

STRUCTURAL SPECIFICATIONS

ISSUED FOR PROPOSALS



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STRUCTURE

Pages

DIVISION 00

00 01 07	Seals and Signatures	1
00 01 10	List of Sections	1

DIVISION 01

01 33 00	Submittal procedures	4
01 35 13	CSC Security	8

DIVISION 02

02 41 16	Structure Demolition	6
----------	----------------------	---

DIVISION 03

03 11 00	Concrete Forming	6
03 20 00	Concrete Reinforcing	8
03 30 00	Cast-in-place Concrete	17
03 39 00	Concrete Curing	4

DIVISION 31

31 23 00	Excavation and Fill	18
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DIVISION 32

32 21 13	Chain Links Fences and Gates	8
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END OF SECTION

1 General

1.1 ADMINISTRATIVE

- .1 Submit to Representative of the Ministry submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit 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.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Review submittals and samples prior to submission to Representative of the Ministry. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .5 Notify Representative of the Ministry, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Verify field measurements and affected adjacent Work are coordinated.
- .7 Contractor's responsibility for errors and omissions in submission is not relieved by Representative of the Ministry's review of submittals.
- .8 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Representative of the Ministry review.
- .9 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
 - .2 Submit drawings stamped and signed by a professional engineer registered or licensed in a Province of Canada.
 - .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
 - .4 Allow five (5) days for Representative of the Ministry's review of each submission.
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- .5 Adjustments made on shop drawings by Representative of the Ministry are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Representative of the Ministry prior to proceeding with Work.
 - .6 Make changes in shop drawings as Representative of the Ministry] may require, consistent with Contract Documents. When resubmitting, notify Representative of the Ministry in writing of revisions other than those requested.
 - .7 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .8 Submissions include:
 - .1 Preparation date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .9 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .10 Details of appropriate portions of Work as applicable:
 - .1 The materials and the fabrication details.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .1 Performance characteristics.
 - .2 Standards of reference.
 - .3 Relationship to adjacent work.
 - .11 After Representative of the Ministry's review, distribute copies.
 - .12 If no shop drawing is required due to the use of a product with standard manufacturing, submit one electronic copy of shop drawings for each requirement requested in specification Sections and as Representative of the Ministry may reasonably request.
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- .13 Submit 1 electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Representative of the Ministry.
- .14 Submit pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Delete information not applicable to project.
- .17 Supplement standard information to provide details applicable to project.
- .18 If upon review by Representative of the Ministry, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .19 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 SAMPLES

- .1 Samples: example of materials, material, quality, finish or method of execution.
- .2 If color, pattern or texture is to be used as selection criteria, submit the full range of product samples.
- .3 Once verified and approved, product samples will serve as a quality standard for the purposes of this work.

1.4 MOCK-UPS

- .1 Samples: on-site works using prescribed materials and method of execution.
 - .2 Realize work samples at locations acceptable to the Representative of the Ministry.
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- .3 Notify Representative of the Ministry in writing, when submitting product samples, of deviations from the requirements of contract documents.
- .4 Where color, pattern or texture is prescribed, submit the entire range of samples required.
- .5 Once verified and approved, samples of the works will serve as a quality standard for the purposes of this work.

1.5 « AS-BUILT » DRAWINGS

- .1 The Contractor must include in his fees the costs to prepare “as-built” drawings for the project. As the work progresses, the Contractor will be required to submit one (1) hardcopy of the red line drawings to the Representative of the Ministry that will clearly and legibly identify in red ink the changes that were made relative to the drawings and specifications issued for construction. A special holdback will be retained by the Ministry to ensure that this requirement is met.

1.6 CERTIFICATES

- .1 Immediately after award of the contract, submit the documentation required by the Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST).
- .2 Submit copies of the insurance certificates immediately after award of contract.

2 Product

2.1 NOT APPLICABLE

3 Execution

3.1 NOT APPLICABLE

END OF SECTION

1 - General

1.1 PURPOSE

- .1 To ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.

1.2 DEFINITIONS

- .1 "Contraband" means:
 - .1 An intoxicant, including alcoholic beverages, drugs and narcotics,
 - .2 A weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization,
 - .3 An explosive or a bomb or a component thereof,
 - .4 Currency over any applicable prescribed limit 25.00\$, and
 - .5 Any item not described in paragraphs (a) to (d) that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.
 - .2 "Unauthorized Smoking Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing or snuffing tobacco, cigarette making machines, matches and lighters.
 - .3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.
 - .4 "CSC" means Correctional Service Canada.
 - .5 "Director" means Director or Warden of the Institution as applicable or their representative.
 - .6 "Construction employees" means persons working for the general contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
 - .7 "Departmental Representative" means the Public Works and Government Services Canada (PWGSC) or the Correctional Service Canada (CSC) project manager depending on project.
 - .8 "Perimeter" means the fenced or walled area of the institution that restrains the movement of the inmates.
 - .9 "Construction zone" means the area as shown on the contract drawings where the contractor will be allowed to work. This area may or may not be isolated from the security area of the institution.
 - .10 The construction zone is located outside of the inmate security perimeter and include building C15 (electrical room and diesel tank room) and the outdoor area north of building C15.
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1.3 REFERENCES

- .1 In effect Quebec regulations, rules and standards:
 - .1 Act respecting occupational health and safety;
 - .2 Safety code for the construction industry (L.R.Q., S-2.1, r.6);
 - .3 Regulation respecting occupational health and safety.

1.4 PRELIMINARY DISPOSITION

- .1 Prior to the commencement of work, the contractor shall meet with the Director to:
 - .1 Discuss the nature and extent of all activities involved in the Project.
 - .2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.
- .2 The contractor will:
 - .1 Ensure that all construction employees are aware of the CSC security requirements.
 - .2 Ensure that a copy of the CSC security requirements is always prominently on display at the job site.
 - .3 Co-operate with institutional personnel in ensuring that security requirements are observed by all construction employees.

1.5 CONSTRUCTION EMPLOYEES

- .1 Submit to the Director a list of the names with date of birth of all construction employees to be employed on the construction site and a security clearance form for each employee. A copy of a picture identification will have to be join with the security clearance form.
 - .2 Allow two (2) weeks for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at the institution where the project is taking place.
 - .3 The Director may require that facial photographs may be taken of construction employees and these photographs may be displayed at appropriate locations in the institution or in an electronic database for identification purposes. The Director may require that Photo ID cards be provided for all construction workers. ID cards will then be left at the designated entrance to be picked upon arrival at the institution and shall be displayed prominently on the construction employees clothing at all time while employees are at the institution.
 - .4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.
 - .5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:
 - .1 appear to be under the influence of alcohol, drugs or narcotics.
 - .2 behave in an unusual or disorderly manner.
 - .3 are in possession of contraband.
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1.6 VEHICULES

- .1 All unattended vehicles on CSC property shall have windows closed; doors and trunks shall be locked and keys removed. The keys shall be securely in the possession of the owner or an employee of the company that owns the vehicle.
- .2 The director may limit at any time the number and type of vehicles allowed within the Institution.
- .3 Drivers of delivery vehicles for material required by the project shall not require security clearances but must remain with their vehicle the entire time that the vehicle is in the Institution. The director may require that these vehicles be escorted by Institutional staff or Commissionaires while in the Institution.
- .4 If the Director permits trailers to be left inside the secure perimeter of the Institution, these trailer doors will be locked at all times. All windows will be securely locked when left unoccupied. All trailer windows shall be covered with expanded metal mesh. All storage trailers inside and outside the perimeter must be locked when not in use.

1.7 PARKING

- .1 The parking area(s) to be used by construction employees will be designated by the Director. Parking in other locations will be prohibited and vehicles may be subject to removal.

1.8 SHIPMENTS

- .1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the institution's own shipments. The contractor must have his own employees on site to receive any deliveries or shipments. CSC staff will NOT accept receipt of deliveries or shipments of any material equipment or tools for the contractor.

1.9 TELEPHONES

- .1 There will be no installation of telephones, Facsimile machines and computers with Internet connections permitted within the perimeter of the institution unless prior approval of the Director is received.
- .3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, BlackBerries, telephone used as 2-way radios, are not permitted within the perimeter of the Institution unless approved by the Director. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.
- .4 The Director may approve but limit the use of two way radios.

1.10 WORK HOURS

- .1 Work hours within the Institution are: Monday to Friday 7 :00 a.m. to 16:00 p.m.
 - .2 Work will not be permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the
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required permission. In case of emergencies or other special circumstances, this advance notice may be waived by the Director.

- .3 In the event the contractor must cancel one or more work days, the contractor must notice the Departmental Representative at least 24 hours before the cancellation. Costs to Canada for such events may be attributed to the contractor. See following table for rates.

FIRM ALL INCLUSIVE HOURLY BILLING RATES/TAUX HORAIRES FERMES TOUT COMPRIS À FACTURER						
Level/Niveau	Unranked/ Non Gradés	Supervisor/Surveillant				
		Supervisory Premium Included/la prime de surveillance a inclus				
		1	2	3	4	5
Basic Level/ Niveau de base	23.67	24.74	25.81	27.95	30.09	32.23
Overtime/ Temps Supplé	34.42	35.96	37.52	40.64	43.75	46.86
Stat Worked/Stat Travaillé	45.16	47.21	49.25	53.33	57.41	61.50
Level 1/Niveau 1	24.10	25.18	26.24	28.38	30.52	32.67
Overtime/ Temps Supplé	35.04	36.58	38.14	41.26	44.37	47.47
Stat Worked/Stat Travaillé	45.98	48.02	50.06	54.15	58.22	62.30

1.11 Overtime work

- .1 No overtime work will be allowed without permission of the Director. Give a minimum forty-eight (48) hours advance notice when overtime work on the construction project is necessary and approved. If overtime work is required because of an emergency such the completion of a concrete pour or work to make the construction safe and secure, the contractor shall advise the Director as soon as this condition is known and follow the directions given by the Director. Costs to Canada for such events may be attributed to the contractor.
- .2 When overtime work, weekend statutory holiday work is required and approved by the Director, extra staff members may be posted by the Director or his designate, to maintain the security surveillance. The actual cost of this extra staff may be attributed to the contractor.

1.12 TOOLS ET EQUIPMENT

- .1 Maintain on site a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required.
 - .1 « prohibited » tools:
 - .1 Use of strip fastener tools, commonly called « ramset » is strictly forbidden in the institution.
 - .2 Acetylene torch must be stored in a locked storage at all time. Oxygen bottles must be stored in a different location from the torch and in a locked storage at all time. Inventory must be completed at the end of each day.
 - .3 Impact tools, cables, ropes and ladders are forbidden except in area where inmate do not have access.
- .2 Throughout the construction project maintain an up-to-date list of tools and equipment specified above.

- .3 Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.
- .4 Store all tools and equipment in approved secure locations.
- .5 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the contractor.
- .6 Scaffolding shall be secured and locked when not erected and when erected, shall be secured in a manner agreed upon with the director.
- .7 All missing or lost tools or equipment shall be reported immediately to the Director.
- .8 The Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:
 - .1 At the beginning and conclusion of every construction project.
 - .2 Weekly, when the construction project extends longer than a one week period.
- .9 the contractor will have to remove every tools and equipment at the end of each work days.
- .10 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day.
- .11 If propane or natural gas is used for heating the construction, the institution will require that a commissionaire supervise the construction site during non-working hours.

1.13 KEYS AND LOCK

- .1 All padlocks required to lock the working areas will be provided by CSC and the keys required to open these padlocks will be held by the security guard in charge of the field overseeing.
- .2 Padlocks and keys required to lock the new fence sections, are provided by others.

1.14 PRESCRIPTION DRUGS

- .1 Employees of the contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one day supply only into the Institution.

1.15 SMOKING RESTRICTIONS

- .1 Contractors and construction employees are not permitted to smoke inside correctional facilities or outdoors within the perimeter of a correctional facility and must not possess unauthorized smoking items within the perimeter of a correctional facility.
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- .2 Contractors and construction employees who are in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist, will be directed to leave the institution.
3. Smoking is only permitted outside the perimeter of a correctional facility in an area to be designated by the Director.

1.16 CONTRABAND

- .1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on institutional property.
- .2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Director.
- .3 Contractors should be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.
- .4. Presence of arms and ammunition in vehicles of contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

1.17 SEARCHES

- .1 All vehicles and persons entering institutional property may be subject to search.
- .2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband or unauthorized items, he may order that person to be searched.
- .3 All employees entering the Institution may be subject to screening of personal effects for traces of contraband drug residue.

1.18 ACCESS TO AND REMOVAL FROM INSTITUTIONAL PROPERTY

- .1 Construction personnel and commercial vehicles will not be admitted to the institution after normal working hours, unless approved by the Director.

1.19 MOVEMENT OF VEHICLES

- .1 Escorted commercial vehicles will be allowed to enter or leave the institution through the vehicle access gate during the following hours:
 - .1 from 07 h 00 to 16 h 00
 - .2 The contractor shall advise the Director twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.
 - .3 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC staff or Commissionaires working under the authority of the Director.
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- .4 Commercial vehicles will only be allowed access to institutional property when their contents are certified by the Contractor or his representative as being strictly necessary to the execution of the construction project.
- .5 Vehicles shall be refused access to institutional property if, in the opinion of the Director, they contain any article which may jeopardize the security of the institution.
- .6 Private vehicles of construction employees will not be allowed within the security perimeter of medium or maximum security institutions without the authorization of the Director.
- .7 With the approval of the Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another fixed object.

1.20 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY

- .1 Subject to the requirements of good security, the Director will permit the Contractor and his employees as much freedom of action and movement as is possible.
- .2 However, notwithstanding paragraph above, the Director may:
 - .1 Prohibit or restrict access to any part of the institution.
 - .2 Require that in certain areas of the institution, either during the entire construction project or at certain intervals, construction employees only be allowed access when escorted by a member of the CSC security staff or a commissionaire.
- .3 During the lunch and coffee/health breaks, all construction employees will remain within the construction site. Construction employees are not permitted to eat in the officer's lounge or the dining room of the institution.

1.21 SURVEILLANCE AND INSPECTION

- .1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.
- .2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among construction employees and maintained throughout the construction project.

1.22 STOPPAGE OF WORK

- .1 The director may order at any time that the contractor, his employees, sub-contractors and their employees to not enter or to leave the work site immediately due to a security situation occurring within the Institution. The contractor's site supervisor shall note the name of the CSC staff member giving this instruction, the time of the request and obey the order as quickly as possible.

The contractor shall advise the Departmental Representative of this interruption of the work within 24 hours.

1.23 CONTACT WITH INMATES

- .1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any construction employee doing any of the above will be removed from the site and his security clearance revoked.
- .2 It is to be noted that cameras are not allowed on CSC property.
- .3 Notwithstanding the above paragraph, if the director approves of the usage of cameras, it is strictly forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this contract.

1.24 COMPLETION OF CONSTRUCTION PROJECT

- .1 Upon completion of the construction project or, when applicable, the takeover of a facility, the Contractor shall remove all remaining construction material, tools and equipment that are not specified to remain in the Institution as part of the construction contract.

