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8.1 SECTION 1 - SUPPLY AND APPLICATION OF PAINTED ROADWAY MARKINGS**8.1.1** **DESCRIPTION**

Painted Roadway Markings consists of the supply and application on paved roadways of two colours of paint and reflecting glass beads and includes painting single and double, solid and broken directional dividing lines, edge lines, lane lines, continuity lines, gore areas, arrows, stop lines, crosswalk areas and railway crossing markings.

8.1.2 **MATERIALS****8.1.2.1** **General**

The Contractor shall be responsible to supply and safely apply and cure as specified all roadway marking materials.

The Contractor shall choose the white and yellow traffic paints to be supplied and applied from the list of traffic paint suppliers and paint formulations which have been approved for the same by Alberta Transportation or its successor at the time of the supply and application of the roadway markings.

Paints shall be reflectorized in accordance with the latest edition of AASHTO M 247.

The Contractor shall provide the Engineer with the following information prior to commencing the Work:

- a) Names and addresses of the suppliers and manufacturers.
- b) Formulation to be supplied.
- c) Written confirmation from the manufacturer that the materials to be supplied meet all specified requirements.

The Contractor shall verify that all materials delivered and used in the Work are the type specified.

8.1.2.2 **Supply, Handling and Storage**

The Contractor shall make all arrangements for the supply and delivery of paint and glass beads and shall provide the Engineer with records of all materials received and/or returned, on a daily basis.

The Contractor shall provide, maintain and reclaim all material storage sites. The storage of materials at Department facilities will not be permitted.

No paint formulation shall be diluted or mixed with a different formulation or with any other material, without the specific prior approval of the Engineer.

The Contractor shall take all necessary steps to prevent contamination of materials. Materials shall be protected from freezing.

The Contractor shall be responsible for the proper clean-up of waste or spilled material to the satisfaction of the Engineer, and the proper disposition of containers.

8.1.2.3 **Quality Control**

The Contractor shall be totally responsible for quality control inspection throughout every stage of the Work to ensure that materials and workmanship comply with the requirements of this Specification and the Manufacturer's recommendations. The Contractor shall develop and submit in writing to the Engineer a quality control inspection plan that addresses all the elements that affect the quality of the Painted Roadway Markings including but not limited to:

- a) Colour
- b) Retro-reflectivity
- c) Paint Application Rates
- d) Glass Bead Application Rates
- e) Pavement Surface and Atmospheric Conditions
- f) Line Widths, Line Lengths and Space Lengths.

The Contractor shall maintain records of quality control data, complaints from the public, and other details relevant to the Work and shall provide these records to the Engineer daily.

8.1.2.4 Quality Assurance Sampling and Testing

The Contractor shall supply the Engineer with the manufacturer's quality control test results and a quality assurance sample for each batch of material as it is delivered to the project. Samples for quality assurance shall be obtained by the Contractor from the manufacturer or from drums as delivered to the Contractor's storage location.

If the Contractor obtains quality assurance samples at the time of delivery to their storage location, the sampling and minimum frequency of testing shall be as described in the latest edition of Alberta Transportation's (or successor's) Test Methods for Sampling Traffic Paint (TLT-636) and Sampling Glass Beads (TLT-601), or ASTM and AASHTO equivalent (T 346).

If glass beads are supplied in bags, a minimum of one 25 kg bag shall be selected from each project or for every 10,000 kg of glass beads delivered to the project.

All materials shall be subject to further inspection, sampling and testing by the Engineer and the Contractor shall provide safe, convenient access, acceptable to the Engineer, for inspection and sampling of the materials, and shall cooperate in the inspection and sampling process when requested to do so.

8.1.3 CONSTRUCTION

8.1.3.1 General

The locations of painted roadway markings include the sections of highway and intersections specified, as well as through towns, at roadside turnouts, rest areas, points of interest and weigh scale turnouts.

8.1.3.2 Survey, Layout and Referencing Requirements

Interim Roadway Markings

The Contractor shall be responsible for the supply and application of interim roadway markings (spotting) required for the application of the permanent painted roadway markings, prior to the application of the permanent markings.

The spots shall be applied exactly on the location of the roadway marking using paint suitable for temporary pavement markings. The Contractor shall provide paint product data used for spotting to the Engineer for review and approval.

The Contractor shall carry out all surveying, layout and referencing required for the establishment of roadway marking locations and the accurate application of the spots.

All spots shall be 100 mm wide and a minimum of 150 mm long, applied lengthwise to the road surface.

The maximum distance between spots shall be 15 m on tangents and 10 m on curves.

On roadways exposed to traffic overnight, the spotting shall be carried out daily.

Barrier Line Limits

The Contractor will establish and carry out pre-marking of barrier line limits (solid yellow line) for no-passing zones. The Contractor shall be responsible for determining the locations of the no-passing zones based on the requirements in the most recent version of the Transportation Association of Canada Geometric Design Guide for Canadian Roads and the Manual of Uniform Traffic Control Devices for Canada. The location of no-passing zones shall be certified by a Professional Engineer. Provide certification to the Engineer prior to construction.

The Contractor shall be responsible for referencing all existing paint and traffic markings and the end points of no-passing zones on stakes such that the markings and the end points of no-passing zones can be accurately re-established and pre-marked by the Contractor. While referencing the existing roadway markings, the Contractor shall verify all roadway markings are in compliance with the most recent versions of the Transportation Association of Canada Geometric Design Guide for Canadian Roads and the Manual of Uniform Traffic Control Devices for Canada. The station location shall be recorded on each stake and in a field book which shall become the property of the Department.

8.1.3.3 Safety and Traffic Control Equipment

Safety and traffic control equipment shall be the Contractor's responsibility.

Traffic control equipment requirements shall include:

- a) One pilot truck and,
- b) Warning signs and traffic cones as required.

The paint truck and the pilot truck shall each be equipped with the following:

- a) All lights as required by the Northwest Territories *Motor Vehicles Act*, including a roof mounted overhead rotating amber beacon. The beacon shall be mounted on the top of the vehicle and fully visible to traffic approaching from both front and rear.
- b) A two-way radio for voice communication.
- c) A sequential arrowboard meeting the following Specifications:
 - i. Minimum size 0.75 m x 1.52 m.
 - ii. Operating modes which include:
 - sequential left arrow or chevron,
 - sequential right arrow or chevron,
 - sequential double arrow or chevron,
 - horizontal bar,
 - all flash warning mode.
 - iii. The arrowboard shall be controlled from a console located in the vehicle cab.
 - iv. The arrowboard display shall be visible to traffic approaching the rear of the trucks.
- d) A "Slow Moving Vehicle" sign. The sign shall be mounted at the rear of the vehicle and shall be visible to the public only when the paint truck is applying paint.
- e) A warning sign, mounted at the rear of the truck, stating "Wet Paint - Keep Off". The sign shall have standard warning colours and shall be visible to the public only when the paint truck is applying paint.

Operation of the paint truck against the flow of traffic is not permitted.

8.1.3.4 Pavement Surface and Atmospheric Conditions

Painting shall not be carried out during the following conditions: When the ambient temperature is below 0°C for solvent based paints, and 10°C for water-based paints, when wind conditions cause overspray, when the visibility is less than 700 m and during periods of rainfall.

