

B741 - TEMPORARY CONSTRUCTION BARRIERS (TCB) - OPSS 741

741.1 GENERAL

Temporary construction barrier (TCB) is a portable barrier system consisting of precast concrete or prefabricated steel segments that are positively connected together to form a continuous barrier system.

TCBs are often used to provide separation between traffic and work zones, to protect the travelling public from excavations adjacent to the roadway or at the edge of bridge decks after barrier wall removal on structure rehabilitation projects.

Policies and descriptions for the various types of systems that are accepted for use and specified on provincial highway projects are provided in the Roadside Design Manual (RDM).

741.2 REFERENCES

- OPSS 741 - Construction Requirements for Temporary Construction Barriers
- Roadside Design Manual (RDM)

741.3 TENDER ITEMS

Item Code	Title	Col Type	U.O.M.	PQP
0741-0011	TCB, Restraints Permitted, Category I	Normal	m	Y
0741-0012	TCB, Restraints Permitted, Category II	Normal	m	Y
0741-0013	TCB, Restraints Permitted, Category III	Normal	m	Y
0741-0014	TCB, Restraints Permitted, Category IV	Normal	m	Y
0741-0021	TCB, Freestanding, Category I	Normal	m	Y
0741-0022	TCB, Freestanding, Category II	Normal	m	Y
0741-0023	TCB, Freestanding, Category III	Normal	m	Y
0741-0024	TCB, Freestanding, Category IV	Normal	m	Y
0741-0031	TCB, Freestanding, Narrow, Category I	Normal	m	Y
0741-0032	TCB, Restrained, Narrow, Category IV	Normal	m	Y
0741-0041	TCB, End Restraints Only, Category I	Normal	m	Y
0741-0060	TCB, Relocation	Normal	m	Y
0741-0101	Movable TCB	Normal	m	Y
0741-0111	Movable TCB, Relocation	Normal	m	Y
0741-0121	Movable TCB, Shift	Normal	Lump Sum	N

741.4 SPECIFICATIONS

The requirements for the work are contained in OPSS 741.

741.5 SPECIAL PROVISIONS

The designer shall refer to the Standard Special Provisions (SSP) Manual to review additional special provisions that may be applicable to the work.

Non-standard special provisions are required to specify and provide payment for:

- a) TCB that is to remain on a project upon its completion;
- b) The identification of specific temporary storage sites for TCB that cannot be accommodated within the project limits during staging or seasonal shutdown on carryover projects; and
- c) Restoration of asphalt and concrete surfaces that are disturbed during the installation and removal of concrete temporary construction barrier restraint systems and steel temporary construction barrier anchorages.

741.6 STANDARD DRAWINGS

Applicable standard drawings are contained in the 900 series of the Ontario Provincial Standards Drawings (OPSD) and 900 series of the Ministry of Transportation Ontario Drawings (MTOD).

741.7 DESIGN

741.7.1 General

TCB systems are typically designed and crash tested for placement on paved surfaces. Paved surfaces should extend at least one metre beyond the back of unrestrained concrete TCB and all steel TCB systems.

Temporary Construction Barrier Dynamic Deflections

All temporary construction barrier configurations used on the provincial highway network have been successfully crash tested to NCHRP Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH). Measured outcomes from crash testing are the dynamic deflection and working width, as described in the Roadside Design Manual. Detailed information on working width and dynamic deflection, including definitions, can be found in the Roadside Design Manual.

Test Level 3 (TL-3) systems are typically used in construction zones.

A temporary construction barrier system should have a dynamic deflection of less than the distance from the back of the barrier to the edge of the work zone, including all fixed objects.

For constrained areas, one way to reduce the dynamic deflection is to restrain barrier systems by anchoring them to the pavement structure. Temporary construction barriers of varying rigidity and various restraint systems are available which provide reduced deflection values and are detailed in the appropriate standard drawings. The use of higher performing barrier categories may be considered where workers are expected to be working close to the back of a barrier for extended periods of time.

In locations where composite pavements are present, restraint systems for asphalt pavement should be considered where 1m from the back of the TCB cannot be maintained. This may require extensive drilling of holes in concrete which can increase labour costs considerably.

