

RETURN BIDS TO:
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Public Works Government Services Canada- Bid
Receiving / Réception des soumissions
189 Prince William Street
Room 405
Saint John
New Brunswick
E2L 2B9

SOLICITATION AMENDMENT MODIFICATION DE L'INVITATION

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

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

Comments - Commentaires

All enquiries are to be submitted in writing to the Contracting Officer, Janine Donovan: Email - janine.donovan@pwgsc.gc.ca or Fax No. (506) 636-4376.

Vendor/Firm Name and Address

**Raison sociale et adresse du
fournisseur/de l'entrepreneur**

Issuing Office - Bureau de distribution

Public Works Government Services Canada- Bid
Receiving / Réception des soumissions
189 Prince William Street
Room 405
Saint John
New Bruns
E2L 2B9

Title - Sujet Diesel Generators - Dorchester Med.	
Solicitation No. - N° de l'invitation EC016-161237/A	Amendment No. - N° modif. 005
Client Reference No. - N° de référence du client R.061866.001	Date 2015-10-20
GETS Reference No. - N° de référence de SEAG PW-\$PWB-004-3703	
File No. - N° de dossier PWB-5-38081 (004)	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2015-10-27	Time Zone Fuseau horaire Atlantic Daylight Saving Time ADT
F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input checked="" type="checkbox"/> Other-Autre: <input type="checkbox"/>	
Address Enquiries to: - Adresser toutes questions à: Donovan, Janine PWB	Buyer Id - Id de l'acheteur pwb004
Telephone No. - N° de téléphone (506) 636-5347 ()	FAX No. - N° de FAX (506) 636-4376
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction:	

Instructions: See Herein

Instructions: Voir aux présentes

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

This Solicitation Amendment No. Five (5) is raised to include the following addendum no. 5.

The following addendum to the tender documents is effective immediately. This addendum shall form part of the contract documents.

All other terms and conditions remain the same.

Addendum 5

1. **DRAWINGS**

1.1 Refer to electrical sketch ESKE102-1 for revisions to the portable generator accessory disconnect switch on the exterior of the building.

1.2 **Reference Drawing E-102**

.1 Refer to electrical sketch ESKE102-1 for revisions to the portable generator accessory disconnect switch on the exterior of the building.

.2 Refer to electrical sketch ESKE102-2 for revisions to the generator stack drain heat trace system.

1.3 **Reference Drawing E-104**

.1 Refer to electrical sketch ESKE104-1 for revisions to the underground conduits serving the Food Services Building.

1.4 **Reference Drawing E-105**

.1 Refer to electrical sketch ESKE105-1 for revisions to the underground conduits serving the Food Services Building.

1.5 **Reference Drawing E-603**

.1 Refer to electrical sketch ESKE603-1 for revisions to feeds from new Panel "DPC".

1.6 **Reference Drawing E-604**

.1 Provide breaker handle locking devices for breakers serving lighting and emergency battery packs in Panel "EP".

.2 Revise 15A-1P breaker for heat trace in Panel "EP" to a 30ma GFCI style breaker.

.3 Generator Control Wiring: Revise generator grounding from "Refer to Single Line Diagram" to "Provide a #6AWG copper ground from generator to main electrical room ground bus."

2. **SPECIFICATIONS**

2.1 The following may be bid as an alternate to the specified product, provided they meet or exceed the quality, capacity, functionality, and servicing of the product shown on the drawings and described in the specifications:

Specification/Drawing Reference

Manufacturer

Section 23 11 13, 2.3 Automated Fuel Filtration System

Refuel Systems, Albany.

2.2 **Reference Specification Section 21 07 19, Thermal Insulation for Piping:**

.1 Add the following to item 3.4: ".4 All exposed piping shall have minimum 38mm thick fiberglass insulation complete with aluminum jacketing. The aluminum jacket shall be 0.5mm sheet, stucco embossed, with 50mm lapped joints. All seams and joints shall be sealed water-tight."

2.3 **Reference Specification Section 26 05 01:**

.1 Revise paragraph 2.4.11.1 to read, "Lamicoid 3 mm thick plastic engraving sheet, black letters, white face, for all electrical systems except generator power systems and fire alarm systems which shall have white letters on red face."

2.4 Add the following specification sections:

- .1 01 91 00 Commissioning
- .2 26 27 26 Wiring Devices
- .3 26 52 01 Unit Equipment for Emergency Lighting
- .4 32 31 13 Fencing

3. **ATTACHMENTS**

3.1 **Drawings:**

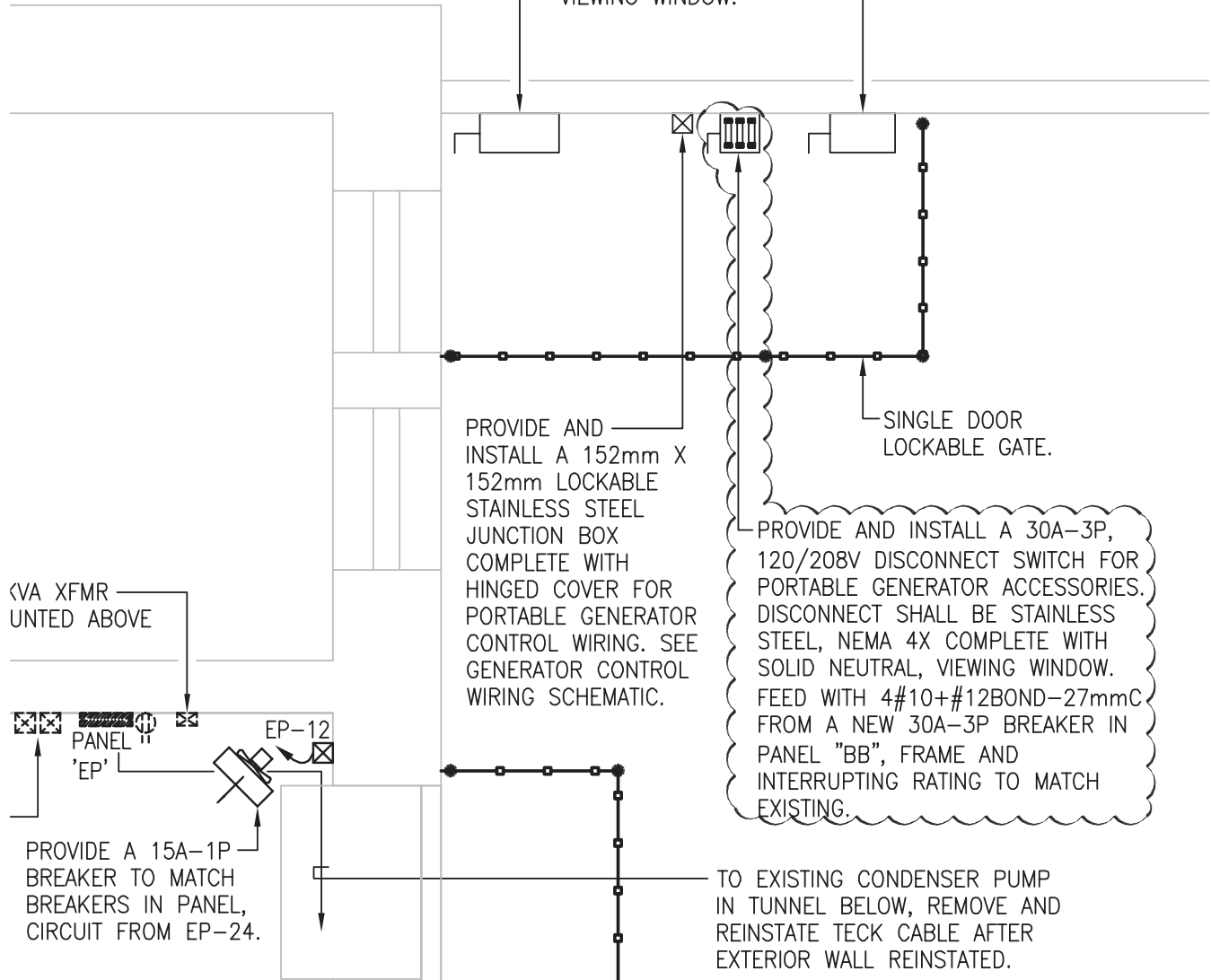
- .1 ESKE102-1
- .2 ESKE102-2
- .3 ESKE104-1
- .4 ESKE105-1
- .5 ESKE603-1

3.2 **Specifications**

- .1 01 91 00 Commissioning
- .2 26 27 26 Wiring Devices
- .3 26 52 01 Unit Equipment for Emergency Lighting
- .4 32 31 13 Fencing

PROVIDE AND INSTALL AN 1200A-3P DISCONNECT SWITCH FOR PORTABLE GENERATOR. DISCONNECT SHALL BE STAINLESS STEEL, NEMA 4X COMPLETE WITH SOLID NEUTRAL, VIEWING WINDOW. SEE SINGLE LINE FOR WIRING.