Areas to be painted shall be clean and dry during the application of paint.

Prior to the commencement of work, the Contractor shall inspect the areas to be painted to ensure they are clean, dry, free of sand and debris and suitable for painting.

The Contractor shall carry out sweeping operations as required, prior to the application of the roadway markings.

8.1.3.5 Hours of Work

The Contractor shall only carry out roadway marking operations during hours of daylight and must receive approval from the Engineer prior to commencing roadway marking operations. There will be no payment for roadway markings applied during hours of darkness or without the Engineer's approval.

The Engineer's approval to commence roadway marking operations shall in no way relieve the Contractor from their obligation to provide materials, mixtures and workmanship in accordance with the Specifications.

8.1.3.6 Paint and Bead ApplicationPaint

The Contractor shall apply paint to the road surface such that all markings have a minimum wet film thickness of 375 microns (minimum 38.7 L/km of solid 100 mm wide line).

On tangents, the roadway lines shall not deviate more than 40 mm from either side of the tangent line at any point, as measured between the tangent line and the edge of the roadway marking.

Beads

Reflectorization of all painted markings shall be obtained by uniformly covering the markings with glass beads at a minimum rate of 600 gm/L of paint sprayed on the road surface. The glass beads shall be applied to the wet paint film on the roadway surface by means of guns and under air pressure, immediately following the application of paint.

Evaluation of Road Surface

The Contractor shall be responsible for evaluating the porosity and texture of the road surface and applying the paint and beads at rates and in a manner, which results in the optimum visibility and reflectivity of the markings. All roadway markings shall be applied uniformly in thickness and coverage with no splatter, excessive overspray, shadowing, bare areas or other defects.

8.1.3.7 Dimensions of Markings

Directional dividing line spacing for dashed or broken lines shall consist of 3 m dashes and 6 m gaps.

Unless otherwise specified, all directional dividing lines, edge lines, lane lines and continuity lines shall be 100 mm wide.

Edge line markings shall be applied no less than 100 mm clear distance from the edge of the pavement surface.

Gore areas, arrows and stop lines shall be applied in accordance with the Drawings.

Crosswalk areas and railway crossing markings shall be applied in accordance with the standards set out in the latest edition of the *Manual of Uniform Traffic Control Devices for Canada*.

8.1.3.8 Existing Paint and Traffic Markings

When painting is required in areas where there are existing paint and traffic markings, the Contractor shall ensure that the paint and markings match the existing paint and markings exactly, unless specified otherwise.

When specified, remove existing painted roadway markings prior to the application of new Painted Roadway Markings. Removal of the existing painted roadway markings shall be considered incidental unless a separate bid item is identified.

8.1.3.9 Protection of Markings

The Contractor shall make every reasonable effort to protect the roadway markings from damage until they are dry. This shall include the use of warning signs and traffic cones as required. Roadway markings which in the opinion of the Engineer have been damaged as a result of the Contractor's failure to reasonably protect the Work will not be eligible for payment. The Contractor shall repair and make good the damaged Painted Roadway Markings at the Contractor's expense to the satisfaction of the Engineer.

8.1.3.10 Quality of Markings and Acceptance Criteria

Painted Roadway Markings which in the opinion of the Engineer do not comply with the Specifications for application rates, thickness, visibility, reflectivity, coverage, overspray, shadowing, dimensions, alignment, straightness and location shall be removed, repaired or repainted by the Contractor, as required by the Engineer, at the Contractor's expense.

Acceptance Criteria

- a) All painted lines shall not exceed a dimensional width of 110 mm for specified 100 mm wide line.
- b) No tolerance below 100 mm is allowed for the specified 100 mm wide line.
- c) All painted lines shall not exceed a dimensional width of 210 mm for specified 200 mm wide line.
- d) No tolerance below 200 mm is allowed for the specified 200 mm wide line.
- e) All painted direction dividing, lane dividing or continuity lines shall not exceed a maximum dimensional length deviation of +/- 100 mm for specified 3 m length of line.
- f) All spaces between painted direction dividing, lane dividing or continuity lines shall not exceed a maximum dimensional length deviation of +/- 100 mm for specified 6 m or 3 m length of space.
- g) All paint shall be applied at the proper locations in accordance with the Drawings or as directed by the Engineer.
- h) All paint and glass beads shall be uniformly applied.
- i) All painted lines shall be uniform in thickness and free of tire tracking, with no splatter, excessive overspray or other defects.

8.1.3.11 Removal of Incorrectly Painted Markings

Any markings that are incorrectly painted by the Contractor or painted where no markings are specified shall be removed by the Contractor at their own expense and to the satisfaction of the Engineer. The method and equipment used by the Contractor to remove incorrectly painted markings shall be subject to the Engineer's approval.

8.1.3.12 Contractor's Records and Reporting

The Contractor shall maintain complete and accurate records of the daily production and quantities of paints and glass beads used, weather conditions and other details relevant to the Work.

The Contractor shall provide original copies of this information to the Engineer on industry standard forms, daily.

8.1.4 MEASUREMENT AND PAYMENT

Payment for Supply and Apply Painted Roadway Directional Dividing Lines, Edge Lines, Lane Lines and Continuity Lines will be at the Contract unit price per line-kilometre.

Directional dividing lines consisting of two lines will be considered as one line for measurement and payment purposes.

Payment for Supply and Apply Painted Roadway Gore Area and Crosswalk Area Markings will be at the Contract unit price per square metre.

Payment for Supply and Apply Painted Roadway Arrows, Stop Lines and Railway Crossing Markings will be at the Contract unit price per unit.

The unit price shall be compensation in full for inspecting and evaluating the roadway surface, cleaning, sweeping, all surveying, layout and referencing, supplying and applying centreline spotting material, applicable pre-marking, paint truck, pilot truck, ordering, purchasing, scheduling, delivering, supplying, storage facilities, handling, storing, sampling and applying paint and glass beads, quality control and quality control testing, protection of markings, signing, traffic control and accommodation, safety, record keeping and reporting and the supply of all equipment, labour, materials, tools and incidentals required for the supply and application of the painted roadway markings in accordance with the Specifications.

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8.2 SECTION 2 – PORTLAND CEMENT CONCRETE**8.2.1 DESCRIPTION**

This Specification refers to the supply and production of Portland cement concrete for Roadway Concrete (Division 8, Section 3) such as curbs, gutters, sidewalks, medians and traffic islands.

8.2.2 SUPPLY

Unless otherwise specified, the Contractor shall be responsible for the supply and delivery of all Portland cement, coarse aggregate, fine aggregate, water, and admixtures where required.

The Contractor shall indicate in their bid submission under "List of Subcontractors", their designated source of all specified Portland cement, aggregates, water and admixtures.

8.2.2.1 Cement Storage Facilities

The Contractor shall provide, at their expense and to the satisfaction of the Engineer, cement storage facilities of sufficient capacity to store all cement ordered to the job site and, notwithstanding the foregoing, shall provide, at least, sufficient cement storage capacity to store the cement required for one full day of production. Cement storage facilities shall be capable of protecting the materials from the weather.

