
CONCRETE CONSTRUCTION

PART 1 GENERAL

- 1.01 OTHER CONTRACT DOCUMENTS The General Conditions of the Contract, General Requirements, and Supplemental Conditions attached hereto shall apply to and be part of this Section.
- 1.02 DESCRIPTION OF WORK The Work described herein shall be for the construction of reinforced and non-reinforced Portland Cement Concrete pavements, curbs, gutters, sidewalks, drainage channels, driveway approaches, sidewalk ramps, bull-noses, medians, splash strips and other related concrete works.
- 1.03 RELATED WORK Section 02212 Roadway Excavation and Grading
Section 02303 Granular Base Course
Section 02512 Ready Mixed Concrete
Section 02660 Watermains
Section 02700 Sewers
- 1.04 STANDARDS Concrete work shall be in accordance with CSA-A23.1 and as stated in this Section. Where conflicts between the requirements of CSA-A23.1 and this Section exist, the requirements of this Section shall take precedence over those of CSA-A23.1.
- 1.05 QUALITY ASSURANCE The analysis and approval of materials by the City will not relieve the Contractor from his duty to produce an acceptable product as stated in this Section.
- Quality assurance tests will be used to determine the acceptability of the concrete supplied by the Contractor. The Engineer shall obtain samples of concrete and of the constituent materials required for quality assurance tests. The Contractor shall make no charge for these materials. Tests to determine (density), slump, air content and compressive strength of concrete supplied will be made by the Engineer in accordance with CSA-A23.2.

CONCRETE CONSTRUCTION

PART 2 PRODUCTS

2.01 CONCRETE Unless specified otherwise in Section 01001 Supplemental Conditions or shown on the Drawings all concrete shall be Type A as described in Section 02512 Ready Mixed Concrete

2.02 AGGREGATE Unless specified otherwise in Section 01001 Supplemental Conditions or shown on the Drawings all base course aggregate shall be A Base as described in Section 02303 Granular Base Course.

2.03 REINFORCING STEEL Reinforcement for concrete and the methods of testing reinforcement shall conform to the requirements of CSA-A23.1. All reinforcement shall be 300MPa or 400MPa yield grade deformed billet or smooth round steel bars of the type and dimension described in this Section, in Section 01001 Supplemental Conditions or shown on the Drawings. Steel bars shall be straight, free of flaws, cracks and other defects from manufacture. If requested by the Engineer, the Contractor shall provide certified copies of mill test reports of reinforcement steel supplied, showing physical and chemical analysis.

Form ties, inserts, bracing, bar supports, spacers, pipes, conduit, and similar embedded items incidental to concrete construction shall comply with the requirements of Clause 6.6 and 6.7 of CSA-A23.1 and shall be approved by the Engineer. Concrete Bricks are acceptable for support of the bottom layer of reinforcing bars in slabs on grade. Broken concrete blocks, rocks and wood supports will not be accepted.

2.04 FORMWORK PARTING AGENT The Formwork Parting Agent shall be a non staining, non grain raising compound, not injurious to the concrete, suitable for the type of formwork on which used, effective in preventing the adhesion of concrete to forms and providing a clean oil and grease free concrete surface suitable for proper bonding of curing compounds, sealers and finish coatings to the concrete:

The Formwork Parting Agent shall be Sealtight – Duogard by WR Meadows or approved equal.

CONCRETE CONSTRUCTION

- 2.05 CURING COMPOUND The Curing Compound shall be a Type2, white pigmented, liquid membrane-forming curing compound conforming to the requirements of ASTM C309.
- 2.06 SURFACE
EVAPORATION
RETARDER The Surface Evaporation Retarder shall be shall be Confilm by Master Builders or approved equal.
- 2.07 ISOLATION JOINT
FILLER The Isolation or expansion joint filler shall be a preformed, rot proof, non-extruded, resilient type bituminous fibre, conforming to the requirements of ASTM D1751.
The Isolation/Expansion Joint Filler shall be Flexcell by Sternson Limited or approved equal.
- 2.08 EQUIPMENT Equipment shall be of a type approved by the Engineer. The equipment shall be in good working order, kept free from hardened concrete or foreign materials at all times, and shall be cleaned at frequent intervals.
Slip form concrete curbing extrusion machines shall be equipped with internal mechanical vibrators and shall be capable of placing the finished concrete to the correct cross section, line and grade as specified in this Section.

PART 3 EXECUTION

- 3.01 LINE & GRADE The Engineer will establish horizontal and vertical control on the Site. Prior to commencing the Work, the Contractor shall satisfy himself as to the meaning and correctness of all control points and benchmarks, no claim shall be made for any alleged inaccuracy because of his failure to read same correctly. The Contractor shall maintain all control points and benchmarks in good order and transfer the horizontal and vertical control to the Work. If, in the opinion of the Engineer, the Contractor's method of setting alignment and grade is inaccurate or insufficient, the Engineer shall have the right to order that a more suitable method be used to ensure that accurate grade and /or alignment is maintained.
- 3.02 TOLERANCES The Contractor shall install the Work to the elevation and alignment shown in this Section, shown on the Drawings, as described in Section 01001 Supplemental Conditions or as set out on the Site by the Engineer. The Work shall not deviate from elevation or alignment by more than;

CONCRETE CONSTRUCTION

- ± 10 millimetres vertical for compacted granular base;
- ± 30 millimetres for reinforcing steel placement;
- ± 5 millimetres for steel dowel placement;
- ± 12 millimetres for reinforcing steel concrete cover. (minimum cover to any surface shall be no less than 40 millimetres);
- ± 5 millimetres vertical / ± 6 millimetres horizontal for concrete curb, curb & gutter, sidewalk, bull nose, driveway approach, drainage channel, splash strip.

During the finishing of the concrete, the surface will be checked by the Engineer using a 3 metre straight edge. The deviation of the finished surface from the elevations and alignment shown on the Drawings, as described in Section 01001 Supplemental Conditions or as set out on the Site by the Engineer, measured with a straight edge placed between any two contact points of the surface in the same plane or placed on the curb parallel to the center line of the street shall not exceed the amounts stated in this Section. Under no circumstances shall the finished concrete present a wavy or uneven appearance.

3.03 EXCAVATION

Excavation and sub-grade preparation shall be in accordance with the requirements of Section 02212, Roadway Excavation and Grading.

The Contractor shall remove the existing pavement / concrete by carefully breaking down and removing the pavement / concrete, or for full depth cuts only, by lifting out the concrete / pavement in one piece. The removal of existing concrete / pavement shall be done in such a manner that adjacent property, concrete or pavement is not damaged. Where the edge of an adjacent surface is spalled, chipped or broken at the surface or undercut below the surface by the excavation process, the Contractor shall excavate the adjacent surface to an additional limit as set out by the Engineer. The additional work required to replace broken or undercut sections shall be at the Contractor's sole expense.

