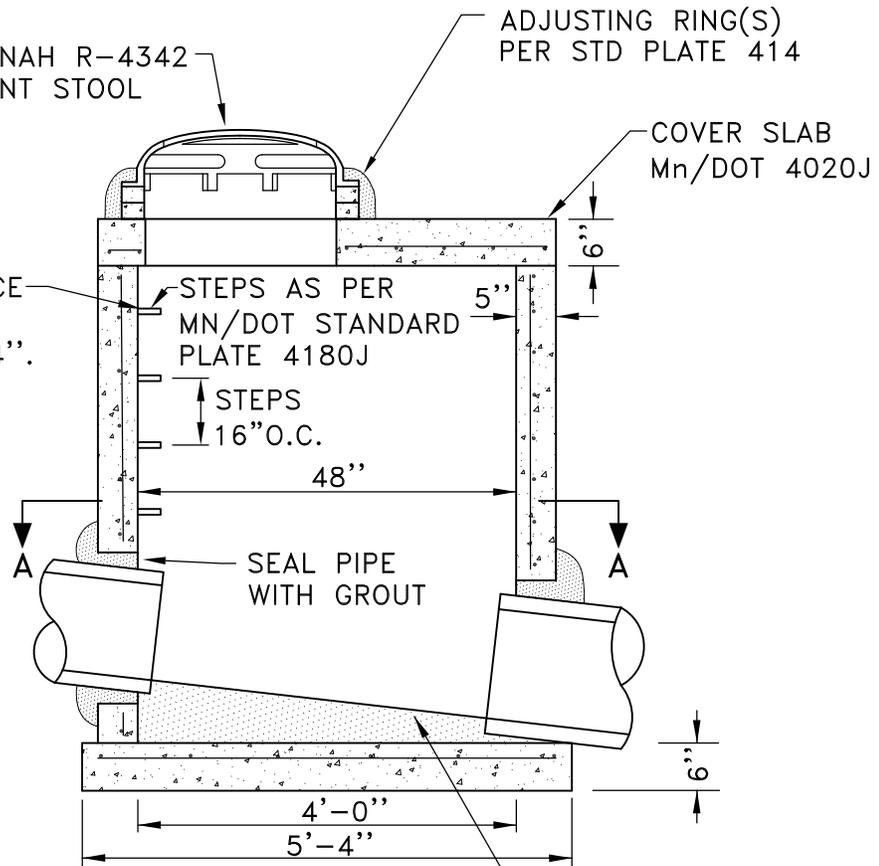
MAXIMUM DISTANCE
FROM RIM TO
FIRST STEP IS 24".

STEPS AS PER
MN/DOT STANDARD
PLATE 4180J

STEPS
16" O.C.

48"

SEAL PIPE
WITH GROUT



NOTES:

REINFORCING:
SINGLE LINE STEEL WIRE FABRIC
HAVING AN AREA OF NOT LESS THAN
0.12 SQ. IN. PER FOOT OF HEIGHT.

MANHOLE INVERT SHALL BE
SLOPED TO PROVIDE SMOOTH
FLOW FROM INLET TO OUTLET

STANDARD STORM MANHOLE-YARD INLET

NO SCALE

Aug 11, 2015 - 5:00pm
K:\cad_eng\Details\OTSEGO_REV15\Stm-408.dwg

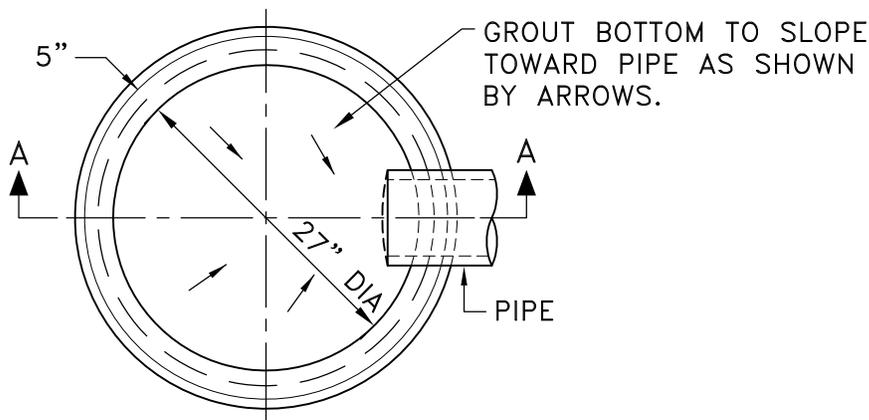
APPROVED

REVISED
8-18-15

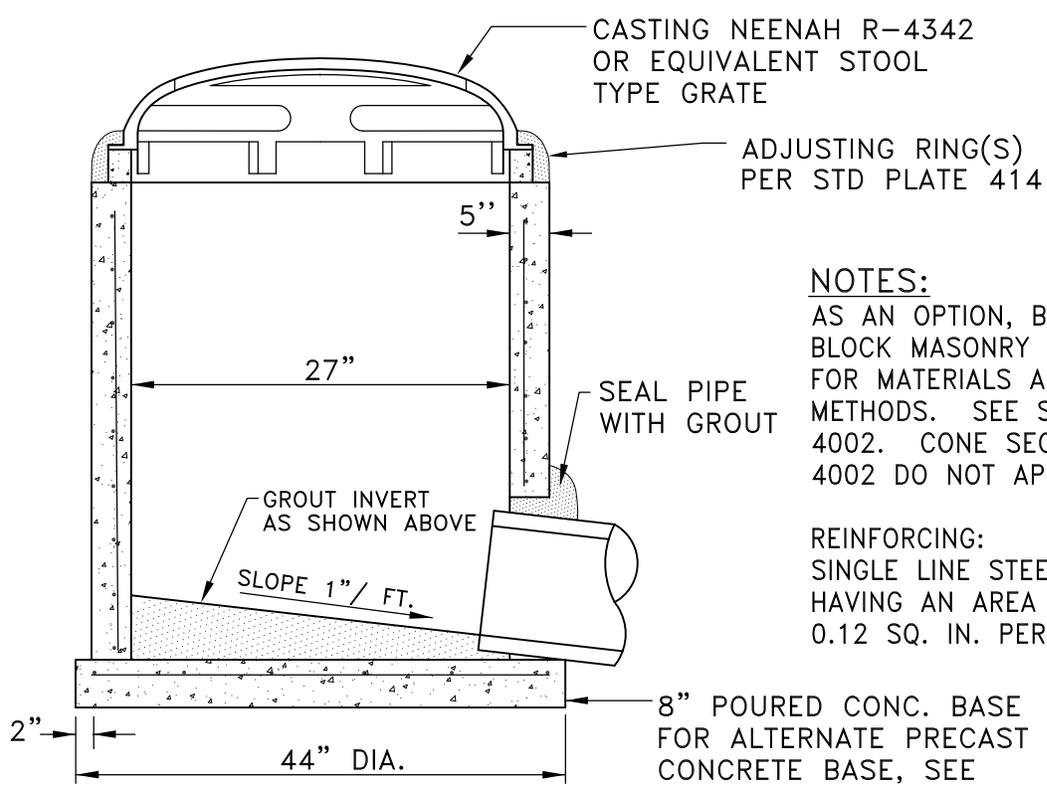


CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
408



TOP VIEW



SECTION A-A

NOTES:

AS AN OPTION, BRICK OR CONCRETE BLOCK MASONRY MAY BE USED. FOR MATERIALS AND CONSTRUCTION METHODS. SEE STANDARD PLATE 4002. CONE SECTION DETAILS OF 4002 DO NOT APPLY.

REINFORCING:

SINGLE LINE STEEL WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT OF HEIGHT.

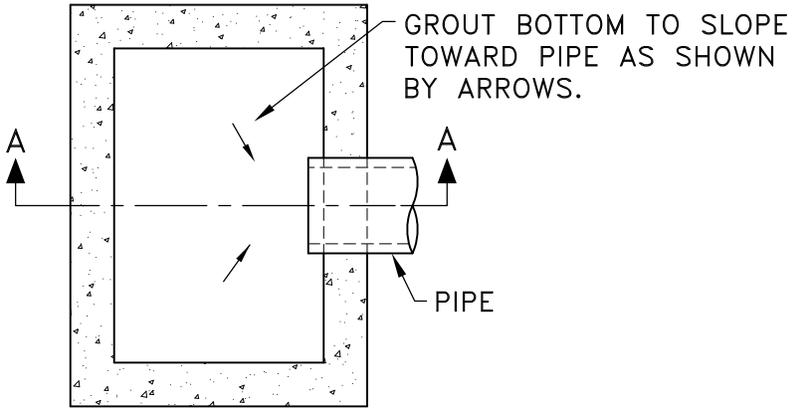
27" PRECAST CATCH BASIN YARD INLET
NO SCALE

Aug 11, 2015 - 5:03pm
K:\cad_eng\Details\OTSEGO_REV15\Stm-409.dwg

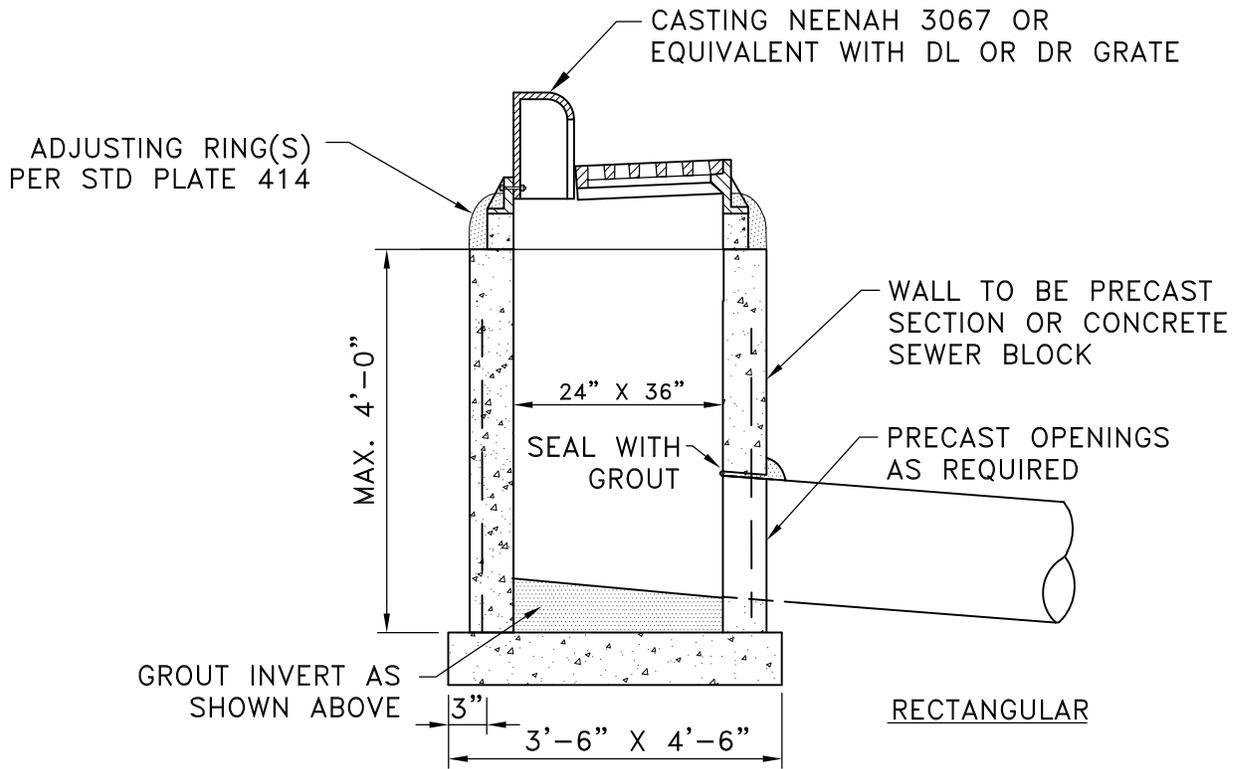
APPROVED
REVISED
8-18-15



STANDARD PLATE NO.
409



TOP VIEW



SECTION A-A

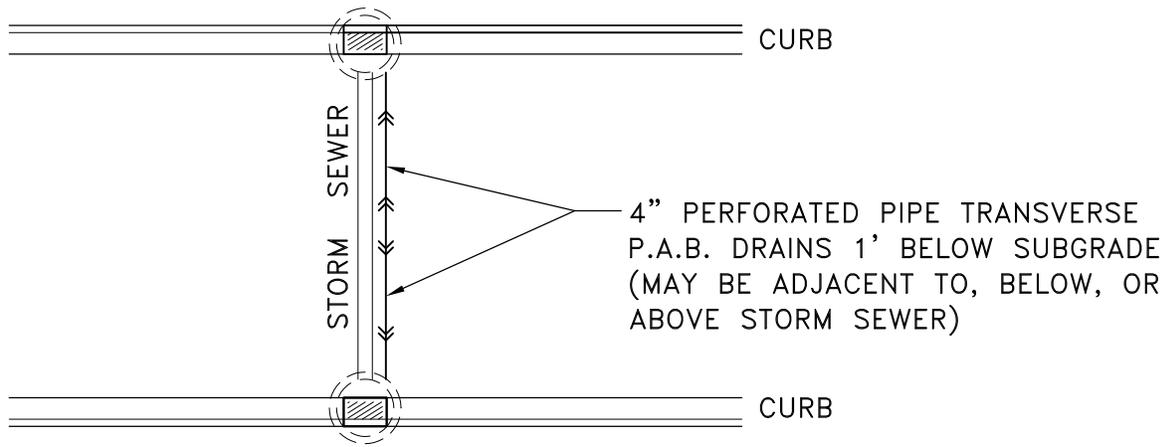
NOTES:

1. CONCRETE BASE SHALL BE 6" POURED IN PLACE OR 5" PRECAST SLAB.
2. REINFORCING SHALL BE SINGLE LINE STEEL WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT OF HEIGHT.

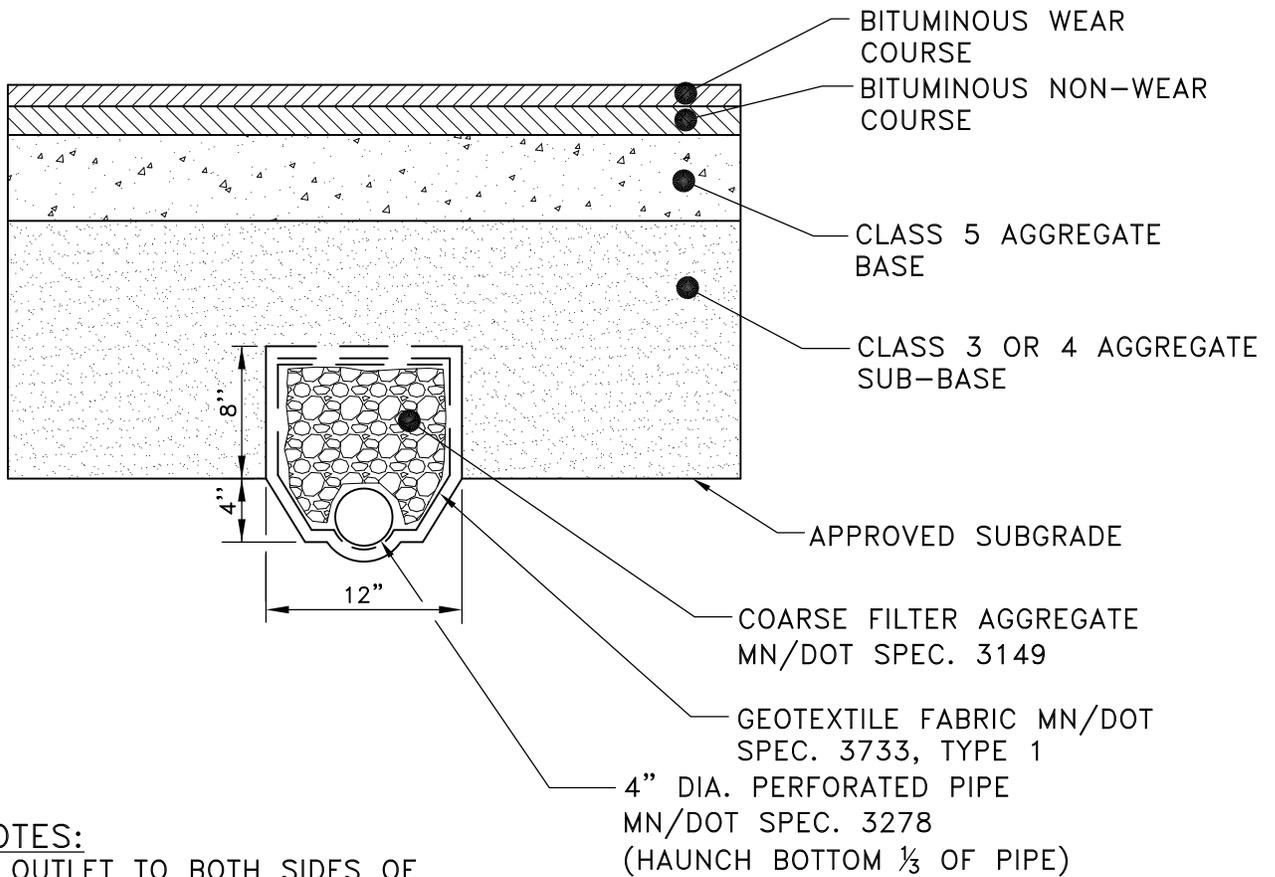
2' x 3' CATCH BASIN
NO SCALE

Aug 11, 2015 - 5:05pm
K:\cad_eng\Details\OTSEGO_REV15\Stm-410.dwg

APPROVED		<p>STANDARD PLATE NO. 410</p>
REVISED 8-18-15		



TOP VIEW



NOTES:

1. OUTLET TO BOTH SIDES OF ROADWAY.
2. MINIMUM TRANSVERSE SLOPE OF PERFORATED PIPE SHALL BE 2%.

4" DIA. PERFORATED PIPE
MN/DOT SPEC. 3278
(HAUNCH BOTTOM 1/3 OF PIPE)

TRANSVERSE PERMEABLE AGGREGATE BASE (P.A.B.) DRAIN

NO SCALE

Mar 20, 2013 - 10:20am
K:\cad_eng\Details\OTSEGO_REV13\dwg\STORM\Stm-411.dwg

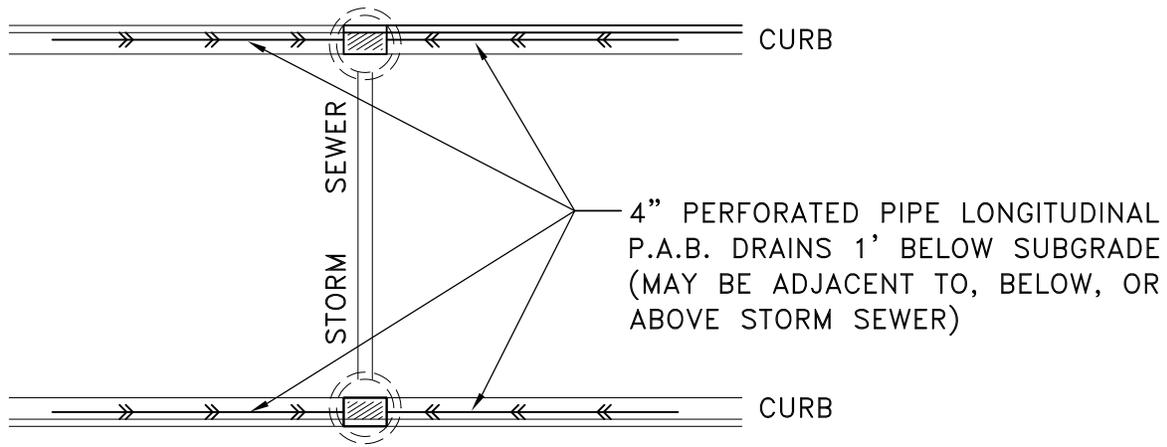
APPROVED

REVISED
5-10-07

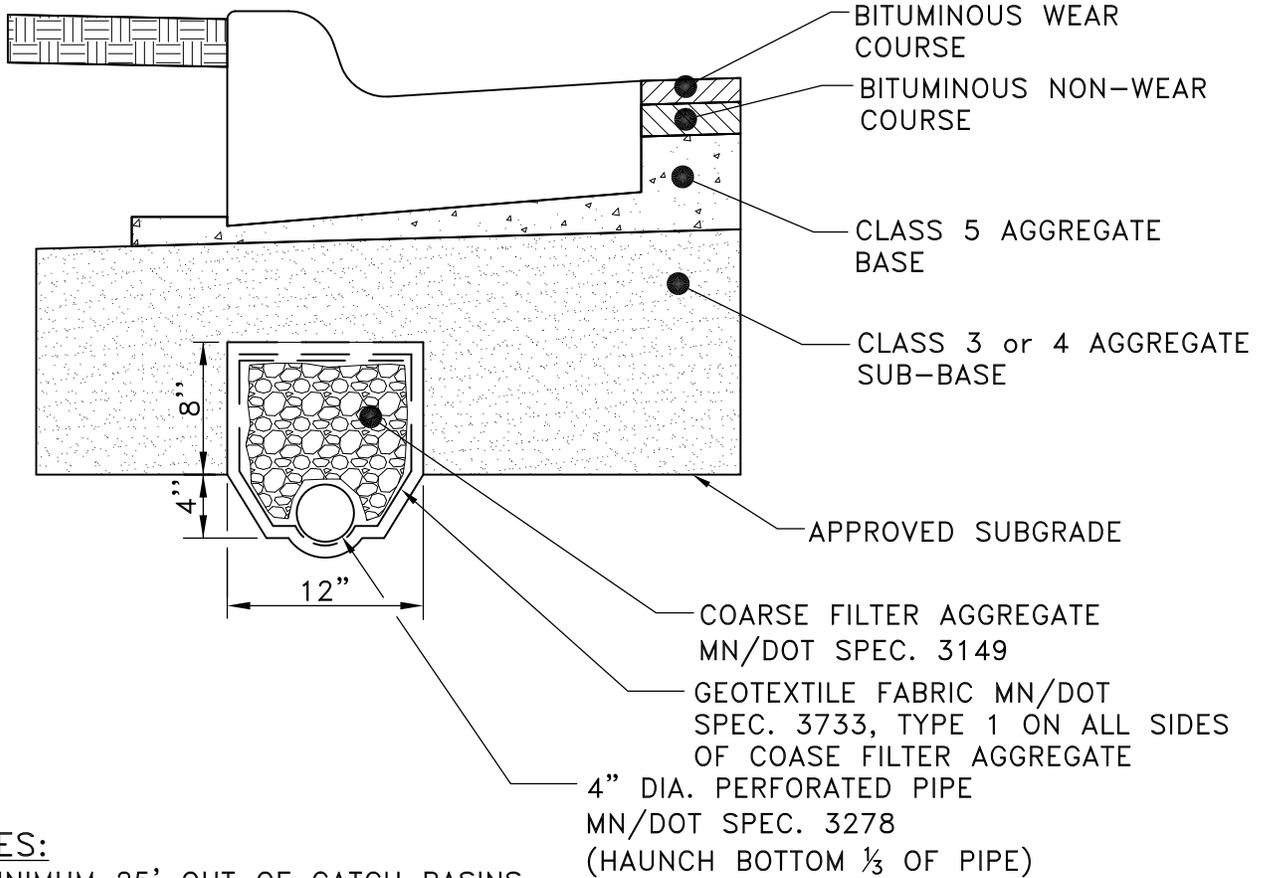


CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
411



TOP VIEW



NOTES:

1. MINIMUM 25' OUT OF CATCH BASINS.
2. MINIMUM SLOPE OF PERFORATED PIPE SHALL BE 1%.

LONGITUDINAL PERMEABLE AGGREGATE BASE (P.A.B.) DRAIN

NO SCALE

Mar 19, 2013 - 10:58am
K:\cad_eng\Details\OTSEGO_REV13.dwg\STORM\Stm-412.dwg

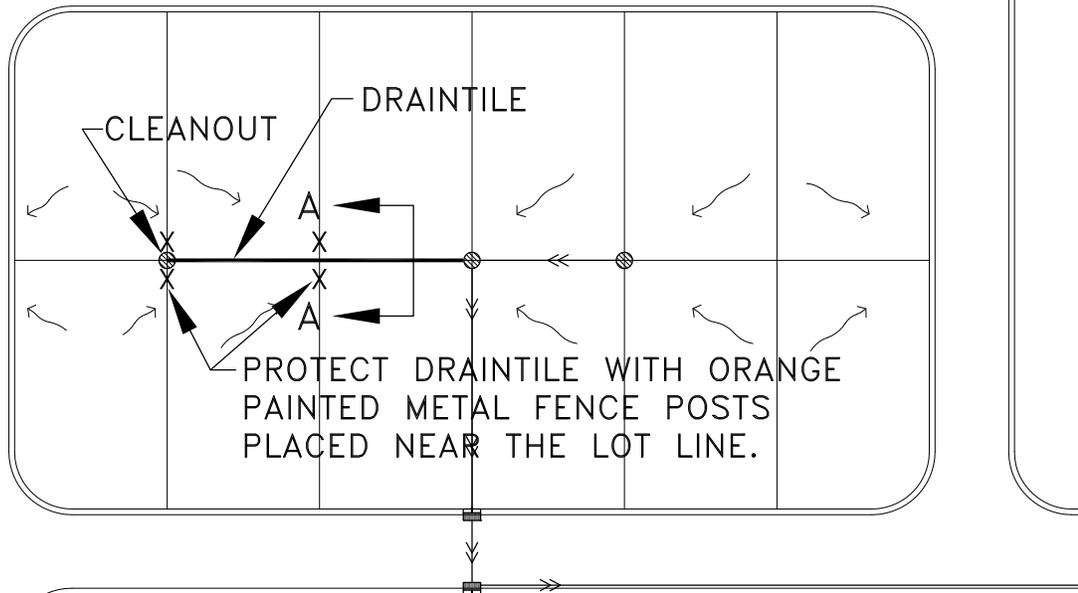
APPROVED

REVISED
5-10-07



CITY OF
Otsego
MINNESOTA

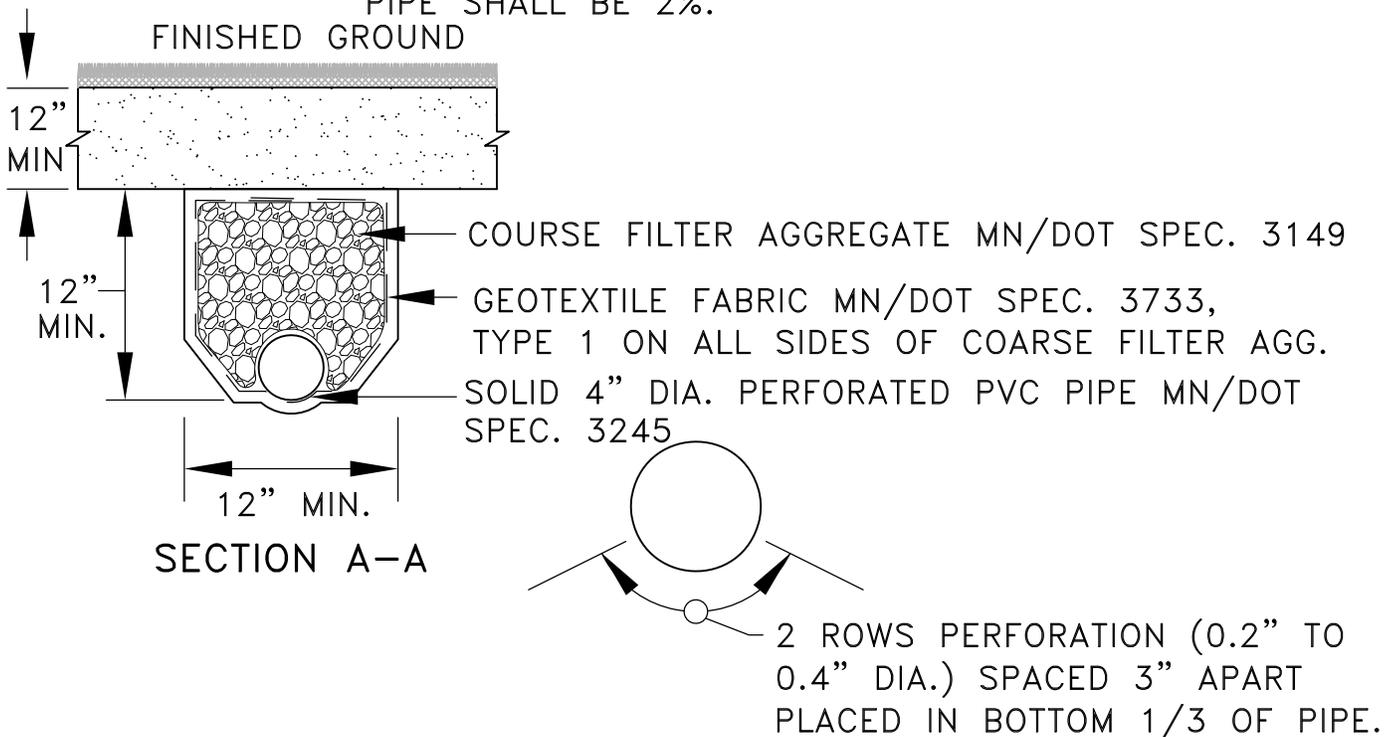
STANDARD PLATE NO.
412



PLAN VIEW

NOTES:

1. IN CLAY SOILS, DRAINTILE SHALL BE PLACED ALONG THE REAR LOT LINES SO THAT NO LOT IS MORE THAN ONE LOT WIDTH AWAY FROM A STORM SEWER STRUCTURE. CLEANOUT(S) SHALL BE BROUGHT TO FINISHED GROUND AT ALL BENDS AND END OF LINES.
2. MINIMUM TRANSVERSE SLOPE OF PERFORATED PIPE SHALL BE 2%.



REAR YARD DRAIN TILE DETAIL

NO SCALE

Oct 09, 2015 - 11:20am
K:\cad_eng\Details\OTSEGO_REV15\Stm-413.dwg

APPROVED

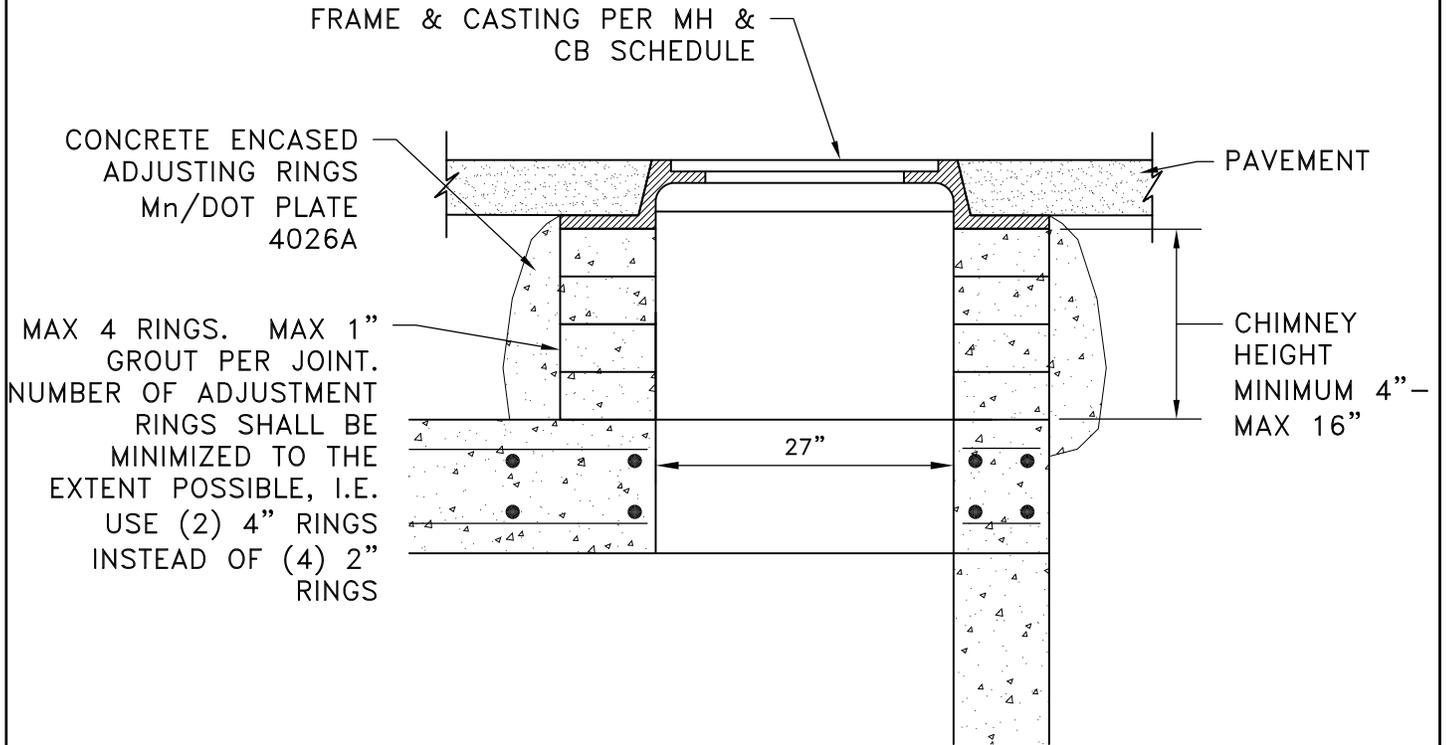
REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
413

Oct 09, 2015 - 11:04am
 K:\cad_eng\Details\OTSEGO_REV15\Stm-414.dwg



NOTES:

1. PRECAST CONCRETE OR BRICK CHIMNEY RINGS MAY BE USED FOR ALL CATCH BASINS, EXISTING STORM MANHOLES, AND ANY NEW MANHOLES OUTSIDE OF PAVED AREAS AND WITHIN CURB AND GUTTER.
2. STORM MANHOLES WITHIN PAVED AREAS SHALL USE HDPE "PLASTIC" RINGS AND CONFORM TO STD PLATE 309
3. CONCRETE ENCASED ADJUSTING RINGS Mn/DOT PLATE 4026A
4. SHIMS USED FOR LEVELING SHALL BE METAL OR CONCRETE

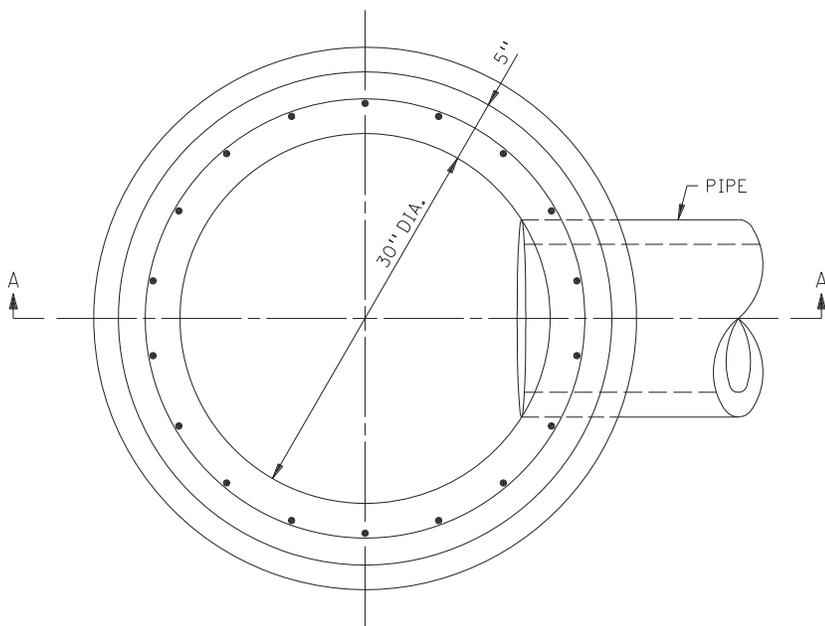
STORM MANHOLE ADJUSTMENT RINGS

NO SCALE

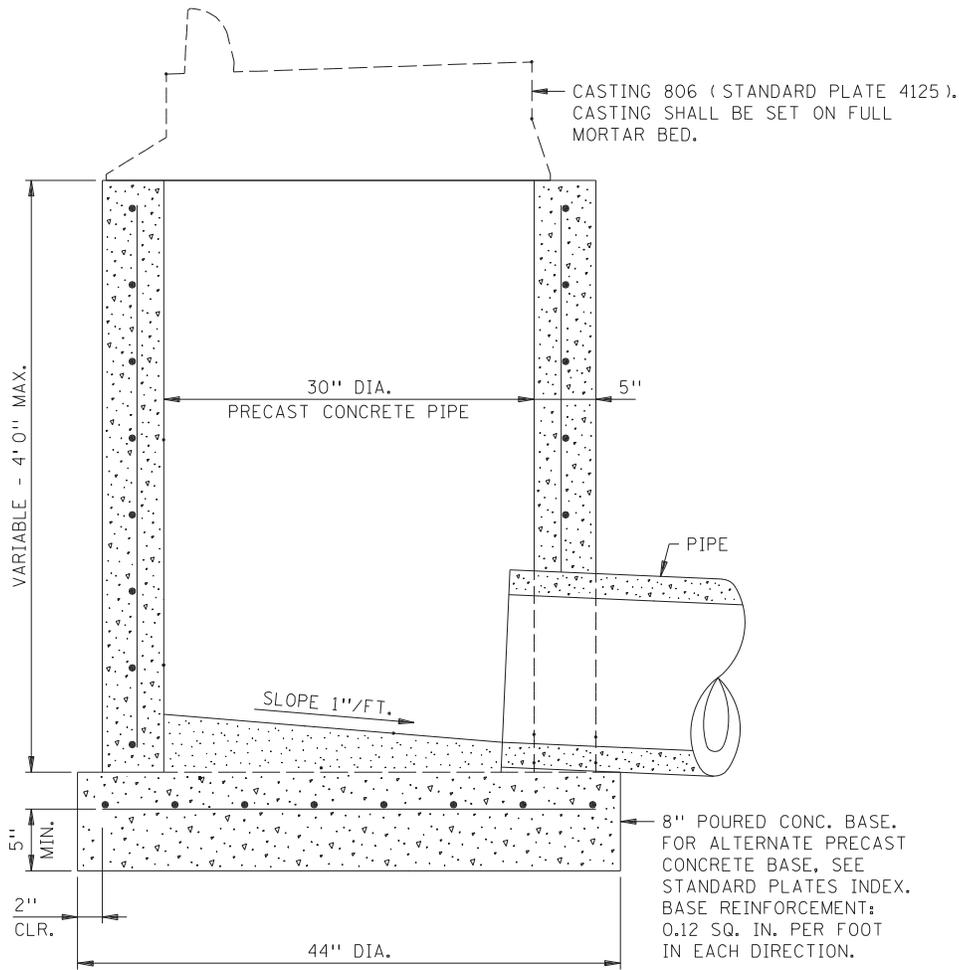
APPROVED
REVISED
8-18-15



STANDARD PLATE NO.
414



TOP VIEW



SECTION A-A

NOTES:

AS AN OPTION, BRICK OR CONCRETE BLOCK MASONRY MAY BE USED. FOR MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD PLATE 4002. CONE SECTION DETAILS OF 4002 DO NOT APPLY.

