



CONSTRUCTION SPECIFICATION FOR TEMPORARY CONSTRUCTION BARRIERS (TCB)

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741.01 SCOPE

This specification covers the requirements for the construction of temporary construction barriers.

741.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction

OPSS 723 Energy Attenuators

Ontario Provincial Standard Specifications, Material

OPSS 1350 Concrete - Materials and Production
OPSS 1440 Steel Reinforcement for Concrete
OPSS 1504 Steel Beam Guide Rail
OPSS 1601 Wood, Preservative Treatment, and Shop Fabrication

Ontario Ministry of Transportation Publications

Ontario Traffic Manual (OTM):
Book 7 Temporary Conditions
Book 11 Pavement, Hazard and Delineation Markings

Designated Sources for Materials (DSM)

CSA Standards

A23.1-19/A23.2-19	Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete
G40.20-13/G40.21-13 W59-18	Rolled or Welded Structural Quality Steel/Structural Quality Steel Welded Steel Construction (Metal Arc Welding)

ASTM International

A123/A123M-17 D4956-17	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products Retroreflective Sheeting for Traffic Control
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Others

O. Reg. 213/91 Construction Projects under Occupational Health and Safety Act, R.S.O. 1990, c. O.1

741.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Movable Temporary Construction Barrier (MTCB) means a concrete temporary construction barrier that can be quickly shifted laterally using a barrier transfer machine.

Relocation means the movement of a temporary construction barrier or movable temporary construction barrier system from one location to another, which typically occurs when construction operations move from one stage to the next.

Shift means the lateral displacement of a movable temporary construction barrier system, which is typically completed to facilitate the opening or closing of traffic lane(s). The lateral displacement may vary throughout the length of a barrier installation.

Temporary Construction Barrier (TCB) means a concrete or steel barrier device which provides a physical limitation, through which a vehicle would not normally pass, and is intended to contain or redirect an errant vehicle of a particular size range, at a given speed and angle of impact.

741.04 DESIGN AND SUBMISSION REQUIREMENTS

741.04.01 Submission Requirements

741.04.01.01 Temporary Construction Barrier

The Contract Administrator shall be notified in writing of the selection of the types and locations of all temporary construction barrier selected, including all applicable Standard Drawings 7 Days prior to the first placement.

When a proposal is made to change the staging and barrier arrangement that will result in the width of the level area between the back of the barrier and the upper edge of an excavation to be less than 1 metre, a memorandum for each installation not meeting the 1 metre width shall be submitted to the Contract Administrator. Each memorandum shall indicate how the proposal meets Ontario Regulation 213/91, include a slope stability evaluation for each proposed barrier installation adjacent to an excavation, and be signed and sealed by an Engineer.

741.04.01.02 Steel Temporary Construction Barrier

One copy of the manufacturer's installation instructions and Working Drawings shall be submitted to the Contract Administrator prior to the installation of steel TCB.

Installation of steel TCB shall not commence until the Contract Administrator has received the copy of the instructions and Working Drawings.

741.04.02.03 Movable Temporary Construction Barrier

Working Drawings, a copy of the manufacturer's specifications, and installation instructions shall be submitted to the Contract Administrator prior to the installation of MTCB.

Installation of MTCB shall not commence until the Contract Administrator has received the copy of the installation instructions and manufacturer's specifications.

741.05 MATERIALS

741.05.01 Concrete Temporary Construction Barrier

741.05.01.01 General

Concrete for the manufacture of TCB units shall be according to OPSS 1350, except that the restrictions on volume batching shall not apply. The following specific requirements shall apply:

- a) Class of concrete: Exposure class C-1 according to CSA A23.1.
- b) Coarse aggregate: 19.0 mm nominal maximum size.

741.05.01.02 Marking

All concrete TCB units shall be permanently and legibly marked by the manufacturer as follows:

- a) Name or trademark of manufacturer on file with Owner including identification of plant if manufacturer has more than one plant and year of manufacture embossed on top of each concrete TCB at one end.
- b) Owner approved three-digit code of manufacturer and plant identification, and six-digit code for date of manufacture (Year Month Day, example January 15, 2008 is 080115) stencilled in minimum 50 mm high digits with indelible ink or paint on top of each concrete TCB at opposite end of embossed markings.
- c) Duplicate three-digit code of manufacturer and plant identification, and six-digit code for date of manufacture, stencilled in minimum 50 mm high digits with indelible ink or paint on the vertical face of one end elevation of each concrete TCB.
- d) Markings are not permitted on traffic faces of concrete TCB.

