



**RETURN BIDS TO:**

**RETOURNER LES SOUMISSIONS À:**

Public Works and Government Services Canada  
ATB Place North Tower  
10025 Jasper Ave./10025 ave. Jasper  
5th floor/5e étage  
Edmonton  
Alberta  
T5J 1S6  
Bid Fax: (780) 497-3510

**SOLICITATION AMENDMENT  
MODIFICATION DE L'INVITATION**

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

**Comments - Commentaires**

**Vendor/Firm Name and Address  
Raison sociale et adresse du  
fournisseur/de l'entrepreneur**

**Issuing Office - Bureau de distribution**  
Public Works and Government Services Canada  
ATB Place North Tower  
10025 Jasper Ave./10025 ave Jasper  
5th floor/5e étage  
Edmonton  
Alberta  
T5J 1S6

<b>Title - Sujet</b> Sinclair Canyon Electrical Upgrade	
<b>Solicitation No. - N° de l'invitation</b> EP922-172961/A	<b>Amendment No. - N° modif.</b> 012
<b>Client Reference No. - N° de référence du client</b> Parks EP922-172961	<b>Date</b> 2017-03-13
<b>GETS Reference No. - N° de référence de SEAG</b> PW-\$PWU-183-11007	
<b>File No. - N° de dossier</b> PWU-6-39328 (183)	<b>CCC No./N° CCC - FMS No./N° VME</b>
<b>Solicitation Closes - L'invitation prend fin</b> <b>at - à 02:00 PM</b> <b>on - le 2017-03-16</b>	<b>Time Zone</b> Fuseau horaire Mountain Daylight Saving Time MDT
<b>F.O.B. - F.A.B.</b>	
<b>Plant-Usine:</b> <input type="checkbox"/> <b>Destination:</b> <input type="checkbox"/> <b>Other-Autre:</b> <input type="checkbox"/>	
<b>Address Enquiries to: - Adresser toutes questions à:</b> Tikhonovitch (RPC), Alex	<b>Buyer Id - Id de l'acheteur</b> pwu183
<b>Telephone No. - N° de téléphone</b> (780) 901-7940 ( )	<b>FAX No. - N° de FAX</b> (780) 497-3510
<b>Destination - of Goods, Services, and Construction:</b> <b>Destination - des biens, services et construction:</b>	

**Instructions: See Herein**

**Instructions: Voir aux présentes**

<b>Delivery Required - Livraison exigée</b>	<b>Delivery Offered - Livraison proposée</b>
<b>Vendor/Firm Name and Address</b> <b>Raison sociale et adresse du fournisseur/de l'entrepreneur</b>	
<b>Telephone No. - N° de téléphone</b> <b>Facsimile No. - N° de télécopieur</b>	
<b>Name and title of person authorized to sign on behalf of Vendor/Firm</b> <b>(type or print)</b> <b>Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)</b>	
<b>Signature</b>	<b>Date</b>



**Stantec Consulting Ltd.**  
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## ADDENDUM

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Proposed By: Stantec Consulting LTD

Date: March 13, 2017

Project: Sinclair Canyon Site Rehabilitation

Project No: 115302913

Addendum No: ADD-02

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TO ALL BIDDERS OF RECORD

### 1 GENERAL

1.1 The bidding documents are amended as noted in this Addendum, which consists of the following.

1.2 This Addendum is issued prior to bid closing to amend the Bid Documents. This Addendum will form part of the contract documents. Include in the Bid Price all such revisions, which will become part of the work. Perform such work in accordance with the Contract Documents.

1.3 Acknowledge receipt of the Post Tender Addendum by reference in the Bid Form submitted by the bidding Contractors. Ensure that all parties submitting bids are aware of all items included in this Addendum.

### 2 TENDER DRAWINGS

2.1 In response to RFI # 24, the following specifications have been revised. The contractor shall arrange for and carry all costs associated with testing throughout the project.

- 01 45 00 – Quality Control
- 03 30 00 – Cast in Place Concrete

### 3 ATTACHMENTS

3.1 Specification 01 45 00 Revision 1

3.2 Specification 03 30 00 Revision 1

**END OF ADDENDUM**

**Part 1            General**

**1.1                INSPECTION**

- .1     Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2     Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3     If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4     Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

**1.2                INDEPENDENT INSPECTION AGENCIES**

- .1     Independent Inspection/Testing Agencies will be engaged by the Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the Contractor.
- .2     Provide equipment required for executing inspection and testing by appointed agencies.
- .3     Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4     If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. The Contractor shall correct defect and irregularities as advised by Departmental Representative and Pay costs for retesting and re-inspection.

