

CITY OF NOWTHEN

**STANDARD SPECIFICATIONS
FOR DEVELOPMENT AND
ENGINEERING MANUAL**

Adopted 1999

REVISIONS:

Revised September 1, 2017

Forward

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

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

Except as modified by herein; utilities shall be designed to conform to 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. 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 Nowthen Ordinances and Comprehensive Plans. Related to engineering, comprehensive plans include the surface water management plan and the city transportation plan with designated collector streets.

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 Nowthen Standard Specifications were approved by the City Council on _____, _____ in Resolution No. _____.

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APPENDIX

- A. Standard Plates

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
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

CONSTRUCTION OF INFRASTRUCTURE

I. General Requirements

As set forth in various sections of the City ordinances, developers of property within the City of Nowthen 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.

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 plans shall be adhered to in design considerations.
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 Lot Buildability Plan listing, soil boring number, soil boring elevation, mottled soil elevation, area 3' above mottling, area 1' above mottling, and proposed garage floor lowest floor elevation.
4. The developer will also provide construction 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. The developer shall furnish a financial

security Letter of Credit to the City in an amount equal to 150% of the City Engineer's estimated costs of the improvements.

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 offices 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. Street(s) shall be constructed in accordance with typical sections shown on City Standard Plates as detailed in Appendix A.
10. 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.
11. 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, materials testing, storm sewer, street subgrade, path subgrade, bituminous base course, wear course, and curb and gutter.

12. 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, and the City Engineer or his representative must be invited. A written recommendation for 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 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 required testing has passed and documentation has been provided.
- 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, in Adobe (.Pdf) and AutoCAD (.Dwg) format, 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 Council, the warranty period, as described below and/or in the Developer's Agreement, shall commence.

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. 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 days 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, 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 engineering and 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. Design Considerations

1. 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.

2. 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.
 - a. Shoulder widths associated with rural streets shall be in accordance with the standard plates section of this specification.
 - b. 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. All curves shall meet minimums established in Mn/DOT Design Manuals.
 - c. 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:
 - i. Mn/DOT Geotechnical and Pavement Manual
 - ii. Mn/DOT Roadway Design Manual
 - iii. Mn/DOT Traffic Manual
 - iv. Mn/DOT State Aid Manual
 - v. Mn/DOT Standard Plates Manual
 - d. Under no circumstances shall a roadway design, which is less restrictive than the specific parameters defined herein, be submitted for review.
 - e. All centerline gradients shall be at least 0.6 % and shall not exceed 7%. Vertical curves shall be utilized when the algebraic grade difference is greater than 0.5%.
 - f. Minimum slope for drainage across bituminous shall be 1.0%.
 - g. Minimum slope for drainage across concrete shall be 2.0%.
 - h. 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.
 - i. A geotechnical evaluation, prepared by a licensed geotechnical engineer, must be submitted for review. Soil borings shall extend a

minimum of 20' from the surface and shall be at 1,000 ft intervals or less, with a minimum of 3. An estimate of the stabilometer R-value must be included in the report. The report shall specifically address the adequacy of the existing subgrade to support the proposed street and the recommended pavement design.

III. 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 "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. If applicable, 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 areas 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 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.

IV. 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", scalable to 11" x 17".

- 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, 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. All detail drawings shall be on a separate sheet and referenced to the proper sheet.
- g. 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.
- h. 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.
- i. All match-line breaks shall be clean with reference points clearly marked. All plans which are broken by a matchline shall be on consecutive sheets, if practical.
- j. Proposed and existing drainage facilities shall be shown in both plan and profile, stationed and labeled as existing.

- k. Approximate locations of gas, electric, telephone and cable lines shall be shown.
- l. 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.
- m. Benchmarks shall be placed on all sheets. (N.G.V.D. 1929 Adj.)
- n. All dead-end streets shall have a temporary cul-de-sac.

2. Grading Plans

- a. Grading plans shall depict existing and proposed contours at 2' intervals.
- b. Proposed house type, lowest floor elevation, lowest opening elevations, and garage floor elevation must be depicted for each lot.
- c. All lot and block numbers shall be depicted on the Grading Plan, and must be consistent with the Final Plat.
- d. All stormwater ponds, infiltration basins, wetlands and other natural courses shall be depicted, and NWL and HWL clearly labeled. Provide details of stormwater facilities.
- e. All soil boring locations shall be depicted and clearly labeled.
- f. Storm sewer facilities, when utilized, shall be adequately depicted on the Grading Plan.
- g. Sufficient detail to depict proposed individual lot grading must be provided, depicting a minimum slope of 2%. Slopes of 1 % to 2% may be allowed on a case by case basis with approval by the City Engineer provided that there is a slope of at least 2% for the first 100 feet from the principal structure.
- h. Stormwater basin perimeter berms shall be clearly depicted and labeled, minimum 10' top width, and shall provide vehicular access to the outlet structure and/or overflow. Label "Maintenance Route" on plans.
- i. Overland emergency overflows must be provided for all stormwater ponding areas. In situations where overland emergency overflows

are not possible or practical, as determined by the City Engineer, the developer shall calculate the HWL of the back to back 100-year assuming the pipe outlet is plugged.

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) and AutoCAD (.Dwg) files.
- 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. 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.
- e. 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.
- f. Benchmarks shall be referenced on each sheet.
- g. 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.
- h. 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.
- i. Lot and block numbers shall agree with final plat.

V. City Standard Materials

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

1. 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. Wood fiber blanket is required at all inlets. (See Mn/DOT Standard Plate No. 9102D)
- d. All flared end sections 24" and larger shall be fitted with trash guards.
- e. Minimum size for storm sewer shall be 15" diameter, or equivalent. However, 12" diameter pipe will be allowed on skimmer structure inlet pipes if necessary (to control discharge rate).
- f. Drantile 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.
- g. 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".

2. Manhole and Catch Basin Structure:

- a. Manhole and catch basin 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 catch basins identified on the plans as slab top shall be constructed from pipe manufactured to ASTM C-76 Standards. Minimum Class 3 strengths.
- c. Castings for storm manholes and catch basin 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.

- d. Castings for surmountable catch basin curb shall be Neenah R-3501 TB, or approved equal. Yard inlet castings shall be Neenah R-4342, or approved equal.
- e. 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.
- f. All manhole and catch basin 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.
- g. 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.
- h. Storm structure adjustment 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.

3. 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:

VI. Standard Specifications for Street Construction

1. Specification Reference:

- a. All work and materials shall conform to the provisions of Minnesota Department of Transportation (Mn/DOT) "Standard Specifications for Construction", 2016 Edition and all subsequent revisions.
- b. All traffic control devices and signing shall conform to the latest edition MN MUTCD.

2. Definitions:

- a. Developer: Developer shall mean the person(s), company, corporation, etc. that enter into a “Developers Agreement” with the City of Nowthen 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 Developer’s engineer.
- c. City Engineer: City Engineer shall mean the engineer designated by the City as such.

3. Control of Work:

- a. Standard Drawings: The Developer 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 Developer’s 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 to insure conformance to City standards and approved drawing(s). The Developer 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.
 - i. The Developer 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 Developer 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 establish in the approved plans. Compaction tests performed by a professional soils engineer shall 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 and wearing course is being placed. Compaction testing shall be required by an approved soil 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.
4. Control of Material:
- a. All material placed on the street shall be new and shall meet all requirements referred to herein.
 - b. The Developer 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, however, are not be limited to topsoil analysis, horizonation of soils and seed analysis.

5. Construction Details:

- a. 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.
- b. 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.
- c. Concrete Curb and Gutter: Concrete curb and gutter shall be constructed in accordance with the provisions of Mn/DOT 2531.
- d. 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 specified density method in accordance with Mn/DOT 2360. 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 ¼". All bituminous pavement construction shall be done in accordance with the provisions of Mn/DOT 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.

- e. 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, latest version.

6. Materials:

- a. Aggregate Subbase: Aggregate subbase course shall be Class III or IV in accordance with the provisions of Mn/DOT 3138.
- b. 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.
- c. Concrete Curb and Gutter: Concrete shall be in accordance with the provisions of Mn/DOT 2531
- d. Bituminous Mixtures: Bituminous mixture shall be in accordance with the provisions of Mn/DOT 2360 of the "Standard Specifications for Construction".
- e. Pipe Culverts and Pipe Sewers: 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.
- f. 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.
- g. Stone and Brick:
 - i. 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.

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

h. Turf Establishment:

- i. 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.
- ii. Topsoil borrow shall be in accordance with the provisions of Mn/DOT 3877.
- iii. Sod shall be in accordance with the provisions of Mn/DOT 3878.
- iv. 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.
- v. 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.
- vi. Silt fence used for erosion control shall be in accordance with the provisions of Mn/DOT 3886.

7. 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.
- 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.

b. Streets (including concrete curb and gutter):

- i. No frozen material shall be placed in the street subgrade or aggregate base.
- ii. 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.
- iii. Concrete samples shall cure overnight in same conditions as concrete (i.e. under poly or under blankets, etc).
- iv. High early curb (adding calcium chloride) is allowed.
- v. No vibratory actions near fresh concrete it reaches 3000 psi.
- vi. Pavement shall not be placed on frozen ground.
- vii. Wear Course paving is not allowed after October 1st or when temperatures are below 50°F.

c. Erosion Control:

- i. Seeding and/or mulching are less effective once the ground is frozen. Special attention regarding perimeter control should be given and seed/mulch shall be placed as soon as possible the next spring.
- 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. 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 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:
 - b. Standard Proctor Density (ASTM D-698-78): 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.
 - e. Test Rolling: Roadway subgrades shall be test rolled prior to placing aggregate base.

3. Class 3 or 4 Aggregate:
 - b. Standard Proctor Density (ASTM D-698-78): 1 test per source of material.
 - c. Gradation Test: 1 test per source of material.

- d. 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.
 - e. 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:
- b. Standard Proctor Density (ASTM D-698-78): 1 test per source of aggregate base.
 - c. 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.
 - d. 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.
 - e. Test Rolling: Street base shall be test rolled prior to paving.
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 VII.5. "Bituminous Tests".
- c. Concrete testing shall be in accordance with Section VII.6 "Concrete Tests".

VIII. POLICY ON STORMWATER DRAINAGE

1. 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:

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

2. Established Ordinances (City Codes):

- a. Section 9-4, Erosion and Sediment Control

b. Section 9-5, Post Construction Stormwater Management

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. 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. State and Federal Requirements:

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

5. 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.

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.

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 Nowthen:

<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	5.24
50 year, 24 hour	6.09
100 year, 24 hour	7.00

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.