REINFORCING:
SINGLE LINE STEEL WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT OF HEIGHT.

DESIGN N

APPROVED MARCH 14, 1996

Donald J. Robinson

STATE DESIGN ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

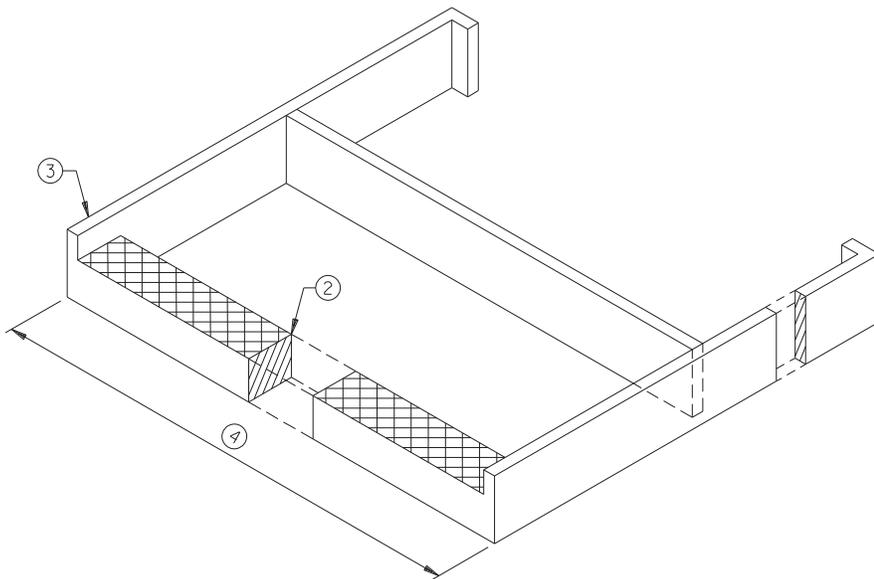
30" PRECAST CATCH BASIN

SPECIFICATION
REFERENCE
2506

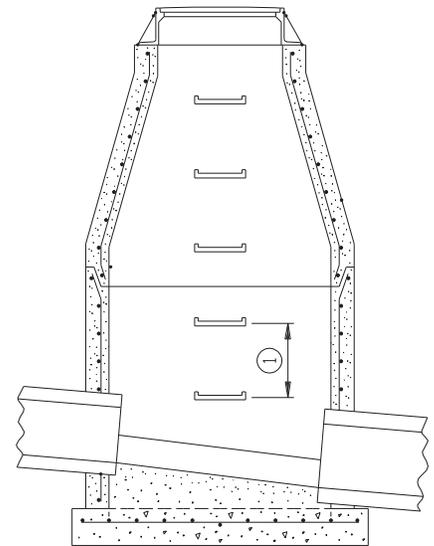
REVISED
8-22-96

STANDARD
PLATE
NO.

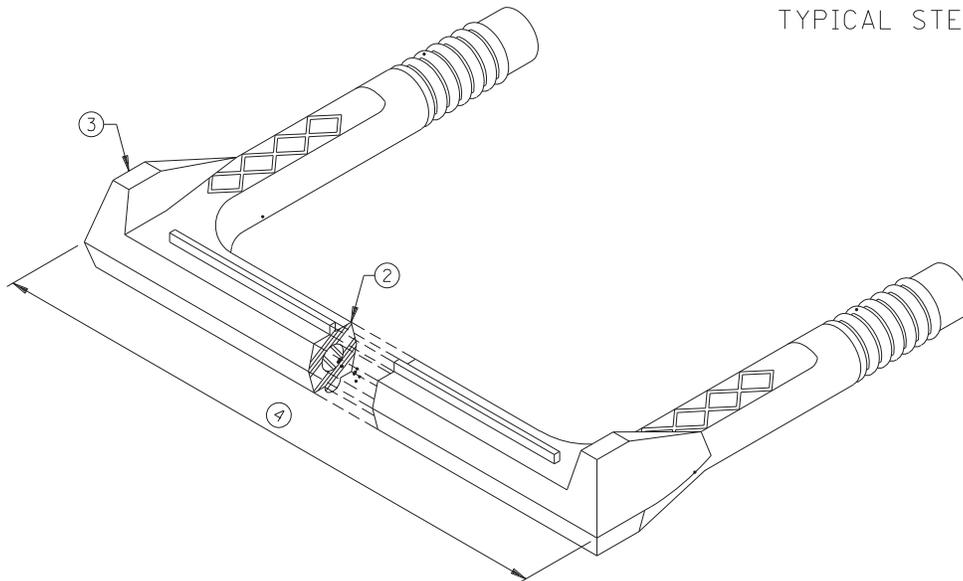
4003B



TYPICAL METAL STEP



TYPICAL STEP ALIGNMENT



TYPICAL REINFORCED PLASTIC STEP

NOTES:

STEPS SHOWN ARE BASIC DESIGNS ONLY. FINAL CONFIGURATIONS MAY VARY FROM THESE DRAWINGS.

VARIATIONS IN THE ABOVE DESIGNS WHICH WILL NOT DECREASE STRENGTH WILL BE PERMITTED.

THE OFFICE OF MATERIALS, RESEARCH AND ENGINEERING WILL MAINTAIN A LISTING OF APPROVED MANHOLE STEPS. CURRENTLY APPROVED STEPS ARE ALUMINUM, CAST IRON AND STEEL REINFORCED PLASTIC. SELECTION OF APPROVED STEP DESIGN IS THE OPTION OF THE CONTRACTOR OR SUPPLIER.

ALUMINUM STEPS SHALL CONFORM TO ASTM B26-64A, ALLOY AA 514.0. EMBEDDED LEG SECTIONS SHALL BE GIVEN A NEOPRENE PROTECTIVE COATING OR EQUIVALENT FOR CORROSION PROTECTION. COATINGS SHALL BE APPROVED BY MATERIALS ENGINEERING.

EXCEPT AS OTHERWISE NOTED ON THIS PLATE, STEPS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C478.

STEPS SHALL BE EMBEDDED IN THE RISER OR CONICAL TOP SECTION WALL A MINIMUM DISTANCE OF 3 IN.

THE RUNG OR CLEAT SHALL PROJECT A MINIMUM CLEAR DISTANCE OF 4 IN. FROM THE WALL OF THE RISER OR CONE SECTION MEASURED FROM THE POINT OF EMBEDMENT.

THE MIN. CLEAR DISTANCE BETWEEN THE RUNG OR CLEAT AND THE OPPOSITE WALL OF THE MANHOLE RISER OR CONE SHALL BE 18 IN. MEASURED AT THE CENTER FACE OF THE STEP.

- ① STEPS SHALL BE SPACED AT A MAXIMUM DESIGN DISTANCE OF 16 IN. APART.
- ② STEPS SHALL HAVE A MINIMUM CROSS SECTION DIMENSION OF 1 IN.
- ③ MINIMUM VERTICAL SIDE DIMENSION TO PREVENT FOOT FROM SLIPPING OFF IS 1/2".
- ④ THE MINIMUM WIDTH OF RUNGS OR CLEATS SHALL BE 10 IN.

APPROVED DEC. 30, 1996

Gerald J. Rofbrink
STATE DESIGN ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

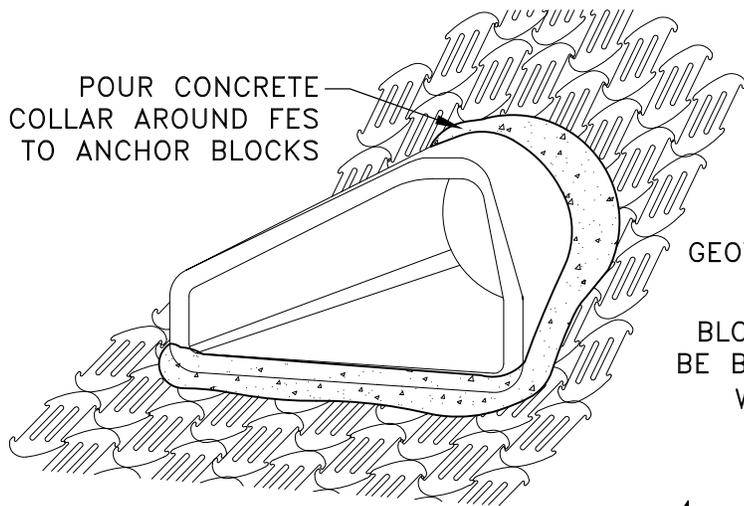
MANHOLE OR CATCH BASIN STEP

SPECIFICATION
REFERENCE

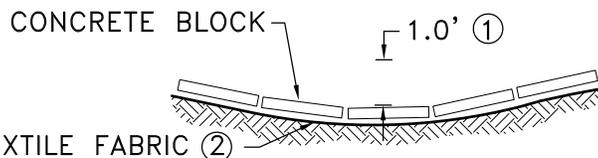
2506

STANDARD
PLATE
NO.

4180J



POUR CONCRETE COLLAR AROUND FES TO ANCHOR BLOCKS



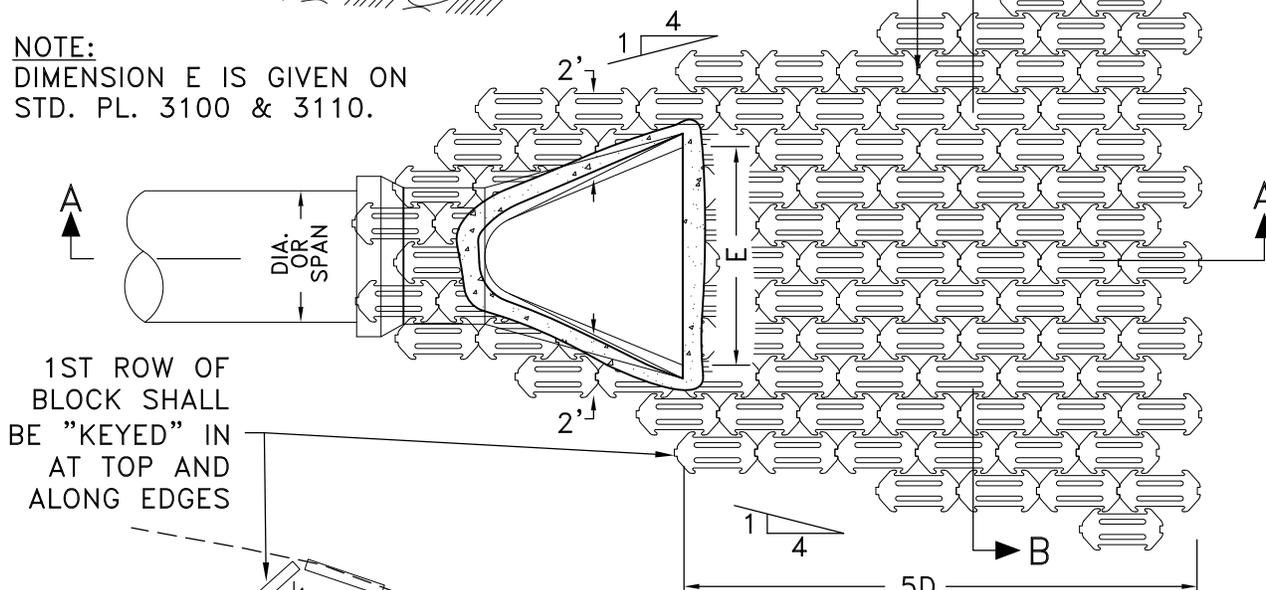
CONCRETE BLOCK 1.0' ①

GEOTEXTILE FABRIC ②

SEC. B-B

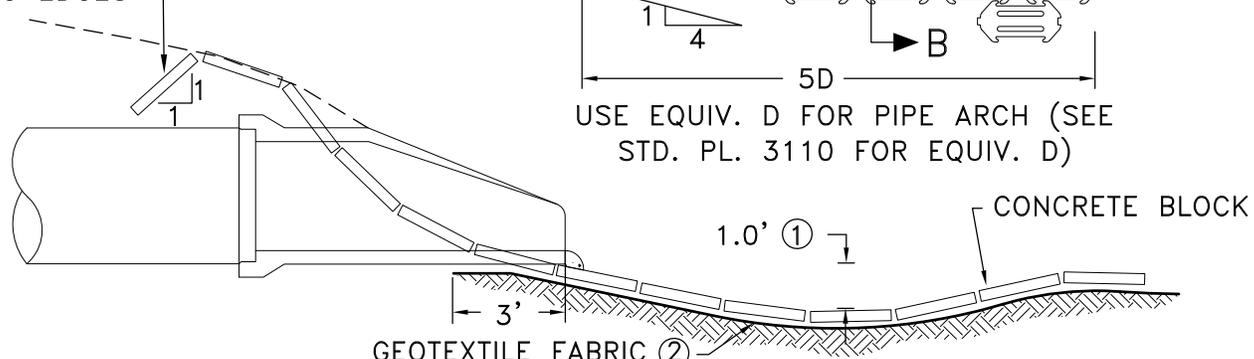
BLOCK SHALL BE BACKFILLED W/TOPSOIL

NOTE:
DIMENSION E IS GIVEN ON
STD. PL. 3100 & 3110.



1ST ROW OF BLOCK SHALL BE "KEYED" IN AT TOP AND ALONG EDGES

USE EQUIV. D FOR PIPE ARCH (SEE STD. PL. 3110 FOR EQUIV. D)



GEOTEXTILE FABRIC ②
SEC. A-A

ARTICULATED CONCRETE BLOCK SHALL BE A HANDPLACED INTERLOCKING CONCRETE BLOCK SYSTEM, CABLE CONNECTED CONCRETE BLOCK MAT, OR APPROVED EQUAL.

- ① FOR PIPES GREATER THAN OR EQUAL TO 48", USE 2.0'
- ② GEOTEXTILE FABRIC PER Mn/DOT SPEC. 3733. FABRIC SHALL BE OVERSIZED A MINIMUM OF 12" AND COVER THE ENTIRE AREA UNDER THE BLOCK MAT AND EXTEND UNDER THE CULVERT APRON 3 FEET.
- ③ IF A CABLE CONCRETE SYSTEM IS USED, MULTIPLE MATS MUST BE TIED TOGETHER PER MANUFACTURERS SPEC. AND ALL CABLES PROTRUDING BEYOND THE FINISHED EDGES SHALL BE CUT FLUSH TO THE BLOCK.

ARTICULATED CONCRETE BLOCK AT R.C.P. OUTLET

NO SCALE

Aug 11, 2015 - 5:26pm
K:\cad_eng\Details\OTSEGO_REV15\Ers-500.dwg

APPROVED

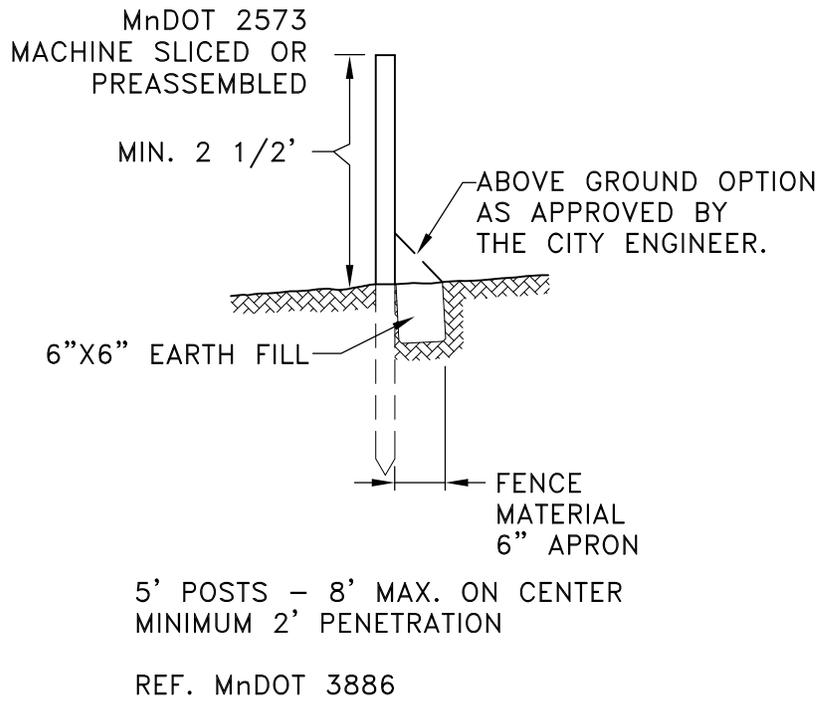
REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
500

Mar 19, 2013 - 9:42am
K:\cad_eng\Details\OTSEGO_REV13\dwg\EROSION\Ers-501.dwg



SILT FENCE
NO SCALE

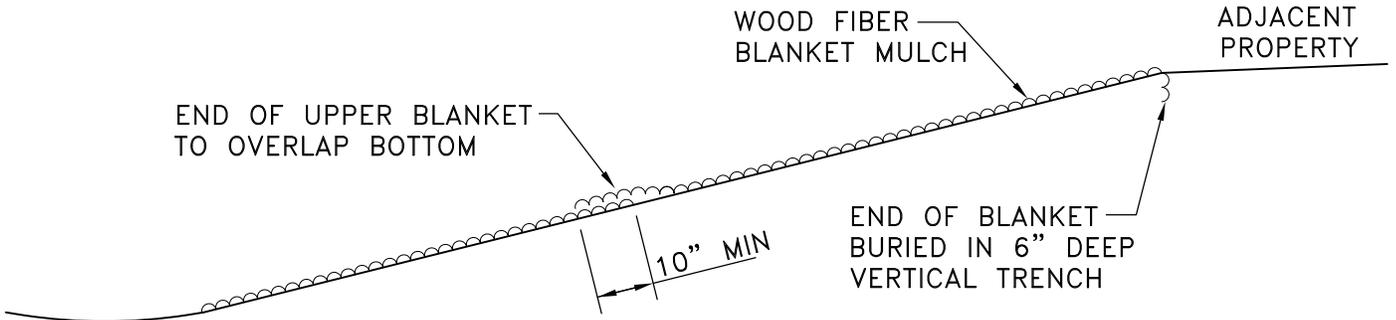
APPROVED

REVISED
5-10-07



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
501



NOTE:

WOOD FIBER BLANKET SHALL BE PLACED AND STAPLED ACCORDING TO Mn/DOT SPECIFICATION 2575.3K2 WITH THE FOLLOWING EXCEPTIONS. ADJACENT STRIP EDGES SHALL BE OVERLAPPED A MINIMUM OF 6".

PLASTIC OR WOOD BIODEGRADABLE STAKES OR STAPLES SHALL BE USED IN PLACE OF METAL WIRE STAPLES.

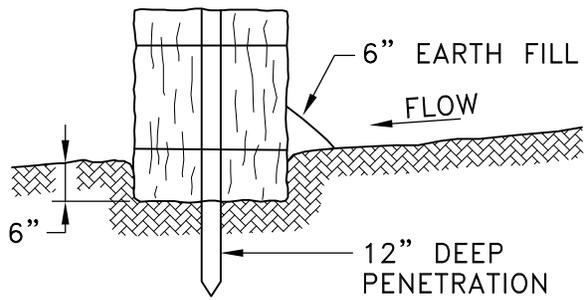
ECOSTAKES AND BIOSTAKES ARE ACCEPTABLE PRODUCTS FOR USE TO FASTEN WOOD FIBER BLANKET.

WOOD FIBER BLANKET INSTALLATION ON A CUT SLOPE
NO SCALE

Mar 19, 2013 - 9:42am
K:\cad_eng\Details\OTSEGO_REV13.dwg\EROSION\Ers-502.dwg

APPROVED		STANDARD PLATE NO. 502
REVISED MARCH 2005		

Mar 19, 2013 - 9:43am
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MINIMUM 2 STAKES PER BALE

STRAW/HAY BALE BARRIER PLACEMENT

NO SCALE

APPROVED

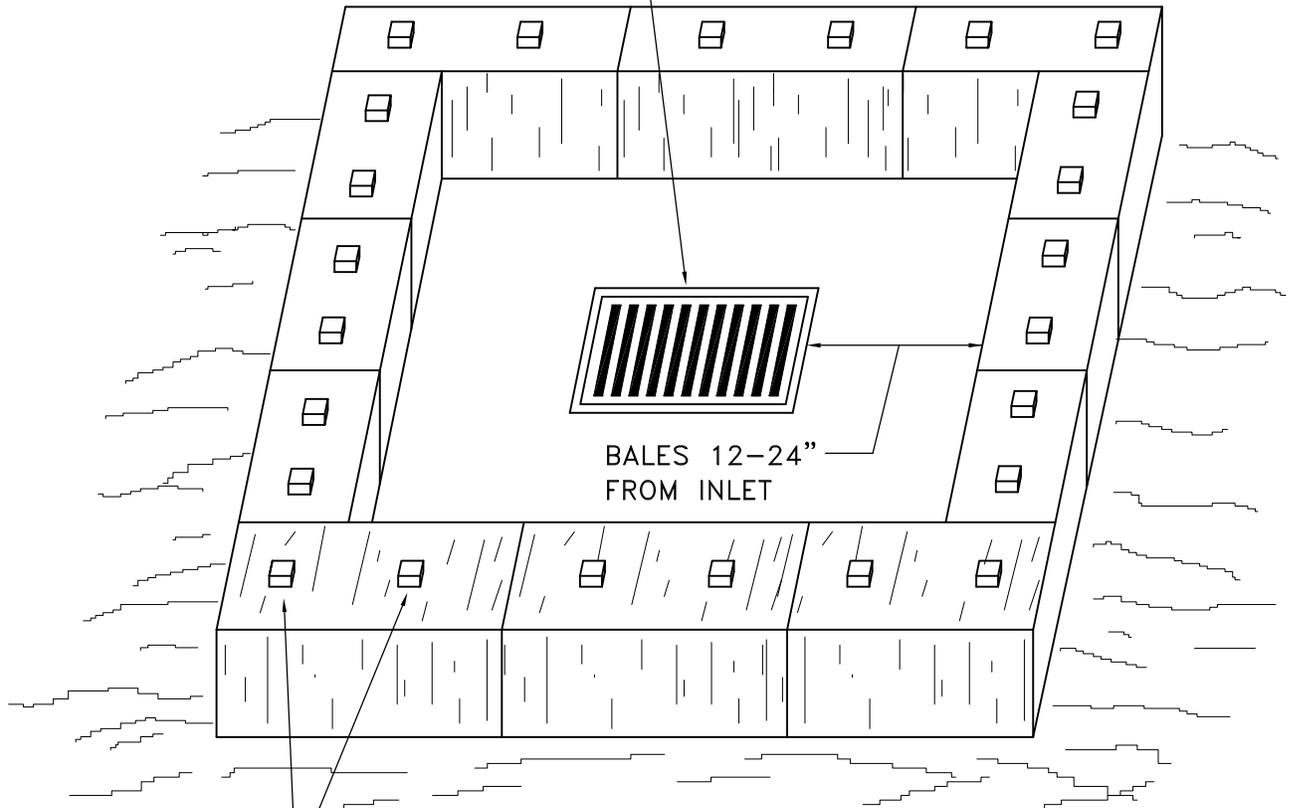
REVISED



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
503

DROP INLET WITH GRATE

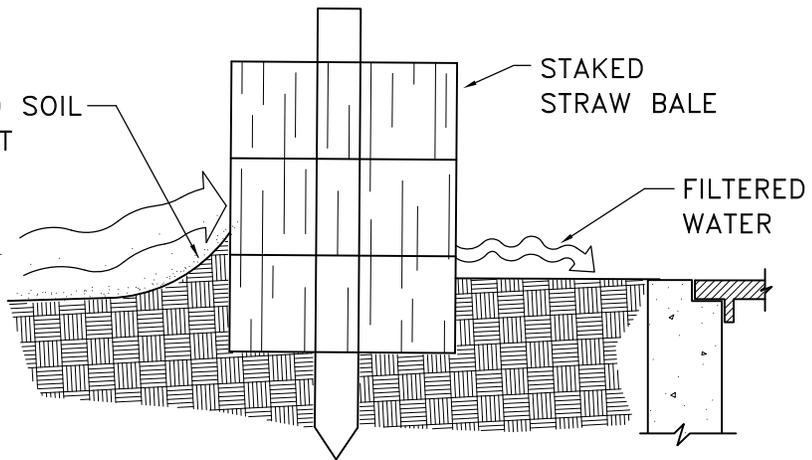


BALES 12-24"
FROM INLET

STRAW BALES
STAKED WITH 2
STAKES PER BALE

COMPACTED SOIL
TO PREVENT
PIPING

RUNOFF WATER
WITH SEDIMENT



STAKED
STRAW BALE

FILTERED
WATER

STRAW BALE DROP INLET SEDIMENT FILTER

NO SCALE

Mar 19, 2013 - 9:43am
K:\cad_eng\Details\OTSEGO_REV13\dwg\EROSION\Ers-504.dwg

APPROVED

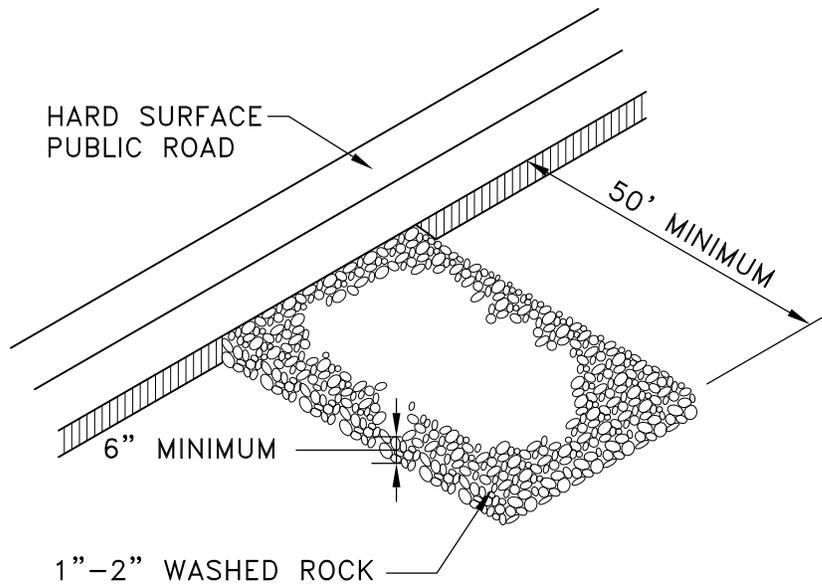
REVISED



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
504

Mar 19, 2013 - 9:44am
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ROCK CONSTRUCTION ENTRANCE

NO SCALE

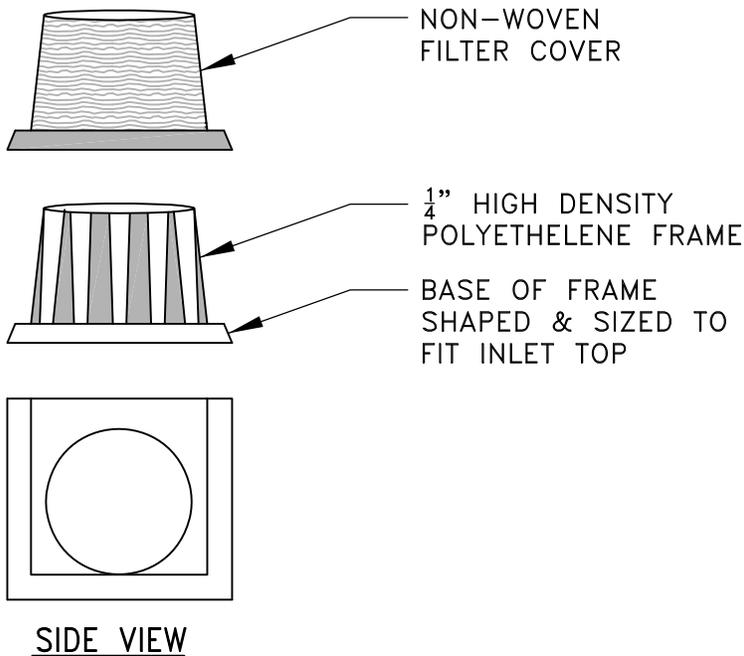
APPROVED

REVISED



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MINNESOTA

STANDARD PLATE NO.
505



TYPICAL CONSTRUCTION SEQUENCE
FOR SILT-SAVER FRAME & FILTER

1. EXCAVATE APPROXIMATELY 4" TO 6" BELOW THE TOP OF THE INLET STRUCTURE.
2. PLACE THE FRAME ONTO THE INLET STRUCTURE, ENSURING PROPER SEATING OF FRAME TO STRUCTURE.
3. SLIDE THE FILTER OVER THE FRAME.
4. FILL THE FILTER POCKETS WITH SOIL, #57 GRAVEL OR EQUIVALENT. THE FILTER POCKETS SHOULD BE COMPLETELY FILLED TO ENSURE A GOOD SEAL BETWEEN THE GROUND AND INLET STRUCTURE.
5. BACK FILL AROUND THE FRAME AND FILTER ASSEMBLY IS NOT REQUIRED TO COMPLETE INSTALLATION; HOWEVER, BACK FILLING MAY BE NECESSARY TO COMPLETE EXCAVATION REQUIREMENTS FOR THE SITE.

SILT-SAVER
NO SCALE

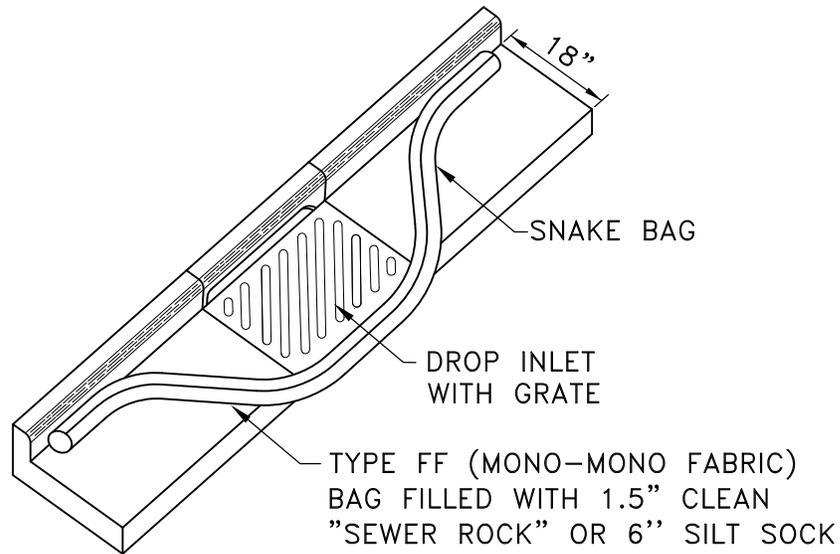
SILT-SAVER, INC.
WWW.SILTSAVER.COM

Mar 19, 2013 - 9:45am
K:\cad_eng\Details\OTSEGO_REV13\dwg\EROSION\Ers-506.dwg

APPROVED
REVISED

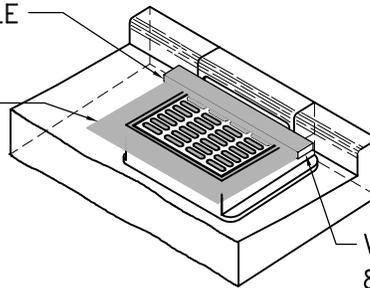


STANDARD PLATE NO.
506



AN ADDITIONAL 18" OF GEOTEXTILE IS WRAPPED AROUND THE WOOD 2"X 4" AND STAPLED.

GEOTEXTILE SIZE SHALL BE 8" MIN. GREATER ON ALL SIDES OF THE INLET COVER. PLACE GEOTEXTILE UNDER INLET COVER. ①



WOOD 2"X4" EXTENDED 8" BEYOND GRATE WIDTH ON BOTH SIDES.

- ① ALL GEOTEXTILE USED FOR INLET PROTECTION SHALL BE MONOFILAMENT IN BOTH DIRECTIONS, MEETING SPEC. 3886 FOR MACHINE SLICED.
- ② WIMCO'S MAY BE USED IN PLACE OF ABOVE.
- ③ ALL DROP INLET PROTECTION SHALL BE REMOVED PRIOR TO WINTER FREEZE.