741.05.01.03 Steel Reinforcement

Steel reinforcement shall be according to OPSS 1440 and as specified in the Contract Documents.

741.05.01.04 Connection Assembly Components

Connection assembly components for non-proprietary concrete TCB systems shall be as specified in the Contract Documents. Connection assembly components for proprietary concrete TCB systems shall be according to manufacturer's specifications and as specified in the Contract Documents.

741.05.01.05 Thrie Beam Guide Rails, Bolts, and Nuts

Thrie beam guide rails shall be fabricated according to OPSS 1504 and as specified in the Contract Documents. Bolts and nuts shall be according to OPSS 1504.

741.05.01.06 Steel Plates, Bolts, and Nuts

Steel plates shall be fabricated according to CSA G40.20/G40.21 and as specified in the Contract Documents. Steel plates shall have minimum yield strength of 345 Mpa. All steel plates shall be hot dip galvanized after fabrication according to ASTM A123. Bolts and nuts shall be according to OPSS 1504.

741.05.01.07 Wooden Blocks

Wooden blocks shall be according to OPSS 1601.

741.05.02 Delineators

Delineators shall be two-sided, and each side shall have a minimum reflective surface of 100 x 100 mm; high intensity retroreflective sheeting according to ASTM D4956, Type VIII; orange colour; and flexibility to bend 90 degrees from vertical and self-restore.

741.05.03 Steel Temporary Construction Barrier

All supplied components shall conform to the manufacturer's specifications.

Table 1 lists the manufacturers and barrier systems that are acceptable for steel TCBs. The choice to supply and install any of the approved systems in Table 1 is allowed.

741.06 EQUIPMENT

741.06.01 Barrier Transfer Machine for Movable Temporary Construction Barrier

Barrier transfer machines required to shift MTCB shall be supplied from a source named on the MTO DSM.

741.07 CONSTRUCTION

741.07.01 Temporary Construction Barrier

741.07.01.01 General

Where a temporary construction barrier, restraints permitted item is used, the TCB shall meet the minimum category in Table 2.

Where a temporary construction barrier, freestanding item is used, the TCB shall meet the minimum category in Table 3.

Where a temporary construction barrier, end restraints only item is used, the TCB shall meet the minimum category in Table 4.

Where a temporary construction barrier, freestanding, narrow item is used, the TCB shall meet the minimum category in Table 5.

Where a temporary construction barrier, restrained, narrow item is used, the TCB shall meet the minimum category in Table 6.

Temporary construction barriers shall be installed at locations as specified in the Contract Documents and according to the convention defined in Table 7.

Temporary construction barrier of higher deflection categories is also acceptable for use for lower categories within the same restraint type (i.e., freestanding, restraints permitted or end restraints only). For example, deflection category II, III and IV items (if available for the restraint type) are also acceptable for use for Category I items of the same restraint type.

741.07.01.02 Type M Connection

Type M connection used for concrete TCB shall have been manufactured after October 2011, as verified by the markings.

All welds shall be according to CSA W59.

741.07.02 Movable Temporary Construction Barrier

741.07.02.01 General

The MTCB system shall be installed and relocated at the locations as specified in the Contract Documents, the Working Drawings, and according to the manufacturer's installation instructions and specifications.

The MTCB shall be installed on a paved surface having a maximum crossfall of 6% measured perpendicular to the installation and shall be in place prior to the opening of traffic operations.

Gaps between barriers shall be kept clear of debris at all times.

The MTCB system shall be removed from the Working Area when no longer required.

741.07.02.02 Shifting

The shift of MTCB, including the shift of energy attenuators, shall be at the locations as specified in the Contract Documents. The method and procedure for the shift shall be according to the manufacturer's installation instructions. The MTCB and energy attenuators shall be shifted back to the original location when required. Shifting of the MTCB and energy attenuators at the locations as specified in the Contract Documents shall be completed as many times as is necessary to complete the work requiring the shift.