TABLE 1
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				
.....	92	92	94	95
Industrial				
.....	88	88	91	93
Residential districts by average lot size:				
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

d. Flood Protection

Consistent with state and federal regulations, the City of Nowthen requires that the level of flood protection along all ditches, detention

basins, and wetlands be established based upon the 1 percent (100-year frequency) flood.

The following freeboard values are required to the lowest opening from the HWL:

- Landlocked Basins (no EOF) 3 feet (Back to Back 100-year events)
- Non-landlocked basins 1.5 feet (100-year frequency)

Structures within the Floodplain Zoning District (11-3-10.E.2.b.1). Structures must be placed in accordance with any floodplain regulations applicable to the site. Where these controls do not exist, the elevation to which the lowest floor, including basement, is placed or flood-proofed must be determined as follows:

- For lakes, by placing the lowest floor at a level at least three feet above the highest known water level, or three feet above the ordinary high water level, whichever is higher;
- For rivers and streams, by placing the lowest floor at least three feet above the flood of record, if data is available. If data is not available, by placing the lowest floor at least three feet above the ordinary high water level, or by conducting a technical evaluation to determine effects of proposed construction upon flood stages and flood flows and to establish a flood protection elevation.

e. On-Site Detention Basins

It is the policy of the City of Nowthen 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:

- i. A permanent pool (“dead storage”) volume below the normal elevation which shall be greater than or equal to 1,800 CF per acre of drainage area.
- ii. 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.

- iii. An emergency spillway (emergency outlet) adequate to control the one percent frequency/duration rainfall event (usually 100-year, 24-hour).
- iv. 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.
- v. 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.
- vi. 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.
- vii. 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.
- viii. 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.
- ix. 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 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:

- i. Construction of an approved pre-treatment basin shall be required prior to discharge into the infiltration basin.
- ii. 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.
- iii. 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.
- iv. The bottom of the infiltration practice must be at least three feet from the seasonal high ground water table.
- v. Storm sewer discharge pipes shall be extended to the bottom of the basin or concrete block (see Standard Plate 500) shall be extended from the discharge pipe to the bottom of the basin.

g. Volume Control Sequencing

- i. If infiltration is prohibited on the site, the narrative must clearly describe the site restrictions complete with factual data (i.e. geotechnical information relating to soils or water table, contaminated soils, etc).
- ii. If infiltration is prohibited or restricted, filtration BMPs may be considered.
- iii. If infiltration is prohibited or restricted, other volume reducing BMPs such as rainwater harvesting for re-use or irrigation, green roofs, etc, may be considered.
- iv. Extended detention wet sedimentation basis with calculations showing removal efficiencies for total phosphorous, total suspended solids, and total volume on an average annual basis.

h. Storm Sewer

- i. 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 ensure that not more than $\frac{2}{3}$ of the traveled lane for local low volume roads and not more than $\frac{1}{2}$ 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 catch basin 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.

- ii. 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 catch basin leads.

6. 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:
 - i. Title Page. The title page shall list the project name, project location, date prepared, and preparer's name, title, and company.
 - ii. 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.
 - iii. 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 catch basin and the depth of water over each catch basin during the 10-year event.
- iv. Drainage maps depicting pre-development and post-development conditions. The maps may be 22" x 34" plans, but shall also be provided on 11" x 17" 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.

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

7. 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.

IX. Signage, Striping and Lighting

1. 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.
2. The City Engineer will prepare a Signage Plan that is consistent with City requirements at the Developers expense.
3. The Developer shall have his/her contractor install the required signs.

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's 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. 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.
5. All street right-of-ways shall be cleared and grubbed to full width except as specifically directed.
6. 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.

7. 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.
8. Driveway slopes shall be no greater than 10%.

APPENDIX A

APPENDIX A

SERIES 1 PAVEMENT

- 101 Local Residential - Rural Street Section
- 102 Local Residential - Urban Street Section
- 103 Mailbox Pullout - Rural Street Section
- 104 Mailbox Location - Urban Street Section
- 105 Residential Cul-De-Sac - Rural Section
- 106 Residential Cul-De-Sac - Urban Section
- 107 Typical Driveway Sections
- 108 Easement for Roadside Trail
- 109 Local Trail Detail

SERIES 4 STORM SEWER APPURTENANCES

- 401 Storm Sewer Standard Manhole
- 402 Slab-Top Manhole
- 403 Standard Storm Catch Basin
- 404 48-Inch Diameter Shallow Depth Catch Basin
- 405 (Mn/DOT 4101) Ring Casting for Manhole or Catch Basin
- 406 (Mn/DOT 4110) Cover Casting for Manhole
- 407 (Mn/DOT 4180J) Catch Basin Frame Casting 2" x 3" Frame
- 408 Skimmer Structure
- 409 Screen Cover for 48" Diameter Outlet Structure
- 410 Typical Treatment Basin

SERIES 5 EROSION CONTROL & LAND APPURTENANCES

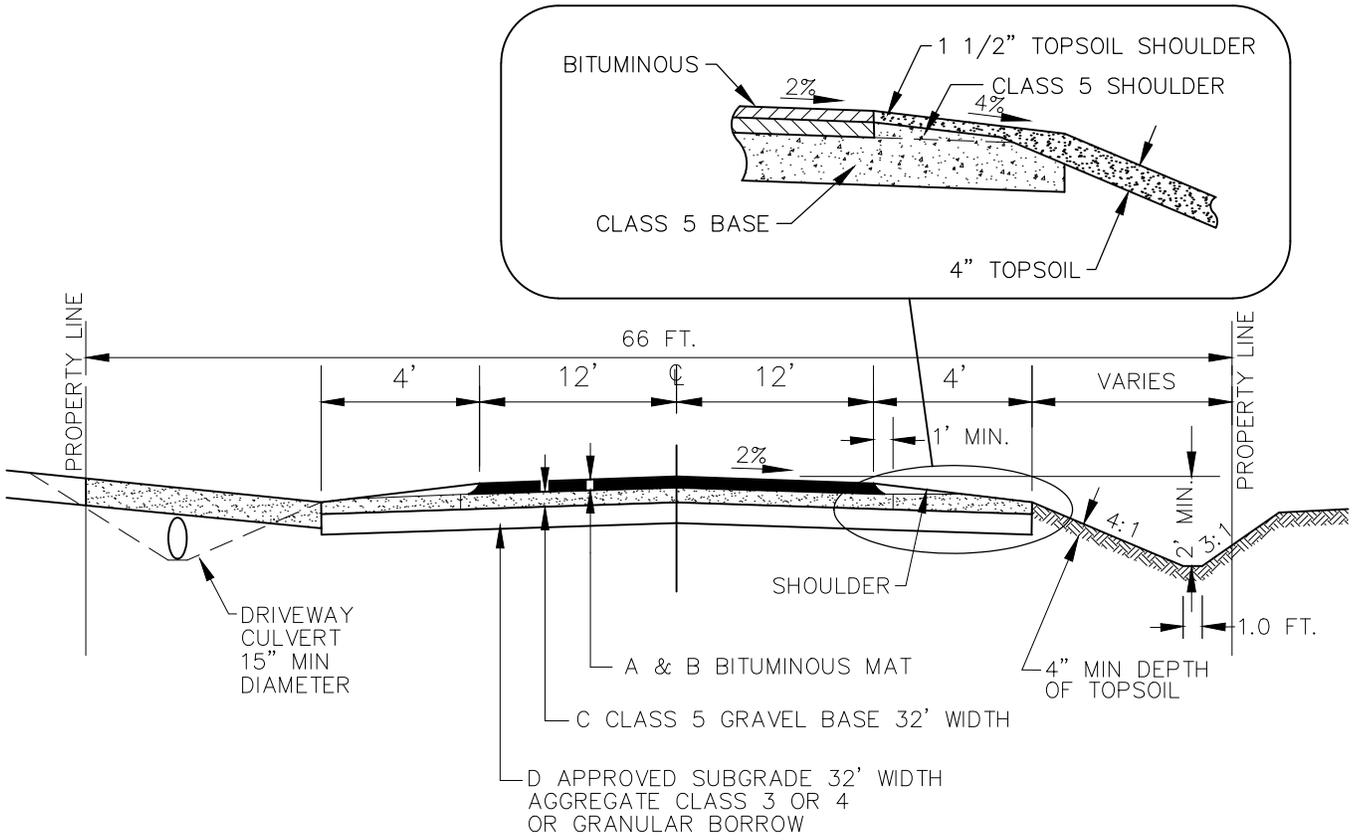
- 501 Rip-Rap at R.C.P. Outlet
- 502 Silt Fence
- 503 Rock Construction Entrance
- 504 Typical Lot Sediment Control - Rural
- 505 Typical Lot Sediment Control - Urban

SERIES 7 CURB & GUTTER AND SIDEWALK

- 701 Surmountable Concrete Curb and Gutter
- 702 (Mn/DOT 710OG) Concrete Curb and Gutter (B618)
- 703 Curb Transition and Catch Basin

SERIES 9 MISCELLANEOUS

- 901 Mailbox Support



LEGEND					
AASHTO SUBGRADE SOIL CLASS	SOIL R VALUE	BITUMINOUS SURFACE		AGGREGATE BASE	SUBGRADE
		WEAR 2360 SPWEA240C A	NON-WEAR 2360 SPNWB230C B	CLASS 5/6 3138 C*	CLASS 3/4 3138 D*
A-3	R-70	** 1 1/2"	** 2"	** 6"	-
A-4	R-20	1 1/2"	2"	8"	-
A-6	R-15	1 1/2"	2"	6"	6"
A-7	R-10	1 1/2"	2"	6"	12"
	R-5	1 1/2"	2"	6"	18"

* BASE AND SUBGRADE TO BE REVIEWED BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