2 Product

2.1 NOT APPLICABLE

3 Execution

3.1 NOT APPLICABLE

END OF SECTION

1. General

1.1 PRICING AND PAYMENT PROCEDURE

- .1 No measurement will be made under this Section. Present a lump sum price for structure demolition.

1.2 REFERENCES

- .1 Canadian Standard Association (CSA)/CSA International.
 - .1 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.
- .2 Department of Justice of Canada (Jus).
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
 - .2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.

1.3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34. DEFINITIONS

- .1 Hazardous Materials: dangerous substances and goods, hazardous commodities and products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.
- .2 Waste Management Co-ordinator (WMC): Contractor Representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.
- .3 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.
- .4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

1.4 QUALITY CONTROL

- .1 Regulatory Requirements: Ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial/Territorial and Municipal regulations.

- .2 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting prior to beginning work of this Section, with the Representative of the Ministry to verify existing site conditions adjacent to demolition work.
 - .2 Hold project meetings at intervals defined by the general specifications.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Sort, on site, scrap material that need to be reused/reemployed or recycled and place them in the identified sites.
- .1 Divert unused material from landfill to a material collection site as approved by the Representative of the Ministry.

1.6 ENVIRONMENTAL PROTECTION

- .1 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .2 Fires and burning of waste or materials is not permitted on site.
- .3 Do not bury rubbish waste materials.
- .4 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout project.
- .5 Do not dump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .6 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction and as directed by the Representative of the Ministry.
- .7 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

1.7 EXISTING CONDITIONS

- .1 Public services may be present into concrete toppings to be demolished. If such ducts are discovered, comply with the following procedure :
 - .1 Stop work in the area adjacent to the duct;
 - .2 Advise the Representative of the Ministry;
 - .3 Pursue work in another area;
 - .4 The Representative of the Ministry shall advise the Ministry. The Ministry shall take measure to allow resuming work. Discovery of ducts within concrete

toppings shall not be considered a good reason to motivate delay in works or change in pricing;

- .5 The Representative of the Ministry will provide directions to the Contractor on how and when to proceed with resuming work in the area where the duct was discovered.
- .2 Remove, protect and store recovery items as directed by the Representative of the Ministry. Recovery items as identified on drawings and specifications. Deliver to the Ministry as directed.

2. Products

2.1 MATERIALS

- .1 Equipment and heavy machinery:
 - .1 On-road vehicles to CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations and CEPA-SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
 - .2 Off-road vehicles to: EPA CFR 86.098-10 and EPA CFR 86.098-11.
- .2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.
- .3 Access to equipment and heavy machinery.
 - .1 The Contractor remains solely responsible for determining accessibility of equipment and heavy machinery when planning work.

2.2 AUTHORIZED DEMOLITION EQUIPMENT

- .1 Choice of materials used for demolition is subject to approval of the Representative of the Ministry.
- .2 The Representative of the Ministry may reject the use of hydrodemolition equipment. If the Contractor wishes to use hydrodemolition, he shall demonstrate to the Representative of the Ministry satisfaction that no ill effects shall occur to mechanical, electrical or any buried utilities. The Contractor shall be liable for any damage, even accidental, resulting from demolition itself or ensuing water infiltration.
- .3 Follow these guidelines for the use of hand-held pneumatic hammers:
 - .1 15 kg hammer: use a 15 kg or less caliber hammer for demolition of concrete over a 100 mm thickness adjacent to existing concrete member to be protected. Use this hammer for selective demolition over the face of vertical members up to the first layer of reinforcement steel.
 - .2 7 kg hammer: use a 7 kg or less caliber hammer for selective demolition of vertical members after attaining the first layer of reinforcement steel, to clear concrete around reinforcement.
- .4 Follow these guidelines for the use of hydraulic hammers:

- .1 200 J or 350 J hydraulic hammers may only be used for complete demolition of concrete farther than 300 mm from existing concrete to protect.

3. Execution

3.1 PROTECTION MESURES

- .1 Prevent debris from blocking surface drainage system which must remain in operation.

3.2 DEMOLITION PROCEDURES

- .1 Methodology, technics and equipment used for demolition are determined by the Contractor.
 - .1 Submit detailed procedure for structure demolition to Representative of the Ministry at least one week prior to beginning work.
 - .2 Follow the indications of article 2.2 to determine methodology, technics and equipment for demolition.
- .2 If the Representative of the Ministry or representatives from regulators consider that the methodology for demolition submitted by the Contractor endangers people, propriety or environment, they may require that the Contractor submit alternative methodology.
- .3 Intervention or comments from the Representative of the Ministry does not relieve the Contractor from his responsibilities. Inversely, the absence of intervention by the Representative of the Ministry does not signify approval of means or methods used by the Contractor.
- .4 Means of demolition used by the Contractor must allow quality control. The Contractor shall be able to control all phase of work, be able to predict the consequences of his actions to the structure including parts that are not being demolished. In particular, the Contractor shall not overload existing part of the structure with debris from demolition.

3.3 SAFETY

- .1 The Contractor shall ensure safety of worksite at any time, including outside normal work hours.
- .2 Install, in accordance with laws, codes and regulations, fences, security shelters, safety guard, rails, lighting, alarm panels, etc., as required during execution of work to protect the public, the Ministry and his Representatives as well as users against material loss or damage, injuries, loss of life or any other safety threat that may occur due to neglect, carelessness or incompetence of the Contractor, subcontractors or their employees.
- .3 Where required, the Contractor shall erect protective panels to prevent debris from reaching installations and existing equipment.

- .4 Blasting operations are not permitted during demolition.

3.4 VIBRATION CONTROL

- .1 Limit ground vibrations to protect existing works and structures.
- .2 Near existing works or structures, peak particular ground speed shall not exceed 25 mm/s at existing works or structures.

3.5 DEMOLITION

- .1 Execute demolition work as required to allow other work.
- .2 Do not use demolition materials as fill for basement or open pits. Remove from basements and open pits concrete or masonry debris from demolition.
- .3 Remove existing services and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.
- .4 At end of each day's work, leave Work in safe and stable condition.

Protect interiors of parts not to be demolished from exterior elements at all times.
- .5 Demolish to minimize dusting. Keep materials wetted as directed by the Representative of the Ministry.
- .6 If by lack of precaution, existing reinforcing steel to protect is damaged and cannot be reused, the Contractor shall replace it properly and at its expense.
- .7 Only dispose of material specified by selected alternative disposal option as directed by the Representative of the Ministry or for own use.
 - .1 It is forbidden to dispose of this material to a landfill or incorporate them into a flow of waste for landfill.
 - .2 Additional disposal options may be provided by the Representative of the Ministry, prior to disposal.
- .8 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.
- .9 Do not execute demolition work during the following period of time:
 - .1 On week days, by night, between 15 h 30 and 8 h 00;
 - .2 On week-end, by day or night, between Friday 15 h 30 and Monday 8 h 00;
 - .3 On holidays, by day or night.
- .10 Shut off lighting except those required for security purposes at the end of each day.

3.6 STOCKPILING

- .1 Label stockpiles, indicating material type and quantity.
- .2 No stockpile of any sort must be at less than 10m of the perimeter walls or fences.

3.7 MATERIALS REMOVAL

- .1 Remove stockpiled material as directed by the Representative of the Ministry, when it interferes with operations of project construction.
- .2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .3 Transport material designated for alternate disposal using approved haulers, facilities and receiving organizations listed in Waste Reduction Workplan and in accordance with applicable regulations.
 - .1 Written authorization from the Representative of the Ministry is required to deviate from haulers, facilities or receiving organizations listed in Waste Reduction Workplan.
- .4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
 - .1 Disposal facilities must be those approved of and listed in Waste Reduction Workplan.
 - .2 Written authorization from the Representative of the Ministry is required to deviate from disposal facilities listed in Waste Reduction Workplan.

3.8 CLEANING

- .1 Area of Work and adjacents areas shall be cleaned to be returned to their state prior to beginning Work, to the satisfaction of the the Representative of the Ministry.
- .2 The location of demolished structure shall be cleaned and secured. Any element susceptible to cause harm, affect adversely public health or representing fire risk shall be evacuated from site.

END OF SECTION

1. General

1.1 RELATED REQUIREMENTS

- .1 Section 03 20 00 – Concrete Reinforcing.
- .2 Section 03 30 00 – Cast-in-Place Concrete.
- .3 Section 03 39 00 – Concrete Curing.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 No measurement will be made under this Section.
 - .1 Include formworks pricing in concreting work package in section 03 30 00 – Cast-in-Place Concrete.

1.3 REFERENCES

- .1 Canadian Standard Association (CSA)/CSA International.
 - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CSA O86-14, Engineering Design in Wood.
 - .3 CSA O121-08, Douglas Fir Plywood.
 - .4 CSA O151-09, Canadian Softwood Plywood.
 - .5 CSA O153-13, Poplar Plywood.
 - .6 CSA O325-07, Construction Sheathing.
 - .7 CSA O437 Series-93(R2006), Standards on OSB and Waferboard.
 - .8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
 - .9 CAN/CSA S269.2-M87(R2003), Access Scaffolding for Construction Purposes.
 - .10 CAN/CSA S269.3-M92(R2008), Concrete Formwork.
 - .11 CSA Z809-08, Sustainable forest management.

1.4 CONTRACTOR'S LIABILITIES

- .1 The Contractor scope of work includes concrete forming their design and installation. No examination or comments from the Representative of the Ministry or anyone else shall relieve the Contractor of assuming solely all risks and liability regarding these parts of work.
 - .1 Calculations, layout and construction of formworks are the sole responsibility of the Contractor.

1.5 FORMWORKS DESIGN

- .1 Formwork design shall be performed by an engineer member of the OIQ employed by the Contractor or mandated to do so.
- .2 Formwork and falsework design shall be done in accordance with laws and regulations in place, including but not limited to the Safety Code for the Construction Industry.
- .3 Describe the construction sequence incorporated into the design of structures. Show or describe the position of construction joints provided and, if applicable, the principle of formworks and falseworks reuse. Provide vertical construction joint every twenty (20) meters maximum in vertical elements. Submit to the Owner's Representative the position of construction joints for approval.
- .4 Calculations shall be made in accordance with recommendations and loads indicated in ACI 347 and ACI 347.2 guides. Wind loads shall conform to the requirements of the Code de la Construction du Québec 2010.

1.6 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit descriptions of all formwork materials in direct contact with wet concrete.
- .3 Indicate formwork design data including permissible rate of concrete placement, and temperature of concrete, in forms.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Place materials defined as hazardous or toxic in designated containers.
 - .2 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the Representative of the Ministry.
 - .3 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the Representative of the Ministry.
 - .4 Divert unused form release material from landfill to an official hazardous material collection site as approved by the Representative of the Ministry.

1.8 ACCEPTABLE MATERIALS

- .1 Where materials are specified by trade name refer to the Instructions to Tenderers for a procedure to be followed in applying for approval of alternatives

2. Products

2.1 MATERIALS

- .1 Formwork materials :
 - .1 For concrete without special architectural features, use wood and wood product formwork materials in accordance with CSA O86, CSA O121, CSA O153 and/or CSA O437 Series.
- .2 Form release agent: use a non-toxic, biodegradable and low VOC product such as :
 - .1 Formshield Pure from Euclid;
 - .2 MasterFinish RL 100 from BASF;
 - .3 King Form Release from Matériaux KING;
 - .4 Alternative Materials: Approved by addendum in accordance with Instructions to Tenderers.
- .3 Form stripping agent: colourless mineral oil, non-toxic, biodegradable and low VOC, free of kerosene, with viscosity between 15 to 24 mm²/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .4 Form ties:
 - .1 For concrete with an apparent surface, use snap ties complete with plastic cones and light grey concrete plugs. Cone diameter shall be less than 38 mm. Insure concrete cover of 25 mm or more.
 - .2 In general, use watertight snap ties for all concrete work considered watertight.
 - .3 Sealing mortar for form ties holes. Cementitious, two-component, fast-setting mortar, grey colored and containing a corrosion inhibitor such as :
 - .1 Sikatop 123 Plus or Sikatop 123 Plus Winter Grade if weather conditions require it.
 - .2 Verticoat Supreme from Euclid;
 - .3 Super-Top OV from Matériaux KING;
 - .4 MasterEmaco N 1501HCR Vertical Overhead from BASF;
 - .5 Planitop X or XS from MAPEI;
 - .6 Alternative Materials: Approved by addendum in accordance with Instructions to Tenderers.

3. Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork and ensure dimensions agree with drawings.

- .2 Prior to concreting, clean formwork and treat surfaces with a form stripping agent in accordance with CSA A23.1.
- .3 Obtain the Representative of the Ministry approval for use of earth forms, or for framing openings not indicated on drawings.
- .4 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .5 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .6 Fabricate and erect formwork in accordance with CAN/CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated. Insure proper temporary bracing to maintain the shape of formwork from pouring to hardening of concrete.
- .7 Geometric configuration and localisation shall be within tolerances required by CSA A23.1, article 6.4.
- .8 Align form joints and make them watertight. Keep form joints to minimum. Adequate reinforcements must be placed at the back of the joints between plywood sheets to ensure obtaining a continuous flat surface able to withstand all stages of concreting without deforming or moving.
- .9 Unless otherwise indicated, use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints.
- .10 For all sharp angles of exposed concrete, provide 25 mm chamfers, even where no indications are given on drawings.
- .11 At least twenty-four (24) hours prior to closing forms, advise the Owner's Representative as to allow inspection of reinforcement.

3.2 ANCHORS, SLEEVES AND EMBEDDED ELEMENTS

- .1 Provide and install into formwork all embedded elements (anchors, sleeves, etc.) in accordance with CSA A23.1 article 6.7.
- .2 Build in anchors, sleeves, and other inserts required to accommodate work specified in other sections.
 - .1 Prior to concreting, ensure, by survey, that all dimensions required in drawings and specifications and tolerances imposed for the implementation are met.
- .3 Tolerances shall be in accordance with standard CSA A23.1 article 6.7.3.
- .4 When authorized by the Representative of the Ministry, incorporate openings, place sleeves, ties, hangers and any other embedded elements as indicated in drawings.
- .5 Unless otherwise indicated, the following guidelines shall be met when installing sleeves, ducts or pipes :

- .1 Centre-to-centre dimension between sleeves or pipes shall be superior to three (3) times the diameter of the larger element;
- .2 The exterior diameter of the embedded element shall not be larger than the third of the thickness of the structural element into which it is embedded;
- .3 Do not remove or move rebars in order to place embedded elements. If placement of embedded elements is impossible where prescribed, any modification need to be approved by the Representative of the Ministry;
- .6 Notify the Representative of the Ministry and wait for his instructions if the preceding requirements cannot be met.
- .7 Coordinate delivery and placement into formworks of embedded elements with subcontractors.