Temporary Construction Barrier Transitions

When used as a temporary construction barrier, unrestrained concrete TCB should be transitioned to restrained concrete TCB as shown on the applicable OPSD. Similarly, unrestrained concrete TCB should be transitioned to permanent concrete barrier as shown on the applicable OPSD. Transitions between concrete TCB and steel TCB or between different types of steel TCB, are currently not permitted.

Where transitions between Category IV and other categories of barrier are required, the designer should consult with the Highway Design Office.

741.7.2 Temporary Construction Barrier

The "Temporary Construction Barrier" tender items typically include the following work:

- a) Supplying and transporting the barriers to the site;
- b) The initial installation and including any additional barriers required for subsequent staging;
- c) The installation of all necessary restraint systems, and;
- d) Removal of barriers after construction has been completed.

Temporary construction barrier systems shall be specified in the quantity sheets based on the maximum allowable dynamic deflection. Deflection categories shall be specified based on the following ranges of available dynamic deflection:

Deflection Category	Available Dynamic Deflection Range
Category I	≥ 1500 mm
Category II	1000 mm - 1499 mm
Category III	500 mm - 999 mm
Category IV	< 500 mm

Temporary construction barrier of higher categories is also acceptable for lower categories. For example, deflection category II, III and IV items are also acceptable for deflection category I items of the same restraint type.

In constrained areas where it is necessary to reduce the width of the level area behind the TCB to the upper edge of each wall of an excavation or temporary protection (support) system to less than one metre, an Engineer shall design and provide documentation according to the policies in the Roadside Design Manual, for use during construction according to Ontario Regulation 213/91.

At locations where the use of restraints (pins or other anchors to be drilled into pavement or bolted through a bridge deck) is not permitted, a Temporary Construction Barrier, Freestanding, Category I, II, III or IV item should be used. This may apply where barriers are to be placed on a bridge deck or due to pavement structure type or condition.

The use of temporary construction barrier systems that require pins or other anchors is not permitted on post-tensioned bridge structures

The "Temporary Construction Barrier, Freestanding, Category IV" item should only be selected at locations with a single reversible lane, controlled by temporary traffic signals resting in red phase with a posted regulatory speed limit of less than 70 km/h and where a minimum of 400 mm of a level paved surface will be available between the back (non-traffic) side of the barrier and any fixed objects, or top of an excavation or bridge deck edge.

Additionally, there are selected Category I steel TCBs that require restraints at end units only. If this situation is permissible, (such as on a bridge deck where the barrier will be terminated beyond the deck ends) and a Category I barrier is required, the "Temporary Construction Barrier, End Restraints Only, Category I" item should be used.

In constrained sites, it may be advantageous to use a barrier with a narrower cross-section. The "Temporary Construction Barrier, Freestanding, Narrow" item allows for the use of a barrier system which is 300 mm wide, compared to approximately 600 mm for a typical concrete or steel TCB. This item may be used, provided a space of at least 1.2 metres can be provided between the back of the barrier and the obstacle or excavation edge. Similarly, the "Temporary Construction Barrier, Restrained, Narrow" item allows for the use of the same 300mm wide barrier anchored to asphalt or concrete pavement and can be used with a minimum offset of 300mm from the back of barrier to an obstacle or excavation edge.

741.7.3 Temporary Construction Barrier, Relocation

The "Temporary Construction Barrier, Relocation" tender item typically includes the following work:

- a) Relocating the barriers within the work area as required for staging or seasonal shutdown for carryover projects; and
- b) The temporary storage of barriers at the site or other designated locations as necessitated by staging or seasonal shutdown for carryover projects.

741.7.4 Movable Temporary Construction Barrier

Movable temporary construction barrier (MTCB) is a temporary construction barrier that can be quickly shifted laterally using a barrier transfer machine.

~~Quickchange® moveable barrier (QMB) is a proprietary system by Barrier Systems Inc. that consists of freestanding precast concrete segments that are positively connected to form a continuous barrier that can be frequently shifted laterally with a QMB barrier transfer machine. QMB has been successfully crash tested to NCHRP Report 350 TL-3.~~

~~FLUX barrier is proprietary by Northern Infrastructure Products that consist of freestanding precast concrete segments positively connected to form a continuous barrier system. The system can be shifted laterally with a FLUX barrier transfer equipment. FLUX barrier was successfully crash tested to MASH 2016 TL-3.~~

QMB and FLUX, Tall42 and Concrete Reactive Tension System barriers are approved for use as concrete MTCB. These systems can also be used as a conventional concrete TCB system that are not shifted back and forth if the contractor desires.