**1.3                ACCESS TO WORK**

- .1     Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2     Co-operate to provide reasonable facilities for such access.

**1.4                PROCEDURES**

- .1     Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2     Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

#### **1.5 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative
- .2 Representative as failing to confirm to Contract Documents. Replace or re-execute in accordance with Contract Document's.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Departmental Representative, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

#### **1.6 REPORTS**

- .1 Submit [4] copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested of material being inspected or tested.

#### **1.7 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

#### **1.8 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Departmental Representative as specified in specific Section.
- .3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.

- .6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

**1.9 MILL TESTS**

- .1 Submit mill test certificates as requested.

**1.10 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for electrical systems.
- .2 Refer to Section 26, 27 for definitive requirements.

**END OF SECTION**

**Part 1            General**

**1.1                SCOPE OF WORK**

- .1            The Scope of Work shall include: All cast-in-place concrete related to work required for the Sinclair Canyon Electrical Upgrade and Site Rehabilitation.

**1.2                RELATED REQUIREMENTS**

- .1            Section 01 33 00 – Submittal Procedures
- .2            Section 01 45 00 – Quality Control
- .3            Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .4            Section 03 10 00 – Concrete Forming and Accessories
- .5            Section 03 20 00 – Concrete Reinforcing
- .6            Section 31 00 00 – Earthwork
- .7            Section 31 23 33.01 – Excavating, Trenching and Backfilling
- .8            Section 02 36 30 – Tangent Concrete Piles

**1.3                PRICE AND PAYMENT PROCEDURES**

- .1            Payment for the work of this section shall be on a lump sum basis as tendered which shall be full compensation for all labour, materials, and equipment necessary to complete the work, including all subsidiary and incidental items thereto for which separate payment is not elsewhere provided.
- .2            Measurement and Payment:
  - .1            Measurement shall not be required. Payment shall be considered inclusive to the single fixed price contract.

**1.4                REFERENCES**

- .1            Abbreviations and Acronyms:
  - .1            Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
    - .1            Type GU, GUb and GUL - General use cement.
    - .2            Type MS and MSb - Moderate sulphate-resistant cement.
    - .3            Type MH, MHb and MHL - Moderate heat of hydration cement.
    - .4            Type HE, HEb and HEL - High early-strength cement.
    - .5            Type LH, LHb and LHL - Low heat of hydration cement.
    - .6            Type HS and HSb - High sulphate-resistant cement.
  - .2            Fly ash:

- .1 Type F - with CaO content less than 15%.
- .2 Type CI - with CaO content ranging from 15 to 20%.
- .3 Type CH - with CaO greater than 20%.
- .3 GGBFS - Ground, granulated blast-furnace slag.
- .2 Reference Standards:

Perform cast-in-place concrete work in accordance with the following standards, except where specified otherwise. All standards to be latest issue at time of tender. Provide one copy on site of the first four standards listed below.

  - .1 BCBC 2012, “British Columbia Building Code”.
  - .2 NBC 2010, “National Building Code”.
  - .3 ASTM International
    - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
    - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
    - .3 ASTM C330-11, “Standard Specification for Lightweight Aggregates for Structural Concrete”.
    - .4 ASTM C494/C494M-13, Standard Specification for Chemical Admixtures for Concrete.
    - .5 ASTM C1017/C1017M-13, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
    - .6 ASTM D412-15a, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
    - .7 ASTM D624-00(2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
    - .8 ASTM D1751-04(2013), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
    - .9 ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
  - .4 CSA International
    - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
    - .2 CSA A283-06 (R2011), Qualification Code for Concrete Testing Laboratories.
    - .3 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .4 CAN/CSA-A3001-13, “Cementitious Materials or Use in Concrete”.

## **1.5 REGULATIONS**

- .1 Abide by the current bylaws and regulations of the province and/or municipality in which the work is located, and abide by the current laws and regulations with regard to public safety.
- .2 The regulations of the Minister of Labour, Occupational Health and Safety Act, the Workers' Compensation Board and other applicable acts administered by the authority having jurisdiction of the province apply to the work of this section.

## **1.6 SAFETY**

- .1 Carry out cast-in-place concrete work in accordance with the current Occupational Health and Safety Act construction safety regulations.