CONCRETE CONSTRUCTION

3.04 GRANULAR BASE

The supply, installation and compaction of granular base course material shall be in accordance with the requirements of Section 02303, Granular Base Course.

3.05 FORMWORK

The installation of Formwork and reinforcing steel shall not commence until the excavation and installation of granular base course has been completed and approved by the Engineer.

Concrete formwork shall be constructed of steel or wood and shall be sufficiently strong, rigid and braced to provide a smooth 'form-finished' product, as defined in CSA-23.1, on all surfaces exposed to public view. The concrete formwork shall be correct to the shape, dimension, elevation, alignment and radii as described in this Section, shown on the Drawings or as set out on the Site by the Engineer.

The concrete forms shall be securely fastened tightly together in the correct position with a minimum of joints. Concrete forms shall be firmly set on a well compacted bearing surface and anchored to prevent displacement during concrete placement. The top of the concrete form shall be set to the proposed elevation of the finished concrete surface.

The surfaces of all formwork that contact the concrete shall be thoroughly cleaned and coated with an approved formwork parting agent. The parting agent shall be applied in accordance with manufacturer's written directions prior to the placing reinforcing steel or anchoring devices and it shall give the concrete forms an even coating without excess or drip. Formwork parting agent shall not be used where the concrete surface will receive a special finish or applied covering. The surface of untreated concrete formwork shall be thoroughly wetted with clean water, and keep wet until the placement of concrete.

Unless stated otherwise in Part 3.11 of this Section, formwork shall remain in place for a minimum of twenty four (24) hours following the placement of concrete.

CONCRETE CONSTRUCTION

3.06 REINFORCEMENT

The Contractor shall supply and place reinforcing steel as shown on the Drawings, described in Section 01001 Supplemental Conditions or as set out on the Site by the Engineer. Unless specified otherwise, bar sizes; bar supports; the requirements for hooks, stirrups, ties and spirals; spacers; the bending, welding and spacing of bars; minimum concrete cover; and the storage and placement of bars and embedded items shall be in accordance with CSA-A23.1.

Reinforcing steel shall be securely fastened at all lap joints, at intersections and splices, and held in place in a manner that ensures the correct position of the reinforcing steel is maintained while the concrete is placed and finished. Splices will only be permitted where shown on the Drawings or approved by the Engineer.

Unless shown otherwise on the Drawings or directed by the Engineer the Contractor shall supply and install 15M deformed steel billet bars spaced at 300 millimetres on centre (both directions), in all commercial driveway approaches, lane approaches and drainage channels.

**3.07 CONSTRUCTION
JOINTS**

The Contractor shall install construction joints as described in this Section, as shown on the Drawings, described in Section 01001 Supplemental Conditions or as set out on the Site by the Engineer.

Construction joints for cast in place curbing, sidewalk and combined curb and sidewalk work shall be reinforced with smooth round steel dowel bars. Steel dowels shall be spaced at one (1.0) metre on center where a new sidewalk joins a new or existing concrete curb (including curb ramps) or where a new sidewalk joins an existing sidewalk.

Steel dowels may be cast into the plastic concrete where it terminates at a new construction joint. For existing concrete, the Contractor shall drill a hole into the existing saw cut concrete surface, remove all debris from the hole and insert the steel dowel so the construction joint will be located the mid-point of the length of the steel dowel. Drill holes shall be no more than 5 millimetres larger than the diameter of the steel dowel. Drilling equipment shall be operated to ensure the existing concrete is not damaged in any manner. Dowel bars shall be installed parallel to one another and to the longitudinal direction of the curbing or sidewalk. If directed by the Engineer, the dowel bars shall be greased.

CONCRETE CONSTRUCTION

3.07 EXPANSION OR
ISOLATION JOINTS

The Contractor shall install expansion or isolation joints as shown on the Drawings, described in Section 01001 Supplemental Conditions or as set out on the Site by the Engineer. The Contractor shall install a 10 millimetre thick approved isolation joint material from the base of the concrete to the proposed finished surface where new concrete is placed against an existing concrete surface, building foundation, light standard, wood pole, sign post, parking meter, hydrant, valve cover or water service box,

The Contractor shall prepare the surface to ensure a smooth continuous vertical joint prior to installing the expansion joint material. Where voids exist between the expansion joint material and the prepared surface after placing the concrete work, the Contractor shall fill the void with an approved grout.

3.08 INSERTS

The Contractor shall supply and install steel sign support clamps as shown in this Section, shown on the Drawings, described in Section 01001 Supplemental Conditions or as set out on the Site by the Engineer.

3.09 PROTECTION

The Contractor shall take all necessary measures to protect the concrete from adverse weather conditions, including freezing, abnormally high temperatures or temperature differentials, and severe drying conditions continuously from the time of concrete placement to the time required for the concrete to develop the desired properties specified in this Section and Section 02705 Ready-Mixed Concrete. The concrete shall be protected when and as stated in CSA-A23.1 and as directed by the Engineer.

When the air temperature is at or below 5°Celsius, or when there is a probability of its falling below 5°Celsius within 24 hours of the placing of the concrete, as forecast by Environment Canada, the Contractor shall ensure all forms, rebar and base materials are maintained at a minimum temperature of 5°Celsius prior to the placement of any concrete. The Contractor shall also supply and install sufficient covers to maintain a minimum temperature of 10°Celsius in the concrete for the duration of the curing period stated in Part 3.12 of this Section.

CONCRETE CONSTRUCTION

3.10 CONCRETE PLACING

In addition to the requirements of this Section, all concrete shall be placed as stated in CSA-23.1.

The Contractor shall provide notice to the Engineer of his intention to place concrete a minimum of twenty-four (24) hours in advance of any concrete placement. No concrete shall be placed until the Engineer has approved the condition of the compacted base materials; the layout and integrity of the forms; the installation of reinforcing steel, dowels, and inserts; and the methods of conveying, placing, finishing, curing; and protecting the concrete. All concrete placed without the Engineer's approval will be rejected and shall be promptly removed from the Site.

The Contractor shall ensure all embedded parts, accessories, sign post clamps and other items to be cast into the concrete are securely placed, and will not interfere or be disturbed during the placement of concrete. He shall ensure that exposed portions, such as anchor bolt threads, or embedded parts are protected from concrete and damage.

The Contractor shall not place concrete on granular base course which is littered with debris, excessively wet, dry, or snow covered. Calcium chloride or other de-icing salts shall not be used to de-ice the forms. The granular base course shall be sufficiently moist to prevent absorption of water from the concrete, and shall be free of mire or standing water.