3.3 FORMWORK REMOVAL AND RESHORING

- .1 Leave formwork in place for the following minimum periods of time after placing concrete:
 - .1 One (1) day for footings;
 - .2 Seven (7) days for column;
 - .3 Refer to section 03 39 00 – Concrete Curing for the minimum time prior to formwork removal, notwithstanding the indication of the preceding articles. Coordinate the time required before formwork removal with concrete curing.
- .2 Formwork removal will be authorized by the Representative of the Ministry if non-destructive tests demonstrate that the concrete has reached 75% of its computed resistance. The Contractor shall assume all expenses related to those tests and the Representative of the Ministry shall be the sole individual able to evaluate test results. After formwork removal, replace reshores immediately.
- .3 Notwithstanding preceding articles, formwork removal is authorised only when the Representative of the Ministry allows it. The authorization shall be given only if proper methods of curing are ensured, including protection against cold- or hot-weather, rain or any other adverse conditions. Moreover, time prior formwork removal may be increased depending on the process used for concreting, curing conditions and weather conditions.
- .4 The Contractor remains the sole responsible for any damage to concrete following early formwork removal, even if he has been authorized to proceed.
- .5 Reuse formworks and falseworks as indicated in CSA A23.1 standard. Except for exposed surfaces, reuse of formwork is allowed as long as the surfaces are thoroughly cleaned and are not cracked, nor rough.

3.4 PATCHING OF FORM TIE HOLES

- .1 Refer to article 7.9.3 from CSA A23.1 standard for patching of form tie holes.

- .2 All conical cavities left after removal of the plastic cones on the ends of snap ties shall be filled with grout. Proceed according to the instructions of the grout manufacturer. Moisten the surface beforehand. Ensure a smooth finish with the grout blending into the surrounding concrete surfaces. Allow to cure.

3.5 FIELD QUALITY CONTROL

- .1 During inspection of concrete reinforcement, formworks and falseworks shall be inspected as well. Formwork quality and its cleanliness shall be inspected, as well as solidity of falseworks.
- .2 Surveys will be conducted prior to concreting to measure the level of the top of the form.
- .3 The Contractor shall cooperate fully to facilitate testing by allowing access to work site and equipment.
- .4 The Ministry will pay for the costs of tests indicated above.

END OF SECTION

1. General

1.1 RELATED REQUIREMENTS

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 30 00 – Cast-in-Place Concrete.
- .3 Section 03 39 00 – Concrete Curing.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A 82/A 82M-07, Standard Specification for Steel Wire Plain, for Concrete Reinforcement.
 - .2 ASTM A 143/A 143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .3 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .4 ASTM A 496/A 496M-07, Standard Specification for Steel Wire Deformed, for Concrete Reinforcement.
 - .5 ASTM A 497/A 497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - .6 ASTM A 641/A 641M-09a(2014), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .7 ASTM A 706/A 706M-14, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
 - .8 ASTM A 722/A 722M-12, Standard Specification for Uncoated High-Strength Steel Bars for Prestressing Concrete.
 - .9 ASTM A 767/A 767M-09, Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
 - .10 ASTM A 775/A 775M-14, Standard Specification for Epoxy-Coated Steel Reinforcement Bars.
 - .11 ASTM A 780/A 780M-09, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - .12 ASTM A 1035/A 1035M-11, Standard Specification for Deformed and Plain, Low-carbon, Chromium, Steel Bars for Concrete Reinforcement.
 - .13 ASTM A 1044/A 1044M-05(2010), Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete.
 - .2 Canadian Standard Association (CSA)/CSA International.
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- .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;
 - .2 CSA A23.3-14, Design of Concrete Structures;
 - .3 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement;
 - .4 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3 Reinforcing Steel Institute of Canada (RSIC).
- .1 RSIC-2006, Reinforcing Steel Manual of Standard Practice.

1.3 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315 standard.
 - .3 Submit shop drawings. Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists of reinforcing elements.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by the Representative of the Ministry, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
 - .4 Submit, in conjunction with shop drawings, lists of steel reinforcing elements corresponding to shop drawings.
 - .5 Verify on field all dimensions and levels not defined on drawings or that may depend on field conditions.
 - .6 The Representative of the Ministry may take up to ten (10) working days to verify and return shop drawings.
 - .7 Corrections and comments made on shop drawings during the revision process do not limit the Contractor responsibility to respect requirements of drawings and specifications. Review of shop drawings is done only to ensure the general conformity in regard to design and contract requirements. Contractor shall confirm and correlate all dimensions and characteristics, choose method of fabrication and construction and execute work safely.
 - .8 If revision required on shop drawings are too numerous or too important, the Representative of the Ministry will return drawings without annotations, awaiting a
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new submittal. If drawings are submitted more than two times, the Contractor shall pay, by mean of a permanent deduction, the cost of review.

- .9 Work shall not begin before shop drawings have been reviewed and approved by the Representative of the Ministry.
- .10 The Contractor assumes full responsibility for the exactness of his drawings. He may not claim any extra charge for delays resulting from the discovery, be it on the field or before, of mistakes on his drawings, even if they were examined by the Representative of the Ministry.

1.4 REBAR DETAILLING

- .1 In general, use details in accordance with *RSIC Reinforcing Steel Manual of Standard Practice*.
- .2 Unless otherwise indicated, development lengths and cover shall be in accordance with articles 7 and 12 of CAN/CSA A23.3 standard.
- .3 Detail lap lengths and bar development lengths as type B tension lap splices unless otherwise indicated. Refer to *RSIC Reinforcing Steel Manual of Standard Practice*, table 17B, for lap lengths.
- .4 Dimensions of ties, spiral reinforcing, hangers and stirrups shall be determined in accordance with minimum concrete cover from article 6.6.6 of CSA A23.1 standard.
- .5 Unless otherwise indicated, hooks required, including stirrups and ties, shall be standard hooks as defined in article 6.6.2.2 of CSA A23.1 standard.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal :
 - .1 Separate waste materials for reuse/recycling.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the Representative of the Ministry.
 - .4 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the Representative of the Ministry.
 - .5 Divert unused hazardous material from landfill to an official hazardous material collections site.

1.6 ACCEPTABLE MATERIALS

- .1 Where materials are specified by trade name refer to the Instructions to Tenderers for a procedure to be followed in applying for approval of alternatives

2. Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by the Representative of the Ministry.
 - .2 Reinforcing steel: unless otherwise indicated, billet bars, according to CSA G30.18 grade 400W, or ASTM A 706/A 706M, grade 60.
 - .3 High strength steel bars: according to ASTM A 722/A 722M.
 - .4 Galvanized steel bars: according to ASTM A 767/A 767M, class I or II.
 - .5 Plain steel wire for concrete reinforcement: cold-drawn steel wire, as-drawn or galvanized, for the reinforcement of concrete, according to ASTM A 82/A 82M.
 - .6 Deformed steel wire for concrete reinforcement: cold-worked by drawing, rolling, or both drawing and rolling, steel wire for the reinforcement of concrete according to ASTM A 496/A 496M.
 - .7 Steel welded wire reinforcement: welded wire reinforcement (mesh), according to ASTM A 185/A 185M.
 - .1 Provide in flat sheets only.
 - .8 Steel welded wire reinforcement, high adherence: welded wire reinforcement (mesh) made from cold-worked drawn or rolled deformed wire, or a combination of deformed and non-deformed wires, to be used for the reinforcement of concrete, to ASTM A 497/A 497M.
 - .1 Provide in flat sheets only.
 - .9 Galvanized carbon steel wire: according to ASTM A 641/A 641M.
 - .10 Epoxy Coating of non-prestressed reinforcement: according to ASTM A 775/A 775M.
 - .11 Galvanizing of non-prestressed reinforcement: according to ASTM A767/A 767M class I or II, minimum zinc coating 610 g/m².
 - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
 - .2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.
 - .3 Temperature of solution equals to or greater than 32 degrees and galvanized steels immersed for minimum of twenty (20) seconds.
 - .4 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
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- .1 In this case, no restriction applies to temperature of solution.
- .5 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.
 - .1 Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .12 Chairs, bolsters, bar supports, spacers: according to CSA-A23.1/A23.2.
- .13 Plain round bars: according to CSA-G40.20/G40.21.
- .14 Zinc-rich coating:
 - .1 Use zinc-rich coating according to CAN/CGSB 1.181 and ASTM A 780/A 780M containing at least 92% of metallic zinc in dried coat, brush applied.
 - .2 Approved products:
 - .1 Zinc-paste 70-40 by Metaflux;
 - .2 ZRC Galvilite by Meta-Plus.
 - .3 Rust-anode by Galvatech (distributor).
 - .4 Alternative Materials: Approved by addendum in accordance with Instructions to Tenderers.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA A23.1, ACI 315 standards and RSIC Reinforcing Steel Manual of Standard Practice.
- .2 Fabrication tolerances shall be in accordance with RSIC manual chapter 6 or the following paragraphs, as determined by the more stringent requirement. Bars fabricated without conforming to those tolerances will be rejected.
- .3 Tolerance for cutting rebar.
 - .1 10M and 15M rebar:
 - .1 Less than 4.0 meters long: ± 12 mm;
 - .2 4.0 meters or more: ± 25 mm.
- .4 Tolerance for bent rebars.
 - .1 10M to 35M rebar :
 - .1 Overall length: ± 25 mm;
 - .2 Overall height: ± 12 mm;
 - .3 Hook diameter: ± 12 mm.
 - .2 Ties and stirrups :
 - .1 Overall width and length: ± 12 mm.

- .5 Obtain the Representative of the Ministry written approval for locations of reinforcement splices other than those shown on placing drawings.
- .6 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
- .7 Ship epoxy coated bars in accordance with ASTM A 775A/A 775M.
- .8 Galvanized bars shall be bent after galvanizing.
 - .1 After the bar is bent, minor peeling of coating is considered acceptable. A value of surface peeling up to the bar nominal section area is considered acceptable. For surface peeling higher than the nominal section area, bar will be rejected and need to be replaced.
- .9 All reinforcing steel shall be bent to be parallel to the edge of concrete works, as indicated on drawings. Bending shall be done in shop, as indicated on shop drawings.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide the Representative of the Ministry with certified copy of mill test report of reinforcing steel, minimum two (2) weeks prior to beginning reinforcing work. Test reports shall indicate physical and chemical properties of steel.
- .2 Upon request, submit in writing to the Representative of the Ministry, proposed source of reinforcement material to be supplied.
- .3 Identify bundles of bar reinforcement and wire mesh, in accordance with shop drawings, bar bending details and lists before shipping.
- .4 All rebars shall be identified during fabrication. Identification shall include diameter, grade and fabricator. Rebar not properly identified will not be allowed on site.

2.4 STORAGE

- .1 Store materials off ground over wood studs or indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area to prevent rusting.
- .2 Protect reinforcing steel if stored over a long period.
- .3 Replace defective or damaged materials with new.

3. Execution

3.1 PREPARATION

- .1 Galvanizing to include chromate treatment.
 - .1 Duration of treatment: 1 hour per 25 mm of bar diameter.

- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A 143/A 143M.

3.2 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except for a written approval by the Representative of the Ministry.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars which develop cracks or splits.
- .4 Unless otherwise indicated, field weld reinforcement is prohibited. When authorized, weld specially identified rebars.

3.3 PLACING REINFORCEMENT

- .1 Clean reinforcing steel before placement. Steel shall be free from mud, oil, or other coatings that adversely affect bond strength. Bar surface shall be in accordance to CSA A23.1 article 6.1.6.
- .2 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1. Refer to article 6.6.7 of this standard for placement and number of supports.
- .3 Attach reinforcing steel solidly to supports to prevent any movement during concreting.
- .4 When concrete will never be exposed to weather conditions, use chairs and hangers with nylon- or plastic-covered extremities.
- .5 When concrete will be exposed to weather conditions or sandblasted, use chairs and hangers with nylon- -covered extremities or fabricated with stainless steel.
- .6 For footings, reinforcing steel is placed on chairs, supports and/or cement brick, spaced on center 1 000 mm maximum.
- .7 Rocks, piece of rocks, woods or pipes shall not be used to support reinforcing steel.
- .8 Lifting the reinforcing steel with a hook at the time of concreting is prohibited.
- .9 Install dowels and anchors for walls and columns with template before concreting. Spacing of anchors shall be within 1.5 mm of dimensions indicated on drawings.
- .10 Use plain round bars as slip dowels in concrete, unless otherwise indicated in drawings.
 - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
 - .2 When paint is dry, apply thick even film of mineral lubricating grease.

- .11 At least forty-eight (48) hours prior to placing concrete, obtain the Representative of the Ministry approval of reinforcing material and placement.
- .12 Ensure cover to reinforcement is maintained during concrete pour.
- .13 During concreting, a worker shall be assigned to replacing reinforcing steel that may have been displaced during the operation.
- .14 Drill holes into concrete, place adhesive and anchor steel into existing concrete per manufacturer's recommendations.
- .15 Protect reinforcement coating during concreting.
- .16 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

3.4 CONCRETE COVER

- .1 Unless otherwise indicated, cover thickness for reinforcement in concrete, shall be :
 - .1 Concrete over ground forms, in permanent contact with soil: 75 mm.
 - .2 Concrete exposed to soil or weather conditions :

Columns	
35M and smaller rebar	50 mm
Ties, hangers, stirrups	40 mm

d_b : nominal bar diameter.

3.5 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.
 - .1 For galvanized steel, use zinc-rich coating to article 2.1.14.

3.6 WELDING

- .1 Unless written approval, do not weld reinforcement.

END OF SECTION

1. Generals

1.1 RELATED REQUIREMENTS

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 20 00 – Concrete Reinforcing.
- .3 Section 03 39 00 – Concrete Curing.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 No measurement will be made under this Section. Present a lump sum price for Cast-in Place Concrete.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A 820/A 820M-11, Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.
 - .2 ASTM C 31/C 31M-12, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - .3 ASTM C 33/C 33M-13, Standard Specification for Concrete Aggregates.
 - .4 ASTM C 39/C 39M-14a, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - .5 ASTM C 42/C 42M-13, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - .6 ASTM C 88-13, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - .7 ASTM C 109/C 109M-13, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
 - .8 ASTM C 143/C 143M-12, Standard Test Method for Slump of Hydraulic-Cement Concrete.
 - .9 ASTM C 260-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .10 ASTM C 330/C 330M-14, Standard Specification for Lightweight Aggregates for Structural Concrete.
 - .11 ASTM C 457/C 457M-12, Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
 - .12 ASTM C 494/C 494M-13, Standard Specification for Chemical Admixtures for Concrete.
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- .13 ASTM C 535-12, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .14 ASTM C 618-12a, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
 - .15 ASTM C 873/C 873M-10a, Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds.
 - .16 ASTM C 989/C 989M-13, Standard Specification for Slag Cement for Use in Concrete and Mortars.
 - .17 ASTM C 1017/C 1017M-13, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .18 ASTM C 1116/C 1116M-10a, Standard Specification for Fiber-Reinforced Concrete.
 - .19 ASTM C 1157/C 1157M-11, Standard Performance Specification for Hydraulic Cement.
 - .20 ASTM C 1202-12, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.
 - .21 ASTM C 1240-12, Standard Specification for Silica Fume Used in Cementitious Mixtures.
 - .22 ASTM C 1609/C 1609M-12M, Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading).
 - .23 ASTM C 1611/C 1611M-14, Standard Test Method for Slump Flow of Self-Consolidating Concrete.