## **1.7 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit the proposed mix design for all concrete and grout mix types to the Departmental Representative for approval two weeks prior to their initial use.
- .2 Submit data sheets for all proposed pre-mixed grouts to the Departmental Representative for review.
- .3 Submit samples of fine and coarse aggregate and all admixtures proposed for concrete mixes to the testing firm's laboratory, if requested by the Departmental Representative.
- .4 Prior to conducting trial mixes, submit data on all specified or proposed concrete admixtures with the mix design to the Departmental Representative for approval. Data is to confirm the compatibility of the water reducing admixture, the superplasticizer, the air entraining agent, the cement, the fly ash and the silica fume where used.
- .5 Submit copies of mill certificate test reports of cement, silica fume and fly ash, if requested by the Departmental Representative.
- .1 Submit data on all concrete accessories specified or proposed.
- .6 Submit responses to all site review reports stating that all reported defects and deficiency items were corrected or stating what action was taken.
- .7 Provide testing results for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .8 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .9 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

## **1.8 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

- .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
  - .1 When plant does not hold valid certification, provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete (air temperature above 25°C).
  - .3 Cold weather concrete (air temperature below 5°C).
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
- .4 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- .5 Sustainability Standards Certification:
  - .1 Construction Waste Management: provide copy of plan.

## **1.9 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 2 hours after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
    - .2 Deviations to be submitted for review by Departmental Representative.
  - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
  - .3 Store cementitious materials in accordance with CSA-A23.1, “Concrete Materials and Methods of Concrete Construction”.
- .2 Packaging Waste Management: remove for reuse and return pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **1.10 INSPECTION AND TESTING OF CONCRETE**

- .1 Test all concrete by a testing firm certified in accordance with CSA-A283, retained and paid for by the Contractor and approved by the Departmental Representative.

- .2 Provide casual labour to the testing firm's field personnel for the purpose of obtaining, handling, and storing sample materials. Provide free access to all portions of the work, and cooperate with the testing firm.
- .3 Advise testing firm 24 hours in advance of concrete placement.
- .4 The Contractor is to provide properly designed temperature-controlled storage boxes for test cylinders, as specified in CSA-A23.2, for a period of at least 24 hours and further protection from adverse weather and mishandling until removed from the site. The Contractor is to provide a max-min thermometer for each storage box. Storage in a portable building that will be used by the Contractor's personnel or the Departmental Representative during the first 24 hour storage period will not be permitted. Storage facilities are to be provided, installed, checked and approved before any concrete may be placed.
- .5 Secure sufficient 3 and 7-day test cylinders for testing of concrete to ensure quality control and sufficient strength for application of construction loads and formwork stripping. Cost for these additional tests to be borne by the Contractor.
- .6 Testing firm to conduct all tests in accordance with CSA-A23.2.
- .7 Samples of concrete to be taken as close to the point of final deposit in the form as possible, at end of pipe when pumping is used.
- .8 Testing firm to take a minimum of three (3) test cylinders for a strength test and not less than one strength test for each 40 m<sup>3</sup> of concrete, or portion thereof, for each type of concrete placed and not less than one (1) test for each type of concrete placed in any one day.
- .9 Testing firm to moist cure and test one (1) cylinder in 7 days and to moist cure and test the remaining two (2) cylinders in 28 days or (1) in 7 days, (1) in 28 days and (2) in 56 days.
- .10 Testing firm is to take one additional test cylinder during cold weather concreting and cure on job site under same conditions as the concrete it represents.
- .11 Testing firm is to take at least one slump test and one entrained air test for each set of test cylinders taken.
- .12 Testing firm is to report results of tests immediately to the Contractor. The Contractor is responsible for ensuring that the concrete meets the requirements of the specifications. Report adverse test results to the Departmental Representative immediately.
- .13 Testing firm is not authorized to revoke, relax, enlarge or release any requirements of the specification, nor to approve or disapprove any portion of the work.
- .14 Testing firm is to advise placing crews to halt placing of adverse concrete immediately, and thereafter notify Contractor to reject the concrete. The execution, or lack of execution, of this request is to be recorded.
- .15 Testing firm is to submit to the Departmental Representative and Contractor certified copies of test results. Include the following information with the results:
  - .1 Name of the project.