The concrete placing methods and equipment for conveying concrete shall be capable of providing a continuous and adequate supply of concrete without segregation or separation of the materials and without changing or affecting any of the specified qualities of the concrete at the point of deposition. If requested by the Engineer the Contractor shall use chutes, drop pipes, or other specialized placing equipment to prevent segregation in the concrete.

An approved concrete extrusion machine may be used for curb, curb and gutter, drainage channel and sidewalk construction provided the extrusion machine produces a finished product which meets the requirements of shape, dimension and elevation described in this Section, shown on the Drawings, or described in Section 01001 Supplemental Conditions. The supply of concrete to the machine shall be sufficient for uninterrupted placement to the full width and depth of the mould in the curbing machine.

CONCRETE CONSTRUCTION

The discharge of concrete from the transit mixer shall be completed within 120 minutes after the introduction of the mixing water to the cement and aggregates. The placing temperature of the concrete shall be kept as close as possible to the minimum temperature of 10°Celcius and shall not exceed 30°Celcius.

Concrete shall be placed in the forms while in a plastic state and before it has taken its initial set. Concrete shall be deposited as nearly as practicable to its final position in a rapid and continuous operation until the placing of the section is completed. The lateral movement of the concrete will not be permitted. Concrete shall be placed in layers that are approximately horizontal. The rate of placing shall be such that each successive lift can be vibrated into the previous lift for proper bonding. Retempering of partially hardened concrete with additional water, mortar or other materials will not be permitted.

If formwork, reinforcing steel or embedded hardware is displaced during the placing of concrete, the Contractor shall immediately cease any further placing of concrete until the displaced item has been set to its original position and the Engineer has determined the placement of concrete can continue.

The deposited concrete shall be spread by means of a mechanical spreader or by an approved hand method. The surface of the concrete shall be struck off with appropriate tools in a manner so that when the concrete is vibrated and finished the concrete will conform to the cross-section and elevations shown in this Section, shown on the on the Drawings or as directed by the Engineer.

The Contractor shall only use mechanical vibrators to consolidate the concrete. Spading, hand tamping, or other similar methods will not be permitted. Mechanical vibrators shall not be used to flow or spread the concrete into place. The concrete shall be consolidated to produce a uniform, dense, homogeneous mass, free of cold joints, segregation, fill planes, voids and other defects.

CONCRETE CONSTRUCTION

Construction joints shall be formed at the termination of each days work or when the placing of concrete has been delayed in excess of forty-five (45) minutes. The location and method of installation of the construction joint shall be as stated in this Section or as directed by the Engineer.

At the end of a slip form paving pour the concrete shall be cut full-depth, removed and disposed of. Openings for driveways, sidewalk ramps, drainage channels etc shall be formed by striking off the curb portion of the concrete and reducing the finished height of the back of the curb to 30 millimetres above the gutter elevation.

3.11 FINISHING

In addition to the requirements of this Section, all concrete shall be finished as stated in CSA-23.1.

The Contractor shall finish the concrete immediately following the placing of the concrete as described in Part 3.10 of this Section and while it is sufficiently plastic to achieve the desired shape, slope and surface finish as stated in this Section. The Contractor shall strike off the surface of the concrete to the specified elevation with an approved screed or straight-edge. No person shall be permitted to walk in the struck off concrete. All finishing work shall be done from the sides of the concrete pour or from work bridges. Formwork shall not be jarred, and projecting reinforcing steel or inserts shall not be disturbed, for a minimum period of twenty-four (24) hours. If directed by the Engineer, the Contractor shall only use an aluminium or magnesium bull float and/or darby to smooth and texture the concrete.

The Contractor shall regulate the finishing of the concrete to ensure the quality of the surface is not impaired by overworking or by bringing excessive fines and water to the surface. The Contractor shall not use steel trowels, apply powdered cement or other fine materials to dry up excess water on the concrete surface or add water to the concrete surface to assist in finishing.

Final finishing of the concrete shall commence when; all bleed water has evaporated from the surface; the surface is level and free of float marks; the concrete is sufficiently stiff to prevent the working of excess mortar and fines to the surface; and all formwork on surfaces which are to be exposed to public view have been removed. The Contractor shall round all exposed

CONCRETE CONSTRUCTION

concrete edges with an approved edging tool to the radii shown in this Section, on the Drawings or as directed by the Engineer. Edging and grooving tools shall not be used to construct contraction joints in the concrete. Contraction joints shall be installed as described in Part 3.13 of this Section.

If placement of the concrete is with a extrusion machine, the additional floating or trowelling of the concrete surface by hand methods shall only be done to correct surface imperfections identified by checking with the 3.0 metre long metal straight edge, or as directed by the Engineer. If bleed water is present on the surface of the concrete, floating or troweling shall be delayed until the bleedwater has evaporated or been removed.

The Contractor shall apply a fine uniform textured finish to all surfaces of the plastic concrete which are intended to be exposed to public view. The textured finish shall be applied with a steel or fibre broom of a type approved by the Engineer. The broom shall produce straight and even lines; free of surface depressions greater than 3.0 millimetres in depth; perpendicular to the direction of travel on all sidewalks, medians, bull noses and parallel lines; and to the direction of travel/flow on all curbs, curb and gutters, and drainage channels or such orientation as directed by the Engineer.

3.12 CURING

The curing of exposed concrete surfaces shall commence as soon as possible after finishing, the concrete has set sufficiently that it will not be damaged in the process and excess moisture due to bleeding has evaporated. The surface of the concrete shall be uniformly treated with a white-pigmented curing compound, applied according to the manufacturer's written directions or as directed by the Engineer. Following the removal of the side forms, the edges of all concrete slabs shall also be treated with the same curing compound, and for extruded concrete, the edges shall be treated at the same time as the surfaces are finished.

Curing compounds shall not be used the ambient air temperature is below 5° Celcius. The Contractor shall cure the concrete by an alternate method acceptable to the Engineer. Concrete surfaces shall be cured for 7 days at a minimum temperature of 10° Celcius and for the time necessary to attain seventy (70%) percent of the specified 28 day compressive strength of the concrete

CONCRETE CONSTRUCTION

The Contractor shall not allow the temperature of the concrete to exceed that required for a rate of surface moisture evaporation of 1.0 kg/ (m²h) as determined in CSA-A23.1. During freezing weather, water curing of concrete shall be terminated 12 hours prior to the termination of the protection period.

3.13 CONTRACTION JOINTS

The Contractor shall saw-cut contraction joints with an abrasive blade power saw to the dimensions and in accordance with the details attached to this Section, shown on the Drawings or as directed by the Engineer. Contraction joints shall be installed when the concrete is sufficiently hard to not ravel or be damaged by the blade but prior to the formation of shrinkage cracks on the surface. The time at which saw-cutting is to be performed shall be determined by the Contractor.