PROVIDE AND INSTALL AN 800A-3P DISCONNECT SWITCH FOR LOAD BANK. DISCONNECT SHALL BE STAINLESS STEEL, NEMA 4X COMPLETE WITH VIEWING WINDOW.



Job Title **GENERATOR REPLACEMENT DORCHESTER PENITENTIARY**



F.C. O'Neil Scriven & Assoc's Limited
Consulting Engineers
5450 Cornwallis Street, Halifax, Nova Scotia, B3K 1A9
tel: (902) 429-0701 f: (902) 429-9729 w: www.onesa.ca
341 Townsend Street, Sydney, Nova Scotia, B1P 5G1
p: (902) 562-6090 f: (902) 562-6821 w: www.onesa.ca

Sheet Title
ADDITIONAL FEEDER AND BREAKER

Dwn.
R.J.T.

Ck'd.
D.M.S.

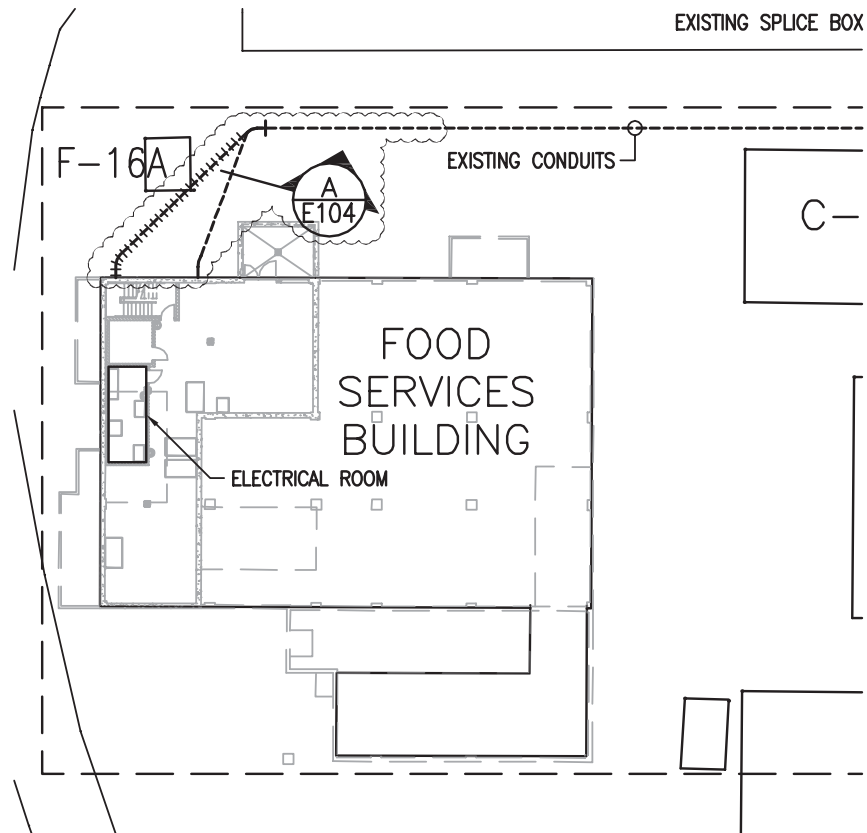
Client **PUBLIC WORKS AND GOVERNMENT SERVICES
CANADA - TRAVAUX PUBLICS ET SERVICES
GOUVERNEMENTAUX CANADA**

Date
14/10/2015

Dwg. No.
ESKE102-1

NOTE 1: PROVIDE AND INSTALL SELF REGULATING HEAT TRACE ON GENERATOR STACK DRAIN LINE, APPROXIMATE LENGTH 900mm. HEAT TRACE SHALL BE 6W/FT, COMPLETE WITH GLASS TAPE END SEALS, POWER KIT REQUIRED FOR A COMPLETE INSTALLATION.





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Sheet Title
**EXISTING AND NEW CONDUIT
ROUTING**

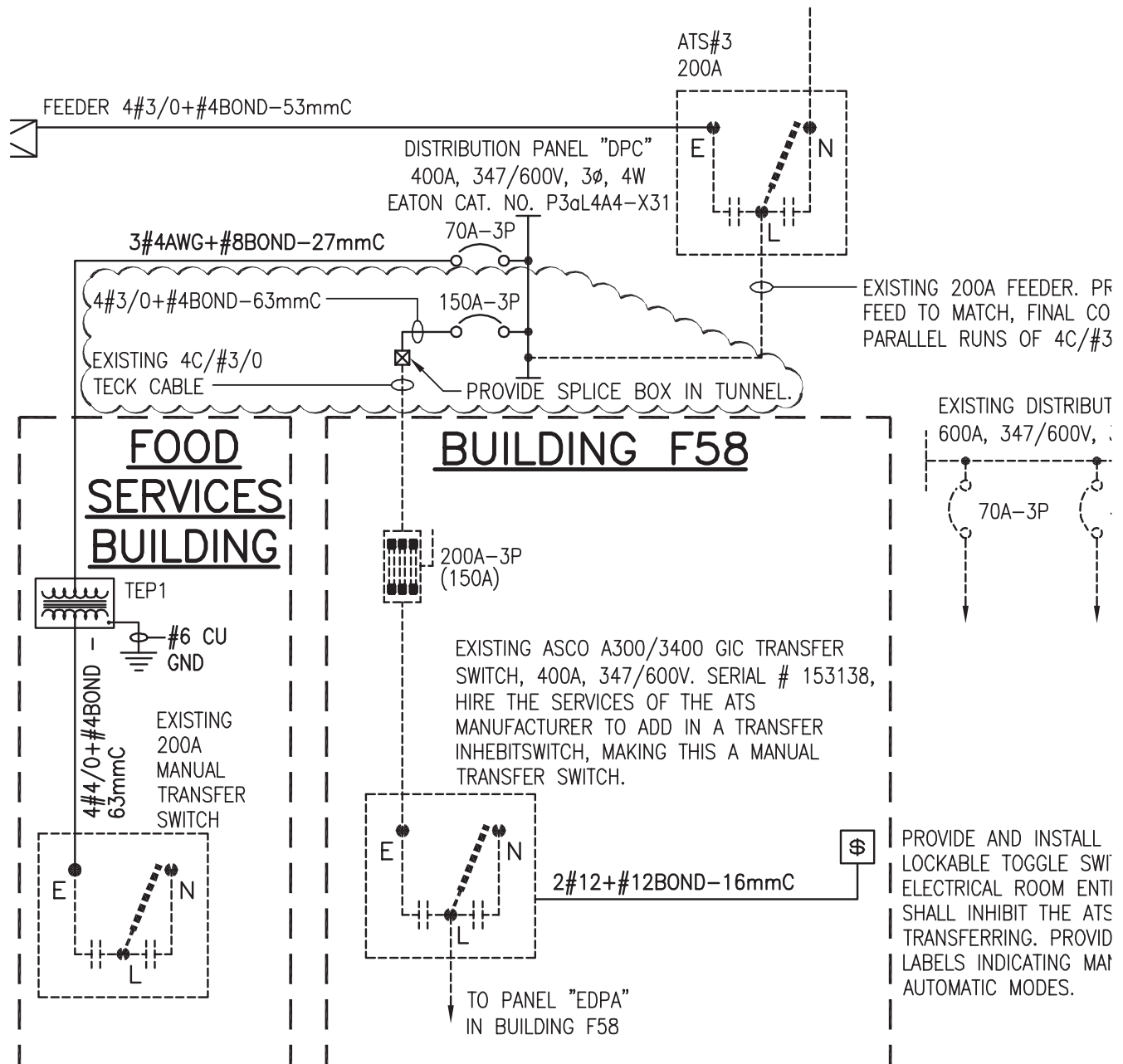
Dwn.
R.J.T.

Ck'd.
D.M.S.

Client **PUBLIC WORKS AND GOVERNMENT SERVICES
CANADA – TRAVAUX PUBLICS ET SERVICES
GOUVERNEMENTAUX CANADA**

Date
14/10/2015

Dwg. No. **ESKE104-1**



Job Title **GENERATOR REPLACEMENT DORCHESTER PENITENTIARY**



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Sheet Title
FEEDER AND SPLICE BOX

Dwn.
R.J.T.

Ck'd.
D.M.S.

Client **PUBLIC WORKS AND GOVERNMENT SERVICES
CANADA - TRAVAUX PUBLICS ET SERVICES
GOUVERNEMENTAUX CANADA**

Date
14/10/2015

Dwg. No.
ESKE603-1

Part 1 General

1.1 Section Includes

- .1 Undertake commissioning to CSA Z320-11, Building Commissioning Standards, as a minimum. Provide documentation to Departmental Representative.
- .2 The main objectives of the commissioning process can be classified as follows:
 1. To ensure installation of all new equipment conforms to the contract document.
 2. Performance verification that all components of the equipment actually perform as specified. This will be verified by measurements, visual inspection, equipment data sheets, manufacturer's representative assistance at start-up, and integrated testing.
 3. Operation & Maintenance Personnel fully trained to operate and maintain the new equipment and systems.