When more than one type of cementitious material is specified, separate storage shall be provided for each type.

Cement and cementitious materials shall be stored and handled in such a way as to prevent any damage or contamination.

8.2.2.2 Protection of Materials

No cement type shall be mixed with a different type or with any other material without the specific approval of the Engineer.

The Contractor shall take all necessary precautions to prevent contamination of the cement by cement of another type or by any deleterious material. Any cement contaminated, or damaged for any reason whatsoever, shall be replaced by the Contractor at their own expense.

The Contractor shall take all necessary precautions to prevent the segregation, damage and contamination of all aggregates used in the production of Portland cement concrete. Any segregated, damaged or contaminated aggregate shall be replaced by the Contractor at their own expense.

8.2.2.3 Production of Concrete

The Contractor is responsible for the proper operation and maintenance of all equipment necessary for handling materials, producing and delivering of the concrete and performing all parts of the Work to meet this Specification.

Concrete shall be supplied from a facility that is certified in accordance with a recognized independent concrete organization which operates a formal facility certification program. Certification shall conform to a recognized standard (e.g., ASTM C94 and/or ASTM C685), be completed by a Professional Engineer, and shall include periodic documentation that demonstrates compliance with the applicable certification standard.

Scales or other mass-measuring devices shall be accurate to $\pm 0.4\%$ of the total capacity of the device when static-load-tested. A certificate of accuracy not more than 180 days old shall be provided for the scales or measuring devices by a company using weights traceable to national standards. Where there is reasonable

doubt concerning the accuracy of the scales or measuring devices, the Department may require calibration before or during progress of Work.

8.2.2.4 Sampling and Testing

In accordance with Division 2, quality control testing and inspections are the sole responsibility of the Contractor. The Contractor shall outline in the QC Plan the quality control planned for Portland cement concrete.

Quality assurance sampling, testing and inspections may be performed by the Engineer and/or their representative on all cement and concrete materials.

The Contractor shall cooperate with the Engineer and/or their representatives in obtaining the samples required, and shall provide safe, convenient access, acceptable to the Engineer for inspection and sampling of materials used to supply the Portland cement concrete.

All properties shall be determined in accordance with the requirements of the latest versions of CSA A23.1 (Concrete Materials and Methods of Concrete Construction), CSA A23.2 (Test Methods and Standard Practices for Concrete), and CSA A3000 (Cementitious Materials Compendium).

Field sampling and test procedures shall be carried out in accordance with the requirements of CSA A23.2 by personnel certified under an industry-recognized program such as: CSA A283 or ISO 9001 with equivalent scope to CSA A283; CCIL Certified Concrete Testing Technician; or ACI Concrete Field Testing Technician Grade 1.

8.2.3 MATERIALS

8.2.3.1 Portland Cements and Supplementary Cementitious Materials

Portland cements and all cementitious materials shall conform to CSA A3001.

Unless otherwise specified, Type GU (General Use) Portland cement shall be used in all concrete.

The blending proportions of the supplementary cementitious materials shall not qualify the concrete mix design as a concrete made with high-volume supplementary cementing materials (HVSCM) as defined by CSA A23.1, clause 8.7. Use of HVSCM concrete shall be subject to the prior approval of the Engineer.

8.2.3.2 Water

Water used for producing and curing shall conform to the requirements of the latest version of CSA A23.1/A23.2.

Water deemed not potable shall be subject to the prior approval of the Engineer. The testing shall be performed by an organization certified by the Standard Council Canada.

8.2.3.3 Aggregates

All aggregates used in the production of Portland cement concrete shall conform to the requirements of the latest version of CSA Standard CSA A23.1, Concrete Materials and Methods of Concrete Construction. All aggregates shall be subject to the prior approval of the Engineer.

8.2.3.4 Admixtures

All admixtures shall be in liquid form and non-chloride base. The admixtures shall be stored and handled in accordance with the requirements of the manufacturer. All admixtures shall be supplied by one manufacturer.

Air Entraining Agent

Air entraining admixtures shall conform to the requirements of the latest version of CSA A23.1 and ASTM C260. Air-entraining admixtures shall be subject to the prior approval of the Engineer.

Water-Reducing Admixture

Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. High-range water reducing admixtures (superplasticizers) shall meet the requirements of ASTM C494, Type A and F or ASTM C1017.

Other Admixtures

Where the use of other admixtures is approved by the Engineer, the admixtures shall conform to the requirements of the latest versions of CSAA23.1 and ASTM C494.

8.2.3.5 Aggregates

Aggregates are suitable for most concrete applications if the aggregates comply with Clauses 4.2.3.1 to 4.2.3.7 and Tables 10 to 12 of the latest version of CSA A23.1.

Additionally, the maximum Petrographic Number (PN) of coarse aggregate shall not exceed 125 for concrete pavements and shall not exceed 140 for Structures, Sidewalk, Curb and Gutter, and Concrete Base, and shall be determined in accordance with CSA A23.2-15A. The petrographic analysis report shall be signed and sealed by a Professional Engineer or a Professional Geologist.

Fine aggregates shall have no more than 45% passing any sieve and retained on the next consecutive sieve. The fineness modulus shall be a minimum of 2.3 and a maximum of 3.1.

All aggregates shall be subject to the prior approval of the Engineer. All required supporting test data shall be less than 12 months old at the time the concrete mix design is submitted.

8.2.4 CONSTRUCTION**8.2.4.1 Mix Design**

The concrete shall be produced in accordance with CSA A23.1, Table 5, Alternative Number 1, Performance Approach. The Contractor is responsible for the preparation and submission of a mix design for the production of Portland cement concrete to be used in the Contract. The concrete mix shall be designed to provide adequate strength and durability for the intended use and to meet the requirements specified in the Contract.

The Contractor shall use professional engineering services and a qualified testing laboratory licensed to practice in the Northwest Territories to carry out the design of the concrete mixture.

A complete mix design submission (e.g., the Sample Concrete Mix Submittal Form in CSA A23.1- Annex J), shall be submitted to the Engineer for approval a minimum of seven days prior to the production of concrete. The Contractor shall not produce concrete until the mix design has been approved by the Engineer.

If, during the progress of the Work, it is determined that the concrete does not meet the requirements of the Specification, the Contractor shall provide a new mix design for the Engineer's approval, in accordance with the foregoing requirements.

All concrete shall be produced in accordance with the approved mix design.

8.2.4.2 Class of Concrete and Properties

The CSA Class of Exposure of the concrete and its corresponding properties (i.e., maximum water-to-cementing materials ratio, minimum specified compressive strength, air content category, curing type and chloride penetrability requirement) and any additional/special performance requirements of the Portland cement concrete at 28 days shall be specified in the Contract.

Unless otherwise specified, the concrete for concrete roadway structures such as curbs, gutters, sidewalks, medians and traffic islands shall be CSA Class of Exposure of C-2 concrete with a minimum 28-day compressive strength of 32 MPa and shall have a nominal maximum aggregate size of 19 mm. The air content of plastic concrete shall be 5.0% to 8.0% ($6.5 \pm 1.5\%$) at the time of placement.