 - .2 Canadian Standard Association (CSA)/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 A23.3-14, Design of Concrete Structures.
 - .3 CSA A283-06(R2011), Qualification Code for Concrete Testing Laboratories.
 - .4 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA A3001-13, Cementitious materials for use in concrete.

 - .3 International Concrete Repair Institute (ICRI).
 - .1 Guideline No. 310.1R-2008, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion.
 - .2 Guideline No. 320.1R-1996, Guide for Selecting Application Methods for the Repair of Concrete Surfaces.
 - .3 Guideline No. 320.2R-2009, Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces.
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1.4 DESIGN CRITERIA

- .1 Performance: according to CSA A23.1, and as described in MIXES of PART 2 - PRODUCTS.

1.5 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Material Safety Data Sheets (MSDS) in accordance with the Workplace Hazardous Materials Information System (WHMIS).
- .3 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets. Minimum four (4) weeks prior to starting concrete work, submit to the Representative of the Ministry test reports and certificate from testing laboratory certifying that the following materials meet the requirements of this section:
 - .1 Portland cement,
 - .2 Supplementary cementing material,
 - .3 Admixtures,
 - .4 Aggregates,
 - .5 Water.
- .4 Provide the Representative of the Ministry, minimum fourteen (14) days prior to starting concrete work, with valid and recognized certificate from plant delivering concrete. Certificate shall indicate that plant, materials and methods used in fabricating concrete are in accordance with CSA A23.1 standard.
 - .1 If plant does not have a valid certificate, submit test data and certificate from independent testing laboratory certifying that concrete mix materials meet the requirements of this section.
- .5 Minimum fourteen (14) days prior to starting concrete work, provide proposed quality control procedures for review by the Representative of the Ministry on following items:
 - .1 Hot weather concrete.
 - .2 Cold weather concrete.
 - .3 Curing.
 - .4 Finishes.
 - .5 Formwork removal.
 - .6 Joints.

Minimum fourteen (14) days prior to starting concrete work, provide the Representative of the Ministry with concrete mix formulas including admixtures for this project. Concrete formulas will be submitted to testing laboratory for approval prior to beginning work.

- .6 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet the specified resistance.
- .7 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.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: deliver to site of work and discharged within one hundred and twenty (120) minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from the Representative of the Ministry and concrete producer as described in CSA A23.1.
 - .2 Deviations to be submitted for review by the Representative of the Ministry.
- .2 Deliver concrete using means to prevent separation of concrete mix component or any alteration to consistency.
- .3 Waste Management and Disposal :
 - .1 Divert unused concrete and concrete materials to local quarry after receipt of written approval from the Representative of the Ministry.
 - .2 Provide on-site adequate space for the safe washing of concrete trucks.
 - .3 Divert unused admixtures from landfill to an official hazardous material collections site.
 - .4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
 - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

1.7 ACCEPTABLE MATERIALS

- .1 Where materials are specified by trade name refer to the Instructions to Tenderers for a procedure to be followed in applying for approval of alternatives

2. Products

2.1 MATERIALS

- .1 Portland Cement: according to CSA A3001, type GU, unless otherwise indicated.
- .2 Supplementary cementing materials: according to CSA A3001.

- .1 Maximum total supplementary cementing materials mass inferior to 25% of total cementitious materials.
 - .2 Fly ash and natural pozzolan: according to ASTM C 618.
 - .3 Ground granulated blast-furnace slag: according to ASTM C 989/C 989M.
 - .4 Silica fume: according to ASTM C 1240.
 - .3 Water: according to CSA A23.1, article 4.2.2.
 - .4 Non-reactive to alkalis aggregates: according to CSA A23.1, article 4.2.3 and ASTM C 33/C 33M, normal weight coarse aggregate.
 - .1 The particles must be clean, durable, without dust or deleterious materials, containing less than 25% of flat or elongated particles, as determined by testing according to CSA A23.2-13A.
 - .2 Loss by abrasion (according to ASTM C 535, CSA A23.2-16A) shall be less than 50%. Loss shall be less than 12% after five (5) cycles of testing soundness by use of sodium sulfate or magnesium sulfate (ASTM C 88, CSA A23.2-9A).
 - .3 Aggregates should not be made of fine-grained limestone and crystalline limestone.
 - .4 The use of potentially reactive aggregates will be permitted only if compensatory measures as defined in CSA A23.2-27A are used. The use of a mixture containing potentially reactive aggregates is subject to the written approval of the Representative of the Ministry, under favorable opinion of the laboratory responsible for the quality control of materials.
 - .5 Fine aggregates (sand): according to CSA A23.1, article 4.2.3 and ASTM C 33/C 33M, normal weight.
 - .6 Lightweight aggregates: according to ASTM C 330/C 330M.
 - .7 Recycled aggregates: according to NQ 2560-600.
 - .8 Admixtures:
 - .1 Air entraining admixture: according to ASTM C 260.
 - .2 Chemical admixture: according to ASTM C 494/C 494M or ASTM C 1017/C 1017M when added to flowing concrete. The Representative of the Ministry to approve accelerating or set retarding admixtures during cold and hot weather placing.
 - .3 Anti-washout admixture such as :
 - .1 Eucon AWA by Euclid ;
 - .2 MasterMatrix UW450 by BASF ;
 - .3 Sika Stabilizer Aquagel by SIKA ;
 - .4 Alternative Materials: Approved by addendum in accordance with Instructions to Tenderers.
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- .9 Evaporation retardant: such as :
 - .1 MasterKure ER 50 by BASF ;
 - .2 Eucobar by Euclid ;
 - .3 Evapre by W.R. Meadows ;
 - .4 Alternative Materials: Approved by addendum in accordance with Instructions to Tenderers.

2.2 MIXES

- .1 Provide concrete to meet content and performance requirements defined by the Representative of the Ministry in accordance with CSA A23.1 on following articles. Refer to table 1 and table 2 of CSA A23.1 for requirements related to exposition class.
- .2 Ensure that concrete supplier meet component and performance requirements identified hereafter and control compliance as indicated in article FIELD QUALITY CONTROL or PART 3.
- .3 Concrete mix used for **all concrete works, unless otherwise indicated**, shall meet the following requirements:
 - .1 Cement : Portland cement type GUb-SF (10-SF);
 - .2 Nominal size of coarse aggregate: 20 to 40 mm;
 - .3 Slump at discharge: 80 ± 30 mm;
 - .4 Air content: 5 to 8 %;
 - .5 Exposition class: C-1;
 - .6 Ion chloride permeability : less than 1 500 coulombs,
 - .7 Minimum compressive strength: 35 MPa at twenty-eight (28) days.
 - .8 Minimum flexural strength: 3 MPa at twenty-eight (28) days.
- .4 Refer to the table at the end of this section for a summary of concrete mix requirements.
- .5 Concrete supplier and Contractor shall ensure that all concrete meet the following requirements:
 - .1 Unless otherwise indicated, aggregates shall be of normal weight.
 - .2 For all parts of work, concrete mix shall be homogeneous and when cured, have the strength, resistance to deterioration, durability, appearance and other properties required by this specification.
 - .3 Mix design shall ensure durability, strength, workability and other properties required for concrete.
 - .4 Mix shall ensure that concrete flows everywhere into formworks, wrap up reinforcing bars completely but without allowing segregation of materials or excessive bleeding

- .5 Concrete shall be free from surface blemishes, loss of mortar or color variations.
- .6 When concrete thickness is less than 200 mm, maximum size of coarse aggregate shall be 14 mm.

2.3 SPECIAL REQUIREMENTS

- .1 Use of admixtures.
 - .1 Provide samples of admixtures by the Representative of the Ministry's request.
 - .2 Follow manufacturer's recommendations for admixtures use.
 - .3 Ensure compatibility of admixtures, between them and with all components of concrete mix.
 - .4 Use of admixture shall never affect adversely concrete durability including resistance under freeze-thaw cycles.
- .2 Internal vibrators shall be used for consolidating concrete.
- .3 Do not modify concrete mix formulas without the Representative of the Ministry approval. If source of supply for concrete materials is modified, new concrete mix formulas need be approved by the Representative of the Ministry.
- .4 Unless written authorization is given by the Representative of the Ministry, no water shall be added into concrete mix during transport or after arrival on work site.

2.4 METHODS OF TEST FOR CONCRETE

- .1 Reference values indicated in this section shall be obtained from tests in accordance with standards indicated in the following table:

Tests	Standard
Air content	ASTM C 457/C 457M, CSA A23.2-4C
Compressive strength of 50 mm cube specimens	ASTM C 109/C 109M
Compressive strength of concrete cylinders	ASTM C 873/C 873M, CSA A23.2-9C
Degradation of coarse aggregates	ASTM C 535, CSA A23.2-16A
Degradation of fine aggregates	ASTM C 88, CSA A23.2-9A
Flat and elongated particles in coarse aggregate	CSA A23.2-13A

Tests	Standard
Air content	ASTM C 457/C 457M, CSA A23.2-4C
Ion chloride permeability	ASTM C 1202
Obtaining and curing concrete test specimens	CSA A23.2-3C
Obtaining and testing drilled cores of concrete (compressive resistance)	ASTM C 42/C 42M, ASTM C 39/C 39M, CSA A23.2-14A
Obtaining concrete test specimens	ASTM C 31/C 31M, CSA A23.2-1C
Slump	ASTM C 143/C 143M, CSA A23.2-5C
Slump-flow (self-consolidating concrete)	ASTM C 1611/C 1611M, CSA A23.2-5C

- .2 Tests shall be carried out by an independent testing laboratory.

3. Execution

3.1 PREPARATION

- .1 Place formworks in accordance with section 03 11 00 – Concrete Forming. Place concrete reinforcing in accordance with section 03 20 00 - Concrete Reinforcing.
- .2 Obtain the Representative of the Ministry's approval before placing concrete.
- .1 Provide forty-eight (48) hours minimum notice prior to placing of concrete.
- .3 During concreting operations:
- .1 Development of cold joints is not allowed.
- .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .3 Placing of concrete shall be done in accordance with article 7.4 of CSA A23.1 standard.
- .4 Pumping of concrete is permitted only after approval of equipment and mix, conditional to execution in accordance with testing laboratory recommendations.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing concrete, formworks shall be cleaned and free of water.
- .7 Prior to placing of concrete, obtain the Representative of the Ministry's approval of proposed method for protection of concrete during placing and curing.

- .8 Approval is given before concreting, conditional to:
 - .1 Previous approval of formworks and concrete reinforcing after inspection by the Representative of the Ministry.
 - .2 Favorable climatic conditions, namely an external temperature between 5 and 25°C and the absence of rain or snow, unless the Representative of the Ministry has approved arrangements (shelter, heating, etc.) previously.
- .9 Protect previous work from staining.
- .10 Take special precautions where concrete will be exposed to prevent any damage.
- .11 Clean and remove stains prior to application for concrete finishes.
- .12 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken. Submit concrete works registry at the end of each phase of work.
- .13 In locations where new concrete is dowelled to existing work, drill holes in existing concrete, 300 mm deep minimum, unless otherwise indicated.
 - .1 Place steel dowels of 20M 400W steel reinforcing bars and pack solidly with adhesive to anchor and hold dowels in positions as indicated.
 - .2 Unless otherwise indicated, use epoxy adhesive.
- .14 Do not place load upon new concrete until authorized by the Representative of the Ministry.

3.2 PRODUCTION OF CONCRETE

- .1 Provide ready-mixed concrete, fabricated in concrete plant, delivered and offloaded to site in accordance to section 5.2 of CSA A23.1 standard. Alternatively, provide concrete fabricated on site in accordance to the same section. When concrete is fabricated on site, submit methods and equipment for approval by the Representative of the Ministry.
 - .2 Producer of ready-mixed concrete is the sole responsible for formulation of concrete. Producer shall take all steps required to ensure production of high quality, uniform concrete.
 - .3 Request from concrete provider delivery slip for each delivery of concrete and hand over one copy to the Representative of the Ministry. Delivery slip shall include: name and address of the batch plant, truck number, name of Contractor, designation of the job (name and location), class or designation of the concrete, amount of concrete delivered and cumulative amount, time of loading, of beginning of unloading and of end of unloading, maximum size of coarse aggregate, slump and air content required, admixtures used, amount and type of cement and water quantity.
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- .4 **Adding water after initial batching at concrete plant is prohibited**, notwithstanding any indications given in article 5.2.5.3.2 of CSA A23.1 standard. Use water-reducing admixture to ASTM C 494, type F or G, to correct concrete's slump.
- .5 Plan fabrication of concrete and spread deliveries to site to ensure that pouring is continuous.
- .6 Never again batch concrete or mortar after beginning of hardening.
- .7 Concrete temperature at discharge shall be within limits of table 14 of CSA A23.1, tested to article 5.2.5.4 of the same standard. Use protective measures whenever necessary.

3.3 INSTALLATION / APPLICATION

- .1 Execute cast-in-place concrete work to CSA A23.1.
 - .2 Saturate with water hardened concrete surfaces where new concrete will be placed.
 - .3 Bond fresh concrete to rock or hardened concrete to CSA A23.1 article 7.8.5.
 - .4 Concrete shall look good, be free from honeycomb, cold joints, burrs or other defects.
 - .5 Ensure no shocks or impacts occur on formworks and on freshly poured concrete.
 - .6 Deposit concrete in horizontal layers, 500 mm thick maximum, as near as possible to its final position.
 - .7 The Contractor is the sole responsible for choosing free-drop height of concrete as to obtain a high-quality work. In general, free-drop shall not exceed 1.5 m to prevent segregation. Use chutes, slides and/or trunks whenever necessary.
 - .8 For placing concrete for any concrete element, specifically columns, shear walls and any element with significant reinforcing quantity, use superplasticizer admixture to facilitate placing.
 - .9 Internal vibrators shall be used for consolidating concrete. Vibrators shall be applied at such spacing intervals as to compact all concrete properly. Do not vibrate excessively as to prevent segregation. Do not use vibration to force concrete horizontally in place. Follow requirements of CSA A23.1 article 7.4.4.2 and ACI 309R for consolidating concrete.
 - .10 Do not place concrete in water unless special authorization is given. Follow the the Representative of the Ministry and testing laboratory instructions strictly. If a special authorization is given for placing concrete in water, use an anti-washout admixture.
 - .11 Under adverse weather or if equipment failure occurs, take measures to prevent deterioration of freshly poured concrete. When discontinuing work, prepare construction joints and protect fresh concrete with membranes.
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- .12 If Contractor does not use shores, the Representative of the Ministry may request that the Contractor demonstrates, by mean of a letter signed by an engineer member of the Ordre des ingénieurs du Québec (OIQ), that shores are not required for that part of works.
- .13 Place grout under machinery bases and pedestals, per manufacturer's recommendations, to obtain a bearing surface of 100% of the area covered by grout.