DROP INLET PROTECTION

NO SCALE

Mar 19, 2013 - 9:45am
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APPROVED

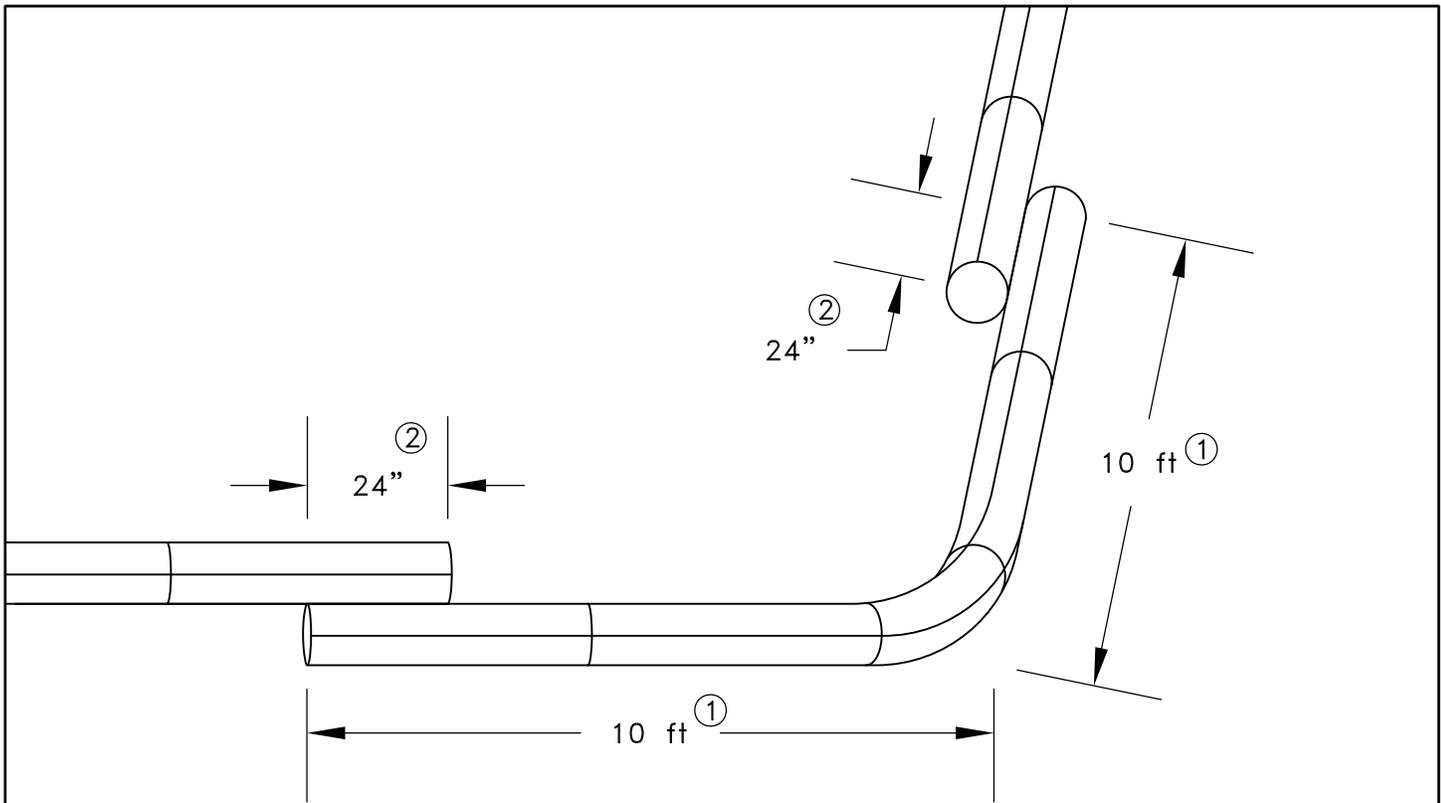
REVISED
FEB 2009



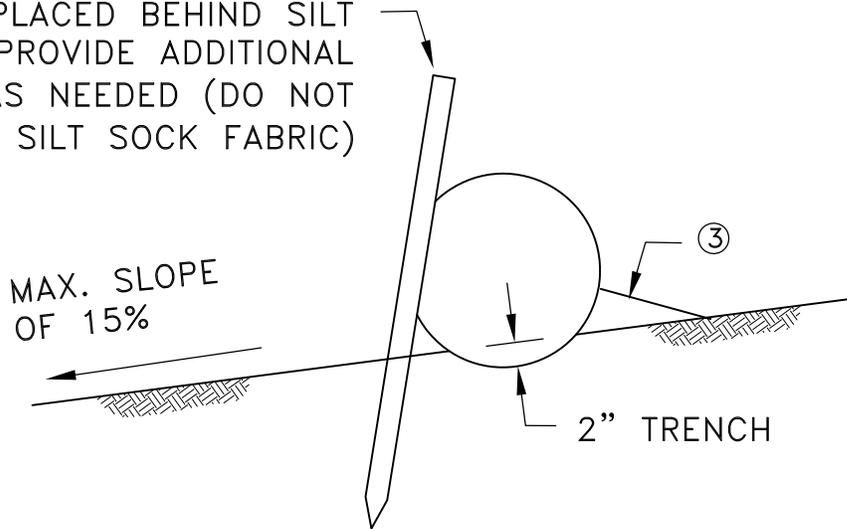
CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
507

Mar 19, 2013 - 9:46am
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STAKES PLACED BEHIND SILT SOCK TO PROVIDE ADDITIONAL SUPPORT AS NEEDED (DO NOT PENETRATE SILT SOCK FABRIC)



- ① BREAKS IN SILT SOCK SHALL BE LOCATED A MINIMUM OF 10 FEET FROM ANY SHARP BEND OR CHANGE IN SOCK DIRECTION.
- ② SOCK'S SHALL BE OVERLAPPED A MINIMUM OF 24" WITH THE UPSLOPE SIDE INFRONT.
- ③ SEDIMENT ACCUMULATION OF 1/2 THE SOCK HEIGHT MUST BE REMOVED.

SILT SOCK
NO SCALE

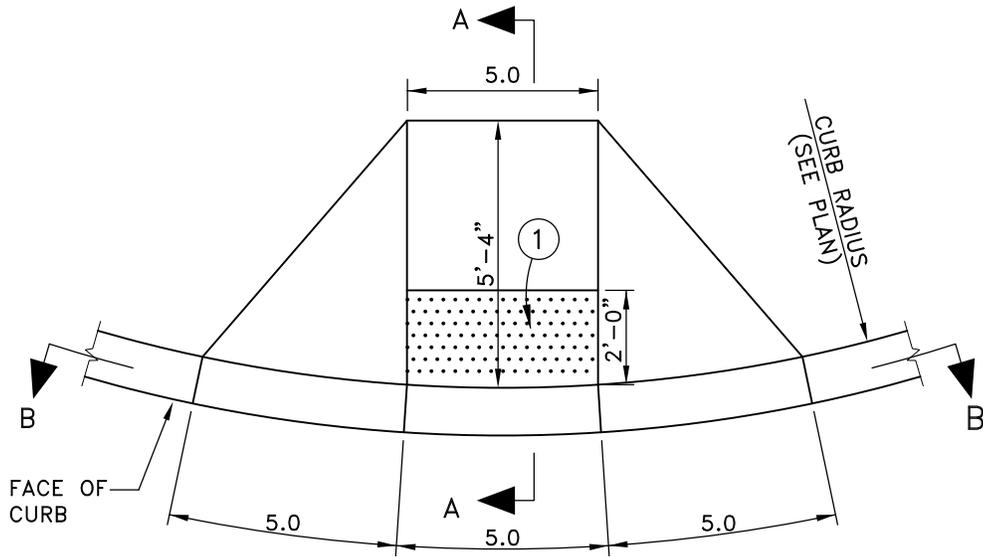
APPROVED

REVISED
FEB 2009

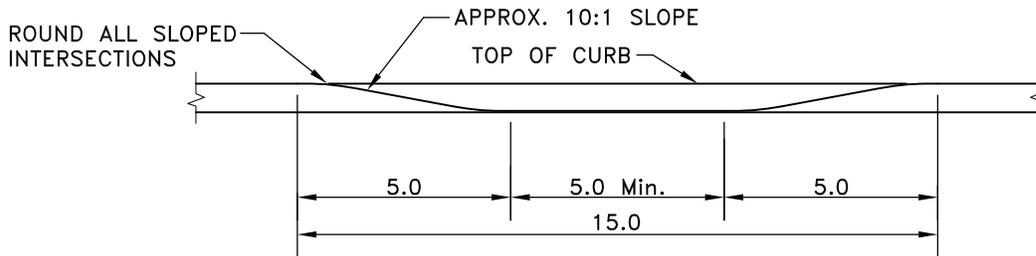


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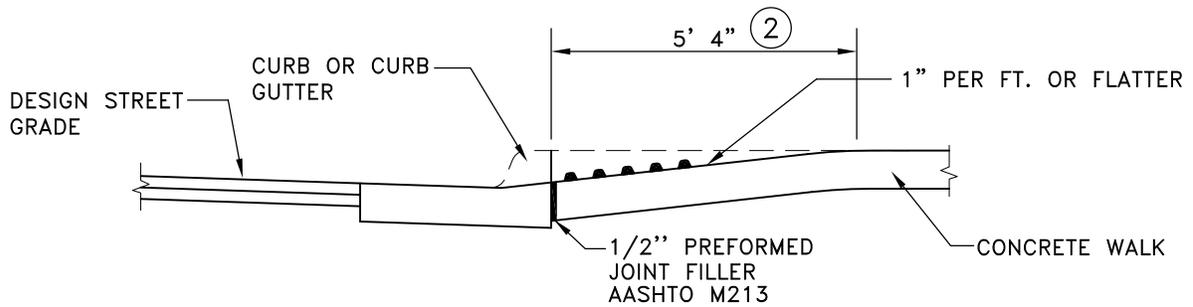
STANDARD PLATE NO.
508



PLAN VIEW OF RAMP



ELEVATION OF RAMP



SECTION A-A

1. ADA REQUIRED TRUNCATED DOME AREA SHALL BE CAST IRON INSERTS AND SHALL COMPLY WITH Mn/DOT STANDARD PLATE NO. 7038A. PRECAST TRUNCATED DOME INSERTS SHALL BE DARK GRAY IN COLOR TO VISUALLY CONTRAST WITH THE ADJACENT SIDEWALK. THE CURB ADJACENT TO THE TRUNCATED DOME INSERTS SHALL BE HAND FORMED SUCH THAT NO GAP EXISTS AS A RESULT OF THE CURVATURE OF THE BACK OF CURB.
2. VARIES WITH CURB HEIGHT. EXAMPLE SHOWN IS FOR 6" CURB HEIGHTS.

PEDESTRIAN CURB RAMP

NO SCALE

Aug 11, 2015 - 5:29pm
K:\cad_eng\Details\OTSEGO_REV15\Curb-701.dwg

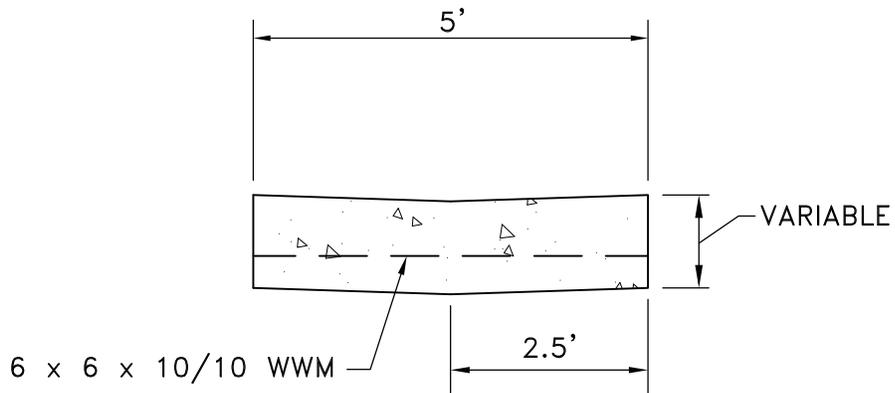
APPROVED

REVISED
8-18-15



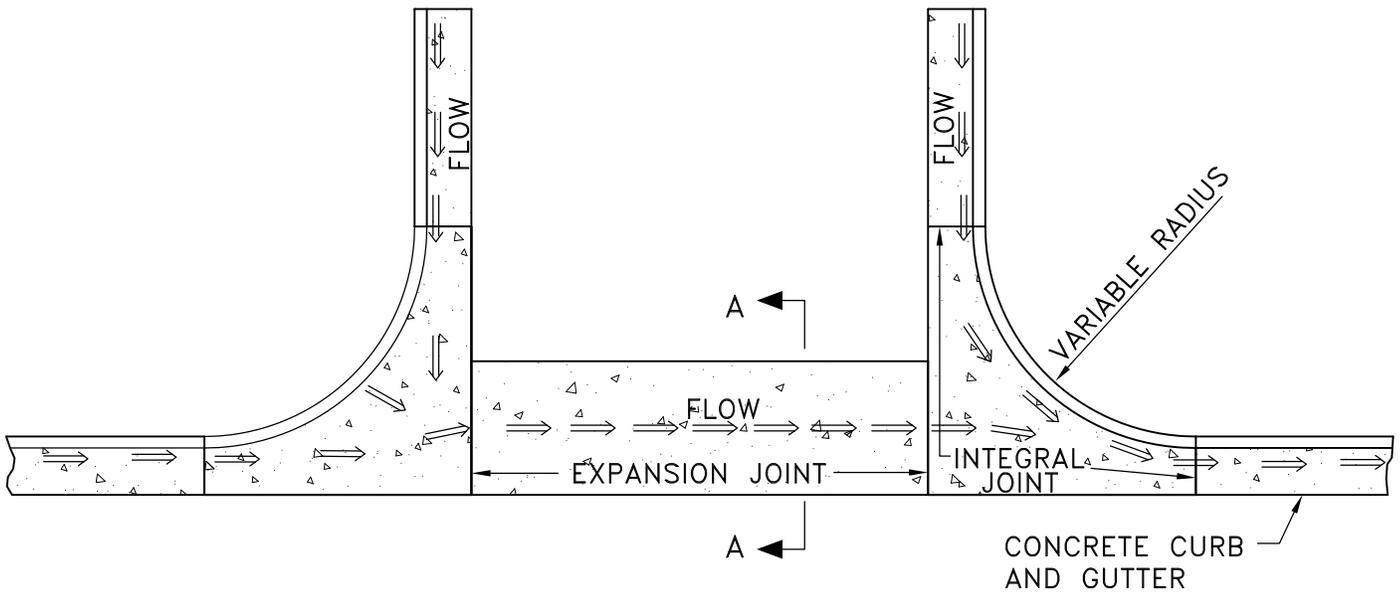
CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
701



NOTE:
 DEPTH OF CONCRETE SHALL
 BE DETERMINED BY TYPE OF
 CURB AND GUTTER

SECTION AA



TYPICAL CROSS GUTTER

NO SCALE

Mar 19, 2013 - 9:48am
 K:\cad_eng\Details\OTSEGO_REV13.dwg\CURB_GUTTER\Curb-702.dwg

APPROVED

REVISED
 JANUARY 2007

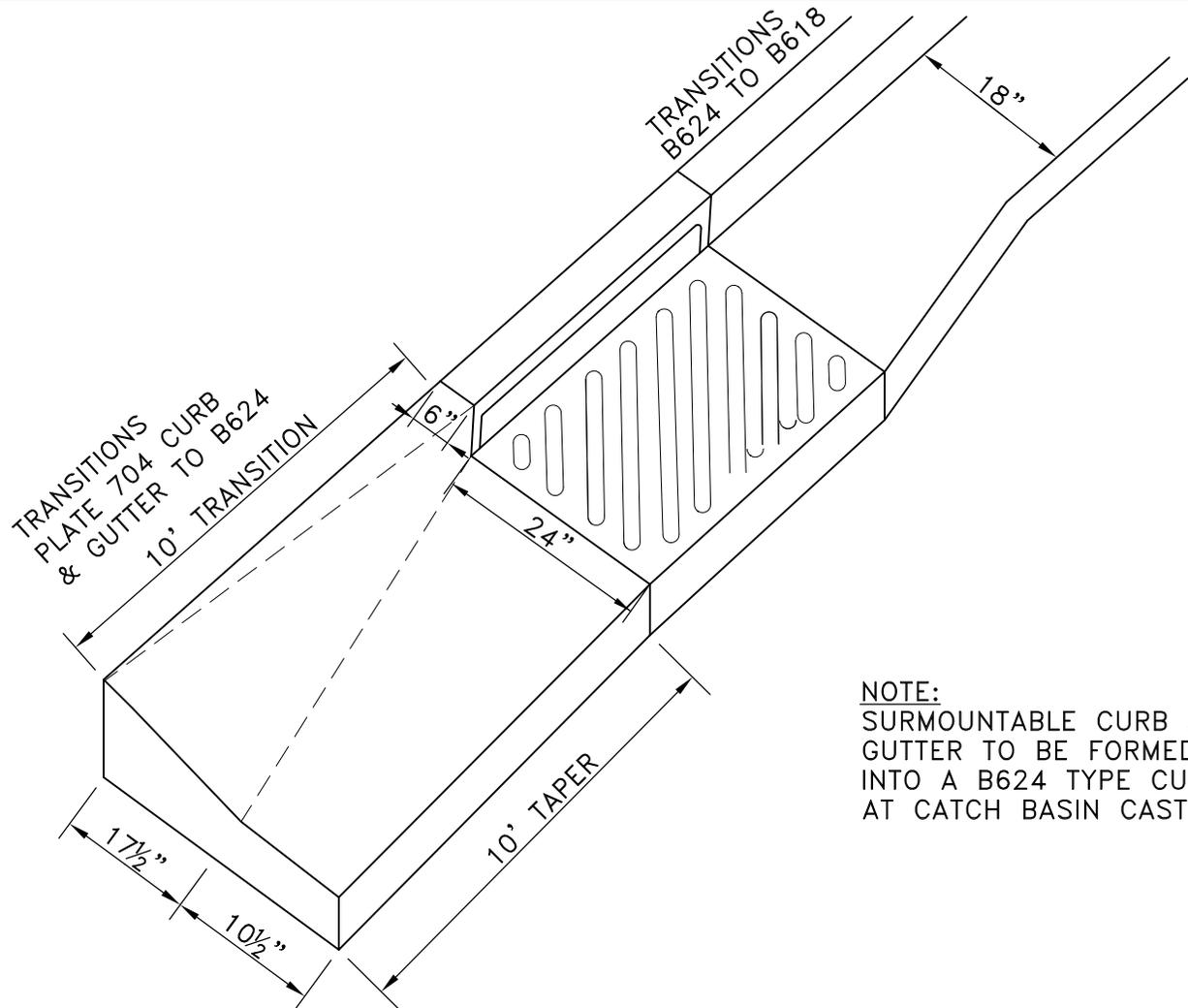


CITY OF
Otsego
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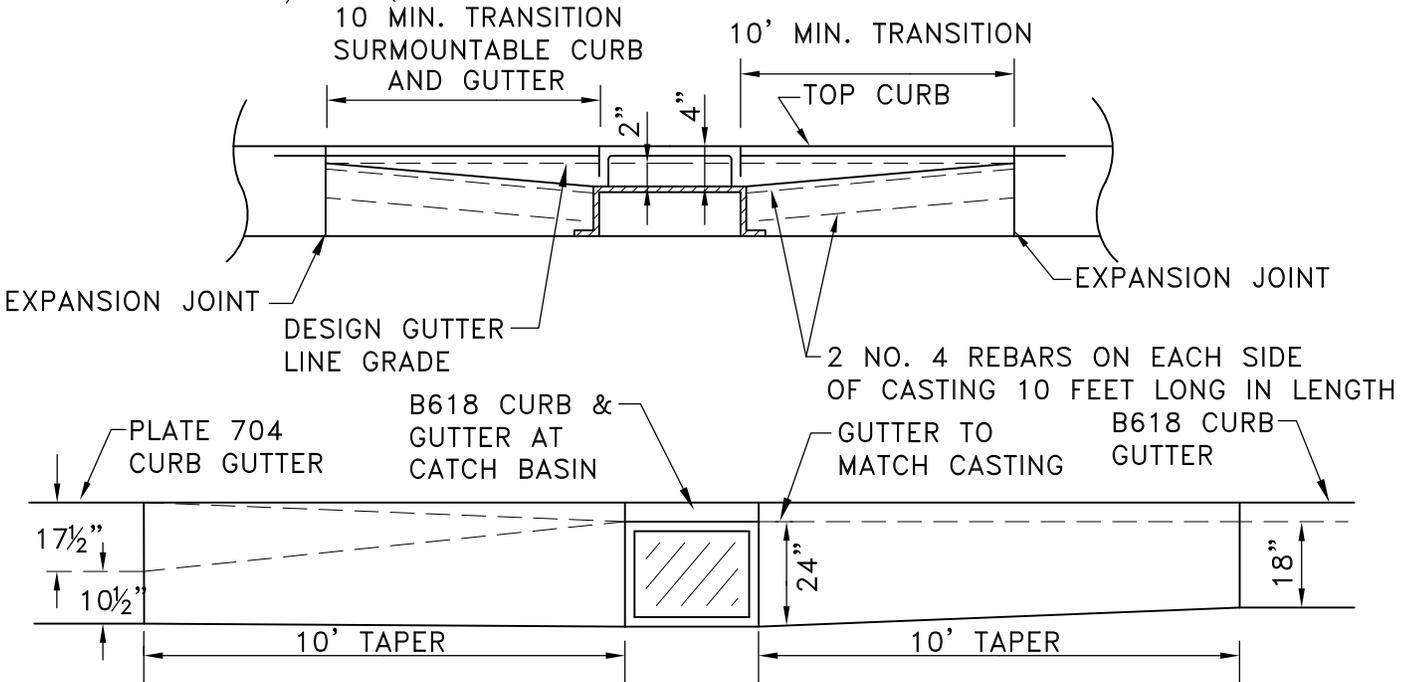
STANDARD PLATE NO.
 702

Mar 19, 2013 - 9:49am

K:\cad_eng\Details\OTSEGO_REV13.dwg\CURB_GUTTER\Curb-703.dwg



NOTE:
 SURMOUNTABLE CURB AND GUTTER TO BE FORMED INTO A B624 TYPE CURB AT CATCH BASIN CASTING.



CURB TRANSITION (B624) AT CATCH BASIN

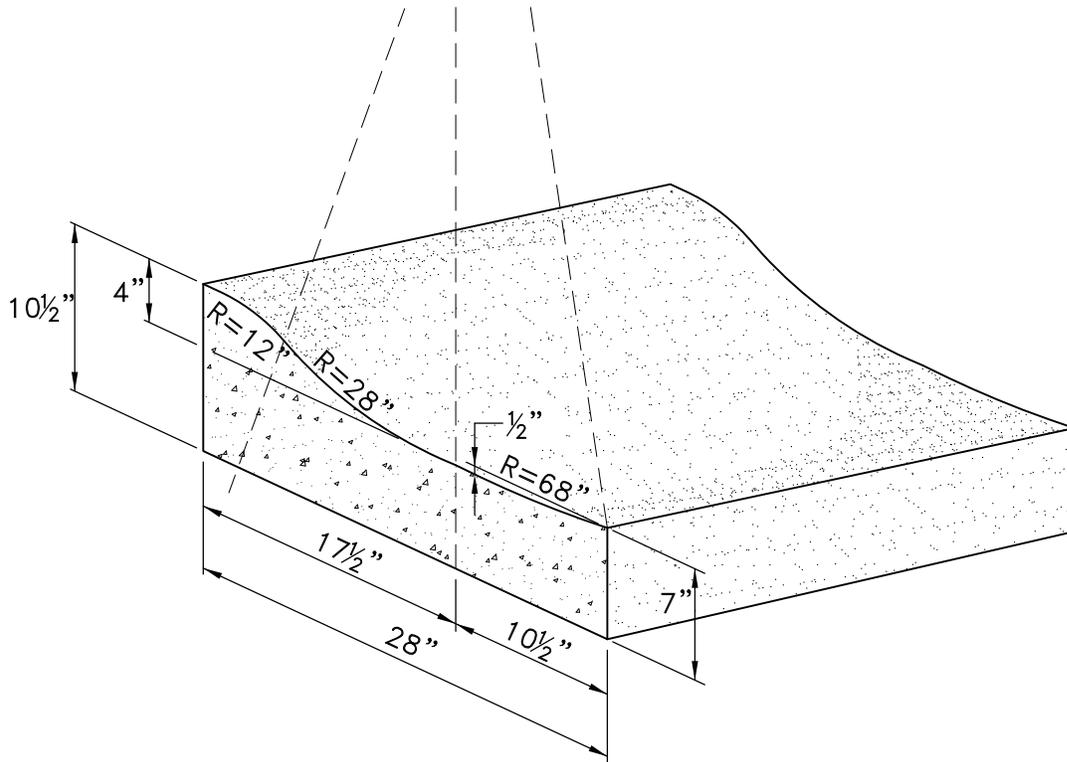
NOT TO SCALE

APPROVED
REVISED 5-10-07



STANDARD PLATE NO.
703

Mar 19, 2013 - 9:50am
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SURMOUNTABLE CONCRETE
CURB AND GUTTER
NO SCALE

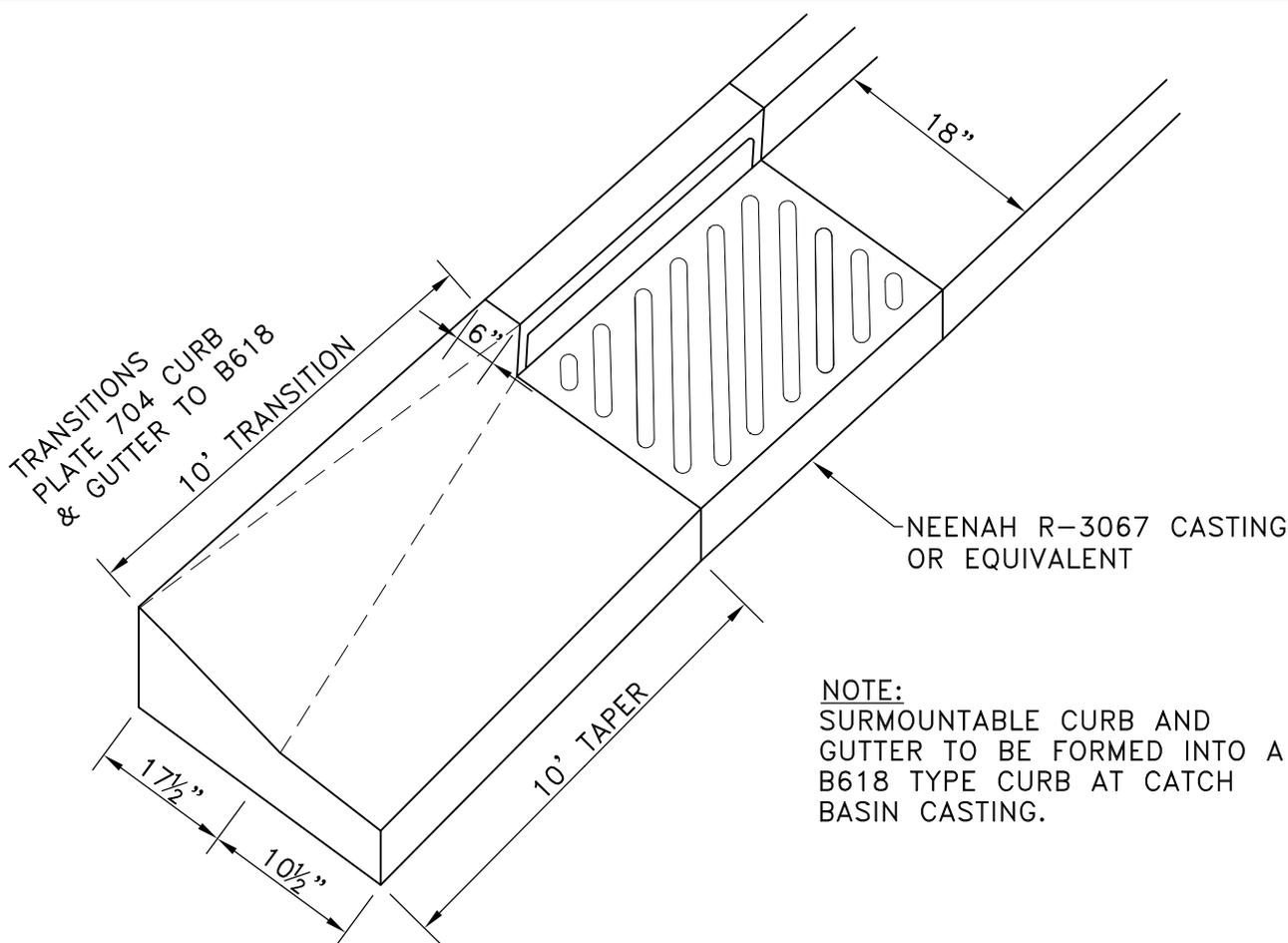
APPROVED

REVISED

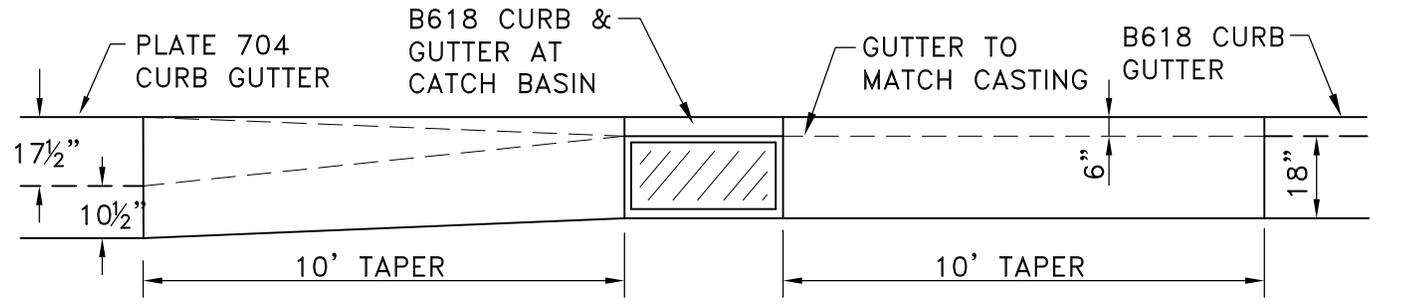
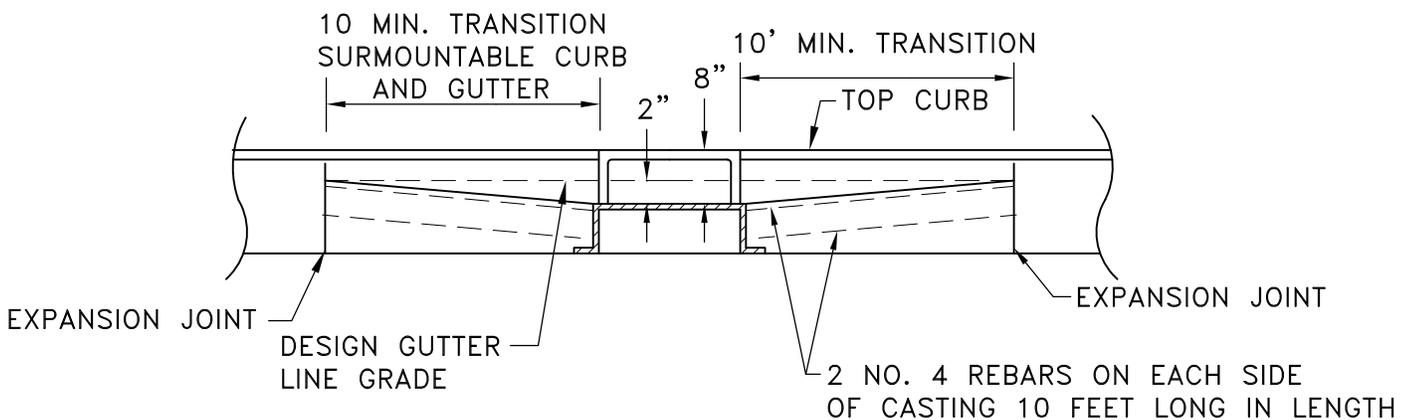


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Otsego
MINNESOTA

STANDARD PLATE NO.
704



NOTE:
SURMOUNTABLE CURB AND
GUTTER TO BE FORMED INTO A
B618 TYPE CURB AT CATCH
BASIN CASTING.