8.2.4.3 Air Content

The air content of the plastic concrete shall be in accordance with the requirements of the latest version of CSA A23.1, Table 4 based on the nominal maximum size of the coarse aggregate and air content category.

8.2.4.4 Slump

The minimum permissible slump shall be that which allows the concrete to be placed efficiently and provide a homogenous mass. The maximum permissible slump shall be 80 mm, ± 30 mm, unless otherwise specified in the contract documents.

When superplasticizer is approved by the Engineer, the Contractor shall identify target slump for the concrete after the addition of superplasticizer. The tolerance on measurement of concrete slump after addition of superplasticizer shall be ± 30 mm and the maximum slump including tolerance shall not exceed 230 mm. Slump of concrete shall be measured before and after the addition of superplasticizer.

Re-tempering concrete by adding water will not be permitted.

8.2.4.5 Concrete Temperature

The concrete temperature at the time of placement shall be according to the requirements of the latest version CSA A23.1, Table 14 based on the thickness of the section.

8.2.4.6 Sampling and Testing

All sampling and testing shall be in accordance with the requirements of the latest version of CSA A23.1 and CSA A23.2 by personnel certified under an industry-recognized program. Temperature shall be measured according to CSA A23.2-17C. Slump shall be measured according to CSA A23.2-5C. Air content shall be measured according to CSA A23.2-4C. Compressive strength shall be measured according to CSA A23.2-9C. Copies of calibration certificates shall be available for review.

Samples for determining acceptance of concrete for slump and air shall be collected according to CSA A23.2-1C after approximately 10% of the load has been discharged. The discharge shall be stopped until found acceptable. If the test results indicate that the concrete does not meet the specified requirements and adjustments permitted in the Acceptance and Field Adjustments of Plastic Concrete clause cannot produce acceptable concrete, the remainder of the load shall be rejected.

Slump, air content, and temperature shall be measured on each load of concrete until satisfactory control is established. It is established when five consecutive concrete loads are within the specified requirements without field adjustments as described in the Acceptance and Field Adjustments of Plastic Concrete clause. After satisfactory control has been established, quality control testing shall be carried out on every third load.

If testing indicates that a load does not meet the requirements, quality control testing shall resume on each load until satisfactory control is established.

Not less than one compressive strength test shall be made from samples from each 50 m³ of concrete placed, and in no case shall there be less than one test from each day's production. Concrete test cylinders for compressive strength testing for acceptance, and for referee testing purposes where required, shall be cast, cured and transported according to CSA A23.2-3C. One set of cylinders for concrete made with aggregate of nominal maximum size larger than 19.0 mm shall consist of three 150 mm diameter x 300 mm long cylinders. For all other concrete, a set of cylinders shall consist of four 100 mm diameter x 200 mm long cylinders. Additional samples may be cast, at the discretion of the Engineer or Contractor.

When any individual strength test result falls below the specified minimum strength at the corresponding testing age by more than 3.5 MPa or when the average strength test result falls below the specified minimum strength, the Engineer may require the Contractor to extract and test concrete cores in accordance with CSA-A23.2-14C by an independent CSA certified testing laboratory. The compressive strength of the concrete in the area of the structure represented by the core tests shall be considered adequate when satisfies the requirements of clause 4.4.6.6.2.2 of the CSA A23.1. Unacceptable concrete shall be subject to removal and replacement.

The Contractor shall supply temperature-controlled storage boxes (e.g., cooler box), as specified in Subsection 8.3.2.1 of CSA A23.2-3C, to store the samples for a period of not less than 24 hours or until removed from the site. The Contractor shall place a max-min thermometer in each storage box and record site curing temperatures. Further protection from adverse weather conditions may be required.

Slump, temperature of plastic concrete, air content shall be determined in conjunction with each strength test.

The Contractor is responsible to deliver the test cylinders to an independent CCIL certified testing laboratory.

8.2.4.7 Acceptance and Field Adjustments of Plastic Concrete

Slump of concrete shall be measured before and after the addition of superplasticizer (if allowed by the Engineer). Air content shall be measured after any addition of superplasticizer. No field adjustment for air content or temperature shall be permitted.

The following actions may be allowed prior to acceptance of the load when the measured slump is high:

- a) Concrete before addition of superplasticizer or concrete without superplasticizer: When the measured slump is higher than that specified, the Contractor shall be permitted to immediately measure the slump again when there is time available within the discharge time limit specified. When the measured slump is higher than that specified, the plastic concrete shall be rejected.
- b) Concrete containing superplasticizer: When superplasticizer is added on site and the measured slump prior to addition of superplasticizer is within specified limits but exceeds the upper limit after the addition of superplasticizer and there is time available within the discharge time limit specified, the Contractor shall be permitted to wait and measure the slump again. If the measured slump is higher than that specified, the plastic concrete shall be rejected.

The following field adjustments may be carried out prior to acceptance of the load when the measured slump is low:

- a) For site-added superplasticizer:
 - i. Water may be added before superplasticizer is added at the site. Water additions may be done

- before discharge of concrete from the truck has started or when the measured slump of concrete is lower than the maximum targeted range provided the extra water does not exceed the maximum specified water-to-cementing ratio of the mixture.
 - ii. No water shall be added after the addition of a superplasticizer. Only one dosage of the superplasticizer is allowed.
- b) For plant-added superplasticizer:
- i. No water shall be added at the site.
 - ii. Only one dosage of the superplasticizer may be added.

To ensure that the concrete is uniformly mixed, the load of concrete shall be mixed for 30 revolutions or more at the designated mixing speed after the field adjustment. The load shall be tested for acceptance for slump, air content and temperature.

8.2.4.8 Discharge Time

When concrete is transported to the site by means of agitating or mixing equipment, discharge of the concrete shall be completed within 120 minutes after introduction of the mixing water to the cement and aggregates, except when the air temperature exceeds 28°C, the concrete shall be discharged within one hour after the introduction of the mixing water.

Exceptions to the maximum time limit, if required, shall be approved by the Engineer prior to placement of the concrete.

8.2.4.9 Delivery Ticket

A delivery ticket shall be issued for each load. The following information shall be printed on each delivery ticket:

- a) Contract number;
- b) Date and time of batching concrete;
- c) Address of the batching plant;
- d) Truck number;
- e) Any adjustments at the site;
- f) Concrete Mix Design number; and
- g) Specified minimum compressive strength of concrete at the corresponding testing age.

8.2.4.10 Submission of Plastic Concrete Test Results

After each day's work, the Contractor shall submit to the Engineer a copy of the delivery ticket for each load of concrete and a daily summary report summarizing air contents, slumps before and after any modifications, concrete temperature, and all adjustments made to each load of concrete and shall identify rejected material.

8.2.4.11 Submission of Hardened Concrete Test Results

The test results on the hardened properties of the concrete along with the properties of the fresh concrete and recorded max-min temperatures during the first 24 hours shall be provided to the Engineer once they become available. One cylinder shall be tested at seven days. Three cylinders shall be tested at 28 days. Three cylinders shall be tested at 56 days (when required).

The compressive strength of concrete shall be considered satisfactory if: the averages of all sets of three consecutive strength tests equal or exceed the specified strength with no individual strength test result below the specified minimum strength by more than 3.5 MPa.