1.2 Related Sections

- .1 All applicable Division 01 subsections.
- .2 All Canadian Electrical Code Part I C22-12 requirements
- .3 CSA C282 09, Emergency Electrical Power Supply for buildings

1.3 Scope of Commissioning

- .1 The scope consists of:
 1. Testing of the 'new' components installed.
 2. Testing of system(s) including existing system(s) which has been modified or extended as part of the work.
 3. Remote monitoring and all other related Integrated System Performance Testing, and fine tuning.

1.4 Commissioning Schedule

- .1 Within 2 weeks of contract award, the contractor will be responsible for providing a detailed schedule for showing all commissioning activities. Schedule to include the following milestones as a minimum; testing, start-up, training, delivery of O&M Manual, sequencing of commissioning, acceptance, and occupancy.
- .2 Unless otherwise specified in writing by the Departmental Representative, all testing and related requirements specified herein will be successfully performed prior to the issuance of the Interim Certificate of Completion.

1.5 Submittal

- .1 Prior to start of Work; submit one (1) set of shop drawings to the Departmental Representative for review and comments, from an O&M perspective. This shall include all components and systems delivered within Division 1- 21- 23- and 26.
- .2 Submit NMMS/CMMS documentation for all components or systems to be removed as part of this project prior to removal.

- .3 Submit start-up report forms prior to scheduling commissioning activities.
- .4 Submit O&M Manual for review and comments prior to scheduling commissioning activities and training of O&M personnel.
- .5 Submit reports of testing, adjusting and balancing postponed due to seasonal, climatic, occupancy or other reasons beyond Contractor's control, promptly after execution of those services.
- .6 Documentation will be required from all equipment manufacturers outlining that their respective equipment is operational, has been installed to their requirements, started and commissioned successfully.
- .7 Submit not later than 2 weeks after award of contract. Request to make any changes to these commissioning specification, including; timing, procedures, tolerances and instruments. Request should be made in writing to the Departmental Representative, and approval obtained from the Departmental Representative not less than 3 weeks prior to start of commissioning.

1.6 Manufacturers Involvement

- .1 Arrange for Manufacturer to submit copies of all production test records for production test required by these specifications prior to shipping.
- .2 Prior to start-up of equipment or systems, obtain manufacturer's installation, start-up and operation instructions and review with Departmental Representative.
- .3 Use manufacturer's trained start-up personnel to maintain integrity of warranty.
- .4 Verify with manufacturer that testing as specified will not void any warranties.
- .5 Manufacturer's personnel to be experienced in design, installation and operation of equipment and systems and be able to interpret test results in clear, concise, logical manner.
- .6 Report in writing to Departmental Representative any deficiencies or defects noted during performance of services.

1.7 Seasonal Testing

- .1 Notwithstanding all inclusive requirements specified in this section, additional separate cycles of performance testing and verification will be required at later date for components and systems whose full operation is dependent on seasonal conditions.
- .2 Contractor's responsibilities with respect to such commissioning activities will be as specified in relevant sections.

1.8 Responsibilities

- .1 Departmental Representative is responsible for the overall delivery of commissioning activities, review and approval of all documentation, overview of performance, verification of activities, and verification of accuracy of reported results.
- .2 Where requested, consultant or Departmental Engineering Specialists is responsible for the witnessing and certification of the performance verification results.
- .3 Contractor is responsible to perform all commissioning activities and record results.
- .4 Responsibility of the satisfactory completion of the project, and demonstration that the requirements of the commissioning are satisfied rest with the Contractor, who will

employ and pay for Specialists, supervision, inspection and testing as required, to complete the work as described.

- .5 Coordinate all sub-trades, other divisions, manufacturers, suppliers, and other specialists as required to ensure all phases of work shall be properly organized prior to commencement of each particular testing procedure. Establish all necessary manpower requirements.
- .6 Coordinate the activities of this Section with the starting and testing of:
 - .1 Mechanical components and systems specified in Division 23.
 - .2 Electrical components and systems specified in Division 26.
 - .3 All Electrical Synchronizing components
 - .4 Where any components or systems require testing prior to starting, ensure that such work has been completed and approved prior to starting of these components and systems.

1.9 Preparation

- .1 The contractor shall have contract documents, shop drawings, product data, and operation and maintenance data in hand during equipment performance verification process.
- .2 Except when otherwise specified, complete all start-up and testing prior to acceptance test and hand-over of the project.
- .3 Co-ordinate work and manpower requirements of sub-trades, suppliers, manufacturers, specialists, disciplines as required ensuring that all work is properly organized prior to start-up and testing.
- .4 Where equipment or systems require testing prior to start-up, ensure that such work is completed and approved prior to delivery of equipment or systems.
- .5 Notify Departmental Representative seven [7] days prior to time project will be ready for testing, adjusting, and balancing.

1.10 Computerized Maintenance Management System (CMMS)

- .1 All contract work shall comply with the requirements of the PWGSC CMMS. It is required to provide CMMS inventory sheets and coding. Inventory sheets will include all product data, serial and model numbers, equipment description, and location. Departmental Representative will assist the Contractors by providing CMMS sequential numbers as are available.
- .2 Collect and record all CMMS data for all new or relocated equipment being installed, replaced, removed from or taken out of service from existing inventory of equipment.
- .3 Submit to the Departmental Representative an inventory sheet identified with CMMS number only for each existing system or component being removed prior to removal.
- .4 Submit to Departmental Representative fully completed inventory data sheets for all new equipment two (2) weeks prior to seeking approval for proposed component identification. All CMMS inventory sheets are to be added in to the O&M Manual.
- .5 CMMS applies to all major components or systems. Minor items such as switches, thermostats, etc., are not to be inventoried under the CMMS. The Departmental Representative will provide clarification to the Contractors upon request.

1.11 Start-Up And Testing

- .1 Before start-up, clean all newly installed equipment and or systems and verify same to be free from all contaminants.
- .2 After testing, protect equipment and systems from construction activities.
- .3 Conceal equipment and systems only after inspection and testing is completed and approved by Departmental Representative.
- .4 Assume all liabilities and costs for inspections including disassembly and re-assembly after approval, starting, testing, and adjusting, including supply of testing equipment.

1.12 Witnessing Of Starting And Testing

- .1 Provide sufficient notice not less than seven (7) days prior to commencement.
- .2 Departmental Representative may witness all or any portion of start-up and testing at their discretion.
- .3 General Contractor to be present at all tests performed by sub-trades, suppliers, and equipment manufacturers.

1.13 Start-Up Activities

- 1. Factory and or on-site testing
- 2. Pre-start-up, component by component inspections.
- 3. Check of all equipment, systems, installation, electrical connections, etc. for conformity to contract documents, equipment manufacturer's installation requirements, etc.
- 4. Check of location, installation, setting of controls, limit and safety devices and operate as designed.
- 5. Compilation of pre-start-up deficiency list and rectification of all deficiencies in writing to Departmental Representative.
- 6. Start-up verification for proper and safe operation.
- 7. Identification and correction of start-up and pre-commissioning deficiencies.
- 8. Failure to follow specified start-up procedures shall result in a re-evaluation of equipment by independent testing agency selected by Departmental Representative. Should results reveal that the equipment start-up was not in accordance with specified requirements, the contractor shall remove from site and replace with new, which will also be subject to specific start-up procedures.
- 9. TAB shall be as specified in relevant sections and shall verify the performance of all systems to ensure that they meet requirements of the contract document.
- 10. Electrical Breaker coordination to be verified and breaker adjustments completed if applicable.

1.14 Maintenance of Equipment And Systems

- 1. After start-up, maintain equipment and systems as directed by equipment/system manufacturer.

2. Provide Maintain equipment support and service as described in CSA C282 Emergency Electrical power supply for buildings maintenance logbook.
3. In conjunction with the manufacturer, develop written maintenance program. Submit to Departmental Representative for approval before implementation.

1.15 Start-Up Documentation

1. Assemble and submit start-up reports to the Departmental Representative and Departmental Representative before commencement of commissioning.
2. Start-up documentation to include as a minimum, witness and certified by the Departmental Representative, factory or on-site test certificates, pre-start-up inspection reports, installation/start-up check lists signed, certified and witnessed.
3. Marked-up schematics of systems as actually installed.