Contraction joints shall be 5 millimetres wide, vertical, with true square edges, uniform and straight. The horizontal alignment shall not vary by more than 5 millimetres over any 3.0 metre length. Contraction joints in curbs shall be constructed at 3 metre intervals or to match existing adjacent contraction joints. During periods of cold weather, contraction joints may be struck using a trowel if approved by the Engineer.

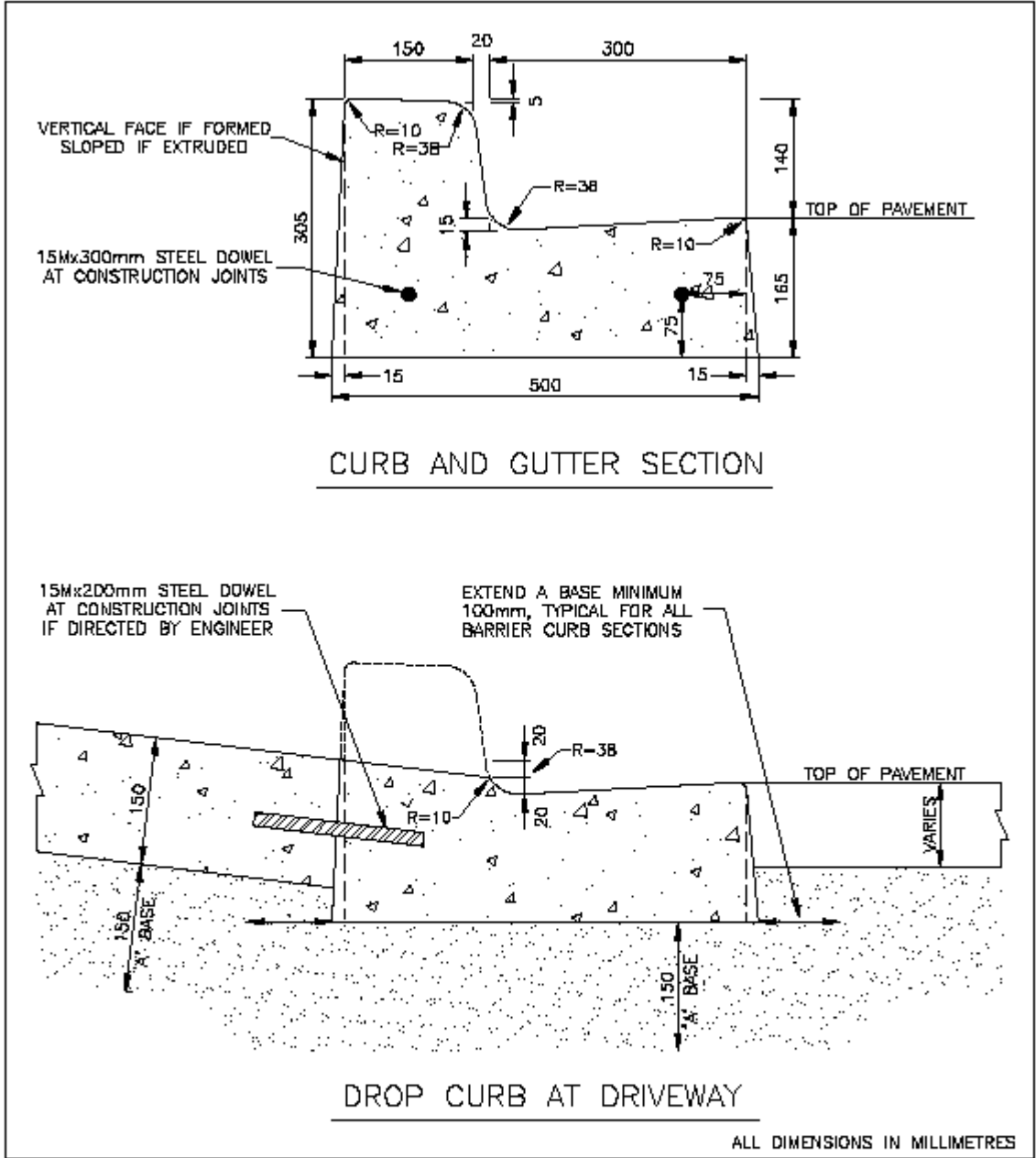
3.14 ACCEPTANCE

The finished concrete surface shall be at the required elevation and alignment and have a smooth even consistent surface free of open spaces, depressions, impressions, indentations, excess concrete mortar or projections.

The Contractor shall, at his sole expense, correct or replace concrete Work which has failed to attain the required 28 day compressive strength, is not within the tolerances stated in this Section, has not been cured as stated in Part 3.12 of this Section, or displays surface defects or a finish which is not acceptable to the Engineer.

