

City of Winnipeg

RFP 429-2011 – Design and Construction of the Public Works East Yard
Complex at the Former Elmwood/Nairn Landfill Site

Appendix C. Specifications

Appendix C1
Outline Specifications

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PART 1 - GENERAL

1.1 RELATED
SECTIONS

.1 All sections and divisions.

1.2 ADMINISTRATIVE

- .1 Submit to Owner, Owner's Advisor, and Design-Builder's Consultants reviewed and approved 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 designs, calculations, quantities, shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to the Owner and Owner's Advisor. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated 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.
- .6 Notify the Owner and the Owner's Advisor, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 The Design-Builder's responsibility for errors and omissions in submission is not relieved by the Owner's or Owner's Advisor's review of submittals.
- .9 The Design-Builder's responsibility for deviations in submission from requirements of Contract Documents is not relieved by the Owner's or Owner's Advisor's review.
- .10 Keep one reviewed copy of each submission on site.

1.3 DESIGNS

.1 Submit to the Owner, Owner's Advisor, and Consultants a copy of the Design-Builder's approved designs, drawings and supporting calculations, details and documentation for review. Submissions shall

be made at the following stages of the design process and include the information noted below as a minimum.

- .1 33% design stage: Submission shall include the following requirements as a minimum:
 - .1 Drawings including plans, sections, details, elevations and flow diagrams or single line diagrams for all systems and elements of the building.
 - .2 Schedules of equipment and finishes.
 - .3 Specification drafts.
 - .4 Indicative Capital Cost Estimate accurate to a Class C (+/-15%).
 - .5 Copies of calculations of load, flow rates, pressure, and energy requirements.
 - .6 LEED® Scorecard and Supporting documentation to demonstrate LEED® silver certifiable design.

- .2 66% design stage:
 - .1 Drawings including plans, sections, details, elevations and flow diagrams or single line diagrams for all systems and elements of the building.
 - .2 Schedules of equipment and finishes.
 - .3 Specification drafts.
 - .4 Substantive Capital Cost Estimate accurate to a Class B (+/-10%).
 - .5 Life Cycle Cost Analysis.
 - .6 Maintenance estimates and operating cost estimates per year of operation (\$2010).
 - .7 Copies of calculations of load, flow rates, pressure, and energy requirements.
 - .8 LEED® Scorecard and Supporting documentation to demonstrate LEED® silver certifiable design.

- .3 Construction Document submission stage (design complete):
 - .1 Drawings including plans, sections, details, elevations and flow diagrams or single line diagrams for all systems and elements of the building.
 - .2 Schedules of equipment and finishes.
 - .3 Specification.
 - .4 Guaranteed Price not to exceed proponent's originally offered costs.
 - .5 Life Cycle Cost Analysis.
 - .6 Maintenance costs and operating costs per year of operation (\$2011).
 - .7 Copies of calculations of load, flow rates, pressure, and energy requirements.
 - .8 LEED® Scorecard and Supporting documentation to demonstrate LEED® silver certifiable design.

1.4 SHOP DRAWINGS
AND PRODUCT DATA

- .1 Refer to CCDC 14-2000 GC 3.10 provisions.
- .2 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.

- .3 Submit shop drawings bearing stamp and signature of qualified professional engineer or architect registered or licensed in Province of Manitoba, Canada.
- .4 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 co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .5 Allow 10 business days for Owner's and Owner's Advisor's Engineer's review of each submission.
- .6 Adjustments made on shop drawings by Owner or Owner's Advisor are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant, Owner and Owner's Advisor prior to proceeding with Work.
- .7 Make changes in shop drawings as the Owner and Owner's Advisor may require, consistent with Contract Documents. When resubmitting, notify the Consultant, Owner and Owner's Advisor in writing of revisions other than those requested.
- .8 Accompany submissions with transmittal letter, in triplicate, 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.
- .9 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.

- .10 Relationship to adjacent work.
- .10 After the Owner and Owner's Advisor's Engineer's review, distribute copies.
- .11 Submit one transparency or hard copy print bearing seals, stamp, date and signature and an electronic copy of shop drawings for each requirement requested in specification Sections and as the Owner and the Owner's Advisor may reasonably request.
- .12 Submit an electronic copy and 6 hard copies of product data sheets or brochures for requirements requested in specification Sections and as requested by the Owner and/or the Owner's Advisor where shop drawings will not be prepared due to standardized manufacture of product.
- .13 Submit an electronic and 6 hard copies of test reports for requirements requested in specification Sections and as requested by the Owner and/or the Owner's Advisor.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within two years of date of contract award for project.
- .14 Submit an electronic and 2 hard copies of certificates for requirements requested in specification Sections and as requested by the Owner and/or the Owner's Advisor.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .15 Submit an electronic and 4 hard copies of manufacturers instructions for requirements requested in specification Sections and as requested by the Owner and/or the Owner's Advisor.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .16 Submit an electronic and 4 hard copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by the Owner and/or the Owner's Advisor.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit and electronic and 4 hard copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by the Owner and/or the Owner's Advisor.

- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by the Owner and the Owner's Advisor, no errors or omissions are discovered or if only minor corrections are made, transparency (if provided) and one hard transparency copy 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.

1.5 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Owner's Advisor's business address.
- .3 Notify Consultant, Owner and Owner's Advisor in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by the Owner and/or the Owner's Advisor are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Consultant, the Owner, and the Owner's Advisor prior to proceeding with Work.
- .6 Make changes in samples which the Owner and/or the Owner's Advisor may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.6 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

PART 1 - GENERAL

1.1 SUMMARY

- .1 The Design Build Team shall design and construct the Public Works East Yards Project to achieve a minimum Leadership in Energy and Environmental Design (LEED®) Silver level of certification with the Canadian Green Building Council's (CaGBC) Green Building Rating System®.
- .2 The Public Works East Yards project was registered by the Contract Administrator for the Thomas Avenue site with the CaGBC as a LEED Canada-NC Version 1.0 project. The registration for the Thomas Avenue site was completed prior to June 21, 2010, to lock-in this project under the LEED Canada-NC Version 1.0 rating system. If the Design Build Team is proposing another site, the project may have to be re-registered under the newer LEED Canada-NC 2009 rating system, and comply with the requirements of the 2009 rating system to achieve the minimum LEED Silver level of certification.
- .3 Based on the Thomas Avenue site the Design Build Team shall achieve a minimum of 36 LEED points in order to achieve the LEED Silver Level of Certification.
- .4 Based on the Thomas Avenue site the LEED points which are "required", "recommended" and "optional" are listed in the Project Checklist; Table C2-1 in Appendix C2 LEED points that are "required" in the Project Checklist are mandatory. LEED® points that are identified in the "No" column in the Project Checklist should be considered as "not recommended" based on their difficulty to achieve for this project .
- .5 Based on the Thomas Avenue site the potential strategies for achieving a LEED Silver level of certification under the LEED Canada-NC Version 1.0 rating system are suggested in Table C2-2, LEED Commentary/Potential Strategies in Appendix C2. The strategies presented in Table C2-2 are for guidance only. The DesignBuild Team shall take full responsibility and determine best methods to fully comply and achieve the LEED Silver certification with the CaGBC.
- .6 The DesignBuild Team shall have a LEED Coordinator on the team for the duration of the project. The LEED Coordinator should have a LEED Accredited Professional (AP) designation with the CaGBC. The LEED Coordinator's responsibilities will include:
 - .1 Coordination, integration and execution of LEED requirements throughout the project design, construction and close-out.
 - .2 Management of the project's LEED Checklist through the various stages of project.
 - .3 Liaise with the City and provide LEED updates at monthly meetings during the project design and construction phases.
 - .4 At completion of the design phase submit a written report indicating all LEED strategies, with supporting calculations and information with sufficient detail for the City to confirm

- that the LEED Silver goal will be met.
- .5 Coordinate and compile all LEED documentation, for submission to the CaGBC, including those credits which require City input and signatures.
 - .6 Submit LEED documentation to the Canadian Green Building Council, on behalf of the City, within 6 months of total completion.
 - .7 The City of Winnipeg will engage a third party Commissioning Agent in order to achieve EA Prerequisite 1 and EA Credit 3. The DesignBuild Team shall make provision to accommodate the LEED commissioning process including meetings, commissioning coordination and execution of commissioning documentation as prescribed by the Commissioning Agent.

1.2 REFERENCES

- .1 LEED® Canada-NC 1.0 Green Building Rating System for New Construction and Major Renovations as published by the Canadian Green Building Council, December 2004, and as amended by addenda issued to date.

1.3 SUBMITTALS

- .1 General: submit requested documentation in accordance with Section 01 33 00 – Submittals Procedure.
- .2 Submit the following information to the Contract Administrator to verify compliance with indicated LEED® requirements.
 - .1
 - .2 LEED® Action Plan: As part of the LEED Action Plan provide the LEED Scorecard, strategy descriptions, calculations and preliminary submittals indicating how the LEED® project requirements will be met. A preliminary LEED Action Plan and a schedule for all LEED Action Plan updates shall be submitted at time of Tender. For example the following information should be provided as part of the LEED Action Plan, if pursuing the following credits:
 - .1 Credit EQ 8.1: Provide a description of daylighting strategies, daylighting calculations including plans shown, daylighting levels achieved for occupants.
 - .2 Credit SS 8: Provide photometric calculations for the exterior lighting of the site.
 - .3 Prerequisite SS 1: Provide a copy of the “Erosion & Sedimentation Control Plan” prior to execution during construction.
 - .4 Credit MR 2.1: Provide a copy of the “Construction Waste Management Plan” prior to execution on the site.
 - .3 LEED® Progress Reports: Concurrent with each Application for Payment, submit a LEED Progress Report listing LEED activities during the billing period and the status of each LEED credit being pursued.
 - .4 LEED® Documentation Submittals. Provide duplicate

documentation to the Contract Administrator for submittals that will be made to the CaGBC as part of the official LEED Silver certification application.

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Division 1.
- .2 Section 01 47 17 – Sustainable Requirements – Contractor's Verification.
- .3 Section 01 74 19 – Construction Waste Management and Disposal.

1.2 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 14-2000, Design-Build Stipulated Price Contract.
- .2 City of Winnipeg Purchasing Department requirements.

1.3 PROJECT
CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Consultant and Owner's Advisor. Do not burn waste materials on site, unless approved by Owner's Advisor.
- .3 Clear snow and ice from access to building, remove from site to the nearest operating snow dump facility.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site dump containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 19 - Construction Waste Management and Disposal.
- .7 Dispose of waste materials and debris off site at a licensed operating facility approved to accept such waste.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose. Do not allow volatile or noxious substances to gas-off in the structure.

- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.4 FINAL CLEANING

- .1 Refer to CCDC 14 – 2000 General Condition 3.13, and in specific as follows:
- .2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 Remove waste products and debris including that caused by Owner or other Contractors.
- .6 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Owner's Advisor.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors, and ceilings.
- .10 Clean lighting reflectors, lenses, and other lighting surfaces.
- .11 Vacuum clean and dust building interiors, behind grilles, louvers and screens.
- .12 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .13 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .14 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

- .15 Remove dirt and other disfiguration from exterior surfaces.
- .16 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .17 Sweep and wash clean paved areas.
- .18 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .19 Clean roofs, downspouts, and drainage systems.
- .20 Remove debris and surplus materials from crawl areas, shafts, and other accessible concealed spaces.
- .21 Remove snow and ice from access to building.

1.5 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction Waste Management And Disposal.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

- 1.1 RELATED ITEMS
- .1 Divisions 1 through 49 may contain LEED® requirements specific to the work of each of those Divisions. These requirements may or may not include reference to LEED®.
 - .2 Section 01 47 13 – LEED Requirements.
- 1.2 DEFINITIONS
- .1 **Waste Reduction Workplan (WRW):** Written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from the DWA (Schedule A).
 - .2 **Materials Source Separation Program (MSSP):** Consists of a series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at the point of generation.
 - .3 **Leadership in Energy and Environmental Design: (LEED®) A** Green building rating system administered by the Canadian Green Building Council.
 - .4 **Waste Management Coordinator (WMC):** Designated individual whose primary responsibility is to be in attendance on-site to monitor waste activities. Designate, or have designated, individuals from each Subcontractor to be responsible for waste management related to their trade and for coordinating activities with WMC.
 - .5 **Waste Reduction Agreement (WRA):** Written agreement signed by all contractors/sub contractors outlining and confirming commitment to reduction of waste onsite.
 - .6 **Daily Waste Management Inventory (DWMI):** Mechanism for detailing and tracking all waste material leaving site.
 - .7 **Proof Of Disposal (POD):** Written documentation detailing the correct disposal of all materials leaving site.
 - .8 **Hazardous Waste (HW):** Regulated waste materials and substances that are listed by Manitoba Environment and require separate collection streams and special disposal procedures. These include all containers in which there is a residue of a hazardous material or Dangerous Good.
- 1.3 DOCUMENTS
- .1 Maintain at job site, one copy of following documents:
 - .1 Waste Reduction Workplan.
 - .2 Daily Waste Management Inventory.
 - .3 Waste Reduction Agreement.
 - .4 Proof of Disposal.
- 1.4 USE OF SITE AND
- .1 Execute work with least possible interference or disturbance to area

FACILITIES

surrounding premises.

- .2 Conform to temporary security measures approved by WMC.

1.5 SUBMITTALS

- .1 Submit requested submittals in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Prepare and submit draft copies of the following submittals prior to contract finalization and project start-up for review:

- .1 Waste Reduction Workplan (WRW)
- .2 Waste Reduction Agreement.

- .3 Prepare and submit the following submittals on a weekly basis:
 - .1 Completed Daily Waste Management Inventory (DWMI): Schedule B.
 - .2 Completed Proof of Disposal (POD): Schedule D.

1.6 WASTE REDUCTION
WORKPLAN (WRW)

- .1 The WRW is intended as a commitment by the waste management contractor to estimate targets for the diversion of waste. The contractor will be asked to review the site conditions and the available markets to provide confirmation of the overall diversion of waste materials.
- .2 The bidders LEED® Approved Professional shall prepare and have ready for use prior to project start-up the WRW.
- .3 The WRW will identify opportunities for reduction, reuse, and/or recycling of materials. It is required that the Contractor will update the WRW on a monthly basis as part of the progress billing.
- .4 Review the workplan with all workers on the site and post workplan or summary where workers at site are able to review its content.

1.7 DAILY WASTE
MANAGEMENT
INVENTORY (DWMI)

- .1 The intent of this form is to provide a tracking mechanism for all material leaving the site. Every item leaving the site is to have its destination described, be identified, described, weighed or quantified by volume as per the categories identified on the schedule in order that the WMC has a quantitative inventory of all wastes.
- .2 The bidders LEED® Approved Professional shall prepare and have ready for use prior to project start-up the DWMI.
- .3 Contractor to review DWMI and become familiar with the requirements of compliance with this schedule.
- .4 The Contractor is to educate all workers on the site to ensure they are aware of the reasons for compliance and to ensure that the directives for compliance are followed.
- .5 The form is to be completed by the WMC with the cooperation of the CM.

- .6 Time and effort to sort, distribute, schedule, weigh and track all material is to be included in the base bid amount.
 - .7 Hazardous materials and land clearing debris including excavated soil are to be separately tracked and inventoried for record purposes. DO NOT include their volume or weight in overall waste stream inventories.
- 1.8 WASTE REDUCTION AGREEMENT (WRA)
- .1 The bidders LEED® Approved Professional shall prepare and have ready for use prior to project start-up the WRA.
 - .2 The form to be completed prior to start up to confirm compliance with project objectives from all of the Contractors.
- 1.9 PROOF OF DISPOSAL (POD)
- .1 The bidders LEED® Approved Professional shall prepare and have ready for use prior to project start-up the POD.
 - .2 The POD is to be completed on a monthly interval and provided to the Waste Management Co-ordinator to validate disposal/recycling/reuse of material in a manner that is consistent with the stated objectives of the Deconstruction Waste Management Plan.
- 1.10 MATERIAL SOURCE SEPARATION PROGRAM
- .1 Prepare MSSP and have ready for use prior to project start-up.
 - .2 Implement MSSP for waste generated on project in compliance with approved methods and as approved by WMC.
 - .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and/or recyclable materials.
 - .1 Maintain separate collection, handling and storage facilities for hazardous waste as required by Manitoba Environment and the Manitoba Fire Code.
 - .4 Provide containers to deposit reusable and/or recyclable materials.
 - .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
 - .6 Locate separated material in area as designated by WMC.
 - .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition. Transport to approved and authorized recycling facility.
 - .8 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition. Ship material to site operating under Certificate of Approval. Materials must be immediately separated into required categories for reuse of recycling.
 - .1 **WASTE PROCESSING SITES**
 - .1 Provide details of waste processing sites to be utilized.
 - .2 **DISPOSAL OF WASTES**
 - .1 Burying of rubbish and waste materials is prohibited unless approved by WMC.
 - .2 Disposal of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers is prohibited.

- .3 Disposal of waste to be to approved recycling, crushing, and landfill sites as confirmed by the WMC.
- .3 STORAGE, HANDLING AND PROTECTION**
 - .1 Store, materials to be reused, recycled and salvaged in locations as directed by WMC.
 - .2 Unless specified otherwise, materials for removal become Contractor's property.
 - .3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility. Confirm location with CM.
 - .4 Protect structural components not removed for demolition from movement or damage.
 - .5 Support affected structures. If safety of building is endangered, cease operations and immediately notify WMC.
 - .6 Protect surface drainage, mechanical and electrical from damage and blockage.
- .4 SCHEDULING**
 - .1 Coordinate work with other activities at site to ensure timely and orderly progress of the work.
 - .2 Remove deconstruction material in efficient fashion to expedite overall site work. Ensure removal as requested by CM.

1.11 HAZARDOS WASTES

- .1 Maintain documentation of the quantities, types and classifications of Hazardous waste, and custody transfer to authorized/Licensed carriers and disposal facilities.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 APPLICATION

- .1 The Contractor is to implement the waste management procedures described in this Section in order to ensure that compliance with the LEED Materials and Resources credits MR 2.1 and 2.2.
- .2 Do work in compliance with the requirements of this Section.
- .3 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

- .1 Remove tools and waste materials on completion of work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF
MATERIALS

- .1 Separate materials, including concrete, masonry, metals and asphalt from general waste stream, as approved by the WMC, and consistent with applicable fire regulations. Label containers. Provide instruction on disposal practices.
- .2 On-site sale of salvaged, recovered, reusable, and recyclable material is NOT permitted.

3.4 CANADIAN GOVERNMENTAL
DEPARTMENTS CHIEF
RESPONSIBILITY FOR THE
ENVIRONMENT

Province Address:
Manitoba Environment
Building 2, 139 Tuxedo
Avenue Winnipeg, MB
R3N 0H6
(204) 945-7100

General Inquiries:
The Clean Environment
Commission 284
Reimer Avenue Box
21420 Steinbach, MB
R0A 2T3

Phone/Fax:
(204) 326-2395 (204) 326-2472

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Division 1.
- .2 Section 01 33 00 Submittal Procedures.

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned after final inspection, with Owner's Advisor's comments.
- .4 Revise content of documents as required prior to final submittal.
- .5 Two weeks prior to Substantial Performance of the Work, submit to the Owner and the Owner's Advisor final copies of operating and maintenance manuals in English and French, four in each language.
- .6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .7 Furnish written evidence of quantity, size, capacity, quality of products provided.
- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.

1.3 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with

typed description of product and major component parts of equipment.

- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on CD.

1.4 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Design-Builder with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.5 AS-BUILTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for reference and review by Consultant, Owner's Advisor and Owner one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

1.6 RECORDING
ACTUAL SITE
CONDITIONS

- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Consultant and Owner's Advisor.
- .1 Record information on set of black line opaque drawings, provided by Consultant.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information. Do not use yellow ink.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.7 EQUIPMENT AND
SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.

- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Design-Builder's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 23 05 93 Testing, Adjusting and Balancing for HVAC and 01 91 13 - General Commissioning (Cx) Requirements.
- .15 Additional requirements: as specified in individual specification sections.

1.8 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

-
- 1.9 SPARE PARTS
- .1 Provide spare parts for major wear items on all equipment as recommended by the manufacturer.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items. Submit inventory listing to Consultant and Owner's Advisor. Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- 1.10 MAINTENANCE MATERIALS
- .1 Provide maintenance and extra materials. Materials are to be sufficient to satisfy one year of normal operations.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site, place and store.
 - .4 Receive and catalogue items. Submit inventory listing to Consultant and Owner. Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- 1.11 SPECIAL TOOLS
- .1 Provide special tools to allow service of equipment during future maintenance.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items. Submit inventory listing to Consultant and Owner's Advisor. Include approved listings in Maintenance Manual.
- 1.12 STORAGE, HANDLING AND PROTECTION
- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
 - .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
 - .3 Store components subject to damage from weather in weatherproof enclosures.
 - .4 Store paints and freezable materials in a heated and ventilated room.

1.13 WARRANTIES AND
BONDS

- .5 Remove and replace damaged products at own expense and to satisfaction of Consultant and Owner's Advisor.
- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Consultant and Owner's Advisor for approval.
- .3 Warranty management plan to include required actions and documents to assure that the Owner receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to the Consultant and Owner's Advisor for review and approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 6 month and 12 month warranty inspection, measured from time of acceptance, by Consultant, Owner and Owner's Advisor.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems and lightning protection systems.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:

- .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
 - .12 Typical response time and repair time expected for various warranted equipment.
 - .4 Contractor's plans for attendance at 6 and 12 month post-construction warranty inspections.
 - .5 Procedure and status of tagging of equipment covered by extended warranties.
 - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
 - .10 Respond in a timely manner to oral or written notification of required construction warranty repair work.
 - .11 Written verification will follow oral instructions. Failure to respond will be cause for the Owner to proceed with action against Design-Builder.
- 1.14 PRE-WARRANTY CONFERENCE
- .1 Meet with Consultant, Owner and Owner's Advisor to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Owner and Owner's Advisor.
 - .2 Consultant will establish communication procedures for:
 - .1 Notification of construction warranty defects.
 - .2 Determine priorities for type of defect.
 - .3 Determine reasonable time for response.
 - .3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.15 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Consultant and reviewed by the Owner's Advisor.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 SUMMARY

.1

Sections Includes:

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.

.2 Related Sections:

.1 Division 1.

.2 Section 21 12 01 – Standpipe and Hose Systems

.3 Section 21 13 01 – Sprinkler Systems.

.4 Section 21 25 01 – Other Fire Suppression Systems

.5 Section 22 11 19 – Domestic Water Distribution

.6 Section 22 15 00 – General Service Compressed Air Systems

.7 Section 22 42 00 – Plumbing Fixtures

.8 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC

.9 Section 23 11 00 – Energy Supply

.10 Section 23 21 00 – Heat Generation

.11 Section 23 30 00 – HVAC Distribution

.12 Section 23 81 00 – Refrigeration

.13 Section 23 82 00 – Terminal and Packaged Units

.14 Section 23 84 00 – Other HVAC Systems and Equipment

.15 Section 25 01 00 – Integrated Automation

.16 Section 26 05 01 – Common Electrical Requirements

.17 Section 26 05 02 – Electrical Service and Distribution

.18 Section 26 05 03 – Lighting, Power and Branch Wiring

.19 Section 26 05 04 – Electrical Controls and Instrumentation

.20 Section 27 05 13 – Communication Services

.21 Section 28 13 00 – Electronic Safety and Security

.3 Acronyms:

.1 AFD = Alternate Forms of Delivery, service provider.

.2 BMM = Building Management Manual.

.3 Cx = Commissioning.

.4 CA = Contract Administrator.

.5 CxA = Commissioning Agent.

- .6 DBT = Design Build Team
- .7 EMCS = Energy Monitoring and Control Systems.
- .8 O&M = Operation and Maintenance.
- .9 PI = Product Information.
- .10 PV = Performance Verification.
- .11 TAB = Testing, Adjusting and Balancing.

1.2 GENERAL

- .1 The CA will retain the services of a CxA as a third Party. Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
 - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the BMM.
 - .3 Effectively train O&M staff.
- .2 The CxA coordinates, leads and directs the Cx process, answering directly to the CA, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 The CxA will be involved in the design process as a member of the Design Build Team from the pre-design stage throughout the life of the project.
 - .2 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .3 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per the Program of requirements or determined by the Design Build Team, to meet Project functional and operational requirements.
- .4 AFD managed projects the term in Cx specifications to be interpreted as AFD Service Provider.

1.3 COMMISSIONING OVERVIEW

- .1 The commissioning process does not take away or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.
- .2 The CxA coordinates the commissioning activities through the Contract Administrator. Cooperate and provide all labour, equipment, tools and

devices required to execute the Cx.

- .3 The Design-Builder shall retain such expertise as is required to demonstrate and optimize system operation.
- .4 Cx activities to be a line item of Contractor's cost breakdown.
- .5 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .6 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .7 The CxA will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability by the Contract Administrator, and approved.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O&M training has been completed.

1.4 NON-CONFORMANCE
TO PERFORMANCE
VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Consultant, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by The Design-Builder. Above costs to be in form of progress payment reductions or hold-back assessments.

1.5 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to the Contract Administrator before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.6 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

- .1 Submit no later than 4 weeks after award of Contract:
 - .1 Names of all subcontractors.
 - .2 Tentative Cx planning meetings.
 - .3 Project schedule identifying commissioning start date.
- .2 Provide additional documentation relating to Cx process required by the Contract Administrator.

1.7
MANUFACTURER'S INVOLVEMEN
T

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing with CxA.
 - .2 Provide testing documentation for approval by the Contract Administrator.
 - .3 Arrange for the CxA and Design Build Team to witness tests.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Consultant.
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.8 OPERATION AND
MAINTENANCE OF
EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit to the Contract Administrator for approval before

implementation.

- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until the end of the Warranty period.

1.9
WITNESSING COMMISSIONING

- .1 The Contract Administrator is to witness activities and the CxA will verify results.

1.10 AUTHORITIES
HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to the Contract Administrator within 5 days of test and to the CxA for inclusion with Cx report.

1.11 REPEAT VERIFICATIONS

- .1 Assume costs incurred by the Contract Administrator and the CxA's third and subsequent verifications where:
 - .1 Verification of reported results fail to receive CxA's approval.
 - .2 Repetition of second verification again fails to receive approval.
 - .3 CxA deems that the Contractor's request for second verification was premature.

1.12 SUNDRY CHECKS
AND ADJUSTMENTS

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required by the CxA.

1.13 DEFICIENCIES,
FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of CxA and the Contract Administrator.
- .2 Report problems, faults or defects affecting Cx to the Contract Administrator and CxA in writing. Stop Cx until problems are rectified. Proceed with written approval from the Contract Administrator.

1.14 COMPLETION
OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities, complete Cx

work prior to issuance of Interim Certificate of Completion.

- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by the Contract Administrator.

1.15 OCCUPANCY

- .1 Cooperate fully with Contract Administrator and CxA during all stages of commissioning, acceptance and occupancy of facility.

PART 2 – PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

- 1.1 RELATED SECTIONS
- .1 03 20 01 - Concrete Reinforcement
 - .2 03 30 01 – Cast-in-place Concrete
 - .3 03 35 01 – Concrete Finishing
- 1.2 REFERENCES
- .1 Canadian Standards Association (CSA International)
 - .1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA O86S1-05, Supplement No. 1 to CSA O86-09, Engineering Design in Wood.
 - .3 CSA O121-08, Douglas Fir Plywood.
 - .4 CSA O151-09, Canadian Softwood Plywood.
 - .5 CSA O153-M1980(R2008), Poplar Plywood.
 - .6 CSA O325-07, Construction Sheathing.
 - .7 CSA O437 Series-93(R2001), Standards for OSB and Waferboard.
 - .8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
 - .9 CAN/CSA-S269.3-M92(R2008), Concrete Formwork, National Standard of Canada
 - .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- 1.3 SUBMITTALS
- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Prepare shop drawings for formwork and falsework for review by the Consultant.
 - .3 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings Comply with CAN/CSA-S269.3 for formwork drawings.
 - .4 Indicate formwork design data: permissible rate of concrete placement and temperature of concrete in forms.
 - .5 If required by the Consultant, indicate sequence of erection and removal of formwork/falsework.
- 1.4 DELIVERY,
- .1 Specify packing, shipping, handling, storage and protection for

STORAGE AND
HANDLING

prefabricated forming to prevent any damage.

1.5 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 19 – Construction Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Select materials and resources in accordance with Section 01 47 13 – LEED Requirements.
- .2 Select reusable formwork systems where possible to reduce waste generation.
- .3 Consultant to specify material requirements for formwork including, but not limited to, the following, as applicable:
 - .1 For architectural concrete surfaces.
 - .2 For standard concrete surfaces.
 - .3 Rigid insulation board.
 - .4 Pan forms.
 - .5 Tubular column forms.
 - .6 Form ties.
 - .7 Form release agent.
 - .8 Falsework.
 - .9 Sealants.
 - .10 Chamfer and fillet forming.