8.2.5 BASIS OF PAYMENT

Supply and Production of Portland Cement Concrete will not be measured separately for payment but shall be measured and paid for in accordance with the applicable Specifications for the respective structure for which the concrete is being used.

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8.3 SECTION 3 – ROADWAY CONCRETE

8.3.1 DESCRIPTION

This Specification refers to concrete roadway structures, such as curbs, gutters, sidewalks, medians and traffic islands.

These structures shall consist of air entrained Portland cement concrete with or without reinforcing steel, prepared in accordance with the Specifications and to the lines, grades and typical cross-sections as shown in the Drawings or as designated by the Engineer.

8.3.2 SUPPLY AND MATERIALS

8.3.2.1 Supply

Unless otherwise specified, the Contractor shall be responsible for the supply of all materials, including concrete, formwork, bedding, joint filler, curing compound, and reinforcing steel.

8.3.2.2 Materials

- a) Concrete shall be in accordance with Division 8, Section 2, Portland cement concrete and the Class of Exposure shall be according to the most recent version of CSA A23.1, Table 1. Coarse aggregate for the concrete shall have a nominal maximum size of 19.0 mm.
- b) Bedding and/or level course aggregate shall be Designation 2, Class 20 crushed granular base course.
- c) Joint filler shall conform to the requirements in the most recent version of ASTM D1751 and shall be of adequate dimensions to fill the joint fully and continuously throughout its entire depth.
- d) Curing compound shall conform to the most recent version of ASTM C309, Type 2 (white pigmented), Class B (must be a resin).
- e) Reinforcing bars shall conform to the most recent version of CSA G30 Grade 400W and shall be deformed bar unless indicated otherwise on the Drawings. Welded steel wire fabric shall conform to the most recent version of ASTM A1064.

8.3.3 CONSTRUCTION

8.3.3.1 General

Equipment and methods used on this work shall be suitable to produce and place materials as specified herein and shall be subject to the approval of the Engineer. The Engineer may order the discontinuance of use of any equipment or method which, in the opinion of the Engineer, fails to produce satisfactory results.

8.3.3.2 Testing

General

In accordance with Division 2, quality control testing and inspections are the sole responsibility of the Contractor. The Contractor shall outline in the QC Plan the quality control planned for the Concrete Roadway Structures.

Quality assurance testing and inspections may be performed by the Engineer and/or their representative who shall take samples, carry out testing and inspection of materials incorporated or being incorporated into the Work. The Contractor shall cooperate with the Engineer during the sampling, testing and inspection. Such inspection and testing shall not relieve the Contractor from any obligation to perform all the Work in accordance with the requirements of the Contract.

Results of the tests will be made available to the Contractor for their information. The Contractor shall be responsible for interpretation of test results and alter their operation if necessary, so that the product meets

the Specifications.

Test Methods

Unless otherwise specified, the most recent versions of the following test methods shall be used to determine the material characteristics.

Test Description	Method No.
Slump	CSA A23.2-5C
Plastic Air Content	CSA A23.2-7C
Concrete Temperature	CSA A23.2-17C
Compressive Strength	CSA A23.2-9C
Hardened Air Void System	ASTM C457
Rapid Chloride Permeability	CSA A23.2-23C

8.3.3.3 Construction Conditions

Concrete shall not be placed during heavy rain, snow, freezing temperatures or other unsuitable conditions. Concrete shall not be placed upon a frozen, wet, muddy or rutted base unless otherwise directed by the Engineer.

Concrete shall not be placed when it appears likely that the temperature will fall below 5°C within the next twenty-four hours, unless special precautions approved by the Engineer are taken.

8.3.3.4 Excavation and Subgrade Preparation

Excavation and subgrade preparation shall be as specified in Division 5, Section 4, Subgrade Preparation.

8.3.3.5 Level Course

Level course shall be placed and compacted to a maximum depth of 50 mm as required to adjust the subgrade to the design grades and cross-sections.

8.3.3.6 Dimensions

Concrete roadway structures shall be constructed to the dimensions shown in the Drawings, or as designated by the Engineer.

8.3.3.7 Joints

Expansion Joints

Expansion joints shall be formed at the beginning and end of all curves. The expansion joint material shall be installed flush with the concrete surfaces.

Isolation Joints

Isolation joints shall be formed using joint filler around telephone poles, light poles, hydrants, manholes and all other structures located within the curb and gutter and sidewalk areas.

Longitudinal isolation joints shall be formed using joint filler where sidewalk is installed directly against a wall or other permanent or fixed structure.

Contraction Joints

Contraction joints shall be sawcut or formed within a sufficient time of placing the concrete to prevent uncontrolled cracking.

a) Curb and Gutter

Transverse contraction joints shall be constructed every 3 m by means of sawcut or formed or as approved by the Engineer. Joints shall be not less than 50 mm in depth and shall be 5 mm in width. When steel plates are used, an area of not less than 50% of the concrete shall be continuous through the joint. The joint shall be edged with a tool having a radius of 5 mm.

b) Sidewalk

Transverse contraction joints shall be constructed every 3 m by means of sawcut or formed or as approved by the Engineer. Joints shall be not less than 50 mm in depth and shall be 5 mm in width. The joint shall be edged with a tool having a radius of 5 mm.

c) Monolithic Sidewalk curb and Gutter

Transverse contraction joints shall be constructed every 3 m by means of sawcut or formed or as approved by the Engineer. Joints shall be not less than 50 mm in depth and shall be 5 mm in width and shall extend through the full width of the monolithic sidewalk, curb and gutter. The joint shall be edged with a tool having a radius of 5 mm.

Surface Joints

a) Sidewalk

Transverse surface joints shall be constructed midway between contraction joints and shall be 15 mm deep and 5 mm wide. The joints shall be edged with a tool having a radius of 5 mm.

b) Monolithic Sidewalk Curb and Gutter

Transverse surface joints shall be constructed midway between contraction joints and shall be constructed the full width of the sidewalk but shall not extend through the curb and gutter section. An additional surface joint shall be constructed to mark the back of the curbs. This joint shall be at the distance from the back of the walk as shown on the drawings and shall be continuous through all driveway and lane crossings. The surface joints shall be 15 mm deep, 5 mm wide and edged with a tool having a radius of 5 mm.

8.3.3.8 Steel Reinforcement

Steel reinforcement, dowels or tie bars, when specified, shall be properly spaced, aligned, and held in the correct position during the placement of the concrete using bar chairs or other means to be approved by the Engineer. Longitudinal bars shall extend through all contraction joints and shall terminate a minimum of 50 mm from any expansion or construction joint. Bars shall overlap at splices by at least 300 mm.

8.3.3.9 Wire Mesh Reinforcement

Wire mesh reinforcement, when specified, shall be properly placed and held in the correct position during the placement of concrete using chairs or other means approved by the Engineer. Joints in the wire mesh shall be overlapped 100 mm. Wire mesh reinforcement shall terminate a minimum of 50 mm from any expansion or construction joint.

8.3.3.10 Extra Reinforcing Bars

Extra reinforcing bars shall be installed in concrete roadway structures as directed by the Engineer.

