



**CONSTRUCTION SPECIFICATION FOR
GUIDE RAIL END TREATMENT - STEEL BEAM
ENERGY ATTENUATING TERMINAL SYSTEMS**

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559.01 SCOPE

This specification covers the requirements for the installation of steel beam energy attenuating terminal (SBEAT) systems.

559.01.01 Specification Significance and Use

This specification has been developed for use in provincial- and municipal-oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities and the Ontario Ministry of Transportation.

Use of this specification or any other specification shall be according to the Contract Documents.

559.01.02 Appendices Significance and Use

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

559.02 REFERENCES

When the Contract Documents indicate that provincial-oriented specifications are to be used and there is a provincial-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.PROV, unless use of a municipal-oriented specification is specified in the Contract Documents. When there is not a corresponding provincial-oriented specification, the references below shall be considered to be to the OPSS listed, unless use of a municipal-oriented specification is specified in the Contract Documents.

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 552 Steel Beam Guide Rail and Cable Guide Rail

Ontario Provincial Standard Specifications, Material

OPSS 1504 Steel Beam Guide Rail
OPSS 1601 Wood, Preservative Treatment, and Shop Fabrication

Ontario Ministry of Transportation Publications

Ontario Traffic Manual (OTM):
Book 6 - Warning Signs

ASTM International

A 780-01(2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings

559.04 DESIGN AND SUBMISSION REQUIREMENTS

559.04.01 Submission Requirements

Two copies of the manufacturer's installation instructions for each type of SBEAT system to be installed shall be submitted to the Contract Administrator.

Installation of the SBEAT system shall not commence until the Contract Administrator has received copies of the installation instructions.

559.05 MATERIALS

559.05.01 General

All supplied system components shall be according to the manufacturer's specifications.

559.05.02 Wooden Posts and Blocks

Wooden posts and blocks shall be according to OPSS 1601.

559.05.03 Steel Beam Guide Rails, Nuts, Bolts, and Washers

Steel beam guide rails, nuts, bolts, and washers shall be according to OPSS 1504.

559.07 CONSTRUCTION

559.07.01 General

When a SBEAT system is specified in the Contract Documents, the Contractor has the option of using one of the following systems:

- a) Extruder Terminal system
- b) Sequential Kinking Terminal system

When a specific SBEAT system is specified in the Contract Documents, there shall be no option of substitution for the SBEAT system.

SBEAT systems with steel posts shall be installed to steel beam guide rail systems with steel posts.

SBEAT systems with wooden posts shall be installed to steel beam guide rail systems with wooden or steel posts.

SBEAT systems shall be installed according to manufacturer's instructions at locations specified in the Contract Documents using only the components supplied for a particular SBEAT system unit.

A minimum 2 m wide area behind the posts, measured from the back of the posts, shall be clear of all obstacles for the entire length of the SBEAT system.

559.07.02 Posts and Steel Foundation Tubes

All posts and steel foundation tubes shall be set to the depth and alignment at the locations specified in the Contract Documents regardless of the material encountered. Permissible tolerance for plumb shall be 20 mm maximum over the post length above ground.

Wooden post tops shall be cut to the height and to the chamfer specified in the Contract Documents.

All holes shall be drilled in the wooden posts prior to installation and in the steel posts prior to galvanizing.

The predrilled holes and the cut tops of the wooden posts shall be treated with two coats of an approved wood preservative according to OPSS 1601.

All lower hinge break away posts, steel foundation tubes, and soil plates shall be installed such that no more than 100 mm is exposed above finished grade.

559.07.03 Steel Beam Guide Rails

Steel beam guide rails shall be installed according to OPSS 552.

SBEAT systems shall be connected to new or existing steel beam guide rail as specified in the Contract Documents.

SBEAT system mounting heights shall be measured vertically from the top of the steel beam guide rail to the ground or gutter line. SBEAT system mounting heights shall be within the following ranges:

- a) 685 to 760 mm during construction and seasonal shutdown.
- b) 685 to 735 mm for completion of the work.