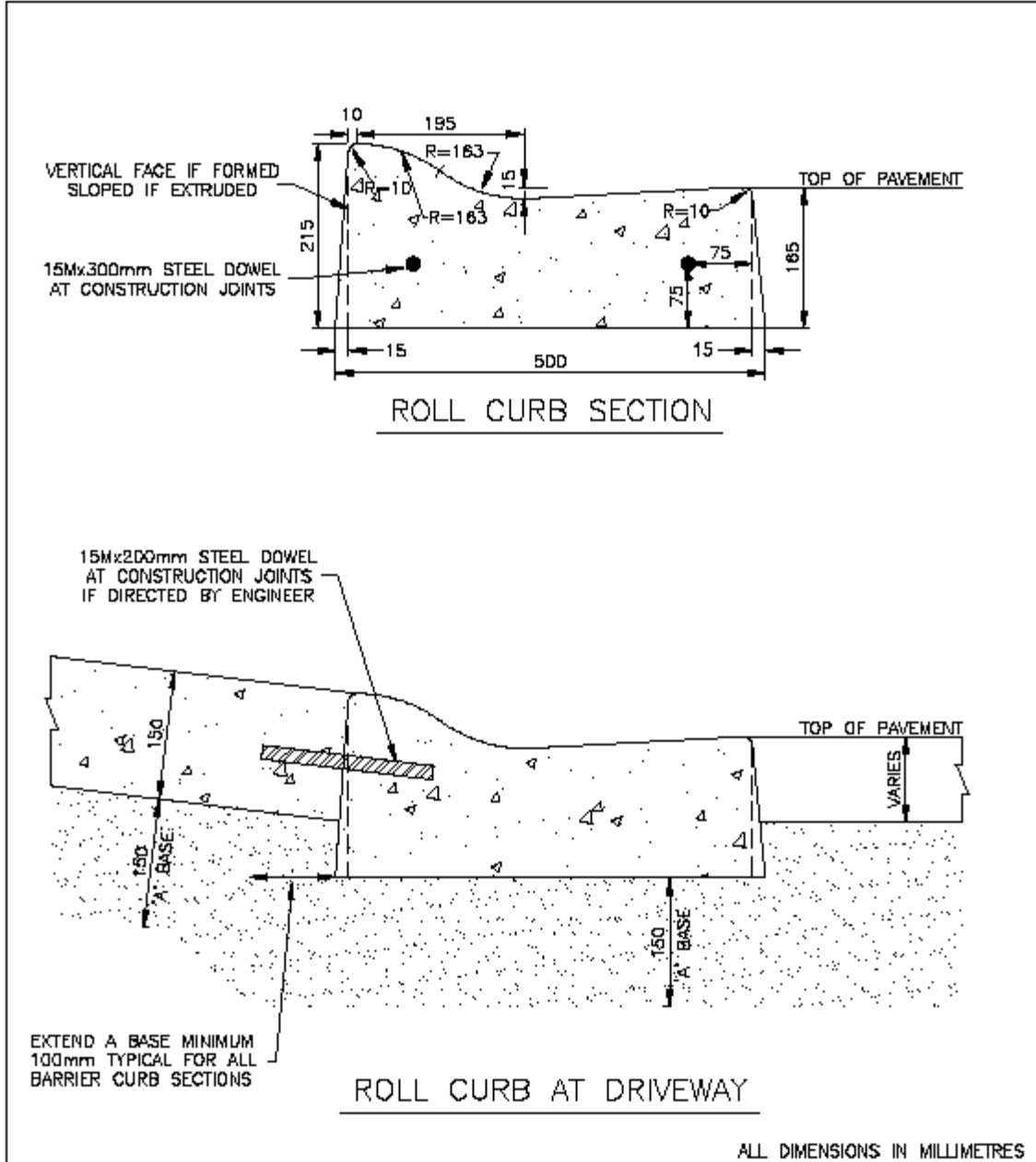
The Contractor shall place and compact approved fill material in open excavations adjacent to the concrete work to a depth of 100 millimetres of the finished grade, top of curb or finished surface. Unless otherwise specified in Section 01001 Supplemental Conditions or shown on the Drawings the supply and installation of Topsoil and Sod will be by others.

CONCRETE CONSTRUCTION



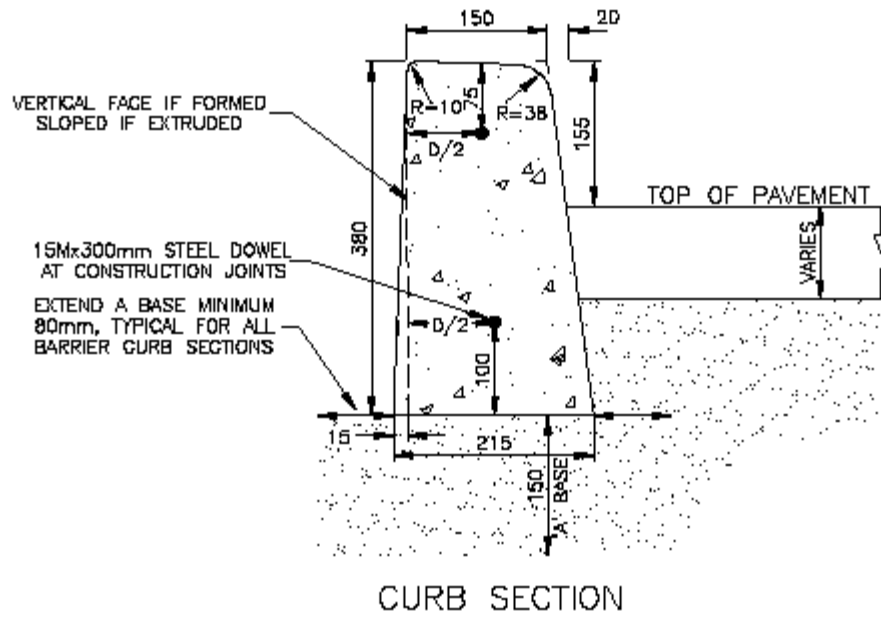
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| CITY OF BRANDON ENGINEERING DEPARTMENT | | BARRIER CURB & GUTTER | |
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CONCRETE CONSTRUCTION



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| CITY OF BRANDON ENGINEERING DEPARTMENT | | ROLLED CURB | |
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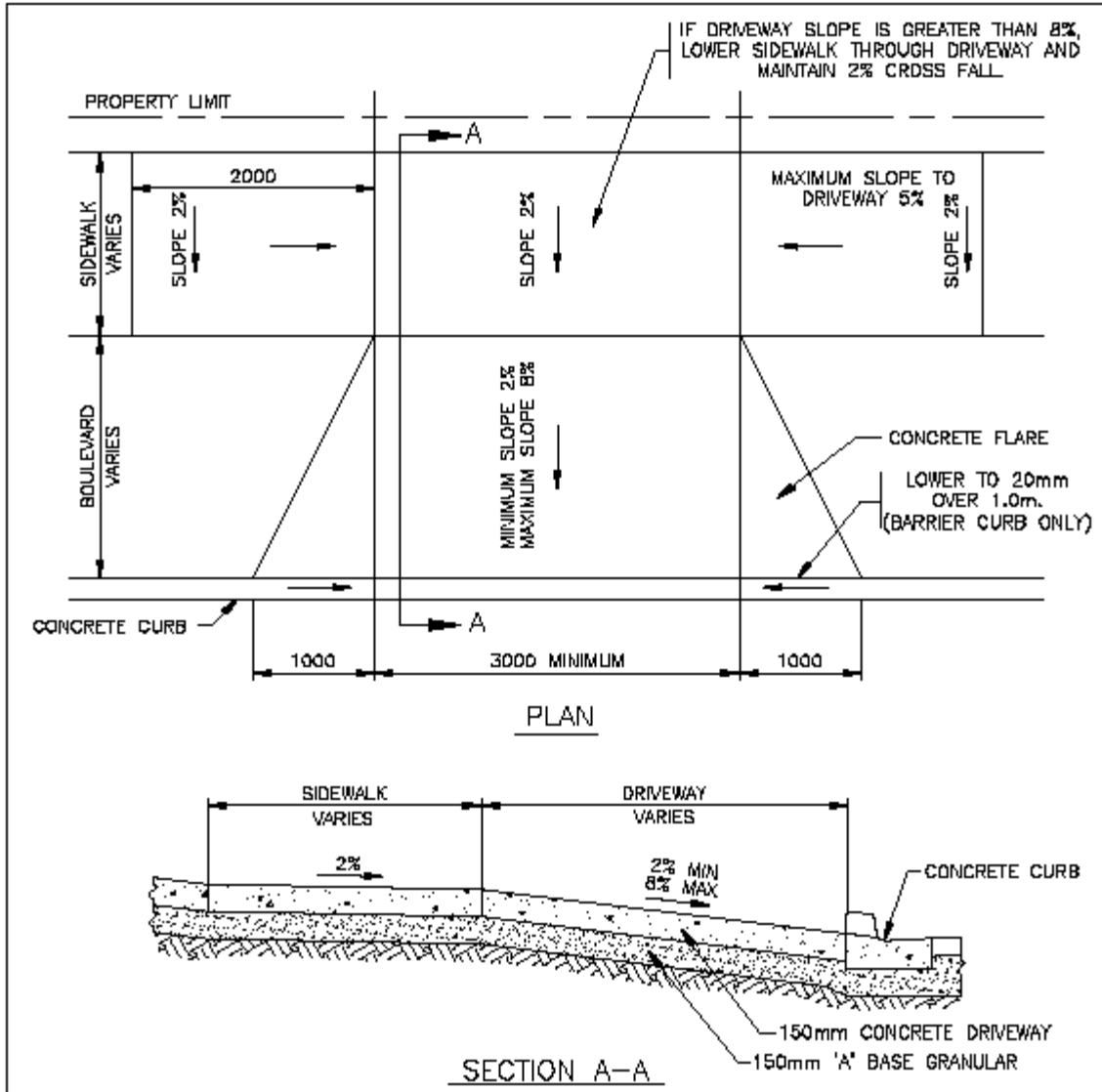
CONCRETE CONSTRUCTION