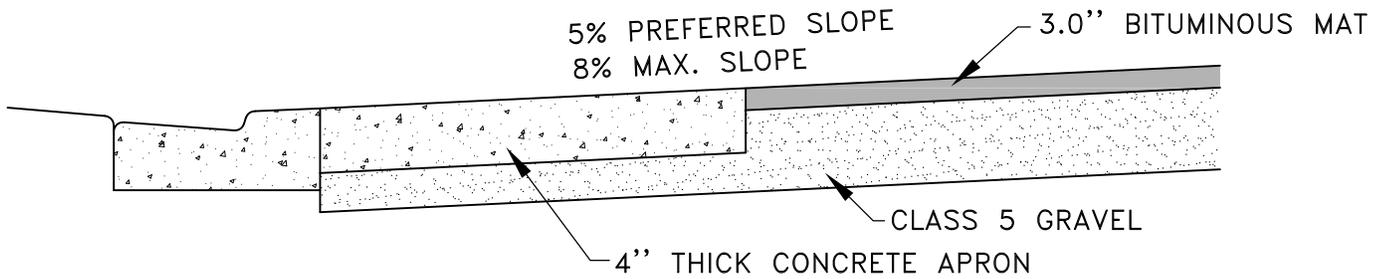
CURB TRANSITION (B618) AT CATCH BASIN
NOT TO SCALE

Mar 19, 2013 - 9:51am
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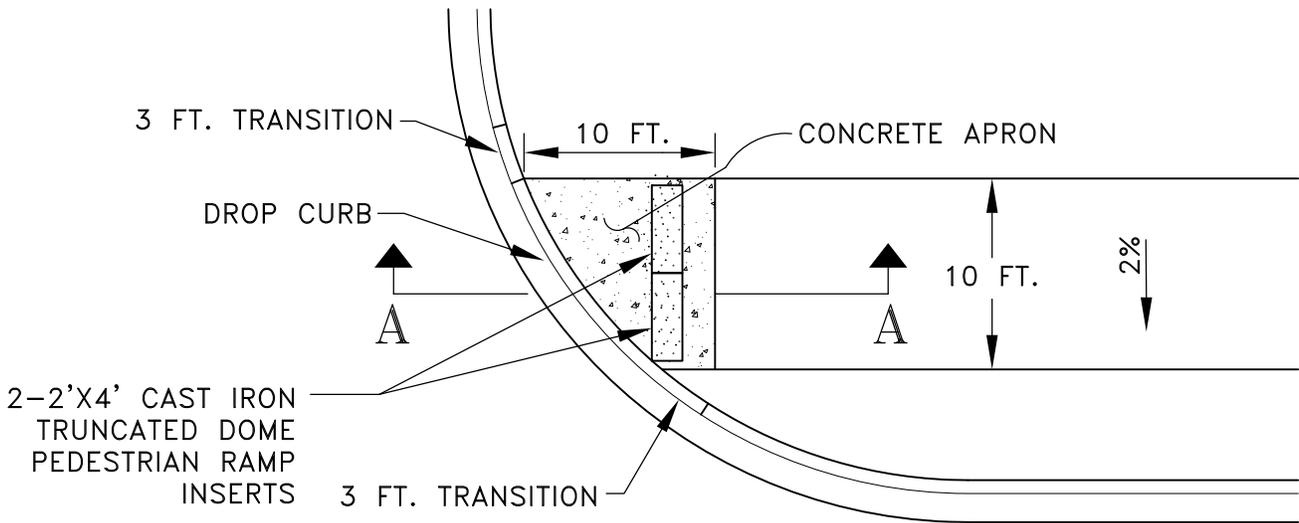
APPROVED
REVISD 5-10-07



STANDARD PLATE NO.
705



SECTION A-A
NO SCALE



TYPICAL DROP CURB - BIKE TRAIL
NO SCALE

Aug 11, 2015 - 5:38pm
K:\cad_eng\Details\OTSEGO_REV15\Curb-706.dwg

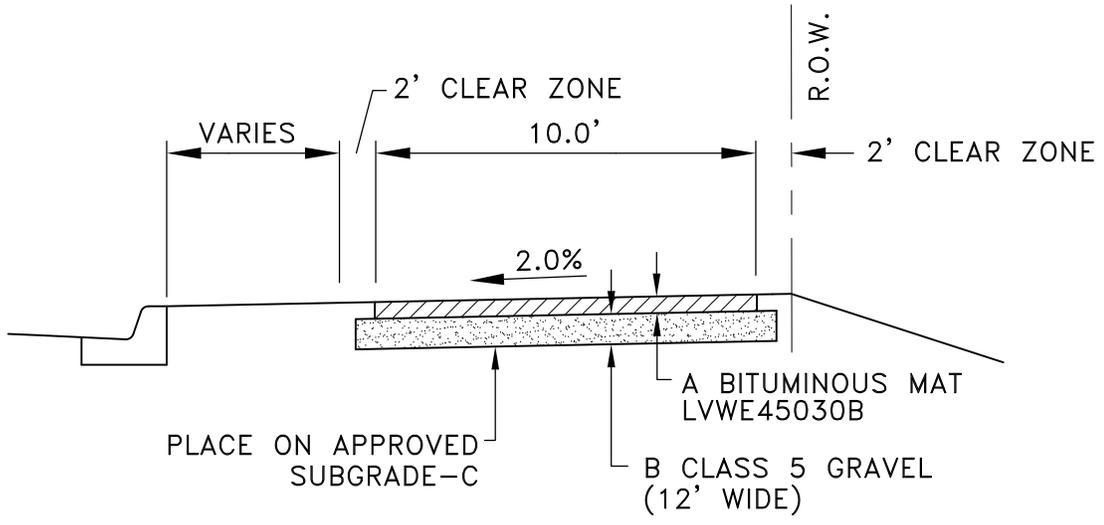
APPROVED

REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
706



TYPICAL SECTION – BIKE TRAIL

NO SCALE

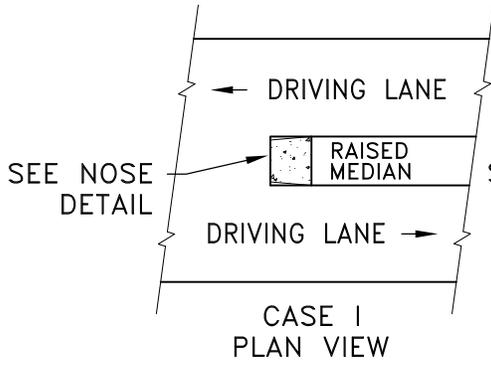
LEGEND				
AASHTP	R VALUE	BITUMINOUS SURFACE	AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2350/2360 A	CLASS 5 3138 B*	CLASS 3 OR 4 3138 C*
A-3	R-70	** 2.5"	** 5"	–
A-4	R-20	3.0"	5"	–
A-6	R-15	3.0"	6"	–
A-7	R-10	3.0"	7"	–
	R-5	3.0"	7"	12"

- * SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER
- ** MINIMUM ALLOWABLE DESIGN THICKNESS

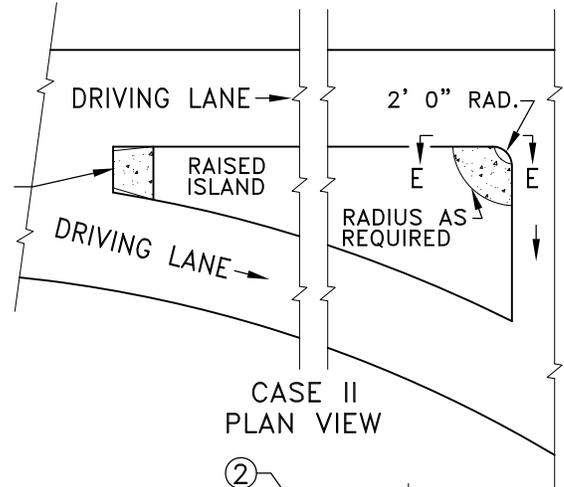
NOTES: R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

Aug 11, 2015 - 5:40pm
K:\cad_eng\Details\OTSEGO_REV15\TRAIL-707.dwg

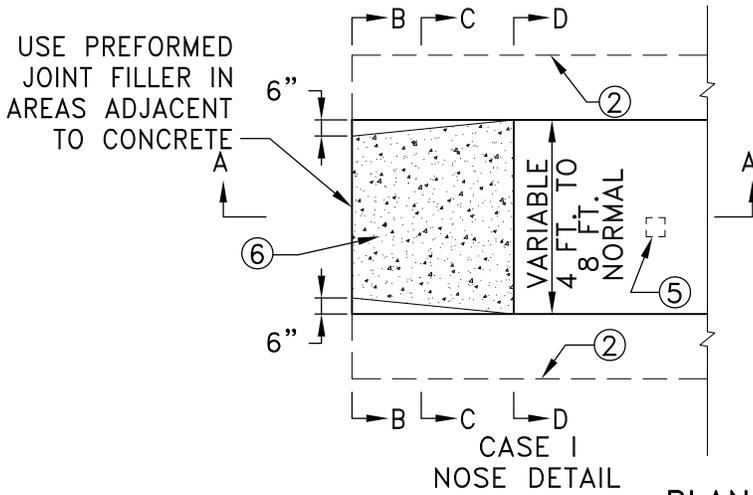
APPROVED		STANDARD PLATE NO. 707
REVISED 8-18-15		



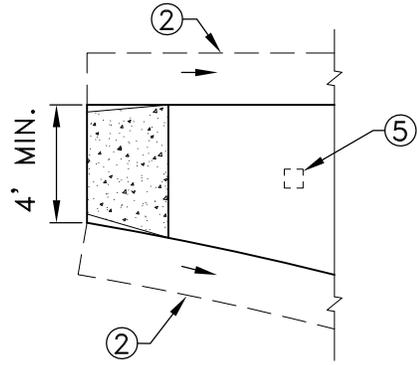
CASE I
PLAN VIEW



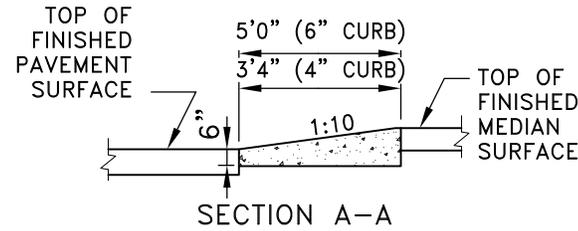
CASE II
PLAN VIEW



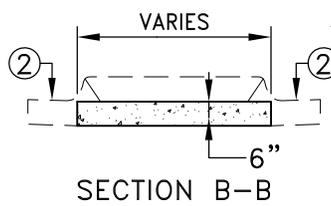
CASE I
NOSE DETAIL
PLAN VIEW



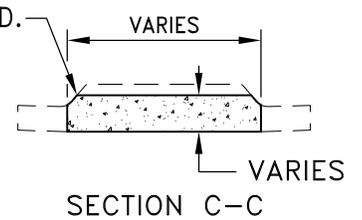
CASE I
NOSE DETAIL
SEE CASE I FOR DIMENSIONS



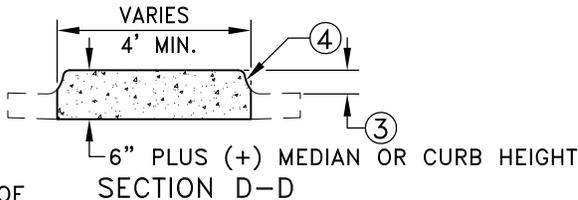
SECTION A-A



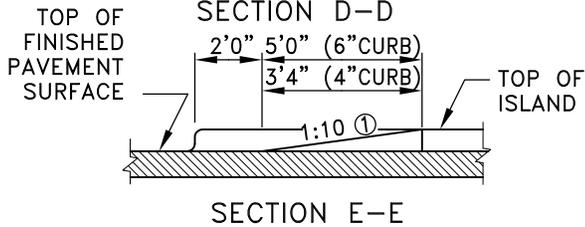
SECTION B-B



SECTION C-C



SECTION D-D



SECTION E-E

NOTES:

- ① TYPICAL SLOPE ALONG GUTTER LINE EACH DIRECTION
- ② GUTTER, IF REQUIRED
- ③ VARIABLE MEDIAN OR CURB HEIGHT
- ④ SHAPE SAME AS MEDIAN OR CURB
- ⑤ PROVIDE ONE 6" X 6" OPENING IN MEDIAN FOR SIGNING IF REQUIRED.
- ⑥ PAID FOR AS CONCRETE WALK, INCLUDES GUTTER IF REQUIRED

CONCRETE APPROACH NOSE DETAIL

NO SCALE

Mar 19, 2013 - 9:54am
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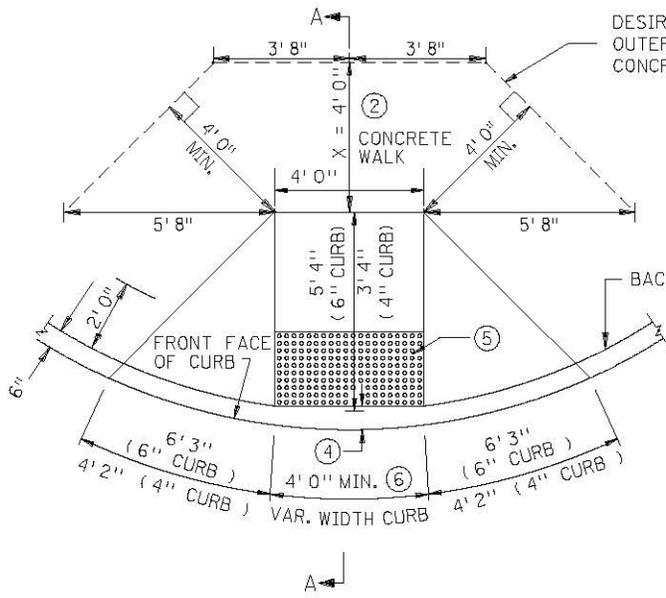
APPROVED

REVISED
FEB 2009

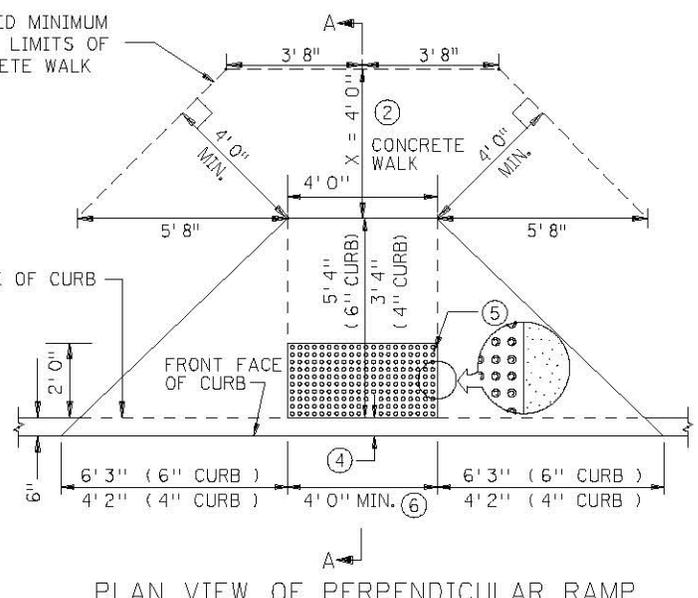


CITY OF
Otsego
MINNESOTA

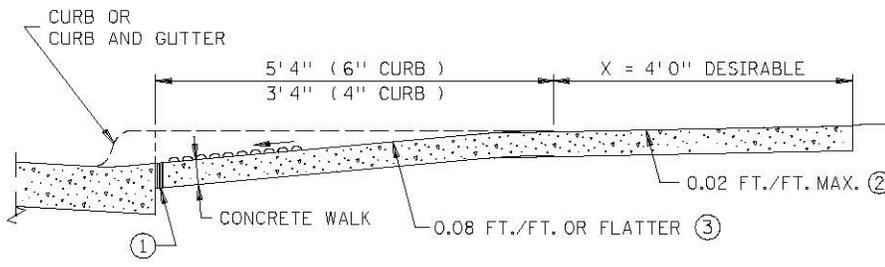
STANDARD PLATE NO.
708



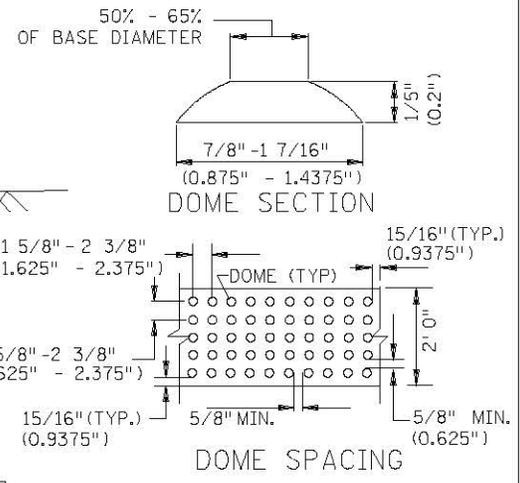
PLAN VIEW OF DIAGONAL RAMP



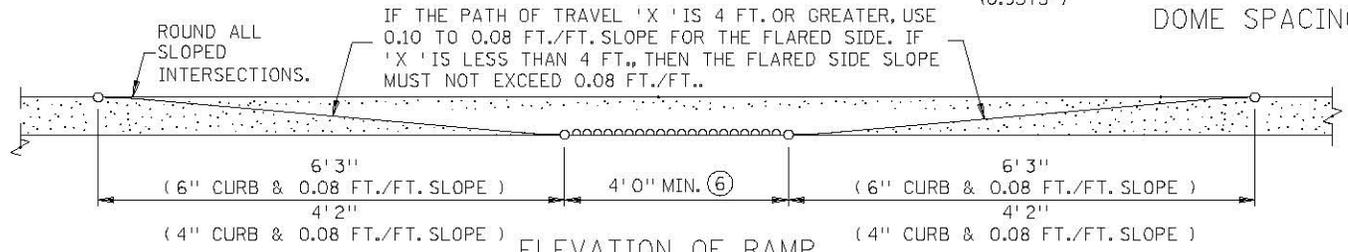
PLAN VIEW OF PERPENDICULAR RAMP



SECTION A-A



DOME SPACING



ELEVATION OF RAMP

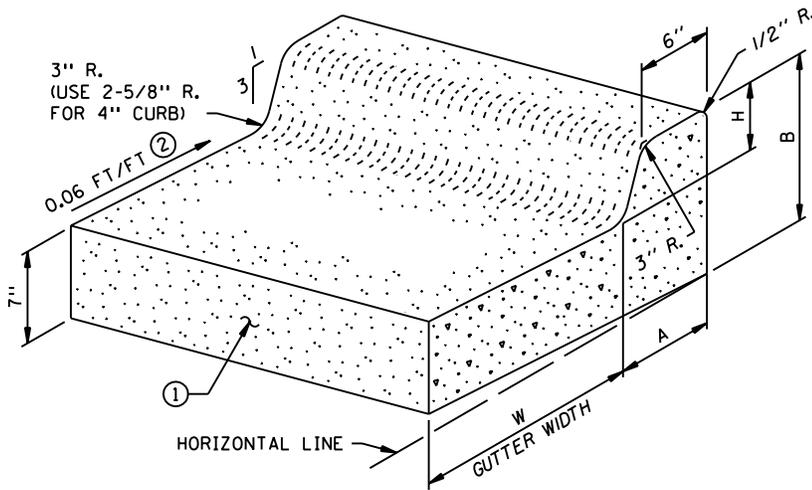
NOTES:

TO COMPLY WITH THE AMERICANS WITH DISABILITIES ACT (ADA), ALL STATE AND LOCAL AGENCIES ARE REQUIRED TO COMPLY WITH THIS STANDARD PLATE.

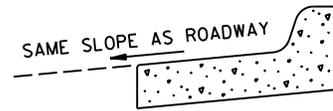
THE CURB AND CURB TRANSITION ON THE RAMP WILL BE PAID FOR AS LINEAR FEET OF CONCRETE CURB OR CONCRETE CURB AND GUTTER. THE RAMP AREA WILL BE PAID FOR AS CONCRETE WALK EXCLUDING THE TRUNCATED DOME AREA WHICH WILL BE PAID FOR AS TRUNCATED DOMES BY THE SQUARE FOOT. BIKE TRAILS SHALL HAVE TRUNCATED DOMES ACROSS THE ENTIRE WIDTH OF TRAIL WHEN THE TRAIL CROSSES A ROAD. DOMES ARE NOT TO BE USED ON SIDEWALKS OR TRAILS WHEN CROSSING ALLEYS OR DRIVEWAYS.

- ① 1/2 INCH PREFORMED JOINT FILLER MATERIAL, AASHTO M 213.
- ② WHEN POSSIBLE, PROVIDE A CLEAR PATH OF TRAVEL 4' 0" WIDE BEHIND THE PEDESTRIAN RAMP. A RELATIVELY FLAT 4' X 4' LANDING WILL ALLOW WHEELCHAIRS TO NAVIGATE AROUND THE PEDESTRIAN RAMP. NO SIGNALS, SIGNS, CABINETS, OR OTHER OBSTRUCTIONS ARE ALLOWED IN THE RAMP OR PATH OF TRAVEL.
- ③ WHEN A MEDIAN IS NOT WIDE ENOUGH FOR TWO PEDESTRIAN RAMPS AND A 48" LANDING BETWEEN THEM, THE PEDESTRIAN CROSSING SHALL BE CUT THROUGH THE MEDIAN AT STREET LEVEL.
- ④ PLACE THE DETECTABLE WARNINGS (TRUNCATED DOMES) AT THE BACK OF CURB. WHEN THE DETECTABLE WARNING SYSTEM IS A PRECAST MATERIAL, THE CURB SHALL BE HAND FORMED TO FILL THE GAP.
- ⑤ ADA REQUIRED TRUNCATED DOME AREA SHALL BE 2' 0" MIN. IN DIRECTION OF TRAVEL AND SHALL EXTEND THE FULL WIDTH (3' 0" OR 4' 0" TYP.) OF THE CURB RAMP. THIS 2' 0" BY 3' 0" OR 4' 0" WIDTH (TYP.) TRUNCATED DOME AREA SHALL CONTRAST VISUALLY WITH THE ADJACENT WALKING SURFACE. THE ENTIRE TRUNCATED DOME AREA SHALL BE A LIGHT (GRAY OR BUFF TYPICALLY) COLOR WHEN THE ADJACENT SIDEWALK IS A DARK COLOR. THE ENTIRE TRUNCATED DOME AREA SHALL BE A DARK COLOR (RED OR DARK GRAY TYPICALLY) WHEN THE ADJACENT SIDEWALK IS A LIGHT GRAY CEMENT COLOR.
- ⑥ 4' 0" MIN. FOR NEW CONSTRUCTION. 3' 0" ALLOWED TO STAY IN PLACE FOR RETROFIT PROJECTS. IN SITUATIONS WHERE THE CURB CUT WIDTH EXCEEDS 4' 0", THE DETECTABLE WARNINGS SHALL EXTEND THE FULL WIDTH.

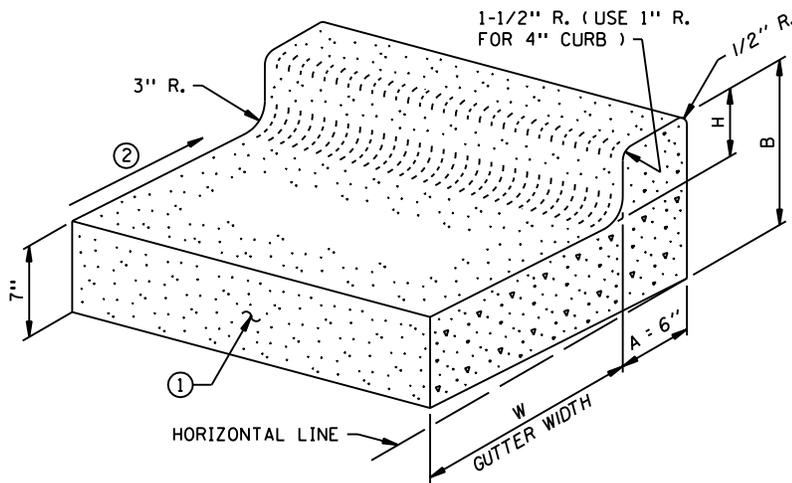
APPROVED FEB. 20, 2004  STATE DESIGN ENGINEER	STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION PEDESTRIAN CURB RAMP FOR THE HANDICAPPED	SPECIFICATION REFERENCE 2521 2531 REVISION DATE 4-14-2004	STANDARD PLATE NO. 7036F 1 OF 2
--	--	---	--



DESIGN B



REVERSE SLOPE GUTTER SECTION
(FORMS MAY BE TILTED)



DESIGN V

- NOTES:
- ① LONGITUDINAL JOINT WHEN ADJACENT TO RIGID PAVEMENT OR BASE.
SEE STANDARD PLANS MANUAL FOR JOINT INFORMATION.
 - ② SLOPE 0.06 FT/FT NORMAL, UNLESS OTHERWISE SPECIFIED. IF A DIFFERENT GUTTER SLOPE IS PERMITTED, THE FORM MAY BE TILTED.

DESIGN B			W = 12"			W = 18"			W = 24"			W = 30"			W = 36"		
			DESIGN NO.	CONCRETE		DESIGN NO.	CONCRETE		DESIGN NO.	CONCRETE		DESIGN NO.	CONCRETE		DESIGN NO.	CONCRETE	
H	A	B		CU. YDS. PER LIN. FT.	LIN. FT. PER CU. YD.		CU. YDS. PER LIN. FT.	LIN. FT. PER CU. YD.		CU. YDS. PER LIN. FT.	LIN. FT. PER CU. YD.		CU. YDS. PER LIN. FT.	LIN. FT. PER CU. YD.		CU. YDS. PER LIN. FT.	LIN. FT. PER CU. YD.
4	7-3/8"	11-1/2"	B412	0.0421	23.8	B418	0.0529	18.9	B424	0.0637	15.7	B430	0.0745	13.4	B436	0.0853	11.7
6	8"	13-1/2"	B612	0.0474	21.1	B618	0.0582	17.2	B624	0.0690	14.5	B630	0.0798	12.5	B636	0.0906	11.0
8	8-5/8"	15-1/2"	B812	0.0529	18.9	B818	0.0637	15.7	B824	0.0745	13.4	B830	0.0853	11.7	B836	0.0962	10.4
9	9"	16-5/8"	B912	0.0559	17.9	B918	0.0667	15.0	B924	0.0775	12.9	B930	0.0883	11.3	B936	0.0991	10.1
10	9-3/8"	17-5/8"	B1012	0.0589	17.0	B1018	0.0697	14.4	B1024	0.0805	12.4	B1030	0.0913	11.0	B1036	0.1021	9.8

DESIGN V			W = 12"			W = 18"			W = 24"			W = 30"			W = 36"		
			DESIGN NO.	CONCRETE		DESIGN NO.	CONCRETE		DESIGN NO.	CONCRETE		DESIGN NO.	CONCRETE		DESIGN NO.	CONCRETE	
H	A	B		CU. YDS. PER LIN. FT.	LIN. FT. PER CU. YD.		CU. YDS. PER LIN. FT.	LIN. FT. PER CU. YD.		CU. YDS. PER LIN. FT.	LIN. FT. PER CU. YD.		CU. YDS. PER LIN. FT.	LIN. FT. PER CU. YD.		CU. YDS. PER LIN. FT.	LIN. FT. PER CU. YD.
4	6"	11-3/8"	V412	0.0396	25.3	V418	0.0504	19.9	V424	0.0612	16.4	V430	0.0720	13.9	V436	0.0828	12.1
6	6"	13-3/8"	V612	0.0426	23.5	V618	0.0534	18.7	V624	0.0642	15.6	V630	0.0750	13.4	V636	0.0858	11.7
8	6"	15-3/8"	V812	0.0457	21.9	V818	0.0565	17.7	V824	0.0673	14.9	V830	0.0781	12.8	V836	0.0889	11.3
9	6"	16-3/8"	V912	0.0472	21.2	V918	0.0580	17.2	V924	0.0688	14.5	V930	0.0796	12.6	V936	0.0904	11.1
10	6"	17-3/8"	V1012	0.0487	20.5	V1018	0.0595	16.8	V1024	0.0703	14.2	V1030	0.0811	12.4	V1036	0.0919	10.9

APPROVED MARCH 11, 1994

R.H. Carped

ACTING STATE DESIGN ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

CONCRETE CURB AND GUTTER
DESIGN B AND DESIGN V

SPECIFICATION
REFERENCE
2531

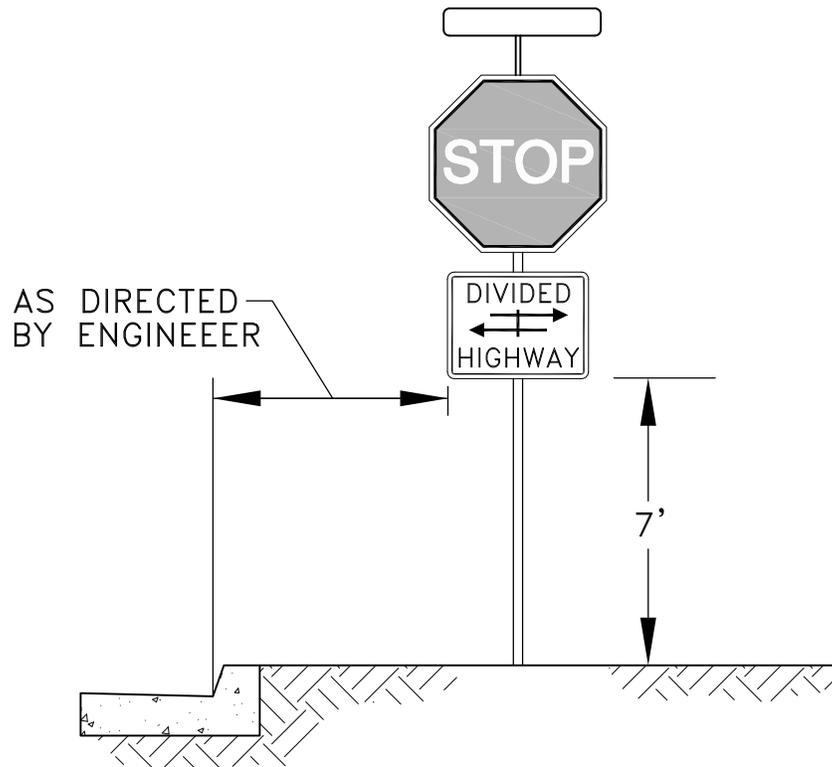
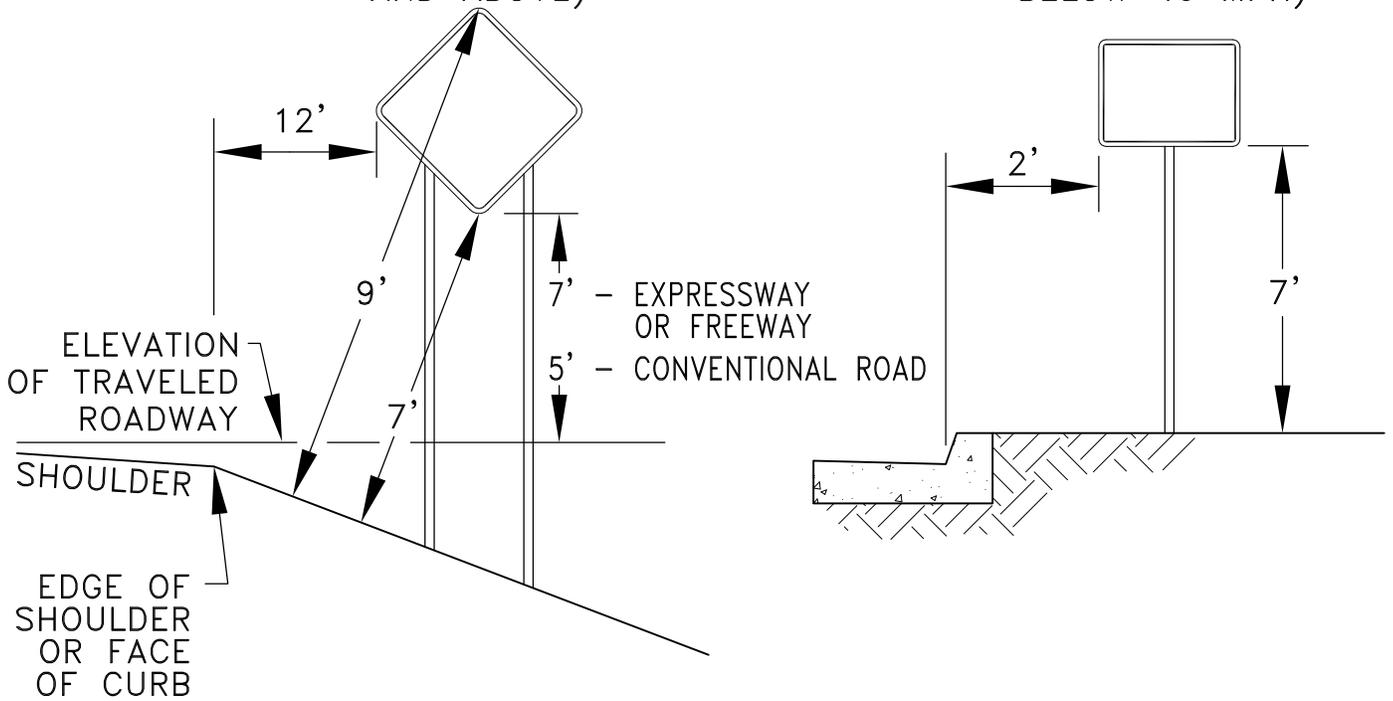
REVISION DATE
2-28-05

STANDARD
PLATE
NO.

7100H

RURAL
(TYPICAL SPEEDS 40 MPH
AND ABOVE)

URBAN
(TYPICAL SPEEDS
BELOW 40 MPH)



**LATERAL OFFSET AND VERTICAL CLEARANCE
REQUIREMENTS FOR TYPE C & D SIGNS**

NO SCALE

Mar 19, 2013 - 10:26am
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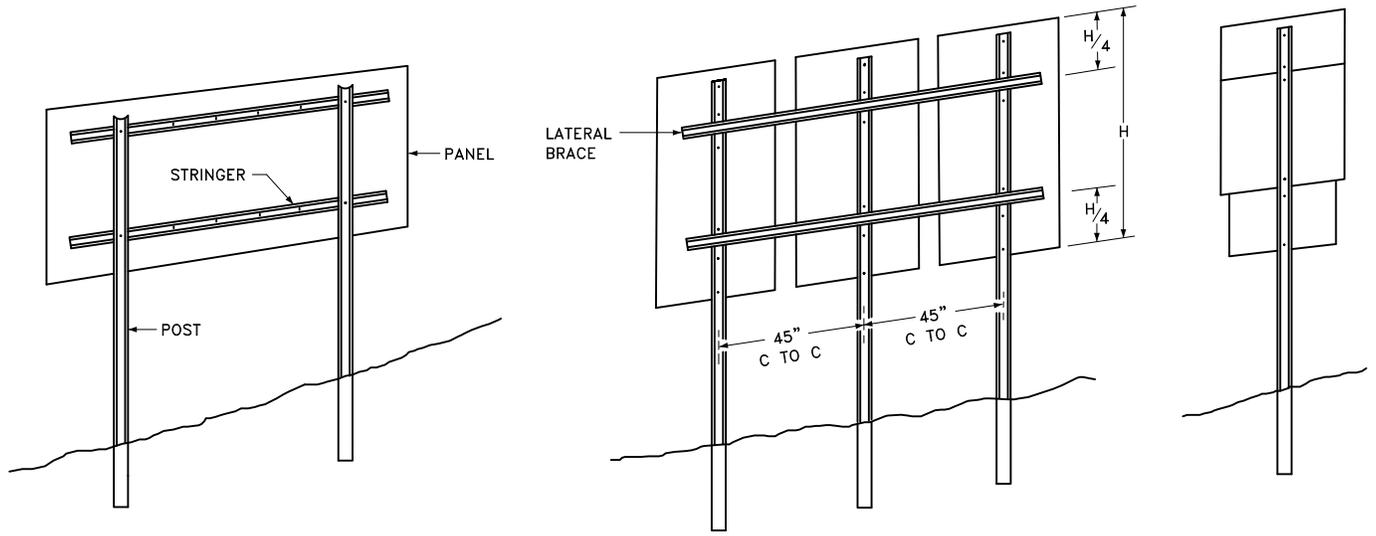
APPROVED

REVISED
FEB 2009



CITY OF
Otsego
MINNESOTA

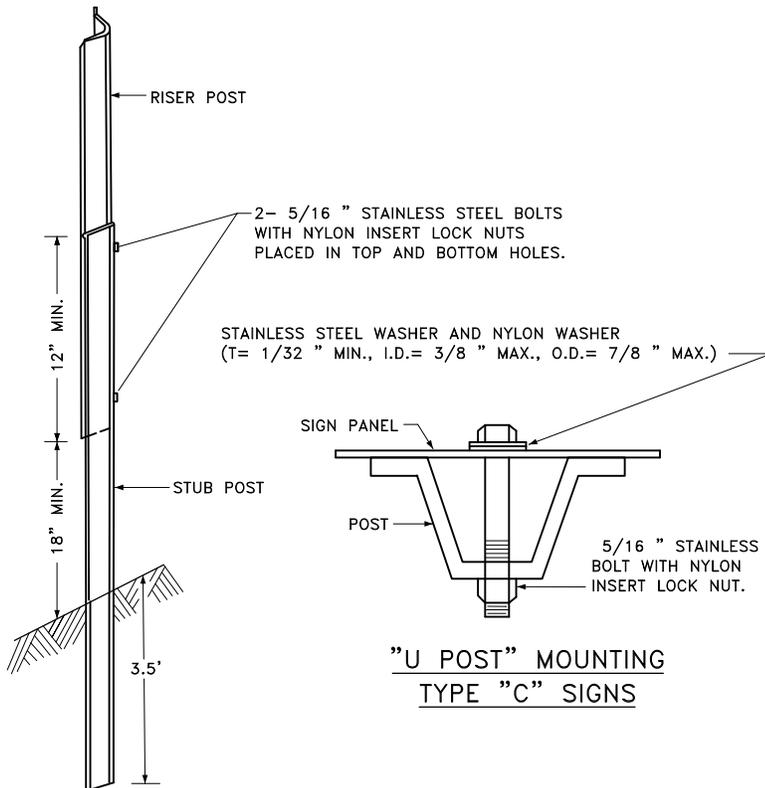
STANDARD PLATE NO.
800



TYPICAL TYPE "D" INSTALLATION

TYPICAL TYPE "C" INSTALLATIONS

TYPE "C" & "D" POST



"U POST" MOUNTING
TYPE "C" SIGNS

"U POST" SPLICE

NOTES:

1. USE 3# STUB POSTS, RISER POSTS, STRINGERS, KNEE BRACES, LATERAL BRACES AND KNEE BRACE STUB POSTS. ALL SHALL CONFORM TO MN/DOT 3401.
2. FOR TYPE "D" SIGN POSTS LENGTHS AND SPACINGS, SEE SIGN DATA SHEET.
3. TYPE "D" SIGN PANELS SHALL BE BOLTED TO STRINGERS AT 24" MAXIMUM INTERVALS IN ACCORDANCE WITH TYPE "D" STRINGER AND PANEL-JOINT DETAIL (SEE STANDARD SIGNS MANUAL).
4. MOUNTING (PUNCHING CODE) FOR TYPE "C" SIGN PANELS SHALL BE AS INDICATED IN THE STANDARD SIGNS MANUAL UNLESS OTHERWISE SPECIFIED.
5. ALL RISER (VERTICAL) "U POSTS" SHALL BE SPLICED. DRIVEN STUB POSTS SHALL BE AT LEAST 7' LONG.
6. USE STAINLESS STEEL 5/16" BOLTS, WASHERS, AND NYLON INSERT LOCK NUTS AS SHOWN FOR ALL GROUND MOUNTED AND OVERHEAD MOUNTED SIGNS.
7. STAINLESS STEEL WASHER WITH SAME DIMENSIONS SHALL BE PROVIDED BETWEEN ALL NYLON WASHERS AND BOLT HEADS.
8. BRACING STUBS SHALL BE NO MORE THAN 4" ABOVE GROUND AND EMBEDDED AT LEAST 3 1/2'.
9. A-FRAME BRACKET SHALL BE STEEL CONFORMING TO MN/DOT 3306 AND GALVANIZED IN ACCORDANCE WITH MN/DOT 3394.
10. COLLARS SHALL BE USED TO SHIM OVERLAYS AND DEMOUNTABLE LEGEND AWAY FROM PANEL WHERE INTERFERENCE WITH BOLT HEADS IS ENCOUNTERED. MN/DOT 3352.2A7.
11. 2 AND 3 POST TYPE "C" SIGNS SHALL BE REINFORCED WITH AT LEAST ONE LATERAL BRACE. INSTALLATIONS WHERE THE TOTAL PANEL HEIGHT IS 60" OR MORE SHALL HAVE TWO LATERAL BRACES LOCATED APPROXIMATELY AT THE QUARTER POINTS.
12. WHERE 2 OR MORE SINGLE POST SIGNS (TYPE "C") ARE MOUNTED SIDE BY SIDE, THEY SHALL BE REINFORCED LATERALLY BY AT LEAST 2 POST SECTIONS, BOLTED AT EACH POST AND LOCATED APPROXIMATELY AT THE QUARTER POINTS AS SHOWN IN SKETCH.