PART 3 - EXECUTION

3.1 FABRICATION AND
ERECTION

- .1 Fabricate and erect falsework in accordance with CSA S269.1 and CAN/CSA-S269.3.
- .2 Consider all exposed concrete as architectural concrete.
- .3 The Consultant to provide acceptable procedures and criteria as required for concrete formwork including, but not limited to, the following:
 - .1 Architectural exposed finishes.
 - .2 Chamfers and fillets.
 - .3 Joint pattern and tie layout.
 - .4 Build-in anchors, sleeves, and other inserts required in other Sections.
 - .5 Cleaning formwork.
 - .6 Re-use of formwork.
 - .7 Removal and re-shoring.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Outline requirements for materials, fabrication, and installation for concrete reinforcing.
- 1.2 REFERENCES .1 American Concrete Institute (ACI)
.1 SP-66-04, ACI Detailing Manual 2004.
- .2 American Society for Testing and Materials International (ASTM)
.1 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
.2 ASTM A 497/A 497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
- .3 Canadian Standards Association (CSA International)
.1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
.2 CSA A23.3-04, Design of Concrete Structures.
.3 CSA G30.18-09, Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.
.4 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.
- 1.3 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 SP-66.
- .3 Submit shop drawings including placing of reinforcement and indicate:
.1 Bar bending details.
.2 Lists.
.3 Quantities of reinforcement.
.4 Sizes, spacing, locations of reinforcement and mechanical splices if approved by Consultant, with identifying code marks to permit correct placement without reference to structural drawings.
.5 Indicate sizes, spacing and locations of chairs, spacers and hangers.
.6 Indicate lap lengths, bar development lengths and tension lap splices conforming to CSA A23.
- 1.4 QUALITY CONTROL .1 Quality Control: as described in PART 2 - SOURCE QUALITY CONTROL

- .1 Mill test reports.
 - .2 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting prior to beginning work of this Section.
 - .1 Verify project requirements.
 - .2 Review installation conditions.
 - .3 Co-ordination with other building sub-trades.
 - .2 Pre-installation meeting shall be attended by representatives of all trades affected by the Work of this Section. Notify the Contract Administrator at least four (4) days in advance of the scheduled time of the meeting; notification to include the meeting agenda. The Contract Administrator reserves the right to attend the meeting.
- 1.5 DELIVERY, STORAGE AND HANDLING
- .1 Store and manage materials in accordance with CSA A23.1.
 - .2 Delivery, storage, and handling of reinforcing steel shall be done to not damage the reinforcing. Do not store reinforcing directly on the ground.
- 1.6 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
- PART 2 - PRODUCTS
- 2.1 MATERIALS
- .1 Supply materials and products in accordance with Section 01 47 13 – LEED Requirements.
 - .2 Consultant to specify material requirements for concrete reinforcement including, but not limited to, the following:
 - .1 Bar size substitutions.
 - .2 Reinforcing steel.
 - .3 Weldable reinforcing steel.
 - .4 Wire ties.
 - .5 Welded steel wire fabric.
 - .6 Welded deformed steel wire fabric.
 - .7 Fibre reinforcement.
 - .8 Epoxy coating.
 - .9 Chairs, bolsters, bar supports, spacers.
 - .10 Mechanical splices.
 - .11 Plain round bars.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Upon approval of Consultant, weld reinforcement in accordance with CSA W186.

2.3 SOURCE QUALITY CONTROL

- .1 Provide Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum three (3) weeks prior to beginning reinforcing work.
- .2 Inform Consultant of proposed source of material to be supplied.

PART 3 - EXECUTION

3.1 PLACING REINFORCEMENT

- .1 Place reinforcing steel in accordance with CSA A23.1/A23.2.
- .2 Prior to placing concrete, obtain Consultant's approval of reinforcing material and placement.
- .3 The Consultant to provide acceptable procedures and criteria for placing reinforcing including, but not limited to:
 - .1 Chair spacing.
 - .2 Tie reinforcing spacing.
 - .3 Alignment tolerances.
 - .5 Required concrete cover.
 - .6 Securing reinforcing against displacement.
 - .7 Vapour barrier and void form.
 - .8 Safety caps for reinforcing ends.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Outline requirements for materials and installation for cast-in-place concrete.
- 1.2 REFERENCES .1 National Research Council Canada
.1 National Building Code of Canada 2010 (NBCC).
.2 American Society for Testing and Materials International (ASTM)
.1 ASTM C 260-01, Standard Specification for Air-Entraining Admixtures for Concrete.
.2 ASTM C 309-03, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
.4 ASTM C 494/C 494M-05, Standard Specification for Chemical Admixtures for Concrete.
.5 ASTM C 1017/C 1017M-03, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
.6 ASTM D 1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
.7 ASTM D 1752-04a, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-37.2, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Damp-proofing and Waterproofing and for Roof Coatings.
.2 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
.4 Canadian Standards Association (CSA International)
.1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
.2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
.3 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- 1.3 DESIGN REQUIREMENTS .1 Alternative 1 - Performance: in accordance with CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.
.2 Structures to be designed to the NBCC, Part 4, Post-Disaster Importance Category.
.3 Design the floor slab, grade beams, and approach slabs of the

Streets Maintenance Heated Vehicle and Equipment Storage building for vehicle and equipment loading as shown on the schematic plan in Appendix C7: Figure C7 – *Schematic Plan for Streets Maintenance Heated Vehicle and Equipment Storage (SM-09)*.

.4 Design of structures shall conform to City of Winnipeg requirements in *Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities and Guidelines for Construction on Landfill Sites* (Appendix D).

.5 Design all slabs, approach slabs, and grade beams to safely support all anticipated vehicle axle loads.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit concrete mix design statements. Concrete mix design statements shall be stamped and signed by Consultant, a qualified Professional Engineer licensed in the Province of Manitoba.

.1 Submit documentation demonstrating that the proposed mix designs and materials will achieve the required strength, durability, and performance requirements.

.3 Submit WHMIS Material Safety Data Sheets.

.4 Submit testing results and reports for review by Consultant and do not proceed without written approval from Consultant when deviations from mix design or parameters are found.

.5 Concrete pours: submit 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.

1.5 QUALITY CONTROL

.1 Convene pre-installation meeting two (2) weeks prior to beginning concrete works.

.1 Ensure key personnel, including site supervisor, Consultant, specialty subcontractor for finishing and forming, concrete producer and testing laboratory representative, attend.

.2 Verify project requirements.

.3 Notify the Contract Administrator at least four (4) days in advance of the scheduled time of the meeting; notification to include the meeting agenda. The Contract Administrator reserves the right to attend the meeting.

.2 The Design Build Team shall be fully responsible for quality control of all aspects of production, pre-placement, placement, and post-placement of concrete and related testing.

.3 Cast-in-place concrete shall conform to the CSA A23.1.

.4 Prior to starting concrete work submit valid and recognized certificate from plant delivering concrete to Consultant.

- .5 Testing of cast-in-place concrete shall be performed by a CSA A23.1 certified Third Party Testing Agency. Testing to conform to CSA A23.1/A23.02. Third Party Testing shall be paid for by the DesignBuild Team.
- .6 Submit a Quality Control Plan well in advance (as required by the Consultant) of first scheduled concrete casting; the Quality Control Plan shall include, but not be limited to, the following:
 - .1 Identify the Quality Control Manager.
 - .2 Concrete supplier certification with Manitoba Ready Mixed Concrete Association.
 - .3 Qualifications of construction supervisory personnel.
 - .4 Quality Control testing plan for concrete.
 - .5 Pre-placement procedures, checklists, and project specific finishing procedures for concrete.
 - .6 During placement contingency plans and procedures.
 - .7 Post-placement procedures and checklists for concrete.
 - .8 Documentation demonstrating that the propos.
- .7 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Consultant verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS. Submit verified Control Plan to Contract Administrator at least four (4) days prior to pre-installation meeting.
- .8 Checklists supplied in the Quality Control Plan by the DesignBuild Team to be used by Consultant for inspecting the work.
- .9 DesignBuild Team shall schedule inspection by Consultant of embedded items and reinforcing in walls prior to closing forms, allowing ample time for any corrective work, if required, before concrete placement.

1.6 QUALITY ASSURANCE

- .1 The Contract Administrator reserves the right to arrange and pay for a CSA A23.1 certified Third Party Testing Agency for additional testing of the concrete works. Provide unencumbered access to all portions of the Work and cooperate with appointed Third Party Testing Agency.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets requirements of CSA A23.1/A23.2.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

PART 2 - PRODUCTS

- 2.1 SUSTAINABLE REQUIREMENTS
- .1 Select products and materials with recycled content or resource efficient characteristics whenever possible. Use least toxic sealants, fillers, compounds, adhesives, sealers and finishes necessary to comply with the requirements of the project.
 - .2 Supply materials and products in accordance with Section 01 47 13 – LEED Requirements.
- 2.2 MATERIALS
- .1 Consultant to specify material requirements in accordance with CSA A23.1 and Section 01 47 13, LEED Requirements, including, but not limited to, the following:
 - .1 Cementing materials.
 - .2 Aggregates (ensure aggregates meet criteria per CSA A23.1).
 - .3 Water.
 - .4 Air entrainment.
 - .5 Curing compound.
 - .6 Chemical admixtures.
- 2.3 CONCRETE MIXES
- .1 Proportion concrete to meet performance criteria in accordance with CSA A23.1/A23.2 Alternative 1 to give properties as provided by the Consultant including, but not limited to, the following:
 - .1 Class of exposure.
 - .2 Minimum compressive strength.
 - .3 Minimum cement content, if applicable, when specific concrete characteristics such as finish or architectural appearance are required.
 - .2 Submit mix design statement for review by the Consultant. Mix design statement shall contain as a minimum:
 - .1 Nominal size of coarse aggregate
 - .2 Water cement ratio.
 - .3 Chemical admixtures.
 - .4 Air-dry density.
 - .5 Slump at time and point of discharge.
 - .3 The Consultant shall provide criteria for the following plastic state requirements for the concrete mix to meet:
 - .1 Uniformity.
 - .2 Placeability.
 - .3 Workability.
 - .4 Finishability.
 - .5 Set time.

- .4 Mix design statements shall be stamped and signed by Consultant, who is a qualified Professional Engineer licensed in the Province of Manitoba.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Obtain Consultant's approval before each concrete placing.
- .2 Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing.
- .3 Do not place load upon new concrete until authorized by Consultant.
- .4 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature, and test samples taken.

3.2 CONSTRUCTION

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Consultant to specify requirements and review procedures for all concrete work including, but not limited to, the following:
 - .1 Finishing and curing.
 - .2 Toppings.
 - .3 Embedments.
 - .4 Construction, control, and expansion joints.
 - .5 Repair of defects.
 - .6 Concrete tolerances.
 - .7 Concrete accessories.
 - .8 Hot and cold weather concrete work.

3.3 FIELD QUALITY CONTROL

- .1 Site tests: conduct concrete testing in accordance with the Quality Control Plan and submit reports as described in PART 1 - SUBMITTALS.
- .2 Inspection and testing of concrete and concrete materials shall be carried out by testing laboratory retained by DesignBuild Team for review in accordance with CSA A23.1/A23.2.
 - .1 Ensure testing laboratory is certified in accordance with CSA A283.
- .3 Design Build Team shall pay for all costs of all concrete tests for testing laboratory services.
- .4 Non-destructive methods for testing concrete when required shall be performed in accordance with CSA A23.1/A23.2.
- .5 Contract Administrator reserves the right to conduct additional concrete testing for quality assurance. Provide unencumbered access

to all portions of the Work and cooperate with appointed testing agency. Such testing will not augment or replace Design Build Team quality control nor relieve Design Build Team of contractual responsibility.

3.4 VERIFICATION

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - Products, by Consultant and provide verification of compliance as described in PART 1 - QUALITY CONTROL.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Outline requirements for materials and work for concrete finishing.
- 1.2 REFERENCES .1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
.2 Canadian Standards Association (CSA)
.1 CSA A23.1-09, Concrete Materials and Methods of Concrete Construction.
- 1.3 PERFORMANCE REQUIREMENTS .1 Products and workmanship to be selected for quality and durability in accordance with Section 01 47 13, LEED Requirements.
.2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.
- 1.4 PRODUCT DATA .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
.2 Submit WHMIS MSDS - Material Safety Data Sheets. Indicate VOC content.
.3 Include application instructions for concrete floor treatment.
- 1.5 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- 1.6 ENVIRONMENTAL REQUIREMENTS .1 Temporary lighting:
.1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
.2 Electrical power:
.1 Provide sufficient electrical power to operate equipment normally used during construction.
.3 Work area:
.1 Make the work area water tight protected against rain and detrimental weather conditions.
.4 Temperature:
.1 Establish and maintain ambient temperature and relative humidity requirements for before and after installation.

- .5 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .6 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Provide continuous ventilation during and after coating application as directed by Consultant by use of approved portable supply and exhaust fans.

PART 2 - PRODUCTS

- 2.1 CHEMICAL HARDENERS .1 When chemical hardeners, paint, or other floor finishes are selected, ensure that the finish materials will be compatible with the curing agents used. Remove curing agents if the finish material is not compatible with the curing agent.
- 2.2 WATER .1 Potable water in accordance with CSA A23.1.
- 2.3 SEALING COMPOUNDS .1 Only Type 2 is recommended in fire-hazard areas, furnace rooms, and where solvent fumes are not permitted such as kitchens. Note: Type 2 water-based sealing compounds generally have lower VOCs than Type 1 - solvent based products.
 - .2 Select lowest VOC coatings that will adequately perform intended job.
 - .3 Surface sealers shall not be manufactured or formulated with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, and hexavalent chromium and their compounds or will produce carbon oxides when decomposing in fire.
- 2.4 CURING COMPOUNDS .1 Select low VOC, water-based, organic-solvent, free curing compounds.
- 2.5 CONCRETE STAINS .1 Select low VOC, water-based, breathable, water repellent, and colour stable concrete stains.
- 2.6 MIXES .1 Mixing, ratios, and application in accordance with manufacturer's instructions.

PART 3 - EXECUTION

- | | | |
|---|----|---|
| <u>3.1 EXAMINATION</u> | .1 | Consultant to verify that concrete surfaces are ready to receive Work and as indicated on the Design Build Team drawings and in accordance with manufacturers' instructions. |
| <u>3.2 PREPARATION OF EXISTING SLAB</u> | .1 | Follow manufacturer's instructions for their product for surface preparation. |
| | .2 | All surface materials must be removed before application of floor treatment, i.e. wax and chlorinated rubber. Select strong solvent to remove chlorinated rubber. The use of mechanical stripping methods to remove existing surface coatings will avoid environmental degradation due to solvents, VOCs and other toxic ingredients contained in chemical strippers. |
| | .3 | Specify edge and corner forming or treatment. |
| | .4 | Ensure that locations of saw cuts are indicated on drawings. Saw cut control joints to CSA A23.1. |
| <u>3.3 APPLICATION</u> | .1 | Applications of all materials to be to manufacturers' written instructions. |
| | .2 | Ensure materials that will be in contact with each other are compatible. |
| | .3 | Clean over sprays. Clean sealant from adjacent surfaces. |
| <u>3.4 PROTECTION</u> | .1 | Protect finished installation in accordance with manufacturer's instructions. |
| <u>3.5 SCHEDULE</u> | .1 | Provide schedule of floor treatments if these items are not covered in Room Finish Schedule. |
| | .2 | Ensure compatibility of floor treatment materials with adhesives of finished flooring materials. |

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Outline requirements for materials and installation for both load bearing and non-load bearing, plant-precast structural and architectural concrete.
- 1.2 REFERENCES .1 National Research Council Canada
.1 National Building Code of Canada 2010 (NBCC).
- .2 American Society for Testing and Materials International (ASTM)
.1 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
.2 ASTM A 775/A 775M-07, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
.3 ASTM C 260-06, Standard Specification for Air-Entraining Admixtures for Concrete.
.4 ASTM D 412-06a, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
.5 ASTM D 2240-08, Standard Test Method for Rubber Property - Durometer Hardness.
.6 ASTM A123/A 123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
.7 ASTM A153/A 153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
.8 ASTM A 82/A 82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
.9 ASTM A 416/A 416M-06, Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
.10 ASTM A 421/A 421M-05, Standard Specification for Uncoated Stress-Relieved Steel Wire for Prestressed Concrete.
.11 ASTM A 496/A 496M-07, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
- .3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.
.2 CAN/CGSB-1.181-99, Ready Mixed Organic Zinc-Rich Coating.
- .4 Canadian Standards Association (CSA International)
.1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
.2 CSA A23.3-04, Design of Concrete Structures.
.3 CSA A23.4-09, Precast Concrete Materials and Construction.
.4 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
.5 CSA G30.18-09, Billet-Steel Bars for Concrete Reinforcement.

- .6 CAN/CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .7 CSA W47.1-09, Certification of Companies for Fusion Welding for Steel.
 - .8 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .9 CSA W59-03, Welded Steel Construction (Metal Arc Welding)
 - .10 CSA W186-7 M1990 (R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
 - .11 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
- .5 The Master Painters Institute (MPI) - Architectural Painting Specification Manual (ASM) - [February 2004]
 - .1 MPI # 18, Organic Zinc Rich Primer.
 - .2 MPI # 23, Oil Alkyd Primer.
 - .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 DESIGN REQUIREMENTS

- .1 Structures to be designed to the National Building Code of Canada 2005, Part 4, Post-Disaster Importance Category.
- .2 Design precast elements to CSA A23.3 and CSA A23.4.
- .3 Design precast elements to carry loads specified by Consultant in accordance with NBCC.
- .4 Design connections/attachments of precast elements to load/forces specified by Consultant.
- .5 Design for quality and durability to meet criteria of Section 01 47 13, LEED Requirements.
- .6 Submit calculations and design drawings for typical precast elements and connections to Consultant for approval prior to manufacture.

1.4 PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements to CSA A23.4.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings in accordance with CSA A23.3 and CSA A23.4 including, but not limited to, following:

- .1 Design calculations for items designed by manufacturer.
 - .2 Details of pre-stressed and non-pre-stressed members, reinforcement and their connections.
 - .3 Camber.
 - .4 Finishing schedules.
 - .5 Methods of handling and erection.
 - .6 Openings, sleeves, inserts and related reinforcement.
- .3 Each drawing submitted shall bear stamp and signature of a qualified Professional Engineer registered in the Province of Manitoba.
- 1.6 QUALITY CONTROL
- .1 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Consultant verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS. Submit verified Control Plan to Contract Administrator at least four (4) days prior to pre-installation meeting.
 - .2 Submit Quality Control Plan as described in Section 03 30 01 – Cast-in-Place Concrete.
 - .1 Convene pre-installation meeting two (2) weeks prior to beginning precast concrete works.
 - .1 Ensure key personnel, including plant supervisor, Consultant, personnel for finishing and forming, concrete producer, and testing laboratory representative, attend.
 - .2 Verify project requirements.
 - .3 Notify the Contract Administrator at least four (4) days in advance of the scheduled time of the meeting; notification to include the meeting agenda. The Contract Administrator reserves the right to attend the meeting.
- 1.7 QUALIFICATIONS
- .1 Precast concrete elements to be fabricated and erected by manufacturing plant certified by Canadian Standards Association in appropriate categories according to CSA A23.4.
- 1.8 DELIVERY, STORAGE AND HANDLING
- .1 Deliver, handle, and store precast/pre-stressed units according to manufacturer's instructions.
 - .2 Protect unit from contacting earth to prevent from staining.
- 1.9 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
- 1.10 WARRANTY
- .1 For Work of this Section 03 41 01 – Precast Concrete, the 24 months warranty period prescribed in the RFP under *General Conditions* for construction is extended to 60 months.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Products and workmanship to be selected for quality and durability to meet criteria of Section 01 47 13, LEED Requirements.
- .2 Consultant to specify material requirements including, but not limited to, the following:
 - .1 Cementing material.
 - .2 Reinforcing steel.
 - .3 Prestressing steel wire.
 - .4 Welded steel wire fabric / welded deformed steel wire fabric.
 - .5 Forms.
 - .6 Hardware and miscellaneous materials.
 - .7 Anchors and supports.
 - .8 Welding materials, electrodes.
 - .9 Galvanizing.
 - .10 Steel primer.
 - .11 Epoxy coating.
 - .12 Air entrainment admixtures.
 - .13 Chemical admixtures.
 - .14 Post-tensioning ducts.
 - .15 Bearing pads.
 - .16 Shims.
 - .17 Zinc-rich primer.
 - .18 Surface retardant (water based, low VOC, solvent free).
 - .19 Weephole tubes.
 - .20 Insulation.
 - .21 Curing compound.
 - .22 Sealers (low VOC, water-based, washable, chemical resistant).
 - .23 Exposed aggregate.
- 3 Use same brands and source of materials for entire project to ensure uniformity of colouration and other mix characteristics.

2.2 MIXES

- 1 Proportion concrete in accordance with CSA A23.1/A23.2 Alternative 1 – Performance Method.
- .2 The Consultant to provide criteria for concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure.
 - .2 Minimum compressive strength.
 - .3 Minimum cement content when specific concrete characteristics such as finish or architectural appearance are required.
 - .4 Volume stability due to shrinkage, creep, and freeze thaw cycles.
 - .5 Surface texture.

- .6 Geometric requirements.
- .3 The Consultant to provide criteria for concrete mix to meet following plastic state requirements:
 - .1 Uniformity.
 - .2 Placeability.
 - .3 Workability.
 - .4 Finishability.
 - .5 Set time.
- .4 Submit mix design statement for review by the Consultant. Mix design statement shall contain as a minimum:
 - .1 Nominal size of coarse aggregate
 - .2 Water cement ratio.
 - .3 Chemical admixtures.
 - .4 Air-dry density.
 - .5 Slump at time and point of discharge.
- .5 Cement grout to CSA A23.1/A23.2:
 - .1 Cement grout with minimum compressive strength as specified by the Consultant.
- .6 Mix design statements to be stamped and signed by -qualified Professional Engineer licensed in the Province of Manitoba.

2.3 FABRICATION

- .1 Manufacture units in accordance with CSA A23.4.
- .2 The Consultant to provide fabrication criteria for precast concrete including, but not limited to, following requirements:
 - .1 Marking of units.
 - .2 Handling hardware.
 - .3 Closure of hollowcore cell ends.
 - .4 Tendons, anchorages, and post tensioning ducts.
 - .5 Primer for steel embedments.
 - .6 Galvanizing of steel embedments.

2.4 FINISHES

- .1 Structural units: finish units to grade specified by the Consultant and to CSA A23.4.
- .2 Architectural units: finish and colour of precast units to match sample.

2.5 SOURCE QUALITY CONTROL

- .1 Provide Consultant with certified copies of quality control tests related to this project as specified in CSA A23.4.
- .2 Inspect pre-stressed concrete tendons in accordance with CSAG279.
- .3 Provide records from in-house quality control program based upon plant certification requirements to Consultant for inspection and review.

- .4 Upon request, provide Consultant with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
- .5 Precast plants to keep complete records of supply source of concrete material, steel reinforcement, pre-stressing steel and provide to Consultant for review upon request.

PART 3 - EXECUTION

3.1 ERECTION

- .1 Perform precast concrete work in accordance with CSA A23.4 and CSA A23.3.
- .2 The Consultant to provide erection criteria for precast concrete including, but not limited to, the following requirements:
 - .1 Allowable tolerances.
 - .2 Welding steel elements.
 - .3 Welding reinforcement.
 - .4 Elevations and alignment between units.
 - .5 Bearing plates and pads.
 - .6 Grouting for bearing.
 - .7 Fastening units in place.
 - .8 Bolted connections.
 - .9 Welded connections.
 - .10 Sliding joints.
 - .11 Closure elements.
 - .12 Grouting for alignment of surfaces.
 - .13 Cleaning and touch-up.

3.2 VERIFICATION

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in Part 2 - Products, by the Consultant and provide verification of compliance as described in PART 1 - QUALITY CONTROL.

3.3 FIELD QUALITY CONTROL

- .1 Site tests: conduct concrete testing in accordance with the Quality Control Plan and submit report as described in PART 1 - SUBMITTALS.
- .2 Inspection and testing of concrete and concrete materials shall be carried out by testing laboratory retained by Design Build Team for review in accordance with CSA A23.1/A23.2.
 - .1 Ensure testing laboratory is certified in accordance with CSA A283.
- .3 Design Build Team shall pay for all costs of all concrete tests for testing laboratory services including re-testing and testing resulting from defective concrete.

- .4 Non-destructive methods for testing concrete when required shall be performed in accordance with CSA A23.1/A23.2.
- .5 Contract Administrator reserves the right to conduct additional concrete testing for quality assurance. Provide unencumbered access to all portions of the Work and cooperate with appointed testing agency. Such testing will not augment or replace Design Build Team quality control nor relieve Design Build Team of their contractual responsibility.

3.4 CLEANING

- .1 Obtain approval of cleaning methods from Consultant before cleaning soiled precast concrete surfaces.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Outline requirements for materials and installation for structural steel for buildings.
- 1.2 REFERENCES .1 National Research Council Canada
.1 National Building Code of Canada 2010 (NBCC).
- .2 American Society for Testing and Materials International, (ASTM)
.1 ASTM A 36/A 36M-08, Specification for Structural Steel.
.2 ASTM A 193/A 193M 09, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
.3 ASTM A 307-07b, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
.4 ASTM A 325-09a, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
.5 ASTM A 325M-09, Specification for High-Strength Bolts for Structural Steel Joints (Metric).
.6 ASTM A 490M-09a, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
.7 ASTM A123/A 123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
.8 ASTM A153/A 153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- .3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
.1 CISC/CPMA 1-73b, Quick-Drying, One-Coat Paint for Use on Structural Steel.
.2 CISC/CPMA 2-75, Quick-Drying, Primer for use on Structural Steel.
- .5 Canadian Standards Association (CSA International)
.1 CAN/CSA-G40.20-04/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA S16-09, Limit States Design of Steel Structures.
.3 CSA-S136-07, Cold Formed Steel Structural Members.
.4 CSA-S136.1-95 (R2002), Commentary on CSA Standard S136.
.5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
.6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
.7 CSA W55.3-08, Resistance Welding Qualification Code for

- .8 Fabricators of Structural Members Used in Buildings.
CSA W59-03 (R2008), Welded Steel Construction (Metal Arc
Welding).
- .6 Master Painters Institute
 - .1 MPI-INT 5.1, Structural Steel and Metal Fabrications.
 - .2 MPI-EXT 5.1, Structural Steel and Metal Fabrications.
- .7 The Society for Protective Coatings (SSPC)
 - .1 SSPC SP-6/NACE No. 3-07, Commercial Blast Cleaning.

1.3 DESIGN
REQUIREMENTS

- .1 Design structural steel framing in accordance with requirements of
CSA S16 and CSA S136 to resist forces, moments, shears, and allow
for movements.
- .2 Design all steel framing connections.
- .3 Structures to be designed to the NBCC, Part 4, Post-Disaster
Importance Category.
- .4 Design for quality and durability in accordance with Section 01 47 13,
LEED Requirements.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings including fabrication and erection documents
and materials list in accordance with Section 01 33 00 - Submittal
Procedures.
- .2 Shop drawings shall be stamped and signed by a qualified
Professional Engineer licensed in the Province of Manitoba.

1.5 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal
Procedures.
- .2 If applicable for the final design of the buildings, prepare sample of
typical exposed structural connections for approval by Consultant.
Samples to be judged upon alignment of surfaces, uniform contact
between surfaces, smoothness, and uniformity of finished welds.
When approved, sample units will serve as a standard for
workmanship, appearance, and material acceptable for entire project.

1.6 QUALITY CONTROL

- .1 Submit mill test reports prior to fabrication of structural steel.
- .2 Submit structural steel Fabricator's affidavit stating that materials and
products used in fabrication conform to applicable material and
products standards specified and indicated.

- 1.7 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse, recycling, and disposal in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Products and workmanship to be selected for quality and in accordance with Section 01 47 13, LEED Requirements.
- .2 Consultant to specify material requirements including, but not limited to, the following:
- .1 Structural steel.
 - .2 Anchor bolts.
 - .3 High strength anchor bolts.
 - .4 Bolts, nuts and washers.
 - .5 Welding materials.
 - .6 Shop paint primer.
 - .7 Galvanizing for steel shapes.
 - .8 Galvanizing for steel fasteners.
 - .9 Shear studs.

- 2.2 FABRICATION .1 Fabricate structural steel in accordance with CSA S16 and CSA S136 and in accordance with shop drawings approved by Consultant.
- .2 The Consultant to provide fabrication criteria as required including, but not limited to, the following:
- .1 Drawing dimensions.
 - .2 Openings and punched holes.
 - .3 Shop connections.
 - .4 Field connections.
 - .5 Column ends and bearing plates.
 - .6 Items exposed to exterior.
 - .7 Shear studs.
 - .8 Minimizing corrosion potential.
 - .9 Passivation for stainless steel.
 - .10 Shop priming.

PART 3 - EXECUTION

- 3.1 GENERAL .1 Perform structural steel work in accordance with CSA S16 and CSA S136.
- .2 Perform welding in accordance with CSA W59 for steel and CSA W59.2 for aluminum.
- .3 Companies to be certified under Division 1 or 2 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance

welding of structural components.

- 3.2 MARKING .1 Mark materials in accordance with CAN/CSA-G40.21.
- 3.4 ERECTION .1 Erect structural steel in accordance with CSA S16 and CSA S136 and in accordance with erection and shop drawings approved by Consultant.
- .2 Consultant to specify acceptable procedures and criteria as required for all structural steel erection including, but not limited to, the following:
- .1 Field cutting or altering.
 - .2 Damaged members.
 - .3 Field connections.
 - .4 Field welding (surfaces, temperature, preheat and interpass temperatures).
 - .5 Erection loads.
 - .6 Temporary bracing.
 - .7 Column bases.
 - .8 Enlarging or matching of unfair bolt holes.
 - .9 Touch-up.
- 3.5 FIELD QUALITY CONTROL .1 Inspection and testing of materials and workmanship shall be carried out by testing laboratory designated by Consultant.
- .2 Consultant to prepare testing plan.
- .3 Design Build Team to pay costs of tests.
- .4 The Contract Administrator reserves the right to arrange and pay for additional testing. Provide unencumbered access to all portions of the Work and cooperate with appointed testing agency. Such testing will not augment or replace Design Build Team quality control nor relieve Design Build Team of their contractual responsibility.
- 3.6 CLEANING .1 Clean up in accordance with Section 01 74 11, Cleaning.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Outline requirements for materials, fabrication, and installation for steel joist framing.
- 1.2 REFERENCES .1 National Research Council Canada
.1 National Building Code of Canada 2010 (NBCC).
.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.
.2 CAN/CGSB-1.105-M91(R1999), Quick Drying Primer.
.3 CAN/CGSB-85.10-99, Protective Coatings for Metals.
.4 CAN/CGSB-85.100-93, Painting.
.3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
.1 CISC/CPMA 2-75, Quick-Drying, Primer for Use on Structural Steel.
.2 CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.
.4 Canadian Standards Association (CSA International)
.1 CAN/CSA-G40.20-04/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA S16-09, Limit States Design of Steel Structures.
.3 CSA S136-07, Cold Formed Steel Structural Members.
.4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
.5 CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
.6 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding) [Metric].
- 1.3 QUALITY CONTROL .1 If requested by the Consultant submit mill test reports prior to fabrication of steel joists.
.2 Submit affidavit prepared by fabricator of structural steel joists stating that materials and products used in fabrication conform to this specification.
- 1.4 DESIGN OF STEEL JOISTS .1 Design steel joists and bridging to carry loads provided by the Consultant and in accordance with CSA S16.
.2 Ensure joists are manufactured to consider load effects due to fabrication, erection, and handling.

