

MUNICIPAL PUBLIC ROAD DESIGN AND CONSTRUCTION STANDARD

1.0 GENERAL

The following are the minimum road standards for municipal public roads (ie. municipal streets and roadways) in the Municipality. In every case, roadway designs will be prepared by a qualified professional engineer licensed to practice in the Province of Nova Scotia. All roadway design drawings and roadway construction, will be subject to approval by the Municipal Engineer. No roadway will be considered a municipal public road unless stamped engineered drawings, designed to standard, and related survey plans, are approved, and construction of the roadway is completed in accordance with such approved drawings.

Existing provincial public roadways transferred, by law, from the Province of Nova Scotia to the Municipality, will not be subject to these road standards.

Requirements in excess of the minimum standards may be necessary for certain roadways, subject to the Municipal Engineer's discretion.

Submitted drawings will include:

legal survey plans showing property boundaries, and proposed rights-of-way and easements;

topographic contour drawings, to minimum 2 m (6.56') intervals, within the project area, and to minimum 5 m (16.40') within the contributing drainage area outside the project area;

road and drainage design plans and profile drawings, with preferred metric scales at 1:100 or 1:250 – horizontal, and 1:10 or 1:25 – vertical, with each drawing stamped, signed and dated by the professional engineer responsible for its preparation;

and, all other details of structures, equipment and appurtenances, including manufacturer's and fabricator's shop drawings, and material and equipment test reports, necessary for the Municipal Engineer in his or her sole discretion to properly complete the review of the roadway project design and construction.

Submitted drawings will be clearly drawn and annotated, to scale, and include a title block with appropriate project information and location, and professional engineer and subdivision applicant identification. No drawing sheet in the drawing set will be larger than 1.0 m² (ANSI E size).

Drawing sets will be submitted in both paper form and electronic data, with electronic data in either the *.dwg, *.dxf or IGES file format, and will be on electronic data media that can be read by Municipality personal computer equipment.

In this Standard, regulatory dimensions are stated in metric; US customary units are provided for convenience only. The use of metric (Systeme International – S.I.) units in engineering design submissions is preferred, however, use of U.S. customary units is acceptable.

2.0 TECHNICAL REFERENCES

The following technical references are noted in these Standards:

- 2.1 “Geometric Design Guide for Canadian Roads”, September 1999, latest revision, issued by the Transportation Association of Canada.
- 2.2 “Uniform Traffic Control Devices for Canada”, March 1994, latest revision, issued by the Transportation Association of Canada.
- 2.3 “Standard Specifications for Municipal Services”, January 2003, latest revision, issued by the Joint Committee on Contract Documents of the Nova Scotia Road Builders Association and the Nova Scotia Consulting Engineers Association.
- 2.4 “Nova Scotia Department of Transportation Metric Standard Specification Book”, January 1994, latest revision, issued by the Nova Scotia Department of Transportation and Public Works.
- 2.5 “Guidelines for Residential Subdivision Street Design”, recommended practice, 1997, Institute of Transportation Engineers.
- 2.6 “Erosion and Sedimentation Control Handbook for Construction Sites”, 1988, Nova Scotia Department of Environment and Labour.
- 2.7 “Canadian Highway Bridge Design Code”, CAN/CSA-S6-00, latest revision.

- 2.8 “Urban Hydrology for Small Watersheds, TR-55”, Technical Release 55, June 1986, United States Department of Agriculture, Natural Resources Conservation Service.
- 3.9 “Standards for Concrete Pipe”, CAN/CSA-A257-Series-M92, latest revision.
- 3.10 “Thermoplastic Pressure Piping Compendium”, CAN/CSA-B137-Series-02, latest revision.
- 3.11 “Corrugated Steel Pipe Products”, CAN/CSA-G401-01, latest revision.

