Construction Specification for Concrete Sidewalk and Concrete Raised Median

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TS 3.70.01 SCOPE

This specification covers the requirements for the construction of plain or reinforced concrete sidewalks and concrete raised medians.

TS 3.70.02 REFERENCES

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

City of Toronto Standard Specifications

TS 310	Construction Specification for Hot Mixed, Hot Laid, Asphaltic Concrete Paving
TS 3.50	Construction Specification for Concrete Curb and Concrete Curb and Gutter
TS 3.80	Construction Specification for Concrete Unit Pavers
TS 4.50	Construction Specification for Utility Adjustments
TS 501	Amendment to OPSS.MUNI 501 – Construction Specification for Compacting
TS 1010	Amendment to OPSS.MUNI 1010 – Material Specification for Aggregates – Base, Subbase, Select Subgrade and Backfill Material
TS 1350	Amendments to OPSS.MUNI 1350 – Material Specification for Concrete – Material and Production

City of Toronto Standard Drawings

T-310.010-1	Location and Detail of Joints for Sidewalk
T-310.010-5	Joints at Sidewalk Openings
T-310.010-6	Construction Stamp Location for New Sidewalk Installation
T-310.010-7	Detail of Sidewalk Stamp
T-310.030-7	Signalized Intersection Configurations of Pedestrian Crossings
T-310.030-8	Controlled Non Signalized Intersection Configuration of Pedestrian Crossings
T-310.030-9	Location of Dropped Curbs at Controlled Intersections
T-310.030-10	Tactile Walking Surface Indicator and Curb Ramp Detail
T-310.030-11	Tactile Walking Surface Indicator and Depressed Curb Detail

Ontario Provincial Standard Specifications

OPSS 180	General Specification for the Management of Excess Materials
OPSS 919	Construction Specification for Formwork and Falsework

Canadian Standards Association

A 23.1	Concrete Materials and Methods of Concrete Construction
B 651-12	Accessible Design for the Built Environment

American Society of Testing and Materials

A 48	Standard Specification for Grey Iron Castings
C 174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
C 501-84	Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser

Ontario Provincial Legislation

O. Reg. 191/11 Integrated Accessibility Standard, 2005

TS 3.70.03 DEFINITIONS

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

Base Course means a layer of specified or selected materials of planned thickness constructed on the subgrade for drainage and to distribute pavement loads.

Contraction Joint means a cut or formed joint to regulate the location and degree of cracking in the plane of the pavement.

Expansion Joint means a physical separation between the concrete and appurtenances, or between arts of the concrete crosswalk, which allows both horizontal and vertical movement.

Slipform means the placing, consolidating and extruding of plastic concrete in a machine without the use of fixed side forms.

Subgrade means the soil prepared and compacted to support a structure or pavement.

TS 3.70.04 DESIGN AND SUBMISSION REQUIREMENTS

TS 3.70.04.01 General

Any required submissions shall be in writing. All submissions shall be submitted to the City at least three weeks prior to the beginning of the work.

The requirements for submissions and design requirements are given in TS 1350.

TS 3.70.04.02 Materials

Prior to starting the work, the Contractor shall supply the Contract Administrator with material safety data sheets (MSDS) for all the materials to be incorporated in the work.

The Contractor shall be responsible for selecting the concrete materials and for the mix design for the concrete. The concrete mix proportions shall be according to CSA A23.1 and this specification.

The certificate of ready mix facilities and/or the certificate of mobile mix concrete production facilities along with the City of Toronto Form A or B (concrete mix details) shall be submitted as required by TS 1350.

Details of the method of curing and curing materials (including manufacturers' literature, where applicable) shall be submitted to the Contract Administrator.

One copy of the concrete delivery ticket shall be submitted to the Contract Administrator for each load of concrete delivered.

TS 3.70.04.03 Contract Drawings Provided

The Contractor shall provide shop drawings and installation layout details (radius and tangent plate layout) for each radius. The Contractor shall not order any material until shop drawings have been approved. The City is not responsible for restocking or return charges or both for material ordered prior to the approval of the shop drawings.

All costs associated with this Work shall be incidental to all related items of Work. No separate payment shall be made.