- .3 Structures to be designed to the NBCC, Part 4, Post-Disaster Importance Category.
- .4 Design for quality and durability in accordance with Section 01 47 13, LEED Requirements.

1.5 SHOP DRAWINGS

- .1 Submit shop details and erection drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings and design briefs stamped and signed by a qualified Professional Engineer registered in the Province of Manitoba.
- .3 Consultant to provide criteria to be shown on the shop drawings for steel joists including, but not limited to, the following:
 - .1 Fabrication and erection schedule.
 - .2 Profile of rolled sections, sizes, spacing and location of joists, connections, bridging, reinforcing, anchorage, cambers, loads, and accessories.
 - .3 Erection drawings, elevations, and details.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 19 – Construction Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 The Consultant to provide material criteria as required including, but not limited to, the following:
 - .1 Steel sections.
 - .2 Accessories.
 - .3 Welding materials.
 - .4 Shop paint primer (for areas where condensation is not a problem and for areas where condensation is expected, as applicable).

2.2 FABRICATION

- .1 Fabricate steel joists and accessories in accordance with CSA S16 and in accordance with shop drawings approved by the Consultant.
- .2 The Consultant to provide fabrication criteria as required including, but not limited to, the following:
 - .1 Chord extensions.
 - .2 Bridging.
 - .3 Anchorages.
 - .4 Shear studs.
 - .5 Bearing plates.
 - .6 Welding.

- .7 Shop priming.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Structural steel work: in accordance with CSA S16.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2 of CSA W47.1 for fusion welding and/or CSA W55.3 for resistance welding.

3.2 ERECTION

- .1 Erect steel joists and bridging in accordance with CSA S16 and in accordance with erection and shop drawings approved by Consultant.
- .2 The Consultant to provide procedures and criteria as required for erection of steel joists including, but not limited to, the following:
 - .1 Bridging.
 - .2 Anchorages.
 - .3 Construction loads.
 - .4 Field cutting and altering of joists or bridging.
 - .5 Touch-up.

3.3 FIELD QUALITY CONTROL

- .1 Inspection and testing of materials and workmanship shall be carried out by testing laboratory designated by Consultant.
- .2 Consultant to prepare testing plan.
- .3 Design Build Team to pay costs of tests.
- .4 The Contract Administrator reserves the right to arrange and pay for additional testing Provide unencumbered access to all portions of the Work and cooperate with appointed testing agency. Such testing will not augment or replace Design Build Team quality control nor relieve Design Build Team of their contractual responsibility.

3.4 CLEANING

- .1 Clean up in accordance with Section 01 74 11, Cleaning.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Outline requirements for materials and installation for steel deck.
- 1.2 REFERENCES .1 National Research Council Canada
.1 National Building Code of Canada 2010 (NBCC).
.2 American Society for Testing and Materials International, (ASTM)
.1 ASTM A 653/A 653M-09a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.2 ASTM A 792/A 792M-09a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
.4 Canadian Standards Association (CSA International)
.1 CSA C22.2 No.79-1978(R1999), Cellular Metal and Cellular Concrete Floor Raceways and Fittings.
.2 CSA S16.1-09, Limit States Design of Steel Structures.
.3 CSA S136-07, Cold Formed Steel Structural Members.
.4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
.5 CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
.6 CSA W59-03(R2008), Welded Steel Construction, (Metal Arc Welding) [Metric].
.5 Canadian Sheet Steel Building Institute (CSSBI)
.1 CSSBI 10M-08, Standard for Steel Roof Deck.
.2 CSSBI 12M-08, Standard for Composite Steel Deck.
- 1.3 DESIGN REQUIREMENTS .1 Structures to be designed to the NBCC, Part 4, Post-Disaster Importance Category.
.2 Steel deck and connections to steel framing to carry dead, live, environmental, and other loads including lateral loads, diaphragm action, composite deck action, and uplift in accordance with NBCC, Part 4.
.3 Deflection under specified live load not to exceed 1/240 of span, except that when gypsum board ceilings are hung directly from deck, live load deflection not to exceed 1/360 of span.
.4 Design for quality and durability in accordance with Section 01 47 13, LEED Requirements.

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- 1.4 SHOP DRAWINGS
- .1 Submit shop drawings erection and shoring drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Submit drawings stamped and signed by a qualified Professional Engineer licensed in the Province of Manitoba.
 - .3 Consultant to provide criteria to be shown on the shop drawings for steel deck including, but not limited to, the following:
 - .1 Decking plan.
 - .2 Deck profile dimensions and thicknesses.
 - .3 Anchorage and supports.
 - .4 Projections.
 - .5 Openings and reinforcement.
 - .6 Closures, flashings and applicable accessories.
 - .7 Details.
- 1.5 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- PART 2 - PRODUCTS
- 2.1 MATERIALS
- .1 Products and workmanship to be selected for quality and in accordance with Section 01 47 13, LEED Requirements.
 - .2 Consultant to specify material requirements including, but not limited to, the following:
 - .1 Steel sheet for interior surfaces not exposed to weather.
 - .2 Steel sheet for exterior surfaces exposed to weather.
 - .3 Steel sheet to be painted.
 - .4 Primer.
- 2.2 TYPES OF DECKING
- .1 The Consultant to specify steel deck requirements for roof and floor applications including, but not limited to, the following:
 - .1 Base steel thickness.
 - .2 Profile depth.
 - .3 Side laps.
 - .4 Acoustic requirements.
 - .5 Composite requirements.
 - .6 Electrical raceway accommodation.

PART 3 - EXECUTION

- 3.1 GENERAL
- .1 Structural steel work: in accordance with CSA S136, CSSBI 10M, and CSSBI 12M.
 - .2 Welding: in accordance with CSA W59.
 - .3 Companies to be certified under Division 1 or 2 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding.
- 3.2 ERECTION
- .1 Erect steel deck and in accordance with CSA S136, CSSBI 10M, and CSSBI 12M and in accordance with shop drawings approved by the Consultant.
 - .2 The Consultant to specify acceptable procedures and workmanship for all steel deck erection including, but not limited to, the following:
 - .1 Butt ends and cover plates.
 - .2 Lap ends.
 - .3 Shear studs.
 - .4 Side clinching.
 - .5 Welds.
 - .6 Touch up welds.
 - .7 Preparations for concrete placement.
 - .8 Temporary shoring.
 - .9 Reinforcing for concrete deck.
 - .10 Closures.
 - .11 Opening reinforcement and framing.
 - .12 Connections.
- 3.3 FIELD QUALITY CONTROL
- .1 Inspection and testing of materials and workmanship shall be carried out by testing laboratory designated by Consultant.
 - .2 Consultant to prepare testing plan.
 - .3 Design Build Team to pay costs of tests.
 - .4 The Contract Administrator reserves the right to arrange and pay for additional testing. Provide unencumbered access to all portions of the Work and cooperate with appointed testing agency. Such testing will not augment or replace Design Build Team quality control nor relieve Design Build Team of their contractual responsibility.
- 3.4 CLEANING
- .1 Clean up in accordance with Section 01 74 11, Cleaning.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Outline requirements for materials, fabrication, and installation for metal fabrications.
- 1.2 REFERENCES .1 National Research Council Canada
.1 National Building Code of Canada 2010 (NBCC).
- .2 American Society for Testing and Materials International, (ASTM)
.1 ASTM A 53/A 53M-07, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
.2 ASTM A 269-08, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
.3 ASTM A 307-07, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
.4 ASTM F 593-02(R2008), Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
.5 ASTM A123/A 123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
.6 ASTM A153/A 153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
.2 CAN/CGSB-1.181-99, Ready-Mixed, Organic Zinc-Rich Coating.
- .4 Canadian Standards Association (CSA International)
.1 CAN/CSA-G40.20-04/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel.
.2 CSA S157-05/S157.1-05, Strength Design in Aluminum/Commentary on CSA S157-05 Strength Design in Aluminum.
.3 CSA S16-09, Limit States Design of Steel Structures.
.4 CAN/CSA-S136-07, Cold Formed Steel Structural Members.
.5 CSA S136.1-95 (R2002), Commentary on CSA Standard S136.
.6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
.7 CSA W59-2003 (R2008), Welded Steel Construction (Metal Arc Welding).
.8 CSA W59.2-1991 (R2003), Welded Aluminum Construction.
.9 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
.10 CSA W47.2-M1987 (R2008), Certification of Companies for Fusion welding of Aluminum.
- .5 Aluminum Association.

.1 Standard SSA-46, Anodizing for Aluminum.

1.3 DESIGN
REQUIREMENTS

- .1 Design steel fabrications conforming to requirements of CSA S16 and CSA S136 as applicable.
- .2 Design aluminum fabrications conforming to requirements of CSA S157 as applicable.
- .3 Structures to be designed to the NBCC, Part 4, Post-Disaster Importance Category.
- .4 Design for quality and durability in accordance with Section 01 47 13, LEED Requirements.

1.4 SUBMITTALS

- .1 Submittals to be in accordance with Section 01 33 00 - Submittal Procedures:
- .2 Shop drawings shall be stamped and signed by a qualified Professional Engineer licensed in the Province of Manitoba.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets. Indicate VOC's for finishes, coatings, primers and paints.
- .4 Submit manufacturer's printed product literature, specifications, and data sheet.
- .5 Consultant to provide criteria to be shown on the shop drawings for steel joists including, but not limited to, the following:
 - .1 Fabrication and erection schedule.
 - .2 Materials.
 - .3 Core thicknesses
 - .4 Finishes
 - .5 Connections
 - .6 Joints
 - .7 method and number of anchorages
 - .8 Supports
 - .9 Reinforcement
 - .10 Accessories
 - .11 Details.

1.5 QUALITY
CONTROL

- .1 Test reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and

manufacturer's warranty requirements.

1.6 DELIVERY,
STORAGE, AND
HANDLING

- .1 Specify packing, shipping, handling, storage, and protection for all metal fabrication items to prevent any damage.

1.7 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Products and workmanship to be selected in accordance with Section 01 47 13, LEED Requirements.
- .2 Consultant to specify material requirements including, but not limited to, the following:
- .1 Steel sections and plates.
 - .2 Steel pipe.
 - .3 Aluminum.
 - .4 Welding materials for steel.
 - .5 Welding materials for aluminum.
 - .6 Welding electrodes.
 - .7 Bolts and anchor bolts.
 - .8 Aluminum sheet.
 - .9 Stainless steel.
 - .10 Grout: non-shrink, non-metallic.

2.2 FABRICATION

- .1 Fabricate work square, true, straight, and accurate to required size, with joints closely fitted and properly secured.
- .2 Specify any special architectural and workmanship requirements.

2.3 FINISHES

- .2 Consultant to specify finishes including, but not limited to, the following:
- .1 Galvanizing for steel shapes.
 - .2 Galvanizing for steel fasteners.
 - .3 Steel.
 - .4 Zinc primer.
 - .5 Chromium plating.
 - .6 Aluminum anodizing.
 - .7 Stainless steel passivation.

2.4 ISOLATION

- .1 Isolate aluminum from following components, by means of bituminous

COATING

paint:

- .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
- .2 Concrete, mortar and masonry.
- .3 Wood.

2.5 SHOP PAINTING

- .1 Apply one shop coat of primer to metal items to be painted.
- .2 Use primer as prepared by manufacturer to manufacturer's instructions.

PART 3 - EXECUTION

3.1 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Make field connections with bolts or welds to CSA S16.1.
- .3 The Consultant to provide acceptable procedures and criteria as required for all metal fabrication including, but not limited, to the following items:
 - .1 Anchorage.
 - .2 Built-in supports.
 - .3 Exposed fastenings (bolts, rivets, welds).
 - .4 Special features.
 - .5 Items cast into concrete or built into masonry.
 - .6 Site cutting or altering.
 - .7 Temporary bracing.
 - .8 Damaged items.
 - .9 Finish touch-up.

3.2 FIELD QUALITY CONTROL

- .1 Inspection and testing of materials and workmanship shall be carried out by testing laboratory designated by Consultant.
- .2 Consultant to prepare testing plan.
- .3 Design Build Team to pay costs of tests.
- .4 The Contract Administrator reserves the right to arrange and pay for additional testing. Provide unencumbered access to all portions of the Work and cooperate with appointed testing agency. Such testing will not augment or replace Design Build Team quality control nor relieve Design Build Team of their contractual responsibility.

3.3 CLEANING

- .1 Clean up in accordance with Section 01 74 11, Cleaning.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Interior Steel Stairs
- .1 Stairway: minimum (2) exit stairways from offices on the second floor.
 - .2 Stairway: minimum (1) communication stairway from offices second floor to main.
 - .3 Type: Straight
 - .4 Class: Architectural.
 - .5 Treads / Landings: Steel pan concrete filled.
 - .6 Balustrade: Steel rails with round steel balusters for exit stairs; Stainless steel & glass system for communication stairs
- 1.2 RELATED SECTIONS .1 Division 1
- 1.3 STANDARDS .1 Canadian Standards Association (CSA International)
- .1 CAN/CSA-B651-most recent Barrier-Free Design.
- .2 City of Winnipeg
- .1 Universal Design Guide
- 1.4 DESIGN & PERFORMANCE REQUIREMENTS .1 Design components / assemblies to comply with requirements for "Post Disaster" buildings.
- .2 This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
- .3 Design stairways in accordance with NBC 2010
- 1.5 QUALITY ASSURANCE .1 Retain qualified professional engineer, registered or licensed in Province of Manitoba, Canada with experience in of comparable complexity and scope, to perform following services.
- .1 Design stairways in accordance with design requirements and to resist live, dead, lateral, wind, and seismic loads:
 - .2 Review, stamp, and sign shop drawings.
- .2 All personnel for Design, Construction or Commissioning to be experienced and familiar with this type of system.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Products in accordance with NAAMM AMP 510.
- 2.2 FABRICATION .1 Fabricate stairways to NAAMM AMP 510, and reviewed shop

- drawings.
- .2 Fit and assemble Work in shop where possible.
 - .1 Shop fabricate stairways in sections as large and complete as practicable.
 - .2 Where shop fabrication is not possible, make trial assembly in shop.
 - .3 Accurately cut, machine and fit joints, corners, copes and miters so that junctions between components fit together tightly and in true planes.
 - .4 Carefully make and fit details.
 - .1 Take special care with finished Work to produce neat and correct appearance to review of Departmental Representative.
 - .5 Conceal fastenings from view unless otherwise indicated on Drawings.
 - .6 Cut off bolts flush with nuts.
 - .1 Countersink bolt heads, and provide method to prevent loosening of nuts.
 - .2 Ream holes drilled for fastenings.
 - .7 Weld joints tight, flush, and in true planes with base metals.
 - .1 Ensure exposed welds are continuous for length of each joint.
 - .2 Exposed welds to be smooth and flush file or grind as required.
 - .8 Provide for differential movements within assemblies and at junctions of assemblies with surrounding construction.
 - .9 Assemble members without twists or open joints.
 - .10 Correctly size holes for connecting Work of other trades where such can be determined prior to fabrication.
 - .1 Show holes on shop drawings where possible.
 - .2 Place holes in manner to avoid reducing strength in member.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install Stair Systems

3.2 COMMISSIONING

- .1 Verify fit, finish and compatibility

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Section Includes:
.1 Materials and fabrication of cabinetry, shelving, casework, wood trims
- 1.2 RELATED SECTIONS .1 Division 1
- 1.3 STANDARDS .1 Design stairways in accordance with current AWMAC Standards
- 1.4 DESIGN PERFORMANCE REQUIREMENTS .1 Design components / assemblies to comply with requirements for "Post Disaster" buildings.
.2 This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
.3 Quality of work and materials: Unless otherwise specified, comply with the requirements for Premium Grade in accordance with current AWI/AWMAC Architectural Woodwork Quality Standards.
- 1.5 QUALITY ASSURANCE .1 Execute the work of this Section by fully equipped, expert craftsmen, highly skilled in millwork fabrication.

PART 2 - PRODUCTS

- 2.1 MILLWORK ASSEMBLIES .1 Provide millwork consisting of, but not limited to the following:
.1 Cabinetry: Upper and Lower cabinets
.2 Wood shelving Units
.3 Open shelving
.4 Vanities.
.5 Tack boards, writing boards (chalk, LCS)
.6 Counters
.7 Benches
- 2.2 MATERIALS .1 Wood members: Clean, seasoned, straight, square and true on all four sides. Comply with minimum size and tolerances of CSA 0141. Grade-mark all wood materials. Kiln dry wood materials for interior use to a moisture content of 4 to 8%, and 7 to 10% for exterior use.
.2 Plywood: Veneer core plywood.
.1 Douglas Fir plywood: CSA 0121; Western Softwood Plywood: CSA 0151. Exposed two sides shall be Grade S2S, and exposed one side shall be Grade S1S.
.2 Hardwood Plywood: CSA 0115, Type II (Type I for high

humidity conditions). Exposed faces of Good Sequence Matched, selected veneers, and unexposed faces of Sound Grade, So, veneers.

- .3 Birch Faced Hardwood Plywood: CSA 0115, Good Sequence Matched, Select White or Select Red.
- .3 Particleboard: ANSI A208.1, 720 kg/m³ (45 lb/ft³) density, mat formed wood particleboard.
- .4 Concealed Framing: NLGA, S-Dry No. 1 grade Ontario White Pine or Douglas Fir, comply with BCLMA Construction grade.
- .5 Sealer: Water-repellent, low VOC, clear, colourless, penetrating wood sealer, compatible with final finish.
- .6 Hardboard: CGSB 11-GP-3, impregnated, pressed wood with a tempering compound and polymerized by baking.
- .7 Glue For Wood Assemblies: CSA 0112 Series, polyvinyl adhesive.
 - .1 Plastic Laminate: NEMA LD-3, high pressure paper base decorative laminates
- .8 Melamine Board: Melamine resin impregnated paper, thermally fused to particle board or MDF core.
 - .1 Type 1: Colour to match almond S16 by Roseburg Forest Products.
 - .2 Type 2: Colour to match Hard Rock Maple S55 by Roseburg Forest Products.

2.3 FABRICATION

- .1 As far as practical, shop assemble work for delivery to site ready for installation and in size easily handled and to ensure passage through building openings. Leave ample allowance for fitting and scribing on the job.
- .2 Fabricate work square and to the required lines. Recess and conceal fasteners and anchor heads. Fill with matching wood plugs.
- .3 Make each unit rigid and self supporting, suitable for individual removal.
- .4 Provide wood members free from bruises, blemishes, mineral marks, knots, shake and other defects and select for colour, grain and texture. Machine and hand sand surfaces exposed in the finished work to an even, smooth surface free from defects detrimental to appearance.
- .5 Finish exposed edges and curves smooth. Keep contrast in colour and grain in adjoining materials to a minimum.
- .6 Provide running members in the maximum lengths obtainable.

- Provide thickness of members in maximum dressed size of standard lumber. Where thickness or width indicated is not available in hardwoods, use glue laminations to obtain sizes required.
- .7 Spline or key solid boards 150 mm (6") and wider and glue under pressure. Unless otherwise specified or indicated, book-match veneered faces, using selected and approved veneers. Provide unexposed backs of veneers having the same physical characteristics as the face veneer.
 - .8 Design and fabricate work to allow for expansion and contraction of the materials. Unless otherwise specified, work shall be glued, and blind screwed or nailed. Properly frame material with tight, hairline joints and hold rigidly in place. Use glue blocks where necessary.
 - .9 Conceal joints and connections wherever possible. Locate prominent joints where directed. Glue and pin mortise and ten on joints. Intermediate joints between supports will not be permitted. Set and fill surface nails. Prevent opening-up of glue lines in the finished work.
 - .10 Comply with glue Manufacturer's recommendations for lumber moisture content, glue shelf life, pot life, working life, mixing, spreading, assembly time, time under pressure and ambient temperature.
 - .11 Provide exposed end grain of solid members and edges of exposed plywood with matching solid edging at least 6 mm (¼") thick.
 - .12 Seal finish carpentry wood items before they leave the fabricating shop. For surfaces to receive a natural or stain finish ensure that the sealer is compatible with the final finish. Co-operate with Division 9 Section Painting and obtain written approval of proposed sealer.
 - .13 Fit shelf, door, drawer, gable and cabinet edges and other edges with 13 mm (½") hardwood edging prior to application of laminated plastic edging or subsequent finishing.
 - .14 Set nails and screws, apply wood filler to indentations, sand smooth and prepare to receive finish. Clean, ensure surfaces are free of dust.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install Millwork Systems

3.2 COMMISSIONING

- .1 Verify fit, finish and compatibility

PART 1 - GENERAL

<u>1.1 SECTION INCLUDES</u>	.1	Performance criteria for weather tight roofing system
		1. Roofing System AVB, Insulation and Weather membrane
		2. Associated flashings and sealants
		3. Sealing and flashing for all penetrations and junctions
		4. Quality Control requirement
	.2	Related Sections:
<u>1.2 RELATED SECTIONS</u>	.1	Division 1
<u>1.3 STANDARDS</u>	.1	Canadian Roofing Contractor's Association (CRCA).
	.2	Comply with applicable ULC, local authority having jurisdiction requirements for Class A, fire resistant roof system.
	.3	Underwriters Laboratories of Canada (ULC)
		.1 Fire Resistance List of Equipment and Materials.
	.4	NBC 2010
<u>1.4 DESIGN AND PERFORMANCE REQUIREMENTS</u>	.1	Design components / assemblies to comply with requirements for "Post Disaster" buildings.
	.2	This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
	.3	Performance: watertight roof system.
	.4	Insulation Requirement; RSI 5.28 (R 30)
	.5	Air tightness Requirement: 0.01 L/M ² /S
<u>1.5 QUALITY ASSURANCE</u>	.1	Conduct pre-installation meeting
<u>1.6 WARRANTY</u>	.1	Warranty for Water tightness: 10 years.
	.2	Sheet Metal Roofing Components: Warranty for colour fastness - 20 years.

PART 2 - PRODUCTS

- 2.1 ACCEPTABLE PRODUCTS .1 Roof Membrane:
.1 2-ply modified bituminous roofing system , or
.2 Standing-seam prefinished metal roofing system.
- .2 Interior Finish:
.1 Pre-finished metal or galvanized liner paneling.

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 Install Roofing Systems
- 3.2 QUALITY CONTROL .1 Air Barrier –Leakage Tests: Provide ASTM certified leakage tests on air/vapour barrier/penetration junctions – minimum (4) per Streets / bridge garage component, minimum (4) per Administration component, minimum (4) per Parks garage component, Log results and submit to Quality Assurance representative daily.
- 3.3 COMMISSIONING .1 Verify fit, finish and performance compliance

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Provide all labour, materials, methods, equipment and accessories for a complete watertight wall system, including, but not necessarily limited to following ;
 - .1 Wall System AVB, Insulation and Weather membrane
 - .2 Associated flashings & sealants
 - .3 Sealing and flashing for all penetrations and junctions
 - .4 Quality Control requirement
- .2 Related Sections:
 - .1 Division 1 – all sections

1.2 RELATED SECTIONS

- .1 Division 01

1.3 STANDARDS

- .1 Employ current standards of the following bodies as applicable to the system selected;
- .2 American Society for Testing and Materials International (ASTM)
- .3 Canadian General Standards Board (CGSB)
- .4 Canadian Standards Association (CSA International)
- .5 Canadian Sheet Steel Building Institute (CSSBI)
- .6 The National Building Code of Canada (NBC) 2010,
- .7 Underwriter's Laboratories of Canada (ULC)

1.4 DESIGN PERFORMANCE REQUIREMENTS

- .1 Design components / assemblies to comply with requirements for "Post Disaster" buildings.
- .2 This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
- .3 Provide continuous, complementary and compatible air/vapour/thermal barriers throughout building elements.
- .4 Provide complete enclosure assembly, including exterior skin, inner air/vapour seal membrane, thermal insulation.
 - .1 Design components sufficiently robust to serve as final interior finish.
- .5 Design wall components and assemblies to resist air leakage caused by static air pressure across wall assembly, including connections to

windows, glass, doors and other interruptions to maximum air leakage rate of: 0.01 L/s/m² when subjected to a pressure differential of 75 Pa.

- .6 Provide continuity of air seal materials and assemblies.
- .7 Design wall to provide for thermal movement of component materials caused by ambient temperature range from -35 C to +35 C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .8 Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.
- .9 Design members to withstand dead load and wind loads calculated in accordance with NBC 2010 and applicable local regulations, to maximum allowable deflection of 1/180 of span.
- .10 Water Tightness: design exterior facade and wall panels to rain screen principles. Prevent water infiltration into interior systems.
- .11 Provide for positive drainage of condensation occurring within wall construction and water entering at joints, to exterior face of wall in accordance with "Rain Screen Principles". Discharge drainage water to avoid staining of finishes, puddling or formation of icicles.
- .12 Ensure total absence of condensation on interior surfaces under the following minimum conditions:
 - .1 Interior: 22 C, 30% RH, still air.
 - .2 Exterior: -30 C, 60 km/hr wind.
- .13 Vapour seal building enclosure to withstand, without failure, design RH at design ambient temperature condition, maintained against interior atmospheric pressure of 250 Pa.
- .14 Provide minimum thermal resistance of RSI 3.52
- .15 Permeance through wall system not to exceed 3 ng/(Pa.s.m²).
- .16 Sealants:
 - .1 Select sealant to suit particular conditions of job, with careful adherence to manufacturer's instructions for application.
 - .2 Provide sealant colour to match adjacent surfaces. Provide sealant resistant to ultra-violet degradation or fading.
- .17 Height – Garages: Minimum 20' to U/S structure. Height – Offices: Minimum 24' to U/S structure

1.5 QUALITY
ASSURANCE / Control

- .1 Quality Assurance in accordance with Division 01
- .2 Quality Control in accordance with Section 3.2

PART 2 - PRODUCTS

2.1 ACCEPTABLE FINISHES

- .1 Garages
 - .1 Interior Finish
 - .1 Concrete
 - .2 Concrete Unit Masonry
 - .3 Metal Liner – above 2400 AFF
 - .2 Exterior Finish
 - .1 Concrete
 - .2 Concrete Unit Masonry – split-face, coloured
 - .3 Clay Unit Masonry
 - .4 Metal Cladding – above 900 AFF
- .2 Offices
 - .1 Interior Finish
 - .1 Drywall
 - .2 Exterior Finish
 - .1 Concrete
 - .2 Concrete Unit Masonry – split-face, coloured
 - .3 Clay Unit Masonry
 - .4 Metal Cladding – above 900 AFF

2.2 MATERIALS

- .1 Preformed Metal Cladding:
 - .1 Metal panels exposed to exterior: sheet steel, commercial grade to ASTM A 653/A 653M with zinc coating, factory finished both sides conforming to test procedures of CSSBI.
 - .2 Profile: 38 mm deep fluted section.
 - .3 Exterior corners: of same profile, material and finish as adjacent siding material.
 - .4 Exposed joint (perpendicular to profile): ends shop cut clean and square, backed with tight fitting filler lapping back of joint, exposed components colour matched to siding.
 - .5 Accessories: cap flashings, drip flashings, internal corner flashings, copings and closures for head, jamb, sill and corners, of same material, thickness and finish as exterior siding, brake formed to shape.
- .2 Structural Metal Framing Sub-girts: commercial grade to ASTM A 653/A 653M with zinc coating, to accept liner and exterior sheet with structural attachment to building frame.
- .3 Non-Structural Metal Framing:
 - .1 Non-load bearing channel stud framing to ASTM C 645: roll formed hot dipped galvanized steel sheet, complete with knock-out service holes.
 - .2 Floor and ceiling tracks: to ASTM C 645, in widths to suit stud sizes.
- .4 Structural Steel Stud Framing:
 - .1 Load bearing channel stud framing: to ASTM A 653/A 653M,

- galvanized steel studs.
- .2 Floor and ceiling tracks: to ASTM A 653/A 653M. Profile and section properties to conform to: CSA S136. Minimum grade A. FY = 33 ksi.
- .3 All section properties to be computed on the basis of metal thickness shown.
- .4 Bridging channels, clips, etc: to CSA S136 and ASTM A 653/A 653M.
- .5 Non-loadbearing truss stud framing system:
 - .1 Studs: truss-type bent rod web, welded construction, with cold drawn steel wire rods having tensile strength of 620 MPa. Design studs for clip attachment of gypsum lath or wire tying of metal lath.
 - .2 Floor track: snap-in type formed to hold studs securely in place, fabricated from steel sheet. Size to suit studs.
 - .3 Ceiling track: channel shaped track for use with stud shoes. Size to suit studs.
 - .4 After fabrication, apply one shop coat primer to steel surfaces. Clean surfaces before painting.
 - .5 Metal channel stiffener: cold rolled steel, coated with rust inhibitive coating.
- .6 Accessories:
 - .1 Screws: to CSA A370, head colour same as exterior sheet.
 - .2 Powder actuated fasteners: galvanized, peened ballistic point, plastic cap of same colour as exterior sheet.
 - .3 Gaskets: purpose made, manufacturer's standard.
 - .4 Touch-up paint: as recommended by panel manufacturer.
 - .5 Isolation coating: alkali resistant epoxy resin.
 - .6 Acoustical sealant
 - .7 Insulating strip: rubberized, moisture resistant, with self sticking adhesive on one face.
- .7 Masonry:
 - .1 Mortar and grout for masonry to CSA A179.
 - .2 Use same brands of materials and source of aggregate for entire project.
 - .3 Colour: ground coloured natural aggregates or metallic oxide pigments.
 - .4 Mortar for masonry.
 - .1 Load bearing: type N or S based on Property or Proportion specifications to suit application.
 - .2 Non-Load bearing: type N or S based on Property or Proportion specifications to suit application.
 - .5 Following applies regardless of mortar types and uses specified above.
 - .1 Mortar for grouted reinforced masonry: type S or M based on Property or Proportion specifications to suit application.
 - .2 Mortar for pointing: type designed to suit application based on Proportion specifications.
 - .3 Mortar for glass block: 1 part Portland cement, 1 part hydrated lime, 4 parts aggregate by volume.
 - .4 White mortar: use to produce mortar type specified.