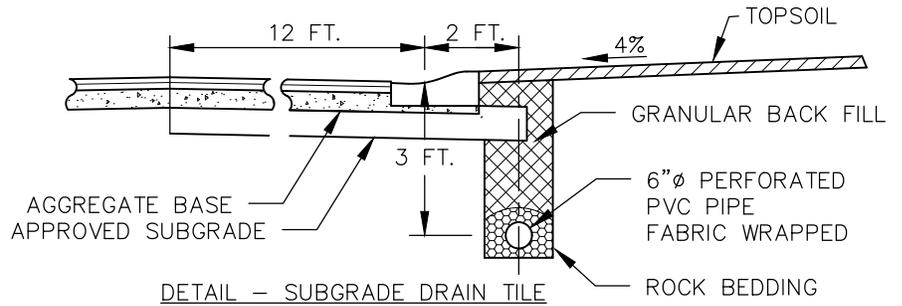
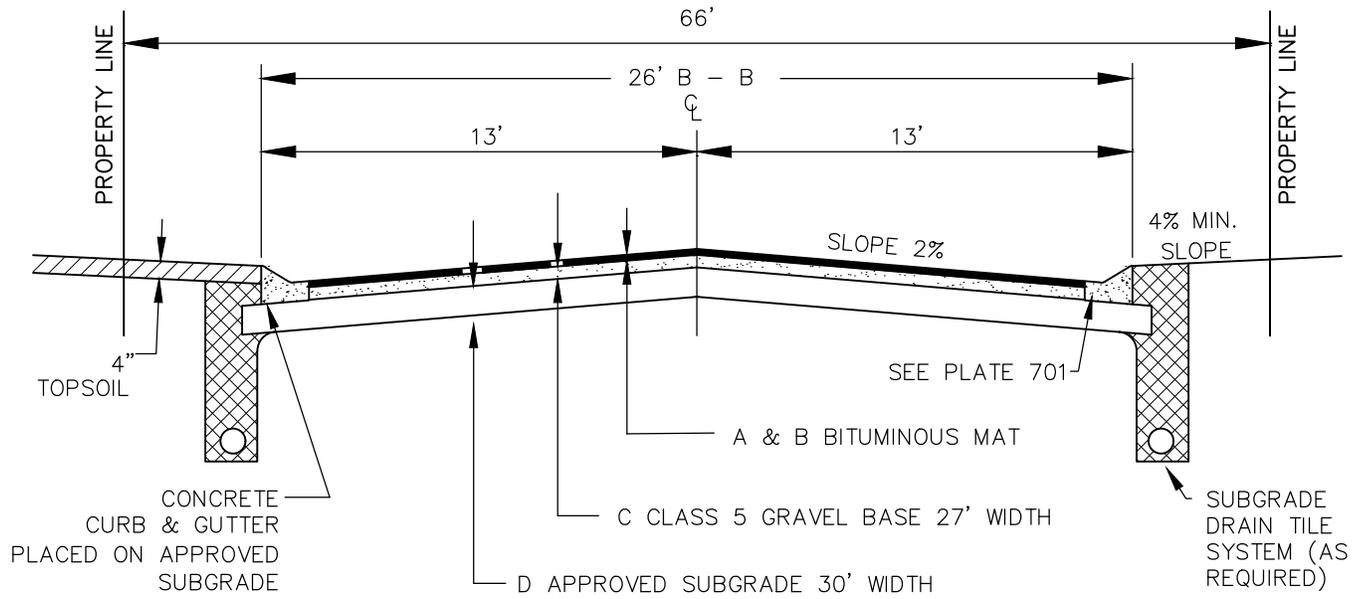
LOCAL RESIDENTIAL RURAL STREET SECTION

NO SCALE

APPROVED



STANDARD PLATE NO.
101



LEGEND					
AASHTO SUBGRADE SOIL CLASS	SOIL R-VALUE	BITUMINOUS SURFACE		AGGREGATE BASE	
		WEAR 2360 SPWEA240C A	NON-WEAR 2360 SPNWB230C B	CLASS 5/6 3138 C	CLASS 3/4 3138 D*
A-3	R-70	** 1 1/2"	** 2"	** 6"	-
A-4	R-20	1 1/2"	2"	8"	-
A-6	R-15	1 1/2"	2"	6"	6"
A-7	R-10	1 1/2"	2"	6"	12"
	R-5	1 1/2"	2"	6"	18"