3.4 HOT-WEATHER CONCRETING

- .1 Hot-weather concreting shall be done in accordance to CSA A23.1, article 7.1.1 and ACI 305R. Submit, for approval by the Representative of the Ministry, hot-weather concreting procedure prior to beginning works.
- .2 The Contractor shall protect in-place concrete against the effects of heat and dry weather. During very hot periods, the Contractor must protect formworks, reinforcement and concreting equipment against the direct rays of the sun or cool them by spraying water.
- .3 When outside temperature is 25°C or more, or when the Representative of the Ministry judges that the temperature may rise to 25°C or more during concreting, use special precautions to maintain concrete temperature as low as practicable, and never higher than 30°C when minimum dimension of concrete element is smaller than 1 m, 25°C when this dimension is between 1 and 2 m and 20°C for elements larger than 2 m.

3.5 PROTECTION AGAINST DRYING

- .1 During placement of concrete, Contractor shall estimate the rate of superficial moisture evaporation using figure D.1 of CSA A23.1 standard. When the rate is higher than 0.50 kg/(m²*h), the Contractor shall use the supplementary measures defined by article 7.1.1 of CSA A23.1, such as:
 - .1 Wet support before placing concrete.
 - .2 Lower concrete temperature.
 - .3 Cover concrete surface prior to and between different steps when finishing concrete.
 - .4 Vaporize water (use fogging) continuously after concrete placement, taking care that ponding does not occur.
 - .5 Start curing immediately after final finishing; or
 - .6 Place and finish concrete by night or early in the morning.
- .2 In addition to measures defined in article 3.5.1, the Contractor may use an evaporation retardant to article 2.1.14 as a supplementary measure. The evaporation retardant shall be used immediately following concrete placement, following the manufacturer's recommendations. Depending on climatic conditions, many successive applications may be required.

- .3 The Representative of the Ministry or the representative from the testing laboratory may require the use of the supplementary measures listed above if the Contractor is not able to demonstrate that the rate of superficial moisture evaporation is lower than $0.50 \text{ kg}/(\text{m}^2 \cdot \text{h})$.

3.6 COLD-WEATHER CONCRETING

- .1 Cold-weather concreting shall be done in accordance with CSA A23.1, article 7.1.2 and ACI 306R. Submit, for approval by the Representative of the Ministry, cold-weather concreting procedure prior to beginning works.
- .2 Before placing concrete under cold-weather conditions, all equipment needed to protect concrete shall be available on site of works.
- .3 Obtain approval from the Representative of the Ministry before pouring concrete when exterior temperature is below 5°C .
- .4 When outside temperature is 5°C or below, or when the Representative of the Ministry judges that temperature may fall below 5°C during concreting, ensure that concrete temperature remains above 16°C , and never higher than 32°C . Heat water and aggregates if necessary before mixing.
- .5 When concreting is not done under heated enclosures, the Representative of the Ministry may stop concreting if temperature drops to -10°C or below or if winds or snow affects adversely concreting.
- .6 Before concreting, inner walls, reinforcing bars and bottom of formworks shall be cleaned free of snow or ice. Heat formwork and reinforcing bars if necessary. No concrete shall be poured where surfaces or reinforcing bars temperature is below 5°C .
- .7 After concreting, maintain surface temperature of concrete at 21°C for a minimum of three (3) days or 10°C for a minimum of seven (7) days. Concrete temperature shall remain over freezing point for a minimum of seven (7) days and concrete shall not be exposed under freeze-thaw cycles for a minimum of fourteen (14) days.
- .8 Use of calcium chloride, other de-icing salts or chemical products as substitute to proper curing and protection methods is prohibited.
- .9 After protection, concrete temperature shall be lowered progressively, up to a maximum of 6°C per day, until concrete reaches the outside temperature.
- .10 If heated enclosures are used, the Contractor shall, if necessary, moisten air to maintain concrete and formwork moist. Stationary heaters can be used as long as concrete surfaces will not be exposed to heating gases resulting from combustion.
- .11 Costs for cold-weather concreting are included in pricing defined in item 1.2 Pricing and Payment Procedure.

3.7 CONCRETE CURING AND FINISHING

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .2 Using chisel, break concrete projections left by the open joints of the formwork.
- .3 Curing to section 03 39 00 – Concrete Curing.
- .4 Do not place load upon new concrete before concrete has reached the required strength.

3.8 CONSTRUCTION TOLERANCES

- .1 Follow requirements of CSA A23.1, article 6.4, for construction tolerances for cast-in-place concrete.
- .2 In case of non-compliance, the Representative of the Ministry may require that the non-compliant element be demolished and constructed anew, following tolerances to article 6.4, without any additional cost. Alternatively, a permanent deduction may be applied to the global price of the contract as a compensation for the lower quality of the work. The Representative of the Ministry will be the sole judge of the appropriate withholding amount, which may amount up to the equivalent to the cost of demolition and reconstruction of the element.

3.9 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory, certified to CSA A283, designated by the Representative of the Ministry for review to CSA A23.1.
- .2 The Contractor shall cooperate fully to facilitate testing by allowing access to work site and equipment, providing manpower and materials needed to prepare cylinders, and providing a proper secure space for storing samples.
 - .1 Inform testing laboratory at least twenty-four (24) hours before pouring concrete, no matter the volume of concrete to be poured.
 - .2 Set aside on site a place protected against weather conditions where concrete cylinders will be stored, at a temperature of at least 10°C and at most 25°C before being delivered to laboratory.
- .3 One group of test shall be carried out to evaluate compressive strength for every 50 m³ of concrete, but not less than one group of test for each class of concrete poured in a given day.
- .4 Tests shall be carried out in accordance with the indication of article 2.4 of this specification. A group of test shall include, as a minimum, three (3) cylinders, one slump test and one air content test. Test air content for each concrete truck when concrete will be exposed to freeze-and-thaw cycles or exposed to de-icing salts.

- .5 Slump tests shall be carried out in sufficient number as to ensure uniform consistency of concrete.
- .6 Testing laboratory shall take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .7 The Ministry will pay for the costs of tests indicated above.
- .8 Non-Destructive Methods for Testing Concrete: to CSA A23.2.

3.10 INTERPRETATION OF COMPRESSIVE STRENGTH TEST RESULTS

- .1 Interpretation of compressive strength test results will be done in accordance with article 4.4.6.6.1 of CSA A23.1 standard. Concrete meets the requirements of this specification for compressive strength if:
 - .1 The average value of a group of three (3) consecutive tests equals or exceeds the specified strength.
 - .2 Compressive strength equals at least the specified resistance minus 3.5 MPa for all individual tests.
- .2 When test results do not meet the above requirements, the Representative of the Ministry may require, without any additional costs from the Contractor, that:
 - .1 Mix proportions are changed for the remainder of work,
 - .2 Additional curing is done on the portion of the work represented by test specimens,
 - .3 Cores be drilled from the portion of structure in question, in accordance with ASTM C 42/C 42M, ASTM C 39/C 39M and CSA A23.2-14C, interpreted to article 4.4.6.6.2 of CSA A23.1,

3.11 NON-COMPLIANT WORK

- .1 Structural deficiency.
 - .1 Work or part of work has a structural deficiency when concrete strength, as interpreted by article 3.12 of this specification, does not meet the specified resistance.
 - .2 Moreover, work or part of work presents a structural deficiency if one of the following conditions occur:
 - .1 Concrete mix formula was not approved prior to pouring,
 - .2 Representative of the Ministry and/or testing laboratory was not informed before concreting,
 - .3 Concrete pouring was not done following the requirements of this specification.
 - .3 Notwithstanding the results of any tests done during concrete pouring, work or part of work presenting a structural deficiency has interpreted by article 3.13.2

is considered as if not meeting the specified strength requirement per article 3.12.1.

- .4 When specific requirements are given for mixes formula, such as chloride ion permeability or spalling due to salt, to ensure or improve durability of concrete, failure to meet these requirements is considered a structural deficiency.

- .2 Esthetic deficiency.
 - .1 Work or part of work has an esthetic deficiency when concrete is soiled, contaminated by debris, contains honeycombs, surface voids or bug holes, protrusion, smudges, change in colors or any other similar defect. Work that does not respect the finish criteria defined in the article 3.4 section 03 11 00 – Concrete Forming of the specifications is also considered as having an esthetic deficiency.
 - .2 Notwithstanding the article above, presence of surface voids, bug holes and/or honeycombs in concrete with an exposition class of C-1 or C-XL is considered presenting a structural deficiency as in article 3.13.4.
 - .3 The following definitions shall be used when determining esthetic deficiencies:
 - .1 Surface voids or bug holes: Small regular or irregular cavities, usually not exceeding 15 mm in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and compaction.
 - .2 Honeycombs: Concrete or part of concrete that, due to lack of the proper amount of fines or vibration, contains abundant interconnected large voids or cavities; honeycombs may result from improper consolidation. Any regular or irregular voids exceeding 15 mm in diameter are considered honeycombs.
 - .3 Protrusion: any part of concrete work protruding 10 mm or more from concrete work.
 - .4 Smudges: any spillage of concrete from formwork.
 - .5 Changes in color: any change in color that affects adversely the overall look of the concrete work.

- .3 Cracking in new concrete work:
 - .1 Presence of cracks with openings of 0.3 mm or more in new concrete work is considered a deficiency. Presence of a network of cracks with openings of 0.2 mm or more is considered a deficiency. One or more cracks of a total length exceeding 1.5 m on an area of 0.25 m² constitute a network of cracks.

3.12 CORRECTION OF DEFICIENCIES

- .1 Structural deficiency.
 - .1 If, after taking the measures identified in section 3.12.2 of this specification, the Representative of the Ministry still believes that concrete of part of or of all of the works does not meet the strength requirements, he may require

- strengthening or replacement (demolition and reconstruction) of part of or of the whole work as appropriate. All costs shall be assumed by the Contractor.
- .2 When a structural deficiency is identified resulting in a lesser durability of the work, but without affecting strength, the Representative of the Ministry may require that:
 - .1 One or more compensatory measures to obtain a work of a durability equivalent, in the opinion of the Representative of the Ministry, to that which would have been obtained with the use of a concrete meeting the requirements of this specification, the costs will be assumed by the Contractor;
 - .2 A permanent deduction may be applied to the global price of the contract as a compensation for the lower quality of the work. The Representative of the Ministry will be the sole judge of the appropriate withholding amount determined on the basis of future expenses (maintenance and repairs) due to the lesser durability, which may amount up to the equivalent of the cost of demolition and reconstruction of the element.
 - .2 Esthetic deficiency.
 - .1 Make sure the Representative of the Ministry has inspected defects before beginning surface repairs.
 - .2 Any damaged concrete, soiled or containing debris shall be repaired in accordance with the Representative of the Ministry directives.
 - .3 Honeycombs made visible after removal of formworks will be scraped to solid concrete, to a minimum depth of 10 mm. Repairs shall be circumscribed by saw cuts of a regular shape without angles of 60 degrees or less. Zone of repairs shall extend at least 50 mm into sound concrete near honeycombs.
 - .4 When necessary, concrete faces will be cut to obtain sharp regular edges using saw. Surfaces will be cleaned and cavities coated with an epoxy bonding agent then filled with an epoxy modified grout, held in place by formworks if necessary.
 - .5 Protrusions, burrs, smudges, etc. due to formworks shall be grinded.
 - .6 If concrete faces finish is not satisfactory, if the extent of repair needed is too extensive or if concrete presents significant changes of colors, the Representative of the Ministry may require the application of a coating product (cement-based paint, epoxy-based grout, or any other product deemed appropriate) on all exposed faces, without any added costs.
 - .7 The repairs must be executed in accordance with the requirements of the article 3.4 of the section 03 11 00 – Concrete Forming of the specifications.
 - .3 Cracks in new concrete.
 - .1 Cracks with openings of 0.3 mm or more will be injected.
 - .2 Where a network of cracks is present, the Representative of the Ministry may require one of the following measure:
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- .1 Application of a coating product (cement-based paint, epoxy-based grout, or any other product deemed appropriate),
 - .2 Partial demolition and reconstruction with an appropriate product.
- .4 Procedure for repairing deficiencies.
- .1 The Contractor is responsible to submit methods for repairing deficiencies. He needs to obtain the Representative of the Ministry approval of said method before proceeding with reparations.
 - .2 Refer to Guideline No. 310.1R *Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion* by ICRI when preparing methods for repairing deficiencies. Refer to chapters 5 to 7 when determining geometry and extent of surfaces to demolish prior to repairing.
 - .3 Refer to Guideline No. 320.2R *Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces* by ICRI when selecting repair materials.
 - .4 Refer to Guideline No. 320.1R *Guide for Selecting Application Methods for the Repair of Concrete Surfaces* by ICRI when selecting application method for repair materials.
- .5 Inform the Representative of the Ministry after finishing demolition prior to reparation, at least forty-eight (48) hours before applying repair materials, to allow for inspection.
- .6 All costs associated with additional work site supervision due to deficiency repairs are considered the responsibility of the Contractor and will be paid by applying a permanent deduction to the contract.

END OF SECTION

1. General

1.1 RELATED REUIREMENTS

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 20 00 – Concrete Reinforcing.
- .3 Section 03 30 00 – Cast-in-Place Concrete.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 No measurement will be made under this Section. Curing shall be considered integral part of concreting works.
 - .1 Include concrete curing pricing in concreting work package in section 03 30 00 – Cast-in-Place Concrete.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM C 171-07, Standard Specification for Sheet Materials for Curing Concrete.
 - .2 ASTM C 309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C 1315-11, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- .2 Canadian Standard Association (CSA)/CSA International.
 - 1. CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.4 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.
- .3 At least fourteen (14) days prior to curing concrete, submit to the Representative of the Ministry methods for curing concrete and to control quality of concrete curing.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse/recycling.
-

1.6 ACCEPTABLE MATERIALS

- .1 Where materials are specified by trade name refer to the Instructions to Tenderers for a procedure to be followed in applying for approval of alternatives

2. Products

2.1 MATERIALS

- .1 Water: to CSA A23.1, article 4.2.2.
- .2 Membranes, sheet materials: to ASTM C 171 such as :
 - .1 UltraCure by McTech Group;
 - .2 Transguard 4000 by Reef industries;
 - .3 ConKure by Sweeney Materials;
 - .4 Alternative Materials: Approved by addendum in accordance with Instructions to Tenderers.
- .3 Curing compound: white or colorless, to CSA A23.1, ASTM C 309 or CAN/CGSB 19.24. Compound to ASTM C 1315 may be used conditional to approval.
- .4 Jute or burlap cloth: to ASTM C 171 and AASHTO M 182.

3. Execution

3.1. GENERAL REQUIREMENTS

- .1 Follow requirements of section 03 30 00 – Cast-in Place Concrete for concreting.
- .2 Concrete curing to CSA A23.1, article 7.7 and ACI 308R. Refer to those standards when choosing curing methods.
- .3
- .4 Use of curing compound is prohibited unless written authorization is given. If the Contractor wishes to use curing compounds, he shall submit in writing curing methods and all relating documents including technical datasheets for compounds. The Representative of the Ministry may or may not approve use of curing compounds.
- .5 Whenever possible, curing methods shall be chosen such that concrete is moistened by direct contact with water.
 - .1 Use methods reviewed to Representative of the Ministry satisfaction and as defined in CSA A23.1 standard to eliminate bleeding water. Ensure no damage is done to concrete surfaces.

- .6 During curing, ensure that concrete remains unloaded and is protected against chocks, vibrations, weather conditions or any other element that might affect quality of works.