- .2 Date of sampling.
- .3 Mix design, specified strength, slump and air content.
- .4 Name of supplier, truck and ticket number.
- .5 Time batched and time placed.
- .6 Identification of sampling and testing technician.
- .7 Cement type and admixtures used.
- .8 Exact location in the structure of the concrete sampled, including floor, elevation, and grids where applicable.
- .9 Ambient air and concrete temperatures.
- .10 Nominal aggregate size.
- .11 Water added and personnel authorizing additional water.
- .12 Concrete density.
- .16 Testing firm to certify, in writing, that all concrete meets the specified requirements.
- .17 Testing firm to submit to the Departmental Representative a final report certifying that all concrete is in accordance with the contract documents. Submit the report under the seal and signature of a professional engineer registered in the Province of British Columbia.
- .18 Reject and do not place concrete with slumps greater than maximum specified, air content lower than minimum specified and concrete over 2 hours from batch time.

**1.11 INSPECTION AND TESTING OF UNIT MASONRY CORE FILL**

- .1 All clauses pertaining to inspection and testing of concrete contained in this specification are to apply to unit masonry grout unless noted otherwise.
- .2 Testing firm to take a minimum of three (3) test cylinders, one slump test and one entrained air test for each 20 m<sup>3</sup> placed or portion thereof for a project having more than 20 m<sup>3</sup> of grout and for each 10 m<sup>3</sup> placed or portion thereof for a project having less than 20 m<sup>3</sup> and not less than one (1) test in any one day of grout placed.
- .3 Reject and do not place job site-mixed grout over 1.5 hours from mixing time.

**1.12 INSPECTION AND TESTING OF GROUT**

- .1 Test all grout by a testing firm certified in accordance with CSA-A283, retained and paid for by the Contractor and approved by the Departmental Representative in accordance with Section 01400 of these specifications.
- .2 In accordance with ASTM C109, provide at least two (2) cube tests on all types of non-shrink grout used. Provide at least 5 tests of cement grout but maximum one (1) test per day.

**1.13 INSPECTION AND TESTING OF GUNITE**

- .1 Take a minimum of three cores for each day's operation or 200 m<sup>3</sup> of material placed, and test in accordance with ASTM C42.

**1.14 ACCEPTABILITY**

- .1 Failure to comply with the requirements of these specifications will result in the structure being considered potentially deficient.
- .2 Strength evaluation tests and analysis:
  - .1 The Departmental Representative may order an independent testing firm to obtain cores, x-rays or similar non-destructive tests where evidence points to a potentially deficient structure.
  - .2 The Departmental Representative may order a load test and/or analysis, as defined by CSA-A23.3, if the non-destructive tests are impractical or inconclusive.
- .3 Pay all costs for the evaluation tests and additional engineering analysis required:
  - .1 To demonstrate the adequacy of a structure that does not meet the requirements of these specifications or the drawings.
  - .2 For a structure that has been placed before formwork and reinforcing have been made available for review by the Departmental Representative.
- .4 Reinforce by additional construction or replace as directed by the Departmental Representative at Contractor's expense concrete that is judged inadequate by structural analysis or by results of load tests.
- .5 Revise mix design proportions as required for the remainder of the work.
- .6 The Departmental Representative may order further additional testing to the above at any time even though the required tests indicate that the strength requirements have been met. In this instance, the Owner will pay for those tests that meet the specified requirements, and the Contractor will pay for those that do not.
- .7 Concrete in place not meeting air content or slump specifications as tested is to be replaced or protected by remedial measures to the satisfaction of the Departmental Representative at no cost to the Owner.

**Part 2 Products**

**2.1 DESIGN CRITERIA**

- .1 Alternative 1 - Performance: in accordance with CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

## 2.2 PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

## 2.3 MATERIALS

- .1 Cementing materials
- .2 Supplementary cementing materials
  - .1 Silica fume used in the work is to meet all the requirements for a Type U supplementary cementing material as specified in CSA-A3000, with a minimum SiO<sub>2</sub> content of at least 85%, a maximum ignition loss of 6% and a maximum SO<sub>3</sub> content of 1%.
  - .2 Fly ash is to be a Type F or Type CI pozzolan and is to meet the requirements identified in CAN/CSA-A3000 with the following additional requirements:

.1	Minimum SiO <sub>2</sub> and Al <sub>2</sub> O <sub>3</sub> and Fe <sub>2</sub> O <sub>3</sub> content	70%
.2	Maximum retained on 45 NM sieve	20%
.3	Maximum loss of ignition	4%
.4	Maximum Na <sub>2</sub> O equivalent	4.5%
.5	Maximum CaO content	12%
- .3 Water
  - .1 Water for use in concrete production and curing is to be clean and free from injurious amounts of oil, acid, alkali, soluble chlorides, organic matter, sediment or any other deleterious substances as per CSA-A23.1.
- .4 Aggregates
  - .1 For all concrete mix types, the fine aggregate is to conform to the requirements identified in CSA-A23.1 for the specified exposure class.
  - .2 For all concrete mix types, the coarse aggregate is to conform to the requirements identified in CSA-A23.1 for the specified exposure class. The aggregate is to meet the Group 1 gradation requirements listed in Table II of CSA-A23.1.
  - .3 Aggregates are not to react with alkalis in the cement to an extent that results in excessive expansion of concrete.
  - .4 The source of the aggregate and the method of manufacture or production, including the type of equipment used, is not to be altered for the duration of the project following the acceptance of the aggregate.
- .5 Admixtures:
  - .1 Air-entraining admixtures are to conform to the requirements of ASTM C260. The admixture is to be of uniform consistency and quality within each container and from shipment to shipment.
  - .2 Water-reducing admixtures are to conform to the requirements of ASTM C494, Type A or D. The admixture is to be of uniform consistency and quality within each container and from shipment to shipment.

- .3 Superplasticizers, if approved by the Departmental Representative, (high-range water reducers) are to conform to the requirements of ASTM C494, Type F or G.

**2.4 MIXES**

.1 Concrete Mixes

- .1 The Contractor is to design all concrete mixes and is to pay for all costs associated with the development of the mix designs.
- .2 The Contractor is to supply concrete in accordance with CSA-A23.1, except that the additional requirements of this specification are also to apply.
- .3 Only such materials or blends of materials that will result in a uniform colour of exposed surfaces are to be used.
- .4 Concrete mixes that will be placed by concrete pump are to be designed for pumping.
- .5 In the event that slump and/or air content are outside the specified tolerance range as determined by the inspection and testing firm appointed by the Contractor and the Departmental Representative may, at his sole discretion, accept a proposal for one adjustment of the deficient condition as an alternate to rejection.
- .6 Supply “Controlled Concrete” in accordance with CSA-A23.1 with properties as noted in the following table:

Concrete Element	Exp. Class	Min. Strength MPa @ days	Coarse Aggregate Size(mm)	Cement Type	Fly Ash %
Footings, Grade Beams	F-1/S-3	30@56	20	MS or HS	40
Piles	F-1/S-3	30@56	20	MS or HS	40
Pavements & Sidewalks	C-2	32@28	20	GU	15
Curb & Gutter	C-2	32@28	20	GU	15
Site Concrete (Non-Structural)	C-2	32@28	20	GU	15

- .7 Aggregate size specified is maximum nominal allowance. Contractor may use smaller nominal size to ease placing. Air content may have to be increased for smaller aggregate to meet exposure class requirements.
- .8 Ensure aggregate does not react with alkalis in the cement or produce excessive expansion in concrete. Conform to Appendix B of CSA-A23.1.
- .9 Maximum fly ash content as a percentage of the total cementitious material:
  - .1 Concrete with exposure classes C-XL, C-1 and C-2: Maximum 15% fly ash.
  - .2 Concrete with exposure classes C-3, C-4 and F-1: Maximum 25% fly ash.

- .3 Concrete with exposure classes F-2 and N: Maximum 40% fly ash.
- .10 Slump: No slumps outside the range of maximum or minimum will be permitted without written permission of the Departmental Representative. Supply slumps at 20 mm below maximum.
- .11 Air Content: All mix types with exposure classifications to be air-entrained in accordance with the above table and CSA-A23.1.
- .12 Use a water-reducing agent in all concrete.
- .13 Use accelerating admixtures in cold weather only when approved by the Departmental Representative. If approved, the use of admixtures will not relax cold weather placement requirements.
- .14 Do not use calcium chloride or admixtures containing calcium chloride.
- .15 Use all admixtures in strict accordance with the manufacturer's recommendations.
- .16 Use set-retarding admixtures during hot weather with written approval of the Departmental Representative
- .17 Do not use non-specified admixtures unless approved in writing by the Departmental Representative. Where superplasticizers are thus approved, ensure mix designs are correctly adjusted for placement, strength, durability and air content requirements.
- .18 Documentation indicating the compatibility of the water reducing admixture, the air entraining admixture, the superplasticizing admixture (if any), the cement, the silica fume (if any) and the fly ash (if any) is to be submitted upon request with the mix design for review by the Departmental Representative.