- .5 Coloured mortar: use colouring admixture not exceeding 10% of cement content by mass, or integrally coloured masonry cement, to produce coloured mortar to match approved sample.
 - .6 Parging mortar: type to suit application to CSA A179.
 - .7 Bar reinforcement: to CSA A371 and CSA G30.18, grade to suit application.
 - .8 Wire reinforcement: to CSA A371 and ASTM A 82, ladder or truss type; truss type for exterior load bearing and shear walls.
 - .9 Connectors: to CSA A370 and CSA S304.1.
 - .10 Corrosion protection: to CSA S304.1, galvanized.
 - .11 Standard concrete block masonry units: to CSA A165.1. Size: modular.
 - .12 Special shapes: provide square and bull-nosed units for exposed corners. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as required.
 - .13 Prefaced concrete masonry units: to CSA A165.3.
 - .14 Special fire resistant concrete block units: to CSA A165. Size: modular. Aggregate used in units and equivalent thickness of units to Supplement to the National Building Code of Canada, Chapter 2 for fire-resistance ratings indicated.
 - .15 Burned clay brick: to CAN/CSA-A82.1, Grade: SW.
 - .16 Calcium silicate brick: to CSA A82.3, Grade: SW.
 - .17 Concrete brick masonry unit: to CSA A165.2, Type: I.
 - .18 Ceramic glazed brick: to ASTM C 126.
- .8 Gypsum Board:
- .1 Exterior sheathing: to ASTM C 79.
 - .2 Metal furring runners, hangers, tie wires, inserts, and anchors are to be galvanized.
 - .3 Water resistant board: to ASTM C 630/C 630M.
 - .4 Metal furring runners, hangers, tie wires, inserts, and anchors are to be galvanized.
 - .5 Gypsum board furring channels: galvanized steel.
 - .6 Steel drills screws to: ASTM C 1002.
 - .7 Casing beads, corner beads: commercial grade sheet steel with zinc finish to ASTM A 653/A 653M, perforated flanges. One piece length per location.
 - .8 Acoustic sealant
 - .9 Polyethylene: to CAN/CGSB-51.34, Type 2.
 - .10 Insulating strip: rubberized, moisture resistant, with self sticking permanent adhesive on one face, lengths as required.
 - .11 Joint compound: to ASTM C 475/C 475M, asbestos-free.
 - .12 Texture finish: asbestos-free, standard white texture coating and primer-sealer, recommended by gypsum board manufacturer.
- .9 Metal Liner Panel:
- .1 Liner sheet: commercial quality to ASTM A 653/A 653M with zinc coating, prefinished. Conforming to film test procedures of CSSBI.
- .10 Insulation:
- .1 Compressive strength, thickness and design RSI value to suit wall assembly application.

- .11 Sealants:
 - .1 Colour selected by Owner from standard available colour range.
 - .2 To meet expansion, cohesion, adhesion and weather requirements of joint.
 - .3 Typical joint applications include:
 - .1 Between window frames and masonry.
 - .2 Between door frames and walls.
 - .3 Perimeter joints, window frames, preformed metal siding components.
 - .4 Primers: type recommended by sealant manufacturer.
 - .5 Joint fillers:
 - .1 General: compatible with primers and sealants, oversized 30 to 50%.
 - .6 Bond breaker: pressure sensitive plastic tape, which will not bond to sealants.

- .12 Fireproofing:
 - .1 Sprayed fireproofing: ULC, UL, WH and NRC/IRC certified fireproofing qualified for use in ULC, UL, WH and NRC/IRC Designs.
 - .2 Curing compound: type recommended by fireproofing manufacturer, qualified for use in ULC, UL, WH and NRC/IRC Designs.
 - .3 Sealer: type recommended by fireproofing manufacturer, qualified for use in ULC, UL, WH and NRC/IRC Design.

- .13 Fire stopping and Smoke Seals:
 - .1 Fire stopping and smoke seal systems: in accordance with ULC-S115. Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of ULC-S115 and not to exceed opening sizes for which they are intended and conforming to special requirements specified in ULC, UL, WH and NRC/IRC.
 - .2 Service penetration assemblies: certified by ULC, UL, WH and NRC/IRC in accordance with ULC-S115.
 - .3 Service penetration fire stop components: certified by ULC, UL, WH and NRC/IRC in accordance with ULC-S115.
 - .4 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
 - .5 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
 - .6 Sealants for vertical joints: non-sagging.

- .14 Metal Flashings and Trim:
 - .1 Prefinished metal flashings to suit application, protect components being flashed, and prevent intrusion of water
 - .2 Finish: factory applied coating, colour selected by Owner.
 - .3 Plastic cement: to CAN/CGSB-37.5.
 - .4 Underlay for flashing: to suit application.
 - .5 Cleats: of same material and temper as sheet metal, wide as

- required.
- .6 Thickness: same as sheet metal being secured.
- .7 Fasteners: of same material as sheet metal. Length and thickness suitable for application.
- .8 Washers: of same material as sheet metal.
- .9 Touch-up paint: as recommended by metal flashing manufacturer.

- .15 Exterior Louvers:
 - .1 Prefinished metal louvers, sized to suit openings, moisture penetration prevention, and project air flow design requirements.
 - .2 Fasteners: same material as fabricated items.
 - .3 Insect screens: with 60% free area, secured to frame.
 - .4 Bird screens: aluminum wire cloth secured to extruded aluminum frame % free area.
 - .5 Extruded aluminum louvers:
 - .1 Louvers constructed from aluminum extrusions.
 - .2 Blades, mullions and frame extrusions arranged as indicated.
 - .3 Concealed vertical stiffeners installed and spaced to meet required loads.
 - .4 Bird and insect screen attached to louver face as required.
 - .6 Adjustable louvers:
 - .1 Manually adjustable louvers constructed from aluminum extrusions.
 - .2 Blades, mullions and frame extrusions with center pivot storm proof type blades arranged to suit design requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install Wall Systems

3.2 QUALITY CONTROL

- .1 Air Barrier –Pull Tests: Provide pull tests on wall air-barrier membrane on a daily basis – minimum (4) test per day. Log results and submit to Quality Assurance representative daily.
- .2 Air Barrier –Leakage Tests: Provide ASTM certified leakage tests on wall air/vapour barrier membrane/window junctions – minimum (4) per Streets / bridge garage component, minimum (4) per Administration component, minimum (4) per Parks garage component, Log results and submit to Quality Assurance representative daily.

3.3 COMMISSIONING

- .1 Verify fit, finish and performance compliance

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Performance specification for building envelope criteria for concrete floor slabs
- .1 Concrete slab
 - .2 Associated surface sealant
 - .3 Moisture – Vapour Barrier
- 1.2 RELATED SECTIONS .1 Division 01
- 1.3 DESIGN PERFORMANCE REQUIREMENTS .1 Design components / assemblies to comply with requirements for “Post Disaster” buildings.
- .2 This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
 - .3 Provide continuous, reinforced, moisture / vapour barrier under floor slab
 - .4 Construct Garage floors reflecting requirement for *Minimum Energy Performance and Minimum Insulation values complying with Ashrae 90.1 – 2004* set out in LEED credit EA Prereq 2
- 1.4 QUALITY ASSURANCE .1 Quality Assurance in accordance with Division 01

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Slab
- 1. CIP Concrete
- .2 Moisture Barrier
- 1. 10 mil Polyethylene, reinforced, taped joints

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 Install Envelope components to concrete floors at grade
- 3.2 COMMISSIONING .1 Verify fit, finish and compatibility

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Materials, installation, and performance design requirements of Exterior Entrance Doors, Exterior Utility Doors and Large Exterior Special Doors.
- .2 Exterior Entrance Doors:
 - .1 Aluminum exterior doors and frames.
 - .2 Operation.
 - .3 Hardware.
 - .4 Glazing.
 - .5 Joint sealants.
- .3 Exterior Utility Doors:
 - .1 Steel doors and frames.
 - .2 Glazing.
 - .3 Joint sealants.
- .4 Large Exterior Special Doors:
 - .1 Overhead doors.
 - .2 Operators.
 - .3 Hardware.
 - .4 Glazing.
 - .5 Joint sealants.
- .5 Related Sections: Division 1 – all sections

1.2 RELATED SECTIONS

- .1 Division 01

1.3 DESIGN PERFORMANCE REQUIREMENTS

- .1 Design components / assemblies to comply with requirements for “Post Disaster” buildings.
- .2 This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
- .3 Exterior Entrance Doors: Design frames and doors in exterior walls to:
 - .1 Accommodate expansion and contraction within service temperature range of -35 to 35 C.
 - .2 Limit deflection of mullions to maximum 1/175th of clear span when tested to ASTM E 330 under wind load of 1.2 kPa.
 - .3 Allow for deflection of structure to ensure that structural loads are not transmitted to frames.
- .4 Exterior Utility Doors:
 - .1 Accommodate expansion and contraction within service temperature range of -35 to 35 C.
 - .2 Limit deflection of mullions to maximum 1/175th of clear span

when tested to ASTM E 330 under wind load of 1.2 kPa.
.3 Allow for deflection of structure to ensure that structural loads are not transmitted to frames

.5 Large Exterior Special Doors:

- .1 Design exterior door assembly to withstand wind load of 2 kPa with a maximum horizontal deflection of 1/240 of opening width.
- .2 Design door panel assemblies with thermal insulation factor 3.0 RSI.
- .3 Design door assembly to withstand minimum 100,000 cycles per annum.

1.4 QUALITY ASSURANCE

- .1 Quality Assurance in accordance with Division 01 – all sections

PART 2 - PRODUCTS

2.1 MATERIALS:
EXTERIOR ENTRANCE
DOORS

- .1 Description:
..1 Aluminum, insulated, thermally broken exterior doors and frames complete with hardware, weather-stripping and glazing.
..2 Size: 16'W x 16'H; glazed 4' -6'
- .2 Metal:
.1 Aluminum extrusions: Aluminum Association alloy AA 6063-anodizing quality.
.2 Sheet aluminum: Aluminum Association alloy AA anodizing quality.
- .3 Core: insulation manufacture's standard.
- .4 Finishes: finish exposed surfaces of aluminum components in accordance with AA DAF-45
.1 Clear anodic finish
.2 Power Operators:
.1 Power-operated pedestrian doors: to CAN/CGSB-69.26.
.2 Power assist and low energy power operated doors: to CAN/CGSB-69.35.
- .5 Hardware:
.1 Locks and latches:
.1 Bored and preassembled locks and latches: to CAN/CGSB-69.17.
.2 Mortise locks and latches: to CAN/CGSB-69.29.
.3 Knobs or lever handles type and finish to suit design requirements.
.4 Cylinders: key into keying system compatible with

- City of Winnipeg Systems.
- .5 Butts and hinges: to CAN/CGSB-69.18,
 - .2 Exit devices: to CAN/CGSB-69.19,
 - .3 Door controls (closers): to CAN/CGSB-69.20,
 - .4 Auxiliary locks and associated products: to CAN/CGSB-69.21.
 - .5 Architectural door trim: to CAN/CGSB-69.22.
 - .6 Auxiliary hardware: to CAN/CGSB-69.32.
 - .1 Door stops.
 - .2 Door silencer.
 - .7 Thresholds: sized to suit door opening and comply with barrier free requirements, material aluminum
- .6 Glazing: double glazed, hermetically sealed units, glazing materials and sealant.
- .7 Joint sealants:
 - .1 Provide sealant products
 - .2 For primers and sealants, indicate VOC in g/L during application and curing.
 - .3 Preformed compressible and non-compressible back-up materials, CFC free.
 - .4 Joint cleaner : non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
 - .5 Primer: to manufacturer's recommendations.
- .8 Fabrication:
 - .1 Fabricate doors and frames to profiles and maximum face sizes.
 - .2 Provide structural steel reinforcement as required.
 - .3 Fit joints tightly and secure mechanically.
 - .4 Conceal fastenings.
 - .5 Mortise, reinforce, drill and tap doors, frames and reinforcements to receive hardware using templates.
 - .6 Isolate aluminum from direct contact with dissimilar metals, concrete and masonry.
- 2.2 MATERIALS:
EXTERIOR UTILITY
DOORS
- .1 Steel doors and frames:
 - .1 Description: steel, insulated, thermally broken, fire rated as required, exterior doors, and frames complete with hardware, weather-stripping and glazing.
 - .2 Core: insulation manufacture's standard.
 - .3 Finishes:
 - .1 Prime painted.
 - .4 Fabrication:
 - .1 Fabricate doors and frames in accordance with CSDMA specifications.
 - .2 Fabricate frames to profiles and maximum face sizes required.
 - .3 Blank, reinforce, drill and tap frames and doors for mortised, templated hardware, and electronic hardware using templates provided by finish hardware

- .4 supplier. Reinforce frames for surface mounted hardware.
 - .4 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.
 - .5 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
 - .6 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.
 - .7 Apply insulation.
- .2 Glazing: double glazed, hermetically sealed units, glazing materials and sealant.
- .3 Joint sealants:
- .1 Provide sealant products
 - .2 For primers and sealants, indicate VOC in g/L during application and curing.
 - .3 Preformed compressible and non-compressible back-up materials, CFC free.
 - .4 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
 - .5 Primer: to manufacturer's recommendations.
- 2.3 LARGE EXTERIOR SPECIAL DOORS
- .1 Description: steel, insulated, thermally broken, exterior doors, and frames, electric operation complete with hardware, track for standard weather-stripping and glazing.
 - .2 Door Panels:
 - .1 Metal: galvanized steel sheet, commercial quality to ASTM A 653/A 653M zinc coating.
 - .3 Core: insulation manufacture's standard.
 - .4 Finishes:
 - .1 Prefinished: factory applied coating
 - .5 Operation:
 - .1 Manual: equip doors for operation by: hand, with chain hoist
 - .2 Electric: electrical motors, controller units, remote pushbutton stations, relays, and electrical components: to CSA approval with CSA enclosure.

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 Install Door Systems

- 3.2 COMMISSIONING .1 Verify fit, finish and performance compliance

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Provide all labour, materials, methods, equipment, accessories for a complete aluminum curtain wall, including, but not necessarily limited to following:
1. Frames
 2. Frame anchorage
 3. Air Barrier tie-in
 4. Splines & Connectors
 5. Hermetically sealed glazing
 6. Glazing blocks, shims
 7. Sealing gaskets
 8. Sealants
- 1.2 RELATED SECTIONS .1 Division 01
- 1.3 SYSTEM DESCRIPTION
- .1 Design, fabrication, installation.
 - .2 Aluminum curtain wall frames.
 - .3 Aluminum entrance frames, aluminum doors.
 - .4 Sealed insulating glass units.
 - .5 Spandrel glazing, single glass glazing.
 - .6 Insulated air barrier panels.
 - .7 Incidental, required aluminum covers, formed aluminum flashings.
 - .8 Aluminum cap, base, counter flashings, closer.
 - .9 Brake metal section.
 - .10 Accessories, related fittings, clamping bars, cap plates gaskets, fasteners, anchoring devices, thermal break materials.
 - .11 Finish process to exposed aluminum.
 - .12 Back priming of metal surfaces.
 - .13 Glazing beads, seals, gaskets, tape, base shims.
 - .14 Caulking, sealants, backup materials for caulking interior, exterior curtain walls to adjacent materials.
 - .15 Protective coating on finished aluminum, glass.

- .16 Steel, aluminum sub-framing, attachment, reinforcing items, anchors and clips as shown and as required.
- .17 Shop priming steel sub-framing, reinforcing, attachment steel.
- .18 Related support angles, plates.
- .19 Cleaning down aluminum, glass at completion of installation.
- .20 Flexible membrane vapour retarder/air seal.
- .21 Metal vapour retarder/air seal anchor plates.
- .22 Aluminum door hardware specified.

1.4 DESIGN & PERFORMANCE REQUIREMENTS

- .1 Design components / assemblies to comply with requirements for "Post Disaster" buildings.
- .2 This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
- .3 Design curtain wall systems to:
 - .1 Limit stress in aluminum, structural components to 13,000 psi under maximum load.
 - .2 Limit lateral deflection under full design load, to maximum L/200 clear span, or glass manufacture's limitations, whichever is less.
 - .3 Withstand maximum wind pressures, suction loads, acting normal to plane of surface, in accordance with National Building Code of Canada 2005 as amended by the Manitoba Building Code Regulation 127/2006, including "Climatic and Seismic Information for Building Design in Canada, Division B, Appendix C.
 - .4 Allow for areas of high positive, negative pressure created by configuration of buildings, their proximity to neighboring buildings.
 - .5 Limit deflection of any member, in direction parallel to wall plane, when member carries full design not to exceed 75% design clearance dimension between that member, panel, glass, other part immediately below.
 - .6 Permit adequate freedom thermal movement, minimize stresses on sealants. Allow for expansion, contraction of members, in range from -20 C. to +76 C. surface temperatures, without detrimental effects, buckling, opening of joints, undue stress on fasteners.
 - .7 Provide complete thermal separation between exterior, interior metal components.
 - .8 Limit air infiltration, ex filtration to maximum 0.06 cfm/sq. ft. at static pressure difference 1.56 psf tested to ASTM E283-73.
 - .9 Exclude water penetration to NAAMM standard TM-1-68T.
- .4 Design, detail, fabricate steel structural design to CSA S16-1969.
- .5 Provide copies structural design calculations.

- .6 Base entire exterior skin design on "Rain Screen", pressure equalized system. Provide complete air, vapour seal within system grid with gaskets, baffles, overlaps, seals, openings between cavities, outside, of sufficient cross-section to provide pressure equalization. Baffle openings or guard to minimize direct water entry.
- .7 Design, verify maximum glass sizes, thickness, strength, etc., for glass types specified, to support design, maximum allowable uniform static loads, using design factor of 2.5.
- .8 Design glass to support design live load 40 lbs/lin. ft., concurrent concentrated load 200 lbs. 3'-6", above floor level, where glazed opening still height is less than 3'-6", difference in adjacent level greater than 2'0".
- .9 Design spandrel glass to meet U.S. General Service Administration Public Building Service Guide Specification PBS 4-0885, February 70.

1.5 QUALITY
ASSURANCE

- .1 Quality Assurance in accordance with Division 01.

PART 2 - PRODUCTS

2.1 ALUMINUM FRAMING

- .1 In accordance with performance specifications

2.2 GLAZING

- .1 In accordance with performance specifications

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install Curtain Wall Systems

3.2 COMMISSIONING

- .1 Verify fit, finish and performance compliance

PART 1 - GENERAL

<u>1.1 SECTION INCLUDES</u>	.1	Steel Stud & Drywall Partition Systems
	.2	Masonry Partitions
<u>1.2 RELATED SECTIONS</u>	.1	Division 01
<u>1.3 STANDARDS</u>		
<u>1.4 SYSTEM DESCRIPTION AND PERFORMANCE REQUIREMENTS</u>	.1	Design components / assemblies to comply with requirements for "Post Disaster" buildings.
	.2	This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
	.3	Partition Types <ol style="list-style-type: none">1. Steel Stud & Drywall Partitions – unrated2. Steel Stud & Drywall Partitions – 1 HR FRR3. Concrete Block Partitions – unrated4. Concrete Block Partitions – 1 HR FRR5. Concrete Block Partitions – 2 HR FRR
	.4	Sound transmission Ratings: <ol style="list-style-type: none">1. Storage Rooms: STC 452. General Rooms: STC 503. Conference / Meeting Rooms: STC 554. Elevator Shaft: STC 55
<u>1.5 QUALITY ASSURANCE</u>	.1	Install mock-ups of all types of Steel stud / Drywall partitions – 10 M ²

PART 2 - PRODUCTS

<u>2.1 STEEL STUD / DRYWALL</u>	.1	Steel Stud / Drywall Partition System: <ol style="list-style-type: none">1 Basic system: full height partitions to underside of deck above. of metal stud type framing faced with gypsum board faced both sides..2 Partition assembly: non-combustible construction, fire resistance / sound-rated rated where indicated / required by code
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- 2.2 MASONRY .1 Masonry:
- .1 Concrete masonry units – size commensurate with structural, fire separation and acoustic attenuation requirements
 - .2 Construct continuous control joints as required.
 - .3 Build in continuous expansion joints as required.
 - .4 Do masonry mortar and grout work in accordance with CSA A179.
 - .5 Install reinforced concrete block or steel lintels over openings

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 Install Partition Systems

- 3.2 COMMISSIONING .1 Verify fit, finish and compatibility

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1
- .1 Performance criteria for Acoustic Tile Ceiling Finish Systems.
 - .2 Performance criteria for Drywall Ceiling Finish Systems
- 1.2 RELATED SECTIONS .1
- Division 01
- 1.3 STANDARDS .1
- Fire-resistance rated floor/ceiling and roof/ceiling assembly: certified by Canadian Certification Organization, accredited by Standards Council of Canada.
- .2 American Society for Testing and Materials International (ASTM)
- .1 ASTM C 636current, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - .2 ASTM C 840-current Specification for Application and Finishing of Gypsum Board.
- 1.4 DESIGN & PERFORMANCE REQUIREMENTS .1
- Design components / assemblies to comply with requirements for "Post Disaster" buildings.
- .2 This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
- .3 Construct ceiling finishes as parts of assemblies reflecting requirements for fire and acoustic separations
- .4 Ceiling system must, when installed in environment established, be sound, rigid, durable and properly related to the building structure. It must maintain specified dimensional tolerances and be free of deformation, de-lamination, and/or discolouration during service life.
- .1 Accessibility:
 - .1 For a suspended modular unit paneled ceiling, accessibility is required to be at every panel. Removal and replacement must be effected without special tools and without damage to panels or to suspension system.
 - .2 Sound Transmission Ratings:
 - .1 Elevator Shafts: STC 57
 - .2 Meeting / conference Area: STC 55
 - .3 Offices / Washrooms; STC 50
 - .4 Garage Office Demising: STC 55
 - .3 Fire Containment/Prevention:
 - .1 As required by NBC

1.5 QUALITY ASSURANCE .1 Execute the work with personnel experienced and familiar with systems of this type

PART 2 - PRODUCTS

2.1 ACOUSTIC TILE CEILING SYSTEMS .1 Provide acoustic tile ceiling system which matches, closely, in form, pattern texture and colour, following examples:
.1 600 x 600 or 600 x 1200 mm grid, using 24 mm tee system and matching wall moulding.
.2 600 x 600 or 600 x 1200 mm acoustic panel with beveled edge.
.3 Colour: white

2.2 DRYWALL CEILING SYSTEMS .1 Provide suspended drywall ceiling system comprised of galvanized furring channels, wire hangers and drywall finishing – type as necessitated by rating requirements

PART 3 - EXECUTION

3.1 INSTALLATION .1 Install Ceiling Systems

3.2 COMMISSIONING .1 Verify fit, finish and compatibility

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Performance criteria for Finished Flooring: Ceramic tile
.2 Performance criteria for Finished Flooring: Resilient flooring
.3 Performance criteria for Finished Flooring: Carpet tile
- 1.2 RELATED SECTIONS .1 Division 01
- 1.3 STANDARDS
- 1.4 DESIGN & PERFORMANCE REQUIREMENTS .1 Design components / assemblies to comply with requirements for "Post Disaster" buildings.
.2 This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
.3 Follow manufacturer's directions for handling, storing and preparing materials
- 1.5 QUALITY ASSURANCE .1 Execute the work with personnel experienced and familiar with systems of this type

PART 2 - PRODUCTS

- 2.1 CERAMIC TILE .1 Provide Ceramic tile flooring system including:
.1 Public Floors: Minimum 450 X 450, unglazed
.2 Room Floors: Minimum 300 X 300, unglazed
.3 Walls: Minimum 200 X 200, glazed
.4 Edge strips, caps, transition pieces as required – aluminum / stainless steel
- 2.2 RESILIENT FLOORING .1 Provide Resilient flooring system including:
.1 Floors: 2.5 – 3.0 mm commercial sheet vinyl, heat welded, through-colour
.2 Base: 100 mm integral cove
- 2.3 CARPET TILE .1 Provide Carpet Tile flooring system including:
.1 Module: 450 x 450
.2 Base: 100 mm carpet with vinyl cap
.3 Type: Level loop, solution-dyed nylon, 32 ounce, 10 Kilotex

PART 3 - EXECUTION

- | | | |
|--------------------------|----|---|
| <u>3.1 INSTALLATION</u> | .1 | Ensure substrate preparation in accordance with manufacturer's requirements for strength, levelness, smoothness and compatibility |
| <u>3.2 COMMISSIONING</u> | .1 | Verify fit, finish |

PART 1 - GENERAL

<u>1.1 SECTION INCLUDES</u>	.1	Interior Signage
	.1	Performance criteria for room signage.
	.2	Performance criteria for Way finding Systems
	.2	Exterior Signage
	.1	Performance criteria for building signage.
<u>1.2 RELATED SECTIONS</u>	.1	Division 01
<u>1.3 STANDARDS</u>		
<u>1.4 DESIGN & PERFORMANCE REQUIREMENTS</u>	.1	Design components / assemblies to comply with requirements for "Post Disaster" buildings.
	.2	This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
<u>1.5 QUALITY ASSURANCE</u>	.1	Execute the work with personnel experienced and familiar with systems of this type

PART 2 - PRODUCTS

<u>2.1 INTERIOR SIGNAGE</u>	.1	Reception / Building Identifier / Divisional Indicator
	.1	Cast Aluminum: 1.5 " – 3" Helvetica
	.2	Wayfinding
	.1	Acrylic Sheet type
	.3	Doors / Room Signage
	.1	Aluminum plates – vinyl lettering
<u>2.2 EXTERIOR SIGNAGE</u>	.1	Building Identifier
	.1	Reveal Edge Aluminum, 24", Lighted
	.2	Public / Contractor Identifiers
	.1	Cast Aluminum, 4"

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 Install Signage plumb and level
- .2 Install Signage with fasteners appropriate for stresses involved
- 3.2 COMMISSIONING .1 Verify fit, finish

PART 1 - GENERAL

- 1.1 SECTION INCLUDES
- .1 Interior Painting: Wall, Doors, Ceilings, Doors & Frames, Stair components
 - .2 Exterior Painting: Doors, Trim, Flashings
- 1.2 RELATED SECTIONS
- .1 Master Painters Institute (MPI) Architectural Painting Specifications Manual.
 - .2 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).
 - .3 National Fire Code of Canada.
- 1.3 STANDARDS
- .1 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
 - .2 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.
 - .3 Standard of Acceptance:
 - .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
 - .2 Ceilings: No defects visible from floor at 45° to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
 - .1 Walls: Eggshell
 - .2 Ceilings: Flat
 - .3 Doors: Semi-gloss
 - .4 Frames: Semi-gloss
- 1.4 DESIGN & PERFORMANCE REQUIREMENTS
- .1 Design components / assemblies to comply with requirements for "Post Disaster" buildings.
 - .2 This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
 - .3 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

1.5 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five years proven satisfactory experience
- .2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under direct supervision of a qualified journeyman in accordance with trade regulations.
- .3 Conform to latest MPI requirements for painting work including preparation and priming.

1.6 SITE REQUIREMENTS

- .1 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:
 - .1 Ambient air and substrate temperatures are below 10 ° C for both interior and exterior work.
 - .2 Substrate temperature is over 32 ° C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .4 Relative humidity is above 85 % or when dew point is less than 3 ° C variance between air/surface temperature.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .2 Perform no painting work when maximum moisture content of substrate exceeds:
 - .1 12 % for concrete and masonry (clay and concrete brick/block).
 - .2 15 % for wood.
 - .3 12 % for plaster and gypsum board.
 - .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
 - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .2 Surface and Environmental Conditions:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.

PART 2 - PRODUCTS .1 Paint interior surfaces in accordance with MPI Architectural Painting
Specification Manual requirements for materials

PART 3 - EXECUTION

3.1 INSTALLATION .1 Paint unfinished surfaces

3.2 COMMISSIONING .1 Verify finish and thickness

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Performance criteria for electric and hydraulic passenger elevators.
- 1.2 RELATED SECTIONS .1 Division 1
.2 National Building Code of Canada 2010
- 1.3 STANDARDS .1 Canadian Standards Association (CSA International).
.1 CSA-B44-[00], Safety Code for Elevators.
.2 CAN/CSA-B651-[95(R2001)], Barrier-Free Design - Public Safety.
.2 One hydraulic passenger elevators, for use in a multi-storey offices condition.
.1 Machine Room located at bottom and immediately beside hoist way.
.2 Double compartment operation.
.3 Barrier-Free in accordance with CAN/CSA B651, Barrier-Free Design.
.4 Conforming "2006 City of Winnipeg Accessibility Design Standards"?
.5 Bilingual Markings:
.1 Provide identification and instructions on operating panels and on all signal equipment in both English and French except where design is such that inference is obvious and readily understood.
.3 Provide elevator in accordance with CSA-B44, local codes and regulations.
- 1.4 DESIGN PERFORMANCE REQUIREMENTS .1 Design components / assemblies to comply with requirements for "Post Disaster" buildings.
.2 This project shall be designed and constructed in accordance with Section 01 47 13, LEED Requirements.
.3 Elevator to be as follows:
.1 3 phase.
.2 Hole less telescoping piston
.3 front door only; stops at all office floors
.4 Rated net capacity: 2500 kg.
.5 Rated speed: 0.55 m/sec.
.6 Travel distance (nominal): 4 m.
.7 No. of stops: as per floors
.8 No. of openings: 1 front

.9 Door operation: side opening in single speed.