741.07.03 Maximum Deflection

Table 2, Table 3, or Table 4 shall be used to determine acceptable barrier types for "restraints permitted", "freestanding", and "end restraints only" items respectively. The back face of a barrier system shall not be placed less than the minimum distance from the top of an excavation or fixed object as specified in the Contract Documents, regardless of the deflection category corresponding to the tender item.

741.07.04 Foundation Preparation

Temporary construction barrier shall be installed on a paved surface having a maximum crossfall of 6% measured perpendicular to the installation and shall be in place prior to the opening of traffic operations. 2 Days shall be allowed between the placement of final asphalt surface and placement of temporary construction barrier. Temporary construction barrier shall be in place prior to the opening of traffic operations.

Drainage shall be maintained under the temporary construction barrier.

741.07.05 Installation

Temporary construction barrier shall be installed at locations as specified in the Contract Documents.

Construction of temporary construction barrier shall be by use of precast concrete or prefabricated steel barrier units.

Temporary construction barrier shall be installed with connections properly engaged. Proprietary systems shall be installed according to the manufacturer's installation instructions.

741.07.06 Anchorages

Steel TCB shall be installed and anchored according to the manufacturer's installation instructions for the specified configuration.

741.07.07 Transitions

741.07.07.01 Concrete Temporary Construction Barrier

Transition from one type of concrete TCB to another type of concrete TCB is permitted by using the concrete TCB transition detail as specified in the Contract Documents.

The proportion of each type of approved concrete TCB used for the Work shall be at the Contractor's discretion. However, a minimum continuous length of 100 m of any one type of concrete TCB is required prior to transitioning to another type.

Transitions between unrestrained concrete TCB and permanent concrete barrier shall be as specified in the Contract Documents.

Transitions between reduced deflection concrete TCBs and unrestrained concrete TCBs shall be as specified in the Contract Documents.

741.07.07.02 Steel Temporary Construction Barrier

Transitions between two different steel TCB systems or between steel and concrete TCB shall not be permitted.

Transitions between permanent concrete barrier and steel TCB shall not be permitted.

Transitions between steel beam guiderail and steel TCB shall not be permitted.

741.07.08 End Treatment

741.07.08.01 Steel Temporary Construction Barrier

One end or both ends, as specified in the Contract Documents, of the steel TCB installation shall be protected with an energy attenuator according to the manufacturer's specifications according to OPSS 723.

741.07.08.02 Movable Temporary Construction Barrier

One end or both ends, as specified in the Contract Documents, of the MTCB installation shall be protected with an energy attenuator according to the manufacturer's specifications and according to OPSS 723.

741.07.09 Drainage Gaps for Concrete Temporary Construction Barrier

Gaps for drainage for concrete TCB shall be installed as identified in the field to accommodate surface runoff using the three beam transition as specified in the Contract Documents.

741.07.10 Tolerances

The horizontal and vertical alignment at the junction of each barrier section shall be within 15 mm. The minimum radius on which the barrier may be placed shall be according to the manufacturer's requirements for each type of connection.

741.07.11 Construction Markers

Construction markers shall be placed in advance of the temporary construction barrier installation to assist in directing the traffic away from the flared approach end treatment. Taper length for full lane closures and the maximum distance between markers shall be according to OTM Book 7.

741.07.12 Quality Control for Temporary Construction Barrier

741.07.12.01 General

Temporary construction barrier units shall be certified that it meets the acceptance criteria. A completed MTO Form PH-CC-876 shall be submitted to the Contract Administrator within 24 hours of installation or relocation of the units. An inspection of temporary construction barrier units shall be performed pre- and post-installation. Certification shall be done by an authorized representative of the Contractor.

When the installed or relocated temporary construction barrier units do not meet the acceptance criteria, they shall be removed and replaced within 48 hours with units that meet the acceptance criteria.

Units damaged while in service as part of the Work or the alignment discontinuity is beyond that allowable by the acceptance criteria shall be replaced or reinstalled as necessary. The repair shall be performed within a 48-hour period starting at the occurrence or first awareness of the damage.