1.16 Commissioning Documentation

1. All results of test, performance verification and commissioning procedures to be reported, documented, witnessed and certified by Departmental Representative
2. All commissioning documentation to be reviewed and approved by the Departmental Representative.
3. Fully completed forms with the exception of verification results data, are to be completed and submitted to the Departmental Representative within four (4) weeks of approval of shop drawings, or as specified.
 1. Supplementing the above, the Contractor shall provide project specific verification forms for electrical mechanical, control (EMCS) systems. Submit sample verification forms with shop drawing submission. Update forms as required and resubmit to Departmental Representative should there be changes to the initial scope of work. After contractor start-up and debugging of programming, complete verification process in the presence of the Departmental Representative.
 2. Component forms shall be completed as follows:
 1. The specified requirements shall be completed by Contractor and verified by the Departmental Representative.
 2. The shop drawing information shall be completed by hand and shall reflect APPROVED shop drawings.
 3. The installed information shall be completed by the contractor from nameplates on installed equipment. This shall be completed by hand.
 4. The systems verification cannot take place before all related components have been verified as correct.
 5. Integrated systems verification cannot take place before all related systems have been verified as correct.
 6. Verification forms will be provided for information and convenience to the Contractor and will not relieve the Contractor of responsibility for verification of components, systems, or integrated systems not included on the verification forms.

7. A verification form is to be completed for each integrated system in a category requiring verification.
8. System and Integrated system verification forms are to be completed by the Contractor and verified by the Departmental Representative.
9. A sample verification form is included as Appendix A.
10. A sample Product Information Form is included as Appendix B

1.17 Training

1. In accordance with CSA Building Commissioning Z320-11
2. As supplemented in other sections of the contract document.

1.18 Start Of Commissioning

1. Notify Departmental Representative not less than seven (7) days prior to commencement of commissioning.
2. Commissioning to be in accordance with the completion schedule for the project and commissioning plan.
3. Start commissioning only after completion of start-up, TAB, and any elements of building affecting start-up and performance verification of systems has been rectified.
4. Contractor to provide sufficient 'qualified' personnel to Departmental Representative's satisfaction at field locations and at the central operation work (monitoring) station to successfully test and commission components, systems, and integrated systems.

1.19 Commissioning General Requirements

1. Carry out commissioning under actual or simulating operating range in all modes. (i.e.: regular, emergency, day, night, heating, and cooling).
2. Each system to be tested independently. If interlocked with or operation is affected by other systems, in unison with those systems.
3. Commissioning procedures to be repeatable and reported results are to be verifiable.
4. Follow equipment manufacturer's instruction re: operating and safety aspects.

1.20 Conflicts

1. If requirements of this or other sections of construction or commissioning specification conflict, report to the Departmental Representative before start-up and obtain clarification.
2. Failure to report conflicts and obtain clarification will result in application of most stringent requirement.

1.21 Commissioning Meeting

1. In accordance with requirements of project meeting supplemented as specified herein, commissioning meetings will be held at same time as, and form part of regular construction progress meetings, or can be separate.

2. Commissioning meetings will be held in conjunction with the project meetings during the construction phase. Meetings to continue on regular basis until issuance of Interim Certificate of Completion, after which meetings will occur as required to address operational and warranty issues.
3. Purpose of meetings shall be to resolve issues, monitor progress, identify deficiencies relating to commissioning.
4. To be present at the meetings, General Contractor and all his sub-contractors, Departmental Representative, operational staff and Project Manager.
5. Departmental Representative to put forward agenda, chair meeting as well as record and distribute minutes.

1.22 Records Of Commissioning Activities

1. Maintain accurate, detailed records of commissioning activities including names of technicians, supervisors and dates of commissioning activities.

1.23 Inter-Disciplinary Co-Ordination

1. Be present, assist and witness commissioning of all systems and equipment of other disciplines which impact upon, interface with, are interlocked or interconnected with system being commissioned.

1.24 Pre-Commissioning Review

1. Review contract documents and confirm in writing to Departmental Representative adequacy of provisions for commissioning and all other aspects of design pertinent to the success of commissioning.
2. Before starting commissioning, review:
 1. Installation
 2. Documentation
 3. Design Criteria and Intents
 4. All Start-up Documentation
 5. Commissioning Specifications, requirements and forms
 6. Commissioning Plan
 7. Commissioning Schedules
 8. Commissioning Standards and Procedures
 9. Cleanliness of Systems
 10. As-built drawings (marked-up)
 11. O&M Manual
4. Report to Departmental Representative in writing all discrepancies and deficiencies.

1.25 Operation Of System During Commissioning

1. Operate and maintain for the length of time required as determined by the Departmental Representative for commissioning to be completed, and as required for verification of reported results.

1.26 Commissioning Tolerances

1. Definitions:
 1. Application tolerances: Specified range of acceptable deviations of measured values from specified values or specified design criteria.
 2. Measurement tolerances: Unless specified otherwise, all measured and reported values to be within $\pm 2\%$ of actual values.
 3. Instrument accuracy tolerances: Accuracy of measured value as percentage of actual value. Refer to relevant sections of these commissioning specifications.
 4. Values measured during verification of reported results to be within $\pm 5\%$ of reported results.

1.27 Results

1. If start-up, testing and or PV produce unacceptable results, repair, replace or repeat specified stating and or PV procedures until acceptance results are achieved.
2. Provide manpower and materials, bear cost for re-commissioning.

1.28 Instruments

1. Submit list of all instruments proposed to be used, listing all data including serial number, current calibration certificate date, calibration expiry date for review and approval by Departmental Representative.
2. Provide safety equipment required for personnel involved in the starting testing and commissioning program.
3. In addition to instruments listed in the specification document, provide the following:
 1. Two way radio
 2. Ladders
 3. Other equipment
 4. Safety equipment for start-up and testing personnel.
 5. Provide list of equipment and instruments to be used in the start-up, TAB, testing for review and approval by the Departmental Representative.

1.29 Installed Instrumentation

1. Instruments installed under Contract may be used for TAB and PV if:
 1. Accuracy complies with these specifications.
 2. Calibration certificates have been deposited with the Departmental Representative.
 3. Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.30 Witnessing Commissioning

1. Commissioning Manager will witness all activities. Departmental Representative may witness some activities to satisfy the design intent has been met.

2. Departmental Representative will certify all the results.
3. Contractor to be present at all tests.

1.31 Authorities Having Jurisdiction

1. The contractor will complete initial start-up successfully prior to performance verifications and certification by presiding authorities having jurisdiction.
2. To facilitate the turnover of the project, call and arrange for authorities to witness procedures in a manner that avoids unnecessary duplication of tests. It shall be the responsibility of the Contractor to confirm which tests the presiding authorities having jurisdiction are required to attend. Confirm that the presiding authorities will be present for each test, as required.
3. Any cost associated with presiding authorities attending testing during the daytime and during off-hours shall be the responsibility of the Contractor. Include all such cost in your tender.
4. Obtain Certificates of Approval, acceptance and compliance with the rules and regulations of authority having jurisdiction. Provide copies to the Departmental Representative within five (5) days of tests with the commissioning report.
5. Submit reports generated by special testing agencies to the Departmental Representative prior to the issuance of the Interim Certificate of Completion.
6. Special Testing agencies shall be approved by the Departmental Representative with acceptable facilities and qualifications.

1.32 Deficiencies, Faults, Defects, Repetition

1. Correct all deficiencies found during start-up and commissioning to satisfaction of the Departmental Representative.
2. Report faults, defects affecting commissioning to Departmental Representative in writing as they become apparent. Unless instructed otherwise, halt commissioning until same is rectified.
3. Where verification of reported results fail to receive Departmental Representative approval, and where repetition of verification again fails to receive approval, and where Departmental Representative deems Contractor's request for 2nd verification was premature, then all costs incurred by Departmental Representative for 3rd and subsequent verifications to be borne by the contractor.

1.33 Activities Upon Completion Of Commissioning

1. After commissioning is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, and ensure sensors are at required settings.
2. Permanently and indelibly mark all settings to allow restoration at any time during life of facility. Markings not be eradicated or covered in any way.
3. Record 'as commissioned' settings in commissioning report.


1.34 Completion Of Commissioning

1. Co-operate fully with Departmental Representative during all stages of acceptance and occupancy of the facility.

2. Upon completion of commissioning, leave all systems in normal operating mode.
3. Except for warranty and seasonal verification activities specified in these commissioning specifications, commissioning to be completed prior to issuance of Interim Certificate of Completion.
4. Compile test reports, verification forms, and certificates, by Division, by specification Section, into one Commissioning Manual.
5. Submit draft manual for review and approval o the Departmental Representative 2 weeks prior to application for Interim Certificate of Completion for the project.
6. Submit 3 copies of the approved manual prior to Interim Certificate of Completion.