8.3.3.11 Crossings

Lane, commercial and private crossings shall be constructed on prepared bases at locations and to the depths and widths indicated on the Drawings and as directed by the Engineer. When specified, crossings shall be

reinforced with steel wire mesh.

8.3.3.12 Precast Sections

Precast sections shall be placed on a prepared base, to the lines and grades specified, as shown on the Drawings or as directed by the Engineer.

8.3.3.13 Construction with Forms

Forms

Forms may be either steel or wood but shall produce a true line without irregularities in the alignment. Flexible forms shall be used for all structures having a radius less than 40 m. Forms shall be cleaned of hardened concrete or other foreign matter and shall be smooth and free from warps and holes and shall be constructed and maintained to be mortar tight. Any form which has lost its shape or has become dented or rough shall not be used. Enough forms shall be placed and checked before concrete is poured to ensure true line and grade. The forms shall be well-stayed and braced or otherwise held rigidly to the established line and grade. Any form which has lost its shape or has become dented or rough shall not be used.

Placing Concrete

Concrete shall be placed only after the forms have been inspected and approved by the Engineer.

Concrete shall be placed only on base which is sufficiently moist to prevent absorption of water from the freshly placed concrete. Where necessary, the base be sprinkled with water to raise the moisture content to the desired level.

All forms shall be thoroughly moistened or oiled prior to placing concrete. Chemicals shall not be used to remove ice or hardened loss of the ingredients.

Concrete shall be handled from the mixer to the place of use as rapidly as possible by methods which will prevent the separation or loss of the ingredients. Concrete shall be deposited in the forms as close as possible to its ultimate location to reduce rehandling or flowing.

Under no circumstances shall concrete that has partially hardened or exceeded the specified delivery time be used.

A mechanical vibrator shall be used during the concrete placing operation as required to eliminate air pockets and honeycombing. To secure uniform dense surfaces, vibration shall be supplemented by hand spading.

Pours shall start and stop at expansion joint and surplus material shall be wasted.

Stripping Forms

The face of curb form shall be removed within two hours after the initial set to permit proper finishing of the concrete. Adequate care shall be taken to avoid damage to the concrete surface when removing the forms. Any patching that is necessary shall be done immediately after the forms have been removed.

8.3.3.14 Construction with Extruding Equipment

Equipment

Slip-form paving machines or concrete extruding machines may be used for placing concrete provided they meet the following requirements and have been approved by the Engineer prior to commencement of the Work.

a) Vibrators

The vibrators on the equipment shall be adequate to produce a dense mass with a smooth surface free of honeycombing. Internal vibrators shall be of the high frequency type with 8,000 minimum to 12,000 maximum vibrations per minute when immersed in concrete. External vibrators shall have a minimum frequency of 3,600 vibrations per minute.

b) Grade Control

The equipment shall include automatic grade and line control.

Additional Subgrade Preparation

Any special grading or preparation of the subgrade required by the Contractor to accommodate their equipment shall be the responsibility of the Contractor. The roadway and right-of-way shall be restored promptly to their original condition after the extruding operation is completed.

Continuity of Work

Whenever possible, the hand forming and placing of concrete as may be required at corners, driveways and catch basins shall be carried out in conjunction with the extruding machine operation. Where this procedure is not practical, the "fill-ins" shall be completed within seven days after construction of the adjacent extruded sections.

8.3.3.15 FinishingCurb and Gutter

The top of the gutter and the top and face of the curb shall be troweled to a smooth finish and the edges neatly rounded by use of a 5 mm radius edging tool. Excessive troweling shall be avoided. The final finish shall be lengthwise brushing with a soft bristle brush as approved by the Engineer. Neat cement or water shall not be used in the finishing process.

Surface cavities larger than 50 mm and any honeycombed areas occurring along the formed surfaces shall be filled with mortar composed of one part Portland cement and two parts sand with 12% of entrained air. The location of repair areas shall be reported to the Engineer.

Sidewalk and Medians

The top of the sidewalk shall be troweled to a smooth, uniform finish. Excessive troweling shall be avoided. The final finish shall be a transverse brushing with a soft bristle brush approved by the Engineer. The edges shall be neatly rounded by use of a 5 mm radius edging tool. Neat cement or water shall not be used in the finishing process.

Surface cavities larger than 50 mm and any honeycombed areas occurring along the formed surfaces shall be filled with mortar composed of one part Portland cement and two parts sand with 12% of entrained air. The location of repair areas shall be reported to the Engineer.

8.3.3.16 Identification StampContractor and Year of Construction

The Contractor shall mark the concrete structure with a marking tool showing the initials of the Contractor and the year of construction. These marks shall be made at the ends of each block and at the termination points if the construction is terminated within the middle of a block.

Reinforcing steel

All sections containing reinforcing steel shall be marked at their extreme limits with a marking tool showing the letter "R".

Curb Boxes

Any sidewalks constructed adjacent to curb boxes shall be marked directly opposite the curb box with a marking tool showing the letter "CC".

The letters and numerals of the marking tools shall be approximately 50 mm high.

8.3.3.17 Curing

The surface of the concrete shall be protected from the sun and wind by an approved curing compound. This protection shall be accomplished by coating the entire exposed surface of the concrete with a curing compound immediately after the concrete has received its finish treatment. The curing compound shall be approved by the Engineer prior to application. When the front and the back forms are removed, the exposed concrete surfaces shall immediately be coated with the approved material.

The curing compound shall be applied uniformly at the manufacturer's recommended rate of application by means of a pressure spray distributor. The curing compound shall be so applied that the concrete surface is completely coated. A second application of curing compound shall be applied within 30 to 60 minutes after the first application. The surface shall be maintained in this condition for a minimum period of seven days.

Under no circumstances shall any material be added to the curing compound as delivered by the manufacturer.

8.3.3.18 Hot Weather Requirements

When the ambient air temperature is at or above 27°C, or when there is a probability of the temperature rising above to 27°C during the placing period (as forecast by the nearest official meteorological office), facilities shall be provided for protection of the concrete in place from the effects of hot and/or drying weather conditions in accordance with the most recent version of CSA A23.1, clause 7.1.1. Concrete shall be protected from excessive loss of moisture during periods of hot or windy weather. Placing operations shall be discontinued if surface cracking due to excessive drying is evident.

8.3.3.19 Cold Weather Requirements

When there is a probability of the air temperature falling below 5°C within 24 hours of placing (as forecast by the nearest official meteorological office), all materials and equipment needed for adequate protection and curing shall be on hand and ready for use before concrete placement is started as per the most recent version of CSA A23.1, clause 7.1.2. All reinforcing materials, forms, and ground with which the concrete is to come in contact shall be defrosted by means of live steam, or as approved by the Engineer. Calcium chloride or other de-icing salts shall not be used.

During cold weather, as defined above, adequate protection of the concrete by means of heated enclosures, coverings, insulation or a combination of these methods shall be provided that will maintain the concrete temperature at a minimum of 10°C for the duration of the required curing period. The protective measures shall be modified as necessary.

Protective coverings used to conserve heat shall be kept clear of the concrete to permit free circulation of air.