1.5 QUALITY ASSURANCE

.1 Installer Qualifications: company or person experienced in performing work in installation of work similar to that required for this project, with minimum five years documented experience and approved by elevator systems manufacturer.

1.6 WARRANTY

.1 Manufacturer's Warranty: submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official.

1.7 MAINTENANCE

.1 Provide complete service and maintenance of elevator system components warranty period.

.2 Systematically clean, adjust, and lubricate equipment as per planned maintenance tasks and frequencies.

.3 Maintenance to include systematic examination, adjustment and lubrication of elevator equipment; repair or replace parts whenever required. Use genuine parts produced by the manufacturer of specific equipment. Replace wire rope as necessary to maintain required factor of safety.

.4 Perform work without removing cars during peak traffic periods.

.5 Provide emergency call back service at during working hours for this maintenance period.

.6 Maintain locally, near the place of work, an adequate stock of parts for replacement or emergency purposes and have qualified installation personnel available to ensure fulfillment of this maintenance service without unreasonable loss of time.

.7 Perform maintenance work using competent personnel, under supervision of elevator manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Materials: as required to achieve specified performance criteria; functionally compatible with adjacent materials and components.

2.2 CAR CAB

.1 Enclose car sides except entrances suitable for removing or resurfacing for maintenance purposes.

.2 Panels: removable, retained securely with hidden fastenings. Design for removal of panels from inside car. Face panels with materials of flame spread rating of 25 or less and with trim edges.

.3 Floor and ceiling: 19 mm, fire retardant treated surfaces and edges.

- .4 Floor to accept carpet tile finish
- .5 Walls: finish stainless steel with satin finish.
- .6 Ceiling: 2700 mm
 - .1 Finish: exposed frame with aluminum lay-in panels.
- .7 Loudspeaker and protective grille: in car top and shielded wiring connected to controller.
- .8 Operating panel and face plate: illuminated call buttons.
- .9 Indicator panel: above operating panel with illuminated position indicators.
- .10 Pad hooks: mounted at 1000 mm height.
- .11 Telephone cabinet in car
- .12 Car doors and frames: doors of sandwich panel construction. Frames of rolled sections, rigid construction.
- .13 Clear height-car ceiling: 2700 mm.
- .14 Clear car entrance height: 2100 mm.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install Elevator Systems

3.2 COMMISSIONING

- .1 Ensure operation as per Performance Requirements
- .2 Ensure compliance with all applicable Standards and Codes

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Outline requirements for materials and installation for cranes.
- 1.2 REFERENCES .1 Crane Manufacturer's Association of America
- .1 CMAA Specification No. 70-2010, Multiple Girder Cranes.
 - .2 CMAA Specification No. 74-2010 Single Girder Cranes.
 - .3 MH27.1-2009, Spec for Underhung Cranes & Monorail Systems.
- .2 American Society for Testing and Materials International, (ASTM)
- .1 ASTM B 30.2-05, Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist).
 - .2 ASTM A 325-09a, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - .3 ASTM A 325M-09, Specification for High-Strength Bolts for Structural Steel Joints (Metric).
 - .4 ASTM 490M-09a, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
 - .5 ASTM ASTM A 307-07b, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- .3 Canadian Standards Association (CSA International)
- .1 CAN/CSA G40.20-04/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA S16-09, Limit States Design of Steel Structures.
 - .3 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
 - .4 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).
 - .5 CSA C22.1-09, Canadian Electrical code, Part I Safety Standard for Electrical Installations.
 - .6 CSA S478-95 (R2001), Guideline on Durability in Buildings
- .4 National Research Council Canada
- .1 National Building Code of Canada 2010 (NBCC).
- 1.3 QUALITY CONTROL .1 Installation is to be done by an established firm having at least five (5) years of proven, satisfactory experience in this trade and employing skilled personnel. The firm is to be authorized by the equipment Manufacturer to install the equipment specified
- .2 Installation firm is to submit proof of qualification and certification in writing to the Consultant prior to commencement of Work.
- 1.4 DESIGN CRITERIA .1 Crane safe lifting capacities to be based on the maximum lift

requirements for the area and tasks being serviced.

- .2 Horizontal hoisting travel limits and vertical hoisting height to be maximized.
- .3 If applicable, design the crane walkways to facilitate building maintenance such as servicing light fixtures. Walkways to have a guard railing conforming to requirements of NBCC. Design access points to the walkways.
- .4 Full fall protection and fall restraint system shall be designed as required for maintenance and inspection activities on the crane.
- .5 Coordinate electrical power requirements with the electrical design: supply, circuit breaker protection and safety disconnect switch. All electrical protection required for crane components to be provided as part of the crane assembly.
- .6 The design and installation of wiring, conduits, control panels, and grounding shall be in accordance with the requirements of Division 26, ELECTRICAL.
- .7 Structural steel design shall conform CSA S16 and to Section 05 12 01 – Structural Steel for Buildings. Design the craneway girders for live load deflection conforming to requirements in CSA S16.
- .8 Structures to be designed to the NBCC, Part 4, Post-Disaster Importance Category.
- .9 Structures to be designed for wind loading and impact loading from crane operations in accordance with the NBCC, Part 4.
- 10 Overhead crane in capacities: refer to Room Data Sheets.
- .11 Design for quality and durability in accordance with Section 01 47 13, LEED Requirements.

1.5 PRE-DESIGN MEETING

- .1 Prior to completion of the design of the overhead crane, the Design Build Team shall conduct a Pre-design meeting attended by Purchaser, Consultant, Design-Builder, and manufacturer to review list of items as prepared by the Consultant including, but not limited to, the following:
 - .1 General requirements.
 - .2 Loading for building design.
 - .3 Operational features such as controls, crane travel speed, trolley travel speed, winch rates, travel limits, horizontal hoisting position limits, hoisting height.
 - .4 Power supply and grounding features and criteria.
 - .5 Elevations, vertical and horizontal gauges, tolerances, dimensions, and clearances of applicable building and crane supporting elements.
 - .6 Access to walkways, trolley, and end trucks.

- .7 Fall protection and fall restraint.
 - .8 Responsibility for verification and correlation of field dimensions, techniques of construction, installation, and coordination of Work and Manufacturer's Technical Representative for all parts of the Work.
 - .9 Testing criteria and procedures.
- .2 Notify the Contract Administrator at least four (4) days in advance of the scheduled time of the meeting; notification to include the meeting agenda. The Contract Administrator reserves the right to attend the meeting.

1.6 SHOP DRAWINGS

- .1 Submit shop details and erection drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit drawings stamped and signed by a qualified Professional Engineer registered in the Province of Manitoba.
- .3 Submit maintenance data for crane maintenance; incorporate into operation and maintenance manual.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 19 – Construction Waste Management and Disposal.

1.8 WARRANTY

- .1 For Work of this Section 14 50 01 – Cranes, the 24 months warranty period prescribed in of the RFP under *General Conditions* for construction is extended to 60 months.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- .1 The Consultant to specify criteria and requirements as applicable for crane equipment and related items including, but not limited to, the following:
 - .1 Acceptable crane suppliers.
 - .2 Safe working load (SWL).
 - .3 Location.
 - .4 Service environment.
 - .5 Classification.
 - .6 Hoist type and speed.
 - .7 Hoist Brake.
 - .8 Test weight.
 - .9 Overload protection.
 - .10 Power supply.
 - .11 Electrical environmental protection.
 - .12 Electrical area classification.
 - .13 Safety disconnect.
 - .14 Limit switches.

- .15 Devices.
- .16 Downshop conductors.
- .17 Controls.
- .18 Warning horn or bell.
- .19 Trolley speed.
- .20 Craneway length.
- .21 Travel distances.
- .22 Span (centre to centre rails).
- .23 Clearances under crane girders and bridge.
- .24 Hook travel.
- .25 Hook Type.
- .26 Wheels for long travel.
- .27 Walkways.
- .28 Identification.
- .29 Wire rope.
- .30 Motors.

2.2 LUBRICATION

- .1 Include means of grouped lubricating bearings requiring periodic lubrication.
- .2 Where grease cups are provided, use automatic feed compression type.
- .3 Provide visible and easily accessible lubrication points.

2.3 SHOP PAINTING

- .1 Girders and associated steel: select surface preparation and shop priming in accordance with severity of environmental conditions by using either CSA S16 series or CAN/CGSB-85.100.
- .2 Crane and all associated equipment as applicable, to be factory finished in accordance with severity of environmental conditions.

2.4 CRANEWAY GIRDERS

- .1 The Consultant to provide requirements for the crane girders including, but not limited to, the following:
 - .1 Type of steel.
 - .2 Tolerances for crane rail installation.
 - .3 Flange requirements.
 - .4 Camber.
 - .5 Coordination between crane supplier and structural steel supplier.
 - .6 End stops.

2.5 RUNNING RAILS

- .1 The Consultant to provide requirements for the running rails including, but not limited to, the following:
 - .1 Splices.
 - .2 Rail clamp plates.
 - .3 Size with respect to maximum wheel loads, wheel spacing and size and craneway spans.

- .4 Rail joint stagger and location with respect to craneway girder splices.

2.6 FALL PROTECTION

- .1 Design, supply, and install a complete fall protection and fall restraint system for all operation and maintenance activities on the crane and hoist. Fall protection and fall restraint system to consist of guardrails and platforms or other appropriate fall protection and restraint systems.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install crane equipment in accordance with manufacturer's instructions.
- .2 Install and hook up all equipment, control unit, remote control, push button stations, relays, and other electrical equipment required for operation.
- .3 Adjust crane operating components to ensure smooth operation.
- .4 Coordinate and cooperate with the structural steel supplier and erector to ensure that the structural steel is erected to the required tolerances for the installation of a fully functioning overhead crane including, but not limited to, the following.
 - .1 Span dimension (centre to centre of rails).
 - .2 Elevation of rails at points opposite each other.
 - .3 Elevation of rails within the length of the wheel base.
 - .4 Column plumbness.
 - .5 Crane rail eccentricity tolerance to craneway girder center line.
- .5 Install all fall protection and fall restraint systems to provide full protection for all crane operation and maintenance and building maintenance activities to be conducted on the crane.

3.2 FIELD QUALITY CONTROL

- .1 The Consultant to prepare a testing plan to ensure a complete working crane installation including, but not limited to, the following:
 - .1 Load test.
 - .2 Commissioning of all crane systems including full range of travel under design load.
- .2 Design Build Team to pay costs of tests.
- .3 The Contract Administrator reserves the right to arrange and pay for additional testing. Provide unencumbered access to all portions of the Work and cooperate with appointed testing agency. Such testing will not augment or replace Design Build Team quality control nor relieve Design Build Team of their contractual responsibility.

3.3 CLEANING .1 Clean up in accordance with Section 01 74 11, Cleaning.

PART 1 - GENERAL

- 1.1 RELATED SECTIONS .1 Section 21 13 01 – Sprinklers
- 1.2 REFERENCES .1 Manitoba Workplace Safety and Health/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).
.2 Underwriter's Laboratories of Canada (ULC)
.1 CAN4 S543-M84, Standard for Internal Lug Quick-Connect Couplings for Fire Hose.
.3 National Fire Protection Association (NFPA)
.1 NFPA 14-2007, Standard for the Installation of Standpipe, and Hose Systems.
.2 NFPA 20-2007, Standard for the Installation of Pumps for Fire Protection.
- 1.3 DESIGN PERFORMANCE REQUIREMENTS .1 Provide hydraulic design of standpipe and hose system.
.2 Design pressure at cabinets: minimum 450 kPa, maximum 690 kPa.
.3 Design type: hydraulically sized, combined with sprinkler system.
- 1.4 SUBMITTALS .1 Submit submittals in accordance with Section 01 33 00 – Submittal Procedures.
.2 Submit fire protection layout drawings and calculations to the advocate engineer and to the authority having jurisdiction for approval, stamped and signed by a Professional Engineer registered or licensed in Province of Manitoba, Canada at project location.
.3 Submit shop drawings for equipment and piping layout in accordance with Section 01 33 00 – Submittal Procedures.
.4 Test reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.6 Closeout Submittals:
.1 Provide maintenance data for standpipe and hose system

for incorporation into manual specified in Section 01 78 00
– Closeout Submittals.

1.5 QUALITY
ASSURANCE

- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .3 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

PART 2 - PRODUCTS

2.1 SUSTAINABLE
REQUIREMENTS

- .1 Refer to Section 01 47 13 – LEED Requirements.

2.2 PIPE AND
FITTINGS

- .1 Materials: NFPA 14, including hangers for attachment to structure.
- .2 Valves: to suit application, capable of operation at design maximum system pressure.

2.3 STANDPIPE
EQUIPMENT

- .1 Cabinets:
 - .1 Style: recessed mounted, sized to accommodate one 9 kg ABC fire extinguisher. Refer to Section 21 24 01 – Fire Protection Specialties for fire extinguishers.
 - .2 Door: flush, glazed, hinged, positive latch device.
 - .1 Finish: prime coated for field painting.
 - .2 Hose rack: swivel type with pins and water stop.
 - .3 Hose: type approved by local authorities, size and length to reach design coverage for unit, collapsible, mildew and rot-resistant.
 - .4 Internal lug quick-connect couplings: to CAN4 S543.
 - .5 Nozzle: combination fog, straight stream, and adjustable shut-off.
 - .3 Fire Department Connections:
 - .1 Provided through the sprinkler system as specified in Section 21 13 01 – Sprinkler Systems.

2.4 FIRE PUMP

- .1 ULC listed centrifugal fire pump with automatic pump controller in accordance with NFPA 20 and the Manitoba Building Code.

PART 3 - EXECUTION

- 3.1 MANUFACTURER'S INSTRUCTIONS
- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
- 3.2 INSTALLATION
- .1 Install equipment to manufacturer's written instructions.
- .2 Install vertical piping plumb with structure.
- .3 Slope horizontal piping to allow for drainage.
- .4 Install drain pipes and valves to allow system to be totally drained.
- .5 Where required, take standpipe systems off of sprinkler systems unless otherwise approved by code authorities.
- .6 Connect standpipe system to water source ahead of domestic water connection.
- .7 Provide backflow prevention on water supply to fire protection equipment. All piping upstream of the backflow preventer is to be potable rated.
- .8 Provide pressure reducing valves to maintain maximum pressure at cabinets.
- .9 Provide packaged fire pump and install within the Mechanical Room in accordance with NFPA 20. The driver shall be an electric motor on emergency power.
- .10 Flush entire system of foreign matter.
- 3.3 FIELD QUALITY CONTROL
- .1 Manufacturer's Field Services:
- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Division 1 Requirements.
- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, as directed in Division 1 Requirements.
- .2 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.
- 3.4 VERIFICATION
- .1 Operate equipment and verify that performance requirements

specified in this section has been achieved.

- .2 Test entire system to NFPA 14.
- .3 Test to be witnessed by the Contract Administrator.

PART 1 - GENERAL

- 1.1 RELATED SECTIONS
- .1 Section 21 12 01 – Standpipe and Hose Systems.
- 1.2 REFERENCES
- .1 Manitoba Workplace Safety & Health/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).
.2 National Fire Protection Association (NFPA)
.1 NFPA 13-2007, Standard for the Installation of Sprinkler Systems.
.2 NFPA 1963-2003, Fire Hose Connections.
- 1.3 DESIGN PERFORMANCE REQUIREMENTS
- .1 Available volume and pressure of incoming water supply from water flow test data from the City of Winnipeg is 31.5 L/s @ 420 kPa.
- .2 Provide a combination of wet pipe and dry pipe type sprinkler system.
- .3 Interface system with building ventilation control system and building fire and smoke alarm system.
- .4 Provide fire department connections near main entrance.
- .5 Sprinkler system shall be designed according to MBC, MFC, NFPA 13-2007 with the following features:
.1 Wet pipe sprinkler zones within heated office and shop areas. Provide fire department connection on the Thomas Avenue face of the building near the main entrance and within 45 m of direct travel distance from the nearest fire hydrant. Coordinate with the City of Winnipeg Water and Waste Division for flow and pressure testing of the water supply to determine the design conditions.
.1 Office areas are to be light hazard, pendant heads where there are finished ceilings, and upright heads wherever else
.2 Shop areas are to be ordinary hazard group 1.
.2 Areas within structures that are not heated to 4.4°C (40°F) at all times must be provided with dry-pipe sprinkler systems having their own dedicated air compressor and air maintenance valve.
.3 Provide standpipe and hose cabinets fed from the sprinkler system where required.
- .6 Sprinkler areas of building unless strictly prohibited by codes or standards.
- .7 Provide sprinkler systems in all areas of building using dry pipe

sprinklers where there is a risk of freezing.

- .8 Sprinkler system to provide fire sprinkler protection for entire area.
- .9 Design and install system in accordance with NFPA 13.
- .10 Pipe sizes are to be determined by hydraulic calculation.
- .11 Base sprinkler system design on hydraulic calculations, and other provisions specified.

1.4 SUBMITTALS

- .1 Provide submittals to Division 1 requirements.
- .2 Submit shop drawings, product data, and hydraulic calculations to authority having jurisdiction, Contract Administrator for review.
- .3 Submit operation and maintenance data for equipment and components for incorporation into manual specified in Division 1.
- .4 Test reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.5 QUALITY ASSURANCE

- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .3 COR Certification.
 - .1 All members of the Design Build Team are to be COR Certified to participate in the design, construction or commissioning.

PART 2 - PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

- .1 Refer to Section 01 47 13 – LEED Requirements.

2.2 MATERIALS

- .1 Materials: to NFPA 13-2007, Manitoba Building and Fire Codes, and local authorities having jurisdiction.

2.3 SPRINKLER HEADS

- .1 Pendant with Escutcheon: semi-recessed, finish chrome plated, and escutcheon plate of same material. Provide head guard in areas where exposed to mechanical damage potential. Tripping thermal element to be glass frangible vial.
- .2 Upright exposed: brass finish with plated head guard to be used in areas without ceilings. Fusible link: temperature rated for specific area hazard.
- .3 Spray nozzles: discharge minimum 120 degrees arc with blow-off dust cap.

2.4 SPRINKLER
PIPING

- .1 Piping: size by hydraulic calculation per NFPA13-2007.
- .2 Wet pipe sprinkler alarm valve: clapper check type valve, to automatically actuate water motor alarm and electric alarm, with test and drain valve.
- .3 Dry Pipe Sprinkler Alarm Valve: clapper check valve with labyrinth seat for air to water-sealing, to automatically actuate water motor gong and electric alarm, complete with test and drain trim.
- .4 Water motor alarm: hydraulically operated impeller type alarm and inlet strainer.
- .5 Fire alarm: electrically operated gong with pressure alarm switch.
- .6 Water flow switch: suitable for horizontal or vertical mounting, with contacts compatible for use with alarm control system.
- .7 Fire Department Connections:
 - .1 Outlet: flush mounted wall type, thread size to suit fire department requirements, internal lug quick-connect, with threaded dust cap and chain of matching material and finish.
 - .2 Capacity: required by local codes.
 - .3 Identification Plaque: "Sprinkler - Fire Department Connection" and with design flow and pressure requirements.

2.5 SPRINKLER
EQUIPMENT

- .1 Pressure Maintenance Pump:
 - .1 Type: close coupled motor and positive displacement pump unit.
 - .2 Performance: flow and pressure required to perform design requirements, plus 30% additional capacity.
 - .3 Motor: capable of additional 30% of design load, open drip proof, permanently lubricated.
 - .4 Accessories: flexible hose connections, inlet strainer, relief valve, steel mounting plate.
 - .5 Operation: automatic, with manual override.
- .2 Air compressor: sufficient size and capacity to maintain design

requirements plus 30%, with motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloader valve.

- .1 Air compressor is to be dedicated to the dry sprinkler zones and have backup from the general compressed air supply system.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 PREPARATION

- .1 Arrange for permits, inspections and tests.

3.3 INSTALLATION

- .1 Do not use plug-in cord type supervisory devices for valve supervision.
- .2 Provide sprinkler risers with adequate posts or guards to protect from physical damage.
- .3 Provide alarm valve with necessary trim, including low pressure alarm switch and automatically activated excess pressure pump.
- .4 Provide fire alarm annunciator panel complete with indication of various fire zones and trouble signal.
- .5 Provide piping to drain points so that entire system can be drained.
- .6 Run piping parallel to building structure.
- .7 Provide sprinklers above and below false ceilings.

3.4 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.
 - .1

3.5 VERIFICATION

- .1 Operate equipment and verify that performance requirements specified in this Section has been achieved.
- .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:
 - .1 After delivery and storage of products.
 - .2 When preparatory work upon which product installation depends is complete.
 - .3 Twice during installation progress at 25% and 60%

.4 complete.
 After installation and cleaning is complete.

PART 1 - GENERAL

1.1 RELATED
SECTIONS

.1 Section 21 12 01 – Standpipe and Hose Systems.

1.2 REFERENCES

- .1 Manitoba Workplace Safety and Health /Workplace Hazardous
Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).
- .2 National Fire Protection Association (NFPA)
.1 NFPA 10-2007, Standard for Portable Fire Extinguishers.
- .3 Underwriter's Laboratories Canada (ULC)
.1 CAN/ULC S503-05, Standard for Carbon Dioxide Fire
Extinguishers.
.2 CAN/ULC S508-02, Rating and Testing of Fire
Extinguishers Extinguishing Agents.

1.3 DESIGN
PERFORMANCE
REQUIREMENTS

- .1 Fire extinguishers shall be provided as required by the MBC, MFC
and NFPA 10 codes.
- .2 Type and location of extinguishers must provide complete fire
protection coverage in accordance with NFPA reference standard.
- .3 Provide extinguisher type and capacity most suitable to extinguish
fire in area served.

1.4 QUALITY
ASSURANCE

- .1 Equipment: ULC listed, to NFPA.
- .2 Extinguisher Ratings: CAN/ULC S508.
- .3 Health and Safety:
.1 Do construction occupational health and safety in
accordance with Manitoba Workplace Safety and Health
Requirements.
- .4 COR Certification:
.1 All members of the Design Build Team are to be COR
Certified to participate in the design, construction and
commissioning.

1.5 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Construction/Demolition Waste Management and Disposal:
separate waste materials for reuse and recycling in accordance
with Section 01 74 19 – Construction/Demolition Waste
Management and Disposal.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

- .1 Manual Fire Extinguishers:
 - .1 Type: multi-purpose dry chemical, stored pressure and cartridge operated rechargeable type, with hose and shut-off nozzle, pressure gauge and signage.
 - .2 ULC labeled for Type A, B, C protection.
 - .3 Capacity: minimum 2A 10BC rating.
- .2 Wheeled Fire Extinguishers:
 - .1 Material: multi-purpose cylinder, suitable for passage through standard doorway, large diameter rubber tread wheels, non kinking hose, ball type shut off nozzle and wheel valve.
 - .2 Type: CAN/ULC S503, B and C rated, pressurized with nitrogen.
 - .3 Capacity: up to 150 kg.
 - .4 Discharge time: 70 sec.
 - .5 Discharge range: 9 - 12 m.

2.2 FIRE BLANKETS

- .1 Silicone coated fibreglass in metal container.
- .2 Size: minimum 1800 x 1800 mm.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install fire extinguishers to NFPA 10 and local regulatory requirements.
 - .1 In finished office areas, extinguishers shall be mounted in bubble-front recessed cabinets with finger latch on hinged door, or inside of standpipe and hose cabinets if the building is so equipped.
 - .2 In clean shop areas, the extinguishers shall be mounted on a vehicle harness on the wall within an exit and access to exit.
 - .3 In dirty or wet shop areas, such as the Woodwork Shop, Grass Seed and Fertilizer Storage or Wash Bay, the extinguisher shall be mounted inside of a surface mounted cabinet with hinged door and finger latch.
- .2 Dry nitrogen cartridge operated multipurpose dry chemical fire extinguishers with non-conductive hose, ABC rating, pressure gauge and signage to indicate its location mounted in

surface-mounted break-glass scored plastic front cabinets with lock mechanism to prevent theft or unauthorized access are to be used in all unheated or outdoor areas.

- .3 Install fire blankets within shop and vehicle garage areas at locations that can be reached from corners of space by occupant travel pathways not exceeding 23 m.
- .4 Provide highly visible signage to indicate the locations of fire extinguishers and fire blankets.

3.3 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 21 12 01 – Standpipe and Hose Systems.
- .2 Section 21 13 01 – Sprinkler Systems.

1.2 REFERENCES

- .1 Manitoba Workplace Safety and Health /Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 12-2005, Standard on Carbon Dioxide Extinguishing Systems.
 - .2 NFPA 13-2007, Installation of Sprinkler Systems.
 - .3 NFPA 14-2007, Standard for the Installation of Standpipe and Hose Systems.
 - .4 NFPA 15-2007, Standard for Water Spray Fixed Systems for Fire Protection.
 - .5 NFPA16-2007, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems.
 - .6 NFPA 17-2009, Standard for Dry Chemical Extinguishing Systems.

1.3 DESIGN PERFORMANCE REQUIREMENTS

- .1 Dry chemical systems: for fires with burning surfaces only.
- .2 Foam systems: for flammable and combustible liquid applications.
- .3 Water Spray Fixed systems: for protection of dust collection and wood working systems.
- .4 Provide complete fire suppression system to ensure protection from potential fire sources that exceed the scope of the general building sprinkler system, such as hazardous material storage and processes.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit shop drawings for equipment for approval by Authority having jurisdiction prior to installation in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Test reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics

and physical properties.

- 1.5 QUALITY ASSURANCE
- .1 Use technically qualified personnel experienced with design of fire suppression systems for selection and placement.
 - .2 Present detailed fire suppression drawings of system for approval by Authority having Jurisdiction prior to commencement of work.
 - .3 Protocol for systems acceptance test developed with and approved by Authority having Jurisdiction prior to commencement of work.
 - .4 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.

PART 2 - PRODUCTS

- 2.1 SUSTAINABLE REQUIREMENTS
- .1 Refer to Section 01 47 13 – LEED Requirements.

- 2.2 MATERIALS
- .1 Products: ULC listed for their intended use.
 - .2 Dry chemical systems: NFPA 17.
 - .3 Foam systems: NFPA 16.
 - .4 Water systems: NFPA 13, 14 or 15 as applicable.
 - .5 Carbon Dioxide Systems: NFPA 12.

PART 3 - EXECUTION

- 3.1 MANUFACTURER'S INSTRUCTIONS
- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

- 3.2 PREPARATION
- .1 Consult with Winnipeg Fire Paramedic Service prior to commencing work.

- 3.3 INSTALLATION
- .1 Install to manufacturer's recommendations, NFPA standards, and local regulatory requirements.

- 3.4 FIELD QUALITY CONTROL
- .1 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.

3.5 VERIFICATION

.1

Operate equipment in presence of Code authority and verify that performance criteria specified in this section has been achieved.

PART 1 - GENERAL

- 1.1 SUMMARY OF WORK .1 Section Includes:
- .1 Sustainable requirements for contractor verification.
 - .1 Submit as required in section 01 47 13 – LEED Requirements.
 - .2 Domestic Water Piping:
 - .1 Pipe Components.
 - .2 Joint and Fitting Components.
 - .3 Unions and Flanges.
 - .4 Valves.
 - .3 Fixtures:
 - .1 Hose Bibs.
 - .2 Drain Valves.
 - .3 Water Hammer Arresters.
 - .4 Equipment:
 - .1 In-Line Circulator Pumps.
 - .2 Domestic Hot Water Storage Tanks.
 - .3 Domestic Hot Water Heaters.
- 1.2 RELATED SECTIONS .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 47 13 – LEED Requirements
 - .3 Section 01 74 11 – Cleaning.
 - .4 Section 01 74 19 – Construction Waste Management and Disposal.
 - .5 Section 01 78 00 – Closeout Submittals.
 - .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .7 Section 21 12 01 – Standpipe & Hose Systems.
 - .8 Section 21 13 01 – Sprinkler Systems.
 - .9 Section 22 42 00 – Plumbing Fixtures.
- 1.3 REFERENCES .1 American Society of Mechanical Engineers (ASME).
- .1 ASME B16.18-2001, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .2 ASME B16.22-2001, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME BPVC-2007 - BPVC Section IX - Welding and Brazing Qualifications.
- .2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM B32-08, Standard Specification for Solder Metal.
 - .2 ASTM B88-09, Standard Specification for Seamless Copper Water Tube.
 - .3 ASTM B664-90(2006), Standard Specification for 80% Silver-

- .4 20% Graphite Sliding Contact Material.
- .4 ASTM C547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.
- .5 ASTM D2846/D2846M-09be1, Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
- .6 ASTM F437-09, Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- .7 ASTM F438-09, Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
- .8 ASTM F439-09, Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- .9 ASTM F441/F441M-09, Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
- .10 ASTM-F493-10, "Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- .11 ASTM F877-07, Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems.
- .12 ASTM F1807-10e1, Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing.

- .3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
 - .1 ASHRAE 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings.

- .4 Plumbing and Drainage Institute (PDI).
 - .1 PDI WH201-1992, Water Hammer Arrester Standard.

- .5 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

- .6 National Plumbing Code Of Canada 2010 as amended by the Manitoba Plumbing Code Regulation 32/2011.

- 1.4 DESIGN PERFORMANCE REQUIREMENTS
 - .1 Design domestic hot, cold and recirculated water systems and install components in accordance with applicable regulations of the National Plumbing Code of Canada 2010 as amended by the Manitoba Plumbing Code Regulation 32/2011.
 - .2 Provide metered domestic water services to plumbing fixtures and equipment.
 - .3 Water Pressure at any outlet: minimum 140 kPa under flow conditions, between 300 and 500 kPa static pressure, and where static pressures exceed 500 kPa, provide pressure control valves.