* SUBGRADE TO BE REVIEWED BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

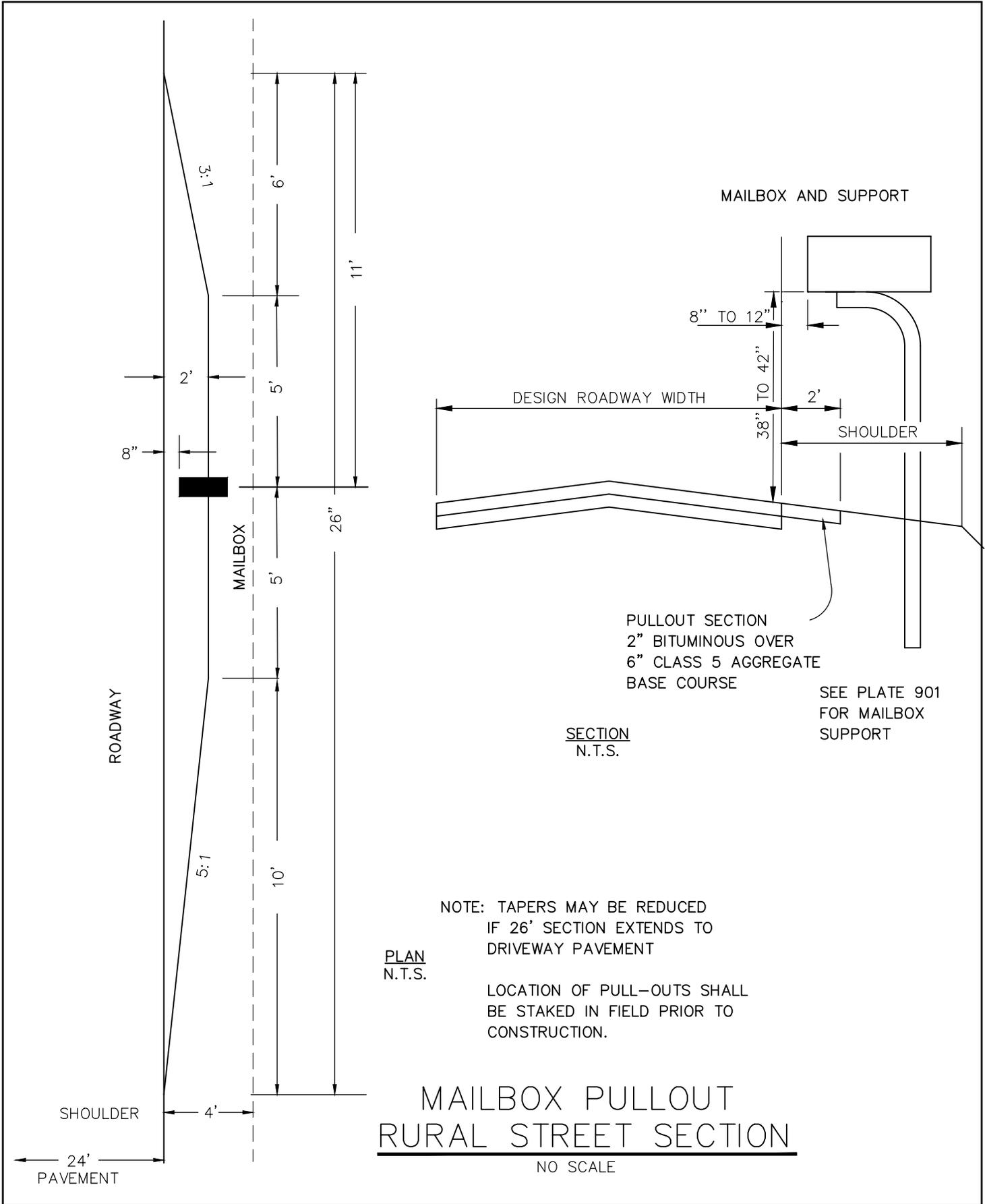
LOCAL RESIDENTIAL URBAN STREET SECTION

NO SCALE

APPROVED



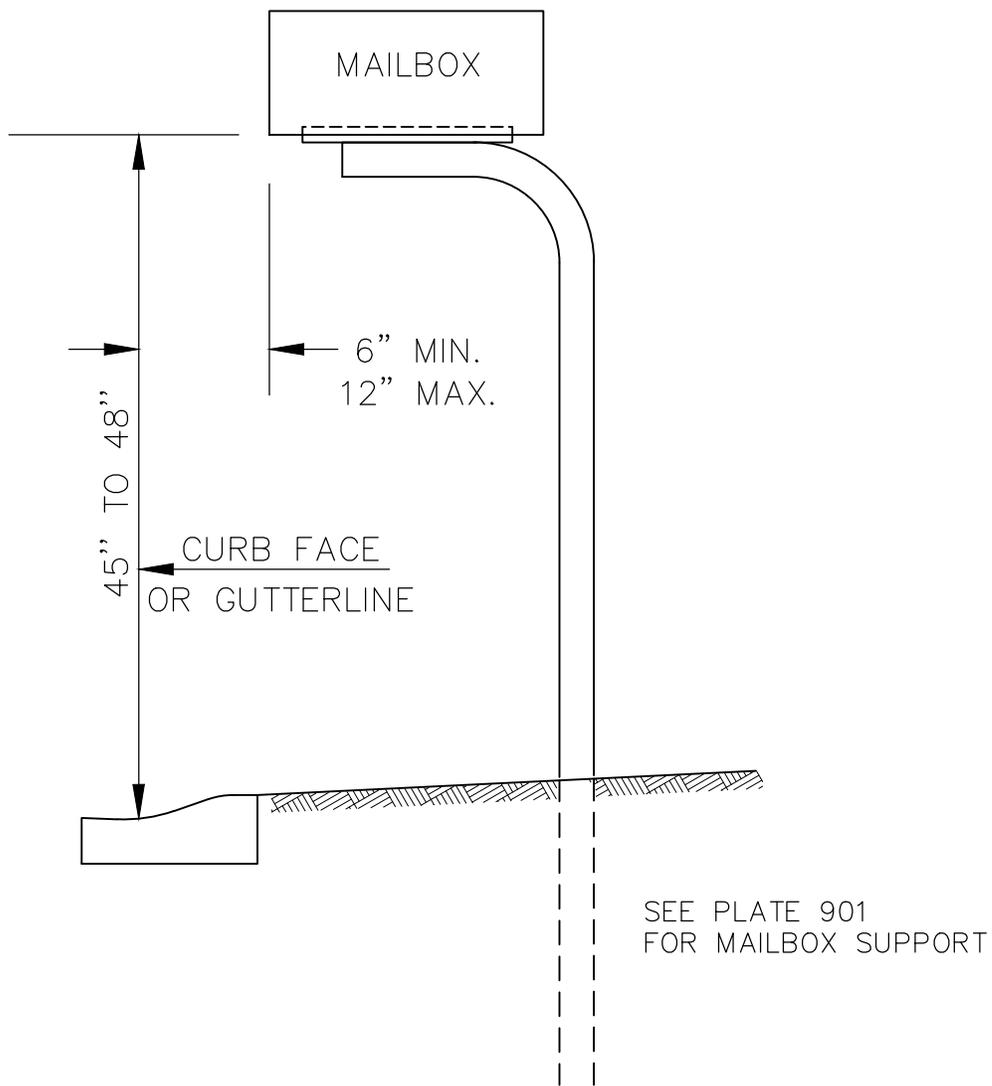
STANDARD PLATE NO.
102



APPROVED



STANDARD PLATE NO.
103



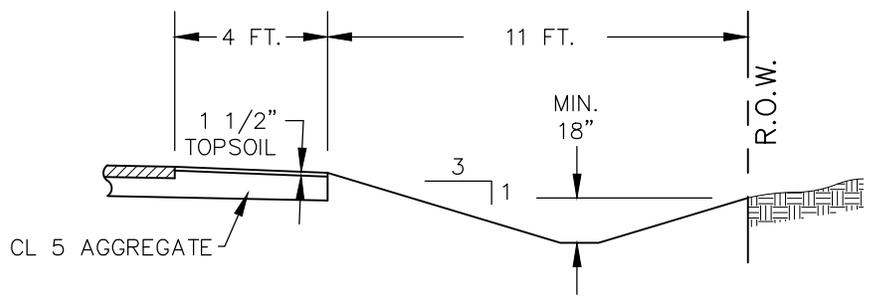
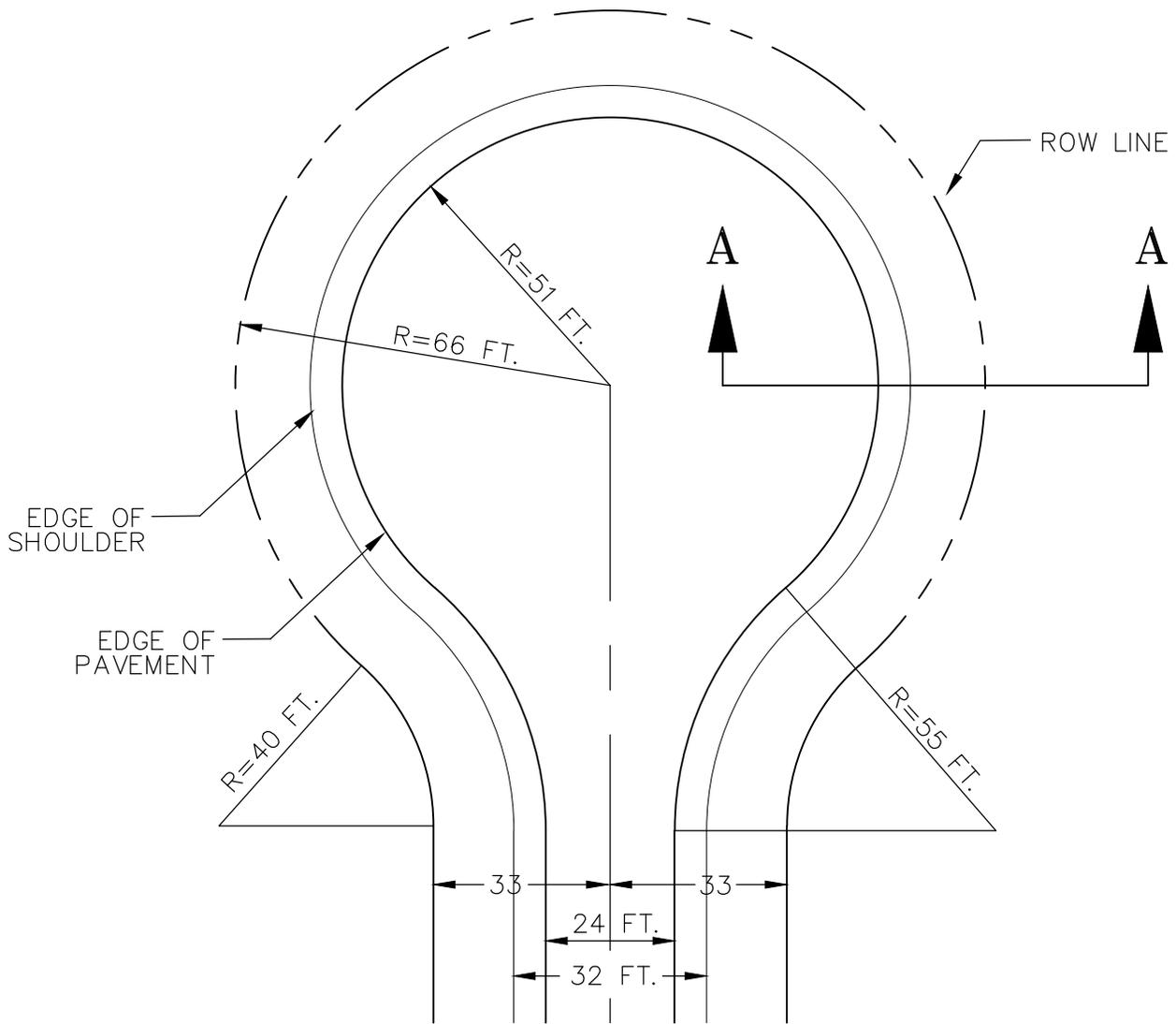
MAIL BOX LOCATION
URBAN STREET SECTION

NO SCALE

APPROVED



STANDARD PLATE NO.
104



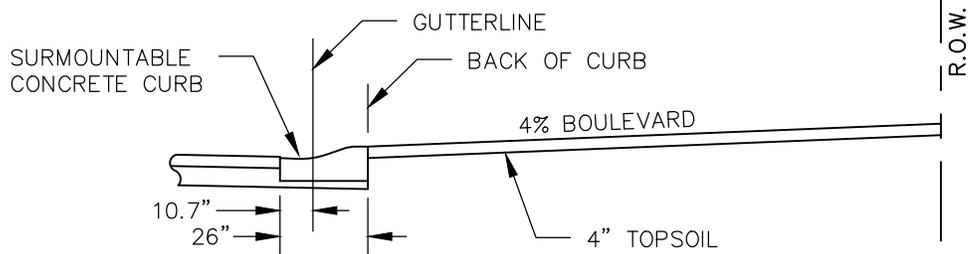
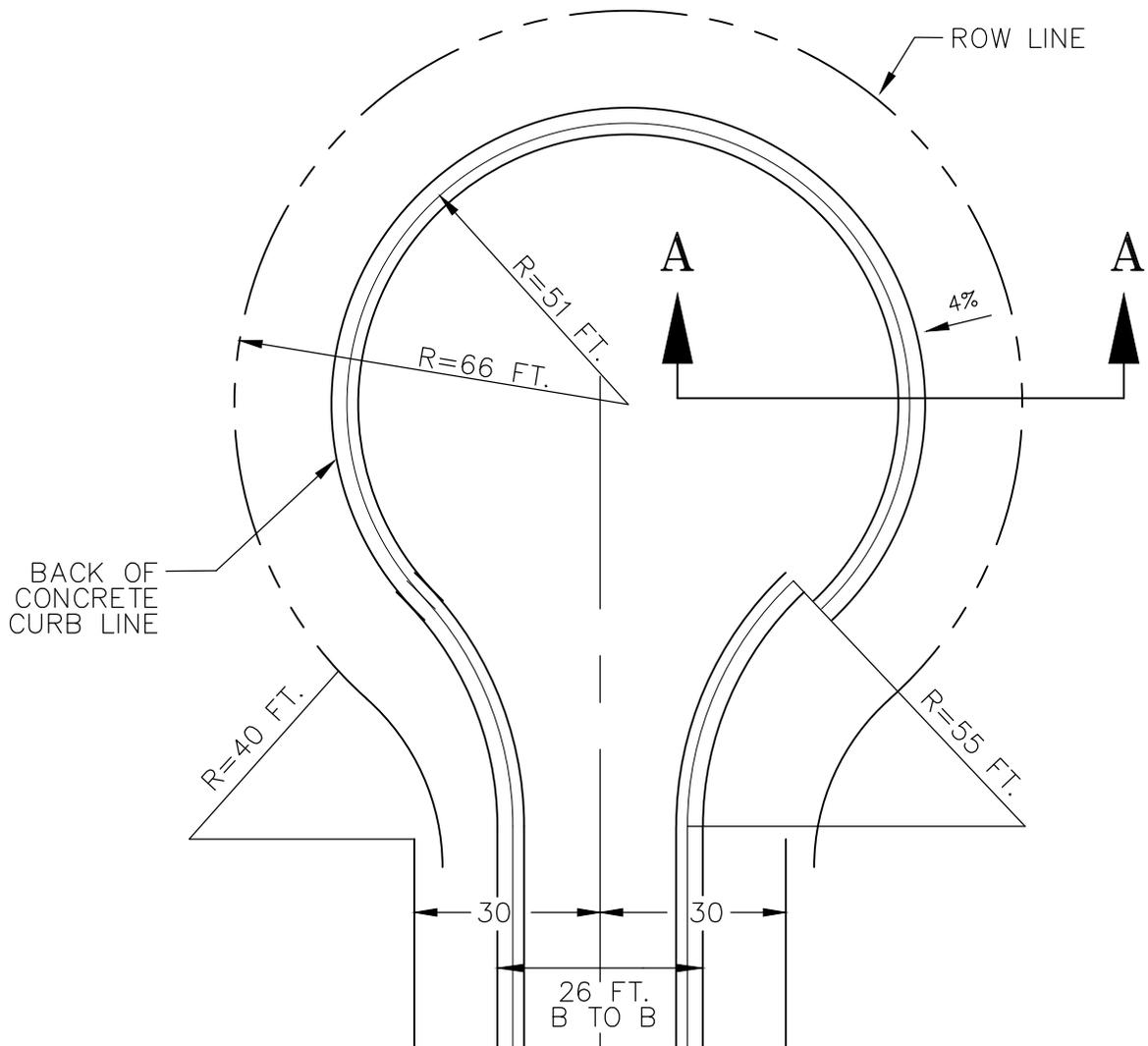
SECTION A-A

RESIDENTIAL CUL DE SAC
RURAL SECTION

APPROVED



STANDARD PLATE NO.
105



SECTION A-A

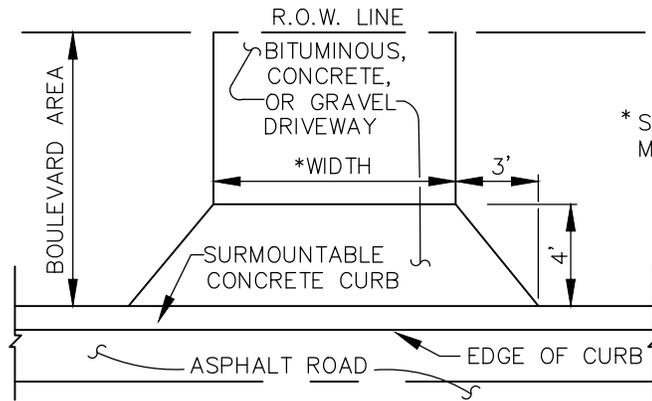
RESIDENTIAL CUL DE SAC
URBAN SECTION

NO SCALE

APPROVED

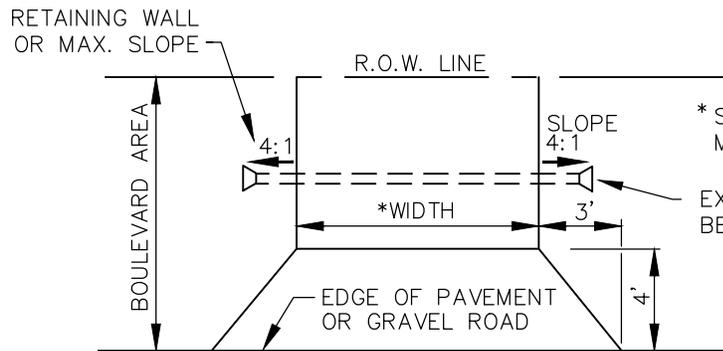


STANDARD PLATE NO.
106



* STANDARD WIDTH - 16 FT.
 MAXIMUM WIDTH - 24 FT.