3.0 ROAD CLASS DESIGNATION

Municipal public roads will be designed according to one of the following road design classes:

- low volume rural road (LVR)
- rural local undivided road (RLU)
- rural collector undivided (RCU)

3.1 Low Volume Rural Road – LVR

Municipal roads will be classed as low-volume rural roads where the Average Annual Daily Traffic count hereafter referred to as AADT is forecast to be less than 300 vehicles per day, and all traffic has an origin or destination along the roadway length (ie. no through traffic).

3.2 Rural Local Undivided Road – RLU

Municipal roads will be classed as rural local undivided roads where the AADT is forecast to be less than 600 vehicles per day.

3.3 Rural Collector Undivided Road – RCU

Municipal roads will be classed as rural collector undivided roads where the AADT exceeds 600 vehicles or more per day. For RCU roads, special design requirements, specific to each case, if any, will be established, by the Municipal Engineer.

3.4 Average Annual Daily Traffic Estimation

At the Municipal Engineer's sole discretion, submission of road design trip generation calculations will be required in order to support the AADT forecast necessary to determine road classification. In any case, the Municipal Engineer will determine and approve the road classification.

3.5 Design Speed

Unless lower design speeds are specified by the Municipal Engineer, based upon the projected use of the roadway, design speeds for road classes will be as follows:

LVR	50 km/hr
RLU	70 km/hr
RCU	70 km/hr

4.0 ALIGNMENT CONTROLS

Design controls for horizontal and vertical road alignment will be for the design speeds as per the assigned road class in sub-section 3.5, and will be in accordance with the Geometric Design Guide for Canadian Roads.

4.1 Minimum Stopping Sight Distance

Minimum stopping sight distances will be:

- a) for 50 km/hr design speed 65m (213ft)
- b) for 70 km/hr design speed 110m(360ft)

Engineering plan drawings will indicate the start and end points, and turning radii for all horizontal curves. Engineering profile drawings will indicate the start and end points for all vertical curves, slopes for all changes in direction and the K value for all crest and sag vertical curves.

Both plan and profile drawings will clearly show road length stations.

4.2 Maximum Vertical Gradients

Maximum vertical gradients will be:

for LVR 10%

for RLU & RCU 6%

4.3 Intersections with Existing Roads

4.3.1 Horizontal Approach

Roadway intersections with existing municipal roadways will have intersection angles at no less than 70 degrees and no greater than 110 degrees to the existing municipal roadway.

Roadway intersections with existing provincial roadways will be subject to the approval of the Nova Scotia Department of Transportation and Public Works.

4.3.2 Vertical Approach

Roadway gradient adjustments for intersections with existing municipal roadways will be designed in accordance with the Geometric Design Guide for Canadian Roads.

Roadway intersections with existing provincial roadways will be subject to the approval of the Nova Scotia Department of Transportation and Public Works.

4.4 Intersections for New Roads

New intersections will be designed in accordance with the Geometric Design Guide for Canadian Roads.

4.5 Cul-de-Sac Design

Culs-de-sac will be placed at the end of all dead-end streets. The geometric layout will be, at a minimum, as per attached drawing H – 1.

All culs-de-sac will be constructed to applicable minimum road standards.

4.6 Reserve Road Allowances

As required by this By-law, all subdivisions will provide for a reserve road allowance for future extension of the public road to the boundaries of an adjacent lot or watercourse, at minimum intervals of 400 metres (1,312.34'), as determined to be feasible at the sole discretion of the Municipal Engineer.

4.7 Road and Driveway Layout

Road layout design will optimize use of materials and future maintenance without compromising safety, the surrounding natural environment, or the convenience of access to the properties served by the road network. The Municipal Engineer will review submitted designs and assess the life-cycle economy provided by such designs. Generally, the Municipal Engineer will approve a road layout design that will result in optimal future maintenance costs, and reduced environmental impact. Guidance in road layout design is available through several publications of the Transportation Association of Canada and the Institute of Transportation Engineers, including the technical documents referenced in Section 2 of this Standard.