- .4 Size piping and select fittings: minimum local plumbing code requirements.
- .5 Hot Water: size and select piping, equipment and insulation to ensure minimum hot water temperature of 60°C in 10 seconds or less at any domestic hot water outlet.
- .6 Provide for continuous hot water delivery at dishwasher.
- .7 Insulate hot and cold water piping to meet design temperature requirements, and to prevent condensation.
- .8 Provide adequate storage and fail-safe water mixing systems to operate eyewash stations within the requirements of ANSI-Z358.1-2009 – “Emergency Eyewash and Shower Equipment”.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 13 – LEED Requirements. Indicate VOC's during application and curing.
- .3 Submit product data sheets for fixtures and equipment.
- .4 Operation and Maintenance Manual: submit operational requirements and spare parts lists.
- .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Submit all load calculations, pipe sizing, pump sizing, water heater sizing and heat loss calculations used in the design process.

1.6 QUALITY ASSURANCE

- .1 Utilize Design and installation personnel thoroughly familiar with systems of this type.
- .2 Provide multiple units from same manufacturer.
- .3 Pre-Installation Meeting:
 - .1 Convene a pre-installation meeting one week prior to beginning on-site installation.
- .4 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.

- .5 COR Certification:
 - .1 All members of the Design Build Team are to be COR Certified to participate in the design, construction and commissioning.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Maintain piping and valve cleanliness by protecting open ends from entry by dust, water, debris or vermin during delivery and storage.
- .2 Material damaged in transit or during storage and handling is to be replaced prior to installations.
- .3 Material for use in potable water system shall be stored in a weathertight storage building or construction.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Sustainable Requirements: Refer to Section 01 47 13 – LEED Requirements.
- .2 Pipe, Joints, and Fittings are to comply with one of the following standards:
 - .1 Copper Pipe: ASTM B 88 with ASME B16.22 wrought copper or ASME B16.18 cast copper, brass and bronze fittings, ASTM B32 solder, or ASTM B664 brazed joints.
 - .2 CPVC Schedule 80 Pipe: ASTM F441/F441M with ASTM F438 socket, ASTM F439 socket, or ASTM F437 threaded type fittings.
 - .3 CPVC System: ASTM D2846/D2846M, SDR 11, pipe or tube and socket fittings.
 - .4 PEX Distribution System: ASTM F877, SDR 9 tubing ASTM F1807, metal-insert type with copper crimp rings and fittings matching PEX tube dimensions.
- .3 Joints:
 - .1 Socket Solvent Weld: ASTM F493.
 - .2 Mechanical Crimp Rings: to ASTM-F1807.
 - .3 Solder Joints: ASTM B32.
 - .4 Brazed Joints: ASTM B664.
- .4 Insulation: ASTM C547, with sufficient insulating value to prevent sweating on cold pipes, and maintain hot water temperature requirements at fixtures on hot pipes.
 - .1 Pipe: minimum 13 mm thick, with vapour barrier on cold pipe.
 - .2 Equipment: size and material to maintain maximum 40°C equipment surface temperature during operation.

2.2 BACKFLOW PREVENTION

- .1 Provide backflow prevention in accordance with the Manitoba Plumbing Code and the City of Winnipeg Water Works Bylaw 504/73.
- .2 Provide annual inspection and service of the backflow preventers, including testing, at the end of the one-year warranty period.

-
- 2.3 WATER METER .1 Install any meter provided by the City of Winnipeg Water Works Department into the main domestic water service where it enters the structure.
- 2.4 EMERGENCY EYEWASH AND SAFETY SHOWER .1 Provide and certify the eyewash and emergency shower stations in accordance with ANSI-Z358.1-2009.
- .2 Provide fail-safe thermostatic mixing valve station(s) arranged such that the water can be recirculated into the domestic hot water system and maintain potable conditions.
- 2.5 VALVES .1 Connections: screwed or soldered connections on 50 mm and smaller valves, flanged connections on valves larger than 50 mm.
- .2 Isolation Valves: type designed for tight seal in closed position, with no measurable leakage at 150% design system pressure.
- .3 Drain Valves: same as isolation valves.
- .4 Throttling Valves: type designed to smoothly throttle flow of water from 0 to full design flow capable of withstanding 150°C fluid temperature on hot piping.
- .5 Check Valves:
.1 Designed to prevent backflow of water as determined by plumbing code.
.2 Use spring loaded check valves where high upstream water pressure may prevent swing check valves from performing.
- 2.6 FIXTURES .1 Hose Bibs: bronze body, spout with vacuum breaker and hose thread, chrome plated on exposed surfaces; provide recessed, drainable, non-freeze hose bibs on exterior walls at approximately 100 m spacing.
- .2 Water Hammer Arresters: to PDI WH201.
- 2.7 DOMESTIC HOT WATER EQUIPMENT .1 Heat Generation:
.1 System: to ASHRAE 90.1.
.2 Heating capacity: maintain design temperature continuously with 30 minute recovery time.
.3 Storage tanks, heaters, expansion tanks, circulating pumps, and other equipment: size to meet design requirements.
.4 Energy Supply: natural gas.
.5 Heaters to be condensing style.
.6 Provide alternative means of heating domestic water using a double walled stainless steel plate and frame heat exchanger from the hydronic heating system.
- .2 Circulating Pumps:

- .1 Type: all-bronze or stainless steel, vertical inline.
 - .2 Size for maximum 5°C temperature drop from domestic hot water supply temperature during non-peak hours and usage of 0 litres per minute.
 - .3 Design: 690 kPa working pressure and 105°C continuous service.
 - .4 Motor: drip-proof with thermal overload protection.
 - .5 Support circulating pumps: manufacturer's recommendations.
- .3 Storage Tanks:
- .1 Construction: closed type pressure vessel, welded steel, with zinc rich primer, inside and out.
 - .2 Support: steel support saddles.
 - .3 Lining: internal corrosion resistant lining on tank and connections.
 - .4 Accessories: thermometer, access manhole, chlorine resistant stainless steel screwed fittings.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install equipment to manufacturer's recommendations.
- .2 Provide domestic water distribution system, including fittings required to service fixtures and equipment.
- .3 Insulate domestic water piping for energy conservation on hot water and recirculated water lines, and to prevent condensation from forming on cold water lines.
- .4 Piping Installation:
 - .1 Maintain minimum 0.5% grade, or steeper as required to drain or vent piping.
 - .2 Provide drain capability at low points.
 - .3 Install piping to conserve headroom and space.
 - .4 Route above grade piping parallel to walls.
 - .5 Where practicable, group piping at common elevations.
 - .6 Install concealed pipes close to building structure to keep furring to a minimum.
 - .7 Do not bury piping except for main service pipe riser.
- .5 Unions and Flanges: make connections to equipment and branch mains with unions or flanges; use gaskets on flanged connections for services.
- .6 Isolation Valves:
 - .1 Locate in accessible locations wherever possible, to facilitate maintenance.
 - .2 Locate at supply piping to fixtures, or group of fixtures, and equipment.
 - .3 Locate at branch take-offs and vertical risers.
 - .4 Locate where water shut-off valves for service or seasonal exposure to freezing conditions may be required. Provide the means to drain piping.

- .7 Locate throttling valves where throttling control of water is required.
- .8 Check Valves: locate at pump discharges, and where backflow prevention is required by plumbing code.
- .9 Drain Valves: locate near main shut-off valves, at low points in piping systems, at bases or vertical risers, and at equipment.
- .10 Water Hammer Arresters:
 - .1 Install to PDI-WH201.
 - .2 Locate in supply water lines at each fixture or group of fixtures, to prevent discernable water hammer during normal fixture operation.
 - .3 Provide with accessible isolation valve for hammer arrestor devices.
- .11 Install vacuum breakers as permitted on directly connected plumbing lines where contamination of domestic water may occur. Provide backflow prevention or air gaps in all other situations where contamination of domestic water may occur.
- .12 Under-floor piping is to be installed, supported and sealed at floor penetrations to maintain the following:
 - .1 Penetrations of the floor slab from underground to the main floor are to be sealed gas-tight to prevent the migration of methane gas into the aboveground spaces.
 - .2 Provide support for underground piping from the main floor slab that is both rigid, and durable to prevent changes in slope or losses in pipe integrity due to settlement, heaving or corrosion.
 - .3 Arrange piping to compensate for pipe expansion and contraction as the soil temperature and temperature of the pipe changes due to its contents.

3.2 VERIFICATION

- .1 Operate equipment and verify that performance criteria specified in this Section has been achieved.
- .2 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for sanitary waste and includes performance specification information for waste and vent piping, waste piping specialties, waste piping equipment and waste piping insulation.
 - .2 Waste and Vent Piping Systems:
 - .1 PVC pipe for buried and exposed pipe.
 - .3 Waste Piping Specialties:
 - .1 Clean-outs and clean-out access covers.
 - .2 Floor drains.
 - .3 Area drains.
 - .4 Planter drains.
 - .5 Sumps.
 - .6 Grease traps.
 - .7 Grit traps.
 - .8 Oil/Water Separators.
 - .4 Waste Piping Equipment:
 - .1 Submersible sump and sewage pumps.
 - .5 Waste Piping Insulation:
 - .6 Sustainable requirements for construction and verification.
 - .1 Energy efficiency.
 - .2 Water conservation.
 - .3 Environmental protection.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 47 13 – LEED Requirements
- .3 Section 01 74 11 – Cleaning.
- .4 Section 01 74 19 – Construction Waste Management and Disposal.
- .5 Section 01 78 00 – Closeout Submittals.
- .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .7 Section 22 42 02 – Plumbing Fixtures.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.
 - .2 ASTM D2564-04 (2009)e1, Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 51-GP-52M-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B1800-06/B181.2-06, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
 - .2 CAN/CSA-B1800-06/B182.11-06, Recommended Practice for the Installation of Thermoplastic Drain, Storm and Sewer Pipe and Fittings.
- .4 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Plumbing Code Of Canada 2010 as amended by the Manitoba Plumbing Code Regulation 32/2011.

1.4 PERFORMANCE REQUIREMENTS

- .1 Design sanitary waste systems and install components in accordance with applicable regulations of the National Plumbing Code of Canada 2010 as amended by the Manitoba Plumbing Code Regulation 32/2011.
- .2 Provide water and drainage connections to equipment furnished by the Contract Administrator.
- .3 Design system to accommodate sanitary waste piping from fixtures in facility with allowance for future expansion to the east of the building as shown on drawings in Appendix B4.
- .4 Design grade for horizontal sanitary waste piping: minimum 1% in direction of flow.
- .5 Route pipes in an orderly manner, and maintain proper grades.
- .6 Design piping routing located above grade in visible locations parallel to walls and adjacent building elements.
- .7 Design building connections to street main: minimum of 2400 mm cover over pipe below finished grade.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
 - .2 Submit WHMIS MSDS in accordance with Section 01 47 13 – LEED Requirements. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Shop Drawings:
 - .1 Submit Shop Drawings to indicate project layout, load

calculations and vent pipe sizing.

- .1 Vertical and horizontal piping locations and elevations and connections details.
- .2 Drain and trap locations, size, type, anchor and installation details, and finishes.
- .3 Submit shop drawings for packaged submersible pumps and controls.
- .4 Other details including grit separators and oil/water separators.
- .2 Submit full size sample of actual product, adhesive or solvent as follows:
 - .1 Backwater valve.
 - .2 Deep seal P-trap.
 - .3 Drain: roof and floor.
 - .4 Clean outs.
 - .5 Access covers.
- .3 Submit information on operating mechanisms and electrical connections, finishes and location of manufacturer's nameplates.
- .4 Submit catalogue details for types of drain, separators neutralizer, trap, pump illustrating profiles, dimensions and methods of assembly.
- .5 Include schedule identifying units and their locations.
- .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates: submit certificates signed by manufacturer, certifying that materials comply with specified performance characteristics and physical properties.
- .7 Instructions:
 - .1 Submit manufacturer's installation instructions.
 - .2 Submit manufacturer's instructions for commissioning activities for equipment provided in this Section.
- .8 Manufacturer's Field Services: submit 3 copies of manufacturer's field reports.
- .9 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.6 QUALITY ASSURANCE

- .1 Utilize Design and installation personnel thoroughly familiar with systems of this type.
- .2 Provide multiple units from same manufacturer.
- .3 Pre-Installation meeting:
 - .1 Convene a pre-installation meeting one week prior to beginning on-site installations.
- .4 Health and Safety:

.1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.

.5 COR Certification:

.1 All members of the Design Build Team are to be COR Certified to participate in the design, construction and commissioning.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Sustainable Requirements: Refer to Section 01 47 13 – LEED Requirements.

.2 Waste and Vent Piping Systems:

.1 PVC Pipe Components:

.1 Pipe: PVC plastic pipe to CAN/CSA-B181.2.

.2 Joint and fitting components:

.1 Fittings: PVC fittings to CAN/CSA-B181.2.

.2 PVC solvent cement: to ASTM D 2564.

.3 Waste Piping Specialties:

.1 Clean-outs and clean-out access covers:

.1 Provide threaded type clean-outs extended to finished floor or wall surface. Provide bolted clean-out cover plates on vertical rainwater leaders only. Ensure ample clearance at clean-out for rodding of drainage system.

.2 Provide access covers for floors in unfinished areas: round with heavy wheel loading rated nickel bronze serrated frames and plates. Provide round access covers in finished areas with depressed centre section to accommodate floor finish. Provide wall clean-outs with chrome plated caps.

.2 Floor drains:

.1 Typical: epoxy coated cast iron body with double drainage flange, weep holes, combined two piece body, and adjustable heavy duty nickel/bronze strainer.

.1 Floor drains in public areas shall be capable of receiving up to 264 litres per minute (139.5 fixture units) without water spilling out of the sloped floor area catchment of the drain, such as from a broken sprinkler head.

.2 Shower and washroom floor drains: complete with a removable perforated sediment bucket.

.3 Equipment rooms: complete with a polished bronze funnel type strainer and extension for floating floor.

.3 Area drains: epoxy coated cast iron body, adjustable collar and galvanized ductile iron locking grate suitable for heavy equipment wheel loads.

.4 Waste Pumping Equipment:

.1 Submersible sump and sewage pumps:

.1 Type: completely submersible, vertical, centrifugal.

- .2 Casing: cast iron volute and oil filled motor chamber.
- .3 Impeller: bronze, non-clog with corrosion resistant alloy steel shaft.
- .4 Bearings: anti-friction ball or roller.
- .5 Accessories: oil resistant power cord with three prong connector on single phase, fractional horsepower units only.
- .6 Duplex Controls: packaged pre-wired alternator with mercury type liquid level controls and control panel to cut in second pump on rising level or pump failure, and separate liquid level control for high level alarm.
- .2 Waste Oil Tanks: ULC approved; conforming to the Environmental Code of Practice for Aboveground and Underground Storage Tank Systems containing Petroleum Products and Allied Petroleum Products.
 - .1 Tank: construction double walled or with secondary containment, gravity fed, with above ground connection to permit manual disposal and storage of other waste oil products.
 - .2 Provide accessories and signage as required by the Manitoba Regulations 188/2001 and 19/2011.
- .3 Sump: reinforced concrete sumps, complete with necessary drainage fittings, 10 mm thick galvanized checkered steel plate covers with gasket seal frames anchor bolts.
- .4 Grease traps:
 - .1 Epoxy finished, cast iron or acid resistant finished, welded steel and complete with flow control fitting and thermometer.
 - .2 Waterflow and grease holding capacities as required by design. Set traps in recess in floor.
- .5 Oil/Water Separator: ULC approved; conforming to the Environmental Code of Practice for Aboveground and Underground Storage Tank Systems containing Petroleum Products and Allied Petroleum Products.
 - .1 Separator: construction gravity fed, double walled, inert to petroleum products, with venting system.
 - .2 30 year manufacturer's warranty against leakage due to internal or external corrosion or structural failure.
 - .3 Capable of producing effluent free oil at 15 ppm.
 - .4 Monitoring system capable of detecting leaks as small as 0.38 litre per hour with 99.9 % probability of detection and less than 1.2% probability of false alarm.
- .5 Waste Piping Insulation:
 - .1 Material: 25 mm formed mineral fibre rigid insulation sleeving.
 - .2 "K" Value: maximum 0.035 W/m. °C at 24°C mean temperature.
 - .3 Service Temperature: -14°C to 100°C.
 - .4 Jacket: factory applied vapour barrier jacket to CAN/CGSB 51-GP-52Ma, Type 1, with longitudinal lap seal.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 INSTALLATION .1 General.
.1 Install components in accordance with CAN/CSA-B182.11.
.2 Route and install piping to maintain design grades.
.3 Install components to conserve headroom and space.
.4 Install concealed piping close to building structure to minimize furring.
.5 Group piping at common elevations.
.6 Arrange piping to compensate for expansion and contraction.
.2 Building sewer service connection is provided under Division 33 from 1 m outside of the building foundation.
.3 Floor Drains:
.1 Where floor drains are located over occupied areas, provide waterproof installation.
.2 Install trap primer to floor drains.
.3 Provide dedicated drains for equipment in Mechanical Room.
.4 Clean Outs: lubricate clean-out plugs with mixture of graphite and linseed oil. Prior to building turnover remove clean-out plugs, re-lubricate and reinstall using enough force to ensure permanent leakproof joint.
.5 Under-floor piping is to be installed, supported and sealed at floor penetrations to maintain the following:
.1 Penetrations of the floor slab from underground to the main floor are to be sealed gas-tight to prevent the migration of methane gas into the aboveground spaces.
.2 Make connections to floor drains, cleanouts, and floor outlet fixtures with rigid mechanical joining methods that will resist pull-out and deflection.
.3 Do not use slip-joint pipe joining methods below the floor slab of any building.
.4 Provide support for underground piping from the main floor slab that is both rigid, and durable to prevent changes in slope or losses in pipe integrity due to settlement, heaving or corrosion.
.5 Arrange piping to compensate for pipe expansion and contraction as the soil temperature and temperature of the pipe due to its contents change.

3.3 PIPE SCHEDULE .1 Install sanitary drain and vent lines as follows:

<u>SERVICE</u>	<u>PIPE</u>	<u>FITTING</u>	<u>JOINT</u>
DWV, above	PVC	PVC	Solvent

		Grade			Weld
		DWV, Buried	PVC	PVC	Solvent Weld
<u>3.4 INSULATION</u>	.1	Insulate minimum of 1500 mm of plumbing vents and above ground horizontal drain lines. Insulate exposed waste lines.			
<u>3.5 FIELD QUALITY CONTROL</u>	.1	Manufacturer's Field Services.			
	.1	Have manufacturer of products, supplied under this Section, review Work involved in handling, installation/application, protection and cleaning, of their products. Submit written reports, in format acceptable to Contract Administrator to verify compliance of Work with Contract.			
	.2	Manufacturer's Field Services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.			
	.3	Schedule site visits, to review Work, at stages listed:			
	.1	After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.			
	.2	Twice during progress of Work at 25% and 60% complete.			
	.3	Upon completion of the Work, after cleaning is carried out.			
	.4	Obtain reports, within 3 days of review, and submit, immediately, to Contract Administrator.			
	.2	Verification: provide verification to Contract Administrator that drainage lines are installed with a 1% grade in the direction of flow.			
	.3	Verification requirements in accordance with Section 01 47 13 – LEED Requirements.			
<u>3.6 CLEANING</u>	.1	Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.			

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for rain water drainage and includes performance specification information for rain water drainage piping systems, collection systems, storage systems, rain water drainage specialties, rain water drainage insulation.
 - .2 Rain Water Drainage Piping Systems:
 - .1 PVC Pipe Components for Buried and Exposed Pipes.
 - .3 Rain Water Drainage Specialties:
 - .1 Clean-Outs and Clean-Out Access Covers.
 - .2 Roof Drains.
 - .3 Submersible Pumps.
 - .4 Sump.
 - .4 Rain Water Drainage Insulation:
 - .5 Sustainable requirements for construction and verification:
 - .1 Section 01 47 13 – LEED Requirements.
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements
 - .3 Section 01 74 19 – Construction Waste Management and Disposal.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 78 00 – Closeout Submittals.
 - .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .7 Section 22 42 00 – Special Plumbing Systems.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/ASME B16.29-2007, Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings: DWV.
 - .2 ANSI/ASME B16.23-2002, Cast Copper Alloy Solder Joint Drainage Fittings: DWV.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.
 - .2 ASTM D2564-04(2009)e1], Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 51-GP-52M-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .4 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B1800-06-B181.2-06, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
 - .2 CAN/CSA-B1800-06-B182.11-06, Recommended Practice for

the Installation of Thermoplastic Drain, Storm and Sewer Pipe and Fittings.

.5 National Plumbing Code Of Canada 2010 as amended by the Manitoba Plumbing Code Regulation 32/2011.

1.3 PERFORMANCE REQUIREMENTS

.1 Design rain water drainage systems and install components in accordance with applicable regulations of the National Plumbing Code of Canada 2010 and the Manitoba Provincial Plumbing Code Regulation 32/2011.

.2 Design storm line to accommodate 1 in 50 year storm intensity, minimum 10 minutes. Provide roof scupper overflow to accommodate heavier storms.

.3 Design Controlled Flow rain water drainage system. Design rain water drainage system consisting of internal roof drains and external scuppers, gutters and downspouts.

.4 Design a storm water retention cistern in which rainwater will accumulate for re-use. Design the cistern to accept up to 800 m³ of rainwater for use in the vehicle wash system, c/w overflow to the storm drainage system for excess volume via gravity flow, and a valved drain for maintenance access. Other clear-water wastes including sump pump discharges, humidifier and condensate drains, and drinking fountain wastes are also to drain to the cistern. Provide access hatches, ladders, pump suction sumps and a vent to outdoors under this section.

.5 Provide 1 internal roof drain for each 250 sq m of roof area. Locate drains at mid points of spans. Size drains and lines to provide overflow capacity from one roof area to adjacent areas in case of blockage.

.6 Design horizontal drain piping at a minimum of 1 % slope in direction of flow.

.7 Insulate all indoor piping from roof drains including roof drain sump. Insulate horizontal runs of storm lines.

.8 Route pipes in orderly manner, and maintain proper grades.

.9 Design piping routing located above grade in visible locations parallel to walls and adjacent building elements.

.10 Design connections to site storm water system as specified in Section 33 44 00 – Storm Utility Drains. Make connection to site main minimum of 2400 mm below finished grade.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets. Indicate VOC's during application and curing.
 - .3 Shop Drawings:
 - .1 Submit Shop Drawings to indicate project layout.
 - .1 Vertical and horizontal piping locations and elevations and connections details.
 - .2 Roof drain locations, size, type, anchor and installation details, and finishes.
 - .3 Submit shop drawings for packaged submersible pumps and controls.
 - .4 Other details including cistern.
 - .4 Submit information on operating mechanisms and electrical connections finishes and location of manufacturer's nameplates.
 - .5 Submit catalogue details for types of drain and cleanout products illustrating profiles, dimensions and methods of assembly.
 - .6 Include schedule identifying units and their locations.
 - .7 Instructions: submit manufacturer's installation instructions.
 - .8 Submit manufacturer's instructions for commissioning activities for equipment provided in this section.
 - .9 Closeout submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.5 QUALITY ASSURANCE

- .1 Utilize Design and installation personnel thoroughly familiar with systems of this type.
- .2 Provide multiple units from same manufacturer.
- .3 Pre-Installation meeting:
 - .1 Convene a pre-installation meeting one week prior to beginning on-site installations.
- .4 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .5 COR Certification:
 - .1 All members of the Design Build Team are to be COR Certified to participate in the design, construction and commissioning.
- .6 Verification: Contractor's verification in accordance with Section 01 47 13 – LEED Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Materials and resources in accordance with Section 01 47 13 – LEED Requirements.
- .2 Rain Water Drainage Piping Systems:
 - .1 PVC Pipe Components for buried and above ground Pipes:
 - .1 Pipe: PVC plastic pipe to CAN/CSA-B181.2.
 - .2 Joint and fitting components:
 - .1 Fittings: PVC fittings to CAN/CSA-B181.2.
 - .2 PVC solvent cement: to ASTM D2564.
 - .3 ABS-PVC solvent cement: to ASTM D3138.
 - .3 Rain Water Drainage Specialties:
 - .1 Clean-Outs and clean-out access covers: caulked or threaded type, extend flush to finished floor or wall surfaces, bolted cover plates on vertical rainwater leaders only.
 - .1 Floor clean-out access covers in unfinished areas: round with nickel bronze frames and plates.
 - .2 Floor clean-out access covers in finished areas: round with depressed centre section to accommodate floor finish.
 - .3 Wall clean-outs in finished areas: chrome plated caps. Ensure ample clearance at clean-out for rodding of drainage system.
 - .2 Roof Drains: flow characteristics: Control-flow.
 - .1 Material: major components including body, flow control weir flashing clamping flange, under deck clamping ring and dome strainer: cast iron or cast aluminum, epoxy coated. Bolts: hot-dip galvanized.
 - .2 Body:
 - .1 Sump: min 180 mm internal diameter, min 75 mm deep.
 - .2 Discharge: nominal non-threaded MJ.
 - .3 Bosses: solid, integrally cast, for under deck clamping ring and flashing flange bolts.
 - .4 Deck flange: nominal 300 mm outside diameter, min 50 mm width.
 - .3 Flashing clamping flange: outside diameter same as outside diameter of deck flange; V notched positive draining gravel stop lip, 15 mm high.
 - .4 Dome strainer: min 150 mm high, 8 - 15 mm slotted openings, sides and top.
 - .3 Submersible sump pump:
 - .1 Type: completely submersible, vertical, centrifugal.
 - .2 Casing: cast iron volute and oil filled motor chamber.
 - .3 Impeller: bronze, non-clog with corrosion resistant alloy steel shaft.
 - .4 Bearings: anti-friction ball.
 - .5 Accessories: oil resistant power cord with three prong connector on single fractional horsepower units only.
 - .6 Duplex controls: packaged pre-wired alternator with

- mercury type liquid level controls and control panel to cut in second pump on rising level or pump failure, and separate liquid level control for high level alarm.
- .4 Sump: reinforced concrete sump, complete with necessary drainage fittings; 10 mm thick checkered steel plate cover, gasket frame and anchor bolts.
 - .4 Rain Water Drainage Insulation:
 - .1 Material: 25 mm formed mineral fibre rigid insulation sleeving to ASTM C 547. "K" Value: maximum 0.035 W/m. °C at 24°C mean temperature. Service Temperature: -14°C to 100°C.
 - .2 Jacket: factory applied vapour barrier jacket to CGSB 51-GP-52M, Type 1, with longitudinal lap seal.

2.2 SYSTEM PERFORMANCE

- .1 Provide calculations to verify that roof drains are located to specified area requirements and anticipated design flows for drains.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

- .1 General:
 - .1 Install components in accordance with CAN/CSA-B182.11.
 - .2 Route and install piping to maintain design grades.
 - .3 Install components to conserve headroom and space.
 - .4 Route above grade piping parallel to walls.
 - .5 Install concealed piping close to building structure to minimize furring.
 - .6 Group piping at common elevations.
- .2 Building Service Connection: Refer to Section 33 44 00 – Storm Utility Drains.
- .3 Install PVC connections from building weeping tile to rain water drainage system including: backwater valve, deep seal P-trap, clean-out and manual valve. Provide access for servicing of backwater valve.
- .4 Lubricate clean-out plugs with mixture of graphite and linseed oil. Prior to building turnover remove clean-out plugs, re-lubricate and reinstall using enough force to ensure permanent leakproof joint.
- .5 Under-floor piping is to be installed, supported and sealed at floor penetrations to maintain the following:
 - .1 Penetrations of the floor slab from underground to the main floor are to be sealed gas-tight to prevent the migration of methane gas into the aboveground spaces.
 - .2 Make connections to floor drains, cleanouts, and floor outlet fixtures with rigid mechanical joining methods that will resist

pull-out and deflection.

- .3 Do not use slip-joint pipe joining methods below the floor slab of any building.
- .4 Provide support for underground piping from the main floor slab that is both rigid, and durable to prevent changes in slope or losses in pipe integrity due to settlement, heaving or corrosion.
- .5 Arrange piping to compensate for pipe expansion and contraction as the soil temperature and temperature of the pipe due to its contents change.

3.3 PIPE SCHEDULE

- .1 Pipe Schedule:

SERVICE	PIPE	FITTING	JOINT
DWV, above	PVC	PVC	tin-lead Solvent Weld
DWV, Buried	PVC	PVC	Solvent Weld

3.4 INSULATION

- .1 Insulation: insulate all above ground rainwater piping from roof drains. Insulate roof drain sump. Insulate horizontal run of storm line.

3.5 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.

3.6 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.

PART 1 - GENERAL

- 1.1 SUMMARY .1 Section Includes:
- .1 Materials and installation for General Service Compressed Air Systems and includes performance specification information for
 - .2 Compressed air production, storage and distribution systems.
 - .3 Pneumatic tool stations.
 - .4 Sustainable requirements for construction and verification.
 - .1 Energy efficiency, 01 47 13 – LEED Requirements.
- .2 Related Sections:
- .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 74 19 – Construction Waste Management and Disposal.
 - .5 Section 01 74 11 – Cleaning.
 - .6 Section 01 78 00 – Closeout Submittals.
 - .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
- 1.2 REFERENCES .1 American Society of Mechanical Engineers (ASME)
- .1 ASME B16.11-2009, Forged Fittings Socket Welding and Threaded.
- .2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A48/A48M-03(2008), Standard Specification for Gray Iron Castings.
 - .2 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - .3 ASTM A181/A 181M-06, Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
 - .4 ASTM A216/A216M-08, Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
- .3 Canadian Standards Association (CSA International)
- .1 CAN/CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
 - .2 CSA-W178.1-08, Certification of Welding Inspection Organizations.
 - .3 CSA-W178.2-08, Certification of Welding Inspectors.
- 1.3 PERFORMANCE REQUIREMENTS .1 Select equipment to operate at best efficiency points.
- .2 Compressed Air Systems: design system to deliver continuous 690 kPa pressure at compressed air fixtures, during full flow condition. Maintain pressure air dew point after dryer of -40°C.
- 1.4 SUBMITTALS .1 Submittals in accordance with Section 01 33 00 – Submittal

Procedures.

- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
 - .2 Submit WHMIS MSDS in accordance with Section 01 47 17 – LEED Requirements. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Shop Drawings:
 - .1 Submit Shop Drawings to indicate project layout, including:
 - .1 Information on operating mechanisms, finishes and location of manufacturer's nameplates.
 - .2 Vertical and horizontal piping locations and elevations and connections details.
 - .3 Catalogue details for types of pipe, valves, fittings, filters, drains and accessories illustrating profiles, dimensions and methods of assembly.
 - .4 Schedule identifying units and their locations.
- .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Instructions:
 - .1 Submit manufacturer's installation instructions.
 - .2 Submit manufacturer's instructions for commissioning activities for equipment provided in this section.
- .8 Manufacturer's Field Services: submit reports within three days of receipt from manufacturer.
- .9 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.5 QUALITY ASSURANCE

- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .2 Provide multiple units from same manufacturer.
- .3 Pre-installation meeting:
 - .1 Convene a pre-installation meeting one week prior to beginning on-site installations
- .4 Health and Safety:
 - .1 Do construction occupational health and safety in accordance

with Manitoba Workplace Safety and Health Requirements.

- .5 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.
- .6 Welding Inspectors: must comply with CSA-W178.2.
- .7 Verification: contractor's verification in accordance with Section 01 47 17 – LEED Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Materials and resources in accordance with Section 01 47 13 – LEED Requirements.

2.2 COMPRESSED AIR SYSTEMS

- .1 Compressor: size and type to provide compressed air at design parameters to meet all shop loads and equipment usage as listed below and attached in Appendix C5.
 - .1 Control: Hand-Off-Auto starter, automatically cycled to maintain desired receiver pressure.
 - .2 Receiver: Maximize size to manage peak loads and minimize compressor cycling. Select receiver in accordance with the Manitoba Hydro recommendation for Power Smart compressor systems. Affix provincial inspector's certificate and label.
 - .3 Air Dryers: include necessary accessories, controls and appurtenances. Must be duplex unit for continuous drying of air at full consumption during maintenance and/or regeneration.
 - .4 Filter/Regulator: heavy duty, factory assembled with low pressure side relief valve. Parallel duplex filters with isolation valves are required to permit service during operation.
- .2 Piping: ASTM A53/A53M, Grade B or ASTM A106, Grade B, seamless or electric-resistance welded, Schedule 80 black steel. Fittings to ASME B16.11, Schedule 80 steel.
- .3 Valves: ASTM A181/A181M, Class 70.
- .4 Compressed air systems for Fleet Management Agency and the remainder of the facility are to be separate.

2.3 PNEUMATIC TOOL STATIONS

- .1 Where required in the program of requirements and Room Data Sheets, provide pneumatic tool stations for the following uses:
 - .1 Tire mounting, tire inflating machine.
 - .2 Pneumatic hoists.
 - .3 Impact guns.
 - .4 Pneumatic umps for lubricants.
 - .5 Pneumatic ratchets, drills, and hand tools.
 - .6 Paint application spray guns.

- .7 Work bench air outlets.
- .8 Tire inflating and brake charging hose stations.
- .2 Minimum branch line size: 19 mm.
- .3 Provide drain pocket and blow-down valve at base of all lines flowing down.
- .4 Provide 15 m of compressed air hose in self-retracting reel c/w tire inflation chuck where designated in Room Data Sheets.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, and data sheets.

3.2 PREPARATION

- .1 Obtain approval of authorities having jurisdiction prior to commencing work of this section.

3.3 INSTALLATION

- .1 Compressed Air:
 - .1 Mount compressor with vibration isolators on housekeeping pad.
 - .2 Provide drain from refrigerated air dryer and compressor to oil/water separator.
 - .3 Use zero-loss drains and coalescing filters to maintain air quality.
 - .4 Mount compressed air tool stations at 1200 mm above the floor c/w isolation valve, strainer, pressure regulator, oiler and control valve in the order of flow.
 - .5 Standard and special connectors and quick-release couplings are to be provided to match City of Winnipeg equipment.
- .2 Pressure test systems and submit results in writing to Consultant.

3.4 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer of products, supplied under this Section, review Work involved in handling, installation/application, protection and cleaning, of their products. Submit written reports, in format acceptable to Consultant to verify compliance of Work with Contract.
 - .2 Manufacturer's Field Services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.

- .2 Twice during progress of Work at 25% and 60% complete.
- .3 Upon completion of the Work, after cleaning is carried out.
- .4 Obtain reports, within 3 days of review, and submit, immediately, to Consultant.

.2 Verification:

- .1 Operate equipment and verify that performance criteria specified in this section has been achieved.

- .3 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.

3.5 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.

PART 1 - GENERAL

- 1.1 SUMMARY OF WORK
- .1 This section includes the requirements for the following systems and features:
 - .1 Vehicle Wash Systems.
 - .2 Storm water retention and recycling.
 - .3 Vehicle wash water treatment and recycling.
 - .2 Sustainable requirements for construction and verification.
 - .1 Energy metering, water conservation, waste reduction, and performance optimization.
 - .3 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 74 11 – Cleaning.
 - .4 Section 01 74 19 – Construction Waste Management and Disposal.
 - .5 Section 01 78 00 – Closeout Submittals.
 - .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .7 Section 22 11 19 – Domestic Water Distribution.
 - .8 Section 22 13 18 – Drainage, Waste and Vent Piping – Plastic.
 - .9 Section 22 13 19 – Rain Water Drainage.
- 1.2 REFERENCES
- .1 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- 1.3 DEFINITIONS
- .1 LAND DRAINAGE SEWER: A drainage system solely designed to accept Land Drainage as defined under the Sewer Bylaw 92/2010 issued by the City of Winnipeg.
- 1.4 DESIGN REQUIREMENTS
- .1 Provide a vehicle wash system that recycles the wash water after treatment, and is supplied/refilled from a reservoir (cistern) that receives rain water and melt water from the building roof, and from clearwater waste systems in the building.
 - .2 The wash water treatment and recycling system is to produce effluent water that matches or is cleaner than the City of Winnipeg Sewer Bylaw 7070/97 requires for discharge to a land drainage sewer.
 - .3 The general flows in the system shall be: wash water drains drain into grit interceptors, which empty into pumping sump, and are pumped into the treatment process. Rain water, clear water waste (groundwater sump discharges, drinking fountain drainage and HVAC condensate flows other than from compressed air) and treated wash water are to discharge into the cistern. Wash water flows will be withdrawn from the cistern and pumped through UV disinfection and polishing filters to control particulates and water-borne bacterium in

the vehicle wash system. Any excess storage above an overflow weir will drain by gravity to the Land Drainage System. The cistern must be provided with the means to be drained to the Land Drainage Sewer for inspection and cleaning.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for:
 - .1 Provide for purchased components.
 - .2 Submit customer drawings prepared for this project to document the system architecture and component interconnection requirements.
 - .3 Include complete technical information regarding operating ranges, input and output capabilities.
 - .4 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
 - .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .6 Manufacturer's Field Services: submit reports within three days of receipt from manufacturer.
 - .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals include data as follows:
 - .1 Indicate: brief description of system operation, testing and maintenance requirements.
 - .2 Provide for pumps, treatment units, manufacturer's name, type, year, number of units, and capacity.
 - .3 Submit complete start-up report indicating start-up and system verification sequences.
 - .4 Submit manufacturer's standard warranty, executed by authorized company official.

1.6 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health regulations.
- .2 Verification: in accordance with Section 01 47 13 – LEED Requirements.

1.7 WARRANTY

- .1 For Work of this Section the standard 24 months warranty period prescribed is extended to 60 months.

1.8 MAINTENANCE
SERVICE

- .1 Extended Services:
 - .1 Provide extended service contract to conditions in Section 01 78 00 – Closeout Submittals.
 - .2 Service contract: for 24 months from date of acceptance.
 - .3 During service contract period, monitor system operation on a monthly basis and perform repairs and system servicing within 8 hours of fault detection or service call.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Materials and resources in accordance with Section 01 47 13 – LEED Requirements.

2.2 COMPONENTS

- .1 Wash bays are to be drive-through (flow through).
- .2 Wands are to be manual trigger-controlled high pressure nozzles with pistol grip and hand guard.
- .3 Hoses are to be attached to a swing-arm with a hose retractor so that all parts of a motor-grader can be reached for washing from a single station.
- .4 Control console for each wand-wash station is to offer the following options:
 - .1 Vehicle wash
 - .1 Prewash
 - .2 Foamy brush.
 - .3 Wash
 - .4 Wax
 - .5 Rinse.
 - .6 Vacuum.
 - .2 Heavy equipment wash.
 - .1 Degreaser
 - .2 Wash
 - .3 Wax
 - .4 Rinse
 - .5 Vacuum
- .5 Provide a centralized vacuum unit with piping and hoses to each wash station.
- .6 Provide a wash water pumping and metering system c/w chemical mixing and holding tanks, metering valves, and one year's worth of chemicals.
 - .1 Water source shall be from the storm water retention cistern, with automatic back-up from domestic water if the cistern water level reaches the low-level cut-off.
 - .2 Provide wash water heating to the optimum temperature to remove ice, grease, oil and maximize cleaning chemical effectiveness.

- .7 Backflow prevention on the domestic water make-up.
- .8 Low lift pumping of wash water from the drainage collection and grit separation system into the wash water treatment system.
- .9 Gravity/pumped treatment process including settling, dissolved air flotation, coagulation chemical treatment and polishing filters before discharge into the cistern.

2.3 CORROSION RESISTANCE

- .1 Use materials like stainless steel, rubber, plastic, aluminum and brass that are resistant to corrosion wherever possible.
- .2 Isolate dissimilar metals to prevent galvanic corrosion.

2.4 MOTORS

- .1 All motors are to be TEFC, "Hostile Environment" motors with NEMA 4 electrical connection boxes and corrosion resistant unpainted parts.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with manufacturer's written recommendations or specifications, including product bulletins, handling, storage, and installation instructions, and data sheet.

3.2 INSTALLATION

- .1 Install equipment to manufacturer's written instructions.
- .2 Piping: arrange and support piping to allow complete draining of the system, to prevent shock and water hammer from air in the system, and to eliminate stress and vibration related noise in the piping due to operating pumps and automatic valves.
- .3 Equipment:
 - .1 Install equipment with vibration isolation at connections between pumps and piping or structure.
 - .2 Install all equipment on a minimum 100 high housekeeping pad.
 - .3 Anchor all equipment to the floor, pads or structure using stainless steel fasteners grade T304 or better.
 - .4 Align pumps and their drivers prior to first operation, and recheck after 50 hours of operation. Realign the drivers if required.
- .4 Provide sufficient hose length on wand wash stations to reach all parts of the largest vehicle that will be washed in the facility.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product[s] and submit written

reports, in acceptable format, to verify compliance of Work with Contract.

- .2 Manufacturer's Field Services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
- .4 Obtain reports, within 3 days of review, and submit, immediately, to Consultant.

.2 Verification requirements in accordance with Section 01 47 17 – LEED Requirements.

- .3 Performance Verification:
- .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:
 - .1 After delivery and storage of products.
 - .2 After installation and cleaning is complete.
 - .3 Coordinate and cooperate with the third-party Commissioning Agent that will be identified by the Contract Administrator.

3.4 COMMISSIONING

- .1 Commission equipment of this Section to 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Test and adjust pumps, level and pressure control, wax, degreaser and soap feeders. Prove that equipment operates in manufacturer's published operating range for selected model.

3.5 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations. Take water samples and analyze for Legionella Pneumophila, Fecal Coliforms, and substances listed in Schedules C and D of the Sewer Bylaw 92/2010. Provide reports to the owner and owner's advisor for review. The system shall be approved by the owner before discharges are made to the storm water drainage system.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for plumbing fixtures.
 - .2 Sinks:
 - .1 Lavatory Sinks.
 - .2 Countertop Stainless Steel Sinks
 - .3 Utility Basins.
 - .4 Service Sinks.
 - .3 Showers.
 - .4 Urinals.
 - .5 Water Closets.
 - .6 Drinking Fountain/Cooler.
 - .7 Emergency Eyewash Stations.
 - .8 Other Plumbing Fixtures.
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 74 11 – Cleaning.
 - .4 Section 01 74 19 – Construction Waste Management and Disposal.
 - .5 Section 01 78 00 – Closeout Submittals.
 - .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .7 Section 22 11 19 – Domestic Water Distribution.
 - .8 Section 22 13 18 – Drainage, Waste and Vent Piping-Plastic.
 - .9 Section 22 42 00 – Special Plumbing Systems.

1.2 REFERENCES

- .1 American Refrigeration Institute (ARI.)
 - .1 ARI 1010-02, Self-Contained, Mechanically Refrigerated Drinking-Water Coolers.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA B45 Series-02, Plumbing Fixtures.
 - .2 CAN/CSA B125-05, Plumbing Fittings.
 - .3 CAN/CSA-B651-M95(R2001), Barrier-Free Design.
- .3 City of Winnipeg Universal Design Policy.
- .4 American National Standards Institute (ANSI)
 - .1 ANSI Z358.1-04, "American National Standard for Emergency Eyewash and Shower Equipment.

1.3 PERFORMANCE REQUIREMENTS

- .1 Provide low flow fixtures where shown and specified.
- .2 Provide barrier-free fixtures where indicated and specified, to CAN/CSA-B651.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Coordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
 - .2 Submit WHMIS MSDS in accordance with Section 01 47 13 – LEED Requirements. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
- .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Manufacturer's Field Services: submit reports within 3 days of receipt from manufacturer.
- .8 Instructions: submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .3 COR Certification:
 - .1 All members of the Design Build Team are to be COR Certified to participate in the design, construction and commissioning.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Maintain piping and valve cleanliness by protecting open ends from entry by dust, water, debris or vermin during delivery and storage.
- .2 Material damaged in transit or during storage and handling is to be replaced prior to installations.
- .3 Material for use in potable water system shall be stored in a weathertight storage building or construction.

PART 2 - PRODUCTS

- 2.1 SUSTAINABLE REQUIREMENTS .1 Refer to Section 01 47 13 – LEED Requirements.
- 2.2 MATERIALS .1 Materials and resources in accordance with Section 01 47 13 – LEED Requirements.
- .2 Fixtures: free from flaws and blemishes, clear, smooth and bright surface finish.
- .3 Exposed Brass: high quality institutional grade, chrome plated.
- 2.3 SINKS .1 Sinks:
- .1 Bowl: non-staining material, self-rimming, single or double compartment with undercoating, 90 mm crumb cup strainer and discharge fitting, two (2) hole drilling in ledge back.
- .2 Size: Bowl 500 x 510 x 180 mm.
- .3 Trim: chrome plated metal supply with swing spout, aerator.
- .2 Lavatory Sinks:
- .1 Configuration: countertop, with splash lip, soap depressions, front overflow opening.
- .2 Material: vitreous china or stainless steel.
- .3 Size: 500 x 450 mm.
- .4 Trim:
- .1 Supply: aerated water supply, maximum flow rate 8.35 L/min at 413 kPa, adjustable temperature mixing controls.
- .2 Electronic Faucet: proximity sensor, waterproof, incorporated into unit body, impact and scratch resistant lens, manual override button.
- .1 Proximity Adjustment: 100 mm.
- .2 Run Time: 0-60 seconds maximum, adjustable.
- .3 Power: AC 110 volt circuit c/w transformer, UL and CSA listed.
- .4 Waste: washer-less, pop-up.
- .3 Utility Basins:
- .1 Basin: non-staining material, self rimming, single compartment, two (2) hole drilling to suit faucet in ledge back.
- .2 Trim: chrome plated with fixed spout and aerator.
- .4 Service and Slop Sink:
- .1 Bowl: 900 x 600 x 250 mm size, floor mounted sink with 25 mm wide shoulders, stainless steel strainer.
- .2 Trim: exposed wall type supply with cross handle, spout wall brace, vacuum breaker, hose and spout, strainer, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges, 1.5 metre, 15 mm plain

end reinforced rubber base, hose clamp, mop hanger and stainless steel backsplash for 450 mm above the top of the rim on all adjacent walls.

- .3 Provide stainless steel slash guards between the fixture and the adjacent wall(s) and surfaces on two sides, extending 460mm above the fixture rim up the wall.

2.4 SHOWERS

- .1 Stall: Fibreglass reinforced polyester with bonderized white gel coat finish.
- .2 Base: moulded stone with chrome plated brass waste strainer and tailpiece.
- .3 Shower Head: non-clogging, vandal-proof, ball joint with integral wall bracket and escutcheon, maximum 9.5 L/min flow rate at 550 kPa, suitable for handicap use.
- .4 Manual Taps: barrier free, stainless steel.
- .5 Accessories: soap dish.

2.5 URINALS

- .1 Type: Wall-hung automatic hands-free flush valve.
- .2 Vitreous china, wall-hung with floor mounted carrier system, with shields, integral trap, integral splash rim, and stainless steel strainer.
- .3 Hard wired power supply with battery back-up for automatic flush valves, c/w integral water stop and escutcheons, chrome finish.

2.6 WATER CLOSETS

- .1 Capacity: 6 litres per flush, automatic hands free operation.
- .2 Bowl: vitreous china, with elongated rim.
- .3 Hard wired power supply with battery back-up for automatic flush actuation via infrared sensor, c/w adjustable range integral water stop and escutcheons, chrome finish. In accordance with Barrier-Free design.
- .4 Seat: inorganic material warm to the touch, open front, with cover, self-sustaining hinge. Provide cover stop as back rest for accessible fixtures in accordance with Barrier-Free design.

2.7 FOUNTAIN/COOLER

- .1 Refrigerated Fountain/Cooler: semi-recessed, vandal proof cowling, hooded anti-squirt bubbler with stream guard, automatic stream regulator, pushbutton operator, mounting bracket screwdriver stop.
- .2 Refrigeration section:
.1 Capacity: 30 L/h from 27°C to 10°C, with 32°C ambient air, to ARI 1010.
.2 Electrical: grounded electrical cord with plug, CSA certified.

- .3 Bubbler: pushbutton operated, self-regulating, angle stream, squirt-proof, with nozzle and guard.
 - .4 Non CFC refrigerants.
 - .3 Barrier-Free Coolers: stainless steel with floor supported chair carrier.
- 2.8 OTHER PLUMBING FIXTURES
- .1 Thermostatic Mixing Valve: complete with check valve, volume control shut-off valve on outlet, stem type thermometer on outlet, strainer stop check on inlet, mounted in lockable cabinet.
 - .1 When used in conjunction with emergency eyewash stations, the thermostatic mixing valve shall be fail safe to cold water flow and be set according to ANSI Z358.1-04.
 - .2 Emergency Eye Wash Station: wall mounted, non-metallic, twin spray nozzle stay open valve, stainless steel push flag with trap according to ANSI Z358.1-04.
- 2.9 FLOOR DRAIN
- .1 Epoxy coated cast iron body with minimum 150 mm diameter adjustable nickel-bronze strainer per Section 22 13 18 – Sanitary Waste.
- 2.10 FIXTURE PIPING
- .1 Supply: flexible, non-metallic, individual shut-off valves, escutcheon at wall in exposed areas.
 - .2 Waste: non-metallic, with P trap and cleanout on fixtures with no integral trap.
- PART 3 - EXECUTION
- 3.1 MANUFACTURER'S INSTRUCTIONS
- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
- 3.2 INSTALLATION
- .1 Locate plumbing fixtures at locations shown on drawings, in numbers required by code and as indicated in the Program of Requirements.
 - .2 Provide barrier free fixtures where required.
 - .3 Seal sinks to prevent water leaks.
 - .4 Provide flexible supplies to fixtures with screwdriver stops, reducers and escutcheons.
 - .5 Wall Mounted Fixtures: use approved floor supported carriers to suit application.
 - .6 Floor Mounted Fixtures: solidly attach water closets to floor with lag screws and bolt cap. Do not use lead flashing to hold closet in place.

- .7 Install hose and faucets and hose connections with vacuum breakers.
- .8 Supply tempered water to shower heads through a centrally located thermostatic mixing valve.
- .9 Locate thermostatic mixing valve in cabinet at approved locations. Provide one mixing valve for each shower room and one on distribution loop to eyewash basins
 - .1 The eyewash tempered water supply loop requires constant circulation to maintain temperature and potable conditions. Provide a recirculation pump and piping system.
- .10 Clean exposed fixtures after installation is complete.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection.
 - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Pressure test piping to same standards as domestic water piping code requirements.
 - .3 Measure delivery at emergency eyewash station and adjustable fixtures to ensure design pressure and flow performance. Adjust if necessary to meet requirements of CSA B45, CSA B125, and ANSI Z358.1.
- .2 Manufacturer's Field Services.
 - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product[s] and submit written reports to the Consultant and Owner's Advisor, in acceptable format, to verify compliance of Work with Contract.
 - .2 Manufacturer's Field Services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
 - .4 Obtain reports, within 3 days of review, and submit, immediately, to Consultant and Owner's Advisor.
- .3 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.

3.4 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 This section covers all items in the Mechanical scope of work and is to be read in conjunction with all sections of the Mechanical Division and in common with related requirements from all other sections as they pertain to Mechanical.
- .1 Section 01 33 00 – Submittal Procedures
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction Waste Management and Disposal.
 - .6 Section 01 78 00 – Closeout Submittals.
 - .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .8 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.
 - .9 Section 23 11 00 – Energy Supply
 - .10 Section 23 21 00 – Heat Generation
 - .11 Section 23 30 00 – HVAC Distribution
 - .12 Section 23 81 00 – Refrigeration
 - .13 Section 23 82 00 – Terminal and Packaged Units
 - .14 Section 23 84 00 – Other HVAC Systems and Equipment.

1.2 REFERENCES

- .1 Provide a complete and code compliant design, in accordance with the following codes and standards:
- .1 The National Building Code of Canada 2010 (NBC) as referenced by and amended by the Manitoba Building Code (MBC) Regulation 31/2011;
 - .2 The National Fire Code of Canada 2005 (NFC) as referenced by and amended by the Manitoba Fire Code (MFC) Regulation 216/2006;
 - .3 The National Plumbing Code of Canada 2010 (NPC) as referenced by and amended by the Manitoba Plumbing Code (MPC) Regulation 32/2011;
 - .4 The Model National Energy Code of Canada, 1997;
 - .5 The City of Winnipeg Bylaws and Regulations;
 - .6 National Fire Protection Association (NFPA) Standards
 - .7 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) guides, data books and standards;
 - .8 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA);
 - .9 Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) digests
 - .10 The Hydronic Institute (HI);
 - .11 Industrial Ventilation Manual as published by the American Conference of Government Industrial Hygienists (ACGIH);
 - .12 The Canadian Standards Association (CSA);
 - .13 The Canadian Green Building Council (CGBC);
 - .14 The Underwriter's Laboratory of Canada (ULC) or its

- .15 equivalent as accepted under the MBC, MFC, and MPC;
- .16 The American Society of Plumbing Engineers (ASPE);
- .16 As further listed or referenced within this request for proposal.

- .2 The materials and products used within the design shall be compliant with the requirements of:
 - .1 The Canadian Standards Association (CSA);
 - .2 The Underwriter's Laboratory of Canada (ULC) or its equivalent as accepted under the MBC, MFC, and MPC.
 - .3 The American National Standards Institute (ANSI);
 - .4 The American Society of Mechanical Engineers (ASME);
 - .5 The American Society for Testing and Materials International (ASTM);
 - .6 The Canadian General Standards Board (CGSB);
 - .7 The City of Winnipeg Construction Standards.

- 1.3 DESIGN PERFORMANCE REQUIREMENTS
 - .1 Ambient Design Conditions:
 - .1 Exterior:
 - .1 Winter: to local building code for project location, 1% January design temperature and wind velocity of 4.6 m/s.
 - .2 Summer: to local building code for project location, 2.5% July design day and wet bulb temperature, wind velocity of 2.3 m/s.
 - .2 Interior:
 - .1 General interior spaces: 23°C and 30 to 50% relative humidity, at minimum and maximum design outside ambient conditions.
 - .2 Special interior spaces: Shops, enclosed storage and vehicle garages are to be heated to 23°C, and when the outdoor air temperature exceeds 23°C, maintain a space temperature rise over outdoor temperature of 4°C maximum using ventilation.
 - .3 Pressurization: maintain building pressure of +5 Pa, plus or minus 10%.
 - .3 Comfort Conditions shall meet or exceed those stated below, and in accordance with the requirements of the LEED® as specified in Section 01 47 13 LEED Requirements, and values established by the Canadian Green Building Council. Systems are to maintain comfort conditions as listed in ASHRAE 55-2004.
 - .2 Energy Considerations:
 - .1 Design and select mechanical systems to the requirements of the Model National Energy Code for Buildings (MNECB) 1997 as issued by the National Research Council of Canada.
 - .2 Design and select mechanical equipment and systems to meet ASHRAE/IESNA 90.1 – 2007, "Energy Standard for Buildings except Low Rise Residential Buildings".
 - .3 Energy sources are to be chosen based on energy efficiency and operating cost, with preference to renewable energy sources and carbon generation impact. Potential strategies include:

- .1 Use of solar wall technologies for preheating of outdoor air in heating mode.
 - .2 Use of Ground loop heat pump systems or groundwater source geothermal energy for heating where the payback over conventional forms of energy is 10 years or less.
 - .3 Use of groundwater source cooling or snow pile melt-water cooling as opposed to conventional mechanical cooling.
 - .4 Use of solar panels to generate electricity and/or heat domestic water.
 - .5 Incorporating air-to-air heat exchangers and energy recovery devices to reduce energy discharge from exhaust air streams and recover moisture from airstreams not containing hazardous contaminants.
 - .6 Harvesting energy from Clearwater wastes and storm water before these streams are discharged into the disposal system.
- .3 Acoustic Requirements:
- .1 General interior spaces: maintain maximum NC 30.
 - .2 Special interior spaces: maintain maximum NC 40 in shop areas.
 - .3 Equipment:
 - .1 Exterior: maximum radiated noise of 48 dBA at 1m.
 - .2 Interior: maximum radiated noise of 40 dBA at 1m.
- .4 Air Quality:
- .1 Anticipated number of building occupants indoors will vary based on seasons, and shifts. The maximum number of building occupants to be designed for on a continuous occupancy basis is 55. Short term occupancy for meetings, training, at shift changes and during emergency operations will exceed the above, and will impact the design capacity of building systems. Design short term occupancies for 150 persons. MET-Rate Activity Summary Table in Appendix C3 provides the gender and level of effort expended by the full-time occupants, and their assigned locations for peak calculations.
 - .2 Carbon dioxide: limit maximum carbon dioxide levels to 700 ppm.
 - .3 Minimum fresh air: not less than required by ASHRAE Standard 62, 0.812 L/s.sq m of gross floor area, or 10 L/s per person, whichever is greatest.
 - .4 Locate fresh air intakes to prevent contamination by external sources such as road traffic, idling vehicles, smoke stacks or exhaust outlets, and wind-driven odours from nearby properties.
 - .5 Carbon Monoxide (CO): Levels of 12.5 parts per million in areas where motor vehicles are stored or operated are to cause first stage alarm conditions and start ventilation systems to control the concentration of CO. Levels of 25 parts per million are to cause the ventilation system to increase to full purge mode, and annunciate as both an audible and visual

- alarm. Levels of carbon monoxide in all areas are to be controlled to the 8 hour Threshold Limit Value according to the ACGIH standards. Vehicle operation within enclosed garage areas will be limited to 5 minutes duration of 25% of the fleet of vehicles stored.
- .6 Nitrogen Oxides (NO_x): Control the levels to 0.25 parts per million using ventilation, set alarms to actuate at 1.5 ppm, one half of the 8-hour Threshold Limit Value according to the ACGIH standards. Vehicle operation within enclosed garage areas will be limited to 25% of the fleet of vehicles stored.
- .5 Heating:
- .1 Office area perimeter: heat using radiant floor slabs. Use heating water sourced from reclaimed building heat if available. Maintain minimum 18°C inside air temperature during unoccupied hours without operating air handling units.
- .2 Where the floor system is raised, provide ceiling-mounted radiant panels. Use heating water sources from reclaimed building heat if available. Maintain 18°C inside air temperature during unoccupied hours without operating air handling units.
- .3 Heat shops, storage and vehicle garages with radiant floor slabs. Provide supplementary hydronic unit heaters in shops and storage for trim heat. Provide overhead indirect natural gas radiant tube heaters in the vehicle garages for quick temperature recovery.
- .6 Cooling: where possible, interface heat rejection from refrigeration equipment to water heating system. Select interface equipment for minimum 80% efficiency.
- .1 Cooling towers: assume 2°C wet bulb above design outdoor wet bulb temperature.
- .2 Calculate loads including internal heat gains from equipment as listed in the Program of Requirements and occupancy as listed under 1.3.4 Air Quality above.
- .7 Ventilation:
- .1 Provide 100% outside air intake at outdoor ambient temperatures above 18°C to garages and shops where hazardous materials and processes are located. Below 18°C, provide sufficient ventilation to control the hazards that may be created in the space.
- .2 Minimum ventilation:
- .1 Washrooms, janitorial rooms, waste storage rooms, coffee stations and lunch/coffee rooms: 10 L/s/m².
- .2 Other areas: 4.0 L/s/m² or 5 air changes per hour regardless of internal loads, whichever is greater.
- .3 Fully exhaust designated spaces.
- .3 Shops, shipping, receiving and truck areas:
- .1 Above grade: ventilate with multi-speed or variable speed exhaust fans, controlled by carbon monoxide detection and alarm systems. Provide make-up air from outside air through shafts or louvers. Exhaust from overhead and under dock openings where vehicle exhaust gases may pool.

- .4 Smoke control: base smoke control and life safety system design on Measure A for fully sprinklered buildings.
- .5 Special ventilation systems to control particulates, mists, gases and vapours at the source are specified in Section 23 84 00 – Other HVAC Systems and Equipment.