URBAN DRIVEWAY SECTION



* STANDARD WIDTH - 16 FT.
 MAXIMUM WIDTH - 24 FT.

EXTEND CULVERT TO 8 FT.
 BEYOND DRIVEWAY - BOTH SIDES

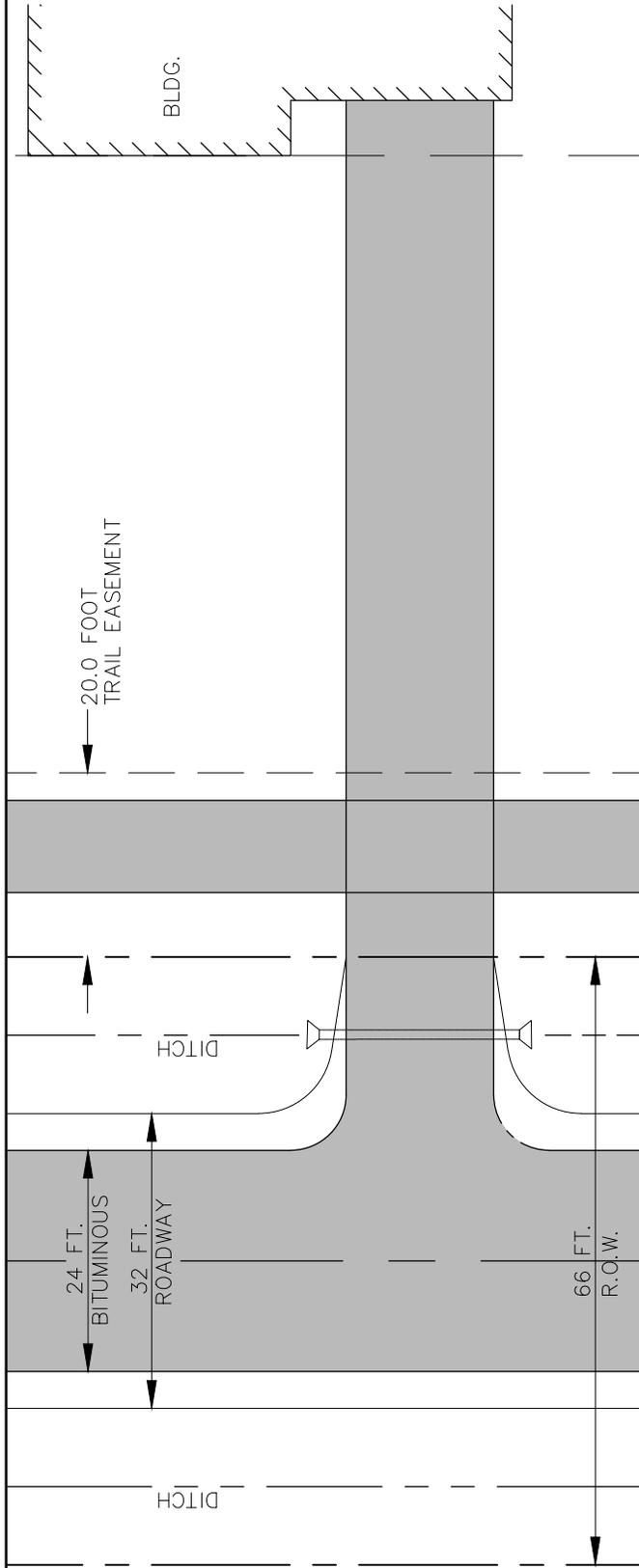
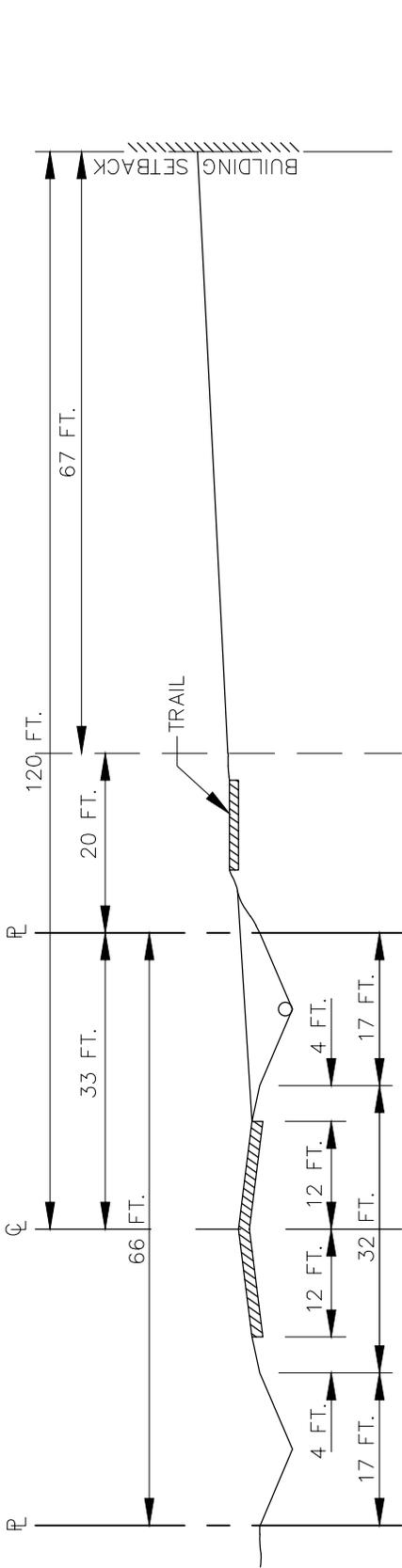
RURAL DRIVEWAY SECTION

TYPICAL DRIVEWAY SECTIONS

APPROVED



STANDARD PLATE NO.
 107

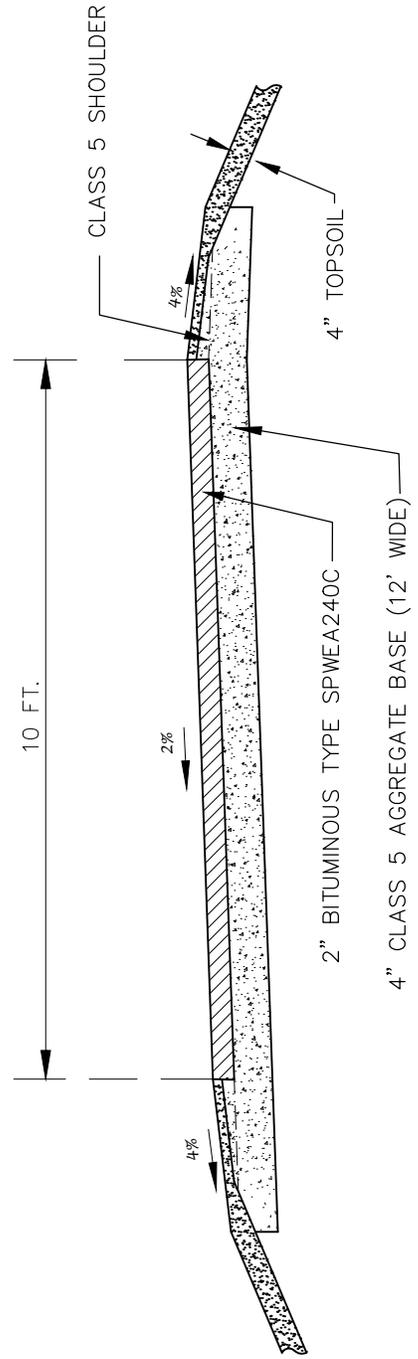
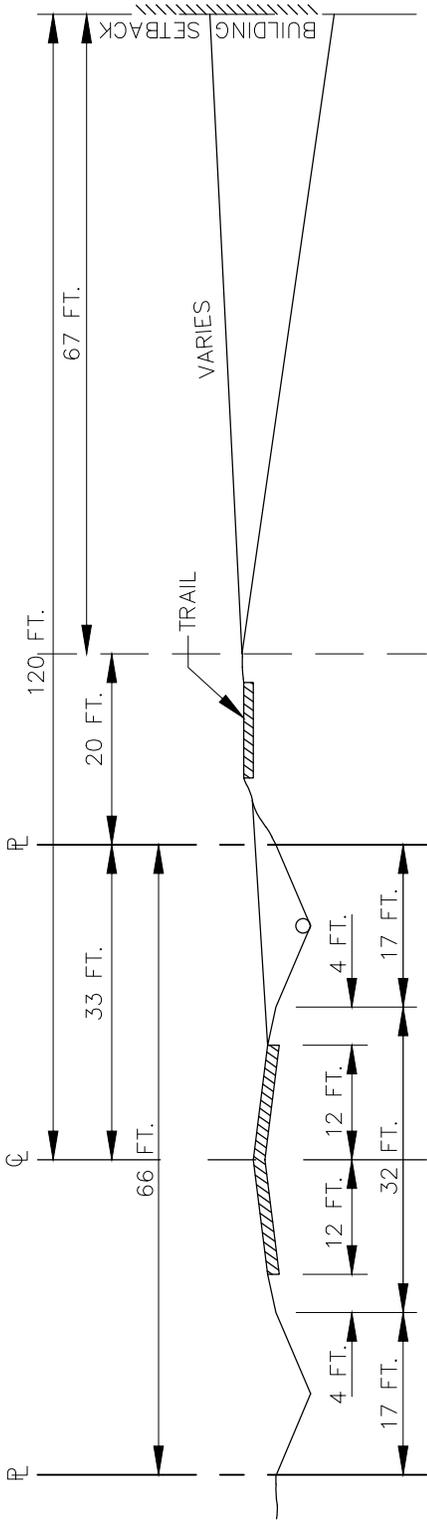