Commissioning - Performance Verification Checklist

Project:		Project #:	Date:

Components:	Emergency Power System (Generator)		
Contractor's Name		Est. Hrs.	
Contractor's Address		Est. Cost:	
Time Period:		MMS Identifier	
Day/ /Month /Year			
Description of Equipment:			

Equipment Details					
Generator Set #2		Engine		Automatic Transfer Switch	
Make		Make		Make	
Model		Model		Model	
S/N		S/N		S/N	Amp
Specifications: _____ <i>KW</i> , _____ <i>Volt</i> , _____ <i>Phase</i> Battery Charger & Batteries Generator Room Ventilation/Cooling System Fuel System _____ <i>Hours</i>					
Engine Data Information					
Oil Filters		Fuel Filters		Oil	
Model #		Model #		Type	
Qty.		Qty.		Engine Qty	

**PWGSC User Notes:**

Special skills are required to perform these Annual Preventative Maintenance Checks, Inspections, and Testings. It is recommended that the manufacturer's representative or a Qualified Emergency Power Systems Specialty Contractor Perform & Certify that all the tasks associated with, but not limited to this checksheet have been completed and have them issue a certificate of approval stating that the results comply with the minimum requirements of the CAN/CSA C282-09

Special Precautions:

Ensure that the Contractors implement and follow minimum Safety requirements for all applicable equipment Lockout and Safety Practices.

Ensure that Safe Work Practice Procedures are submitted by the contractor before work is to begin.

Ensure that the Contractor has all appropriate PPE

Scope of Work Details:

1. - The Emergency Power System(s) shall be Verified, Inspected, and Tested in accordance with manufacturer's recommendations, instruction manuals, and as specified in the CAN/CSA-C282-09. Emergency Electrical Power Supply for Buildings. Reviewed: Yes: ____ No: ____
2. - Prior to implementing the Annual Verifications, Inspections & Tests , contractors are required to submit to PWGSC a copy of their proposed *Safe Work Practice Procedures, and Safety Plans*.
Reviewed: Yes: ____ No: ____
3. - The Emergency Power System shall also be subjected to a full yearly Preventative Maintenance Verification and Inspection as specified in ANNEX A. Results shall be recorded and deficiencies reported to PWGSC.
Reviewed: Yes: ____ No: ____
4. - Prior to implementing the Performance Verifications/Inspections & Testing, contractors are required to perform the Weekly & Semi-Annual Inspection, Test and Maintenance Requirements.
Reviewed: Yes: ____ No: ____
5. - Post Maintenance Building Transfer Exercise. - 10 - 15 Min (From ATS)
Reviewed: Yes: ____ No: ____
6. - Ensure all Logbooks are signed off accordingly.

Annex A**Preventative Maintenance Checklist;
Verification, Inspection & Testing Checks.**

Item	Task Name	Verified		Comments
		Yes	No	
♦	❶ Annual Inspection (CSA 282-09)	♦	♦	
1	Inspect fuel tank level. (2hr. supply)			
2	Inspect lubricating oil level.			
3	Inspect engine coolant.			
4	Inspect heaters, lubricant, and/or coolant			
5	Examine engine, generator, fuel tanks.			
6	Inspect operation of fuel transfer pump.			
7	Inspect cooling systems for leakage.			
8	Inspect fuel filter (Fuel/water separator.)			
	❷ Check Electric Starter System			
9	Examine starting system and starter(s) for cleanliness, mounting, and terminal security.			
10	❸ Air Starter motor system.(If Applicable)			
11	Check air tanks for pressure. (If Applicable)			
12	Check valves for leakage (If Applicable)			
Item	Task Name	Verified		Comments

		Yes	No	
13	Check operation of auxiliary engine and compressor. (If Applicable)	<input type="checkbox"/>	<input type="checkbox"/>	
14	Bleed off any condensation. (If Applicable)	<input type="checkbox"/>	<input type="checkbox"/>	
	⚠ Batteries and charging equipment, Check all cells for electrolyte fill level	<input type="checkbox"/>	<input type="checkbox"/>	
15	Batteries and charging equipment, Check specific gravity for all cells.	<input type="checkbox"/>	<input type="checkbox"/>	
16	Batteries and charging equipment, Check electrical connections for tightness, leaks, and sulfating	<input type="checkbox"/>	<input type="checkbox"/>	
17	Batteries and charging equipment, Check cleanliness and dryness between terminal posts	<input type="checkbox"/>	<input type="checkbox"/>	
18	Batteries and Charging equipment, Check charger electrical connections for cleanliness and tightness.	<input type="checkbox"/>	<input type="checkbox"/>	
19	Batteries and charging equipment, Check charger operation of both float and equalize modes	<input type="checkbox"/>	<input type="checkbox"/>	
	⚠ Engine, Check lubricant/ coolant heaters for proper operation.	<input type="checkbox"/>	<input type="checkbox"/>	
20	Engine, Check governor control linkages and oil level (if applicable)	<input type="checkbox"/>	<input type="checkbox"/>	
21	Engine, Check fuel pump oil sump (if applicable)	<input type="checkbox"/>	<input type="checkbox"/>	
22	Engine, Check fan belts for proper tension and wear	<input type="checkbox"/>	<input type="checkbox"/>	
23	Engine, Check brush operation for sparking.	<input type="checkbox"/>	<input type="checkbox"/>	
24	Engine, Check for bearing seal leakage.	<input type="checkbox"/>	<input type="checkbox"/>	
25	Engine, Check correct operation of Auxiliary Equipment: radiator shutter control.	<input type="checkbox"/>	<input type="checkbox"/>	
26	Engine, Inspect and clean engine crankcase breathers.	<input type="checkbox"/>	<input type="checkbox"/>	
27	Engine, Inspect and clean all engine linkages.	<input type="checkbox"/>	<input type="checkbox"/>	
28	Engine, Lubricate the engine governor and ventilation system.	<input type="checkbox"/>	<input type="checkbox"/>	
Item	Task Name	Verified		Comments
		Yes	No	

29	Engine, Change fuel in fuel tank. (if applicable)) or (full - filter)	<input type="checkbox"/>	<input type="checkbox"/>	
30	Engine, Change engine lubrication and filters.	<input type="checkbox"/>	<input type="checkbox"/>	
31	Engine, Test strength of antifreeze	<input type="checkbox"/>	<input type="checkbox"/>	
32	Engine, Change fuel filters, clean strainers and verify that the fuel supply valve is open.	<input type="checkbox"/>	<input type="checkbox"/>	
33	Engine, Inspect and clean exhaust system. Check & record the back pressure of the exhaust system to ensure that it complies with the engine manufacturer's requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
34	Engine, Drain exhaust system condensate trap.	<input type="checkbox"/>	<input type="checkbox"/>	
35	Engine, Clean and lubricate linkages.	<input type="checkbox"/>	<input type="checkbox"/>	
36	Engine, Inspect air filters.	<input type="checkbox"/>	<input type="checkbox"/>	
37	Engine, Inspect all Mechanical connections.	<input type="checkbox"/>	<input type="checkbox"/>	
38	Engine, Inspect all Electrical connections	<input type="checkbox"/>	<input type="checkbox"/>	
39	Engine, For spark ignition engines, inspect all components of ignition systems and service or replace as appropriate.	<input type="checkbox"/>	<input type="checkbox"/>	
40	Inspect all heat exchangers and clean as necessary	<input type="checkbox"/>	<input type="checkbox"/>	
41	Inspect all belts & hoses and replace if necessary	<input type="checkbox"/>	<input type="checkbox"/>	
42	Test and Inspect ignition systems. Replace any defective components.	<input type="checkbox"/>	<input type="checkbox"/>	
43	Test and Inspect coolant pumps for leaks and external wear (if belt driven remove the belt(s) first)	<input type="checkbox"/>	<input type="checkbox"/>	
44	Inspect block heater hoses and wires.	<input type="checkbox"/>	<input type="checkbox"/>	
	🔴 Control Panel, Check security of panel covers.	<input type="checkbox"/>	<input type="checkbox"/>	
45	Control Panel, Inspect panel settings to ensure generator is in Auto mode.	<input type="checkbox"/>	<input type="checkbox"/>	
46	Control Panel, Check annunciation lamps.	<input type="checkbox"/>	<input type="checkbox"/>	
Item	Task Name	Verified		Comments
		Yes	No	

47	Control Panel, Test remote visual @ audible trouble signals connected to Fire Alarm System.	<input type="checkbox"/>	<input type="checkbox"/>	
48	Control Panel, Open all inspection covers and inspect all electrical connections.	<input type="checkbox"/>	<input type="checkbox"/>	
49	Control Panel, Check breakers for proper operation.	<input type="checkbox"/>	<input type="checkbox"/>	
50	Control Panel, Clean insulators @ brushings	<input type="checkbox"/>	<input type="checkbox"/>	
51	Control Panel, Test voltage regulator for proper operation.	<input type="checkbox"/>	<input type="checkbox"/>	
52	Control Panel, Operate all moving parts to ensure they move freely.	<input type="checkbox"/>	<input type="checkbox"/>	
53	Control Panel, Clean @ dress contacts as required.	<input type="checkbox"/>	<input type="checkbox"/>	
54	Control Panel, Remove all dust.	<input type="checkbox"/>	<input type="checkbox"/>	
55	Control Panel, Check gauge calibration.	<input type="checkbox"/>	<input type="checkbox"/>	
56	Control Panel, with generator set at full load conduct an infrared survey of all electrical connections to identify any high-resistance connections	<input type="checkbox"/>	<input type="checkbox"/>	
57	Test protective devices for proper operation. A. Low Fuel Alarm B. Low Coolant Alarm C. High Temperature Alarm D. Overspend Alarm E. Low Oil F. Cranking Cycle G. Low engine Temperature H. Fuel Leak Alarm	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
58	Before start up perform two full cranking cycles and near the end measure and record the lowest indicated battery's voltage, replace the battery if the voltage is less than 80 % of the battery's rated voltage.	<input type="checkbox"/>	<input type="checkbox"/>	
59	Inspect ventilation system belt(s)	<input type="checkbox"/>	<input type="checkbox"/>	
60	Test Emergency Lighting	<input type="checkbox"/>	<input type="checkbox"/>	
Item #	Task Name	Verified Yes No		Comments