741.07.12.02 Concrete Temporary Construction Barrier

Repaired precast concrete TCB units may be used provided that the structural integrity of the unit is maintained. An Engineer's seal and signature shall be affixed to documentation certifying that the repair method used shall not impact the structural integrity of the unit.

741.07.12.03 Movable Temporary Construction Barrier

Certification is not required after shifting of MTCB.

741.07.13 Acceptance Criteria for Temporary Construction Barrier

741.07.13.01 Concrete Temporary Construction Barrier

For all applications, any concrete TCB unit that fails one or more of the following acceptance criteria shall be rejected:

- a) Dimensions of each unit shall not deviate from those specified by more than the following tolerance:
 - i. Specified dimensions up to 300 mm \pm 5 mm
 - ii. Specified dimensions greater than 300 mm \pm 10 mm
- b) Steel elements of each connecting device shall be free of visible fracture, distortion, and perforation.
- c) Concrete within 200 mm of a connecting device shall be free of visible cracks that are greater than 0.3 mm in width, measured at the widest point of the crack.
- d) All cracks greater than 0.3 mm in width, other than addressed in c), shall neither extend through the precast unit nor be greater than 300 mm in length.
- e) The unit shall be free of honeycombing.
- f) The end of any unit shall not be located greater than 50 mm from the horizontal alignment of the installation.

In addition to the above criteria, when the precast units are used on facilities with a posted regulatory speed limit of 80 km/h or higher, any unit that fails one or more of the following acceptance criteria shall be rejected:

- a) Damage to edges shall not extend greater than 100 mm onto any adjacent face. When edge damage extends greater than 50 mm onto such a face, damage to the opposite side of that edge shall not extend greater than 50 mm onto the opposite face.

- b) The total length of concrete breakout damage to edges flanking the connecting devices, whether repaired or not, shall not exceed 25% of the respective connecting device length on each side of each connecting device.
- c) The concrete damage in the area of the drainage recess shall not reach higher than one third of the lower sloped surface containing the recess.
- d) Concrete breakouts on the traffic faces or on the top of the precast unit other than addressed in a) to c) above shall not be greater than 150 mm in any direction measured on the surface, nor shall the breakout depth at any point be greater than 25 mm measured perpendicularly to the face.
- e) Accumulated total concrete breakouts addressed in d) on the traffic sides of the unit shall not exceed 10% of the total surface area of the respective side.
- f) Drilled holes into the barrier shall not have diameter greater than 40 mm.
- g) The horizontal and vertical alignment discontinuity between adjacent units shall not be greater than 20 mm, as measured with a 1 m straightedge.

741.07.13.02 Steel Temporary Construction Barrier

Any steel TCB unit that fails one or more of the following acceptance criteria shall be rejected:

- a) Dimensions of each unit shall not deviate from those specified by more than the following tolerances:
 - i. For specified dimensions up to 300 mm, the tolerance shall be ± 5 mm.
 - ii. For specified dimensions greater than 300 mm, the tolerance shall be ± 10 mm.
- b) Connecting devices shall be free of visible fracture, distortion, or perforation.
- c) Surface impact deformations shall not exceed 25% of the barrier faces. Surface deformations shall not be greater than 25 mm in depth as measured perpendicularly to the face.
- d) All steel surfaces shall be free of visible gaps.
- e) All welds shall be in visibly cracks or rips.
- f) All steel surfaces shall be free of rust.

741.07.13.03 Movable Temporary Construction Barrier

Any MTCB unit that fails one or more of the following acceptance criteria shall be rejected:

- a) Dimensions of each unit shall not deviate from those specified by more than the following tolerances:
 - i. For specified dimensions up to 300 mm, the tolerance shall be ± 5 mm.
 - ii. For specified dimensions greater than 300 mm, the tolerance shall be ± 10 mm.
- b) Steel elements of each connecting device shall be free of visible fracture, distortion, and perforation.
- c) Top or head of each unit shall not expose mesh or rebar nor have damage greater than 75 mm deep.
- d) Bottom or foot of each unit shall not have:
 - i. Damage greater than 250 mm long measured parallel to roadway.
 - ii. Damage greater than 75 mm wide measured perpendicular to roadway.
 - iii. Damage greater than 150 mm high.