EASEMENT FOR ROADSIDE TRAIL

APPROVED



STANDARD PLATE NO.
108

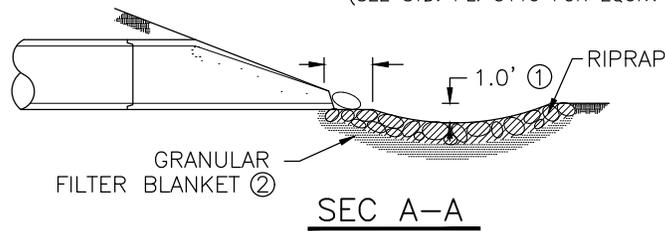
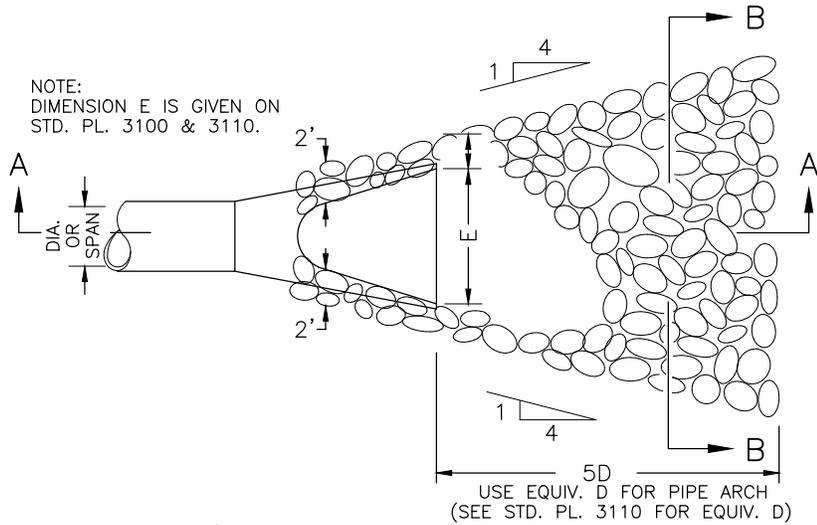
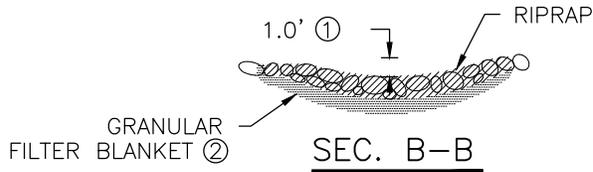


LOCAL TRAIL DETAIL

APPROVED



STANDARD PLATE NO.
109



- ① FOR PIPES GREATER THAN OR EQUAL TO 48", USE 2.0'
- ② THE CONTRACTOR MAY SUBSTITUTE A GEOTEXTILE FABRIC, SPEC. 3601 FOR THE GRANULAR FILTER BLANKET UNLESS OTHERWISE SPECIFIED IN THE PLANS. THE FABRIC SHOULD COVER THE AREA OF THE RIPRAP AND EXTEND UNDER THE CULVERT APRON 3 FEET.
- ③ QUANTITIES AS PER MnDOT STANDARD PLATE

RIP-RAP AT R.C.P. OUTLET
NO SCALE

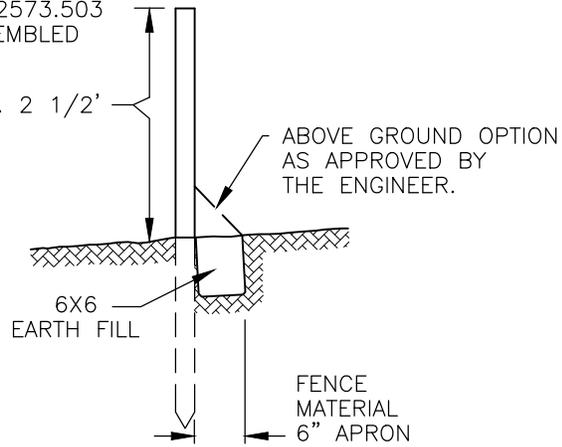
APPROVED



STANDARD PLATE NO.
501

MnDOT 2573.503
PREASSEMBLED

MIN. 2 1/2'



5' POSTS - 8' MAX. ON CENTER
MINIMUM 2' PENETRATION

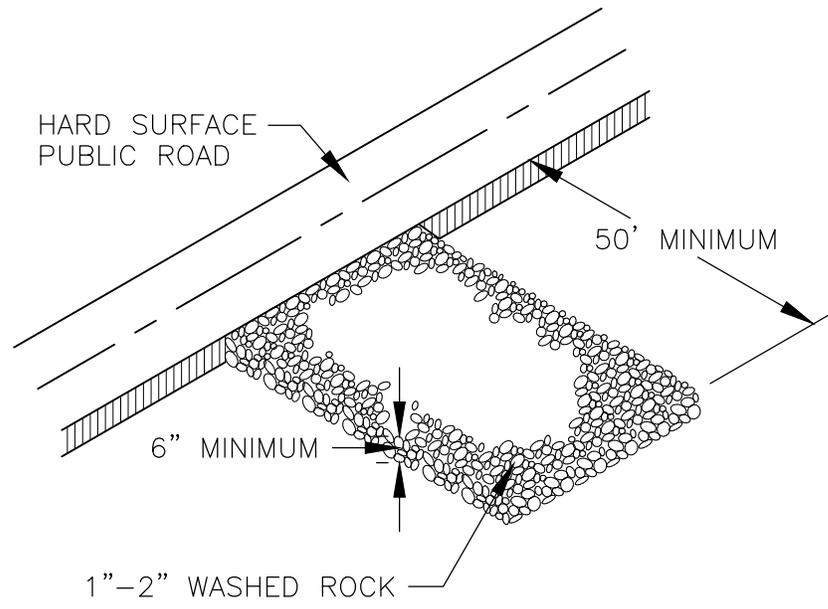
REF. MnDOT 3886

SILT FENCE
NO SCALE

APPROVED



STANDARD PLATE NO.
502



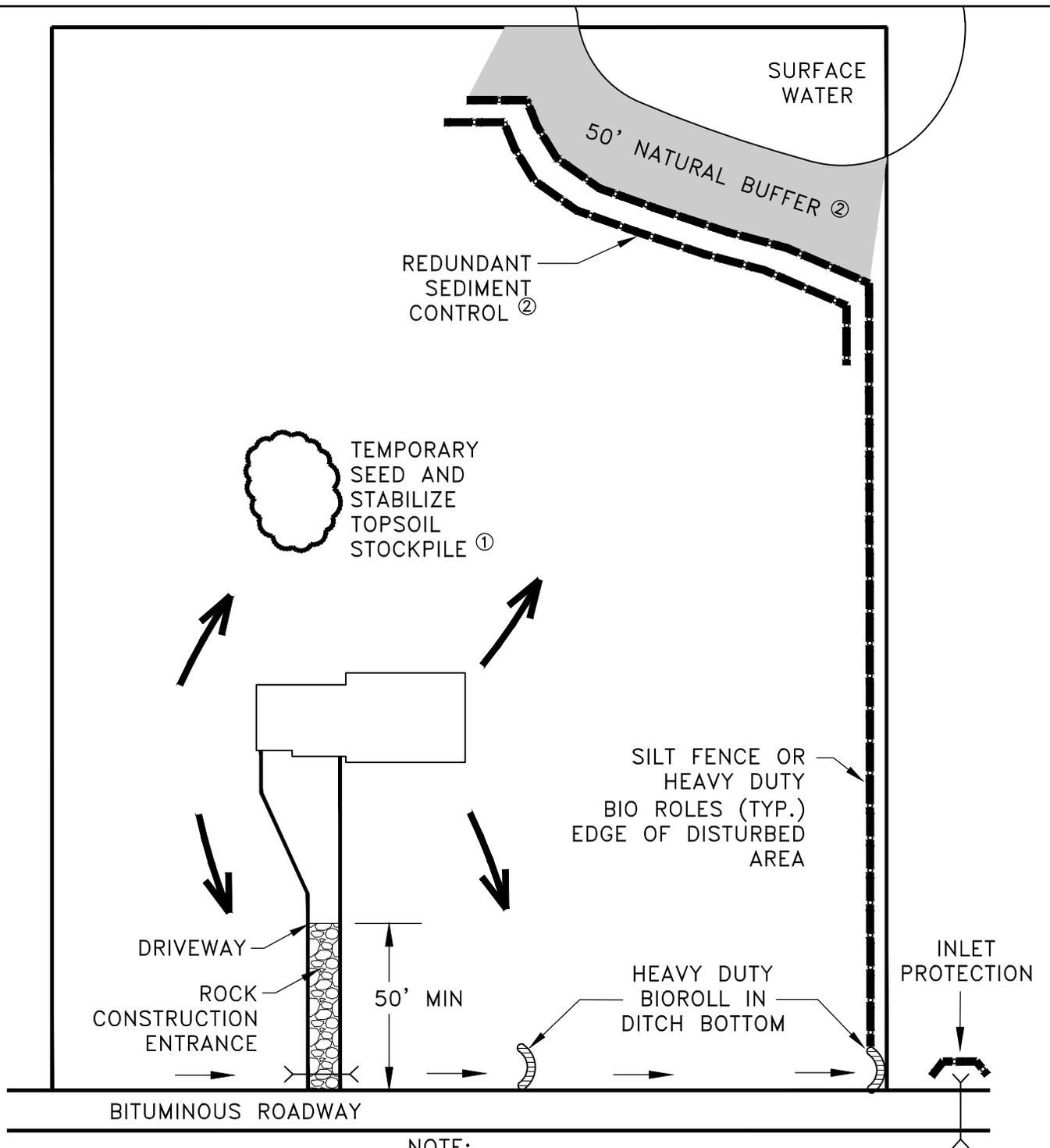
ROCK CONSTRUCTION ENTRANCE

NO SCALE

APPROVED



STANDARD PLATE NO.
503



NOTE:

① TEMPORARY TOPSOIL STOCKPILES SHALL NOT BE LOCATED IN DRAINAGE SWALES.

② IF 50' NATURAL BUFFER IS NOT PRACTICAL, REDUNDANT SEDIMENT CONTROLS ARE REQUIRED.