ALL DIMENSIONS IN MILLIMETRES

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| CITY OF BRANDON ENGINEERING DEPARTMENT | | MEDIAN CURB | |
| DATE: JANUARY 1998 | REVISED: JANUARY 2007 | SCALE: NTS | DRAWING NO.: STD1112U |

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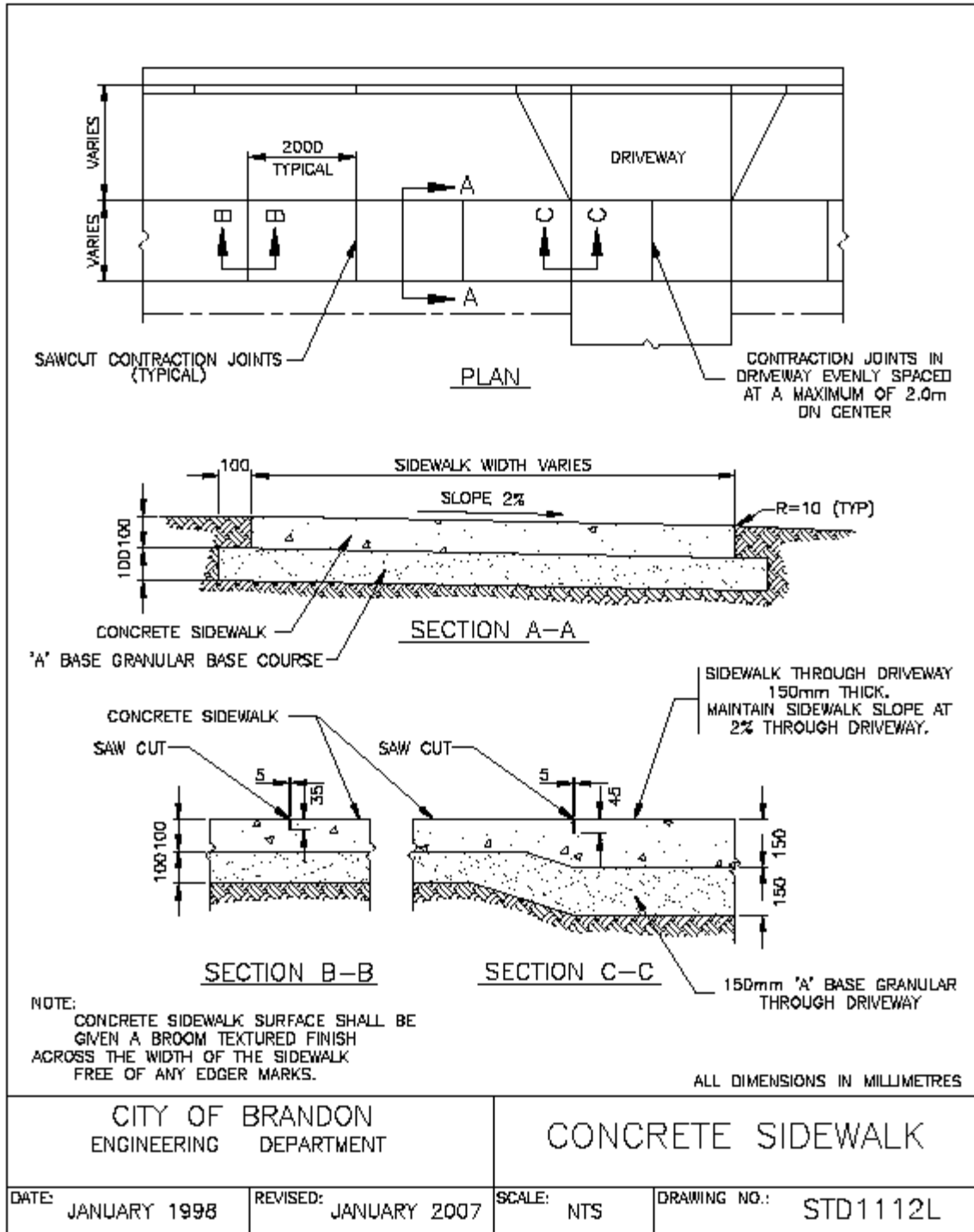


NOTE:
 ALL DRIVEWAY APPROACHES SHALL BE 150mm CONCRETE ON 150mm OF 'A' BASE GRANULAR. COMMERCIAL AND LANE APPROACHES SHALL BE REINFORCED WITH 15M BARS AT 300mm O.C. IN BOTH DIRECTIONS.