Residential driveway access design will conform to the recommendations contained in the "Guidelines for Residential Subdivision Street Design". Where the road traffic will consist of a mix of residential, commercial and/or industrial traffic volumes, the Municipal Engineer may, at his or her sole opinion, specify other driveway design requirements.

Driveway locations will be shown on the submitted plan drawings.

5.0 CROSS-SECTION CONTROLS

Cross-section controls refer to the cross-sectional geometry of the roadway. Roadways of LVR and RLU class are, at a minimum, to be gravel-surfaced, minimum two-lane, with open drainage ditches for collection and disposal of storm water. Roadways of RCU class will be surfaced with asphalt concrete, with minimum cross-section controls and drainage systems as determined by the Municipal Engineer at his or her sole discretion.

5.1 Minimum Right-of-Way Width

The minimum right-of-way width for all municipal public roads will be 20 m (65.62'), assuming maximum drainage ditch back slopes can be accommodated. Where the

maximum drainage ditch back slopes cannot be accommodated, the right-of-way shall be determined by the Municipal Engineer at his or her sole discretion.

Where a road right-of-way concerned is less than 20 m and the road is a private road subject to a municipal takeover of ownership, the Municipal Engineer may specify special engineering criteria regarding the placement of the road and drainage infrastructure within the confined right-of-way, without requiring widening of the right-of-way to the standard width.

5.2 Minimum Cross-Section Criteria

Road Class	Roadway width, incl shoulder	Cut side slope, earth <u>run:rise</u>	Backslope earth, <u>run:rise</u>	Fill side slope earth, <u>run:rise</u>
LVR	8.60m (28.21')	2:1	1:5:1	2:1
RLU	9.75m (32.00')	3:1	2:1	3:1
RCU	Minimum criteria to be determined by Municipal Engineer, but at least equal to RLU			

5.3 Guard Rails

Guard rails will be placed where prudent road safety engineering practice dictates, as determined at the sole discretion of the Municipal Engineer. If guard rails are placed, fill side slopes for RLU and RCU class can be reduced to 2:1. Where guard rails are placed, roadway width is to be increased by a minimum of 0.5m (1'8"), adjacent the guard rail. Guard rail installation will be as per the Nova Scotia Department of Transportation and Public Works Standard Specification Book.

5.4 Rock Slopes

Back slopes in rock are maximum 1:4 for all road classes. Fill side slopes in rock are 1.5:1 with guard rail for all classes. Without guard rail, fill side slopes in rock are the same as for earth fill slopes as per road class.

5.5 Roadway Surface Slope

Generally, the roadway surface is to be crowned in the centre, with a 3% slope towards each drainage ditch, for gravel-surfaced roads, and a 2% slope towards each roadside drainage structure for asphalt concrete surfaced roads. Exceptions can occur where superelevations are required to accommodate turning radii or intersection alignment, or where hydraulic analysis indicates a greater crown slope is required.

5.6 Design for Wide-Turning Vehicles

Where it is expected that wide-turning vehicles (trucks) may be occasionally encountered on the road, adjustments to roadway width, particularly at turns, may be required, in conformance with the Geometric Design Guide for Canadian Roads.

5.7 Retaining Walls

Other than undisturbed, or otherwise stable, naturally-occurring rock faces, all exposed vertical cuts of soil in the road right-of-way will be stabilized and prevented from failure by a retaining wall, of sufficient height and strength, where a cut slope conforming to the requirements of Sub-section 5.2 is uneconomic. The design and the construction inspection of retaining walls will be prepared by and directed through a professional engineer, licensed in the province of Nova Scotia, and competent in the field of structural engineering. The design will be subject to the review and approval of the Municipal Engineer, in his or her sole discretion.

6.0 ROADBED CONSTRUCTION

6.1 Earthwork, Grubbing, Excavation, Compacted Fills, Retaining Structures

Preparation of road sub-grade and related works will be as per the Standard Specifications for Municipal Services. The Municipal Engineer may request geotechnical test reports regarding the bearing capacity of the in-situ subgrade material, as well as other relevant geotechnical information, at the Engineer's sole discretion.