TYPE "C" AND "D" SIGN POST
INSTALLATION DETAIL

NO SCALE

Mar 19, 2013 - 10:27am
K:\cad_eng\Details\OTSEGO_REV13.dwg\SIGNAGE\SIGN 801.dwg

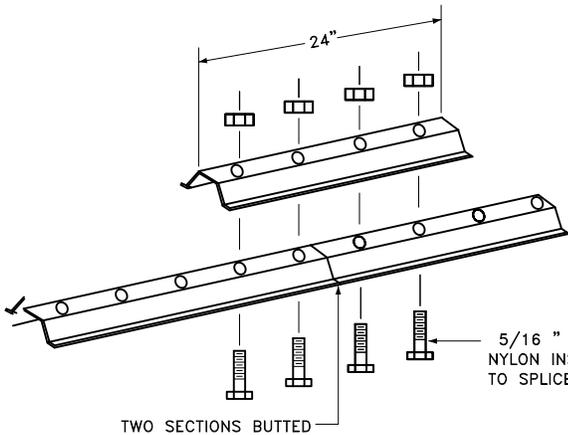
APPROVED

REVISED
FEB 2009



CITY OF
Otsego
MINNESOTA

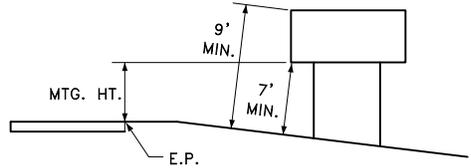
STANDARD PLATE NO.
801



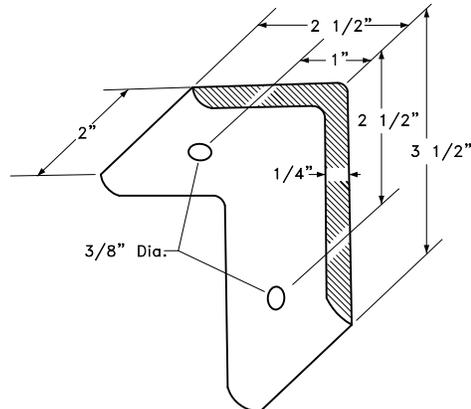
5/16 " STAINLESS STEEL BOLTS WITH NYLON INSERT LOCK NUTS AS CLOSE TO SPLICE & OUTSIDE HOLES.

TWO SECTIONS BUTTED

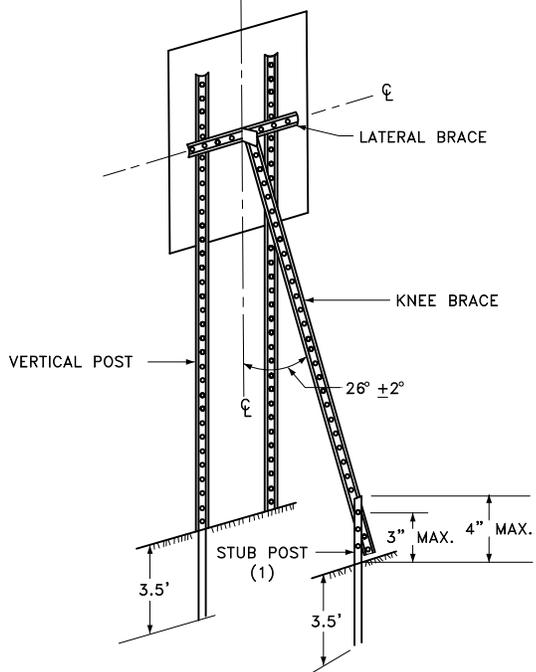
LATERAL BRACE OR STRINGER SPLICE DETAIL (EXPLODED VIEW)



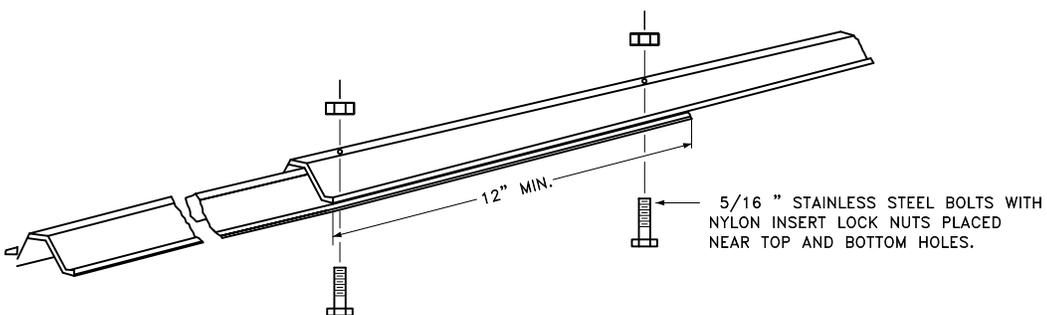
TYPICAL MOUNTING



A-FRAME BRACKET
(STEEL MN/DOT 3306 GALVANIZED PER MN/DOT 3394)



TYPICAL "A-FRAME" INSTALLATION TYPE "C" SIGNS



KNEE BRACE SPLICE

A-FRAME AND STRINGER BRACING DETAIL

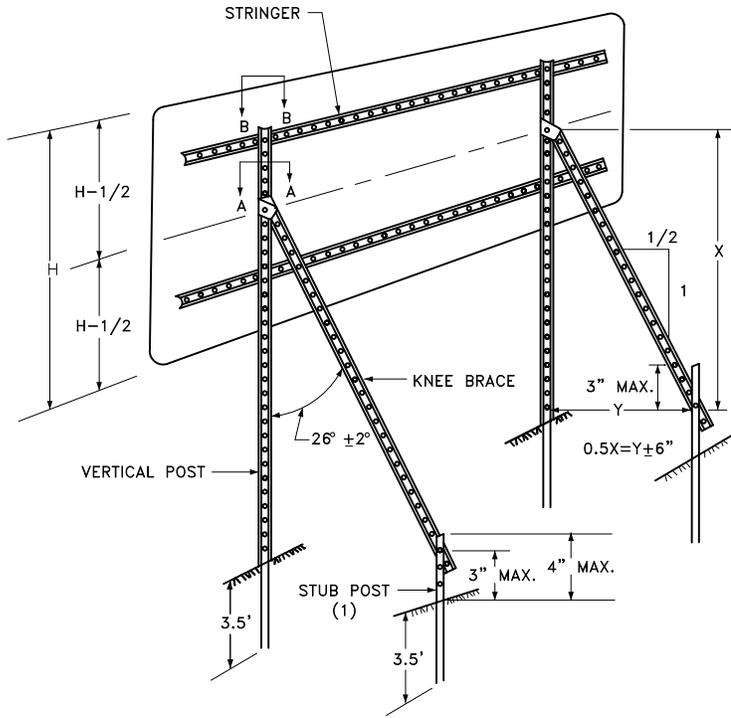
NO SCALE

Mar 19, 2013 - 10:29am
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APPROVED
REVISED FEB 2009

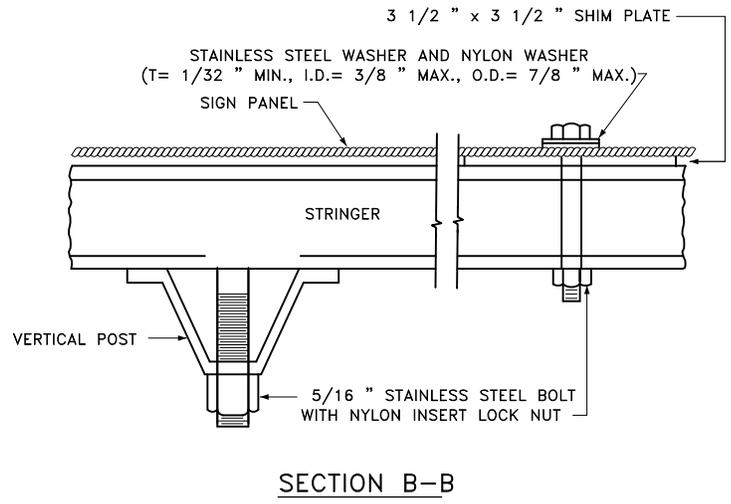
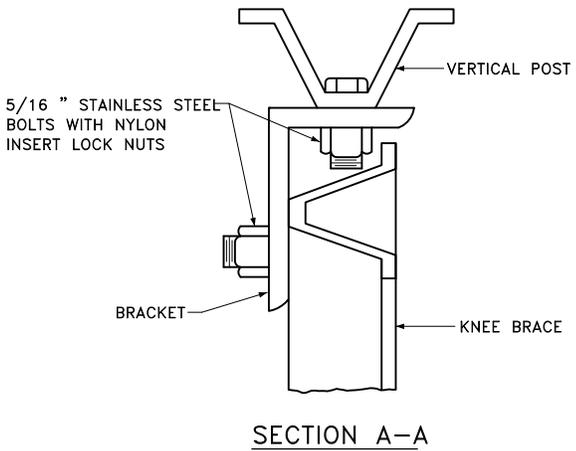


STANDARD PLATE NO.
802A



TYPICAL "A-FRAME" INSTALLATION
TYPE "D" SIGNS

(1) OFFSET STUB POST 1' TOWARD ROADWAY
RELATIVE TO VERTICAL POST.



A-FRAME AND STRINGER BRACING
DETAIL
NO SCALE

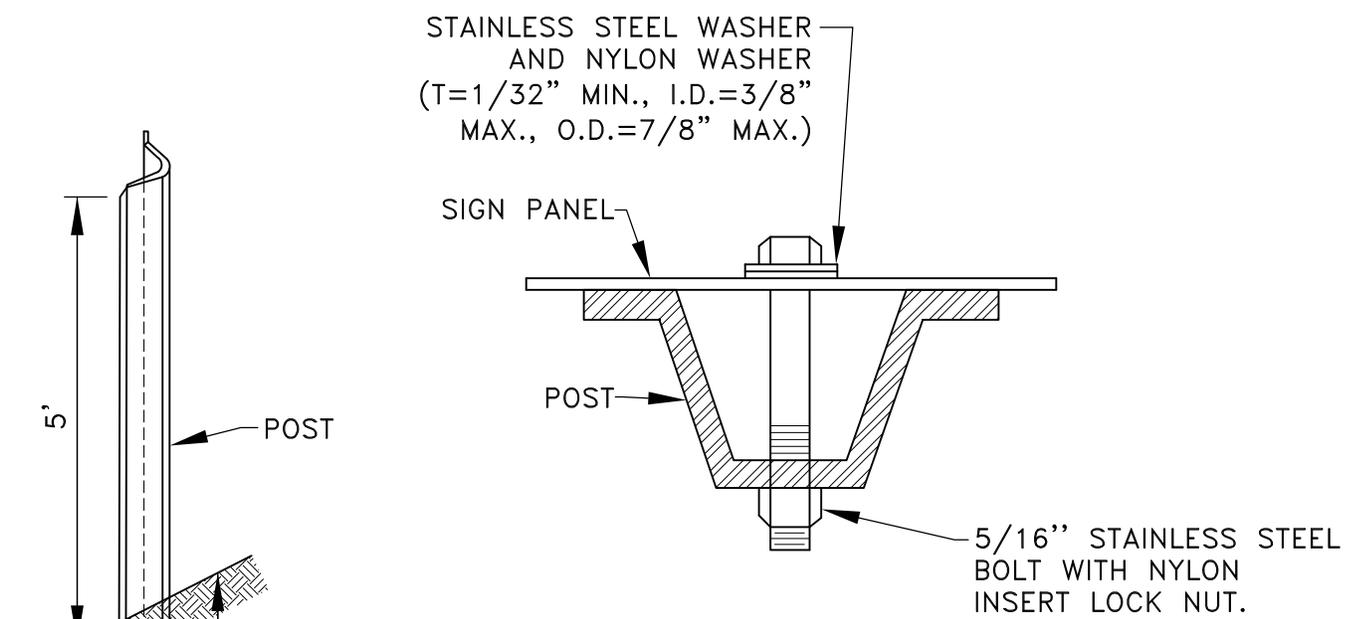
Mar 19, 2013 - 10:29am
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APPROVED
REVISED FEB 2009



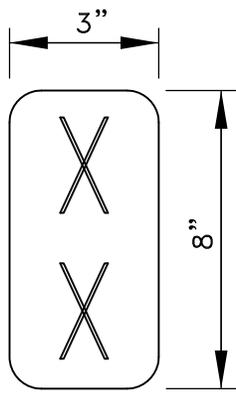
STANDARD PLATE NO.
802B

Mar 19, 2013 - 10:33am
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"U POST" MOUNTING

U POST



SIGN

NOTE:
 POST SHALL CONFORM TO SPEC. 3401 AND HAVE A NOMINAL WEIGHT OF 2 LBS PER FT. AND SHALL BE PAINTED GREEN.

MARKING POSTS SHALL BE OFFSET 2' FROM VALVE BOXES TO ALLOW ROOM FOR OPERATING THE VALVE.

LEGEND
 MH = SAN MANHOLE (WHITE ON GREEN)
 GV = GATE VALVE (WHITE ON BLUE)
 ST = STORM SEWER (WHITE ON BLACK)

MARKER POST INSTALLATION

NO SCALE

APPROVED
REVISED
5-10-07

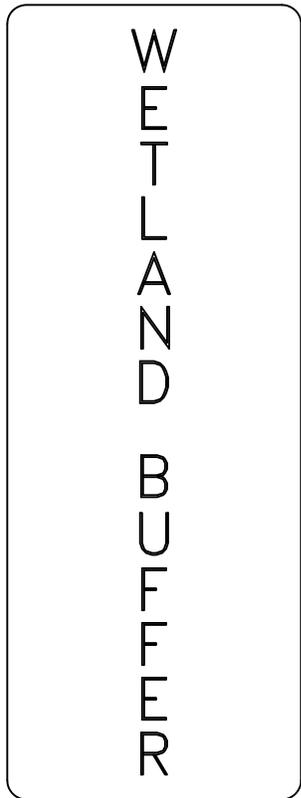


STANDARD PLATE NO.
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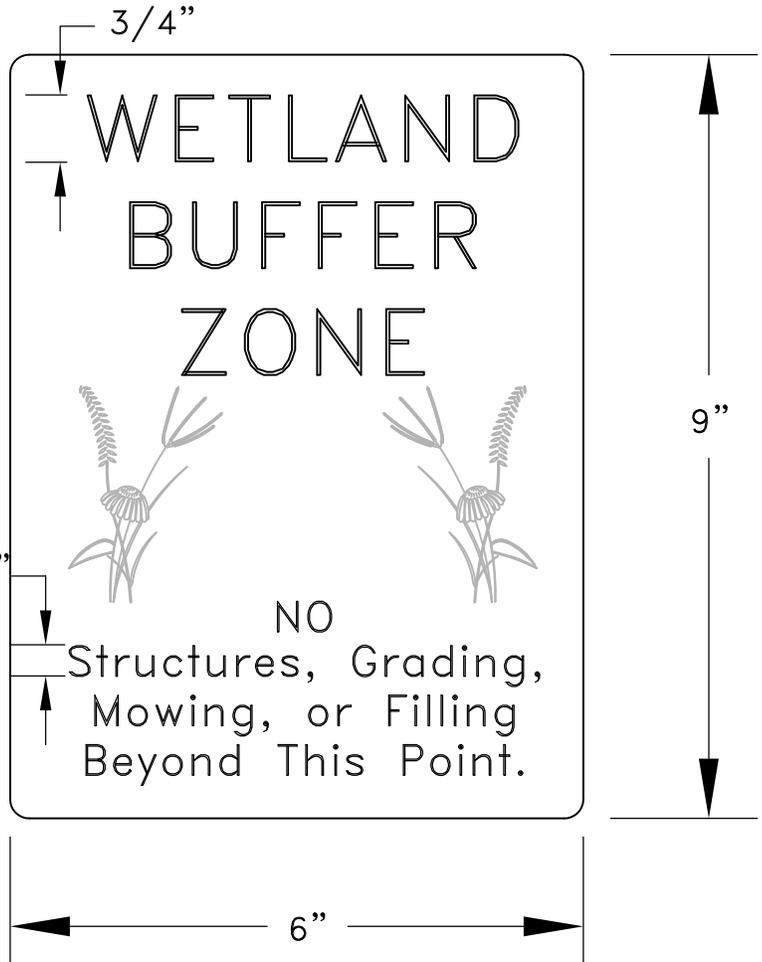
Mar 19, 2013 - 10:35am
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GREEN LETTERING ON
WHITE BACKGROUND

WHITE LETTERING ON
BROWN BACKGROUND
WITH 3/4" LETTERING



ALTERNATE 2



ALTERNATE 1

WETLAND BUFFER SIGNS ARE TO BE PLACED ALONG ALL WETLANDS IN RESIDENTIAL AREAS WHERE THE BUFFERS ARE REQUIRED.

SIGNS SHALL BE INSTALLED ON A "U-POST" MOUNTING. (SEE STANDARD PLATE 801)

SIGNS SHALL BE PLACED 20' FROM THE EDGE OF THE DELINEATED OR MITIGATED WETLAND.

WETLAND BUFFER SIGN

NO SCALE

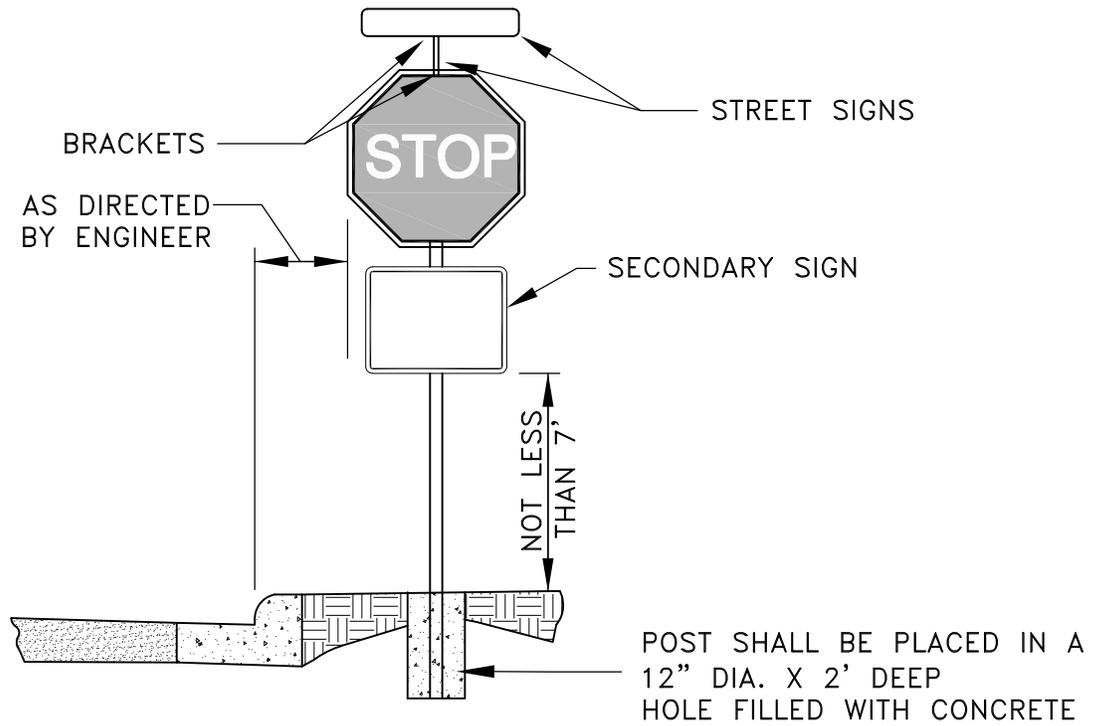
APPROVED

REVISED
FEB 2009



CITY OF
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MINNESOTA

STANDARD PLATE NO.
804



FURNISH AND INSTALL NEW SIGNS

SIGN NUMBER	SIGN	COLOR	SIZE	COMMENTS
R1-1		WHITE ON RED	30" x 30"	
		WHITE ON GREEN	9" PLATES	ALL INTERSECTIONS

NOTES:

POSTS SHALL BE CYLINDRICAL TUBE STEEL POSTS, THE POST SHALL BE 12' LONG, WITH 2-3/8" OD, 12 GAUGE COLD ROLLED GALVANIZE STEEL MEETING ASTM A-446 GRADE A.

SIGN BASE MATERIAL SHALL BE ALUMINUM.

THE STREET NAME SIGNS SHALL BE NOTCHED AND MOUNTED IN AN E450 BRACKET AND PLACED ABOVE THE STOP SIGN.

STREET NAME SIGNS SHALL HAVE HIGH INTENSITY PRISMATIC RETROREFLECTIVE SHEETING (ASTM TYPE IV).

STOP SIGNS SHALL HAVE DIAMOND GRADE VIP RETROREFLECTIVE SHEETING (ASTM TYPE IX).

SIGNS AND INSTALLATION OF SIGNS SHALL BE IN ACCORDANCE WITH THE "MINNESOTA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES"

**STOP SIGN AND STREET NAME SIGN
DETAIL**
NO SCALE

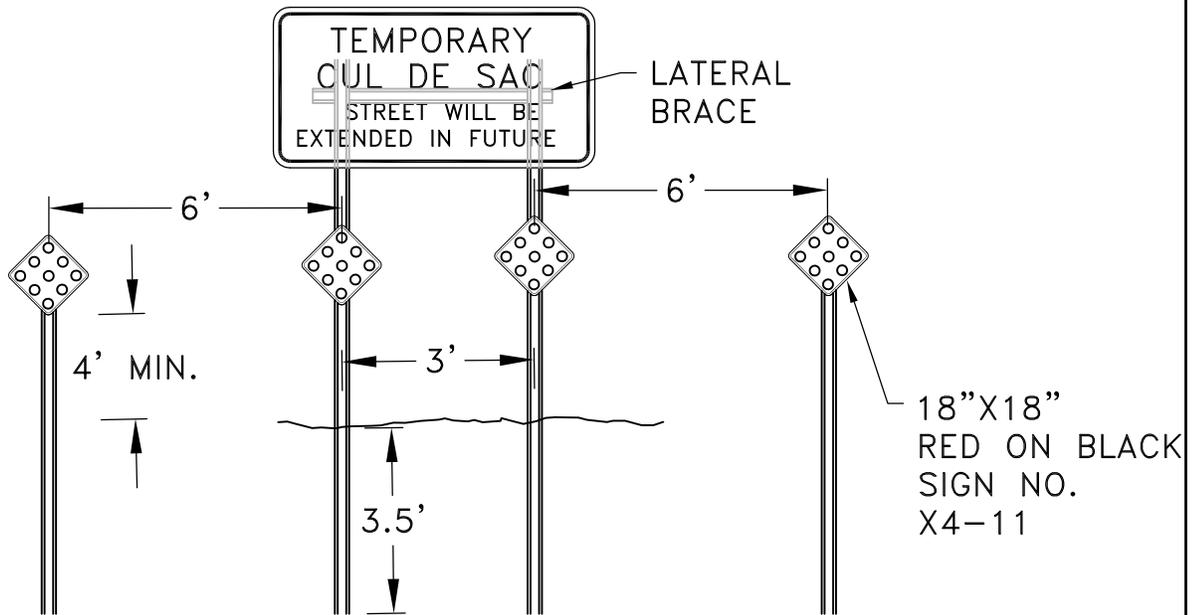
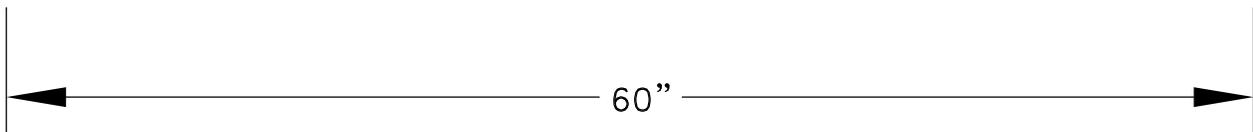
APPROVED

REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
805



NOTES:

TYPE E WHITE LETTERING ON GREEN BACKGROUND

THIS SIGN SHALL BE PLACED AT THE END OF DEAD END STREET OR AS A STAND ALONE SIGN AT THE END OF A TEMPORARY CUL-DE-SAC.

TEMPORARY CUL-DE-SAC SIGN

NO SCALE

Aug 11, 2015 - 5:56pm
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APPROVED

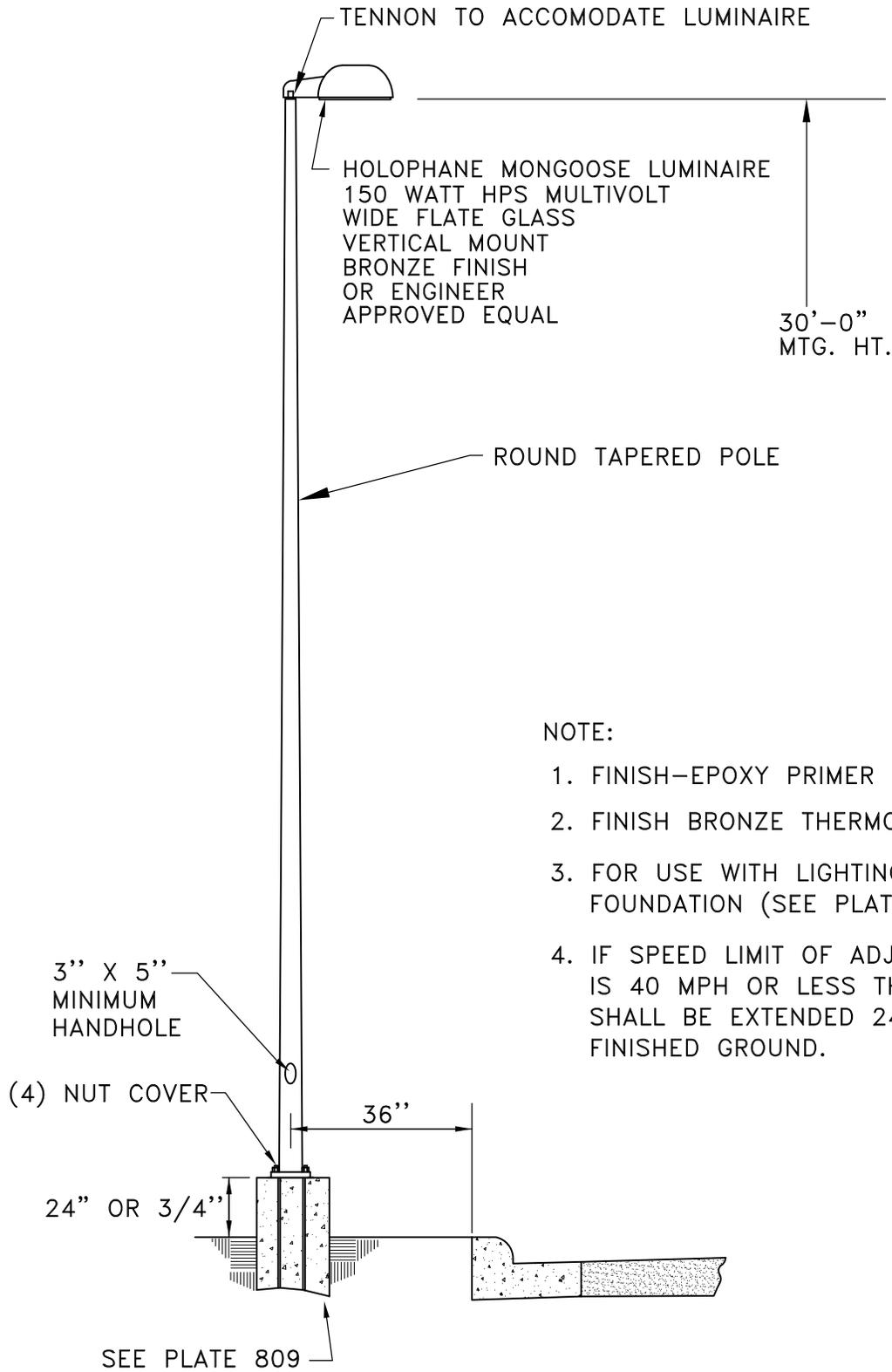
REVISED
8-18-15



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
806

Mar 19, 2013 - 10:39am
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LIGHT UNIT TYPE I

NO SCALE

APPROVED

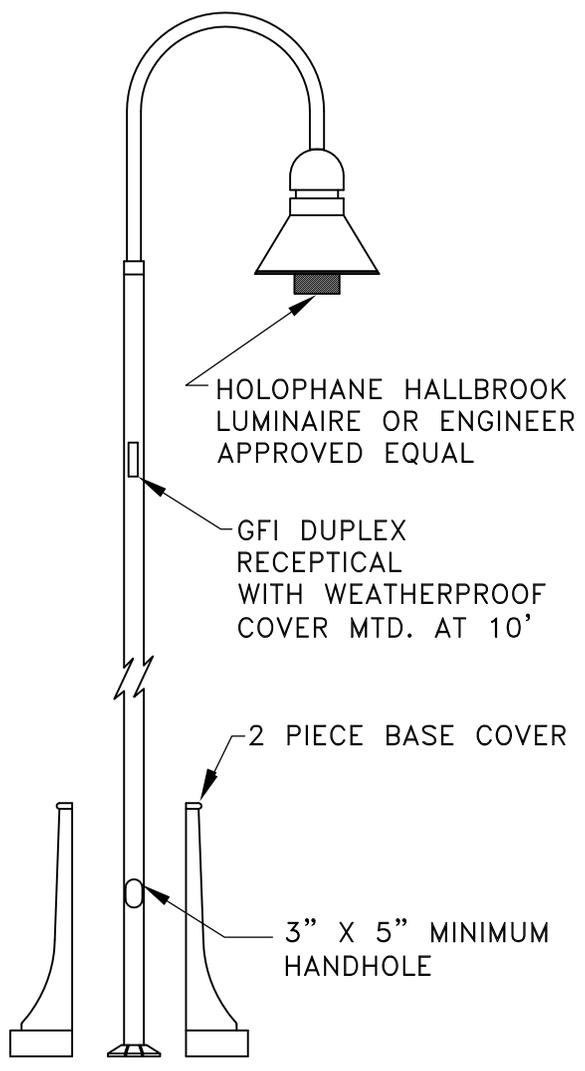
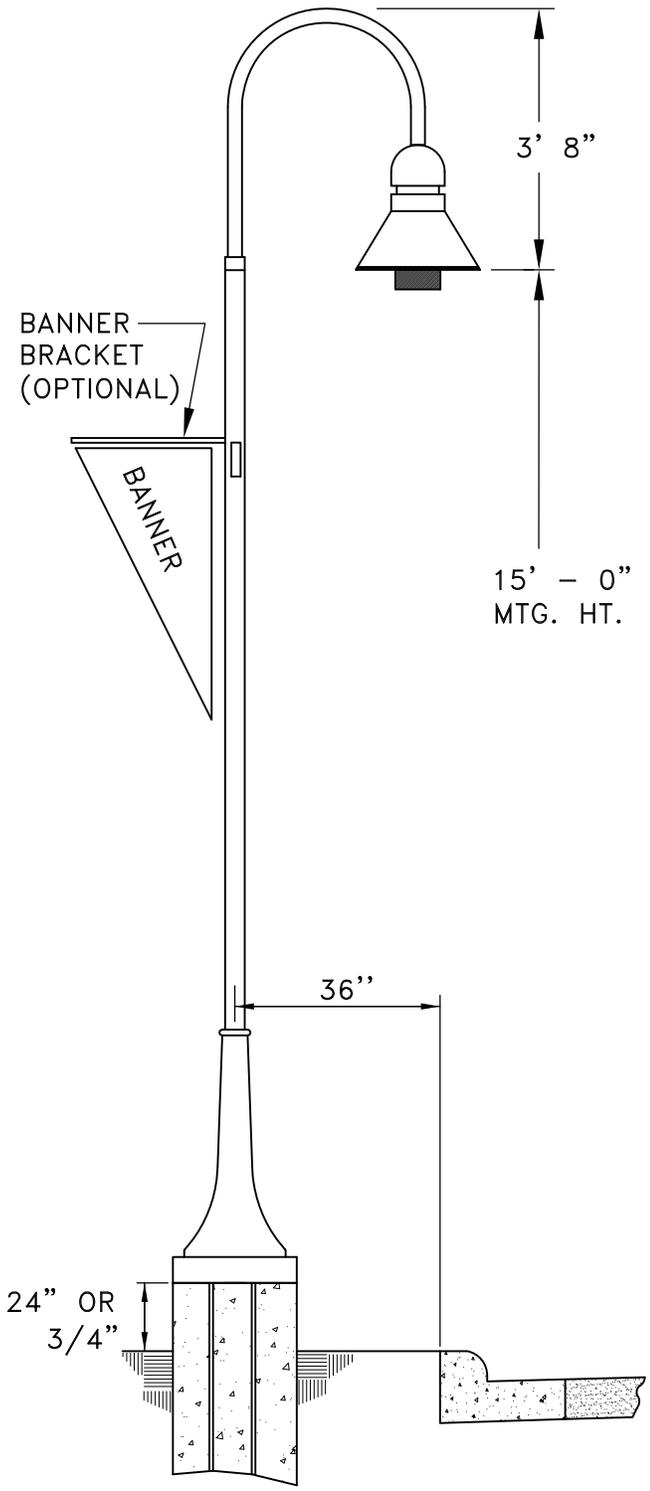
REVISED
FEB 2009



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
807

Mar 19, 2013 - 10:40am
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NOTE:

1. THE POST SHAFT SHALL BE 6063 ALUMINUM ALLOY, 0.188 WALL THICKNESS, HEAT TREATED TO T6 CONDITION AFTER WELDING.
2. THE POST, ARM, AND BASE COVER SHALL BE PAINTED WITH A POLYESTER POWER COAT. COLOR SHALL BE BRONZE.
3. FOR USE WITH LIGHTING TYPE II FOUNDATION (SEE PLATE 810).
4. IF SPEED LIMIT OF ADJACENT ROAD IS 40 MPH OR LESS THE FOUNDATION SHALL BE EXTENDED 24" ABOVE THE FINISHED GROUND.