TS 3.70.04.04 Contract Drawings Not Provided

The corner radius at the intersections varies from location to location. The City shall neither provide corner locations in advance nor will it supply any radius measurements to the Contractor. It shall be the sole responsibility of the Contractor to conduct survey and make assessment to retrofit corners with appropriate rectangular or radial tactile walking surface indicator plates or both. The Contractor shall provide shop drawings and installation layout details (radius and tangent plate layout) for each radius.

The City is not responsible for restocking or return charges or both for materials.

All costs associated with this Work shall be incidental to all related items of Work. No separate payment shall be made.

TS 3.70.05 MATERIALS

TS 3.70.05.01 Concrete

The materials for and the production of concrete crosswalks shall meet the requirements of TS 1350 and the following:

1)	Cement type	Normal Portland GU Portland limestone GUL
2)	Minimum 28 day compressive strength	32 MPa
3)	Class of exposure	C-2
4)	Maximum nominal size of coarse aggregate	19 mm
5)	Slump at point of discharge	80 ± 30 mm
6)	Air content	6.5 ± 1.5%
7)	Maximum water/cementing materials ratio	0.45

TS 3.70.05.02 Granular Base and Backfill

Granular base and backfill, if required, shall be Granular A and shall be according to TS 1010.

TS 3.70.05.03 Welded Steel Wire Fabric

Welded steel wire fabric shall be according to TS 1350.

All welded steel wire fabric detailed on the Contract Plans or ordered by the City for incorporation in the concrete sidewalk or raised median shall be 152 x 152 - MW 13.3 x MW 13.3 welded steel wire fabric at 1.46 kilograms per square metres.

TS 3.70.05.04 Expansion Joint Material

Expansion joint material shall be bituminous fibreboard having a thickness of 12 mm and shall be according to TS 1350.

TS 3.70.05.05 Tactile Walking Surface Indicators

Tactile walking surface indicators shall be according to drawing T-310.030-10 and T-310.030-11 and made of cast iron according to CSA B651, follow Ontario Regulation 191/11 and meet the following requirements:

Table 1: Tactile walking surface indicators

Standard	Property	Minimum Result
ASTM A 48	tensile strength	class 30 B
ASTM C 1028	slip resistance	dry 0.8 min, wet 0.65 min
ASTM C 501-84	wear resistance	wear index: > 15

The truncated domes shall be of uniform size and shape. Units shall be uniform in texture, be free from pouring faults, sponginess, cracks, blowholes, and other defects, and have clean-cut and well-defined edges. All surfaces shall be bare, without any coating, and be uniform and free of flaking rust or mounts of rust or debris. Tactile walking surface indicators shall have ribs cast to the underside of the unit, have vent holes, and have a minimum plate thickness of 5 mm.

TS 3.70.06 EQUIPMENT

TS 3.70.06.01 Forms

Forms shall be steel, wood or metal plate forms and shall be according to OPSS 919. They shall be of sufficient cross section and strength, and so secured as to resist the pressure of the concrete when placed, and the impact and vibration of any construction equipment they support, without springing or settlement.

Forms shall be pinned or staked in place with not less than three pins for each 3 m length, and with a pin at each side of each form butt joint. The top surface of the formwork shall comply with the specified tolerances. The inside face of the form shall be vertical. The form shall deviate from grade by no more than 3 mm in 3 m, and in alignment by no more than 6 mm in 3 m.

Forms shall be cleaned and coated with form oil before each use.

TS 3.70.06.02 Slipforming Equipment

The equipment shall be designed for slipforming concrete sidewalks and shall have automatic horizontal and vertical controls to be used in conjunction with at least one stringline.

TS 3.70.06.03 Finishing Tools

An aluminum or magnesium float shall be used to float the concrete crosswalk and a small edger shall be used to tool the edges.

TS 3.70.07 CONSTRUCTION

Prior to starting the work, the Contractor shall submit the verification that either the foreman/lead hand or the supervisor of the placing crew has ACI Flatwork Certification.

TS 3.70.07.01 Excavation

TS 3.70.07.01.01 *General*

Excavated material shall be removed from the site and disposed of according to OPSS 180, at the Contractor's expense.