- e) All cracks greater than 0.3 mm in width shall neither extend through the unit nor be greater than 300 mm in length.
- f) The unit shall be free of honeycombing.

741.07.14 Restoration of Asphalt and Concrete Surfaces

Restoration of asphalt and concrete surfaces disturbed during the installation and removal of restrained temporary construction barrier shall be as specified in the Contract Documents.

741.07.15 Delineators

Delineators according to OTM Book 11 shall be installed at 4 m intervals on concrete TCBs and at the barrier unit connections on steel TCBs.

Delineators shall be securely fastened to the top of the temporary construction barrier with reflective surfaces clearly visible.

Delineators shall be maintained at all times.

741.07.16 Management of Excess Material

Management of excess material shall be as specified in the Contract Documents.

741.08 QUALITY ASSURANCE

The Owner may conduct random quality assurance checks on units that have been supplied and installed or relocated to verify the Contractor's ability to ensure compliance with the acceptance criteria. Units that are identified by the Owner's representative as not meeting the acceptance criteria or those units that have been repaired and do not have documentation certifying the method of repair must be removed and replaced with units that meet the acceptance criteria for temporary construction barrier. This shall be done within a 48-hour period of notice to the Contractor, unless agreed otherwise in writing.

741.10 MEASUREMENT FOR PAYMENT

741.09.01 Actual Measurement

- 741.09.01.01 TCB, Restraints Permitted, Category I, II, III or IV**
- TCB, Freestanding, Category I, II, III or IV**
- TCB, Freestanding, Narrow, Category I**
- TCB, Restrained, Narrow, Category IV**
- TCB, End Restraints Only, Category I**
- Movable TCB**

Measurement of barriers shall be by length in metres along the centreline of the barrier, from end to end, including temporary end sections installed and removed, up to the maximum length of barriers required to be placed at any one time during the Contract.

741.09.01.02 TCB, Relocation
Movable TCB, Relocation

Measurement of barriers shall be by length in metres along the centreline of the barrier, from end to end, including temporary end sections relocated.

Barriers that are temporarily surplus to a Contract or a stage within a Contract, including for seasonal shutdown requirements, which are required for future stages shall be paid for as one relocation for the combined moves into and out of storage, including any off-site storage required due to on-site restrictions.

741.09.02 Plan Quantity Measurement

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

741.10 BASIS OF PAYMENT

- 741.10.01 TCB, Restraints Permitted, Category I, II, III, or IV - Item**
- TCB, Freestanding, Category I, II, III, or IV - Item**
- TCB, Freestanding, Narrow, Category I - Item**
- TCB, Restrained, Narrow, Category IV - Item**
- TCB, End Restraints Only, Category I - Item**
- TCB, Relocation - Item**
- Movable TCB - Item**
- Movable TCB, Relocation - 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.

741.10.02 Movable TCB, Shift - 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.

Payment shall be prorated over the time requiring shifting of movable temporary construction barrier.

**TABLE 1
Acceptable Steel TCB Systems**

Manufacturer	System
Laura Metaal	BarrierGuard 800
Hill and Smith Inc	Zoneguard
Laura Metaal	Safezone
Safe Barriers	Defender Barrier
Saferoads	HV2
Highway Care	HighwayGuard