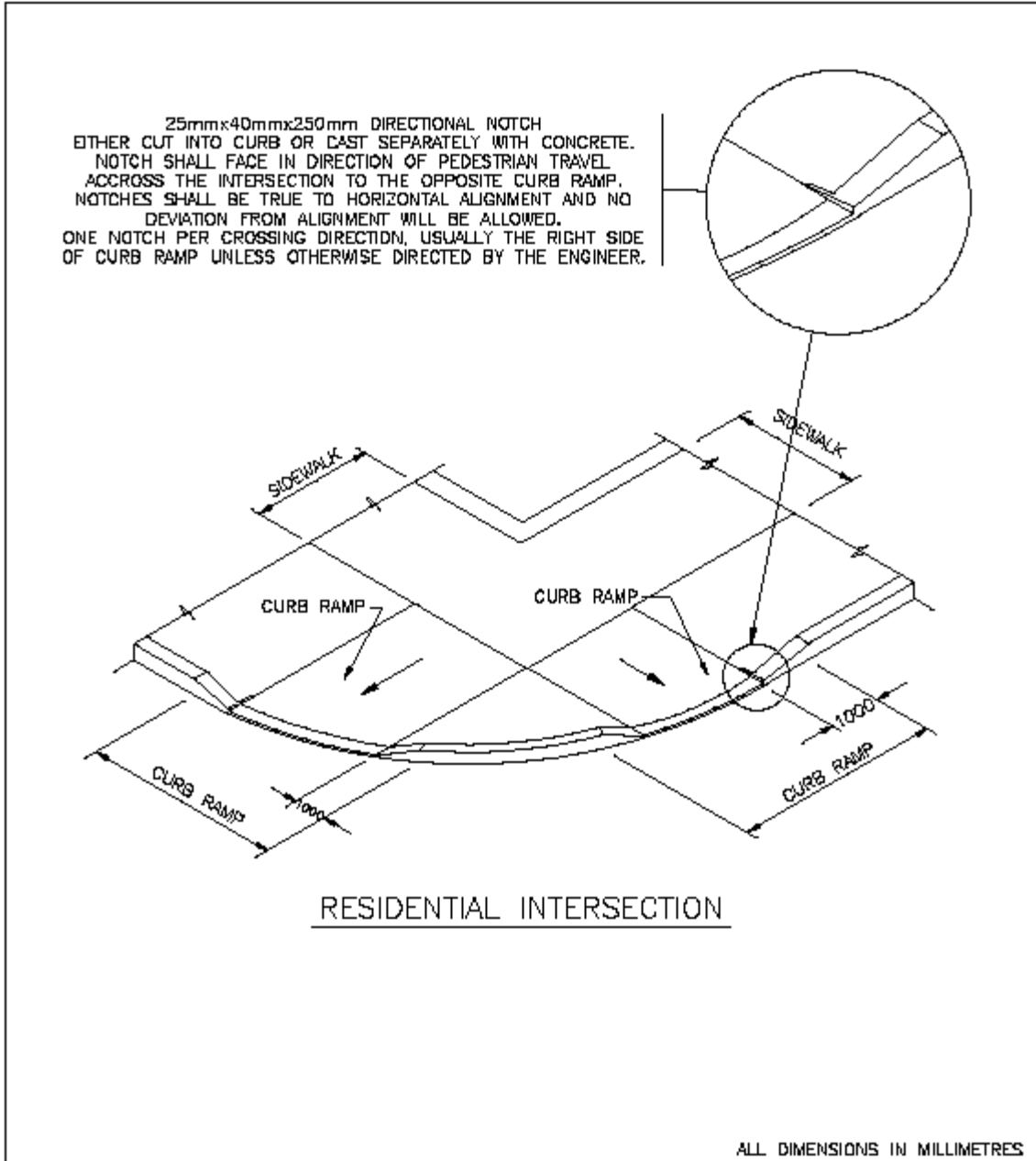
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| CITY OF BRANDON ENGINEERING DEPARTMENT | | DRIVEWAY APPROACH | |
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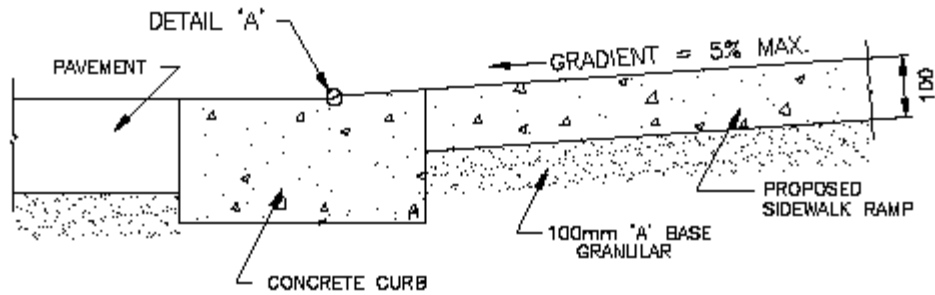


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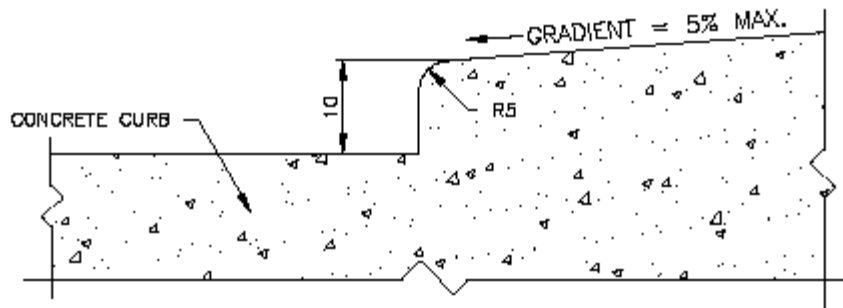


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| CITY OF BRANDON ENGINEERING DEPARTMENT | | CURB RAMPS | |
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CONCRETE CONSTRUCTION