TS 3.70.07.01.02 *Sidewalk*

The excavation for the sidewalk shall be to the lines and grades specified by the Contract Administrator. Care shall be taken to prevent damage to utilities, window openings, areaways, and other appurtenances such as hydrants, water services, poles and gas valves which may be in or under the proposed sidewalk.

The Contractor shall make good all damage caused during the course of the work and return the work to its initial condition at no extra cost to the City.

TS 3.70.07.01.03 *Concrete Raised Median*

Where a raised median is to be placed on an existing pavement, the existing asphalt shall be removed down to the concrete base in the case of a composite pavement, or in the case of a flexible pavement, the asphalt shall be removed to a minimum depth of 75 mm. The existing asphalt shall be removed to form a straight vertical face by saw cutting to the required depth and to a sufficient offset to accommodate framework, but shall not exceed 150 mm from the face of the curb, gutter or median. The asphalt shall be completely removed to the required depth and all loose material swept from the area over which the raised median is to be constructed.

Where a raised median is to be placed, other than as described above, the requirements of the specifications for the individual components shall be used. The individual specifications shall include TS 3.50 and TS 3.80 for concrete curb and concrete curb and gutter, and interlocking pavers..

TS 3.70.07.02 Subgrade

The subgrade shall be compacted to a minimum of 95% of maximum dry density according to TS 501.

TS 3.70.07.03 Granular Base

The granular base shall be placed to the required lines and grades. The compacted depth of granular base shall be 150 mm or as specified in the Contract Documents. The moisture content and compaction of the granular base shall be uniform and shall be according to TS 1010.

The granular base shall be moistened prior to the placement of concrete, but without any standing water. At the time of placing concrete, the base shall not be wet, soft or frozen.

In areas of underground utilities, polyethylene film (100 μm thick) shall be placed on the base.

TS 3.70.07.04 Form Placement

Forms shall be set true to the lines and grades as specified in the Contract Documents and in direct contact with the base.

The crossfall of the sidewalk or raised median shall be at a slope of 2 per cent toward the gutter. When the optimum slope cannot be achieved, the Contract Administrator may instruct the Contractor to adjust the slope to a maximum of 4 per cent.

TS 3.70.07.05 Utility Adjustment

All utility adjustments shall be according to TS 4.50, except that no boxouts will be required. The top portion of the frame shall be encased with 12 mm expansion joint material, placed flush with the surface of the concrete and the frame and cover. The fibre shall be vertical and straight in alignment.

TS 3.70.07.06 Utility Isolation

Utility isolations shall be constructed in the concrete sidewalk as shown on drawing T-310.010-5 at the locations as specified in the Contract Documents.

TS 3.70.07.07 Reinforcement

Welded steel wire fabric reinforcement or hook dowels, if necessary, shall be placed in the concrete sidewalk and concrete raised median to the details and location as specified in the Contract Documents.

TS 3.70.07.08 Placing Concrete

Concrete shall be placed and consolidated to meet the requirements of CSA A23.1 and the requirements of this specification. The concrete delivery and spreading operations shall be coordinated so as to provide a uniform rate of progress for the placing operation. Where concrete placing is interrupted for more than 45 minutes, a 12 mm thick bituminous fibre joint filler shall be placed vertically across the sidewalk width, to form an expansion joint, before resuming concrete placement.

The concrete shall be placed to the specified thickness, line and grade. The concrete shall be thoroughly consolidated by the use of 50 mm vibrators and other suitable tools to eliminate voids, honeycombing and entrapped air.

TS 3.70.07.09 Finishing Concrete

The concrete surface shall be finished while it is sufficiently plastic to achieve the desired grades, elevations and texture, with no water on the surface. The surface shall be uniform, dense and free from undulations and projections apart from those specified in the drawings.

The top surface shall be screeded to true grade and cross-section and finished with a magnesium or aluminum float. The final finish shall have a light broom or swirl float texture.

The application of water, neat cement or sand to the surface shall not be permitted. Localized surface imperfections shall be dug out and repaired with fresh concrete before the concrete has set.

Sidewalks on grades of more than 5 per cent shall be broom finished transversely to the slope of the sidewalk.

The concrete adjacent to all formwork and joints shall be finished with a tool that produces a 5 mm rounded edge and a smooth, horizontal surface with a maximum width of 50 mm. All tooling shall be uniform and straight and shall be depressed no more than 1 mm below the adjacent surface. Any ridges along the tooled marks shall be removed.