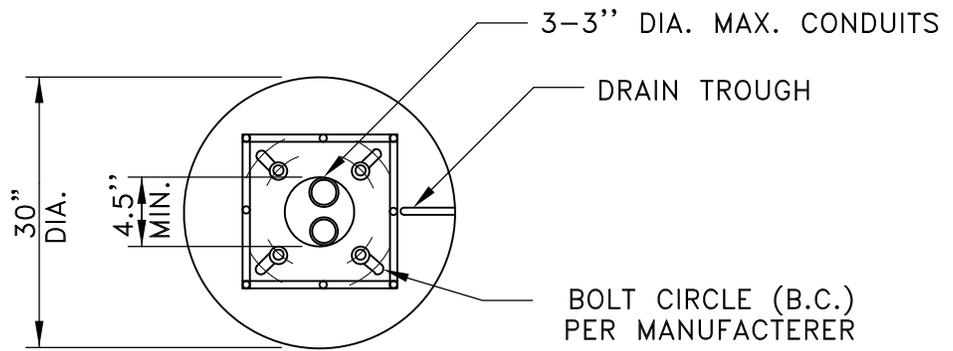
LIGHTING UNIT TYPE II
SPECIAL USE IN COMMERCIAL/INDUSTRIAL AREAS

NO SCALE

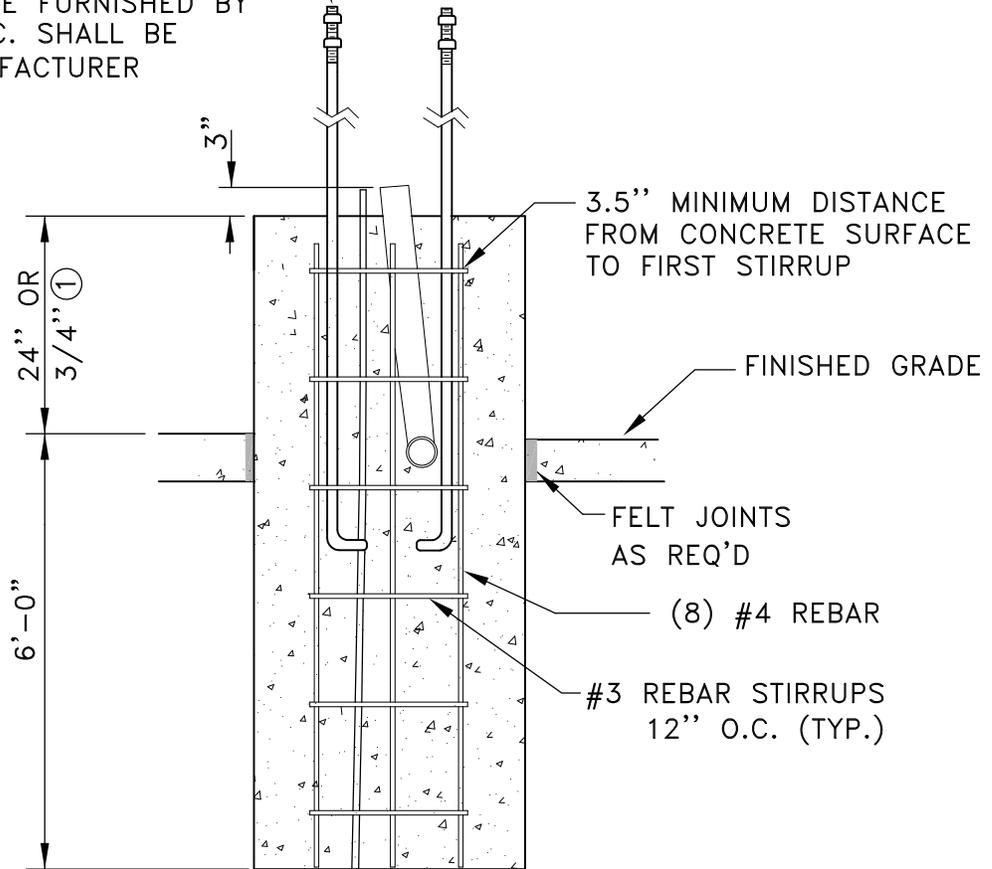
APPROVED
REVISED FEB 2009



STANDARD PLATE NO.
808



PROJECT ANCHOR BOLTS (4) ABOVE TOP OF BASE AS PER MANUFACTURER RECOMMENDATIONS. PROVIDE DOUBLE NUTS FOR LEVELING UNIT (ONE ABOVE AND ONE BELOW BASE FLANGE) ANCHOR BOLTS TO BE FURNISHED BY MANUFACTURER. B.C. SHALL BE VERIFIED WITH MANUFACTURER



① 1/2" X 12' OR 10' GROUND ROD IN EVERY THIRD FOUNDATION AS DIR. BY THE ENGINEER

① IF SPEED LIMIT OF ADJACENT ROAD IS 40 MPH OR LESS THE FOUNDATION SHALL BE EXTENDED 24" ABOVE THE FINISHED GROUND. OTHERWISE ONLY 3/4" ABOVE FINISHED GROUND.

LIGHTING UNIT TYPE I FOUNDATION

NO SCALE

Mar 19, 2013 - 10:41am
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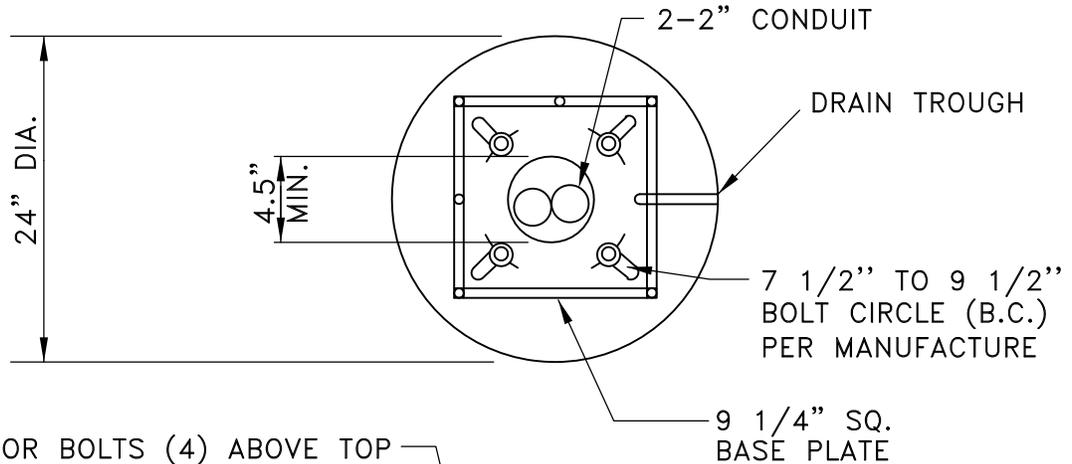
APPROVED

REVISED
FEB 2009

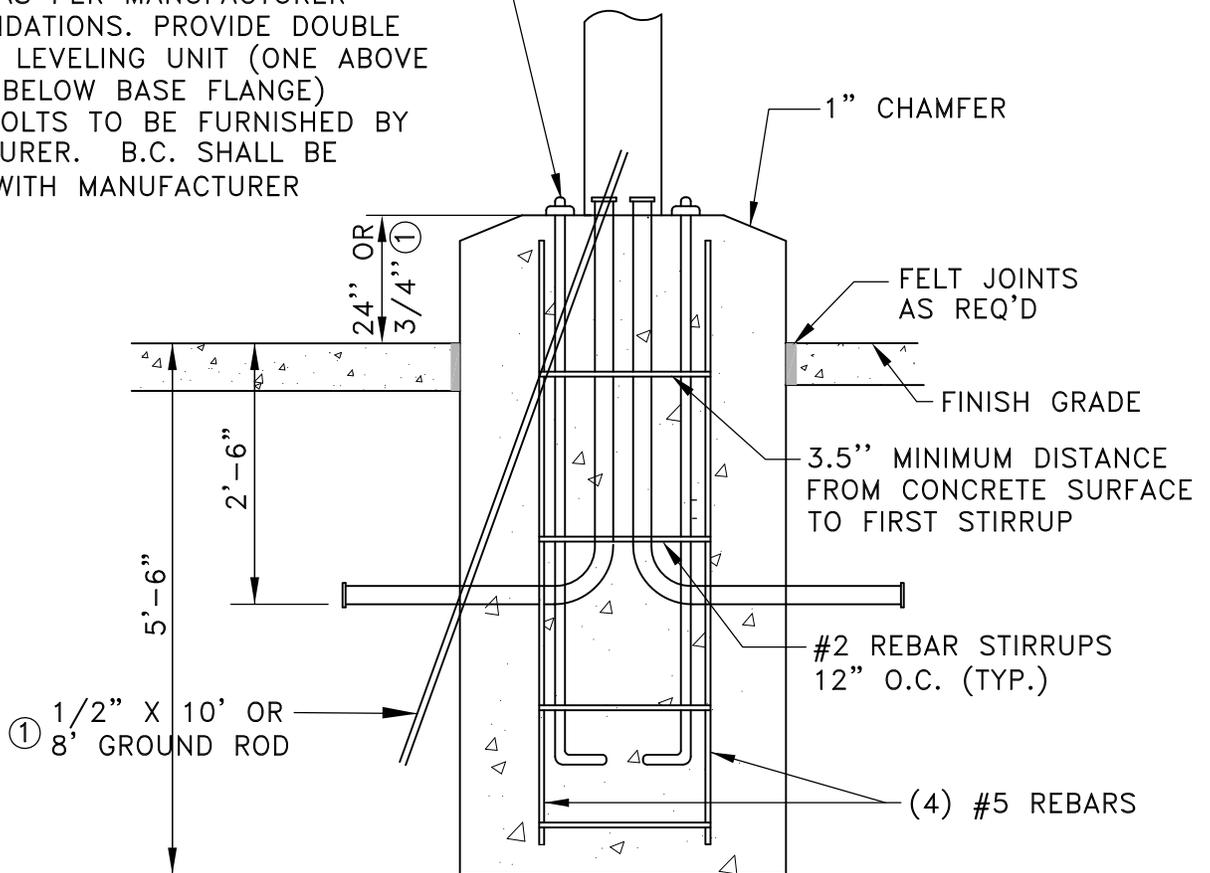


CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
809



PROJECT ANCHOR BOLTS (4) ABOVE TOP OF BASE AS PER MANUFACTURER RECOMMENDATIONS. PROVIDE DOUBLE NUTS FOR LEVELING UNIT (ONE ABOVE AND ONE BELOW BASE FLANGE) ANCHOR BOLTS TO BE FURNISHED BY MANUFACTURER. B.C. SHALL BE VERIFIED WITH MANUFACTURER



- ① IF SPEED LIMIT OF ADJACENT ROAD IS 40 MPH OR LESS THE FOUNDATION SHALL BE EXTENDED 24" ABOVE THE FINISHED GROUND. OTHERWISE ONLY 3/4" ABOVE FINISHED GROUND.

LIGHTING UNIT TYPE II FOUNDATION

NO SCALE

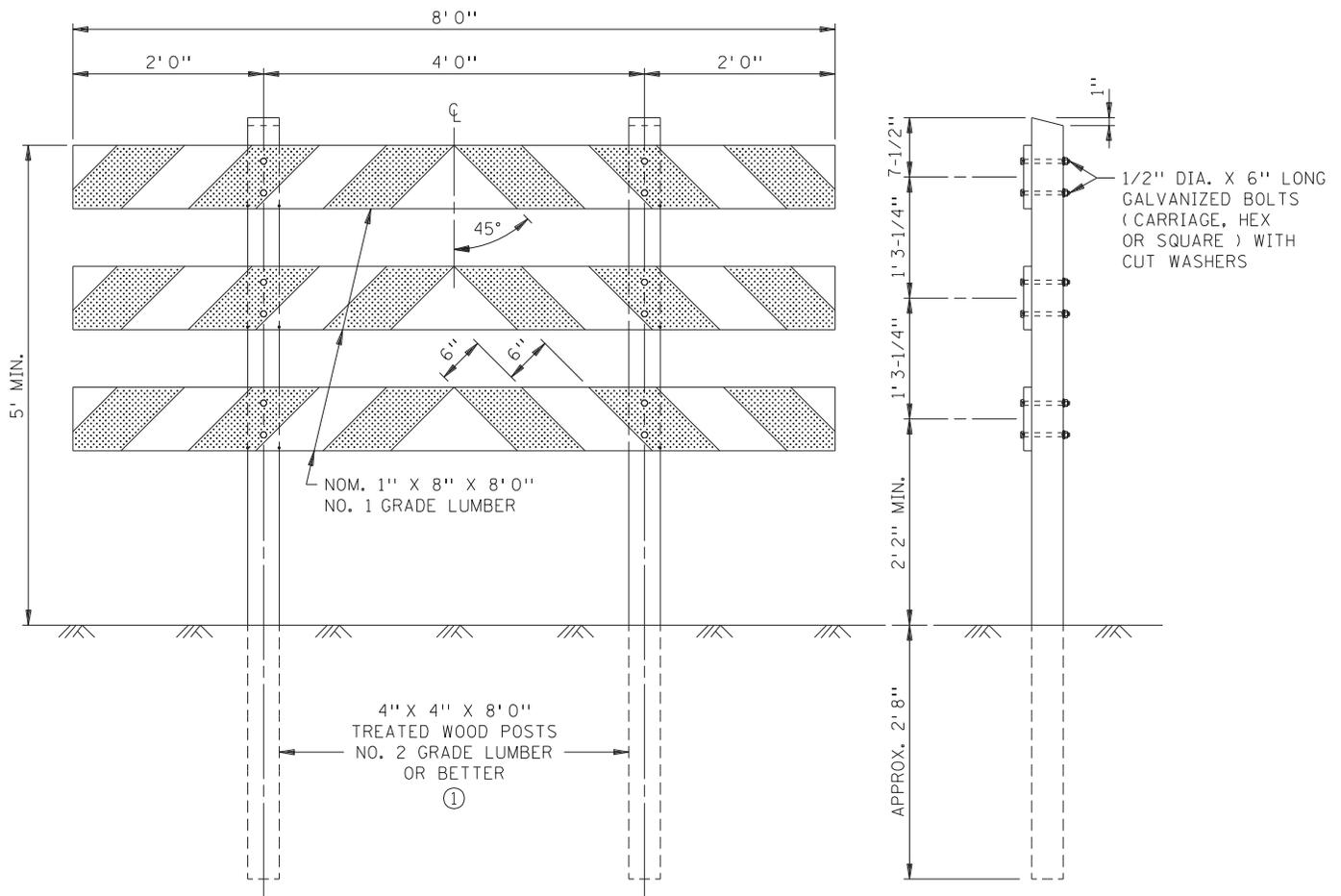
APPROVED

REVISED
FEB 2009



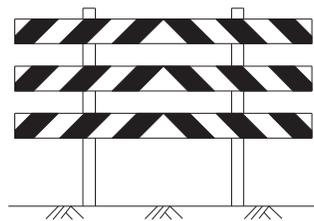
CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
810

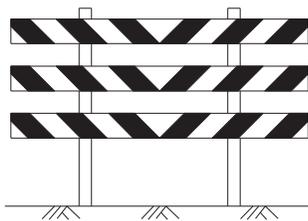


ELEVATION
(TURNS PERMITTED SHOWN)

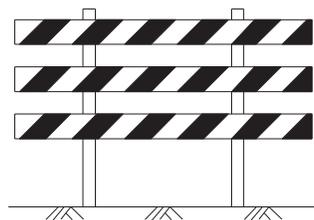
END VIEW



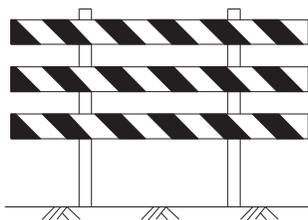
TOTALLY CLOSED ROADWAY
TURNS PERMITTED



TOTALLY CLOSED ROADWAY
NO TURNS PERMITTED



TOTALLY CLOSED ROADWAY
LEFT TURN ONLY



TOTALLY CLOSED ROADWAY
RIGHT TURN ONLY

NOTES:

THE BARRICADE BOARD FACE SURFACES SHALL BE FULLY REFLECTORIZED IN ALTERNATE SILVER-WHITE AND RED STRIPING, USING REFLECTIVE SHEETING CONFORMING TO THE REQUIREMENTS OF SPEC. 3352.2A2b, STANDARD NO. 2.

PRIOR TO INSTALLING THE REFLECTIVE SHEETING, THE BARRICADE BOARDS SHALL BE GIVEN A COMPLETE COATING OF WHITE WOOD PRIMER PAINT FOLLOWED BY A SECOND COAT OF WHITE EXTERIOR PAINT APPLIED ONLY TO THE SURFACES NOT COVERED WITH REFLECTIVE SHEETING.

THE BARRICADE BOARDS SHALL BE COMPLETELY PAINTED AND REFLECTORIZED SHEETING APPLIED BEFORE BEING INSTALLED ON THE POSTS.

① ALTERNATE MATERIALS FOR POSTS MAY BE USED WHEN APPROVED BY THE OFFICE OF TRAFFIC ENGINEERING.

APPROVED AUGUST 8, 1995

Donald J. Rodbruch
STATE DESIGN ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

PERMANENT BARRICADE

SPECIFICATION
REFERENCE

2554

STANDARD
PLATE
NO.

8002G

NOTES:
 ALL SMALL UTILITIES SHALL BE PLACED IN A JOINT TRENCH. IN BOULEVARDS WHERE A SIDEWALK IS PRESENT, THE JOINT TRENCH SHALL BE LOCATED BETWEEN THE EASEMENT LINE AND THE OUTER EDGE OF THE SIDEWALK. IN BOULEVARDS WITH NO SIDEWALK THE JOINT TRENCH SHALL BE LOCATED BETWEEN THE EASEMENT LINE AND THE FIRE HYDRANTS WHICH ARE 5' BACK OF CURB.

STANDARD 10' UTILITY EASEMENT (TYP)

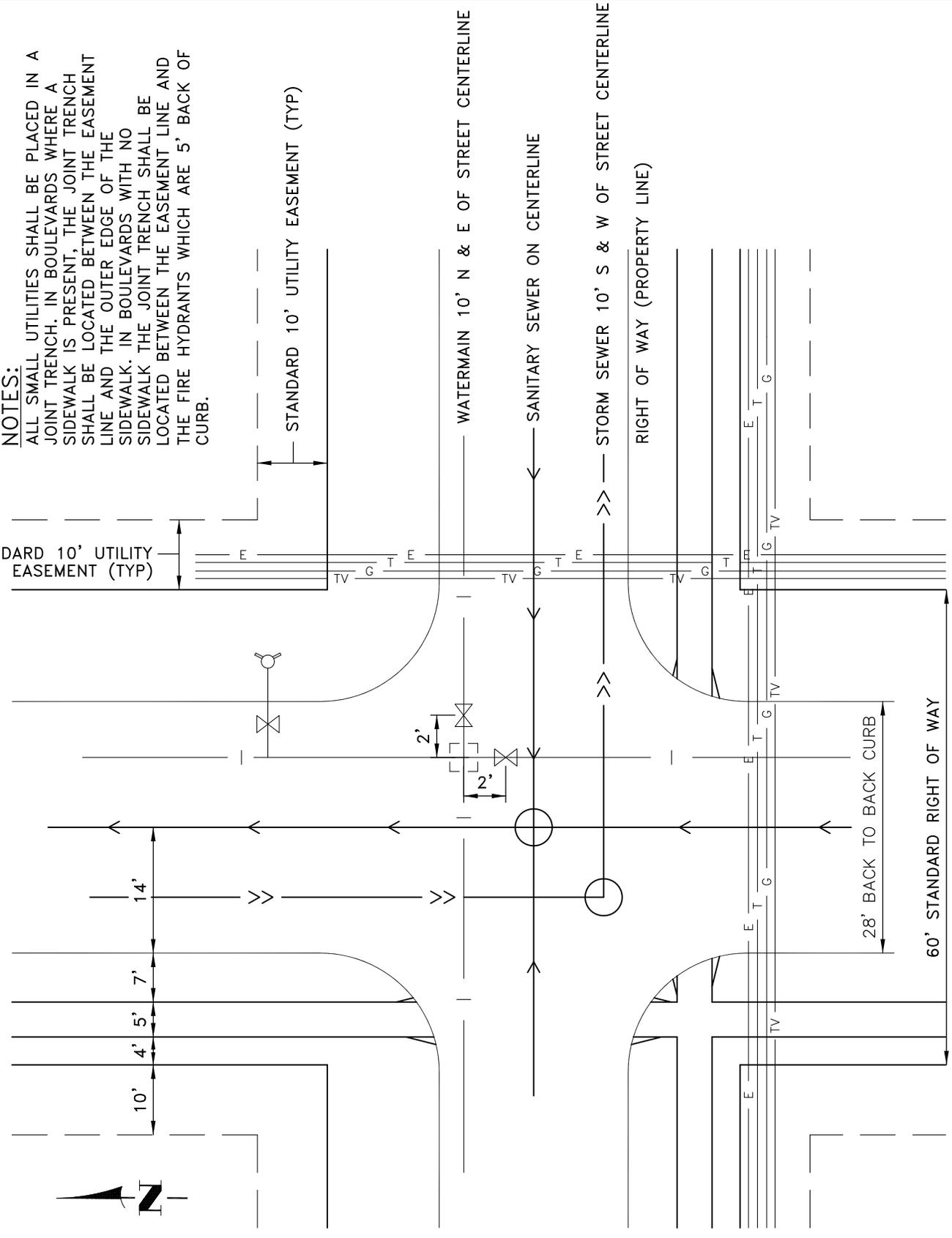
STANDARD 10' UTILITY EASEMENT (TYP)

WATERMAIN 10' N & E OF STREET CENTERLINE

SANITARY SEWER ON CENTERLINE

STORM SEWER 10' S & W OF STREET CENTERLINE

RIGHT OF WAY (PROPERTY LINE)



LOCATION OF PUBLIC UTILITIES

NO SCALE

APPROVED

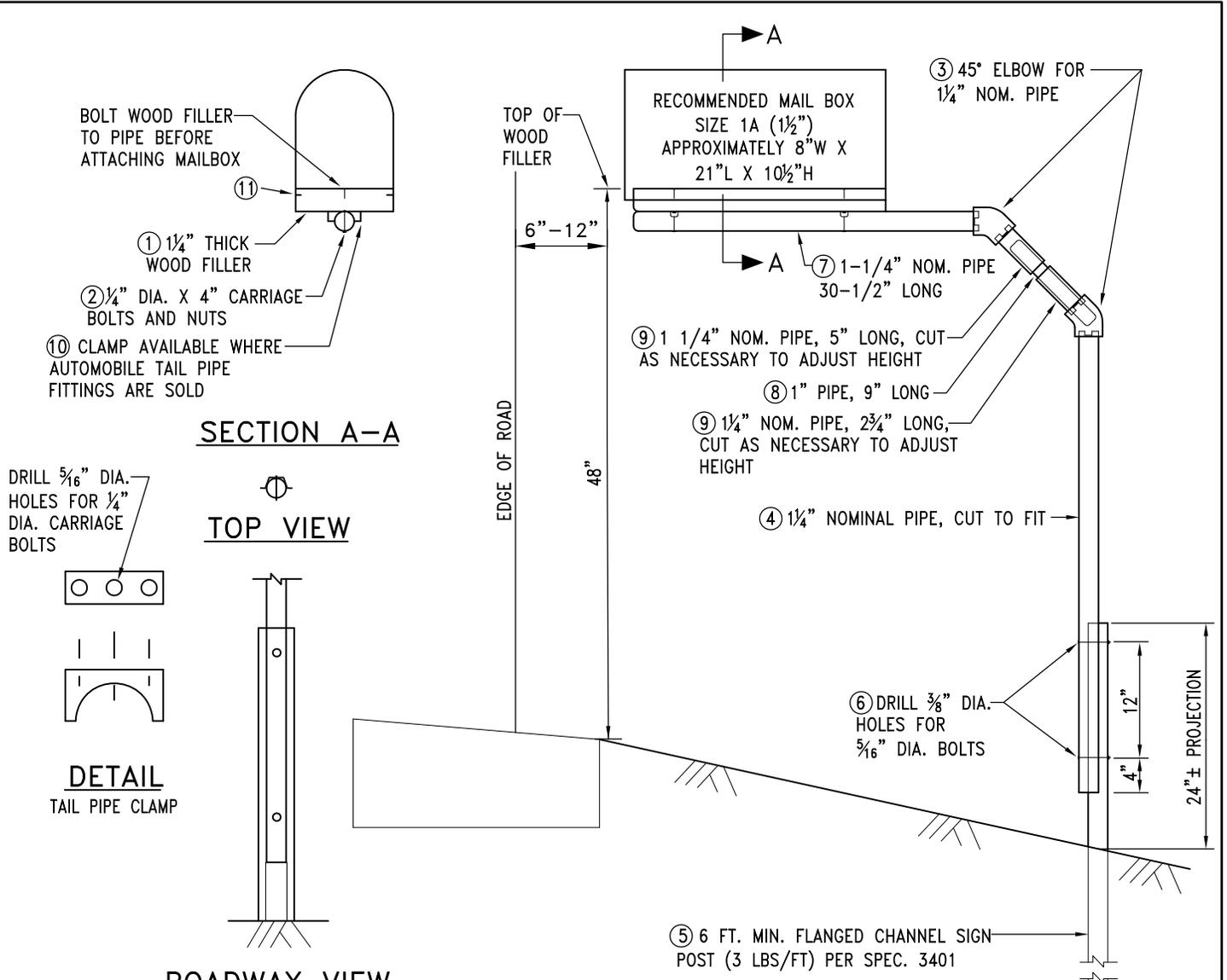
REVISED
 MARCH 2005



CITY OF
Otsego
MINNESOTA

STANDARD PLATE NO.
 900

Mar 28, 2013 - 10:09am
 K:\cad_eng\Details\OTSEGO_REV13.dwg\MISC\Misc-901.dwg



ITEM NO.	NUMBER REQUIRED	DESCRIPTION
1	1	1-1/2" THICK WOOD FILLER CUT TO FIT SNUG UNDER MAILBOX
2	2	1/4" DIA. X 4" LONG CARRIAGE BOLTS AND NUTS
3	2	45° ELBOW FOR 1-1/4" NOMINAL PIPE
4	1	1-1/4" NOMINAL PIPE, CUT TO FIT
5	1	6 FT. MIN. SIGN POST (3LBS_/FT.)
6	2	5/16" DIA. BOLT, NUT & LOCKWASHER
7	1	1-1/4" NOMINAL PIPE, 30-1/2" LONG
8	1	1" PIPE, 9" LONG
9	1	1-1/4" NOMINAL PIPE, 5" LONG 1-1/4" NOMINAL PIPE, 2-3/4" LONG
10	2	1-1/2" TAIL PIPE CLAMP
11	9	NO. 10 X 1" SHEET METAL SCREWS

NOTES:
 ALL PIPE AND PIPE FITTINGS SHALL CONFORM TO SPEC. 3362
 ALL FASTENERS SHALL CONFORM TO SPEC. 3391
 ALL MATERIALS SHALL BE GALVANIZED PER SPEC. 3392
 MAILBOX LOCATIONS SHOULD BE STAKED BEFORE INSTALLATION FOR PROPER HEIGHT AND DISTANCE FROM THE ROADWAY. ONCE STAKED, THE INSTALLER MUST NOTIFY THE ENGINEER THE ENGINEER WILL BE ALLOWED 48 HOURS TO REVIEW AND MODIFY THE STAKED LOCATIONS PRIOR TO FINAL INSTALLATION.
 OTHER MN/DOT APPROVED MAILBOX SUPPORTS MAY ALSO BE USED.
 A MINIMUM 30" CLEARANCE FROM THE GROUND MUST BE MAINTAINED FOR SNOW REMOVAL. CITY WILL NOT REPLACE DAMAGES CAUSED BY SNOW REMOVAL IF 30" OF CLEARANCE IS NOT PROVIDED.

MAILBOX SUPPORT
 STEEL PIPE WITH FITTINGS AND STEEL FENCE POST
 (SINGLE SUPPORT)
 NO SCALE

APPROVED
 REVISED
 3-19-03



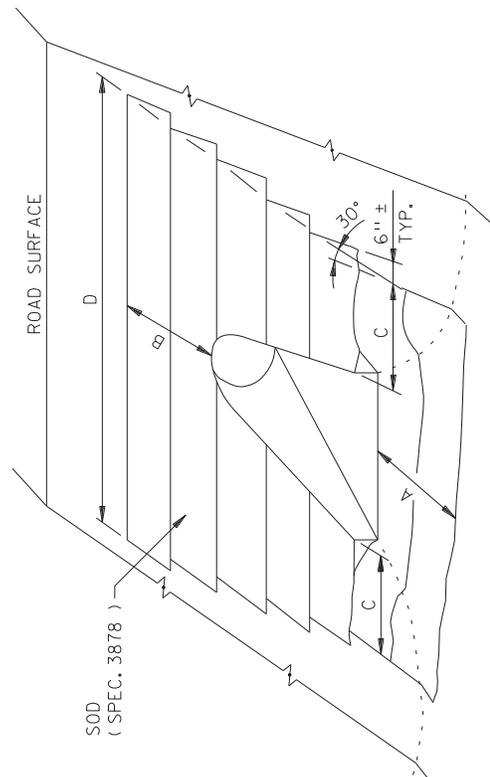
STANDARD PLATE NO.
 901

APPROVED Dec. 12, 1990
R.M. Hill
 DIRECTOR
 OFFICE OF TECHNICAL SUPPORT

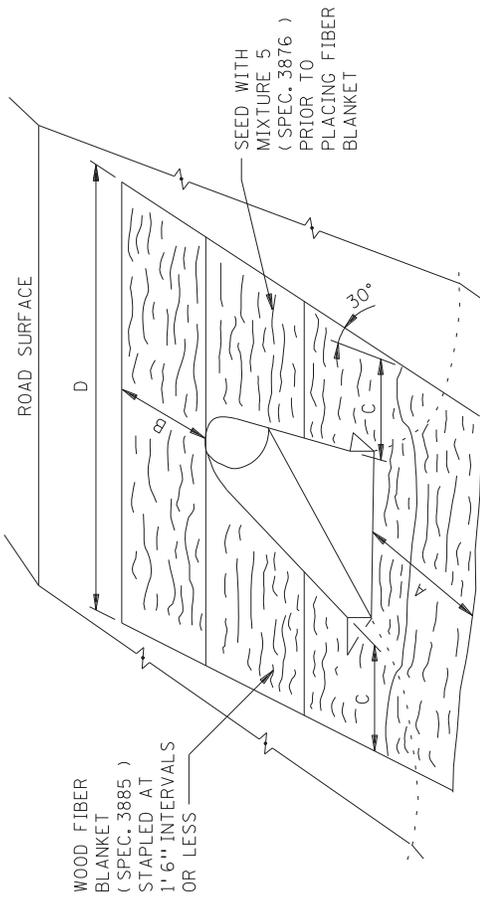
STATE OF MINNESOTA
 DEPARTMENT OF TRANSPORTATION
 TURF ESTABLISHMENT AREAS
 (AT PIPE CULVERT ENDS)

SPECIFICATION
 REFERENCE
 2575

STANDARD
 PLATE
 NO.
 9102D



SODDING DETAIL



MULCHING & SEED DETAIL

QUANTITIES (SQ. YDS.) AROUND CULVERT APRONS ①

CULVERT DIAMETER	SOD OR MULCH AREA (SQ. YDS.)		"A"	"B"	"C"	"D"
	METAL APRON	CONCRETE APRON				
15" & SMALLER	7	8	3'	1.5'	3'	13'
18"	11	10	3'	3'	3'	16'
24"	13	13	3'	3'	3'	18'
30"	19	19	3'	4.5'	3'	22'
36"	28	29	4.5'	4.5'	4.5'	27'
42"	36	34	4.5'	6'	4.5'	30'
48"	45	42	4.5'	7.5'	4.5'	34'
54"	54	47	4.5'	9'	4.5'	37'
60"	57	46	4.5'	9'	4.5'	39'
66"	58	50	4.5'	9'	4.5'	39'
72"	65	59	4.5'	10.5'	4.5'	41'
78"	78	75	6'	10.5'	6'	45'
84"	79	76	6'	10.5'	6'	45'
90"	—	77	6'	10.5'	6'	45'

CULVERT DIAMETER	SOD OR MULCH AREA (SQ. YDS.)		"A"	"B"	"C"	"D"
	METAL APRON	CONCRETE APRON				
15" & SMALLER	9	9	4.5'	1.5'	3'	13'
18"	11	11	6'	1.5'	3'	14'
24"	15	15	7.5'	1.5'	3'	16'
30"	19	20	9'	1.5'	3'	18'
36"	30	30	10.5'	1.5'	4.5'	23'
42"	36	34	12'	1.5'	4.5'	25'
48"	41	39	13.5'	1.5'	4.5'	27'
54"	47	41	15'	1.5'	4.5'	29'
60"	62	52	16.5'	1.5'	6'	33'
66"	63	56	16.5'	1.5'	6'	33'
72"	64	58	16.5'	1.5'	6'	34'
78"	65	62	16.5'	1.5'	6'	34'
84"	66	63	16.5'	1.5'	6'	35'
90"	—	65	16.5'	1.5'	6'	35'

NOTES:

AREA SHOWN IN SQUARE YARDS IS FOR ONE CULVERT END, FOR PIPE ARCHES USE AREA OF EQUIVALENT DIAMETER PIPE.

AREAS AND DIMENSIONS ARE APPROXIMATE AND ARE BASED ON CULVERT SLOPES, BUT NO STEEPER THAN 2:1.

DETAILS ARE SHOWN FOR METAL APRON, THE SAME DIMENSIONS, EXCEPT DIMENSION "D", APPLY WHEN A CONCRETE APRON IS USED. DIMENSION "D" MAY VARY SLIGHTLY DUE TO DIFFERENT WIDTHS OF APRON FROM METAL AND CONCRETE. DIMENSION "D" SHOWN FOR 90" DIA. APRON IS FOR CONCRETE APRON.

① ADDITIONAL QUANTITIES MAY BE SHOWN IN THE PLAN OR REQUIRED BY THE ENGINEER.

APPENDIX B

City Of Otsego, Developmental Policy Trunk and Lateral Sewer and Water Facilities

All lots, parcels, properties or developments within the City of Otsego are responsible for the cost of street, sewer, water, drainage and other public improvements that are of benefit to property. In addition, the City has established per unit connection charges to pay costs of what are deemed “trunk” facilities, which are defined in City ordinance and policies as facilities having area-wide benefit.

For sanitary sewer facilities, any line and appurtenances having an inside pipe diameter of eight inches (8”) or less and a depth to manhole invert of twelve feet (12’) or less is by definition a lateral facility. Any pipe oversizing greater than 8-inch diameter is by definition a trunk oversizing intended to provide service to a large area, and the incremental cost of constructing the oversizing is a trunk benefit. The cost of sewer pipes, manholes and appurtenances greater than 12 ft. in depth are a lateral cost if that depth is required to provide basic services to the abutting properties within a development. The incremental cost of constructing a pipe greater than 12 ft. in depth is a trunk cost if the added depth is required to extend sewer service beyond the area of the developmental property.

For water supply and distribution facilities, any line within a single family zoned area having a pipe size of eight inch (8”) diameter and smaller and any line within a commercial, industrial, institutional or medium to high density residential area having a pipe size of twelve inch (12”) diameter and smaller is by definition a lateral facility. The incremental cost of watermain oversizing greater than the defined lateral size is a trunk cost.

Each property or development is fully responsible for providing a basic water and sewer service system including construction of water and sewer lines to the property boundaries. Each property or development is responsible for system looping, which shall conform to the minimum configuration of the city water plan. All non-looped watermains (cul-de-sacs) shall be a minimum 8-inch diameter. The maximum length of non-looped watermains, regardless of diameter, shall be the 500 ft. cul-de-sac length permitted by the subdivision ordinance. Approval of any variance from that 500 ft. cul-de-sac length shall not be granted if watermain looping cannot be provided. Each property or development shall be responsible for properly located water system hydrants and valves as approved by the city engineer. Hydrant spacing shall be a maximum of 500 ft. in single family residential areas and a maximum of 300 ft. in commercial, industrial or high density residential areas. Water system valves shall be placed as directed by the engineer and may be required at any location with pipe tees or crosses and on straight pipe runs longer than 800 ft. All watermain shall be constructed to a minimum depth of 7 ½ feet from interim and final design grades or surfaces.