CURB RAMP - CROSS SECTION



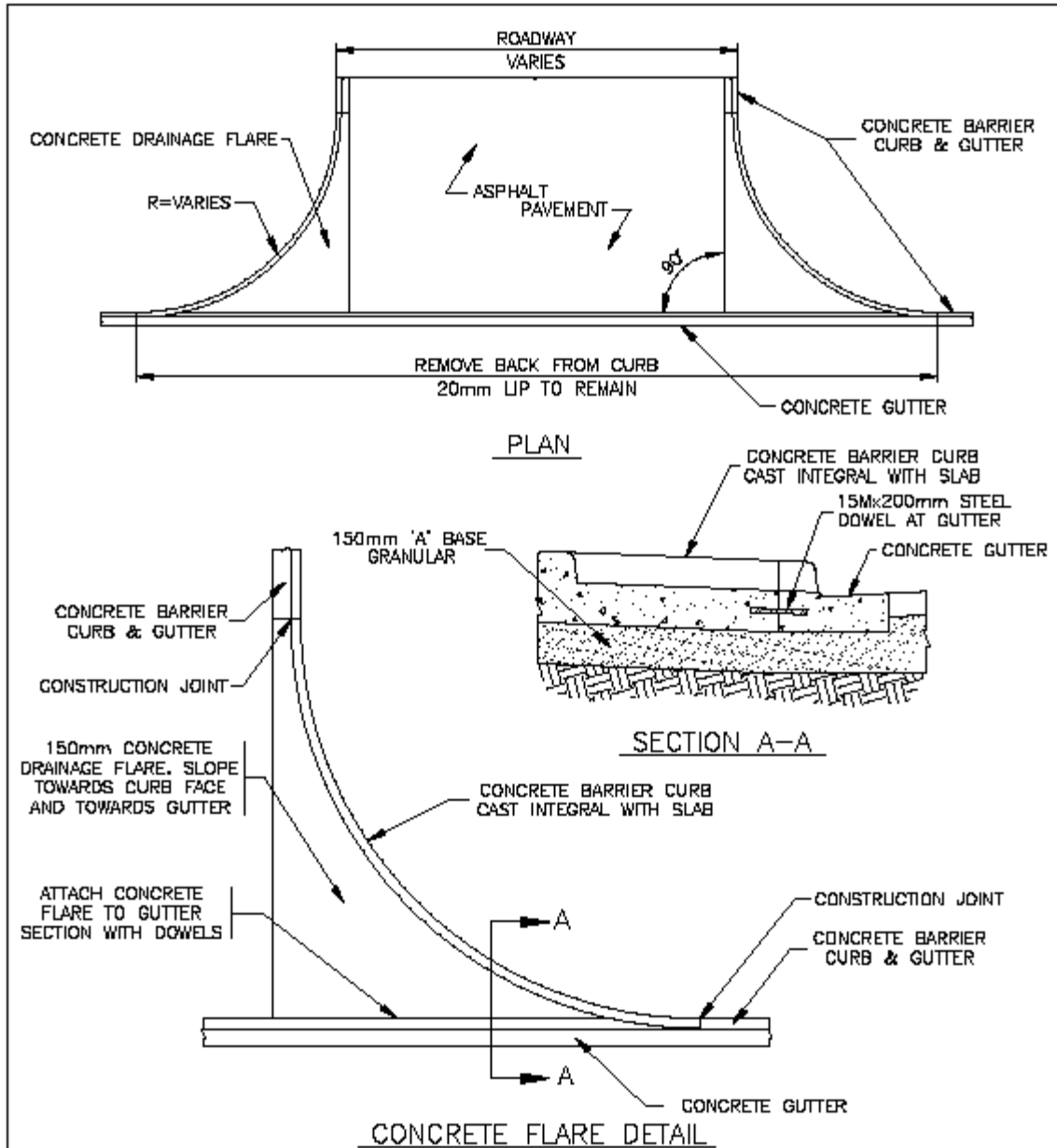
DETAIL 'A'

NOTE:-
 CURB RAMP SURFACE SHALL BE GIVEN A BROOM TEXTURED OR
 APPROVED PATTERN STAMPED FINISH

ALL DIMENSIONS IN MILLIMETRES

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| CITY OF BRANDON ENGINEERING DEPARTMENT | | CURB RAMP DETAILS | |
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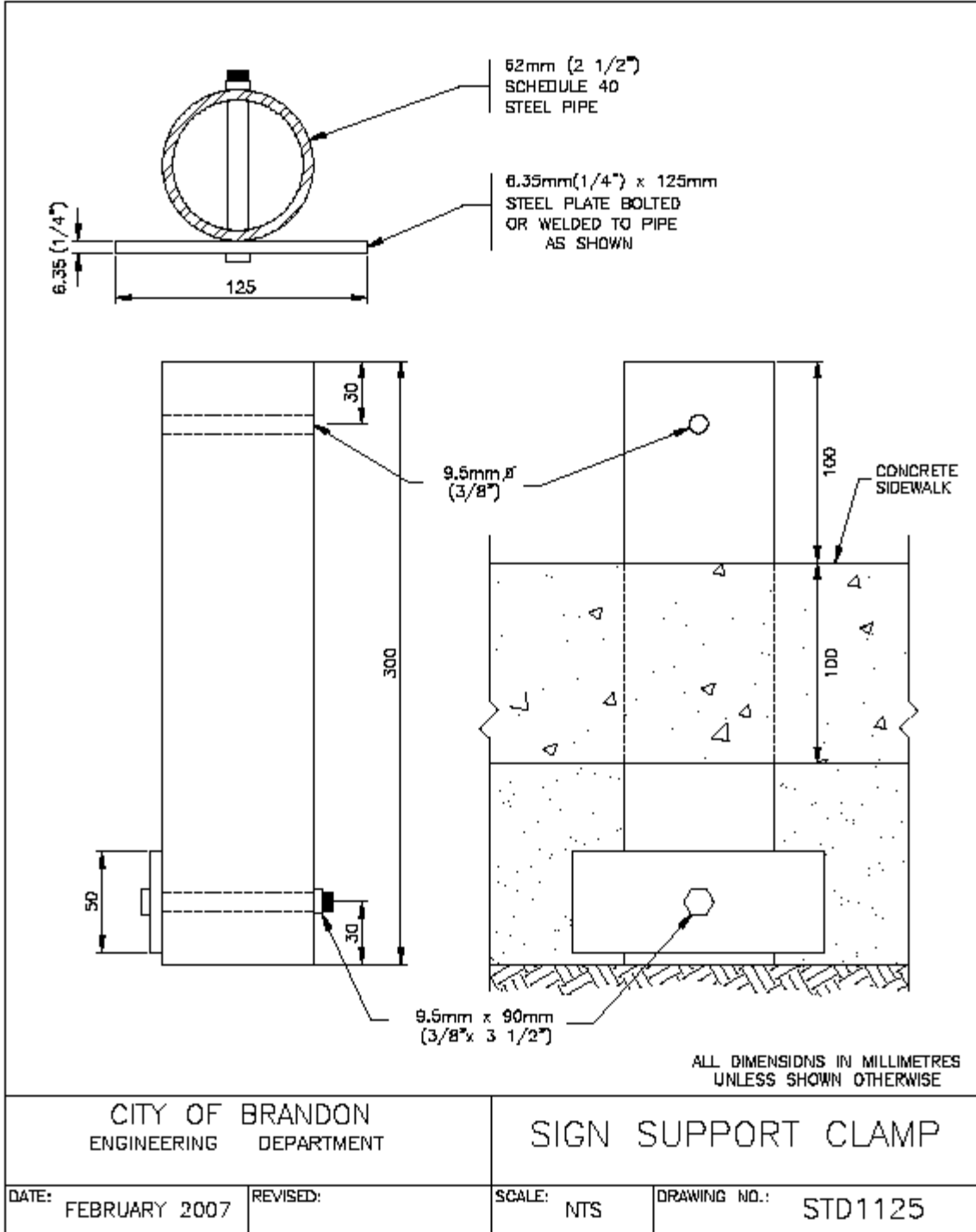
CONCRETE CONSTRUCTION



ALL DIMENSIONS IN MILLIMETRES

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CONCRETE CONSTRUCTION



END OF SECTION