**TABLE 2
Deflection Categories for TCB, Restraints Permitted (Note 1)**

Type	System	Hard Surface, Unrestrained	HMA, Restrained	Concrete, Restrained	Bolted to Bridge Deck	Gravel, Restrained
Concrete TCB	Type J (4 m or 6 m), Non-Restrainable	I	-	-	-	-
	Type J (4 m and 6 m), Restrainable	I	IV	IV	-	-
	Type M	I	-	-	-	-
	Type QMB	I	-	-	-	-
	Type T (4 m and 6 m)	II	-	-	-	-
	Type X (9.0, 6.0, or 3.0 m), Non-Restrainable	III (Note 2)	-	-	-	-
	Type X (4 m), Restrainable	III	IV	IV	-	-
	Type Z, Non-Restrainable	III	-	-	-	-
	Type Z, Restrainable	III	IV	IV	-	-
	Type FLUX	I	-	-	-	-
Steel TCB	BarrierGuard 800	I (Note 3)	-	-	-	-
	BarrierGuard 800 LDS	-	III	III	III	-
	BarrierGuard 800 MDS	-	IV	IV	IV	-
	Defender LDS	-	III	III	IV	I
	HV2	I	-	-	-	-
	SafeZone	I (Note 3)	-	-	-	-
	SafeZone LDS	-	III	III	III	-
	ZoneGuard	I (Note 3)	-	-	-	-
	ZoneGuard MDS	-	IV	IV	IV	-
	HighwayGuard	-	I	I	-	I
	HighwayGuard LDS	-	III	III	-	-
	HighwayGuard MDS	-	IV	IV	-	-

Notes:

1. The Roman numerals I, II, III and IV in the table indicate that a barrier is acceptable for use when the TCB item of the corresponding deflection category is specified.
2. Concrete TCB, Type X, is acceptable for deflection category IV when used adjacent to a single reversible lane, controlled by traffic signals resting in red phase and with a posted regulatory speed of less than 70 km/h.
3. Barrier system requires anchoring at end of run according to the Contract Documents.

TABLE 3
Deflection Categories for TCB, Freestanding (Note 1)

Type	System	Hard Surface, Unrestrained
Concrete TCB	Type J (4 m and 6 m), Non-Restrainable	I
	Type J (4 m and 6 m), Restrainable	I
	Type M	I
	Type QMB	I
	Type T	II
	Type X (9.0, 6.0, or 3.0 m), Non-Restrainable	III (Note 2)
	Type X (4 m), Restrainable	III (Note 2)
	Type Z, Non-Restrainable	III
	Type Z, Restrainable	III
	Type FLUX	I
Steel TCB	HV2	I

Notes:

1. The Roman numerals I, II and III in the table indicate that a barrier is acceptable for use when the TCB, Freestanding item of the corresponding deflection category is specified.
2. Type X TCB is acceptable for deflection category IV when used adjacent to a single reversible lane, controlled by traffic signals resting in red phase and with a posted regulatory speed of less than 70 km/h.

TABLE 4
Deflection Categories for TCB, End Restraints Only (Note 1)

Type	System	Hard Surface, Unrestrained
Concrete TCB	Type J (4 m and 6 m), Non-Restrainable	I
	Type J (4 m and 6 m), Restrainable	I
	Type M	I
	Type QMB	I
	Type T (4 m and 6 m)	I
	Type X (9.0, 6.0, or 3.0 m), Non-Restrainable	I
	Type X (4 m), Restrainable	I
	Type Z, Non-Restrainable	I
	Type Z, Restrainable	I
	Type FLUX	I
Steel TCB	BarrierGuard 800	I (Note 2)
	HV2	I
	SafeZone	I (Note 2)
	ZoneGuard	I (Note 2)

Notes:

1. The Roman numeral I in the table indicates that a barrier is acceptable for use when the Temporary Construction Barrier, End Restraints Only item of the corresponding deflection category is specified.
2. Barrier system requires anchoring at end of run according to the Contract Documents.

TABLE 5
Deflection Categories for TCB, Freestanding, Narrow

Type	System	Hard Surface, Unrestrained
Concrete TCB	Type Z, Non-Restrainable	III
	Type Z, Restrainable	III

TABLE 6
Deflection Categories for TCB, Restrained, Narrow

Type	System	Hard Surface, Unrestrained
Concrete TCB	Type Z, Restrainable	IV

TABLE 7
Contract Drawing Notation - Temporary Construction Barrier

A	TCB - Temporary Construction Barrier REL - TCB Relocation
B	FS - Freestanding FN - Freestanding, Narrow RP - Restraints Permitted ER - End Restraints Only MO - Movable
C	1 - Category I 2 - Category II 3 - Category III 4 - Category IV
Note: 1. Temporary Construction Barrier is noted on the Contract Drawings by AAA-BB-C (e.g., REL-FS-2).	