6.2 Base Gravel Course

For LVR and RLU road classes:

A minimum of 200 mm (8") of Nova Scotia Department of Transportation and Public Works Class "E" material will be placed and compacted to approved grade, as per the Standard Specifications for Municipal Services. The material will meet the specification of the Nova Scotia Department of Transportation and Public Works, as per the Standard Specification Book, and will meet the sulphide content limits of the Sulphide-Bearing Material Disposal Regulations of the Nova Scotia Department of Environment and Labour.

For RCU road class:

The minimum base gravel course specification will be determined at the sole discretion of the Municipal Engineer, but in all cases will at least equal that of the LVR and RLU roads classes.

6.3 Surface Course

For LVR and RLU road classes:

A minimum of 100 mm (4") of Nova Scotia Department of Transportation and Public Works Class A material will be placed and compacted to approved grade, as per the Standard Specifications for Municipal Services. The material will meet the specification of Nova Scotia Department of Transportation and Public Works, as per the Standard Specification Book and will meet the sulphide content limits of the Sulphide-Bearing Material Disposal Regulations of the Nova Scotia Department of Environment and Labour.

For RCU road class:

The minimum top gravel course specification will be determined at the sole discretion the Municipal Engineer, but in all cases will at least equal that of the LVR and RLU roads classes.

RCU roads will be overlain by an asphalt concrete pavement surface of a minimum thickness of 100 mm (4") of which 63 mm (2.5") will consist of a Type B base course asphalt concrete, and 37 mm (1.5") will consist of a Type C surface course asphalt. Required thicknesses and composition of the asphalt concrete pavement may be greater than minimum as determined at the sole discretion of the Municipal Engineer. Material and construction specification will be as per the Nova Scotia Department of

Transportation and Public Works Standard Specification Book, and the Standard Specifications for Municipal Services.

6.4 Erosion Control and Prevention

Minimum erosion control and prevention measures will be as per the Standard Specifications for Municipal Services, and the Erosion and Sedimentation Control Handbook for Construction Sites.

6.5 Municipal Inspections and Approval of Construction

Municipal inspections will occur, at a minimum, by appointment, i) prior to construction; ii) after clearing and grubbing; iii) during placement of drainage culverts and structures; iv) after placement of base gravel; v) after placement of surface gravel; and, vi) during placement of asphalt concrete pavement (where required).

Municipal inspections are not a substitute for the proponent's on-going quality control of the construction of the roadway. All proponents of roadway development and construction will require continuous, independent quality control inspection of the construction of the proposed works under the direct supervision of a named professional engineer, licensed to practice in the Province of Nova Scotia, and competent in the field of civil engineering.

Municipal Engineer's approval will be given only for construction in accordance with approved plans.

No final approval of the constructed works will be given unless complete record drawings and satisfactory test results have been submitted to and approved by, the Municipal Engineer.

7.0 STORM WATER DRAINAGE

7.1 General

All lands serviced by the proposed roadway system will be serviced by a drainage system. Which will consist of such open ditches and closed conduits as required to collect and remove storm water from at least a one in 25 year storm event, for LVR and RLU class roads, and at least a 1 in 100 year storm event for RCU class roads. The Municipal

Engineer may specify a greater return period storm event where infrastructure and/or property are at greater risk of damage due to flooding, or due to the critical service nature of the affected infrastructure and/or property. Rainfall intensity curves to be used for specified return periods will be based on the most recent Environment Canada trending data available for Shearwater, Nova Scotia, adjusted for local meteorological conditions.

All ditches and conduits will be placed in the municipal road right-of-way, or a storm utility easement, identified as such in the submitted plans. Storm utility easements are to be a minimum of 9.144m(30'), unless otherwise approved by the Municipal Engineer. In any case, easements must be of sufficient width to permit safe and efficient public works maintenance operations within the easement.