Where curb with gutter is required, steel beam guide rail mounting height shall be measured:

- a) Vertically at face of steel beam guide rail, when face of steel beam guide rail is more than 300 mm beyond gutter line.
- b) Vertically at gutter line, when face of steel beam guide rail is 300 mm or less beyond the gutter line.

Channel shall not be used within the SBEAT system.

559.07.04 Damage to Galvanizing

Precautions shall be taken to protect galvanizing against damage. Minor abrasions (e.g., a single strip of damage area not wider than 30 mm throughout the length of the steel beam guide rail element) shall be repaired according to ASTM A 780.

The method of repair for any damage shall be approved by the Contract Administrator prior to the commencement of such work.

559.07.05 Flexible Reflective Sheeting

Flexible reflective sheeting on the terminal face shall be installed as specified in the Contract Documents.

559.07.06 Object Markers

When specified in the Contract Documents, a Wa-33 object marker according to OTM Book 6 shall be installed at each SBEAT system installation. The object marker shall be mounted on a delineator post or a flexible post as specified in the Contract Documents. The post shall be anchored according to manufacturer's recommendations and located as specified in the Contract Documents.

559.09 MEASUREMENT FOR PAYMENT

559.09.01 Actual Measurement

**559.09.01.01 Steel Beam Energy Attenuating Terminal System
Extruder Terminal System
Sequential Kinking Terminal System**

For measurement purposes, a count shall be made of each complete steel beam energy attenuating terminal system installed, regardless of the type of steel beam energy attenuating terminal system placed.

559.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the unit shown in the clause under Actual Measurement.

559.10 BASIS OF PAYMENT

**559.10.01 Steel Beam Energy Attenuating Terminal System - Item
Extruder Terminal System - Item
Sequential Kinking Terminal System - Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

Costs associated with any required repairs or removals and replacements of defective materials shall be the Contractor's responsibility at no extra cost to the Owner.

Appendix 559-A, April 2008 FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS

Note: This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

Designer Action/Considerations

The designer should specify the following in the Contract Documents:

- Steel beam energy attenuating terminal system locations. (559.07.01)
- Depth and alignment of system. (559.07.02)

The steel beam energy attenuating terminal system should be installed flared; however, the system may be installed tangent to the roadway, if grading requirements cannot be met.

The steel beam energy attenuating terminal system should not be installed on roadway with centreline curves less than 250 m radius.

Each steel beam energy attenuating terminal system unit comes from the supplier with all components required for its installation, including posts and steel beam guide rail elements for the length of the system.

Reflective sheeting is normally supplied with each steel beam energy attenuating terminal system. The designer should determine if the sheeting is not required and, if so, specify it in the Contract Documents.

The designer should determine if the following are required and, if so, specify them in the Contract Documents:

- Object markers for steel beam energy attenuating terminal systems. (559.07.06)
- Object marker post type. (559.07.06)

Wherever possible, the designer should eliminate the use of curb with gutter, in advance of and along the length of end treatments and crash cushions. See MTO Roadside Safety Manual for additional information.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

Related Ontario Provincial Standard Drawings

OPSD 912.130	Guide Rail System, Steel Beam, Steel Post With Wooden Offset Block Assembly, Installation - Single Rail
OPSD 912.140	Guide Rail System, Steel Beam, Wood Post Assembly, Installation – Single Rail
OPSD 922.180	Energy Attenuator, End Treatment, Sequential Kinking Terminal System With Wooden Posts, Installation
OPSD 922.181	Energy Attenuator, End Treatment, Sequential Kinking Terminal System With Steel Posts, Installation
OPSD 922.530	Energy Attenuator, End Treatment, Extruder Terminal System With Wooden Posts, Installation
OPSD 922.531	Energy Attenuator, End Treatment, Extruder Terminal System With Steel Posts, Installation