61	Verify Whether room temperature is above 10 degrees C	<input type="checkbox"/>	<input type="checkbox"/>	
62	Inspect generator room and transfer switch rooms for cleanliness and accessibility to all components of the emergency system	<input type="checkbox"/>	<input type="checkbox"/>	
	🔧 Generator			
63	Generator, Test surge suppresser and rotating rectifier on brush less machines	<input type="checkbox"/>	<input type="checkbox"/>	
64	Generator, Grease bearings (replace old grease with new)	<input type="checkbox"/>	<input type="checkbox"/>	
65	Generator, Clean commutator and slip rings	<input type="checkbox"/>	<input type="checkbox"/>	
67	Generator, Clean rotor and stator windings (compressed air)	<input type="checkbox"/>	<input type="checkbox"/>	
68	Generator, Check coupling bolts and alignment	<input type="checkbox"/>	<input type="checkbox"/>	
69	Generator, Check conduit for tightness	<input type="checkbox"/>	<input type="checkbox"/>	
70	Generator, Inspect windings at rotor and stator slots	<input type="checkbox"/>	<input type="checkbox"/>	
71	Generator, Inspect all electrical connections	<input type="checkbox"/>	<input type="checkbox"/>	
72	With the generator at full load conduct an infrared survey of all electrical connections to identify any high-resistance	<input type="text" value="N/A"/>	<input type="checkbox"/>	
	🔧 Diesel Fuel Storage			
73	Test fuel system according to CSA 282	<input type="checkbox"/>	<input type="checkbox"/>	
74	Drain and refill with fresh fuel in accordance with NFC 6.7.1.5	<input type="text" value="N/A"/>	<input type="checkbox"/>	
75	Full Filtered to remove water, scale, bacteria gums, resins to minimize filter clogging.	<input type="text" value="N/A"/>	<input type="checkbox"/>	
76	Fuel treatment with a suitable conditioner and stabilizer to minimize degradation while in storage.	<input type="checkbox"/>	<input type="checkbox"/>	
77	Inspect bottom of tanks and test chemically for water. (Clear & Bright Test	<input type="checkbox"/>	<input type="checkbox"/>	
78	Conduct a 4-6 hour Full Load Bank Test on all Generators and record all requirements in Annex A Tables.	<input type="checkbox"/>	<input type="checkbox"/>	
Item #	Task Name	Verified		Comments
		Yes	No	
79	Provide Technical support to person's	<input type="checkbox"/>	<input type="checkbox"/>	

	responsible for carrying out the work identified in this Table.			
80	Correct all defects found during inspections and tests.	<input type="checkbox"/>	<input type="checkbox"/>	
81	Record all inspections tests, and corrective actions in the logbook.	<input type="checkbox"/>	<input type="checkbox"/>	
82	A final report is to be formatted and submitted to the building property manager for Due Diligence towards the Emergency Power System.	<input type="checkbox"/>	<input type="checkbox"/>	
83	Building Emergency Power System Integrated Testing performed A, Fire Alarm Status B, HVAC Status C, Elevator Status E, UPS Status F, Life Safety Components Status	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

84	Annunciator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Check all alarms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Confirm Proper Installion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Confirm Voltage (feed)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
85	Confirm Voltage at Main Generator Feeders located in Automatic Transfer Switch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	AG	BG	CG	<input type="checkbox"/>	<input type="checkbox"/>	
				<input type="checkbox"/>	<input type="checkbox"/>	

	AB	AC	BC	<input type="checkbox"/>	<input type="checkbox"/>	
				<input type="checkbox"/>	<input type="checkbox"/>	
	AN	BN	CN	<input type="checkbox"/>	<input type="checkbox"/>	

4. - After all Preventative Maintenance Checks listed in ANNEX A have been completed, All Emergency Power System components directly connected to the

Generator Set such as, but not limited to, the Generator Engine, Alternator Set, Batteries and Charging Equipment, Fuel Lines, Fuel Pumps, Fuel Tanks, Control Panels, Transfer Switch, Ventilation/Louvre System, etc., shall be subjected to a Full Load 4-6 hr Operational Test as specified in Section 10. the following OPERATIONAL CHECKS shall be observed, and recorded while performing the Emergency Power System Commissioning, 6 Hr. full-load test. (100% of the generator's KW full load rated capacity) This test shall be performed as one complete system.

- (a) the time delay on start, _____
- (b) the cranking time until the engine starts and runs, _____
- (c) the time required to come up to operating speed, _____
- (d) the time required to achieve a steady-state (1800RPM) condition with all switches transferred to emergency position, _____
- (e) the voltages, frequency, amperage, kW, kva, readings at start up, and at any observed change in loads, and at every 15 minutes intervals thereafter. (See chart "A"& B - @100% Load & 110% Load).

Chart "A"
"Full Load Chart" (100%)

<i>Time</i>	<i>Voltage</i>	<i>Frequency</i>	<i>Amperage</i>	<i>K.W.</i>	<i>K.V.A.</i>
<i>Start.</i>					
<i>15 Min.</i>					
<i>30 Min.</i>					
<i>45 Min.</i>					
<i>60 Min.</i>					
<i>75 Min.</i>					
<i>90 Min.</i>					
<i>105 Min.</i>					
<i>120 Min.</i>					
<i>135 Min.</i>					
<i>150 Min.</i>					
<i>165 Min.</i>					
<i>180 Min.</i>					
<i>195 Min.</i>					
<i>210 Min.</i>					
<i>225 Min.</i>					
<i>240 Min.</i>					

**Chart “B”
110% Load Chart**

Time	Voltage	Frequency	Amperage	KW	KVA
15					
30					
45					
60					

(f) the engine oil pressure, water temperature, where applicable and battery charge rate at 5 minutes intervals for the first 15 minutes, all times shall be recorded in Chart “C & D @ 110% Load and 110% Load.)

**Chart “C”
Full Load Chart (100%)**

Time	Oil Pressure	Water Temperature	Battery Charge Rate
<i>Start</i>			
<i>5 Min.</i>			
<i>10 Min.</i>			
<i>15 Min.</i>			
<i>30 Min.</i>			
<i>45 Min.</i>			
<i>60 Min.</i>			
<i>75 Min.</i>			
<i>90 Min.</i>			
<i>105 Min.</i>			
<i>120 Min.</i>			
<i>135 Min.</i>			
<i>150 Min.</i>			
<i>165 Min.</i>			
<i>180 Min.</i>			
<i>195 Min.</i>			
<i>210 Min.</i>			
<i>225 Min.</i>			

240 Min.			
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**Chart “D”
110% Load Chart**

Time	Oil Pressure	Water Pressure	Battery Charge Rate
5 Min.			
10 Min.			
15 Min.			
30 Min.			
45 Min.			
60 Min.			

Also,

(g) the time delay on retransfer for the transfer switch, _____

(h) the time delay on engine cool down, _____ and shutdown, _____.

5. A loss of normal power simulation (for one hour) test of the system shall be conducted. It shall be arranged to simulate a failure of normal power from each emergency power transfer switch. It shall also be arranged that all transfer switches will pick up the normal emergency power building loads. It shall include an inspection to assess the correct functioning of all auxiliary equipment such as the radiator shutter control, coolant pumps, fuel transfer pumps, oil coolers, battery charging unit, emergency transfer switches, engine room ventilation units & controls, etc...

Records of all readings of all instruments associated with the engine, generator, and transfer switch, and verification and confirmation that they are all functioning normally. (see chart “E”)

(a) the time delay on start, _____

(b) the cranking time until the engine starts and runs, _____

(c) the time required to come up to operating speed, _____

(d) the time required to achieve a steady-state condition with all switches transferred to emergency position, _____

- (e) the voltages, frequency, amperage, kW, kva, readings at start up, and at any observed change in loads, and at every 5 minutes intervals thereafter. (See chart “E”).