7.2 Nova Scotia Department of Environment and Labour Approval; Other Agency Approvals

Design and construction of all storm water drainage systems will be in compliance with the Storm Drainage Works Approval issued by the Nova Scotia Department of the Environment and Labour. No construction will take place unless such approval is received in compliance with the Activities Designation Regulations of the Nova Scotia Department of Environment and Labour.

Depending on the nature of the works proposed, approvals may also be required from other public agencies and public and private utilities, including, but not limited, to the Nova Scotia Department of Transportation and Public Works, the Nova Scotia Department of Natural Resources, Fisheries and Oceans Canada, the Canadian Coast Guard (Navigable Waters Protection Act section), Nova Scotia Power Inc., Aliant Telecom and other municipal units. The obtention of these approvals is the responsibility of the subdivision applicant. No construction will take place unless all necessary approvals have been received.

7.3 Acceptable Drainage Structures

The type and placement of culverts, conduits and drainage ditches will be clearly shown on all engineering drawings. Acceptable culvert and conduit materials include concrete Class III pipe to CAN/CSA-A257 Series-M92, PVC and HDPE pipe, complete with smooth interior surface and ribbed exterior, to CAN/CSA-B137 Series-02, and corrosion-resistant corrugated metal pipe, to CAN/CSA-G401-01, where same will be placed in soil conditions that will not promote accelerated corrosion. Other culvert and conduit

structures are acceptable pending Municipal Engineer's approval of their appropriate structural and hydraulic characteristics, and their life-cycle economic maintenance.

7.4 Structural Design

All culvert and conduit structures will be of sufficient design and strength to resist soil, hydraulic, earthquake, temperature, traffic and other environmental loads reasonably anticipated to be imposed upon them.

Structural design calculations and drawings will be submitted for the Municipal Engineer's approval for all drainage structures spanning in excess of 1.5 m (4.92') at their greatest cross-sectional extent (i.e. distance between supports or maximum distance between structure sidewalls). Such calculations and drawings will be prepared by a professional engineer, licensed in the Province of Nova Scotia, and competent in the field of structural engineering. A geotechnical report regarding the soil conditions in the location of the proposed drainage structure(s) will be submitted upon request of the Municipal Engineer. Such geotechnical report will be prepared by a professional engineer, licensed in the Province of Nova Scotia, and competent in the field of geotechnical engineering.

Drainage structures with a span greater than 2.5 m (8.20') and subject to traffic or pedestrian loading will be designed and constructed in accordance with the Canadian Highway Bridge Design Code, CAN/CSA – S6-00. Such design and construction inspection and supervision, will be prepared by and directed through a professional engineer, licensed in the Province of Nova Scotia, and competent in the field of structural engineering.

7.5 Hydrology and Hydraulic Design

Hydraulic calculations can be based on the Rational Method, where the contributing drainage area for the designed drainage system is estimated to be 40 hectares or less (98.84 acres), or storm water detention is not required. Otherwise, flow calculations must be developed from storm water management modeling using TR-55 hydrologic methods, or another equivalent method recognized in civil engineering practice.

Hydraulic calculations and designs will include complete topographical information regarding structure inverts, crowns, head water and tail water elevations and, where applicable, backwater elevations, throughout the proposed system.

All drainage culverts, conduits and other structures will be constructed with headwalls and tail walls of approved design, and of stable and durable material, including stone, concrete, pressure-treated wood cribbing, and pre-manufactured plastic and metal assemblies. Where appropriate, security screening at culvert openings may be specified at the sole discretion the Municipal Engineer.

All culverts and drainage structures with a span greater than 1.5 m (4.92') will include bevelled edge entries, smooth inlet transition and smooth interior surface throughout the flow length.

Hydraulic calculations and designs will be prepared by, and the construction inspection of structures directed through, a professional engineer, licensed in the Province of Nova Scotia, and competent in the field of civil engineering.

Hydraulic calculations will be submitted for review and approval by the Municipal Engineer.