The surface of the concrete sidewalk shall not have irregularities exceeding 6 mm when checked with a 3 m straight edge placed in any direction.

TS 3.70.07.10 Identification Stamp

The Contractor shall mark with an approved stamp according to T-310.010-7 at each end of the work, at each tenth bay, and all others places directed by the Contract Administrator. The stamp shall be located on the centre of the bay parallel to a transverse joint.

The stamp shall identify the Contractor's name and the year of construction.

TS 3.70.07.11 Joints

TS 3.70.07.11.01 *Contraction Joints*

Contraction joints shall be placed transversely as shown on drawing T-310.010-1. Contraction joints shall also be placed longitudinally—parallel to the curb—and 1.5 m from the curb when the slab is 3 m or more in width. The depth of the contraction joint shall be one quarter the concrete thickness.

The maximum distance between joints in the raised median, shall be 2 m.

TS 3.70.07.11.02 *Expansion Joints*

Expansion joints shall be constructed to the full thickness of the sidewalk or raised median and shall be a maximum of 6 m apart.

Expansion joints shall be filled with 12 mm wide bituminous fibre expansion joint material. The top surface of the bituminous fibre shall be flush with the concrete surface. The fibre shall be vertical and straight in alignment.

Full depth (isolation) joints shall be formed where the concrete abuts buildings and rigid structures, changes direction, encounters appurtenances and shall be constructed as shown on drawing T-310.010-1. If the face of the structure is rough or irregular, preventing a tight seal, the joint shall be placed 150 to 300 mm from the structure.

TS 3.70.07.11.03 *Construction Joints*

At the end of each day's work, or in the event of an unavoidable stoppage of concrete placement extending more than 30 minutes, an expansion joint shall be constructed at the planned location of a joint. Any excess concrete is to be removed and disposed of, off the site according to OPSS 180.

TS 3.70.07.12 Concrete Curing

Concrete curing shall be according to TS 1350.

TS 3.70.07.12.01 *Curing with Burlap and Water*

Burlap mats shall be pre-soaked by immersion in water for at least 6 hours immediately prior to placing. The mats shall cover the entire width and edges of the exposed concrete. The mats shall overlap 300 mm and shall be held down to prevent displacement. The mats shall be maintained in place and kept saturated for a minimum period of 7 Days. The Contractor may constantly water the mats or cover them with opaque polyethylene film, or a combination of both, in order to keep the mats saturated.

Alternatively, this method shall be used for a minimum period of 3 Days following which the surface shall be cured with curing compound according to TS 1350.

TS 3.70.07.12.02 *Curing with Geotextile Fabric and Water*

Geotextile fabric shall be pre-soaked by immersion in water for at least 6 hours immediately prior to placing. Two layers of fabric shall be applied to the surface of the concrete and shall cover the entire width and edges of the exposed concrete. Strips shall overlap 100 mm and shall be held down to prevent displacement. The fabric shall be maintained in place and kept saturated for a minimum period of 7 Days. The Contractor may constantly water the mats or cover them with opaque polyethylene film, or a combination of both, in order to keep the mats saturated.

Alternatively, this method shall be used for a minimum period of 3 Days following which the surface shall be cured with curing compound according to TS 1350.

TS 3.70.07.12.03 *Curing with Polyethylene Film*

White, opaque polyethylene film (100 μm thick) shall be placed such that air flow between it and the concrete surface is prevented. The film shall be held down at the edges and laps, and shall be overlapped a minimum of 150 mm, to prevent displacement. The film shall be kept in place for a minimum period of 7 Days.

Alternatively, this method shall be used for a minimum period of 3 Days following which the surface shall be cured with curing compound according to TS 1350.

TS 3.70.07.12.04 *Curing with Membrane Compound*

Immediately prior to application, the curing compound shall be agitated by mechanical means to provide a homogeneous mixture. Curing compound shall be spray applied in two coats to the concrete surface, with the second coat applied at right angle to the first coat, such that the membrane formed is uniform in thickness and colour and is free of breaks and pinholes. The surface shall be maintained in this condition for a minimum period of 7 Days. The rate of application shall not be less than that specified by the manufacturer of the compound.