3.2. WET CURING

- .1 Water used for curing concrete shall be clean and without matters that may leave marks on concrete.
- .2 Exposed faces of concrete shall be moistened for at least seven (7) days and protected against weather conditions and other works. Concrete temperature shall remain at or above ten (10) degrees Celsius.
- .3 When concrete has to be protected against cold weather, maintain protection at least twelve (12) hours after the end of wet curing.
- .4 When temperature is twenty-five (25) degrees Celsius or more, or twenty (20) degrees Celsius for mass concrete, use water jet, wet sand or jute for initial curing of concrete.
 - .1 Moisten formworks before concreting and until formworks are removed.
- .5 Use two layers of constantly wet jute or burlap clothes for curing walls or other vertical elements.
- .6 Non-formed concrete surfaces shall remain wet for a minimum of seven (7) days.
- .7 Formed concrete surface (beams, columns, walls, etc.) shall be cured for at least seven (7) days, as follows:
 - .1 Before formwork removal: three (3) days, but not less than the duration in section 03 11 00 – Concrete Forming.
 - .2 Wet curing following formwork removal: four (4) days.

3.3. MEMBRANE CURING

- .1 Effect of sun, wind, cold or rain can adversely affect concrete curing. Exposed faces of concrete shall be covered partially or completely by tarpaulin or protected by any other means approved by the Representative of the Ministry.
- .2 Rather than using a method in accordance with article 3.2 of this section, the Contractor may use blankets specially designed for curing concrete. Depending on weather conditions, use sheet materials designed for hot weather. Method for using sheet materials shall be as follow:
 - .1 Begin placing immediately after concrete has hardened enough to prevent damages.
 - .2 Spray water over a first strip where sheet materials will be installed. Surface shall be covered by 3 to 6 mm of water.
 - .3 Unroll sheet materials over wet concrete. Add water when needed.

- .4 Use squeegee to smooth out wrinkles and air bubbles.
- .5 Spray water over next strip and repeat preceding operations. Lap strips over 75 mm minimum. At roll ends, overlap over 300 mm minimum. Cover the entire surface of slab.
- .6 Inspect slab frequently and repair immediately any damage to sheet materials.
- .7 Remove sheet materials after seven (7) days of curing or later. Do not reuse sheet materials.

3.4. USE OF CURING COMPOUNDS

- .1 Where authorized, curing compounds shall be used if compatible with floor finish.
 - .1 Curing compound shall be used following manufacturer's recommendations. Compound shall be selected so that dust will not deposit on concrete surface and so that evaporation of water contained in concrete does not occur. Curing compound should not affect architectural flooring.
 - .2 Use curing compounds compatible with finishing products. Submit a written document certifying that all products applied on concrete surfaces are compatible. The Contractor is the sole responsible to determine and demonstrate compatibility between all products applied on concrete surfaces.

END OF SECTION

1 General

1.1 PRICING AND PAYMENT PROCEDURE

- .1 Backfilling to authorized excavation limits will be measured in tonnes for each type of material specified.
- .2 Placing and spreading of topsoil will be measured for payment in cubic metres calculated from cross sections taken in area of excavation from original location.
 - .1 If double handling of topsoil is directed by The Representative of the Ministry, then quantities will be measured twice; on excavation from original location and on excavation from stockpile
- .3 No measurement will be made under this Section. Include excavated materials, trenching, backfilling and any other works required under this section in the global pricing.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM):
 - .1 ASTM C 117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing;
 - .2 ASTM C 131-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;
 - .3 ASTM C 136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates;
 - .4 ASTM C 535-12, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;
 - .5 ASTM C 837-09(2014), Standard Test Method for Methylene Blue Index of Clay;
 - .6 ASTM D 422-63(2007)e1, Standard Test Method for Particle-Size Analysis of Soils;
 - .7 ASTM D 698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³);
 - .8 ASTM D 1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³);
 - .9 ASTM D 2167-08, Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method;
 - .10 ASTM D 4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils;
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- .11 ASTM D 6928-10, Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus;
 - .12 ASTM D 6938-10, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth);
 - .13 ASTM D 7428-15, Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.
- .2 Canadian Standards Association (CSA)/CSA International:
- .1 CSA A23.3-14, Design of Concrete Structures.
 - .2 CAN/CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - 1. CAN/CSA A3001-13, Cementitious materials for use in concrete.
 - .3 CSA S269.1-1975 (R2003), Falsework for Construction Purposes.
 - .4 CAN/CSA S269.3-M92 (R2008), Concrete Formwork.
- .3 Bureau de normalisation du Québec (BNQ) :
- .1 CAN/BNQ 2501-250, Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage normale (600 kN m/m³);
 - .2 CAN/BNQ 2501-255, Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2 700 kN m/m³);
 - .3 NQ 2560-114, Travaux de génie civil - Granulats.
- .4 Commission de la santé et de la sécurité du travail (CSST).
- .1 CSST 2011, Pour mieux exécuter les travaux de creusement, d'excavation et de tranchée, ISBN 978-2-550-59412-3.
- .5 Government of Quebec.
- .1 Safety Code for the Construction Industry R.R.Q., c. S-2.1, r.6.
- .6 Ministère des Transports du Québec (MTQ) :
- .1 Cahier des charges et devis généraux (CCDG), 2014 edition;
 - .2 Méthode d'essai LC 31-228, Évaluation de la teneur en matière organique dans les granulats et les sols;
 - .3 Norme 1101, Classification des sols;

1.3 DEFINITIONS

- .1 Excavation classes: two (2) classes of excavation will be recognized; second class common excavation and first class rock excavation.
 - .1 First class rock excavation: In addition to CCDG stipulations, solid material in excess of 1.25 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.

- .2 Second class common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .5 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB 8.1 or CAN/CGSB 8.2.

- .2 Table:

Sieve Designation	% passing
2,00 mm	100
0,10 mm	45 - 100
0,02 mm	10 - 80
0,005 mm	0 - 45

- .3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

1.4 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Preconstruction Submittals:
 - .1 Submit technical datasheets for any products used in Work and listed in PART 2, in accordance with section 01 33 00 – Submittal Procedures.
 - .2 Inform Representative of the Ministry at least fourteen (14) days prior to beginning Work, of proposed source of fill. Provide all necessary documents to certify conformity of fill materials in regard to the specifications.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Send non-contaminated excess aggregates that can be reused to a quarry or a local recycling installation authorised by the Representative of the Ministry.

1.6 EXISTING CONDITIONS AND GEOTECHNICAL SURVEY

- .1 A subsurface investigation report is **available** for consultation purposes in **Appendix A**, which is appended to the specifications.
 - .2 All recommendations of the geotechnical study are considered part of this specification. Follow all recommendations of the study
 - .3 In case of conflict between the requirements of this section and the recommendations of the geotechnical study, use the most stringent requirements.
 - .4 Buried services:
 - .1 Prior to beginning excavation work, establish location and usage state of buried utilities and structures and submit an application to info-excavation. The Contractor is responsible for the localization of public utilities, aerial or underground. Report findings to the Representative of the Ministry and authorities. Ensure that no service interruption occurs during Work.
 - .2 Confirm locations of buried utilities by careful test excavations (exploratory hole) The costs associated with carrying out these exploratory holes are included in the cost of Works.
 - .3 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .4 Where utility lines or structures exist in area of excavation, obtain direction of the Representative of the Ministry before removing. In general, remove unused utilities located less than 2 meters from footings and obturate cut sections with female plug.
 - .5 Upon obtaining approval from the Representative of the Ministry, arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .6 Remove all obsolete buried channelling found within two (2) meters of the foundations and block off cut sections with a cap. Remove and dispose of all obsolete channelling found in the trenches off site.
 - .7 Record location of maintained, re-routed and abandoned underground lines.
 - .8 Repair as soon as possible all public utility networks that have been damaged during works and bear all costs for repair work. The Contractor must, in all cases, advise the Ministry of the damages he has caused or the danger he has created by or during his work.
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2 Product

2.1 METHODS OF TESTING

- .1 Reference values indicated in this section shall be obtained from tests in accordance with standards indicated in the following table:

Test	Standard
Sieve Analysis	ASTM C 117, ASTM C 136, ASTM D 422, CSA A23.2-2A et CSA A23.2-5A
Compaction Characteristics of Soil Using Standard Effort	ASTM D 698, CAN/BNQ 2501-250
Compaction Characteristics of Soil Using Modified Effort	ASTM D 1557, CAN/BNQ 2501-255
In-Place Density and Water Content of Soil	ASTM D 2167, ASTM D 6938
Los Angeles	ASTM C 131 or ASTM C 535, CSA A23.2-16A or CSA A23.2-17A
Micro-Deval	ASTM D 6928 or ASTM D 7428, CSA A23.2-23A or CSA A23.2-29A
Organic Matter	LC 31-228 tel qu'indiqué au CCDG
Methylene Blue Index	ASTM C 837

- .2 Tests shall be carried out by an independent testing laboratory.
- .3 Unless otherwise specified, the reference value for the maximum soil density corresponds to the value obtained by the compaction characteristics of soil using modified effort test. When the reference test is not otherwise stated for a particular part of the work, the reference value is obtained by this test. When the Modified Proctor (MP) value is mentioned, the modified effort test shall be used as well.

2.2 MATERIALS

- .1 Granular fill: borrow class A material:
- .1 Class A material: in accordance with NQ 2560-114 standard and designation found on Ministère des Transports du Québec's (MTQ) Standard Specification 1101.
 - .2 Material from natural granular or non-plastic soil such as: sand, gravel, stone. Maximum dimensions of stone shall be less than a third of the layer thickness.

- .3 Material shall be non-susceptible to frost heaving and usable as backfill for trench.
- .4 Material shall be compliant with the following requirements (after compaction):

- .1 Sub-grade material:

Sand, gravel and crushed stone designated as MG-112 :

Sieve	% passing
112 mm	100
5 mm	35 - 100
0,080 mm	0 - 10

Physical properties of borrow materials shall be as follow (95% compliant):

Tests	Criterion	
Los Angeles	Maximum	50
Micro-Deval	Maximum	40
Micro-Deval and Los Angeles	Maximum	85
Organic matter	Maximum, gravel and sand deposit only	0,8 %
Methylene blue	Maximum, gravel and sand deposit only	0,2

- .2 Sub-grade, bedding and surround material:

Sand and gravel CG-14:

Sieve	% passing
20 mm	100
5 mm	35 - 100
0,080 mm	0 - 15

Stone dust:

Sieve	% passing
14 mm	100
5 mm	75 – 100
0,160 mm	4 – 25
0,080 mm	0 - 10

Physical properties of borrow materials shall be as follow (95% compliant):

Tests	Criterion	
Los Angeles	Maximum	50
Micro-Deval	Maximum	40
Micro-Deval and Los Angeles	Maximum	85
Organic matter	Maximum, gravel and sand deposit only	0,8 %

- .3 GW, GP, GW-GM, GP-GM, SW, SP, SW-SM soil as determined from MTQ 1101 standard may be considered compliant with requirements herein and designated as class A material.
 - .4 Obtain the Representative of the Ministry's approval for the backfill material prior to beginning Work.
- .2 Class B material: all soil that may be compacted, compliant with MTQ 1101 standard made of excavated materials or materials from a source authorized by the Representative of the Ministry for the proposed use. These materials shall be free of stones whose largest dimension exceeds 75 mm, slag, ash, sod, waste and roots. Organic soils or soils containing organic matter, or contaminated soils containing wastes and soils containing frozen masses are excluded from this classification.

.3 Crushed stone:

- .1 Crushed Stone 56-0 or MG-56: Natural granular material or cleaned crushed stone without shale, clay, pulverulent or organic matter. Grading range shall comply with the requirements below (after compaction):

Sieve	% passing
80 mm	100
56 mm	82 – 100
31,5 mm	55 – 85
5 mm	25 – 50
1,25 mm	11 – 30
0,315 mm	4 – 18
0,080 mm	2 – 7

- .2 Crushed stone 20-0 or MG-20: Cleaned crushed stone without shale, clay, pulverulent or organic matter. Grading range shall comply with the requirements below (after compaction):

Sieve	% passing
31,5 mm	100
20 mm	90 – 100
14 mm	68 – 93
5 mm	35 – 60
1,25 mm	19 – 38
0,315 mm	9 – 17
0,080 mm	2 – 7

- .3 Crushed stone 20 mm: Cleaned crushed stone with a grading range complying with the requirements below (after compaction):

Sieve	% passing
25 mm	100
20 mm	90 – 100
12,5 mm	20 – 55
10 mm	0 – 15
4,75 mm	0 – 5

- .4 Physical properties of crushed stone shall be as follow (95% compliant):

Tests	Criterion	
Los Angeles	Maximum	50
Micro-Deval	Maximum	35
Micro-Deval and Los Angeles	Maximum	80
Fragmentation	Minimum	50 %
Organic matter	Maximum, gravel and sand deposit only	0,8 %
Methylene blue	Maximum, gravel and sand deposit only	0,20

- .4 Riprap 150 - 300 mm :

- .1 Riprap without shale, clay, pulverulent or organic matter. Grading range shall comply with the requirements below (after compaction):

Sieve	% passing
300 mm	100
225 mm	50
150 mm	0

- .5 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Minimum compressive strength of 0.07 MPa at 24 hours.
 - .2 Maximum compressive strength of 0.4 MPa at 28 days.
 - .3 Maximum cement content of twenty-five (25) kg/m³.
 - .4 Concrete aggregates: to CSA A23.1.
 - .5 Cement: Type GU, to CAN/CSA A3001.
 - .6 Slump: 180 ± 30 mm.
- .6 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

3 Execution

3.1 SAFETY AND HEALTH

- .1 The Contractor shall take special precaution to ensure the use methods for performing works ensuring the safety of workers.
- .2 During excavation work, Contractor shall use special precaution in digging safe trenches, as required by the Safety Code for the Construction Industry, notably article 3.15.3.
 - .1 Refer to the guide Pour mieux exécuter les travaux de creusement, d'excavation et de tranchée by the Commission des normes, de l'équité, de la santé et de la sécurité au travail (CNESST).
- .3 For work near excavation or trenches, Contractor shall ensure safe work procedure, as defined by legislation, particularly CNESST. Contractor shall noticeably, but is not limited to:
 - .1 Ensure that circulation, especially machinery circulation, is done at a safe distance from excavation and trenches;
 - .2 Do not stockpile materials near excavation and trenches;
 - .3 At the end of each work day, ensure that access to excavation and trench is secured and that no accidental falls may occur.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION AND PROTECTION

- .1 Keep excavations clean, free of standing water, and loose soil.