Chart “E”

<i>Time</i>	<i>Voltage</i>	<i>Frequency</i>	<i>Amperage</i>	<i>K.W.</i>	<i>K.V.A.</i>
<i>Start</i>					
<i>5 Min.</i>					
<i>10 Min.</i>					
<i>15 Min.</i>					
<i>20 Min.</i>					
<i>25 Min.</i>					
<i>30 Min.</i>					
<i>45 Min.</i>					
<i>60 Min.</i>					

- (f) the engine oil pressure, water temperature, where applicable and battery charge rate at 5 minutes intervals shall be recorded in Chart “F”

Chart “F ”

<i>Time</i>	<i>Oil Pressure</i>	<i>Water Temperature</i>	<i>Battery Charge Rate</i>
<i>Start</i>			
<i>5 Min.</i>			
<i>10 Min.</i>			
<i>15 Min.</i>			
<i>20 Min.</i>			
<i>25 Min.</i>			
<i>30 Min.</i>			
<i>45 Min.</i>			
<i>60 Min.</i>			

Also,

- (g) the time delay on retransfer for the transfer switch, _____

- (h) the time delay on engine cool down, _____ and shutdown, _____.

6. - A final Certificate of Compliance shall be issued to PWGSC once all Verification, Inspections & Testing have been completed in accordance with the CAN/CSA-C282-09.

7. - The final results of the Annual Inspection and Testing & a complete list of deficiencies (if applicable), see chart "E", shall be made available to Public Works and Government Services Canada within fifteen (15) working days after the actual tests and must comply to Section 10, of the CAN/CSA-C282-09 Emergency Electrical Power Supply for Buildings.

Table "G"

Other related issues or deficiencies (if applicable):

Item #	Deficiency Description	Date
--------	------------------------	------

3rd Edition
Jim Tucker
PWGSC Commissioning Manager
Halifax Nova Scotia

		Repaired
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		

Commissioning - Deficiency - Definition

Project	Project #		Date:

Type of Deficiency			
Definitions			
C - Contract: Quote substantiating drawing number, and/or specification section and paragraph			
D - Not in Contract: Assume that deficiency cannot be resolved under terms of contract. Record deficiency for consideration at later date.			
R - Not in Contract:		Requested, suggested by	
-----		-----	

<u>Priority</u>
Provide priority listing of all list of deficiencies
E. - Essential: Give reasons S - Safety H - Health OM - Operational Maintenance P - Performance CV - Code Violation NE - Non Essential - Give Details

Sign off Block:	Signature:	Date:
Project Manager		
Owner's Rep.		
Mechanical Contractor Rep.		
Mechanical Consultant Rep.		
Commissioning Agent		
Commissioning Manager		

Appendix "B"

Part 2 Commissioning - Product Information (PI) Form Electrical

Project:	Project #	Date:

Performance Verification (PV) report form accompanies this PI report form

Yes:	No:

Emergency Power System (Generator)			
No on Contract Drawings:		MMS Identifier	
Description Of System:			
		Generator Type	
Purchasing Information:			
Vender		Address:	
Purchase Order #:			
Ordered by:			
Date of Manufacturer:		Date of Start Up:	
Details of Warranty:		Commencement Date	
		Expiration Date:	
Product Information:			
Manufacturer:			
Model:		KVA:	Kilowatt:
Serial #:			Rated Capacity:
Efficiency:	Frame:		Voltage:
			Phase:
Other Data:			

Sign Off Block	Signature:	Date:
Design Engineer:		
Owners Representative:		
Commissioning Agent:		
Mechanical Contractor Rep.		
Mechanical Consultant Rep.		
Commissioning Manager:		

Part 1 General

1.1 Section Includes

- .1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 Related Sections

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 05 01 - Common Work Results - Electrical.

1.3 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55-M1986(R2008), Special Use Switches.
 - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.4 Shop Drawings and Product Data

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.5 Waste Management and Disposal

- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 Switches

- .1 Line voltage switches shall be specification grade, toggle type, flush mounted where possible, and C.S.A. approved as general purpose alternating current switches.
- .2 Manually-operated general purpose AC switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.

- .4 Suitable for back and side wiring.
- .5 White toggle.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.
- .5 Acceptable manufacturers:
 - .1 Hubbell, Pass & Seymour and Leviton.
- .6 Other types of switches shall be as specifically indicated on the drawings.

2.2 **Receptacles – 15A**

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:
 - .1 Heavy duty compact design.
 - .2 White urea moulded housing..
 - .3 Suitable for No. 10 AWG for back and side wiring.
 - .4 Break-off links for use as split receptacles.
 - .5 Eight back wired entrances, four side wiring screws.
 - .6 Triple wipe contacts and riveted grounding contacts.
 - .7 One piece brass grounding strap.
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.
- .4 Acceptable manufacturers:
 - .1 Hubbell, Pass & Seymour and Leviton.

2.3 **Receptacles – 20A**

- .1 Duplex receptacles, CSA type 5-20 R, 125 V, 15/20 A, U ground, to: CSA-C22.2 No.42 with following features:
 - .1 Extra heavy duty compact design.
 - .2 White urea moulded housing.
 - .3 Suitable for No. 10 AWG for back and side wiring.
 - .4 Break-off links for use as split receptacles.
 - .5 Eight back wired entrances, four side wiring screws.
 - .6 Triple wipe contacts and riveted grounding contacts.
 - .7 One piece brass grounding strap.
- .2 Other receptacles with ampacity and voltage as indicated.

.3 Receptacles of one manufacturer throughout project.

.4 Acceptable manufacturers:

.1 Hubbell, Pass & Seymour and Leviton.

2.4 GFCI Receptacles – 15A

.1 GFCI duplex u-ground receptacles shall be heavy duty grade, A.C. rated 15 amperes at 125 volts, U ground, having parallel slots with double wiping contacts, ground terminal, and one piece body.

.2 GFCI receptacles shall be white complete with LED indication with coverplates as indicated below.

.3 Acceptable manufacturers: Hubbell, Pass & Seymour and Leviton.

2.5 GFCI Receptacles – 15/20A

.1 GFCI duplex u-ground receptacles shall be heavy duty grade, A.C. rated 15/20 amperes at 125 volts, U ground, having parallel slots with double wiping contacts, ground terminal, and one piece body.

.2 GFCI receptacles shall be white complete with LED indication with coverplates as indicated below.

.3 Acceptable manufacturers: Hubbell, Pass & Seymour and Leviton.

2.6 Surge Protection (TVSS) Receptacles – 15/20A

.1 SPD (TVSS) duplex u-ground receptacles shall be heavy duty specification grade, A.C. rated 15/20 amperes at 125 volts, U ground, having parallel slots with double wiping contacts, ground terminal, and one piece body.

.2 SPD (TVSS) receptacles shall have a blue face complete with LED and alarm indication with coverplates as indicated below.

.3 SPD (TVSS) receptacles shall provide 240joule/15000A per mode protection.

.4 Acceptable manufacturers: Hubbell, Pass & Seymour and Leviton.

2.7 Special Receptacles

.1 Receptacles of specified amperage and voltage shall be supplied and installed where noted on the drawings. Where such units are noted they shall be best quality, specification grade and conform to the noted rating and applicable C.S.A. configuration.

.2 See below for coverplates for all receptacles noted in .1. Receptacles shall be complete with lamoid nameplates indicating voltage, amperage, & phase characteristic.

2.8 Coverplates

- .1 Coverplates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Coverplates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Type 302 stainless steel cover plates, for wiring devices mounted in flush-mounted outlet box.
- .5 Sheet metal utility style cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Weatherproof double lift spring-loaded cast aluminum coverplates, complete with gaskets for duplex receptacles for interior wet locations as indicated.
- .7 Weatherproof spring-loaded cast aluminum coverplates complete with gaskets for single receptacles or switches for interior wet locations as indicated.
- .8 Where devices are indicated for exterior weatherproof construction, they shall include a flush mounting weatherproof enclosure and locking cover (Pass & Seymour 4600-26) where protected by overhead soffits or canopies.
- .9 Where devices are indicated for exterior weatherproof construction and are exposed to weather without protection by overhangs or canopies, they shall include a surface mount cast aluminum lockable in-use cover equal to Pass & Seymour Cat. No. WIUCAST1.