TS 3.70.07.13 Concrete Protection

Concrete protection shall be according to TS 1350.

TS 3.70.07.14 Headers

Wooden headers, 40 mm thick and 160 mm deep shall be placed at all unpaved entrances or driveways. They shall be held in place by 40 mm x 80 mm stakes driven into the ground at least 700 mm at one metre centres and with the tops flush with the surface of the sidewalk.

TS 3.70.07.15 Ramps

Sidewalk accessibility ramps shall be according to drawing T-310.030-7, T-310.030-8, T-310.030-9, T-310.030-10 and T-310.030-11 with tactile walking surface indicator plates at all controlled and uncontrolled pedestrian crossings or as specified in the Contract Documents.

TS 3.70.07.15.01 *Installation of Tactile Walking Surface Indicators*

Tactile walking surface indicators plates shall be assembled prior to installation according to the manufacturer's installation instructions. The plates shall be set and pressed into wet concrete at each sidewalk ramp to the final elevation.

Remove any wet concrete that may spill onto the tactile walking surface indicator surface.

Tactile walking surface indicator plates shall be cut to fit around utility maintenance hole covers, hand wells and other appurtenances at no extra cost to the City.

TS 3.70.07.15.02 *Installation Tolerances of TWSI Plates*

Tactile walking surface indicators plates shall be positioned as close to the back of curb as possible; however, in order to accommodate corner radii, a maximum gap of 100 mm between the back of curb and the plates is acceptable.

TS 3.70.07.16 Restoration of Asphalt

The additional asphalt removed for framework is to be restored shall be according to TS 310. The asphalt shall be placed in lifts not to exceed 50 mm in depth after compaction.

TS 3.70.08 QUALITY ASSURANCE

Quality assurance shall be according to TS 1350.

TS 3.70.08.01 Visibly Defective or Damaged Concrete

Concrete that is visibly defective or damaged is not acceptable and shall be removed and replaced at no extra cost to the City.

Concrete is visibly defective or damaged when:

- The concrete is honeycombed.
- The concrete contains embedded debris.
- The concrete has been damaged by freezing.
- The concrete temperature at the time of placement exceeded the requirements of this specification.

- The concrete surface has been damaged by rain.
- The concrete contains footprints or other undesirable impressions.
- The concrete has been subjected to traffic before the concrete attained 20 MPa.
- The concrete has cracked or separated.
- The concrete surface has spalled as defined in the *General Conditions of Contract* that the Contract Administrator will be the sole judge to the determination.
- Expansion and isolation joints are not vertical.
- The concrete sections have heaved or sunk, from their original position.

TS 3.70.08.02 Concrete Thickness

The thickness of the concrete structure shall be determined by field measurement or in accordance with a thickness measurement method specified in Contract Documents.

The Contract Administrator reserves the right to verify the thickness of the concrete structure for structural integrity check and payment purpose using a non-destructive testing method or by coring.

When a measurement of concrete thickness is carried out by coring, the measurement shall be based on either a 100 mm or 150 mm diameter core. The diameter of the core shall be at least three times the size of the maximum coarse aggregate as per CSA A23.1.

No core shall be taken within 250 mm from the joints or edges. The length of each core shall be determined according to ASTM C 174. Core samples that are broken or obviously damaged shall not be used for concrete thickness determination. The damaged cores shall be replaced by acceptable cores taken from the same sublot(s). Core samples taken for concrete thickness determination shall not be used for compressive strength test.

Regardless of the method used, concrete thickness shall be determined on a lot basis. Each lot shall have four sublots of equal size, where each sublot is represented by a thickness measurement. The Contract Administrator will determine the size of the lot(s) and sublots for the purpose of concrete thickness acceptance and payment.

The concrete thickness for a crosswalk in a lot shall be the average concrete thickness of the lot (Tx). The average concrete thickness for a lot shall be calculated from the following formula:

$$Tx = \frac{T1 + T2 + T3 + T4}{4}$$

Where: Tx is the average concrete thickness for a lot, rounded off to the nearest mm.
T1, T2, T3 and T4 are the concrete thickness for sublots 1, 2, 3 and 4.

For the purpose of the calculation, any individual sublot measurement that is more than 5 per cent above the specified thickness shall be assumed to be equal to the specified thickness plus 5 per cent.