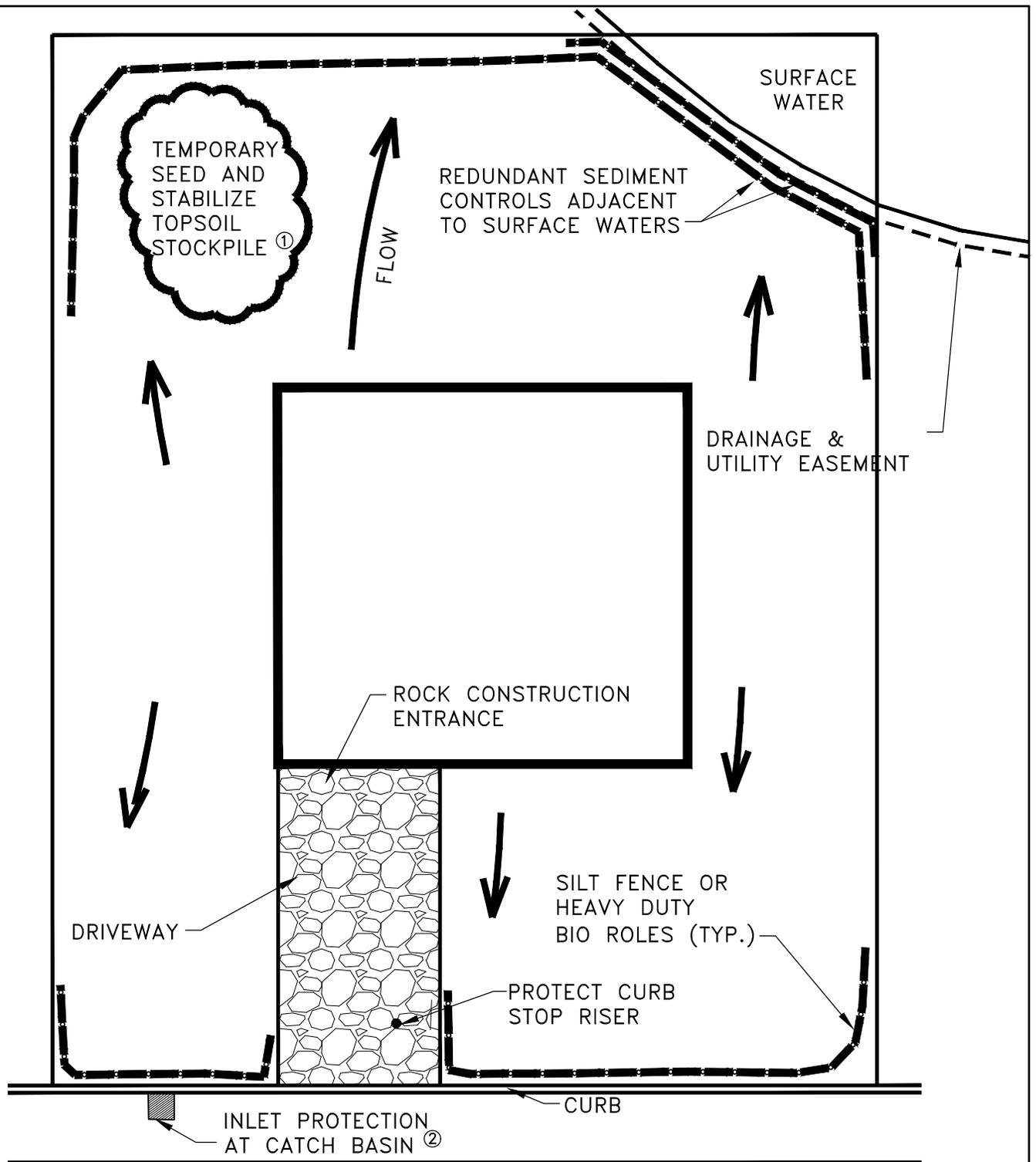
TYPICAL LOT SEDIMENT CONTROL – RURAL

NO SCALE

APPROVED



STANDARD PLATE NO.
504



NOTE:

① TEMPORARY TOPSOIL STOCKPILES SHALL NOT BE LOCATED IN CURB AND GUTTER OR DRAINAGE SWALES.

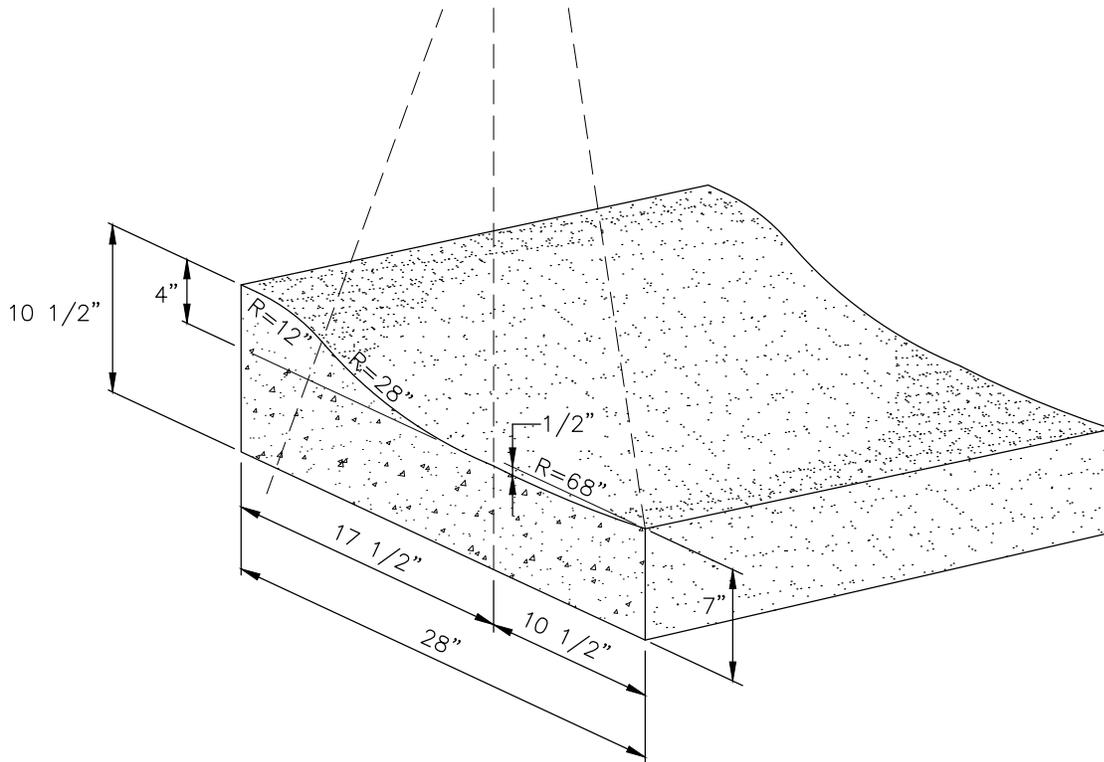
② INLET PROTECTION SHALL BE REMOVED PRIOR TO WINTER FREEZE.

TYPICAL LOT SEDIMENT CONTROL – URBAN
NO SCALE

APPROVED



STANDARD PLATE NO.
505



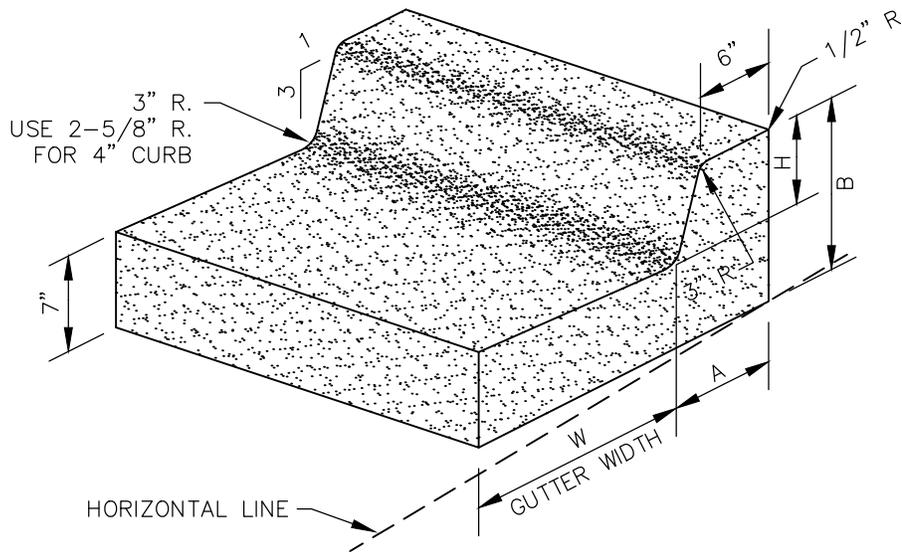
SURMOUNTABLE CONCRETE CURB AND GUTTER

NO SCALE

APPROVED

City of Nowthen

STANDARD PLATE NO.
701



NOTES:

SLOPE 3/4" PER FOOT NORMAL. UNLESS OTHERWISE SPECIFIED. IF A DIFFERENT GUTTER SLOPE IS PERMITTED, THE GUTTER FORM MAY BE TILTED.

DESIGN B			W = 12"				W = 18"				W = 24"				W = 30"				W = 36"			
			DESIGN NO.	CONCRETE																		
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.	CU. YDS. PER LIN. FT.		LIN. FT. PER CU. YD.	CU. YDS. PER LIN. FT.		LIN. FT. PER CU. YD.			
DIMENSIONS																						
H	A	B																				
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					