- .2 Where soil is subject to significant volume change due to change in moisture content, cover and protect subject to the approval of the Representative of the Ministry.
- .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .4 Protect buried services that are required to remain undisturbed.
- .5 Protect side slope from erosion, landslides, slumping or other natural or accidental soil degradation phenomena.
- .6 Protect bottom of excavations from freezing.
- .7 Protect levelling and alignment marks as well as survey and geodesic monuments.
- .8 Protect, in appropriate manner, installations and existing material found on site or in the immediate vicinity, so that they are not damaged during Work.
- .9 Protect bottom of excavations from all softening and, if this occurs, remove softened soil and replace it with chippings according to the instructions of the Representative of the Ministry.
- .10 Take necessary and approved measures to eliminate dust produced by works.
- .11 Never pile debris where it could hinder works or drainage. Follow standards and regulations in effect (CNESST) for storing materials in proximity to excavation zones

3.4 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as indicated by the Representative of the Ministry after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip entirety of topsoil.
 - .1 Do not mix topsoil with subsoil.
 - .1 Conserve useable topsoil on the site Stockpile height not to exceed 2 m and should be protected from erosion.
- .3 Eliminate unused topsoil off the site.

3.5 STOCKPILING

- .1 Stockpile fill materials in areas designated by the Representative of the Ministry.
 - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.6 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress. The Contractor is responsible of the control and the evacuation of rainwater, water from melted snow, underground water, sewage water and water from any other source on the site. The Contractor fixes, at his own expense, all damage caused by water, whatever the nature of it.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 The Contractor must, in a continuous fashion all along the works, protect the bottom of the excavations against any softening or against any freezing. If either were to happen, he must remove the damaged soil and replace it by class B soil at his own expense.
- .4 Dispose of water i in manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
 - .2 The concentration of suspended matter present in the water evacuated off the work site will have to be at all times inferior to 25mg/L. The Contractor will have to submit his erosion control methods for approval before the beginning of the works.

3.7 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated on drawings.
 - .2 Remove concrete other obstructions encountered during excavation.
 - .3 Excavation must not interfere with bearing capacity of adjacent foundations. Do not disturb the normal transfer cone at 45 degrees below existing footings.
 - .4 Keep excavated and stockpiled materials safe distance away from edge of trench.
 - .5 Restrict vehicle operations directly adjacent to open trenches.
 - .6 Do not obstruct flow of surface drainage or natural watercourses.
 - .7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
 - .8 Notify Representative of the Ministry when bottom of excavation is reached.
 - .9 Obtain the Representative of the Ministry approval of completed excavation.
 - .10 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Representative of the Ministry.
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- .11 When required, carefully cut concrete components along the excavation lines so that the surface neatly and evenly. Saw grooves must be vertical.
- .12 Off profile excavation must be corrected according to the methods described below:
 - .1 Under bearing area and footings, use MG 112 fill, and compact to 95 % of the density reference value by 300 mm thick layer for a total thickness up to a maximum of one meter;
 - .2 If the bottom of excavation is located at more than one meter under bearing area and footings, fill the over-excavated area using lean concrete to the level corresponding to one meter below the concrete structure;
 - .3 At any other area, fill using class A material and compact to 90 % of the density reference value.
- .13 Profile excavations by hand, strengthen the walls and remove all non-adherent materials and debris therein:
 - .1 If the bottom material of the excavation was disturbed, compact to a density at least equal to that of the undisturbed soil;
 - .2 Clean cracks identified in the rock and filled with grout or concrete mortar to the satisfaction of the Representative of the Ministry.

3.8 CHARACTERIZATION AND TRACKING OF EXCAVED SOILS AND MATERIALS

- .1 At the request of the ministry representative, soil and materials that have been excavated, they shall be piled and sampled on condition that the environmental quality of such soil and materials is unknown.
- .2 Soils and materials stored for characterization shall be sampled by the departmental representative. The Contractor must coordinate the implementation and operation activities according to the waiting times of the analytical results (delays of 2 to 3 working days).
- .3 No claim by Contractor will be admissible due to delays in chemical analysis of soils.
- .4 Upon receipt of the results and as directed by the Departmental Representative, the Contractor shall use the soil for re-use at the site provided for in the Location Plan or its off-site disposal at a site authorized by the MDDELCC.
- .5 Piles of soil and material shall be deposited on a waterproof surface, covered with impermeable membranes (eg polythene mesh) and have a maximum height of two (2) meters. The volume of each stack to be characterized must not exceed 30 m³.
- .6 Piles of soil and material shall be located in a convenient location with the Departmental Representative so as not to interfere with the continuation of work and to avoid contamination of the uncontaminated areas.
- .7 Only the ministry representative is authorized to determine which floors and materials are to be piled and the contractor.

- .8 The Contractor shall ensure that the temporary pile-up of the soil is carried out in a safe manner.
- .9 The Contractor shall provide all labor and equipment required for the handling of soil and materials in the storage, including impermeable membranes

3.9 EXCAVATION FOR CONCRETE WORKS

- .1 Width of trenches shall exceed width of concrete work at least 600 mm on each side.
- .2 Bottom of excavation shall be reasonably level, solid and without rock, stone, mud, earth or any other debris.
- .3 Ensure adequate drainage of the bottom of excavation.
- .4 Compact soil below work to obtain 95 % of the density obtained by the modified effort test.

3.10 BACKFILLING - GENERAL

- .1 Advise the Ministry Representative when element that will be landfilled are in place. The Ministry Representative must inspect the elements before the excavation is backfilled.
- .2 Do not proceed with backfilling operations until completion of following:
 - .1 The Representative of the Ministry has inspected and approved installations.
 - .2 Inspection, testing, approval of underground utilities and recording of their location;
 - .3 Removal of formworks;
 - .4 Filling of voids using an approved material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Ensure that filling materials remain humid enough so that it may be compacted to the specified density.
- .7 If, during work, materials used are proven non-compliant with requirements of those specifications, the Contractor will be required to remove and replace materials without charge.

3.11 BACKFILLING FOR CONCRETE WORKS

- .1 Do not begin backfilling before obtaining approval from the Representative of the Ministry, after inspection of concrete work.

- .2 Place and compact fill by 300 mm thick layer. Ensure that no movement or damage occur to underground utilities any buried component. Repair any damage.
- .3 Inside and outside building, under concrete slabs and landings, fill using class A material, compacted to 95 % of density reference value to 300 mm below bottom of slab or landing. Fill the last 300 mm using MG-20 crushed stone compacted to 95 % of reference value.
- .4 Do not backfill around or over cast-in-place concrete within twenty-four (24) hours after placing of concrete.
- .5 Place layers simultaneously on both sides of installed Work to equalize loading. Difference of height shall not exceed 300 mm.

3.12 MATERIALS FOR REMOVAL AND COMPACTION

- .1 At locations where soil has been excavated or at sites where enhancement is required, fill areas. The filling is carried out in a layer with a maximum thickness of 300 mm, with class B backfill materials. The fill density of the backfill must be up to 90% of the modified Proctor test and verified on site by a laboratory. The Contractor shall provide sufficient downtime to enable the laboratory to perform the density tests.
- .2 Levels of backfill in the excavated area shall be in accordance with the Representative of the Ministry's plans.
- .3 The filling of the excavated area may begin following the authorization of the Representative of the Ministry and the laboratory.
- .4 Protect the bottom of the excavation from softening or frost at any time and, if this occurs, remove the softened soil and replace it with Class B materials at the Contractor's expense.
- .5 The Contractor is fully responsible for the stability of the infrastructure and shall take all necessary precautions to ensure that the infrastructure materials are protected and well drained to achieve the specified degree of compaction. If the infrastructure is of poor quality due to the working methods, the Contractor must correct the anomalies or excavate and replace the materials according to the Representative of the Ministry's instructions, entirely at the Contractor's expense.
- .6 Provide all materials required for backfilling and leveling work, taking into account the permissible tolerances, in addition to or less, for summary leveling.
- .7 Dispose of surplus materials off site. In the sense that surplus materials and excavated material from excavation, deforestation, cleaning or otherwise, which the Contractor or the Department does not require for its work, become the property of The Contractor and must be arranged off-site. They must be transported and disposed of at the Contractor's expense to a place of his choice where he has previously obtained a written and signed agreement with the owner or owners of the land concerned. The Contractor shall be solely responsible for the consequences of

the filling of one or more lots and the possible claims of the owners concerned, such as leveling, quality of fill material, damage to trees, terraces, etc.

- .8 For excavation (concrete, etc.) and deforestation, the Contractor shall dispose of it at his expense in a site recognized for this type of material by the MDDELCC.
- .9 Class B backfill materials (acceptable geotechnical criteria) for backfilling of excavations include "new" materials, ie materials from recognized borrow pits, quarries or sand pits, As well as soil excavated and stored on site and whose environmental and geotechnical characteristics are compatible with the objectives of backfilling.
- .10 The reuse of excavated soil on the site, ie, soils within the AB criteria of the Policy in the first place and <A second (environmental criteria), should be privileged by the Contractor in relation to the materials Imported, insofar as the re-use of these soils is authorized by the Representative of the Ministry and the laboratory.
- .11 The use of soils imported from another site may also be considered as Class "B" fill. In this case, the Contractor will have to prior to importing the soil on the site, submit to the Representative of the Ministry, information on the provenance of the soil, the volumes to be imported, their granulometry, their environmental quality and their geotechnical characteristics. Any import of soil on the site of the works must be authorized beforehand by the Representative of the Ministry.
- .12 Unless otherwise specified by the Representative of the Ministry, bituminous concrete cost is not acceptable as backfill material.

3.13 LEVELING

- .1 Perform leveling so that water does not flow to foundations, but is directed to sumps and other approved drainage systems.
- .2 Level the ground by giving it a gradual slope between the various points indicated on the drawings.

3.14 ON-SITE QUALITY CONTROL

- .1 Materials testing and compaction testing of fill materials shall be carried out by a laboratory.
 - .2 No later than two (2) weeks prior to commencement of backfilling or filling, provide the designated testing organization with samples of the proposed materials in accordance with PART 1 DOCUMENTS TO BE SUBMITTED.
 - .3 Do not begin backfilling or refilling until materials have been approved for use by the Representative of the Ministry.
 - .4 Notify the Representative of the Ministry no later than 48 hours before commencing backfilling or filling with approved materials to allow the designated testing laboratory to perform the required compaction tests.
-

3.15 MATERIALS REQUIRED OR EXCESSIVE

- .1 Provide all materials necessary for backfilling and leveling, taking into account the allowable tolerances, in addition to or less, for summary leveling.
- .2 Dispose of surplus materials off site.

3.16 INSPECTION AND TESTING

- .1 Tests shall be performed in accordance with ASTM D 6938 standard.
- .2 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Representative of the Ministry. The following non-exhaustive list presents elements likely to be inspected:
 - .1 Bottom of excavation (compactness, presence or absence of disturbed soil, dampness, etc.)
 - .2 Compactness and water content of any fill material to be placed;
 - .3 General workmanship.
- .3 The Contractor shall cooperate freely to allow testing by providing all the necessary assistance on site required by the testing laboratory. If an item is deemed defective by the Representative of the Ministry, the Contractor shall take immediate actions to remedy the situation. All corrective work required shall be performed, without charge, to the satisfaction of the Representative of the Ministry.
- .4 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Representative of the Ministry.
- .5 Submit test reports to Representative of the Ministry within three (3) days of completion of inspection.

3.17 RESTORATION OF SITE

- .1 At the end of the works, the contractor must dispose of all debris and excess material,
- .2 Contractor must apply hydroseeding to every area affected by the project.

3.18 HYDROSEEDING

- .1 Seeding should be performed by using a hydraulic seed drill.
 - .2 The Contractor is responsible for watering the grass 30 days after the hydroseeding.
-

.3 Type of Hydroseeding

.1 The hydroseeding type is "Gloco herbio stable" or approved equivalent. It is composed of the following elements:

- 25% Creeping red fescue
- 22% Tall fescue
- 20% Perennial (ivy) ryegrass
- 15% Canada bluegrass
- 8% Colonial bentgrass
- 10% White clover

.4 Seeding rate: 255 kg/ha (manual), 150kg/ha (mechanical).

.5 A matrix of EarthGuard Fiber Matrix fibers (or equivalent approved) must be applied hydraulically during seeding and adhere to the soil to form a continuous, absorbent, flexible, and biodegradable mat of erosion protection allowing rapid germination. The fiber matrix shall be applied according to manufacturer's recommendations, at a rate of 3400 kg / hectare and shall consist of thermally produced wood fibers (chips 6 mm and longer) and of tackifiers.

.6 Hydroseeding

.1 Hydroseeding must be carried out on 150 mm of topsoil.

.2 This type of seeding using a hydraulic seed drill includes:

- Uniform application of a fertilizer, the basic formula of which meets a 1-3-1 rate, providing a minimum of 25 kg / ha of nitrogen (N), 75 kg / ha of phosphorus (P2O5) and 25 kg / ha of potassium (K2O). The recommendations:
- Uniform spreading of the grass mix at the rate of 255 kg/ha;
- Addition of water;
- Uniform seedling protection with a mulch for seeding at a rate of 1400 kg / ha of wood fiber or straw fiber. In the case of straw fiber mulch, the contractor must add 1,700 l / ha of horticultural peat;
- Impregnating the mulch with a fixing agent at the rate recommended by the manufacturer.

Seeds should not have been in water for more than 2 hours before seeding.

The contractor must perform two fertilization operations: the first at the time of seeding and the second at the time of maintenance.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION GENERAL CONTENT

- .1 Work of this section includes, among others, the supply and installation of the following elements:
 - .1 Construction of new chain link fences and gates with new materials. The types of fences and gates concerned are the following:
 - .1 Type of fence:
 - .1 12' area or yard interior fencing.
 - .2 Types of gates and fences:
 - .1 Swivel gates for pedestrians 1800 mm wide;

1.2 RELATED SECTIONS

- .1 Section 02 41 16 – Construction demolition
- .5 Section 03 30 00 – Cast-in-place concrete
- .6 Section 31 23 00 – Excavation and fill

1.3 REFERENCES

- .1 Laws, regulations and standards in effect in Quebec:
 - .1 Occupational Health and Safety Act (*Loi sur la santé et la sécurité du travail*);
 - .2 Safety code for construction work (L.R.Q., S-2.1, r. 6);
 - .3 Occupational Health and Safety Regulations;
- .2 American Society for Testing and Materials International, (ASTM) latest versions.
 - .1 ASTM A53/A53M, Specifications of Pipe, Steel, Black and Hot-Dipped, Zinc-Coated welded and Steamless.
 - .2 ASTM A90/A90M, Standard Test Method for Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - .3 ASTM A121-99, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
 - .4 ASTM C 618-03, Standard specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete.
 - .5 ASTM F1664-01, Standard Specification for Poly(Vinyl Chloride) (PVC) – Coated Steel Tension Wire used with Chain-Link Fence.
- .3 Canadian General Standards Board (CGSB), latest versions.
 - .1 CAN/CGSB-138.1, Fabric for chain link fence
 - .2 CAN/CGSB-138.2, Steel framework for chain link fence.
 - .3 CAN/CGSB-138.3, Installation of chain link fence.
 - .4 CAN/CGSB-138.4, Gates for chain link fence.
 - .5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

- .4 Canadian Standards Association (CSA)/CSA International
 - .1 CAN/CSA-A23.1/A23.2, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.
 - .2 CAN/CSA-C49.1, Round Wire, Concentric Lay, Overhead Electrical Conductors.
 - .3 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .4 CAN/CSA-A3000-F98, Cementitious materials compendium.
- .5 Health Canada - Workplace Hazardous Materials Information System (WHMIS).
 - .1 Safety data sheet (SDS).
- .6 The Master Painters Institute (MPI) - Architectural Painting Specification Manual.
 - .1 MPI #8, Alkyd, Exterior Flat.
 - .2 MPI #18, Organic Zinc Rich Primer.
 - .3 MPI #134, Primer, Galvanized, Water Based.