Straw or similar materials for protection against frost shall not be allowed to come in contact with fresh concrete.

8.3.3.20 Frozen Concrete

Concrete showing evidence of freezing shall be replaced and removed from the job at the Contractor's expense.

8.3.3.21 Backfilling Structures

The boulevard area behind the concrete structures, medians or traffic islands shall be cleared of construction debris prior to backfilling to the design cross section with the specified material. Backfill shall be placed as shown on the Drawings or as staked by the Engineer. Placing of the backfill shall be done promptly after the forms have been stripped to avoid any possible damage to the concrete structure. The Contractor shall leave all backfill areas in a trimmed, neat condition.

8.3.3.22 Finished GradesSurface

All exposed concrete surfaces shall be checked by the Contractor with a 3 m straightedge, and any water pockets or deviations in line or grade exceeding 5 mm shall be corrected immediately, at the Contractor's expense.

Elevation

Differences in elevation at any given point from that specified shall not exceed ± 25 mm and the variation over 10 m intervals shall not be greater than 25 mm. Any deviations greater than those specified shall be corrected immediately at the Contractor's expense.

8.3.4 REQUIREMENTS FOR ACCEPTANCE

Completed concrete work will not be accepted unless the following requirements have been met:

8.3.4.1 Strength

If the concrete strength requirements specified in Division 8, Section 2, Portland cement concrete, are not met, the construction represented by the low tests is not acceptable and shall be removed and replaced. Removing and replacing of rejected concrete construction shall be done at the Contractor's expense.

8.3.4.2 Air Content

If the measured air content falls outside the limits specified in Division 8, Section 2, Portland cement concrete, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the load or batch of concrete shall be rejected. No field adjustment for air content will be allowed. Replacement of the rejected material shall be done at the Contractor's expense.

8.3.4.3 Slump

If the measured slump falls outside the limits specified in Division 8, Section 2, Portland cement concrete, a check test shall be made immediately on another portion of the same sample. If the second test results indicate that the concrete does not meet the specified requirements and adjustments permitted in the Acceptance and Field Adjustments of Plastic Concrete clause cannot produce acceptable concrete the load or batch of concrete shall be rejected. Replacement of the rejected material shall be done at the Contractor's expense.

8.3.4.4 Other

Any work found to be defective or damaged by weather, traffic or other causes, shall be repaired or removed and replaced, as directed by the Engineer, at the Contractor's expense.

8.3.5 BASIS OF PAYMENT

8.3.5.1 **General**

The quantities, determined as specified, will be paid for at the applicable Contract unit prices which shall be compensation in full for permits, royalties, aggregate purchase, excavating, crushing, blending, screening, elimination of fines, drying, storing, loading and stockpiling of aggregates; purchasing, transporting, storing and handling of cement; preparation of mix design, base preparation, levelling course, forming, concrete mixing and transporting, placing, vibrating, jointing, reinforcing, finishing, curing, backfilling, construction of crossings, and the supply of all materials, equipment, plants, labour, tools and incidentals necessary to complete the Work in accordance with the Specifications.

8.3.5.2 **Concrete Structures**

- a) Curbs, Gutters, Combination Curb and Gutter sections, Sidewalks, Monolithic Sidewalk Curb and Gutter Sections, concrete Barriers, and Swales or combinations thereof.

The following structures will be measured in linear metres to the nearest 0.1 m and payment will be made at the applicable contract unit price for the item:

- i. Curbs, measured along the length of the curb, with separate payment for each type of curb.
- ii. Gutters, and outlet gutters, measured along the length of the gutter.
- iii. Combination curb and gutter, measured along the length of the curb face.
- iv. Separate sidewalk, measured along the length, with separate payment for each specified width.
- v. Monolithic sidewalk curb and gutter, measured along the length, with separate payment for each specified width.
- vi. Swales, measured along the flow line.
- vii. Concrete barriers, measured along the length.

- b) Sidewalk Tie-in

Payment for sidewalk Tie-ins shall be at the all-inclusive Contract unit price per tie-in. Payment will be based on the actual number of sidewalk tie-ins completed.

- c) Solid Concrete Medians and Islands

Solid concrete medians and islands will be measured in square metres of completed top surface area and payment will be made at the applicable Contract unit price per square metre.

The unit prices for solid concrete medians and islands will include the cost of any curbing or curb and gutter forming part of the solid concrete median or island.

8.3.5.3 **Median and Island Fill**

Granular fill material for solid concrete medians or islands will be measured in tonnes and payment will be made under the applicable Contract unit price per tonne for the specified granular fill.

8.3.5.4 **Median Surfacing**

Median asphalt concrete surfacing will be measured in tonnes and payment will be made at the Contract unit price per tonne for Asphalt Concrete Pavement.

Median Portland cement concrete surfacing will be measured in square metres based on the width excluding the curbs and will be paid for at the Contract unit price per square metre for Median Concrete Surfacing. Separate payment will be made for the curb or curb and gutter section forming the perimeter of the median.

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8.4 SECTION 4 – ENGINEER'S CAMP AND BOARD**8.4.1 DESCRIPTION**

Engineer's Camp consists of the supply and operation of accommodation, kitchen facilities, housekeeping services, washroom, laundry and recreation facilities, and Engineer's Board consists of the provision of meals for the Department's Engineer's staff, and subject to the Engineer's approval.

8.4.2 GENERAL

The Contractor shall provide, set-up, operate and maintain, separate from their own camp, self-contained compartment trailer accommodations, including washroom, laundry and recreation facilities, for the exclusive use of the Engineer's staff.

The compartment trailer accommodations and washroom, laundry and recreation facilities shall be in good condition and subject to the approval of the Engineer.

The trailer shall have adequate windows on all sides with screens, shades and security bars, windproof, weatherproof and insulated with adequate lighting, heating, cool air conditioning, and ventilation.

8.4.3 ENGINEER'S CAMP**8.4.3.1 Accommodation Facilities**

Accommodation facilities shall include a minimum of two separate bedrooms plus living area. Each bedroom within the accommodation facilities shall be equipped with the following:

- a) One queen size bed (minimum) with three sets of linen with box spring and mattress, complete with a minimum of three blankets,
- b) One night table/writing shelf and one chair,
- c) One closet suitable for storage and hanging clothes, opening windows with screens,
- d) Entrances fitted with locking doors (keyed) and freezer-lock door handles that will accommodate padlocks, and
- e) Central vacuum.

8.4.3.2 Kitchen Facilities

Provide kitchen facilities in each accommodation as follows:

- a) A kitchen with appliances (refrigerator, freezer, stove top with oven, microwave oven, coffee maker) and kitchenware (pots and pans, cups, plates and bowls, cutlery, cutting knives and boards) and supplies (three sets of wash cloths and dish towels, serviettes),
- b) Stainless steel kitchen sinks, and
- c) Paper waste basket and kitchen garbage can.

8.4.3.3 Washroom and Laundry Facilities

The washroom and laundry facilities shall satisfactorily accommodate both male and female staff and shall include an electrically operated automatic clothes washer and dryer.