Part 3 Execution

3.1 Installation

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 All switches, and their wall plates, shall be installed plumb, with switch handle in the "up" position when switch is closed. Pigtail branch circuit conductors shall be used for connection to switches in multi-gang outlets. Do not use feed through features on switches. Twist stranded conductors and form under head of screw. Tighten terminal screw to specified torque. Use back wiring feature for conductor sizes #12 and #10.
 - .3 Install switches in gang type outlet box when more than one switch is required in one location.
 - .4 Mount toggle switches at height in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

- .2 Mount receptacles at height in accordance with Section 26 05 01 - Common Work Results - Electrical.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 All receptacles, and their wall plates, shall be installed plumb, with long axis in the vertical position, U ground terminal on the top. Pigtail branch circuit conductors shall be used for connection to receptacles in cases where more than one phase conductor or neutral conductor exist in the outlet box. Do not use feed through features on receptacles. Twist stranded conductors and form under head of terminal screw. Tighten terminal screw to specified torque.
 - .5 Power and neutral conductor terminations shall be made using the back wiring feature on the receptacle for conductor sizes #12 and #10. Where voltage drop considerations require #8 AWG conductors to feed a receptacle, the #8 conductor shall be extended to a surface mounted junction box located in the ceiling space directly above the receptacle. The #8 AWG conductor shall be reduced to #10 AWG in the junction box before extending on down in the vertical drop to the receptacle.
 - .6 Install a green insulated bonding conductor, equal in ampacity to the receptacle ampacity, between the grounding terminal of the receptacle and the grounding screw or stud of the outlet box.
 - .7 Receptacles above counters shall be installed above the backslash to a height as indicated on the drawings and coordinated on the site.
 - .8 All receptacles are to be polarity tested.
 - .9 All receptacles are to be identified with Lamicoid nameplates in accordance with Section 26 05 01 - Common Work Results - Electrical. The nameplate for each receptacle shall indicate the panel from which the receptacle is fed, as well as the branch breaker circuit number(s). In addition, a Ty-Rap Cat. No. TY5532M identifying tag shall be secured in the outlet box, marked with the same identification and arrange to be visible when the coverplate is removed, without removal of the receptacle.
- .3 Coverplates:
- .1 Protect all cover plates with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common coverplates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 Section Includes

- .1 Materials and installation for emergency lighting systems.

1.2 Related Sections

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 05 21 - Wires and Cables (0-1000 V).
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.141-10, Emergency Lighting Equipment

1.4 Submittals

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data to indicate system components, mounting method, source of power and special attachments.

1.5 Waste Management and Disposal

- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 Equipment

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: Universal 120V to 347 V, AC.
- .3 Output voltage: 12V DC.
- .4 Operating time: 30 min.
- .5 Battery: sealed, maintenance free with ten year life warranty.

- .6 Charger: solid state, three stage, self diagnostic circuitry, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 87.5% battery nominal voltage.
- .9 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.
- .10 Lamp heads: integral on unit or remote as indicated on the drawings, 345° horizontal and 180° vertical adjustment. Lamp type: MR16 LED, 12V, 6W.
- .11 Cabinet: suitable for direct to wall mounting and c/w knockouts for conduit termination, fully gasketed, cast aluminum back plate with clear heavy duty UV resistant polycarbonate cover, suitable for installation in high abuse and wet areas.
- .12 Finish: White.
- .13 Auxiliary equipment:
 - .1 Test switch.
 - .2 Battery disconnect device.
 - .3 AC input and DC output terminal blocks inside cabinet.
 - .4 Automated self diagnostic circuitry.
 - .5 120V cord set.
- .14 Acceptable Product Manufacturer:
 - .1 Wall /Surface Mount: READY-LITE Cat . No. LDX12-144VQ-ADN-LD10-OT
 - .2 Dual-Lite, Lumacel, Stanpro and Aimlite shall be considered acceptable alternate manufacturers.
- .15 Acceptable product manufacturer of remote heads:
 - .1 READY-LITE Cat. No. RL40MP-2-LD10
 - .2 Dual-Lite, Lumacell, Stanpro and Aimlite shall be considered acceptable alternate manufacturers.

2.2 **Wiring of Unit Equipment**

- .1 Conduit: Type EMT, to Section 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Conductors: RW90 Type to Section 26 05 21 Wires and Cables 0 - 1000V, sized as indicated and in accordance with manufacturer's recommendations.

Part 3 Execution

3.1 Installation

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads on to egress path.
- .3 Connect exit lights to unit equipment.
- .4 Connect battery terminals.

END OF SECTION

Part 1 General

1.1 Work Included

- .1 To complete chain link fencing around the Compound and summarized but not restricted to the following:
 - .1 Post excavation and backfilling.
 - .2 Fence posts, fabric, gates and accessories.

Part 2 Products

2.1 General Materials

- .1 Galvanizing: Galvanize fittings, accessories and steel tube by hot dip method after fabrication to meet specified requirements of CSA Standard G164.
- .2 Concrete: 2500 psi compressive strength at 28 days, with maximum slump of 100mm and air entrainment of 5% to 7%.
- .3 Ensure that all components are fabricated so that galvanic action between dissimilar metals is prevented.

2.2 Chain Link Fabric

- .1 Woven steel wire with twisted and barbed top selvage and knuckled bottom salvage, hot dripped galvanized after weaving.
- .2 Mesh size: 50mm, 9 ga. wire, except for baseball backstop.
- .3 Weight of Zinc Coating: minimum 2.0 oz/sq.in. of uncoated wire surface.
- .4 Tension Wire: 6 ga. single strand finished to match fabric.

2.3 Pipe

- .1 Pipe: for posts, rails, braces: Standard, butt weld steel, galvanized, Standard Continuous Weld, Schedule 40 pipe.

2.4 Gates

- .1 Fabricate gate frames with 43mm (1 11/16") OD pipe with welded joints
- .2 Provide horizontal braces to align with braces on fence.
- .3 Provide diagonal pipe welded to frame and whatever other measures are required to avoid sagging of the gate.

- .4 Provide each leaf with heavy duty hinges and chain hold open. One leaf is to have a foot bolt and latch catch, the other to have a heavy duty latch with a means for the Owner to attach a padlock.
- .5 Hinges shall allow a full 180 deg opening.

2.5 Fittings

- .1 Fabric Bands: galvanized steel to fit post diameter.
- .2 Top and Bottom Rail and Brace Fittings: Galvanized steel bands to fit post diameter, with galvanized terminal fittings for bands, and outside sleeve couplings.
- .3 Tension Bar: 4.8mm x 19mm (3/16" x 3/4") steel, galvanized after fabrication.
- .4 Post Caps: For each post provide -pressed steel, malleable iron or cast iron, with line post caps fabricated to allow top rails to pass through.

Part 3 Execution

3.1 Examination

- .1 Verify that final grading along fence line is completed to ensure that fence may be installed on line of finished grade.
- .2 Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 Preparation

- .1 Lay out fence with lines and stakes.
- .2 Locate line posts to provide equal spacing not exceeding 3048mm. Mark post locations with stakes.
- .3 Locate corner posts where direction of fence changes direction more than 10 deg.

3.3 Post and Rail Installation

- .1 Install posts of the following diameter and length, with caps on the top of each post.
 - .1 In 1828mm high sections for Line Posts: 60mm (2-3/8" O.D.), 915mm longer than the fabric.
 - .2 For Terminal Posts (end, corner and straining posts, at openings and at gates): 89mm (3-1/2" O.D.), 1220mm longer than the fabric.
- .2 Top and Bottom Rail:
 - .1 Install 43mm (1-11/16" O.D.) top rail in random lengths through line post caps, and join with couplings between lengths.
 - .2 Secure top rails to line posts, and by straps to terminal and gate posts.
- .3 Mid Bracing:

- .1 For fences 1828mm and higher, install 43mm (1-11/16") O.D. horizontal braces spaced midway between the bottom and top of fence fabric between all line posts.

3.4 Post Foundations

- .1 Excavate for concrete post foundations.
- .2 Install concrete foundations of following dimensions.
 - .1 For up to 60mm (2-3/8") O.D. posts: 1067mm deep, 305mm dia.
 - .2 For 70mm (2 3/4") to 89mm (3-1/2") O.D. posts: 1525mm deep, 356mm dia.
- .3 Place concrete in excavated hole to bottom level of post.
- .4 Set posts plumb to within 6.4mm in 3048mm (1/4" in 10ft).
- .5 Fill excavation with concrete to flush with grade of topsoil.
- .6 Slope top of foundation away from post and finish smooth.
- .7 Cure concrete at least 7 days before installing fence gates.

3.5 Fence Fabric

- .1 Install fence fabric in one length between terminal (gate or straining) posts.
- .2 Position fabric with bottom 25mm above grade at each post.
- .3 Attach fabric to terminal (gate or straining) posts and gate frames with tension bars threaded through fabric and secured to posts by fabric bands at maximum spacing of 457mm o.c.
- .4 Attach fabric to line posts with galvanized steel wire ties or clips at approximate spacing of 305mm o.c.
- .5 Attach fabric to top rails, bottom rail, and top and bottom gate frames with galvanized steel wire or clips at maximum spacing of 457mm o.c.
- .6 Fabric height: 3810mm to be coordinated on site.

3.6 Gates

- .1 Install gates plumb and level to within 6.4mm in 3048mm (1/4" in 10ft).
- .2 Install footbolt catches, ground set holdbacks and centre rests in concrete
- .3 Install specified hardware to operate smoothly.

3.7 Adjustment & Cleaning

- .1 Adjust and tighten bracing, and tension wires and rods.

- .2 Tighten hardware, fasteners and accessories. Adjust gate hardware as required to ensure it operates smoothly without binding.
- .3 Remove excess materials and debris resulting from work of this Section from the site.

END OF SECTION