1.4 DOCUMENTS/SAMPLES TO SUBMIT

- .1 Submit the required documents and samples in accordance with the general requirements.
 - .2 Submit shop drawings showing clearly the layout and size of fences and gates, posts position, foundation dimensions, and details of components and materials, including all special devices.
 - .3 Shop drawings shall indicate the materials to be used and the methods of construction, fastening or anchorage to be used and shall contain the installation drawings, connection details, relevant explanatory notes and any other information necessary for the execution of the work. Make referrals to specifications and preliminary design drawings
 - .4 The documents submitted must contain or indicate the following:
 - .1 Date;
 - .2 Project number and designation;
 - .3 Name and address of the following people:
 - .1 The subcontractor;
 - .2 The supplier;
 - .3 The manufacturer;
 - .4 The contractor's stamp, signed by the contractor's authorized representative, certifying that the document submitted is approved, that the on-site measures have been verified and that everything complies with the requirements of the contract documents;
 - .5 Relevant details for the portion of the work involved:
 - .1 Materials and details of fabrication;
 - .2 Layout or configuration, showing dimensions -including those taken on-site-, as well as gaps and clearances;
 - .3 Details regarding mounting or adjustment;
 - .4 Performance characteristics;
 - .5 Reference standards;
 - .6 Operational mass;
 - .9 Links to adjacent structures;
 - .6 Submit one (1) electronic copy of the shop drawings prescribed in the technical sections of the specification and as may be reasonably required by the Ministerial Representative.
 - .7 If no shop drawings are required due to the use of a standard manufacturing product, submit one (1) electronic copy of the manufacturer's technical specifications or documentation as prescribed in the technical sections of the specification and required by the Ministerial Representative.
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- .8 Submit one (1) electronic copy of the test reports prescribed in the technical section of the specifications and / or as required by the Ministerial Representative.
- .9 Submit one (1) electronic copy of the activity and maintenance records prescribed in the technical sections of the specification and required by the Ministerial Representative.

1.5 PERFORMANCE CRITERIA

- .1 Fences shall be installed in a straight line from one corner post to the other to ensure a full view of the fences.

1.6 TRANSPORT, STORAGE AND HANDLING

- .1 Transport and store materials to avoid scratches and other damage to the galvanized finish of components.

1.7 TEMPORARY PROTECTION

- .1 Take the necessary measures to prevent damage to adjacent structures, ducts, sidewalks, pavements, earthworks, and adjacent buildings.

1.8 HEALTH & SAFETY

- .1 Observe the occupational health and safety regulations for construction sites in accordance with the general conditions.

1.9 MANAGEMENT AND WASTE DISPOSAL

- .1 Transport the unused metal components to a metal recycling facility approved by the Ministerial Representative.
- .2 Transport other unused materials to local facility approved by the Ministerial Representative.

1.10 WARRANTY

- .1 For the work covered by this section, the 12-month warranty period specified in the General Conditions applies.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Use new materials with the following characteristics:
 - .1 All stainless steel components shall contain 17% chromium.
 - .2 All galvanized steel components shall contain 610 g/m² zinc.
 - .3 See 2.3 Dimensions for information on elements' height.

2.2 CHAIN LINK FENCE FABRIC

- .1 Galvanized chain link fence fabric (lozenge-shaped):
 - .1 In accordance with standard CAN/CGSB-138.1, category 2.
 - .2 The chain link fence fabric must comply with the following characteristics:
 - .1 **Diameter of chain link:** 4.8 mm minimum (gauge 6);
 - .2 **Chain link fence fabric size:** 50.8 mm;

- .3 **Height of chain link fence fabric:** variable, see 2.3 Dimensions;
 - .4 **Average mass of zinc coating:** 610 g/m² minimum;
 - .5 **Breaking strength:** 10,000 N minimum;
 - .6 **Upper selvages:** twisted-tipped 3 turns;
 - .7 **Lower selvages:** folded.
- .3 The chain link fence fabric must be continuous throughout its height and placed on the side of the posts facing the building.
 - .4 The chain link fence fabric must be tightened before installation. See 3.2 Installation of the fence for the tensile test check following installation.

2.3 METAL FRAME

- .1 The metal frame must be in accordance with CAN/CGSB-138.2-96 and must have the following specifications:
 - .1 Posts and top rails:
 - .1 Steel pipes "Schedule 40" with minimum zinc coating of 610 g/m².
 - .2 Posts shall be spaced no more than 2500 mm apart.
 - .3 Intermediate posts shall have a minimum outside diameter of 73 mm and a density of 8.6 kg/m.
 - .4 Tensile posts shall have a minimum outside diameter of 114.3 mm and a density of 15.92 kg / m. They must not be spaced more than 60 m.
 - .5 Corner and gate posts shall have a minimum outside diameter of 143.3 mm and a density of 21 kg/m.
 - .6 Upper and lower rails shall have a minimum outside diameter of 42.2 mm and a linear density of 3.4 kg / m.
 - .7 Intermediate rails shall not be used.
 - .2 Post caps:
 - .1 Hollow sections with a yield strength of 300 MPa adapted to the diameter of the posts.
 - .2 Posts caps ensuring waterproofing, securely fastened to posts and carrying upper crossings.
 - .3 Tension bar:
 - .1 Galvanized steel flat bars of minimum dimensions 5 mm x 20 mm, with rounded edges and covering the total height of the fence.
 - .4 Tension bar clamps:
 - .1 Galvanized steel, semi-oval shaped with a minimum cross-section of 3 mm x 20 mm, shaped at the post diameter with 10 mm diameter galvanized attachment bolts. The nuts must face the outside of the inmates courtyards and be firmly tightened. The spacing between the clamps shall not exceed 300 mm.
 - .2 Forged press turnbuckles.
 - .5 Concertina barbed wired:
 - .1 In accordance with CAN/CGSB-138.2.
 - .2 A galvanized steel ribbon of 20 mm x 0.5 mm around a steel core with galvanized spring of 2.5 mm diameter.
 - .3 Having a nominal outside diameter of 710 mm and a minimum outside diameter of 635 mm when installed.
 - .4 Shall include 20 mm long blades from end to end. The barbed wire bundles should be spaced approximately 45 mm o.c.
 - .5 Composed of helical coil loops fastened together by means of galvanized clamps at three points of their circumference.
 - .6 Space between loops shall not exceed 230 mm.

- .7 Attached to the top of the fences by two barbed wire drawn and attached to the arms of the posts. The barbed wire consisting of two 12-gauge strands galvanized wire equipped with 4-point barbs and spaced 130 mm apart.
- .8 Submit product data sheet and have it approved by an authorized Ministerial representative.
- .6 Support arms for barbed wire rollers:
 - .1 Galvanized steel arms shall be installed on waterproof posts to secure upper and lower wire extensions where a barbed spiral is to be installed.
 - .2 Galvanized steel pipes 300 MPa with diameter matching post diameter. Close the end with a cap welded to the support arm and weld the base to the head cap of the posts or anchor plates.
- .7 Fastening device:
 - .1 Hinges, latches, lugs, latch catches, etc.: galvanized steel with zinc coating of at least 610 g/m².
 - .2 When traction cables are used with corner, end, gate or traction posts, the linings shall be made of galvanized steel.
- .8 All gates must be in accordance with the following specifications:
 - .1 In accordance with CAN/CGSB-138.4.
 - .2 Manufacture gates at the factory as prescribed.
 - .3 Manufactured with electrically welded joints, hot-dip galvanized after welding.
 - .4 All components shall be galvanized.
 - .5 Chain link fabric must be the same for gates and fences.
 - .6 Frames shall be built leveled and square and shall be watertight.
 - .7 Stretch chain link fabric and fasten to frame with appropriate tensioning bars, clamps and wires spaced at 300 mm o.c.
 - .8 Fence chain link fabric shall be fastened to gates so that the twisted edge is at the top.
 - .9 See 2.3 Dimensions for gates' widths.
 - .10 The space between gate bottom rail and the ground must not exceed 125 mm. When gates are located on a fence with a gate, this gate must not be interrupted.
 - .11 Safety equipment must be of industrial manufacture and commercial grade 1 and must be designed to provide a certain level of protection and longevity.
 - .12 Gates with hinges, latches and latch catches made of galvanized malleable iron, must be suitable for use with padlocks and must be operated from either side of the gate.
 - .13 A central support with a vertical lock shall be installed to keep the doors in the closed position. For doors over 2000 mm in height, the lock must include the top and bottom of the gates. The gate latches must lock with a padlock.
- .9 Swivel gates for pedestrians:
 - .1 Gates with one 1800 mm wing.
 - .2 The size of the gates must provide a free space of 1800 mm wide and 2100 mm high.
 - .3 Frames shall be built with 73 mm external diameter galvanized steel pipes, weight 3.4 kg/m, and must be welded and drained.
 - .4 Angle bracers shall be built with 42.2 mm external diameter galvanized steel pipes and placed diagonally from one corner of the gate to the other.
 - .5 The actuating mechanism and the rail must be protected from the weather and heated in order to operate under all climatic conditions. The rack teeth and pinion gear rack may not be protected if they are facing down and the

person operating the mechanism can see them.

- .6 Motors should be placed close to the ground for easy maintenance. Each operator must be protected by an anti-vandal box locked by a padlock. These caissons must be resistant to all weather conditions.

2.4 DIMENSIONS

- .1 Height of fences:
 - .1 3600 mm.
- .2 Width of gates:
 - .1 1800 mm for the swivel gate for pedestrians;
- d.3 Minimum outer diameter of metal frame elements:
 - .1 143.3 mm for corner, end and gate posts;
 - .2 114.3 mm for tensors;
 - .3 73 mm for intermediate posts;
 - .4 42.2 mm for crossings and diagonal braces.
- .4 Dimension of concrete pilasters:
 - .1 1800 mm depth and 400 mm diameter for lines, tension, angle or end posts;
 - .2 2100 mm depth and 400 mm diameter for the end posts at doors only.

2.5 CONCRETE

- .1 Concrete mixes and fencing materials: in accordance with CAN/CSA-A23.1-04 exposure class F-1.
- .2 Thickness of coarse aggregate: 20 mm.
- .3 Compressive strength: at least 30 MPa at 28 days.
- .3 Air entrainment and admixtures in accordance to CAN/CSA-A23.1.
- .4 Mixing water in accordance with CAN/CSA-A23.1-04/A23.2-04.

2.6 CONCRETE REINFORCEMENT

- .1 Hot rolled bars in accordance with CSA G30.18, grade 400 MPa.

2.7 FITTINGS AND HARDWARE

- .1 Fittings and hardware to be in accordance with CAN/CGSB-138.2, galvanized steel.
- .2 All accessories will be for "ultra-robust" use.

2.8 BRACING

- .1 Install all braces necessary to ensure fence stability, particularly at the endpoints of the fence and on both sides of the gates.

2.9 FINISHING

- .1 All steel will be hot-dip galvanized after fabrication and welded in the shop.
-

PART 3 - EXECUTION

3.1 CONDITIONS OF IMPLEMENTATION

- .1 Pay particular attention to underground services (existing tunnels, aqueducts, abutments and other ducts).
- .2 Fix square, vertical, level, and evenly aligned fences as indicated on the drawings.
- .3 Erect fence in accordance to the layout as indicated on the drawings.
- .4 Special attention should be paid to drops in elevation to ensure that there are no gaps between the surface of the ground and the bottom of the fence. If a vertical drop of the terrain exists, the fence may be made in tiers, but the minimum height of the fence must be maintained at all times.
- .5 Barbed wire spirals shall be installed to prevent the passage of an inmate between the spirals, as shown in the drawings.
- .6 Galvanized steel wire 3.7mm (9 gauge) shall be installed every 300 mm to secure the wire mesh to the bottom rail, top rail and intermediate posts.
- .7 When fastening requires bolts and nuts; these must be installed outside the facility. They must be tight and secured with a tack weld.
- .8 All posts not requiring barbed wire must be fitted with galvanized steel caps.
- .9 All materials and equipment must be installed to withstand local conditions, especially wind and wet snow.

3.2 ERECTION OF FENCE

- .1 Chain link fences must be erected as indicated in section 32 31 13 of the Canadian National Master Construction Specification (NMS) and in accordance with CAN/CGSB-138.3-96.
- .2 Dig holes for post as indicated in section 2.3 Dimensions and on the approved shop drawings.
- .3 Pour concrete in post holes then embed posts into concrete as indicated.
 - .1 Extend concrete 100 mm below ground level and slope to drain water away from posts.
 - .2 Brace posts in plumb position and true to alignment and elevation until concrete has cured.
 - .3 Concrete pilasters with visible tops must be either rounded up and finished with a trowel or flushed under the paving.
 - .4 Install overhang tops and posts caps.
- .4 Do not install fence fabric until concrete has cured a minimum of 5 days.
- .5 Install one (1) corner post where change in alignment exceeds 10 degrees.
- .6 Install end posts at fence endpoint and near buildings.
- .7 Install gate posts on both sides of gate openings.
- .9 Install top and bottom rails between posts and fasten securely to the posts, secure caps and overhang tops.
- .10 Install the braces diagonally from corner to corner of the fence. The diagonal braces are used to bracket the main posts (corners, gates, end). Corner posts must be braced in both directions.
- .11 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals. The tension must be determined by tensile tests. A 12 kg perpendicular tensile force applied to the mid-point of a chain link panel (midpoint of

posts / trails) shall not show a displacement greater than 30 mm from the vertical plane.

- .1 Knuckled selvedge at bottom;
- .2 Twisted selvedge at top.
- .12 Secure the chain link fabric to the top and bottom rails with tie wire spaced at 300 mm (every 6 stiches). The chain link fabric will be installed on the inmates' side.
 - .1 Give tie wires minimum two twists.
- .13 Install barbed wire strands and clip securely to lugs of each projection, as previously indicated.
- .14 The barbed wire must be fastened to form 230 mm spirals on each of the barbed wires.
- .15 Take the barriers and position the hinges so that when they are in the open position they fold back against the fence where the hinges are located.

3.3 INSTALLATION OF GATES

- .1 Install gates in locations as indicated in plans and by the Ministerial representative.
- .2 Level ground between gate posts and set gate bottom to meet design criteria.
- .3 Install padlock latches on gates ensuring that they are accessible from both sides of the fence.

3.4 GRADING

- .1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.

3.5 TOUCH UP

- .1 Clean damaged surfaces with wire brush removing loose and cracked coating. Apply two coats of organic zinc-rich paint to damaged areas.
 - .1 Pre-treat damaged surfaces according to the manufacturers' instructions for zinc-rich paint.

3.6 CLEANING

- .1 Clean and trim areas where soil has been disturbed by operations.
 - .1 Dispose of surplus material and replace grass areas with damaged grass with new turf as directed by Ministerial representative.

END OF SECTION