8.4.3.4 Recreation Facility

The recreation facility in each accommodation shall be equipped with the following:

- a) One sofa and one lounge chair,
- b) One remote controlled colour smart television (32-inch screen) and stand,

- c) Wi-Fi internet connection with minimum 150Mbps download speed and unlimited data restrictions. Fully active Wi-Fi to be provided throughout the camp.
- d) Phone, and
- e) Satellite dish with satellite receivers.

The Contractor shall also supply, install and maintain a satellite receiver dish fully compatible with and operational for use in conjunction with the television.

8.4.3.5 Housekeeping and Maintenance

The Contractor shall provide a minimum of two clean towels per day for each of the Engineer's staff staying in the camp. Clean linen shall be provided on a weekly basis, or whenever a change in personnel occurs.

The Contractor shall clean the living quarters, hallways and walkways and wash sinks, urinals, toilets, showers, washing machines and laundry tubs daily.

8.4.3.6 Smoke Detectors

All rooms shall be equipped with CSA approved smoke detectors and an adequate number of CSA approved fire extinguishers shall be installed throughout the facilities.

8.4.3.7 Location

The Contractor must receive approval from the applicable Land Use Authority of the location of the Engineer's camp and Contractor's camp, prior to set-up.

The Engineer's Camp may be located in the same general area as the Contractor's camp; however, the Engineer's camp facilities shall be arranged such that the privacy of the Engineer's staff is ensured.

8.4.4 ENGINEER'S BOARD

The Contractor shall provide all facilities, supplies, services, equipment, labour and materials necessary to supply the Engineer's staff with meals of the same quality and quantity as provided for the Contractor's staff. Meals shall be provided for visiting Department staff or Engineer's guests on an extra basis, if required.

8.4.5 AVAILABILITY REQUIREMENTS

The Engineer's Camp and Engineer's Board shall be set-up and fully operational for use by the Engineer and their staff an ample amount of time prior to the commencement of construction operations and shall remain fully operational until the completion of all construction operations.

8.4.6 MEASUREMENT

Measurement for Engineer's Camp will be for the number of months or portions thereof that the Engineer's staff is acceptably provided with accommodation, washroom, laundry and recreation facilities and housekeeping and maintenance services.

Measurement for Engineer's Board will be for the number of person-days or portions thereof that the Engineer's staff is registered in camp and acceptably provided with meals. Variations in person-day numbers may occur from time to time.

8.4.7 BASIS OF PAYMENT

Payment for Engineer's Camp will be at the Contract unit price per month or portions thereof.

Payment for Engineer's Board will be at the Contract unit price per person-day or portions thereof.

The unit prices shall be compensation in full for the supply, mobilization, set-up, operation, maintenance, dismantling and demobilization of the accommodation, washroom, laundry and recreation facilities and the provision of furnishings, housekeeping services, electrical power, heat, water, satellite, internet, sewage and garbage disposal, insurance and any other equipment, labour, materials, tools and incidentals necessary for the supply and operation of the Engineer's Camp and Engineer's Board in accordance with the Specifications.

Any costs incurred by the Department in providing suitable accommodations, meals and services for the Engineer's staff due to the Contractor's failure to provide these will be recovered from the Contractor.

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8.5 SECTION 5 – ENGINEER'S OFFICE TRAILER**8.5.1 DESCRIPTION**

This work consists of the supply and operation of an Engineer's Office Trailer for the Department's Engineer's staff.

8.5.2 GENERAL

The Contractor shall provide, set-up, operate and maintain, separate from their construction camp, a self-contained office trailer for the exclusive use of the Engineer and their staff.

The office trailer shall be in good condition and subject to the approval of the Engineer.

8.5.3 OFFICE TRAILER REQUIREMENTS

The Engineer's office trailer shall have minimum dimensions of 3 m by 16 m and ceiling height of 2.4 m. A separate and private office shall be located at one end of the trailer and the remaining area shall be open.

The trailer shall be equipped with the following minimum requirements:

- a) Adequate lighting inside and exterior entrance lights, heating, central cool air conditioning and ventilation.
- b) Windproof, weatherproof and insulated.
- c) Two lockable exterior doors equipped with steps and freezer-lock door handles that will accommodate padlocks.
- d) Adequate windows on all sides with screens, shades and security bars.
- e) Safe and reliable electricity supply and six double electrical wall receptacles.
- f) Resilient flooring materials.
- g) CSA approved smoke detectors and fire extinguishers.
- h) Satellite dish and receivers with internet connection with minimum 150 Mbps download speed and unlimited data restrictions. Fully active Wi-Fi to be provided throughout the office trailer.
- i) The Contractor shall provide heat, water, sewage disposal and electrical power to the trailer on a continuous 24-hour basis.
- j) Gravelled surface all weather parking.

Additional project specific requirements, if necessary, will be detailed in the Special Provisions.

8.5.4 FURNISHING REQUIREMENTS

The Engineer's office trailer shall be furnished with the following minimum furniture:

- a) Four desks with drawers
- b) Two tables (750 x 1500 mm each)
- c) Three bookcases with multiple shelves (1 m long)
- d) Four padded steno chairs with casters and four stacking chairs
- e) Two vertical filing cabinets (three drawers per cabinet)
- f) Three wastepaper baskets and one coat rack.

8.5.5 OFFICE TRAILER LOCATION

The Contractor must receive approval from the Engineer and the applicable Land Use Authority of the location of the Engineer's office trailer, prior to set-up.

The trailer shall be situated such that the privacy of the Engineer's staff is ensured and noise and exhaust from the Contractor's power plant are minimized.

8.5.6 AVAILABILITY REQUIREMENTS

The Engineer's office trailer shall be set-up and fully operational for use by the Engineer and their staff an ample amount of time prior to the commencement of construction operations and shall remain fully operational until the completion of all construction operations.

8.5.7 MEASUREMENT AND PAYMENT

- a) Payment for Engineer's Office Trailer will be at the Contract lump sum price.

The lump sum price shall be compensation in full for the supply, mobilization, set-up, operation, maintenance, dismantling and demobilization of the trailer and the provision of furnishings, electrical power, heat, water, satellite, internet, sewage and garbage disposal, insurance and any other equipment, labour, materials, tools and incidentals necessary for the supply and operation of the Engineer's Office Trailer in accordance with the Specifications. The lump sum price will be paid out as a proportion of the time acceptably onsite until the end of construction operations.

or;

- b) Payment for Engineer's Office Trailer will be at the Contract unit price per day.

The unit price per day shall be compensation in full for the supply, mobilization, set-up, operation, maintenance, dismantling and demobilization of the trailer and the provision of furnishings, electrical power, heat, water, satellite, internet, sewage and garbage disposal, insurance and any other equipment, labour, materials, tools and incidentals necessary for the supply and operation of the Engineer's Office Trailer in accordance with the Specifications. The unit price per day will be paid out for the duration in days from the Department's occupation of the trailer from the date as requested by the Engineer. Daily rate compensation shall not be provided for any days that the Engineer's Office Trailer set up onsite without any request of Engineer or vacant. Daily rate compensation shall not be paid for any days that the Engineer's Office Trailer is set up onsite beyond the date of completion of Work in Article A2 of the Construction Contract unless agreed with the Engineer in writing.