Sanitary sewer lift station and forcemains necessary to provide service to individual properties or to provide service within individual developments are a lateral benefit to property and shall be funded by the property or development served. The oversizing of lift stations and force mains to provide service beyond the development area shall be a trunk benefit.

Sanitary sewer lift stations that provide service to multiple properties and multiple development areas shall be trunk facilities. For the purpose of trunk sewer lift station determination, multiple properties are those parcels that had individual Property Identification Numbers and were under separate ownership as of the last day of June 1997, the completion date of the city Sanitary Sewer Study.

APPENDIX C

**POLICY ON STORMWATER DRAINAGE
SUBMITTAL REQUIREMENTS
FOR DEVELOPERS**

CITY OF OTSEGO

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2.0	Established Ordinances (City Codes)
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4.0	State and Federal Requirements
5.0	Calculations and Considerations
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B.	Rainfall
C.	Curve Numbers
D.	Flood Protection
E.	On-Site Detention Basins
F.	Storm Sewer
6.0	General Requirements - Grading, Drainage, and Erosion Control Plan
7.0	Storm Drainage System Submittal Requirements
8.0	Glossary
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TABLE 2	ATLAS 14 PRECIPITATION DATA (DEPTH)
TABLE 3	ATLAS 14 PRECIPITATION DATA (INTENSITY)

POLICY ON STORMWATER DRAINAGE
SUBMITTAL REQUIREMENTS
FOR DEVELOPERS

CITY OF OTSEGO

1.0 Purpose and Intent

This policy is intended to provide Developer's Engineers with a standardized format for submittal of drainage plans and calculations to the City for review. A standardized format will provide the following:

- Reduced preparation time for submittals by providing direct guidelines for Developer's Engineers to follow
- Reduced review time required by the City's Engineer by insuring complete and comprehensive drainage plans and calculations are submitted
- Insure that the City will receive the best possible protection of its resources, which could be adversely affected by inadequate stormwater management planning.

2.0 Established Ordinances (City Codes)

- A. Section 20-16-9, Drainage Plans and Soil Erosion and Sediment Control
- B. Section 21-6-2-C-13, Preliminary Plat Grading Plan
- C. Section 21-6-2-E-7 Preliminary Plat Erosion and Sediment Control
- D. Section 21-6-3-M Final Plat Drainage and Utility Easements
- E. Section 21-7-4-H Lots - Watercourses
- F. Section 21-7-4-J Lots - Drainage
- G. Section 21-7-11-D, Storm Water Drainage Facilities
- H. Section 21-7-11-E, Storm Water Drainage Standards
- I. Section 21-7-14, Drainage
- J. Section 21-7-15-A, Drainage and Utility Easements
- K. Section 21-7-15-B, Drainage
- L. Section 21-7-16, Erosion and Sediment Control
- M. Section 21-7-19, Dedication of Storm Water Holding Areas or Ponds
- N. Section 21-8-8, Drainage
- O. Section 21-9-1-G, Drainage Facilities

The above listed articles are a comprehensive list of previously approved ordinances related to stormwater drainage. Other related sections of the City Code not listed above remain in effect. The ordinance sections listed provide authority for the City to require and review drainage plans.

3.0 Incorporation by Reference

Protecting Water Quality in Urban Areas (Best Management Practices for Minnesota) prepared by the Minnesota Pollution Control Agency, Division of Water Quality, latest edition, shall be incorporated by reference into this policy.

Recommendations set forth in the above referenced manual shall be implemented by the Developer's Engineer. All recommendations set forth within the above referenced manual shall be termed "required" when applicable unless otherwise amended by this policy.

4.0 State and Federal Requirements

State and Federal Ordinances, Codes, Regulations, and Requirements shall be adhered to by the Developer.

5.0 Calculations and Considerations

A. General Hydrology

Hydrologic analysis of storm water runoff for the planning and design of flows in storm sewers, ditches, streams and channels to lakes, detention basins, and wetlands shall be made using generally accepted hydrograph methods.

Determination of total runoff volume should follow the USDA-SCS curve number method which incorporates land use and hydrologic soil groups. Specific step-by-step process can be found in the Soil Conservation Service (SCS) publication National Engineering Handbook: Chapter 4, SCS Hydrology (1972), and Hydrology Guide for Minnesota (1992). Peak runoff rates should be determined through the use of the SCS method incorporating "time of concentration" for both pre and post development conditions.

Then the storm water should be routed through the drainage area, that is, mathematically the peaks and volumes are followed as they move in a wave progressively downstream.

"Design Storms" or storm volumes for hydrologic analyses shall be based upon the depths from the National Oceanic and Atmospheric Administration (NOAA) ATLAS 14, Volume 8, Version 2 Point Precipitation Frequency Estimates 90% confidence intervals (See Appendix D Table 2).

The rational method may be used to determine peak runoff rates for primary systems. Construction of a hydrograph should be undertaken which characterizes the movement of surface water as a function of time and precipitation. Rainfall intensity shall be based upon intensities from the National Oceanic and Atmospheric Administration (NOAA) ATLAS 14, Volume 8, Version 2 Point Precipitation Frequency Estimates 90% confidence intervals (See Appendix D Table 3.).

Minimum time of concentration shall be 10 minutes for drainage areas with tributary areas, 7 minutes without tributary areas. When a portion of the drainage area is highly impervious, the drainage area shall be evaluated both with and without tributary area to verify that just the highly impervious area does not result in greater peak discharge than the area evaluated as a whole.

B. Rainfall

Usually the standard 24-hour SCS rainfall distribution will be used to calculate the peak discharge rates and levels. The following rainfall values shall be used in calculations for the City of Otsego:

<u>Event</u>	<u>Rainfall (inches)</u>
1 year, 24 hour	2.45
2 year, 24 hour	2.85
10 year, 24 hour	4.24
25 year, 24 hour	5.23
50 year, 24 hour	6.07
100 year, 24 hour	6.97

C. Curve Numbers

Table 1 lists the minimum allowable Curve Numbers (CN) which shall be used for design. Hydrologic soil groups shall be determined based upon the Soil Survey for Wright County, Minnesota as published by the United States Department of Agriculture Soil Conservation Service in Cooperation with Minnesota Agricultural Experiment Station.

D. Flood Protection

Consistent with state and federal regulations, the City of Otsego requires that the level of flood protection along all ditches, detention basins, lakes, streams and wetlands be established based upon the 1 percent (100-year frequency) flood. Land use within floodplains shall be regulated in accordance with state floodplain zoning regulations.

The following freeboard values are required for the City of Otsego:

- Landlocked Basins (no outlet) 3 feet (Established high water, see 5.E.8.)
- Non-landlocked basins 1.5 feet (100-year frequency)

E. On-Site Detention Basins

It is the policy of the City of Otsego to require developments to control urban storm water quantity and quality through a management approach of detention and infiltration basins. Detention basins, whether on-site or regional in nature, shall be designed to incorporate the following:

1. A permanent pool (“dead storage”) volume below the normal elevation which shall be greater than or equal to the runoff from a 2.5-inch rainstorm over the entire contributing drainage area assuming full development. This modified NURP criteria includes a 25 percent increase in basin storage to permit routine sediment accumulation over a 20-year design period, assuming the drainage area is protected with proper erosion and sedimentation control practices.
2. A permanent pool average depth (basin volume/basin area) which shall be greater than 4 feet with a maximum depth of less than 10 feet.
3. An emergency spillway (emergency outlet) adequate to control the one percent frequency/duration rainfall event (usually 100-year, 24-hour).
4. Basin side slopes above the normal water level should be no steeper than 4:1, and preferably flatter. A basin shelf with a minimum width of 10 feet and a slope of 10:1 starting at the normal water level.
5. To prevent short-circuiting, the distance between major inlets and the normal outlet shall be maximized. The ratio of maximum length to maximum width of the permanent pool should be at least 3:1.

6. To protect downstream channels and structures, the following flood control criteria are required for basin design:
 - a. A flood pool (“live storage”) volume above the normal elevation shall be adequate so that the peak discharge rates from the 2-year and 100-year frequency, critical duration storms (usually the 24-hour) are no greater than predevelopment basin watershed conditions.
 - b. Storage volumes and discharge rates have been established for the 100-year event for certain portions of the city. In these areas the established storage volumes and discharge rates shall be used for post development design.
 - c. Dead storage volume may not be utilized as live storage.
7. Skimming structures shall be utilized for each basin. The skimming structure shall be in accordance with the City Standard Plates. Skimming structures shall be shown on the plans.
8. Where discharge from the basin is not possible, the permanent basin must be sized for two 100 year events back-to-back. In this situation the free board above the established high water level shall be a minimum of three (3) feet. The high water level shall be established as follows:
 - a. Assume the water surface is at the normal water surface elevation of the basin.
 - b. Above the assumed water surface elevation store the volume of runoff equal to two 100-year, 24-hour storm events over the entire drainage area to the landlocked basin.
 - c. The established high water level is the elevation the water would rise to from the above steps a and b.
9. Discharge must be made to a receiving stream, ditch, or another pond or an approved discharge route as shown in the Storm Water Management Plan.

F. Infiltration Basins

All new developments shall be required to infiltrate the first 1.1 inch of runoff from the new impervious surfaces unless infiltration is prohibited as outlined in the MPCA NPDES Permit. Infiltration basins shall be constructed and designed in accordance with the latest edition of the Minnesota Stormwater Manual with the following additional requirements:

1. Construction of an approved pre-treatment basin shall be required prior to discharge into the infiltration basin.
2. Exit velocities from the pre-treatment system shall be less than 3 feet per second for the 100-year storm event and flows shall be evenly distributed across the width of the outlet.
3. A minimum of three soil borings or pits shall be submitted with the design to verify soil types and infiltration capacity characteristics and to determine the depth to restrictive soil layers and groundwater. The depth of the soil borings or pits shall be a minimum of five feet below the bottom of the proposed infiltration practice. Soil borings reports shall be prepared by a qualified geotechnical professional.
4. The bottom of the infiltration practice must be at least three feet from the seasonal high ground water table.
5. Storm sewer discharge pipes shall be extended to the bottom of the basin or concrete block (see Std Plate 500) shall be extended from the discharge pipe to the bottom of the basin.

G. Storm Sewer

1. Storm sewer sizing, inlet capacities, and roadway spread at each inlet shall be determined based on the intensity of a 10-year storm event.

Storm sewer inlets shall be spaced to insure that not more than 2/3 of the traveled lane for local low volume roads and not more than 1/2 of the traveled lane for all other roads is inundated during the 10-year storm event. Manning's equation shall be utilized to determine the flow in the street at each catchbasin for verification of actual spread. A manning's n of 0.016 shall be utilized for asphalt pavement. Additionally, grate inlet capacities shall be verified at the maximum allowable depth of flow to verify that the proposed grates will pass the 10-year flows. When appropriate, by-pass flows shall be considered in calculations.

2. Storm sewer systems shall also meet the following requirements:

- a. Maintain a minimum velocity of 3 fps for 10-year storm event.
- b. Maintain a minimum cover of 2 feet from top of pipe to top of casting or flow line elevation.
- c. Maintain a minimum of 3 feet of final cover over corrugated high density polyethylene (HDPE) pipe. See engineering guidelines to determine when HDPE is allowed.
- d. Maintain a minimum of 1.5 feet of final cover over RCP in areas not used for vehicle traffic.
- e. Storm sewers inverts, which outlet to detention basins, shall be placed at the normal elevation of the basin. Storm sewers may be submerged a maximum of 1/2 the pipe diameter below the basin normal elevation, provided the tail water does not back up past the first structure.
- f. Minimum size storm sewer shall be 15" diameter, however, 12" diameter will be allowed for catchbasin leads.

6.0 General Requirements - Grading, Drainage, and Erosion Control Plan

Grading, Drainage, and Erosion Control Plans shall be provided by the Developer in accordance with the City Code. Several items critical to the review of the drainage system must be adequately depicted on the plan by the Developer's Engineer. The following key elements must be depicted on the plan:

- A. Existing and proposed contours at a minimum of 2-foot intervals. A 1-foot contour interval or proposed spot elevations shall be used where conditions dictate. The determination of contour interval shall be made based upon clarity and readability of the plans.
- B. Basin locations as depicted by the proposed contours. Normal level and 2 year, 10 year and 100 year flood water levels shall be depicted on the plan for each basin. Detention ponds basins are required at each outfall point from the proposed plat. Perimeter berm elevation and width shall be clearly labeled on plan sheets.

Permanent detention basins may be utilized as construction detention basins, provided they are cleaned after permanent erosion control measures are established. Design features of the detention ponds shall be as described in the BMP Manual.

- C. Locations of silt fence, bale checks, wood fiber blanket, concrete washout areas, rock construction entrances, storm drain inlet protection, outlet

projection, rip rap, temporary seeding, permanent seeding, sod, mulch, or other erosion control features proposed to be implemented for the project.

- D. Storm sewer facilities, when utilized, shall be adequately depicted on the drawings (may be shown on the Construction Plans). As a minimum, the following must be shown on the plan:
1. Storm sewer pipe length, grade, type of material, and size between each catch basin and manhole.
 2. Catchbasin and manhole structural data including size or diameter, depth, and material of construction. A typical section depicting each different type of catchbasin or manhole used shall be shown on the drawing. Type of casting utilized shall be referenced for each catchbasin or manhole. Elevations for the top of inlet and each invert shall be referenced on the drawing.
 3. A typical curb section for urban design streets shall be shown on the drawing.
 4. If ditch sections are used, a typical section shall be shown on the drawing depicting bottom width and side slopes of the ditch.
 5. Details of skimming structures utilized. Access routes a minimum of 10' wide shall be provided to all skimmer structures and rip rap overflows. All access routes shall be labeled on the plan. Easements shall be 20' minimum.
- E. Individual lot grading clearly depicting a minimum slope of 2%. Slopes of 1% to 2% may be allowed on a case by case basis with approval from the City Engineer. Under no circumstances will slopes less than 1% be allowed.
- F. Lots located in clay soils shall have draitile extended to if they are more than one lot away from a storm sewer structure. The draitile is to serve as a means of promoting drainage along lot lines and as a connection point for homes sump pump systems

7.0 Storm Drainage System Submittal Requirements

- A. The stormwater drainage report shall be comprised of the following sections to provide the City Engineer with adequate base information for which to review the report. The following data must be included in the report:
1. Title Page. The title page shall list the project name, project location, date prepared, and preparer's name, title, and company.

2. Table of Contents. The table of contents must provide a description of the major categories of the report and also list each hydrograph and reservoir report presented in the report.
3. Summary. The summary must provide descriptions of items critical to the review of the entire report. Assumptions and results of the calculations shall be included in the summary. As a minimum, the following items must be discussed in the summary:
 - a. Pre-development site conditions (Existing)
 1. Total site area
 2. Delineation of sub-drainage areas, as appropriate.
 3. For each drainage area, or sub-drainage area, provide the following information:
 - a. Area in acres
 - b. Curve number (with justification)
 - c. Time of Concentration (with justification)
 - d. Runoff rate and runoff volume
 - b. Post Development Site Conditions (Proposed)
 1. Total site area
 2. Delineation of sub-drainage areas, as appropriate.
 3. For each drainage area, or sub-drainage area, provide the following information:
 - a. Area in acres
 - b. Curve number (with justification)
 - c. Time of Concentration (with justification)
 - d. Runoff rate and runoff volume
 - c. Comparison of pre-development to post-development runoff rates and volumes.
 - d. Discussion of temporary and permanent erosion control measures utilized.
 - e. A discussion of the storm sewer system, if applicable, to include a summary of flows to each catchbasin and the depth of water over each catchbasin during the ten year event.
4. Drainage maps depicting pre-development and post-development conditions. The maps may be 22"x34" plans, but shall also be provided on 11"x17" reductions. The plans shall delineate drainage area and sub-drainage area boundaries. All areas shall be labeled and referenced to those presented in the report.

5. Computer printouts of all hydrograph and reservoir files shall be included at the back of the report for reference.

8.0 Glossary

Critical Storm

Critical Storm means that rainfall event whose distribution and duration results in a runoff volume and rate establishing the appropriate level of protection.

Freeboard

Is the vertical difference between the lowest floor of proposed buildings and the critical 100-year storm event elevation or established high water level.

Level of Protection

The amount of secondary storm water runoff capacity required to avoid flood damage and provide for public safety.

Level of Service

The amount of primary storm water runoff capacity required to avoid unusual hardship or significant interference with normal public activities (transportation, sanitary, or utilities).

Normal Level

For basins, that water elevation maintained by a natural or man-made outlet.

NOAA

National Oceanic and Atmospheric Administration

NURP

Nationwide Urban Runoff Program (USEPA, 1983).

100-Year Storms

Rainstorms of varying duration (e.g. 2-, 6-, 24- or 48-hour) and intensities expected to recur on the average of once every one hundred years (1% frequency probability).

On-Site Detention

A method of temporarily storing storm water runoff at a development site in the form of wet basins.

Primary Capacity

The volume and/or rate of storm water runoff defined as that level of service provided by the primary system.

Primary System

The primary system conveys runoff from the more frequent events such as the 2 to 10-year events. In general, the system is composed of swales, ditches, gutters, and storm sewers.

Secondary Capacity

The volume and/or rate of storm water runoff in excess of the primary capacity and defined as that level of protection provided by the secondary system.

Secondary System

The system is composed of all the pathways that runoff takes when the capacity of the primary system is exceeded and in general is composed of streets, swales, ditches, storm sewers, detention basins, creeks, streams and rivers.

Grading, Drainage, and Erosion Control Plan: A set of plans prepared by or under the direction of a licensed professional engineer which indicate the specific measures and sequencing to be used to control sediment and erosion on a development site before, during, and after construction.

Storm Water Runoff

The flow on the surface of the ground, resulting from precipitation in the form of rainfall or snowmelt.

TABLE 1
CITY OF OTSEGO MINIMUM RUNOFF CURVE NUMBERS

Cover Description	Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>				
Open space (lawns, parks, golf courses, cemeteries, etc.)				
Grass Cover > 75%	39	61	74	80
Grass Cover < 75%	49	65	77	82
Impervious areas:				
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	98	98	98	98
Streets and roads:				
Paved; curbs and storm sewers (excluding right-of-way)	98	98	98	98
Paved; open ditches (including right-of-way)	83	89	92	93
Gravel (including right-of-way)	76	85	89	91
Dirt (including right-of-way)	72	82	87	89
Water Surface:	100	100	100	100
Urban Districts:				
Commercial and business	NA ¹	92	94	95
Industrial	NA ¹	88	91	93
Residential districts by average lot size:				
1/8 acre or less (town houses)	NA ¹	85	90	92
1/4 acre	NA ¹	75	83	87
1/3 acre	NA ¹	72	81	86
1/2 acre	NA ¹	70	80	85
1 acre	59	68	79	84
2 acres and greater	55	65	77	82
Developing Urban Areas				
Newly graded areas (pervious areas only, no vegetation)	77	86	91	94
Undeveloped areas				
Agricultural land (all current uses)	55	65	77	82
Pasture, grassland, or range - continuous forage for grazing	49	65	77	82
Meadow - continuous grass, protected from grazing and generally mowed for hay	30	58	71	78
Brush - brush-weed-grass mixture with brush the major element	35	56	70	77
Woods - grass combination (orchard or tree farm)	43	65	76	82
Woods	36	60	73	79

**TABLE 2
CITY OF OTSEGO ATLAS 14 PRECIPITATION DATA (DEPTH)**



NOAA Atlas 14, Volume 8, Version 2
Location name: Elk River, Minnesota, US*
Latitude: 45.2742°, Longitude: -93.5917°
Elevation: 878 ft*
* source: Google Maps



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aeriels](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.367 (0.285-0.476)	0.431 (0.334-0.560)	0.538 (0.415-0.699)	0.629 (0.483-0.819)	0.758 (0.567-1.01)	0.860 (0.631-1.15)	0.964 (0.688-1.30)	1.07 (0.739-1.47)	1.22 (0.814-1.69)	1.33 (0.870-1.86)
10-min	0.538 (0.417-0.698)	0.632 (0.489-0.819)	0.788 (0.608-1.02)	0.921 (0.708-1.20)	1.11 (0.831-1.47)	1.26 (0.924-1.68)	1.41 (1.01-1.91)	1.57 (1.08-2.15)	1.78 (1.19-2.48)	1.95 (1.27-2.73)
15-min	0.656 (0.508-0.851)	0.770 (0.596-0.999)	0.961 (0.742-1.25)	1.12 (0.863-1.46)	1.35 (1.01-1.80)	1.54 (1.13-2.05)	1.72 (1.23-2.33)	1.91 (1.32-2.62)	2.18 (1.45-3.03)	2.38 (1.55-3.33)
30-min	0.904 (0.701-1.17)	1.07 (0.826-1.38)	1.34 (1.03-1.74)	1.57 (1.21-2.04)	1.89 (1.42-2.51)	2.15 (1.58-2.87)	2.41 (1.72-3.26)	2.68 (1.85-3.68)	3.05 (2.04-4.24)	3.33 (2.18-4.67)
60-min	1.16 (0.900-1.51)	1.37 (1.06-1.78)	1.73 (1.34-2.25)	2.04 (1.57-2.66)	2.50 (1.88-3.34)	2.87 (2.11-3.85)	3.26 (2.33-4.43)	3.67 (2.54-5.05)	4.25 (2.84-5.92)	4.70 (3.07-6.57)
2-hr	1.42 (1.11-1.82)	1.67 (1.31-2.15)	2.12 (1.66-2.72)	2.52 (1.96-3.24)	3.11 (2.37-4.12)	3.60 (2.68-4.78)	4.11 (2.98-5.54)	4.66 (3.26-6.37)	5.44 (3.67-7.54)	6.06 (3.99-8.42)
3-hr	1.58 (1.25-2.01)	1.86 (1.47-2.37)	2.36 (1.86-3.01)	2.82 (2.21-3.60)	3.51 (2.70-4.64)	4.09 (3.07-5.43)	4.72 (3.44-6.33)	5.39 (3.79-7.34)	6.35 (4.31-8.78)	7.13 (4.71-9.86)
6-hr	1.85 (1.48-2.33)	2.18 (1.74-2.74)	2.78 (2.21-3.49)	3.33 (2.64-4.20)	4.17 (3.25-5.47)	4.89 (3.72-6.43)	5.67 (4.18-7.55)	6.52 (4.63-8.82)	7.73 (5.30-10.6)	8.72 (5.81-12.0)
12-hr	2.14 (1.73-2.65)	2.51 (2.03-3.11)	3.18 (2.57-3.96)	3.81 (3.06-4.74)	4.75 (3.75-6.15)	5.56 (4.27-7.22)	6.42 (4.78-8.47)	7.36 (5.28-9.87)	8.71 (6.02-11.9)	9.80 (6.58-13.4)
24-hr	2.45 (2.01-3.00)	2.86 (2.34-3.49)	3.58 (2.93-4.39)	4.24 (3.45-5.22)	5.25 (4.18-6.70)	6.10 (4.74-7.83)	7.01 (5.27-9.14)	8.00 (5.78-10.6)	9.41 (6.55-12.7)	10.6 (7.13-14.3)
2-day	2.84 (2.36-3.43)	3.25 (2.70-3.92)	3.98 (3.30-4.82)	4.66 (3.84-5.65)	5.69 (4.59-7.18)	6.56 (5.16-8.33)	7.51 (5.70-9.70)	8.54 (6.23-11.2)	10.0 (7.03-13.4)	11.2 (7.63-15.1)
3-day	3.13 (2.62-3.74)	3.53 (2.95-4.23)	4.27 (3.56-5.12)	4.95 (4.10-5.96)	5.99 (4.86-7.50)	6.87 (5.44-8.66)	7.83 (5.99-10.0)	8.87 (6.51-11.6)	10.4 (7.32-13.8)	11.6 (7.93-15.5)
4-day	3.35 (2.82-3.99)	3.77 (3.18-4.50)	4.53 (3.80-5.42)	5.24 (4.37-6.27)	6.30 (5.14-7.85)	7.21 (5.72-9.04)	8.18 (6.28-10.4)	9.24 (6.81-12.0)	10.8 (7.61-14.3)	12.0 (8.23-16.0)
7-day	3.88 (3.30-4.57)	4.40 (3.74-5.18)	5.30 (4.50-6.27)	6.11 (5.15-7.25)	7.30 (5.99-8.96)	8.29 (6.63-10.3)	9.32 (7.20-11.8)	10.4 (7.73-13.4)	12.0 (8.54-15.8)	13.2 (9.15-17.6)
10-day	4.37 (3.74-5.11)	4.96 (4.25-5.81)	5.97 (5.10-7.01)	6.85 (5.82-8.07)	8.13 (6.70-9.88)	9.17 (7.37-11.3)	10.2 (7.95-12.8)	11.4 (8.46-14.6)	13.0 (9.25-17.0)	14.2 (9.85-18.8)
20-day	5.94 (5.16-6.85)	6.65 (5.77-7.67)	7.82 (6.77-9.05)	8.81 (7.58-10.2)	10.2 (8.49-12.2)	11.3 (9.17-13.7)	12.4 (9.72-15.3)	13.6 (10.2-17.1)	15.1 (10.9-19.6)	16.3 (11.4-21.4)
30-day	7.33 (6.43-8.40)	8.16 (7.15-9.35)	9.51 (8.29-10.9)	10.6 (9.21-12.2)	12.1 (10.1-14.3)	13.3 (10.9-15.9)	14.4 (11.4-17.7)	15.6 (11.8-19.6)	17.1 (12.4-22.0)	18.3 (12.9-23.9)
45-day	9.15 (8.08-10.4)	10.2 (9.00-11.6)	11.9 (10.4-13.5)	13.2 (11.5-15.1)	15.0 (12.6-17.5)	16.2 (13.3-19.2)	17.5 (13.8-21.2)	18.7 (14.1-23.2)	20.2 (14.6-25.8)	21.3 (15.0-27.7)
60-day	10.7 (9.52-12.1)	12.0 (10.7-13.6)	14.0 (12.4-15.9)	15.6 (13.7-17.8)	17.7 (14.9-20.4)	19.1 (15.7-22.5)	20.5 (16.2-24.6)	21.7 (16.5-26.8)	23.2 (16.9-29.5)	24.3 (17.2-31.5)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

TABLE 3
CITY OF OTSEGO ATLAS 14 PRECIPITATION DATA (INTENSITY)



NOAA Atlas 14, Volume 8, Version 2
Location name: Elk River, Minnesota, US*
Latitude: 45.2742°, Longitude: -93.5917°
Elevation: 878 ft*
* source: Google Maps



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.40 (3.42-5.71)	5.17 (4.01-6.72)	6.46 (4.98-8.39)	7.55 (5.80-9.83)	9.10 (6.80-12.1)	10.3 (7.57-13.8)	11.6 (8.26-15.6)	12.9 (8.87-17.6)	14.6 (9.77-20.3)	16.0 (10.4-22.4)
10-min	3.23 (2.50-4.19)	3.79 (2.93-4.91)	4.73 (3.65-6.14)	5.53 (4.25-7.19)	6.66 (4.99-8.84)	7.55 (5.64-10.1)	8.47 (6.04-11.4)	9.41 (6.49-12.9)	10.7 (7.15-14.9)	11.7 (7.64-16.4)
15-min	2.62 (2.03-3.40)	3.08 (2.38-4.00)	3.84 (2.97-4.99)	4.49 (3.45-5.85)	5.41 (4.05-7.19)	6.14 (4.51-8.20)	6.88 (4.91-9.31)	7.66 (5.28-10.5)	8.70 (5.81-12.1)	9.52 (6.21-13.3)
30-min	1.81 (1.40-2.35)	2.13 (1.65-2.77)	2.68 (2.07-3.48)	3.14 (2.41-4.08)	3.79 (2.83-5.03)	4.30 (3.15-5.74)	4.82 (3.44-6.52)	5.37 (3.70-7.35)	6.10 (4.07-8.48)	6.67 (4.35-9.33)
60-min	1.16 (0.900-1.51)	1.37 (1.06-1.78)	1.73 (1.34-2.25)	2.04 (1.57-2.66)	2.50 (1.88-3.34)	2.87 (2.11-3.85)	3.26 (2.33-4.43)	3.67 (2.54-5.05)	4.25 (2.84-5.92)	4.70 (3.07-6.57)
2-hr	0.710 (0.556-0.909)	0.837 (0.656-1.07)	1.06 (0.828-1.36)	1.26 (0.980-1.62)	1.55 (1.18-2.06)	1.80 (1.34-2.39)	2.06 (1.49-2.77)	2.33 (1.63-3.19)	2.72 (1.84-3.77)	3.03 (1.99-4.21)
3-hr	0.526 (0.415-0.668)	0.619 (0.489-0.788)	0.787 (0.619-1.00)	0.939 (0.736-1.20)	1.17 (0.899-1.55)	1.36 (1.02-1.81)	1.57 (1.15-2.11)	1.80 (1.26-2.45)	2.12 (1.44-2.92)	2.37 (1.57-3.28)
6-hr	0.310 (0.248-0.389)	0.364 (0.291-0.457)	0.464 (0.369-0.583)	0.556 (0.441-0.701)	0.697 (0.543-0.913)	0.817 (0.621-1.07)	0.947 (0.698-1.26)	1.09 (0.773-1.47)	1.29 (0.885-1.77)	1.46 (0.970-2.00)
12-hr	0.177 (0.144-0.220)	0.208 (0.169-0.258)	0.264 (0.213-0.328)	0.316 (0.254-0.393)	0.395 (0.311-0.511)	0.461 (0.354-0.599)	0.533 (0.397-0.703)	0.611 (0.438-0.819)	0.723 (0.499-0.985)	0.814 (0.546-1.11)
24-hr	0.102 (0.084-0.125)	0.119 (0.098-0.146)	0.149 (0.122-0.183)	0.177 (0.144-0.217)	0.219 (0.174-0.279)	0.254 (0.197-0.326)	0.292 (0.220-0.381)	0.333 (0.241-0.442)	0.392 (0.273-0.530)	0.440 (0.297-0.595)
2-day	0.059 (0.049-0.071)	0.068 (0.056-0.082)	0.083 (0.069-0.100)	0.097 (0.080-0.118)	0.119 (0.096-0.150)	0.137 (0.107-0.174)	0.156 (0.119-0.202)	0.178 (0.130-0.234)	0.208 (0.146-0.279)	0.233 (0.159-0.314)
3-day	0.043 (0.036-0.052)	0.049 (0.041-0.059)	0.059 (0.049-0.071)	0.069 (0.057-0.083)	0.083 (0.068-0.104)	0.095 (0.075-0.120)	0.109 (0.083-0.140)	0.123 (0.090-0.161)	0.144 (0.102-0.192)	0.161 (0.110-0.215)
4-day	0.035 (0.029-0.042)	0.039 (0.033-0.047)	0.047 (0.040-0.056)	0.055 (0.045-0.065)	0.066 (0.054-0.082)	0.075 (0.060-0.094)	0.085 (0.065-0.109)	0.096 (0.071-0.125)	0.112 (0.079-0.149)	0.125 (0.086-0.167)
7-day	0.023 (0.020-0.027)	0.026 (0.022-0.031)	0.032 (0.027-0.037)	0.036 (0.031-0.043)	0.043 (0.036-0.053)	0.049 (0.039-0.061)	0.055 (0.043-0.070)	0.062 (0.046-0.080)	0.071 (0.051-0.094)	0.079 (0.054-0.105)
10-day	0.018 (0.016-0.021)	0.021 (0.018-0.024)	0.025 (0.021-0.029)	0.029 (0.024-0.034)	0.034 (0.028-0.041)	0.038 (0.031-0.047)	0.043 (0.033-0.053)	0.047 (0.035-0.061)	0.054 (0.039-0.071)	0.059 (0.041-0.078)
20-day	0.012 (0.011-0.014)	0.014 (0.012-0.016)	0.016 (0.014-0.019)	0.018 (0.016-0.021)	0.021 (0.018-0.025)	0.024 (0.019-0.028)	0.026 (0.020-0.032)	0.028 (0.021-0.036)	0.032 (0.023-0.041)	0.034 (0.024-0.045)
30-day	0.010 (0.009-0.012)	0.011 (0.010-0.013)	0.013 (0.012-0.015)	0.015 (0.013-0.017)	0.017 (0.014-0.020)	0.018 (0.015-0.022)	0.020 (0.016-0.025)	0.022 (0.016-0.027)	0.024 (0.017-0.031)	0.025 (0.018-0.033)
45-day	0.008 (0.007-0.010)	0.009 (0.008-0.011)	0.011 (0.010-0.013)	0.012 (0.011-0.014)	0.014 (0.012-0.016)	0.015 (0.012-0.018)	0.016 (0.013-0.020)	0.017 (0.013-0.022)	0.019 (0.014-0.024)	0.020 (0.014-0.026)
60-day	0.007 (0.007-0.008)	0.008 (0.007-0.009)	0.010 (0.009-0.011)	0.011 (0.010-0.012)	0.012 (0.010-0.014)	0.013 (0.011-0.016)	0.014 (0.011-0.017)	0.015 (0.011-0.019)	0.016 (0.012-0.020)	0.017 (0.012-0.022)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

APPENDIX D

**STANDARD SPECIFICATIONS
FOR
STREET CONSTRUCTION
FOR DEVELOPERS
CITY OF OTSEGO**

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STANDARD SPECIFICATIONS
FOR
STREET CONSTRUCTION
FOR DEVELOPERS
CITY OF OTSEGO

1.00 GENERAL REQUIREMENTS

1.01 Specification Reference:

- A. All work and materials shall conform to the provisions of Minnesota Department of Transportation (Mn/DOT) "Standard Specifications for Construction", 2005 Edition and all subsequent revisions.
- B. All traffic control devices and signing shall conform to the MN MUTCD, dated December, 2001 and all subsequent revisions.

1.02 Definitions:

- A. Owner: Owner shall mean the person(s), company, corporation, etc. that enter into a "Developers Agreement" with the City of Otsego for the purpose of construction of public improvements on lands under the ownership and control of said person(s), company, corporation, etc.
- B. Engineer: Engineer shall mean the Owner's engineer.
- C. City Engineer: City Engineer shall mean the engineer designated by the City as such.

1.03 Control of Work:

- A. Standard Drawings: The Owner shall construct all road ways to the section as shown on standard plates as attached to the Engineering Guidelines.
- B. Staking: Construction staking shall be performed by Owners Engineer/Surveyor. All plat corners and right-of-way control points shall be installed. Street centerline shall be referenced to the established plat corners and right-of-way control points. Street alignment, horizontal and vertical hubs shall be set at a maximum interval of 50 feet and shall be required at intervals of 25 feet on curves.

- C. Construction Observation: The City Engineer and/or his representative shall observe the construction from time to time to insure conformance to City standards and approved drawing(s). The Owner shall notify the City Engineer at least 24 hours ahead of time to schedule inspection. The Developer shall provide access to the site for the City Engineer or his representatives. Copies of all test results must be sent to the City engineer as soon as possible.

The Owner shall notify the City Engineer to inspect at the following specific periods of construction activity:

1. When clearing and grubbing is completed.
2. When all necessary topsoil and unsuitable subgrade materials have been removed. Soil borings may be required to verify removal of unsuitable soils. The Owner shall furnish such assurance through the services of a professional soil engineer.
3. When subbase has been graded and compacted within 0.10 feet of the lines and grade established in the approved plans. Compaction tests performed by a professional soils engineer may be required in embankments upon discretion of the City Engineer.
4. When base course (Class V) has been placed, compacted and graded within 0.05 feet of the lines and grades established by the approved plans. Compaction test performed by a professional soils engineer shall be required of the base course.
5. When bituminous base/binder and wearing course is being placed. Compaction testing shall be required by an approved soils testing service.

- D. Acceptance of Work: Upon notice from the Engineer that all work has been completed, the City Engineer will make an inspection of the entire project. If any work is found unsatisfactory or incomplete, instructions for correction will be issued and another inspection will be made after receiving notice that the corrective work has been completed.