A lot will be accepted, on a thickness basis, if the average concrete thickness of the lot equals or exceeds 100 per cent of the specified thickness. Payment for the lot will be determined according to TS 3.70.10.

At the sole discretion of the Contract Administrator, a lot may be accepted and allowed to remain in place, if the average concrete thickness of the lot is between 95 and 100 percent of the specified thickness. The lot accepted based on the above conditions will not be eligible for full payment. Payment for the lot will be determined according to TS 3.70.10. Adjustment of the Contract Price for the lot shall be based on Table 2.

If the concrete thickness of an individual sublot is less than 95 per cent of the specified thickness, the Contractor shall remove and replace the sublot at their expense even if the average concrete thickness of a lot is more than 95 per cent of the specified thickness.

All replacement lots shall be accepted on the same basis as the original lot.

TS 3.70.09 MEASUREMENT FOR PAYMENT

TS 3.70.09.01 Concrete Sidewalk
Concrete Raised Median

Measurement of concrete sidewalk and raised median placed shall be by surface area in square metres (m^2), without any deduction for maintenance holes and appurtenances.

TS 3.70.09.02 Tactile Walking Surface Indicator

Measurement of the above tender item shall be along the curb edge of the tactile walking surface indicators in linear metres (m).

TS 3.70.10 BASIS OF PAYMENT

TS 3.70.10.01 Concrete Sidewalk – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include the supplying and placing of the formwork, the supplying, placing, consolidating and finishing of the concrete and the curing and protection of the concrete sidewalk.

At the discretion of the Contract Administrator, payment for the item may be adjusted according to TS 3.70.08.02 and Table 2.

The cost of thickness testing shall be borne by the City unless the results indicate a thickness deficiency of 5 per cent or more, in which case the Contractor shall bear all costs of testing.

TS 3.70.10.02 Concrete Raised Median – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include the removal and disposal of the asphalt and granular material, the supplying and placing of the formwork, the supplying, placing, consolidating and finishing of the concrete and the curing and protection of the concrete raised median.

At the discretion of the Contract Administrator, payment for the item may be adjusted according to TS 3.70.08.02 and Table 2.

The cost of thickness testing shall be borne by the City unless the results indicate a thickness deficiency of 5 per cent or more, in which case the Contractor shall bear all costs of testing.

Table 2: Payment adjustment

Thickness Tx	Per cent payment
100 per cent of specified thickness or above	100
100 per cent of specified thickness to 95 per cent of specified thickness	$\frac{(Actual\ Thickness)^2}{(Specified\ Thickness)^2} \times 100$
less than 95 per cent of specified thickness	remove and replace at no extra cost to the City

TS 3.70.10.03 Tactile Walking Surface Indicator – Item

Payment at the Contract Price for the above item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include the supplying and placing formwork, the supplying, placing, consolidating and finishing of the concrete, the supplying and placing of tactile walking surface indicators, and the curing and protection of the concrete curb, gutter and sidewalk.

Appendix 3.70-A, November 2016

For Use While Designing and Administrating City Contracts

Note: This is a non-mandatory commentary appendix intended to provide information to a designer and contract administrator during the design and construction stage of a contract on the use of this TS specification in a City 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.

Notes to Designer:

The designer should specify tactile walking surface indicators plates when

- new sidewalk is required at a new intersection
- an existing intersection is being reconstructed, widened or narrowed which impacts the existing curb ramps
- the existing sidewalk requires replacement due to condition, or
- the exising sidewalk is being removed and replaced due to new traffic signal installation or other work.

In all other cases, existing curb ramps in each quadrant of an intersection may remain in place and do not require retrofitting with tactile walking surface indicator plates. However, designers may want to consider retrofitting tactile walking surface indicators at pedestrian crossings in the vicinity of facilities such as hospitals, schools, transit hubs, community centres and so on.

The same principle applies to controlled and uncontrolled pedestrian crossings at mid-block locations, such as pedestrian crossovers, pedestrian refuge islands, trail crossings and so on. Only the curb ramps adjacent to the crossings that will be reconstructed or are new require TWSI's to be installed. The designer can consider going above this minimum criterion if the crossing is in the vicinity of key facilities.