### **Part 3 Execution**

#### **3.1 GENERAL**

- .1 Obtain Departmental Representative's written approval before placing concrete.
- .2 Perform cast-in-place concrete work in accordance with requirements of CSA-A23.1 unless indicated otherwise on the drawings.
- .3 Verify top of pile elevations. Cut down piles or increase lengths as required to the proper elevations. Ensure piles project into grade beams and pile caps as indicated on drawings.
- .4 Remove all loose concrete from tops of piles. Ensure tops of piles are clean and of sound concrete.

#### **3.2 PLACING CONCRETE**

- .1 Notify Departmental Representative and testing firm a minimum of 48 hours prior to commencement of any concrete placement. Allow time for corrective work for areas of unusual formwork and congested reinforcement.
- .2 Notify geotechnical engineer to inspect and verify all soil conditions and bearing pressures of all foundations prior to placing concrete for mudslabs or foundations.

- .3 Do not place concrete against frozen ground, frozen concrete or frosted forms.
- .4 In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and set solidly with non-shrink grout or as specified on the drawings. The holes for the inserts are to be thoroughly cleaned.
- .5 Ensure all hardware and all other items to be cast into concrete are placed securely and will not cause undue hardship in placing concrete.
- .6 Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints and other critical items are not disturbed during concrete placement.
- .7 Revise, re-seat and correct improperly positioned reinforcing hardware and other embedded items immediately before concrete placement.
- .8 Ensure specified concrete cover around reinforcing is maintained.
- .9 Place concrete reinforcing in accordance with Section 03 20 00 – Concrete Reinforcing.
- .10 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .11 Pumping of concrete is permitted only after approval of equipment and mix].
- .12 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .13 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.
- .14 Protect previous Work from staining.
- .15 Clean and remove stains prior to application for concrete finishes.
- .16 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .17 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
  - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .18 Do not place load upon new concrete until authorized by Departmental Representative.

### **3.3 INSTALLATION/APPLICATION**

- .1 Do not place concrete older than 2 hours from batch time.
- .2 Do not add water after batching unless in strict accordance with CSA-A23.1, and such that concrete conforms with the specified mix design parameters.
- .3 Where concrete is placed on an inclined surface, the placing operation is to begin at the lower end of the slope and progress upward unless otherwise permitted by the Departmental Representative.

- .4 Place concrete and screed in accordance with the lines and levels indicated on the drawings.
- .5 Place concrete in approximate horizontal layers such that each lift can be vibrated into the previous lift.
- .6 Maximum vertical free fall of concrete is not to exceed 1200 mm in unexposed work or 800 mm in exposed work. Confine concrete with a suitable vertical drop pipe to prevent segregation.
- .7 Place concrete directly into its final position in forms. Do not spread concrete with vibrators.
- .8 Compact concrete thoroughly by mechanical vibrators. Ensure concrete is worked around reinforcement, embedded items and into all areas and corners of forms.
- .9 Use internal vibrators in all sections that are sufficiently large, and supplement with external type in the event that satisfactory surfaces cannot be obtained.
- .10 Check and re-adjust formwork to required lines and levels during placement of concrete.
- .11 Place concrete as a continuous operation, stopping only at construction joints.
- .12 Allow a minimum of three days between adjacent concrete placements.
- .13 Use cold weather concreting methods in accordance with CSA-A23.1 when the mean daily temperature falls below 5°C, and use hot weather methods when the mean temperature rises above 25°C.
- .14 Maintain accurate records of concrete placement. Record date, location of placement, quantity, air temperature and test samples taken.
- .15 Sleeves and inserts:
  - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
  - .2 Where approved by Departmental Representative set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
  - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative.
  - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental Representative before placing of concrete.
  - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
  - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .16 Anchor bolts:
  - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
  - .2 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

- .3 Set bolts and fill holes with epoxy grout.
- .4 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .17 Joint fillers:
  - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.

### **3.4 FIELD QUALITY CONTROL**

- .1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .1 Concrete pours.
  - .2 Slump.
  - .3 Air content.
  - .4 Compressive strength at 7 and 56 days for Class S-3 concrete and 7 and 28 days for Class C-2 concrete.
  - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
  - .1 Ensure testing laboratory is certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Contractor will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.
- .5 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .7 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

### **3.5 CLEANING**

- .1 Repair, remove and clean all drips and smears resulting from the work of this section on exposed, finished surfaces or surfaces to be subsequently finished.
- .2 Hose down sandblasted surfaces. Brush thoroughly with a stiff broom to remove all dust and loose particles.

END OF SECTION