7.6 Watercourse Alterations, Detention Pond Design and Storm Water Disposal

All necessary watercourse alteration permits and approvals required from the Nova Scotia Department of the Environment and Labour, and all other relevant agencies and departments, will be obtained prior to construction and presented to the Municipal Engineer.

All detention pond designs will clearly state the pond dimensions, the volume of water retained during the specified return storm period, the minimum freeboard available at the specified return storm period, the location of the outfall, the anticipated flow and impact on the receiving watercourse and the security features of the structure to prevent unauthorized access.

All storm water drainage systems will drain to a public watercourse with flow and water quality in compliance with the approval issued by the Nova Scotia Department of Environment and Labour.

No storm water drainage system will be acceptable to the Municipal Engineer where, in his or her sole opinion the disposal location of collected storm water negatively impacts the receiving environment or can create property damage.

7.7 Construction Methods

Installation of culverts, conduits and ditches, and related appurtenances will be at a minimum as per the Standard Specifications for Municipal Services. Other requirements shall be as determined at the sole discretion of the Municipal Engineer.

8.0 ROAD SIGNAGE

All road signage, signals and markings will be in accordance with the Uniform Traffic Control Devices for Canada manual and the Nova Scotia Traffic Signs Regulations. All road signage will be placed in the right-of-way, subject to approval by the Municipal Engineer. No signage will be placed in the the municipal right-of-way without the prior approval of the Municipal Engineer.

8.1 Stop Signs

Stop signs will be placed within 5m (16') of all intersections, at the minor leg approaches. Intersections with equal traffic for all approaches may be designated as a four way stop, subject to approval by the Municipal Engineer.

8.2 Traffic Signals

If traffic volumes indicate electrified traffic signals are necessary, a traffic signal warrant will be submitted for approval by the Municipal Engineer.

8.3 Road Names

All municipal public road names will be approved by Municipal Council prior to final approval being given by the Development Officer.

8.4 Road Name Signage

Road name signage will be placed for each road intersection.

8.5 Other Road Signage

Other directional, speed rating and cautionary signage will be placed in the right-of-way, as warranted, in the sole discretion of the Municipal Engineer. Information or advertising

signage will be placed in the right-of-way only with the approval of the Municipal Engineer, and only to such specifications, and terms and conditions, as directed.

8.6 Signage Material

8.6.1 Signs

Signs will be made of plate or extruded anodized aluminum, with high-intensity grade reflective vinyl markings. Signage will be securely fixed to posts.

Street name signs will generally consist of all the letters of the primary street name, with the letters made from 100mm (4") black vinyl marking stock, applied to extruded aluminum plate covered with white, high-intensity grade reflective vinyl material. All letters will be capitalized.