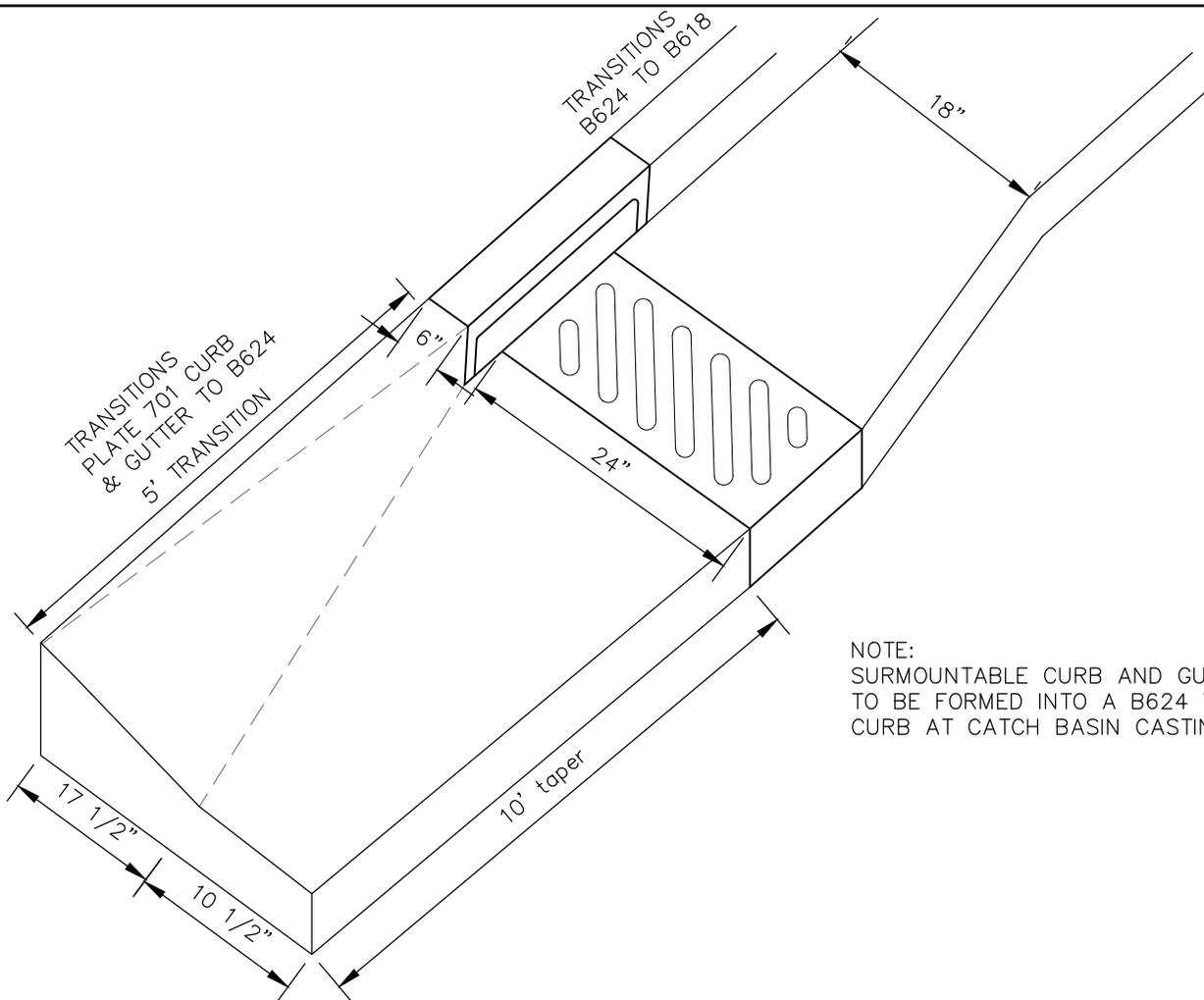
STANDARD TYPE B CURB
NON SURMOUNTABLE

NO SCALE

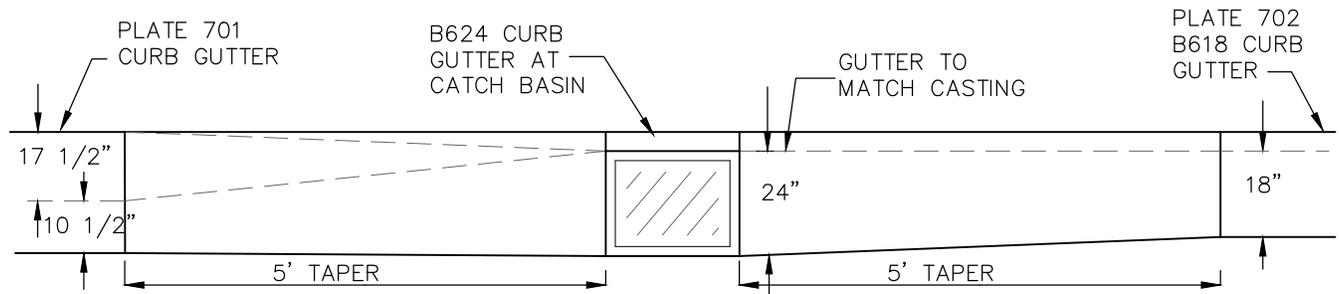
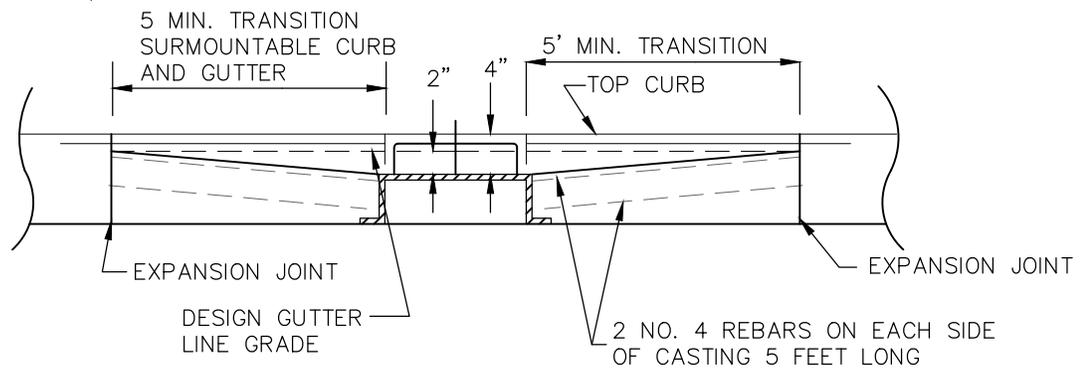
APPROVED



STANDARD PLATE NO. 702
(MnDOT 7100G)



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



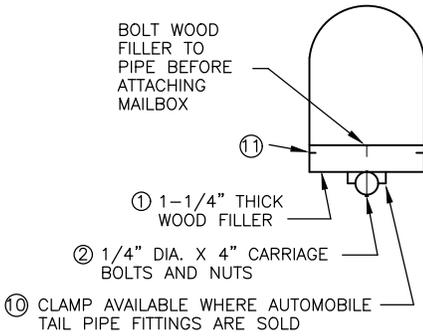
CURB TRANSITION AT CATCH BASIN

NOT TO SCALE

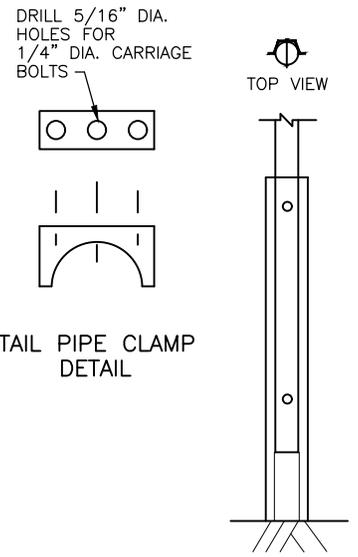
APPROVED



STANDARD PLATE NO.
703

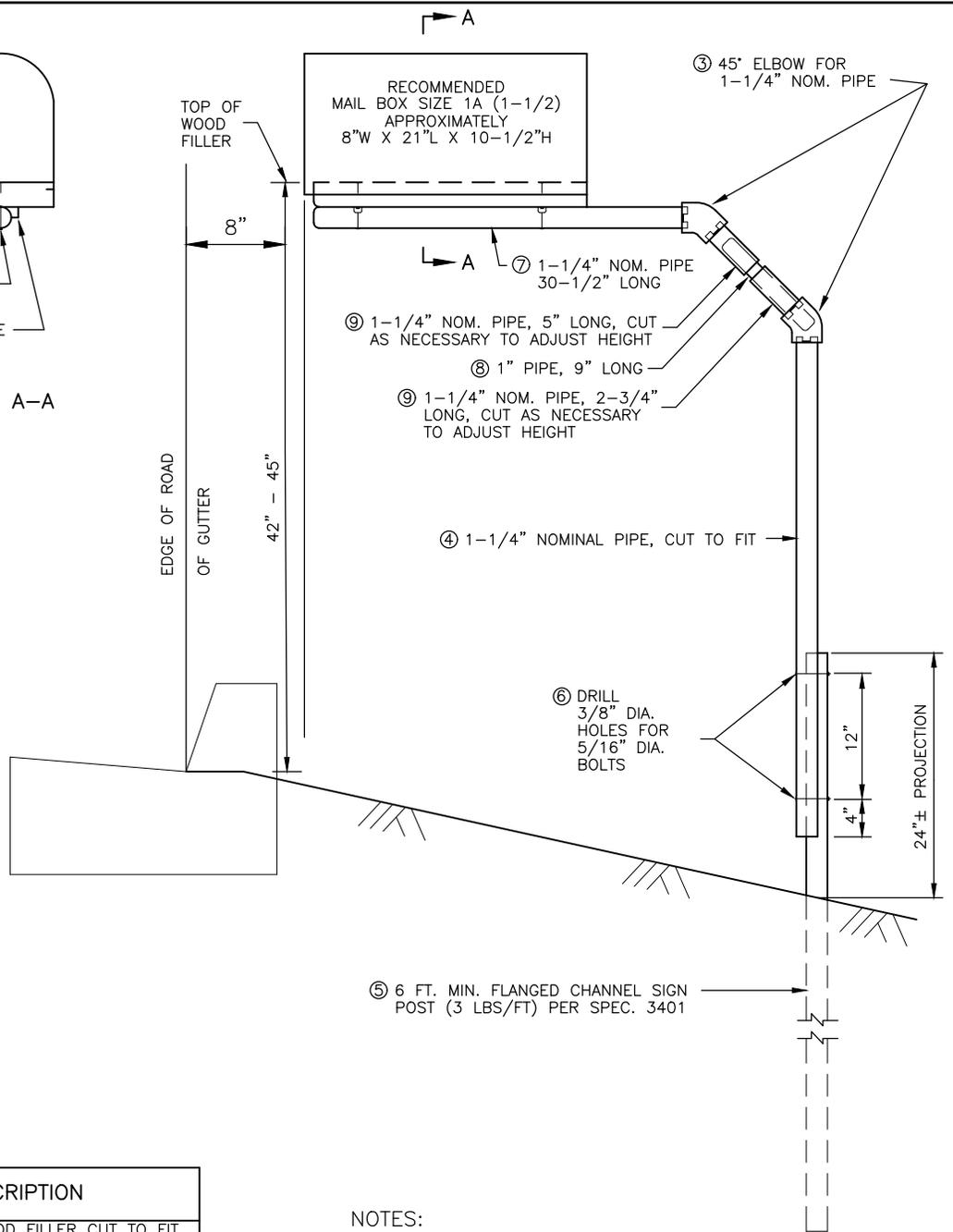


SECTION A-A



TAIL PIPE CLAMP DETAIL

PIPE/POST CONNECTION



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

MAIL BOX 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.

THE MAILBOX TO BE 8 INCHES TO 12 INCHES OUTSIDE THE EDGE OF SHOULDER OR 6 INCHES TO 12 INCHES FROM FACE OF CURB.

MAILBOX SUPPORT

STEEL PIPE WITH FITTINGS AND STEEL FENCE POST (SINGLE SUPPORT)

APPROVED



STANDARD PLATE NO. 901