Construction activities, particularly those on high-volume freeways, may have work that requires temporary construction barrier and requires intermittent lane closures, generally overnight and on weekends. In this case it may be more cost effective to use a MTCB that can be shifted back and forth using a specialized transfer machine, instead of using conventional TCB and TCB, relocation items.

When MTCB is identified as the desired option, the “Movable Temporary Construction Barrier” and “Movable Temporary Construction Barrier, Shift” items shall be used.

The “Movable Temporary Construction Barrier” tender item typically includes the following work:

- a) Supplying and transporting the barriers to the site;
- b) The initial installation and including any additional barriers required for subsequent staging; and
- c) Removal of barriers after construction has been completed.

The “Movable Temporary Construction Barrier, Relocation” tender item typically includes the following work:

- a) Relocating the barriers from one location to another within the work area as required for staging, which typically occurs when construction operations move from one stage to the next, or seasonal shutdown for carryover projects; and
- b) The temporary storage of barriers at the site or other designated locations as necessitated by staging or seasonal shutdown for carryover projects.

The “Movable Temporary Construction Barrier, Shift” tender item typically includes the following work:

- a) The lateral displacement of the barriers and energy attenuators, 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.

741.8 COMPUTATION

741.8.1 Sources of Information

The main sources of information for the computation of these items are the contract plans.

741.8.2 Method of Calculation

- a) Temporary Construction Barrier, Restraints Permitted, Category I, II, III, or IV
- Temporary Construction Barrier, Freestanding, Category I, II, III, or IV
- Temporary Construction Barrier, Narrow, Category I
- Temporary Construction Barrier, Restrained, Narrow, Category IV
- Temporary Construction Barrier, End Restraints Only, Category I
- Movable Temporary Construction Barrier

These are Plan Quantity Payment (PQP) items. The unit of measurement for these items is the length in metres. The quantity is calculated by scaling the applicable lengths from the plans. The length of each segment is measured from end to end, along the centreline of each installation.

These items pay for the supply of the precast or prefabricated units. The total quantity cannot exceed the largest number of units in place at any one time during the contract.

b) Temporary Construction Barrier, Relocation
Movable Temporary Construction Barrier, Relocation

These are Plan Quantity Payment (PQP) items. The unit of measurement for these items is the length in metres. The quantity is calculated by scaling the applicable lengths from the plans. The length of each segment is measured from end to end, along the centreline of each relocation. These items are comprised of all relocations during the contract.

c) Movable Temporary Construction Barrier, Shift

This is a Lump Sum item. The number of shifts required for construction is determined by the contractor and paid as lump sum.

741.9 DOCUMENTATION

741.9.1 Drawings

Show the location of each Temporary Construction Barrier system installation and relocation on the contract drawings with the appropriate notation (from Table 7 in OPSS 741) shown adjacent to the symbol. Detail the station and offset for the start and end of each change in direction and/or offset of TCB.

741.9.2 Quantity Sheets

The ministry's Contract Preparation System (CPS) is used for the preparation of Quantity Sheets. These items are documented on the "Quantities - Miscellaneous 1" sheet in CPS. The individual quantity entries for each item are totalled by CPS and the applicable Tender Totals are automatically transferred to the Form of Tender.

A separate line entry is required for each segment of temporary construction barrier. For each segment, the station to station limits, the location left or right of the roadway centreline, are entered in the Location and Position column, and the applicable quantity in metres is entered in the appropriate column for the item.

Although the Movable Temporary Construction Barrier, Shift item is paid as lump sum, the station locations, and offsets (if required), are to be shown on the Q-sheets.

For contracts that include multiple construction stages, the quantities shall be broken down by each individual stage.

741.9.3 Documentation Accuracy

Stations and quantities are recorded to the nearest whole metre. When required, offsets are recorded to 0.1 m accuracy.