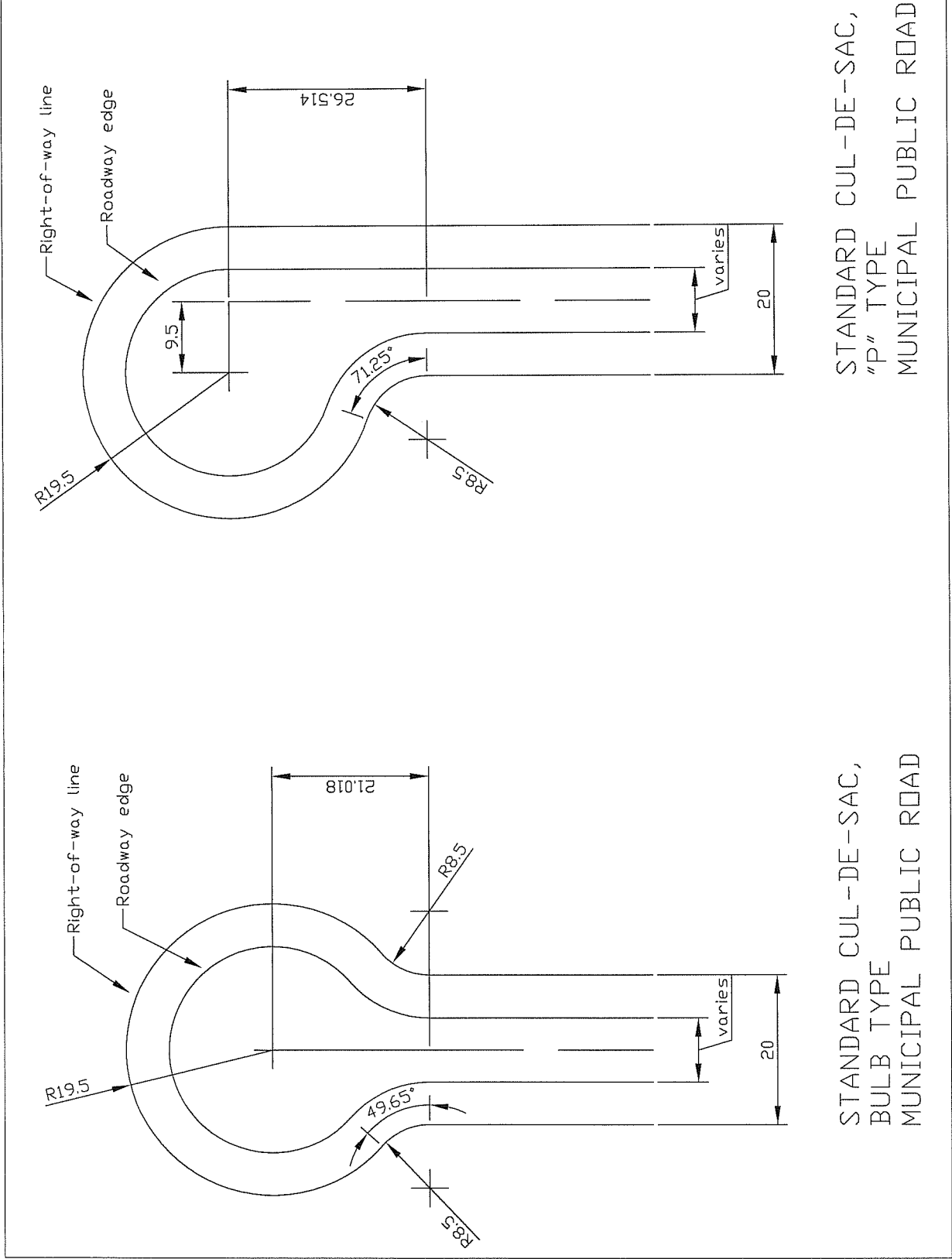
Other highway signage will generally be made from highway sign grade aluminum plate with high-intensity vinyl reflective markings. Minimum size of sign will conform to the Uniform Traffic Control Devices for Canada manual, and the Nova Scotia Traffic Signs Regulations.

8.6.2 Posts

Generally, roadside marking posts will be of galvanized, perforated steel, of nominal 51 mm X 51 mm members; including galvanized steel post anchors and sleeves. Posts will be placed a minimum of 600 mm (23.6") in firm ground and in all cases will be designed and constructed to securely hold all signs and signals upright, and resist loading due to wind, snow, temperature and other environmental factors. All sign anchors and fasteners will be of galvanized steel or anodized aluminum.

There will be special structural requirements for sign assemblies that have an exposed sign area of greater than 0.675 m² (7.27 ft²), with approval of the assembly design and construction subject to approval by the Municipal Engineer.

****END****



STANDARD CUL-DE-SAC,
 BULB TYPE
 MUNICIPAL PUBLIC ROAD

STANDARD CUL-DE-SAC,
 "P" TYPE
 MUNICIPAL PUBLIC ROAD

MUNICIPALITY OF THE DISTRICT OF LUNENBURG

Engineering Department

Municipal Public Road Design and Construction Standard

Cul-de-Sacs H-1 November 20, 2003 Dimensions in meters NTS