When final inspection reveals that all work has been completed in accordance with the terms of the contract, a walk-thru shall be scheduled for initial field acceptance. The developer and/or the developer's representative, the contractor, the City Engineer's representative, and the City Maintenance Department shall be present. After the walk thru has been completed and all parties agree that the improvements are in accordance with the terms of the contract, the City Engineer shall so notify the Owner in writing, on the

date of final inspection. The materials and workmanship will then be accepted subject to warranty and maintenance provisions contained in the developer's agreement, provided that the as-built plans have been satisfactorily completed.

1.04 Control of Material:

- A. All material placed on the street shall be new and shall meet all requirements referred to herein.
- B. The Owner shall provide the City Engineer with sieve analysis performed by an independent approved testing firm for Class V and any other manufactured subbase or base materials. In addition, percentage of crushing shall be provided for virgin Class V materials in accordance with the provisions of Mn/DOT 3138.
- C. The City reserves the right to order compaction tests taken in the embankments, subbase and the base materials. The zone from the bottom of the trench or embankment to within 3 feet of top of subgrade shall be compacted to 95% of standard proctor density or 90% of modified proctor density. The zone within the upper three feet shall be compacted to 100% of standard proctor density or 95% of modified proctor density. Areas outside of the street right-of-way shall be compacted to 95% of standard proctor density or 90% of modified proctor density. Maximum test rate is one compaction test per 500 foot section of roadway in each of the subbase and base. The cost of compaction tests shall be the responsibility of the Owner and shall be performed by an approved testing service.
- D. Bituminous material is required to be produced by a Quality Assurance (QA) plant. The City requires field compaction tests by nuclear devices and core samples taken and Marshall densities provided. The testing method, either specific density method or the test roll strip method, are at the discretion of the City Engineer.
- E. The City reserves the right to have tests run on other material placed on the street or in the right-of-way at the Owner's expense. Those tests may include but not be limited to topsoil analysis, horizonation of soils and seed analysis.

2.00 CONSTRUCTION DETAILS

2.01 Grading: All earthmoving and subgrade work shall be done in accordance with the provisions of Mn/DOT 2101, 2104, 2105, 2111, 2112, 2120, 2130. All other work not covered by these specifications shall be referenced to Mn/DOT specifications where applicable.

2.02 Base Construction: Aggregate base construction shall be constructed to the

thickness shown in standard plates and compacted in place at maximum density in accordance with the provisions of Mn/DOT 2211. All other work not covered by the specification shall be referenced to Mn/DOT specifications where applicable.

- 2.03 Concrete Curb and Gutter: Concrete curb and gutter shall be constructed in accordance with the provisions of Mn/DOT 2531.

All concrete curb and gutter in medium density and high density subdivisions shall be Design B618 with curb cuts placed for driveways as needed.

- 2.04 Pavement Construction: Bituminous non-wear course shall be constructed to the thickness shown in the standard plates. Bituminous material shall be compacted in place by either specified density or by control strip method in accordance with Mn/DOT 2350/2360. The type of testing method for each project will be the decision of the City Engineer. Bituminous wear course shall be constructed to the thickness shown in the standard plates. The depths so specified herein shall not deviate by more than 1/4". All bituminous pavement construction shall be done in accordance with the provisions of Mn/DOT 2350/2360. Oil content shall conform to job mix design provided prior to construction. No bituminous pavement shall be placed when air temperatures are under 40°F or on frozen ground. All other work not covered by these specifications shall be referenced to Mn/DOT specifications where applicable.

A. Traffic Signs and Devices: Street signs and markings shall be installed in accordance with the provisions of Mn/DOT 2564. All traffic control devices and signing shall conform to the MN MUTCD, including Appendix B, dated January, 1998 or as amended herein.

B. Temporary Erosion Control: All erosion control measures required and necessary for the protection of adjoining properties, wetlands, ponds, lakes, rivers, etc. shall be done in accordance with the provisions of Mn/DOT 2573. Their removal and disposal after such time that they are not required as determined by the City Engineer shall be required. Temporary erosion control shall be achieved in accordance with "Best Management Practices for Minnesota," dated October 1989 as prepared by the Minnesota Pollution Control Agency, Division of Water Quality.

C. Turf Establishment: All disturbed areas not surfaced shall be topsoiled, seeded and mulched or sodded and fertilized in accordance with the provisions of Mn/DOT 2575. These areas include but not limited in-slopes, ditches, backslopes, boulevards, temporary construction easements and permanent construction easements. The depth of topsoil shall be a minimum of 4" in-depth compacted in place. All areas shall be graded to drain to appropriate locations.

All other work not covered by these specifications shall be referenced

to Mn/DOT specifications where applicable. Turf establishment and other permanent erosion control measures shall be achieved in accordance with "Best Management Practices for Minnesota", dated October 1989 as prepared by the Minnesota Pollution Control Agency, Division of Water Quality.

3.00 MATERIALS

3.01 Aggregate Subbase: Aggregate subbase course shall be Class III or IV in accordance with the provisions of Mn/DOT 3138.

3.02 Aggregate Base: Aggregate base course shall be Class V in accordance with the provisions of Mn/DOT 3138, excepting that Table 3138-1 shall be modified such that the minimum percent passing the # 200 sieve shall be 6%, with the maximum percent passing remaining at 10%. Also, the crushing requirements under 3138.2C shall be modified such that Class 5 Aggregate contains a minimum of 15% crushed material. Class 7 Aggregate will be accepted as a substitute subject to the provisions of Mn/DOT 3138.

3.03 Concrete Curb and Gutter: Concrete shall be in accordance with the provisions of Mn/DOT 2531

3.04 Bituminous Mixtures: Graded aggregate for bituminous mixtures shall be 3 for bituminous non-wear courses and 4 for bituminous wear course all in accordance with the provisions of Mn/DOT 2350-1. Plant mixture designations shall be LVNW35030B for bituminous base/binder courses and LVWE45030B for bituminous wear course, all in accordance with the provisions of Mn/DOT 2350 of the "Standard Specifications for Construction".

3.05 Pipe Culverts and Pipe Sewers: Pipe culverts shall be reinforced concrete pipe in accordance with the provisions of Mn/DOT 3236. Minimum size storm sewer shall be 15" diameter or equivalent. Minimum size culvert crossing beneath a public street shall be 24" diameter, or equivalent. All pipe culverts shall be furnished with appropriate apron end sections.

3.06 Metals and Metal Products

A. Signs and Markers: Street signs and markings shall be in accordance with the provisions of Mn/DOT 3352. Signs shall attach to galvanized Flanged Channel Sign Posts in accordance with the provisions of Mn/DOT 3401. Minimum weight of posts shall be 2.5 lbs/ft.

3.07 Stone and Brick:

A. Riprap: Riprap shall be Class III (for velocities of 8 FPS and Less) randomly placed in accordance with the provisions of Mn/DOT 3601. Geotextile fabric is required beneath all riprap and shall be Type IV in accordance with the provisions of Mn/DOT 3733. Class of riprap for flow with velocities of greater than 8 FPS shall be determined on an

individual basis.

- B. Sewer Brick (concrete): All concrete sewer brick used for construction of manholes and catch basins shall conform to the provisions of Mn/DOT 3616.

3.08 Turf Establishment:

- A. Seed mixture shall be Mn/DOT 3876, mixture number 270 for residential turf applied at the rate of 120 lbs/ac and mixture number 280 for general seeding at the rate of 100 lbs/ac.
- B. Topsoil borrow shall be in accordance with the provisions of Mn/DOT 3877.
- C. Sod shall be in accordance with the provisions of Mn/DOT 3878.
- D. Commercial fertilizer shall be in accordance with the provisions of Mn/DOT 3881 and shall be a minimum analysis of 20-10-10 and applied at a rate of 500 lbs/ac.
- E. Mulch material shall be in accordance with the provisions of Mn/DOT 3882 and shall be Type I applied at the rate of two tons per acre and disc anchored.
- F. Silt fence used for erosion control shall be in accordance with the provisions of Mn/DOT 3886.

4.00 DESIGN CONSIDERATION

4.01 Stormwater conveyance, storage and treatment ponds shall be designed to meet the requirements shown in the City of Otsego's Policy on Stormwater Drainage, attached herein.

4.02 All right-of-way widths, roadway widths and shoulder widths shall conform to the following minimum standards. All design information shall be subject to review by the City Engineer. Additional widths of right-of-way, roadway or shoulder may be required by the City Engineer, if, in his opinion, conditions warrant.

Local right-of-way and roadway requirements shall also pertain to marginal access roads, frontage roads and cul-de-sac roads for each type (residential or commercial/industrial) of roadway listed. Cul-de-sac streets and turnarounds shall not be permitted in industrial districts. Streets designated as Municipal State Aid routes shall be designed by the City Engineer in accordance with Municipal State Aid standards.

<u>Classification</u>	<u>Urban Design</u>		
	<u>R/W Width</u>	<u>Pavement Width</u>	<u>Back to Back of Curb Width</u>
Collector	80'	41.7'	46'
Local (residential)	60'	23.3'	28'
Local (commercial/industrial)	80'	41.7'	46'
Cul-de-sac turnaround (commercial/residential)	60' radius	47.7' radius	50' radius

<u>Classification</u>	<u>Rural Design</u>		
	<u>R/W Width</u>	<u>Pavement Width</u>	<u>Paved Shoulder Width</u>
Collector	84	40'	2'
Local (residential)	60'	24'	4'
Local (commercial/industrial)	84'	40'	2'
Cul-de-sac turnaround (commercial/residential)	60' radius	50' radius	4'

Shoulder widths associated with rural streets shall be in accordance with the above table. If pavement shoulders are not depicted in the above table, aggregate base course shoulders shall be provided to the dimensions shown on the standard plates section of this specification.

Horizontal and vertical alignment shall provide for not less than 30 mph design speed on local streets, marginal access streets, frontage roads and cul-de-sac streets. A 45 mph or greater design speed shall be utilized on collector streets.

Design of streets shall be governed by this specification where applicable. Where specific design items are not detailed in this specification, the following reference materials shall be utilized to justify roadway design:

- 1) Mn/DOT Geotechnical and Pavement Manual
- 2) Mn/DOT Roadway Design Manual
- 3) Mn/DOT Traffic Manual
- 4) Mn/DOT State Aid Manual
- 5) Mn/DOT Standard Plates Manual

Under no circumstances shall a roadway design, which is less restrictive than the specific parameters defined herein, be submitted for review.

All centerline gradients shall be at least 0.6 % and shall not exceed 7%. Vertical curves shall be utilized when the "m" distance is greater than 0.20'.

Minimum slope for drainage across bituminous shall be 1.0%.

Roadway pavement design shall be based upon a minimum 20-year design using the procedure as described in the Mn/DOT Geotechnical and Pavement Design manual using a minimum projection factor of 4.

5.00 STANDARD PLATES

Standard Plates are included in Appendix A of the City of Otsego Engineering Guidelines. Where standard plates are not shown for a particular roadway, the Owner's engineer shall insure the design meets the requirements of this specification.

APPENDIX E

**GENERAL REQUIREMENTS
FOR
LIFT STATION DESIGN
FOR DEVELOPERS
CITY OF OTSEGO**

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GENERAL REQUIREMENTS
FOR
LIFT STATION DESIGN
FOR DEVELOPERS
CITY OF OTSEGO

1.00 GENERAL REQUIREMENTS

1.01 Purpose:

Provide standardized lift station design and construction requirements to assure uniformity between proposed and existing lift stations.

1.02 Specification Reference:

- A. Sanitary sewer lift station construction shall conform to the applicable provisions of the following specifications and agencies except as modified herein:
1. "Standard Specifications for Trench Excavation and Backfill / Surface Restoration, Watermain and Service Line Installation, Sanitary Sewer and Storm Sewer Installation" as published by the City Engineers Association of Minnesota, (CEAM) 1999 Edition.
 2. 10-State Standards
 3. Minnesota Pollution Control Agency (MPCA)
 4. Federal, State and Local Ordinances, Codes, Regulations and Requirements.

2.00 DESIGN CONSIDERATIONS

2.01 General Site Requirements:

- A. When access to the City water system is feasible, a hydrant shall be located within 20 feet of the lift station for cleaning and maintenance purposes.
- B. The access drive shall be paved per City standards.
- C. An isolation valve shall be located downstream of the valve vault, or flow meter manhole if applicable, for station isolation during maintenance procedures.

2.02 Pumps and Pump Appurtenances:

- A. For maintenance and product, spare-part purposes, the City requires all lift station pumps be Fairbanks-Morse, Hydromatic, or approved equal.
- B. Pumps shall include lifting hook and stainless steel lift chains.
- C. Pump guide rails shall be stainless steel circular tubing (sized according to pump manufacturer's recommendations).

2.03 Wet Well:

- A. Wet well shall be constructed of reinforced precast, or cast-in-place, concrete.
- B. Wet well cover shall include an aluminum access hatch with the following provisions:
 - 1. Stainless steel hardware.
 - 2. Stainless steel hinges with torsion bars or springs that counterbalance the hatch for easy operation. The hatch shall open to 90 degrees and lock automatically in that position. A vinyl grip handle shall be provided to release the cover for closing.
 - 3. A recessed or removable handle and hatch-locking device.
 - 4. A recessed, tamper-resistant padlock assembly
- C. Wet well vent shall be schedule 40 steel pipe with 2 – 90 degree bends. Vent pipe shall include a stainless steel insect screen.

2.04 Valve Vault:

- A. The valve vault shall be constructed of reinforced precast, or cast-in-place, concrete.
- B. For safety and ease of maintenance, the following items shall be located in the valve vault:
 - 1. Air valve (air release, vacuum, or combination). See "City Standard Materials" section IV.1.e.
 - 2. Plug valves
 - 3. Check valves

4. Pressure gauge
 5. Pipe supports for valves and fittings (as required)
- C. Check valves shall include an external operating mechanism that allows manual opening and closing of the valve for back flushing purposes.
 - D. Plug valves shall be fitted with hand-wheel operators.

2.05 Flow Meter Manhole:

- A. The flow meter must be located in a separate manhole, downstream of the valve vault.
- B. The manhole shall be located an adequate distance downstream of the valve vault to establish the required flow profile per the flow meter manufacturer's requirements.
- C. The flow meter manhole shall include a floor drain that drains to the wet well. Provisions, such as a p-trap or plug valve, shall be included to prevent sewer gases from entering the flow meter manhole.

2.06 Electrical Service:

- A. 480vac three-phase power shall be provided when feasible.
- B. 120/240vac single-phase power shall be provide only for smaller lift stations (less than 5hp).
- C. Transformer shall be located on a reinforced concrete pad.

2.07 Control Panel:

- A. A control panel for electrical control of the pumps shall consist of a stainless steel cabinet, mounted on legs with screened and louvered skirt between the legs.
- B. The exterior doors shall be fastened to the enclosure with continuous type stainless steel piano hinges and three-point minimum, stainless steel latch mechanisms with vault-type handles with padlock provisions.
- C. The inside of one of the doors shall contain a data pocket for housing electrical schematics.

- D. All controls, displays, circuit breakers, and other electrical equipment shall be mounted on a second set of inner dead-front hinged doors.
- E. Cables from pumps, float switches, sensors, etc. will pass through an air gap area between the enclosure legs and behind the skirt area to provide isolation from wet well, so that conduit seals are not required. This feature simplifies replacement or repair of the devices in the wet well.
- F. The panel shall be installed on a reinforced concrete slab adjacent to the lift station wet well.
- G. The control panel must be orientated so personnel have easy access to the front panel controls while the wet well hatch(es) are open, yet be located far enough away to provide adequate and safe working space.
- H. Where possible, the control panel shall be installed so the front doors face in a general southeasterly direction, to provide protection from prevailing winds. The exact arrangement of the lift station control panel will be determined in each case by the City Engineer.
- I. The control panel must be insulated with rigid foam insulation, and be equipped with a thermostatically controlled electric heater sized to maintain internal temperature above 32 degrees F during cold weather.
- J. Lift station control panels containing VFDs will also be equipped with air conditioners, sized to maintain an internal temperature of less than 104 degrees F.
- K. The control panel must contain the following items:
 - 1. 120vac convenience receptacle
 - 2. Flashing alarm light mounted on top of the control panel
 - 3. Front panel mounted, high-level alarm light
 - 4. Front panel mounted, high-level float switch, test switch
 - 5. Alarm acknowledge switch.
- L. The high-level alarm, high-level test and alarm acknowledge signals shall also be made available to the SCADA equipment to allow for remote monitoring.

- M. Each front panel indicator light, switch, and circuit breaker shall be identified with an engraved label.
- N. Each panel enclosure shall include a switched interior light fixture for use during maintenance or repair.
- O. The front doors of each enclosure shall be equipped with stops that will hold the doors in an open position for use during maintenance and repair.

2.08 Main/Standby Power:

- A. Lift stations shall have manual transfer switches or interlocked main/standby circuit breakers, with generator receptacles to match City's existing portable generators. Stationary generators and automatic transfer switches may be required for large and/or critical locations.
- B. There shall be lightning/surge protection devices on the electrical service.
- C. The lift station shall be equipped with all metering equipment required by the serving electric utility, including, but not limited to:
 - 1. Meter socket
 - 2. Current tap and voltage tap devices where required
- D. The actual meter will be furnished by the serving electric utility. It will be the responsibility of the Contractor to confirm the exact metering requirements for a given location. Note: there are several different electric utilities serving the City of Otsego depending on location. Developer's Engineer shall contact the City Engineer for the proper utility company.

2.09 Motor Starters:

- A. Across-the-line motor starters shall be provided for pumps less than 10hp, with power factor correction capacitors for pumps between 5 and 10hp.
- B. Larger pumps will use electronic soft starters or VFDs, depending on particular conditions. Developer's Engineer shall consult with the City Engineer during design to discuss the operating conditions.
- C. The motor starting circuitry for each pump shall be interlocked with motor overheat and seal fail probes in the pump motor, using the

appropriate relays or signal modules required for the brand of pump.

2.10 Controls:

- A. The control panel shall include each of the following items for each pump:
 - 1. Front panel mounted, Run-Off-Auto switch
 - 2. Green, run indicator light
 - 3. Red, seal fail indicator light
 - 4. Red, motor hot indicator light
 - 5. Runtime meter. The runtime meters shall be configured to prevent the meter from advancing in the event a pump fails, but the control panel is still calling for its operation. This may be done by interlocking the runtime meters with current relays that monitor actual pump load, minimum flow rate measurement, pump fail signals, or other means as is appropriate.
- B. The pumps shall be called for operation alternately. Provide a front panel mounted selector switch to allow selection of automatic alternation or fixed pumping sequences.

2.11 Wet Well Level Sensing:

- A. Submersible/ultrasonic level transducers are required for wet well level measurement and pump control.
- B. High and low level float switches hard wired to the system shall be provided to serve as backup if the level transducer fails.
- C. Wet well level shall be displayed on the front door of the enclosure.
- D. Level transducers and float switches shall be intrinsically safe, and shall be connected to the control panel through intrinsically safe barriers to meet the requirements of NEC articles 500-505.

2.12 Flow Measurement:

- A. Lift stations with an output flow rate of greater than 100 GPM will be equipped with a magnetic flow meter.

- B. The flow tube portion of the meter will be located in the flow meter manhole, and the flow meter electronics will be located inside the lift station control panel.
- C. Instantaneous flow in gallons per minute and totalized flow in gallons will be displayed on the dead front panel of the control panel enclosure.
- D. The instantaneous flow value will also be made available to the SCADA equipment to allow for remote monitoring.
- E. Lift stations with flow meters will have 120vac branch circuits to power a sump pump, convenience receptacle and light fixture located in the flow meter vault.
- F. The flow meter shall be a magnetic type flow meter, Cadillac, Marsh-Mcbarney, or approved equal.

2.13

General Wiring:

- A. All internal wiring shall be color coded and marked with wire numbers to facilitate maintenance and repair.
- B. All wiring terminations shall be made on terminal blocks.
- C. All wiring shall be neatly routed in wire channels.
- D. The lift station control panel will have a UL label showing that it was built in a UL-approved shop and that it meets UL508 and UL913A requirements for control panels.

2.14

SCADA Provisions:

- A. Each lift station control panel will have an internal open space 24" wide x 30" tall x 8" deep minimum for installation of SCADA equipment.
- B. All monitoring points (pump run, pump alarms, wet well level, flow rate, etc.) will be brought to a terminal strip adjacent to the space for the SCADA panel to allow for ease in installation of the SCADA equipment.
- C. Provide a single 120vac power receptacle for use with the SCADA equipment.
- D. Lift stations must include a 20 foot high antenna mast, with a 1 ½" conduit routed from the antenna mast to the control panel for an antenna and antenna cable provided with the SCADA equipment.

- E. The antenna mast shall be a direct bury fiberglass pole, Whatley, Shakespeare or equal.

2.15

SCADA Panel:

- A. The SCADA panel for each lift station must be sourced from the City's preferred systems integrator.
- B. The SCADA panel must include, but not limited to, the following:
 - 1. Programmable logic controller (PLC)
 - 2. Radio
 - 3. Yagi antenna and cable
 - 4. Power supplies
 - 5. Relays
 - 6. Terminal strips
 - 7. Wiring
- C. The above-mentioned items shall be mounted to a back panel that can be installed inside the lift station control panel enclosure as a unit.
- D. The SCADA panel shall include an uninterruptible power supply (UPS) that will be plugged into the supplied 120vac receptacle. The UPS will be placed in the bottom of the lift station control panel enclosure.
- E. The PLC shall be an Allen-Bradley Micrologix or approved equal. The radio shall be Microwave Data Systems, with a licensed frequency to match the City's existing radio network.
- F. The existing master PLCs at the east and west wastewater treatment facilities shall be programmed to monitor information from the lift stations in a similar manner to existing lift stations.
- G. The existing PCs and Wonderware software at the east and west wastewater treatment facilities must be programmed to monitor and display information from the lift stations in a similar manner to existing lift stations.

- H. Information monitored at the PCs located at the east and west wastewater treatment facilities will include:
1. Pump run status
 2. Pump alarms (including VFD failure and pump overtemp alarms)
 3. Pump in auto status
 4. Pump start and stop set points, with ability to adjust set points remotely
 5. Wet well high-level and low-level alarms, with ability to adjust set points remotely
 6. Lift station power failure and/or generator running
 7. Communication failure
 8. Number of pump starts per day
 9. Runtime for today
 10. Runtime for yesterday
 11. Cumulative runtime
 12. Trend charts for last 24 hours
 13. Trend charts – extended time period
 14. All runtime data shall be configured so the value does not advance in the event a pump fails, but the control panel is still calling for its operation. This may be done by interlocking the runtime data with current relays that monitor actual pump load, minimum flow rate measurement, pump fail signals, or other means as is appropriate.

3.00 MATERIALS

3.01 Isolation Valves:

A. Buried Applications:

1. Valves shall be either eccentric-plug valves conforming to ANSI/AWWA C517 standards as manufactured by DeZurik, Milliken, Clow, or approved equal; or resilient-seated, solid-

wedge gate valves conforming to AWWA C509 and C515 standards as manufactured by J S Valve, Kennedy, Clow, or approved equal.

2. Valves shall be installed on-line with worm-gear for plug-valve or screw-gear for gate-valve actuators and accompanying valve boxes:
 - a. Valve boxes shall be three-piece, adjustable, screw-type boxes, nominal 60" to 90" extension, with a 5-1/4" shaft diameter.
 - b. Valve boxes must be true and plumb.
 - c. Each valve box will be tested for plumbness using a section of 4" PVC pipe.
 - d. Valve boxes shall be provided with extension suitable for design location and a minimum 6-inch available adjustment after final setting.
 - e. Print "Wastewater" on each lid.
3. Manual gear actuator housings shall be totally enclosed and sealed with gear actuator constructed of high-strength, corrosion-resistant, metal and feature sintered bronze bearings on each end of the input shaft for plug valves.
4. Valves shall be fitted with extension stems to bring operating nut to within one foot (12") from finished grade.
5. Valves shall close in a clockwise direction.
6. Valves shall be epoxy coated as per ANSI/AWWA C550.

B. Above ground applications (i.e. valve vault):

1. Plug valves shall be non-lubricated, 100 % full-ported, straight-through body flow pattern, eccentric-type with resilient-faced plugs suitable for raw wastewater service conforming to AWWA C517 with corrosion-resistant seats and bearings and replaceable sleeve-type upper and lower journals.
2. Plug valves shall have flanged ends meeting applicable standards for ANSI Class 125 cast iron valves.

3. Valve pressure ratings shall be as established by hydrostatic tests specified by ANSI Standard B16.1 for working pressures of 175 psi with flow in either direction.
4. Actuators: Geared, metal, hand wheel operator with sealed, corrosion-resistant construction.
5. Manufacturers: DeZurik, Milliken, Clow, or approved equal.

3.02

Check Valves:

- A. Check valve body and cover shall be constructed of heavy cast iron conforming to ASMT A126 Gr. B.
- B. Check valves body shall be long pattern design with integrally cast-on end flanges and full pipe size flow area. Flanges shall conform to ANSI Class 125.
- C. Flapper shall be constructed of Buna-N with internal steel reinforcement and with an O-ring seating edge.
- D. Flapper to be captured between body and body cover in a manner to permit flapper to flex from closed to full open position.
- E. Seating surface to be on a 45⁰ angle requiring the flapper to travel only 35⁰ from closed to full open position.
- F. Valve shall have non-slam closure characteristics, and shall be designed for 175-psi working pressure suitable for use in wastewater.
- G. Furnish an external backflow device to back flush a clogged pump.
- H. Manufacturers and models: APCO, Series 100; Golden Anderson, Fig 200BS; Crispin; Henry Pratt, or approved equal.

3.03

Plug Valves:

- A. Plug valves shall be non-lubricated, 100 % full-ported, straight-through body flow pattern, eccentric-type with resilient-faced plugs suitable for raw wastewater service conforming to AWWA C517 with corrosion-resistant seats and bearings and replaceable sleeve-type upper and lower journals.
- B. Plug valves shall have flanged ends meeting applicable standards for ANSI Class 125 cast iron valves.

- C. Valve pressure ratings shall be as established by hydrostatic tests specified by ANSI Standard B16.1 for working pressures of 175 psi with flow in either direction.
- D. Actuators: Geared, metal, hand wheel operator with sealed, corrosion-resistant construction.
- E. Manufacturers: DeZurik, Milliken, Clow, or approved equal.

4.00 EXECUTION

4.01 Spare Parts:

- A. 10% spare fuses; lamps and other expendable items shall be provided to the City upon completion of lift station construction.
- B. Other spare parts shall include, but not limited to:
 - 1. Spare pump impeller, trimmed for the correct operating point
 - 2. Wear rings
 - 3. Pump seals
 - 4. Additional items specifically requested per the City Engineer.

4.02 Operation and Maintenance Manuals:

- A. Developer shall provide the City with five (5) sets of operations and maintenance manuals complete with all pertinent drawings, product information, functional descriptions, maintenance suggestions, etc.

4.03 Startup and Training

- A. Developer shall furnish the services of an experienced technician to inspect start-up and instruct the City's personnel in the use of all lift station equipment.
- B. After the lift station has been completely installed and has been put into use, a factory service representative of the equipment manufacturer shall spend one (1) full day at the Project Site for training and technical services.

4.04 Call-back Services

- A. In addition to other services specified, provide an experienced technician to return to the project site for two (2), four (4) hour days during the first year of operation. During each trip, the supplier's representative shall be prepared to calibrate and check equipment and give miscellaneous training to City's personnel.
- B. Call-back trips shall be at times determined by the City.

APPENDIX F

**STANDARD SPECIFICATIONS
FOR
SIGNAGE, STRIPING, AND LIGHTING
FOR DEVELOPERS
CITY OF OTSEGO**

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STANDARD SPECIFICATIONS
FOR
SIGNAGE, STRIPING, AND LIGHTING
FOR DEVELOPERS
CITY OF OTSEGO

1.00 GENERAL REQUIREMENTS

1.01 Specification Reference:

All traffic control devices shall conform and be installed in accordance to the "Minnesota Manual of Uniform Traffic Control Devices" (MN MUTCD) and Part 6, "Field Manual for Temporary Traffic Control Zone Layouts", Mn/DOT 2564, 3352 & 3401, Minnesota "Standard Signs Manual", the Mn/DOT "Traffic Engineering Manual", and as modified herein.

All pavement markings shall be installed in accordance to the "Minnesota Manual of Uniform Traffic Control Devices" (MN MUTCD), Mn/DOT 2582, the Mn/DOT "Traffic Engineering Manual", the Traffic Control Layouts/Typical Traffic Control Layouts in the Plans, and as modified herein.

All lighting shall be approved by the City and adhere to section 21-8-11 of the Otsego Subdivision Ordinances, Mn/DOT 2545, and as modified herein. The Mn/DOT "Road Design Manual" and AASHTO "Roadside Design Guide" should be referenced when considering placement of the lighting structures within any Right-of-Way or clear zone.

1.02 Definitions:

Owner: Owner shall mean the person(s), company, corporation, etc. that enter into a "Developers Agreement" with the City of Otsego for the purpose of construction of public improvements on lands under the ownership and control of said person(s), company, corporation, etc.

Engineer: Engineer shall mean the Owner's engineer.

City: City shall mean the City of Otsego.

City Engineer: City Engineer shall mean the engineer designated by the City as such.

2.00 MATERIALS

2.01 Signage:

A. All signs deemed necessary by the City Engineer will be supplied and installed by the City of Otsego. Owners will be financially responsible for all required signs.

B. All Type C and Type D signs (except stop and street name signs) shall

be placed on galvanized flanged channel sign posts (U-Posts) conforming to Mn/DOT 3401. The posts shall have a minimum nominal mass of 2.5 per foot and 3/8" diameter holes punched according to the Minnesota Standard Signs Manual.

- C. All Type C and Type D, delineator, and marker sign base and face materials shall be extruded aluminum and conform to Mn/DOT 2564 and 3352. Refer to the Mn/DOT Traffic Engineering Manual, the Mn/DOT Standard Signs Manual, and/or the MN MUTCD for signage type, color, size, and layout.
- D. All Type C and Type D regulatory and warning signs shall be sized according to the MN MUTCD Conventional Road (CR) or Standard classification. These signs shall have Diamond Grade VIP sheeting (ASTM Type IX) with series C lettering (except No Parking signs).
- E. If a sign structure is to be located within the clear zone as shown in the Mn/DOT Road Design Manual Table 4-6.04A and the speed limit is greater than 40 mph, the sign structure shall meet FHWA breakaway requirements.
- F. Stop signs and street name signs shall be mounted on a 2-3/8" O.D., 12 gauge cold rolled galvanized steel tubular posts. The street name signs shall be double faced, notched and mounted in an E450 bracket and placed above the stop signs on the same post.
- G. Street name plates at the intersections of arterial, collector, or minor collector streets shall be 9" plates. All name plates at the intersections of local to local streets shall be 6" plates. These plates shall have high intensity prismatic sheeting (ASTM Type IV) with series B lettering.
- H. No Parking signs shall be spaced a minimum of 400' apart or so as not to create visual "clutter". No Parking signs shall be 18"x18" plates when placed within the City's Right-of-way. 12"x12" plates are recommended in private townhome driveways. All No Parking signs shall have Engineering Grade or Commercial Grade sheeting (ASTM Type I).
- I. Fluorescent Yellow or Fluorescent Yellow Green signs shall have ASTM Type HP FLY or HP FLYG sheeting respectively.
- J. All temporary traffic control equipment shall be in accordance with Part 6 of the MN MUTCD.

2.02

Striping:

- A. All pavement markings shall be High Solids Water-Based Traffic Paint in conformance with Mn/DOT 3591 and shall be covered with treated

glass beads in conformance with Mn/DOT 3592 for retroreflecting the paint.

2.03 Lighting:

- A. Developers will be responsible for supplying and installing all required street lights in commercial and industrial areas. The responsible electrical company will supply and install all required street lights in residential or rural areas. The developer will be financially responsible for all required lights for a period of 24 months of operation.
- B. A cobra head style luminaire mounted on a 30' tall pole shall be used in all commercial and industrial areas. When approved by the City a 15' tall decorative luminaire (Standard Plate 808) may be used.
- C. If a lighting structure is to be located within the clear zone as shown in the Mn/DOT Road Design Manual Table 4-6.04A and the speed limit is greater than 40 mph, the lighting structure shall meet FHWA breakaway requirements.
- D. The cobra head luminaire shall have a 150 watt, high pressure sodium (HPS) lamp.
- E. All lighting fixtures shall be warranted by the manufacture for a period of 5 years.

3.00 DESIGN LAYOUT

3.01. Signage:

- A. No regulatory, warning, street name or any other permanent traffic control signs will be placed until the street(s) has been paved with at least the bituminous base course.
- B. Signs along streets with urban sections and speed limits of less than 40 mph shall have a lateral offset of 2' from the face of the curb to the edge of the sign panel and shall have a vertical clearance of 7' from the ground to the bottom of the sign panel.
- C. Lateral offsets of signs placed along streets with rural sections or speed limits of 40 mph or greater shall be 12' from the edge of the shoulder or face of curb and shall have a vertical clearance of 7' from the ground or 5' from the elevation of the traveled roadway whichever is greater, unless further considerations require otherwise (i.e. degree of horizontal curves, Right-of-Way limits, etc).
- D. Placement of stop signs shall be marked in the field by the City Engineer. Stop signs shall be placed beyond the through traffic's clear zone when possible. See Mn/DOT Road Design Manual Table 4-6.04A for clear zone distances.

- E. All temporary traffic control layouts shall be in accordance with Part 6 of the MN MUTCD.

3.02. Striping:

- A. Permanent pavement markings are required on all arterial and collector streets and streets identified by the City Engineer.
- B. Temporary pavement markings are required when permanent markings are not feasible and the road is open to public traffic. Temporary markings are required prior to opening the road to traffic and shall include all centerlines, edge (fog) lines, and lane lines.
- C. Crosswalk pavement markings shall consist of two parallel 12" wide white lines when crossing local streets at an intersection. All other crosswalk crossings shall be marked using a zebra pattern crosswalk (3' wide x 6' high, white blocks spaced 3' apart). The crosswalk blocks shall be spaced so that they avoid the wheel path.
- D. Stop bars are required at the intersections of all arterial, collector, or minor collector streets unless crosswalk markings exist or are to be installed at the intersection. Stop bars shall be located in the field by the City Engineer.

3.03. Lighting:

- A. Lights shall be spaced a minimum of 250' and a maximum of 450' along all white-way areas in Commercial and Industrial areas.
- B. A minimum of one light at each street intersection and at least one light within blocks having a length of 900' or greater is required in all residential subdivisions.
- C. All lighting foundations in areas with speed limits of 40 mph or less shall be extended 24" above the finished ground. Where speed limits exceed 40 mph lighting foundations shall be nearly flush with the finished ground (See Standard Plate 809 or 810).

4.00 STANDARD PLATES

Standard Plates are included in Appendix A of the City of Otsego Engineering Manual. Where standard plates are not shown for a particular circumstance, the Owner's engineer shall insure the design and installation procedure meets the requirements of this specification.

APPENDIX G



13400 90th Street NE Otsego, MN 55330

Bldg. Dept. (763) 441-2593 (Fax) 763-441-8823

**CERTIFICATION OF GRADING
-AND-
PLACEMENT OF PROPERTY CORNER MONUMENTS**

This document must be submitted to the city building department and approved by the City Engineer **PRIOR TO** the issuance of the Certificate Of Occupancy.

Lot _____ Block _____ Subdivision _____

Address: _____

I hereby certify that on this _____ day of _____, _____ that the as-built grades and elevations of the site and building are in general accordance with the Development / Grading Plan or amendments approved by the City Engineer.

In addition, all property corner monuments are also in place.

Licensed Land Surveyor's

Signature: _____

Printed Name: _____

MN License #: _____

Note: Attach a copy of the Certificate of Survey showing all as-built elevations and design elevations as per the Development Plan.

City Of Otsego Engineering Department

Approved _____ Denied _____ Date _____ Signature _____
Otsego City Engineer

Remarks: _____