1.4 SUBMITTALS

- .1 Submit documentation of design approach in MNECB recommended format. Indicate whether building will be designed to prescriptive, performance or trade-off approaches.
- .2 Submit documentation for approval of Contract Administrator:
 - .1 Indoor design temperatures.
 - .2 Ductwork: static pressure calculations and leakage class calculation.
 - .3 Heat recovery calculations: from exhaust air streams, gray/clearwater waste and solar wall preheating system.
 - .4 Thermal insulation of pipes and air ducts.
 - .5 Location of dampers and thermostatic controls and cutoffs.
 - .6 Air flow control areas and temperature control zones.
 - .7 Efficiency of unit and packaged heating equipment.
 - .8 Power requirements for operation of heating, ventilating and cooling systems with air volumes and type of control used for ventilation.
 - .9 Types and capacities of, and controls for, heating and cooling systems.
 - .10 Pumps: details of systems with variable flow.
 - .11 Heat recovery ventilators: description of characteristics.
 - .12 Service water heating equipment: efficiency.
 - .13 Service water distribution layouts and controls.
 - .14 Trade-offs: where applicable.
 - .15 Statement of design intent and operation for mechanical systems including:
 - .1 Intended function.
 - .2 Plans, drawn to scale, that indicate nature and extent of work to show conformance with MNEC.
 - .3 System capabilities at design conditions.
 - .4 Performance characteristics.
 - .5 Distribution arrangement.
 - .6 Sequence of operation.
 - .7 Start/Stop procedures.
 - .8 Adjustment procedures.
 - .9 Change over sequences.
 - .10 Start-up and Shut-down sequences.
 - .11 Schematic and control diagrams of systems.
 - .16 Whole Building Energy Simulation showing comparison of proposed construction to MNECB model.
- .3 Tag schedule: submit six identification flow diagrams for each system. Include valve tag schedule, designating number, service, function and location of each tagged item and normal operating position of each valve.

1.5 QUALITY

- .1 Utilize design and installation personnel thoroughly familiar with

ASSURANCE

systems of this type.

- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .3 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

PART 2 - PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

- .1 Refer to Section 01 47 13 – LEED Requirements.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

3.3 MAINTENANCE

- .1 Design to provide:
 - .1 Easy access for cleaning and inspecting filters. Use high quality industrial grade equipment to meet the Durable Building requirements.
 - .2 Access to air handling units for service, inspection, and to facilitate effective drainage of air handling units (AHU's). Rooftop equipment is to be avoided, locate all equipment indoors in accessible locations.
 - .3 No equipment that requires maintenance, repair, or replacement is to be installed below the floor slab.
 - .4 Where rooftop equipment cannot be avoided, provide guardrails if within 1.5m of the edge of the roof, service decks to protect roof from damage, and have freeze-protected water supply and convenience plug-ins nearby for service.

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for balancing and certification of HVAC air and liquid systems.
 - .2 Sustainable requirements for construction and verification.
 - .1 Refer to Section 01 47 13 – LEED Requirements,
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction Waste Management and Disposal.
 - .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .7 Section 01 78 00 – Closeout Submittals.
 - .8 Section 23 05 00 – Design Requirements – HVAC.
 - .9 Section 23 11 00 – Energy Supply.
 - .10 Section 23 21 00 – Heat Generation.
 - .11 Section 23 30 00 – HVAC Distribution.
 - .12 Section 23 81 00 – Refrigeration.
 - .13 Section 23 82 00 – Terminal and Packaged Units.
 - .14 Section 23 84 00 – Other HVAC Systems and Equipment.

1.2 REFERENCES

- .1 Associated Air Balance Council (AABC).
 - .1 National Standards for Total System Balance 2002.

1.3 DESIGN REQUIREMENTS

- .1 Perform air and water balancing, to minimum requirements specified in AABC, National Standards manual.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for testing and balancing equipment.
- .4 Instructions: submit manufacturer's installation instructions.
- .5 Reports:
 - .1 Submit four copies of Balancing and Certifying Report upon

completion of work.

- .2 Report Format: AABC Test and Balance Procedures manual. Include recommendations where additional balancing devices should be installed. Include actual test procedure details, initial and final balanced performance figures.

1.5 QUALITY ASSURANCE

- .1 Engage balancing agency accredited by the Associated Air Balance Council (AABC).
- .2 Measurement Instruments: calibrated to AABC recommendations.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .4 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 ADJUSTING

- .1 Perform system balancing to AABC - Test and Balance Procedures.
- .2 Permanently and indelibly mark valve, damper and other adjustment device settings in their balanced position.
- .3 Set and lock memory stop balancing devices.
- .4 Balance liquid systems only after successful balancing of air systems.

3.2 FIELD QUALITY CONTROL

- .1 Performance Verification:
 - .1 Perform random flow readings in presence of the Contract Administrator after completion of balancing report. If inconsistencies are noted between balancing report and random readings, re-balance entire system and re-submit balancing report until random readings coincide with report at no additional cost.

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 47 13 – LEED Requirements.
- .3 Section 01 47 17 – Sustainable Requirements – Contractor's Verification.
- .4 Section 01 74 11 – Cleaning.
- .5 Section 01 74 19 – Construction Waste Management and Disposal.
- .6 Section 01 78 00 – Closeout Submittals.
- .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .8 Section 23 21 00 – Heat Generation.
- .9 Division 26 – Electrical

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B139-04, Installation Code for Oil-Burning Equipment.
 - .2 CAN/CGA-B149.1-05, Natural Gas and Propane Installation Code.
- .2 Canadian Council of Ministers of the Environment (CCME)
 - .1 CCME PN1326-2003, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products, as referenced by Manitoba Regulation 188/2001 Manitoba Workplace Safety and Health.
- .3 Manitoba Regulation 188/2001 – “Storage and Handling of Petroleum Products and Allied Products “as issued under the Dangerous Goods Handling and Transportation Act”.
- .4 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Fire Code of Canada 2005 as amended by the Manitoba Fire Code under Manitoba Regulation 216/2006.

1.3 DESIGN PERFORMANCE REQUIREMENTS

- .1 Radiant Heating:
 - .1 Indirect fired natural gas radiant tube heaters with vacuum pump in shop and vehicle garage areas for quick recovery.
 - .2 In-floor radiant heating systems within office and administration areas, shops, storage and vehicle garages.

- .3 Overhead radiant panels in locations where there are raised floors
- .2 Hot Water:
 - .1 Source: Central Heating Plant located in at grade adjacent to the building or in a penthouse.
 - .2 Conditions: low temperature hot water, produced in fully condensing natural gas fired boilers.
 - .3 Quantity available: as required to maintain design conditions plus a margin of safety/growth of 10%.
 - .4 Required even if geothermal energy is provided.
- .3 Geothermal Energy:
 - .1 Source: groundwater heat pumps or geothermal loops.
 - .2 Quantity: As available, up to and including 100% of heating capacity including 10% margin of safety/growth.
- .4 Chilled Water:
 - .1 Source: Central Cooling Plant located in penthouse, at grade adjacent to the building or from geothermal/groundwater.
 - .2 Conditions: 6°C or colder.
 - .3 Quantity available: as required to maintain design conditions plus a margin of safety/growth of 5%.
 - .4 Required as backup to the snow dump melt-water system.
 - .5 Snow dump melt-water:
 - .1 Source: snow pile at Foster Street and Thomas Avenue and/or retention ponds on the Public Works yard site.
 - .2 Quantity: as available up to and including 100% of required cooling load of the facility plus a 5% margin of safety/growth.

PART 2 - PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Sections
 - .1 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .2 01 47 13 – LEED Requirements.

2.2 MATERIALS

- .1 Piping:
 - .1 Materials: to latest code and standard for application.
 - .2 Design systems drainable and serviceable.
- .2 Fuel Source:
 - .1 Natural gas: coordinate and pay all fees and contribution of cost to have Manitoba Hydro supply an adequate size of natural gas meter and regulator.
- .3 Fuel Oil: Provide fuel oil storage for the operation of the diesel engine-driven emergency generator for the duration as described in Section 26 05 02. The design is to include storage tank installations and

associated piping, pumps, and valves in accordance with:

- .1 CEPA federal guidelines and CCME Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products as referenced by the Manitoba Regulation 188/2001 "Storage and Handling of Petroleum Products and Allied Petroleum Products Regulation issues under The Dangerous Goods handling and Transportation Act C.C.S.M. c. D12.
- .2 National Fire Code of Canada 2005 as amended by the Manitoba Fire Code Regulation 216/2006.
- .3 CAN/CSA-B139-04, "Installation Code for Oil-Burning Equipment".

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install to manufacturer's written installation instructions.
- .2 Install systems in accordance with latest codes and standards. Install to approval of authorities having jurisdiction.
- .3 Provide required connections and piping at mains, including necessary valves and service vaults from main to equipment.
- .4 Install natural gas pipe and equipment to CAN/CGA-B149.1, and to utility requirements.
- .5 Install fuel oil storage tanks and other oil equipment to the requirements of CAN/CSA-B139-04, "Installation Code for Oil-Burning Equipment" or the National Fire Code of Canada 2005 as amended by the Manitoba Fire Code Regulation 216/2006, whichever is applicable. Tanks are to be equipped with secondary containment and spill containment devices. Provide access at piping to tank connections for oil burning appliances.

3.3 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for:
 - .1 Condensing Boilers.
 - .2 Auxiliary Equipment.
 - .3 Direct Fired Make-up Air Units.
 - .4 Overhead radiant heaters in shops areas.
 - .2 Sustainable requirements for construction and verification:
 - .1 Refer to Section 01 47 17: Sustainable Requirements: Contractor's Verification.
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .4 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .5 Section 01 74 11 – Cleaning.
 - .6 Section 01 74 19 – Construction/Demolition Waste Management and Disposal.
 - .7 Section 01 78 00 – Closeout Submittals.
 - .8 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .9 Section 23 11 00 – Energy Supply.
 - .10 Section 23 05 00 – Design Requirements – HVAC
 - .11 Division 25 – Integrated Automation.
 - .12 Division 26 – Electrical

1.2 REFERENCES

- .1 American Boiler Manufacturer's Association (ABMA)
- .2 American National Standards Institute (ANSI)/Canadian Standards Association (CSA)
 - .1 ANSI Z21.13-2010/CSA 4.9-2010, Gas-Fired Low-Pressure Steam and Hot Water Boilers.
- .3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .4 American Society of Mechanical Engineers (ASME) Codes
- .5 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 53/A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - .2 ASTM A 106-08, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
- .6 Manitoba Workplace Safety and Health / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA MG 1-2006, Rev. 1, Motors and Generators.

- .2 NEMA 250-2008, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - .8 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2009, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 255-2006, Standard Method of Test of Surface Burning Characteristics of Building Materials.
 - .9 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- 1.3 DESIGN REQUIREMENTS
- .1 Piping: size piping and fittings to ASHRAE pipe sizing standards, to maintain conditions specified by equipment manufacturers.
 - .2 Performance Requirements: ANSI Z21.13/CSA 4.9 testing procedures.
 - .3 Design Heating Capacity:
 - .1 Hot Water: sufficient in temperature and capacity to meet maximum design load +10% safety factor.
- 1.4 SUBMITTALS
- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for Boilers, Pumps and Auxiliary Equipment.
 - .3 Submit WHMIS MSDS in accordance with Section 01 33 00 – Submittal Procedures. Indicate VOC's for adhesive and solvents during application and curing.
 - .4 Submit complete start-up report indicating start-up and system verification sequences.
 - .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
 - .6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .7 Instructions: submit manufacturer's installation instructions.
 - .8 Manufacturer's Field Services: submit reports within 3 days of receipt from manufacturer.
 - .9 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout

Submittals include data as follows.

- .1 Indicate: brief description of heat generation equipment and components.
- .2 Provide nameplate data for units, manufacturer's name, type, year, number of units, and capacity.

1.5 QUALITY ASSURANCE

- .1 Provide products from same manufacturer.
- .2 Provide equipment with required ASME plate and stampings.
- .3 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .4 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .5 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.
- .6 Verification: contractor's verification in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Sustainable Design: Refer to Section 01 47 13 – LEED Requirements.
- .2 Pumps:
 - .1 Materials: API 610, ASME.
 - .2 Motor: ANSI/NEMA MG 1.
- .3 Insulation:
 - .1 Maximum flame spread 25 maximum smoke developed 50 to CAN/ULC S102.
 - .2 Adhesives, sealers, vapour coating, mastics, laggings and bedding: material which does not soften, corrode or deteriorate in wet or dry state, of type recommended by insulation manufacturer for the proposed application.
 - .3 Provide low odour, low volatile organic compound (VOC) materials.

2.2 BOILERS

- .1 Boiler: ANSI Z21.13/CSA 4.9, type and size to meet design heating requirements, burner with ULC and CSA label.
- .2 Efficiency: minimum 90% from 25% to 100% of maximum continuous firing rate, fully condensing.
- .3 Size to be a minimum of 50% of the total load each for triplex boilers, or 70% of the total load for duplex boilers. Provide a minimum of two boilers in the facility heating system.

- .4 Accessories: piping, valves, condensate neutralizer and accessories to achieve a complete heating system, with connections to energy supply piping and heat distribution piping.
 - .5 Insulate to maintain maximum equipment skin temperature of 70°C at ambient room temperature of 32°C, and comply with ASHRAE 90.1 energy efficiency.
 - .6 Control System:
 - .1 Packaged controls with outdoor air temperature sensor for reset control. Provide for pump interlock and low flow switch to meet required safety shutdown requirements.
 - .2 Enclosure: to NEMA 250, Type 1.
 - .3 Alarms: electronic, audible, for high temperature and low water level, and with full interface to BAS system using N2 Open or BACnet Protocols. LON protocol will not be accepted.
 - .7 Gauges: pressure and temperature, on fluid in and out connections, and at critical internal conditions.
 - .8 Burner Safeguards.
 - .1 Provide burner safety system for generators.
 - .2 Monitor for boiler, burner and auxiliary equipment failure, and operator error. Take corrective or preventative action. Monitor start-up, shut-down and operation through generator operating range to prevent unsafe operation.
 - .3 Control: microprocessor based, with plug-in modules, compatible with combustion control systems. Bypass logic with hardwired emergency boiler trip circuit.
 - .4 Flame scanners: monitor igniter flame and main flame.
 - .5 Pressure regulators: for pilot, main burner supply pressure, and gas pressure.
- 2.3 INDIRECT FIRED RADIANT TUBE HEATERS
- .1 Provide vacuum type radiant tube heaters with aluminized Steel reflectors, burner section, vacuum fan/pump, and discharge chimney sections.
 - .1 Use for quick temperature recovery in shop and vehicle storage garage areas.
 - .2 Where height is available for proper spacing from occupants and equipment.
 - .3 Refer to Section 23 82 00 – Terminal and Packaged Units.
- 2.4 MAKE-UP AIR UNITS
- .1 Provide direct-fired make-up air units as packaged natural gas-fired units as required in Section 23 82 00 – Terminal and Packaged Units.
- PART 3 - EXECUTION
- 3.1 MANUFACTURER'S INSTRUCTIONS
- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage

and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install equipment according to manufacturer's instructions.
- .2 Install equipment on pads which extend beyond equipment base minimum 100 mm.
- .3 Operate equipment at best efficiency points.
- .4 Install insulation to NFPA 90A.
- .5 Provide insulation to boiler, heat exchangers, expansion tank, pumps, piping and valves to manufacturer recommendations and TIAC Standards.
- .6 Provide gas, heating water and glycol solution, piping, control valves, isolation valves, from point of service connection to heat generator.
- .7 Provide lightning protection on chimney stack.
- .8 Connect breeching from boiler outlet to chimney.
- .9 Provide flexible isolation fittings between suction and discharge of pumps and associated piping.
- .10 Weld piping over 50 mm diameter where the operating pressure is rated over 104 kPa. Welded piping is subject to radiographic inspection where required in ASME B31.1.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product[s] and submit written reports, in acceptable format, to verify compliance of Work with Contract.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
 - .4 Obtain reports, within 3 days of review, and submit, immediately, to Consultant and Owner's Advisor.
- .2 Verification requirements in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification, include:

- .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-emitting materials.
- .3 Performance Verification:
- .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Perform periodic site inspection visits by manufacturer's representative to verify installation complies with manufacturer's instructions:
 - .1 After delivery and storage of products.
 - .2 When preparatory Work upon which product installation depends is complete.
 - .3 Twice during installation progress at 25% and 60% complete.
 - .4 After installation and cleaning is complete.

3.4 DEMONSTRATION

- .1 Demonstrate equipment of this section to the Contract Administrator.
- .2 After hot water generator has been in operation for two weeks, provide experienced and qualified boiler, burner and combustion control system manufacturer representatives to demonstrate boiler operating capability.
- .3 Provide training and instructions to boiler operators, including burner control and safety systems, piping system components, valves, pumps and controls.

3.5 COMMISSIONING

- .1 Commission equipment to 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Test and adjust boiler for capacity and efficiency to ASME standard short form.
 - .1 Prove guaranteed efficiencies at 50% and 100% load.
 - .2 Operate boiler with automatic combustion controls in manual mode.
 - .3 Fuel, water, chemicals, power and heating load will be supplied by the Contract Administrator.

3.6 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

- 1.1 SUMMARY
- .1 Section Includes:
 - .1 Materials and installation for:
 - .1 Air distribution systems.
 - .2 Hydronic distribution systems.
 - .3 Other HVAC distribution systems.
 - .2 Sustainable requirements for construction and verification.
 - .1 Section 01 47 17 – Sustainable Requirements: Contractor’s Verification.
 - .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor’s Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction Waste Management and Disposal.
 - .6 Section 01 78 00 – Closeout Submittals.
 - .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .8 Section 23 05 00 – Design Requirements – HVAC
 - .9 Division 25 – Integrated Automation
 - .10 Division 26 - Electrical
- 1.2 REFERENCES
- .1 Air Moving and Control Association International, Inc. (AMCA)
 - .2 Air-Conditioning, Heating, and Refrigeration Institute (AHRI)
 - .3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings.
 - .4 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 53/A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - .5 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .6 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2009, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 96-2008, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
 - .7 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA MG 1-2006, Motors and Generators.

- .8 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2nd edition, 1995.
- .9 Underwriters Laboratories of Canada Inc. (ULC).

1.3 DESIGN REQUIREMENTS

- .1 Provide complete and operational HVAC and water system, designed to achieve desired space environment criteria.
- .2 Use heat recovery equipment in project HVAC design.
- .3 Size air handling units for the offices areas to provide variable volume design air supply volume and pressures. Provide variable volume operation through use of variable frequency drives on motors. Select fans and motors to match variable frequency drive. Air delivery to shop areas is to be constant volume.
- .4 Pumps and Fans: select fans for optimum efficiency over the design operating pressure range.
- .5 Pipe Sizing: calculate sizes to ASHRAE guidelines.
- .6 Duct Sizing: perform duct sizing calculations in accordance with ASHRAE guidelines. All duct design to conform to ASHRAE guidelines and SMACNA Standards.
- .7 Acoustics:
 - .1 Select equipment, and perform acoustic duct and transmission calculations using ASHRAE handbooks, to meet or exceed design sound level control requirements.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for heating, ventilation and air conditioning distribution piping and ductwork.
 - .2 Submit WHMIS MSDS in accordance with Section 01 33 00 – Submittal Procedures. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Design Data/Test Reports.
 - .1 Perform Life Cycle Cost Analysis for heat recovery equipment and submit design data.
- .5 Submit complete life cycle costing analysis of alternative steam and hot water distribution system proposals for the Contract

Administrator's review.

- .6 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .7 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .8 Instructions: submit manufacturer's installation instructions.
- .9 Manufacturer's Field Services: submit reports within three days of receipt from manufacturer.
- .10 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals include data as follows:
 - .1 Indicate: brief description of heating, ventilation and air conditioning distribution piping and ductwork.
 - .2 Provide for equipment, manufacturer's name, type, year, number of units, and capacity.
 - .3 Submit complete start-up report indicating start-up and system verification sequences.

1.5 QUALITY ASSURANCE

- .1 Provide AMCA or AHRI certified equipment where possible.
- .2 Test air distribution ductwork to SMACNA Duct Leakage Test Manual. The Contract Administrator is to witness tests.
- .3 Equipment: similar functioning equipment from same manufacturer.
- .4 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .5 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .6 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.
- .7 Verification: contractor's verification in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Maintain equipment condition and cleanliness by protecting all openings and surfaces from fouling by dust, water, debris, corrosion, or vermin during delivery, storage and handling.
- .2 Materials damaged in transit or during storage and handling are to be replaced prior to installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Materials and resources in accordance with Section 01 47 17 – Sustainable Requirements: Contractor’s Verification.
- .2 Air Distribution System:
 - .1 Duct: SMACNA HVAC Duct Construction Standards, Metal and Flexible. Use galvanized steel ductwork except as otherwise noted.
 - .2 Dishwasher Exhaust Duct: stainless steel.
 - .3 Wash bay supply air and exhaust ducts are to be made of aluminum for corrosion resistance.
 - .4 Waterproof ducts upstream and downstream of humidifier units, and for fresh air intakes and washbay exhaust.
 - .5 Balancing Dampers: splitter dampers or balancing dampers where possible on larger main branches; duct balancing dampers on small branches. Use outlet balancing devices only where branch balancing is not possible.
 - .6 Flexible Duct Connectors: maximum length 1.5 metres, ULC listed, rated for design system pressure.
 - .7 Dampers - Operating:
 - .1 Select size and type, based on AMCA certified performance ratings.
 - .2 Blade profile to suit service, insulated when in envelope plane or handling outdoor air.
 - .3 Seals: neoprene or low temperature silicone rubber blade and side seals to achieve maximum 1% air volume leakage at design temperature and system pressure, and to withstand and maximum design velocity.
 - .4 Bearings: self-lubricating.
 - .5 Linkage: sufficient strength and locations, allow motors to operate damper without causing structural damage or warping.
 - .6 Motors: sufficient strength to operate dampers at greatest design load, of type compatible with air control system and damper design.
 - .8 Dampers - Fire: ULC labelled, fusible link temperature rating to ULC listing and fire compartment rating.
 - .9 Acoustic Treatment: silencers and acoustic duct lining, to meet specified sound levels.
- .3 Fluid Distribution System: Piping to ASTM A 53/A 53M.
 - .1 Hot Water Distribution Piping: Schedule 40 steel.
 - .2 Glycol Distribution Piping: Schedule 40 steel.
 - .3 Chilled Water Distribution Piping: Schedule 40 steel.
- .4 Terminal Devices:
 - .1 Convectors:
 - .1 Convectors: coil unit with items inside a baked enamel, sheet metal cabinet.
 - .2 Equip units with sheet metal enclosures.
 - .2 Fan Coil Units:

- .1 Fan Coil Units: galvanized steel, centrifugal forward curved, statically and dynamically balanced fan in a galvanized steel housing.
- .2 Cabinet: steel, complete with baked enamel finish and hinged access door.
- .3 Units: acoustically insulated.
- .4 Unit: equip with an externally insulated galvanized steel drain pan complete with minimum 75 mm drain connection.
- .5 Units: equip with a minimum 25 mm thick replaceable pleated media filter.

2.2 AIR HANDLING EQUIPMENT

- .1 Air Handling Units (AHU): AMCA Certified.
 - .1 Cabinet: Industrial quality, rust-resistant construction, hinged and gasketed access doors, acoustically lined casing with inner skin to prevent lining separation.
 - .2 Fans: statically and dynamically balanced, centrifugal type. Select bearings for average life of minimum 150,000 hours, with lubrication fittings extended to side of unit for convenient servicing. Provide internal vibration isolation for fans.
 - .3 Filters: ULC Class 2, disposable. Maximum design face velocity: 2.5 m/s. Provide MERV 8 pre-filters and MERV 13 after filters if required to maintain air cleanliness design parameters. Provide local filter pressure drop gauges for each filter.
 - .4 Coils: AHRI rated, maximum design face velocity for cooling coils: 2.5 m/s.
 - .5 Drain Pans: stainless steel or non-ferrous, externally insulated, sloped to drain at low point. Install deep seal P trap on drain line.
 - .6 Provide drives with motors, adjustable motor slide rail base, adjustable sheaves, belts and belt guards.
 - .7 Include mixing box sections where applicable, with air blenders to achieve uniform mixing.
 - .8 Sheaves: provide one spare set, of size and type determined by the Air Balancing firm.
 - .9 Provide AHRI seal on units larger than 40 kW.
 - .10 Provide N2 Open or BACnet protocol packaged control system with unit, factory wired, and BAS interface pre-programmed and tested for connection to BAS required in Division 25 – Integrated Automation.
- .2 Ventilation and Exhaust System:
 - .1 Equipment: AMCA Certified.
 - .2 Select fans to provide minimum 20% excess design capacity by changing sheaves.
 - .3 Design kitchen exhaust systems to meet local authority having jurisdiction and NFPA 96.

2.3 FLUID DISTRIBUTION SYSTEM

- .1 General:
 - .1 Piping: provide piping materials recommended by ASHRAE for associated medium.
 - .2 Insulation: size and type required to maintain design

- temperature at every outlet, and maintain surface temperature below 70°C and at least 5°C above indoor air dewpoint.
- .3 Allow for system thermal expansion, to prevent structural failure or fluid leakage.
- .4 Install various HVAC distribution piping along similar routing where possible, to share pipe support structures. Locate pipe labels in similar locations.
- .2 Underground geothermal piping system:
 - .1 Provide glycol or water lines connecting from existing snow pile, melt water, or buried loops to mechanical room of new facilities.
 - .2 Base system design on pressure and temperature of medium being carried.
 - .3 If service vaults are provided, ensure adequate clearance to allow for maintenance, and insulation from freezing.
 - .4 Co-ordinate piping and insulation material selection with underground soil conditions to prevent premature corrosion.
- .3 Hot Water Distribution System:
 - .1 Provide hot water distribution piping from equipment to terminal units as required.
 - .2 Insulation: as required to maintain design temperature at every outlet, and maintain surface temperature below 70°C.
- .4 Glycol Distribution System:
 - .1 Provide distribution piping from mechanical room to terminal units as required.
 - .2 Insulation: as required to maintain design temperature at every outlet and maintain surface temperature below 70°C.
 - .3 Provide glycol and water mixing and treatment system, and equip system with means to fill and maintain design glycol system fluid levels. Glycol shall be propylene glycol with inhibitors to prevent corrosion.
- .5 Chilled Water Distribution System:
 - .1 Chilled water distribution piping to follow same routing as steam or hot water piping from source to mechanical room.
 - .2 Insulation: as required to maintain design temperature at every outlet, and maintain a surface temperature at least 5°C above indoor air dewpoint at maximum design saturation.

2.4 PUMPS

- .1 Hot Water Heating Pumps:
 - .1 Provide pumps to circulate hot water from hot water supply appliances through glycol heat exchangers on systems exposed to outdoor air and back to hot water return pipe.
 - .2 Provide minimum two pumping units rated at 100% system capacity each.
 - .3 Design maximum inlet hot water temperature at pumps 82°C.
 - .4 Select pump so that the first critical speed is minimum 125% greater than design operating speed.
- .2 System Distribution Pumps:

- .1 Provide system distribution pumps to pump hot water from hot water supply pipe through hot water distribution system and back to hot water return pipe.
- .2 Provide two pumping units sized for 100% capacity each. Pumps will operate as duty and standby as controlled through the BAS. Provide variable speed control to operate from 200 to 1750 rpm.
- .3 Select pump performance curve to pass through system design operating point.
- .4 Provide single pump control for operation along system curve by varying pump speeds using variable frequency drives.
- .5 Control pump speeds by monitoring distribution system pressure.
- .6 Select pump curves for best efficiency, parallel to system head curve.
- .7 Motors:
 - .1 Suitable for use with variable frequency drive, NEMA design B and class F insulation, to NEMA MG1 Part 31 Definite-Purpose Inverter-fed Motors.
 - .2 Maximum motor and pump speed: 1750 rpm.
 - .3 Power: 575 volts, 3 phase.
- .8 Variable Frequency Drive (VFD):
 - .1 Suitable for this application and for use in normal indoor non-hazardous environments.
 - .2 Provide variable speed control of motors.

2.5 TERMINAL DEVICES

- .1 General:
 - .1 Provide air and water terminal devices, sized and located to achieve desired design environment.
 - .2 Provide similar equipment from one manufacturer.
- .2 Perimeter radiation: mount cabinet below exterior window or on inside of exterior wall to suit application in office spaces. Size to offset envelope losses.
- .3 Provide the embedded tubing, manifolds, valves, pipe and fittings to deliver the primary heating of the space through the structural floor slab.
 - .1 Provide separate circuiting of the system with zone control of areas over 40m².
- .4 Variable and Constant Volume Terminal Units:
 - .1 Size and capacity to achieve design air flow. Select and locate units to achieve zone control as specified.
 - .2 Control System: direct digital controllers.
 - .3 Operation: duct pressure independent air flow control between zero volume and maximum volume.
 - .4 Acoustic Lining: UL 181 and NFPA 90A.
 - .5 Reheat: hot water coils, operated independently of radiation heating.
 - .6 Equip boxes with manufacturer's standard sound attenuators plus additional duct acoustic lining as required to achieve design room acoustic criteria.

- .5 Duct Accessories:
 - .1 Dampers - Balancing:
 - .1 Splitter dampers: material and hardware of thickness and structural strength to withstand design duct velocity and pressures without failure.
 - .2 Balancing dampers: capable of maintaining maximum air leakage of 5% design flow in fully closed position at design operating duct pressure.
 - .2 Dampers - Fire: type B or C, for horizontal or vertical operation as applicable, ULC listed.
 - .3 Registers, Grilles and Diffusers: use equipment from manufacturers with published data tested to AMCA standards. Do not use terminal dampers unless volume control cannot be achieved with duct devices.
- .6 Hydronic System:
 - .1 Select pipe size and material for fluid medium, and design conditions.
 - .2 Select pipe and equipment to ASHRAE 90.1.
 - .3 Provide reverse return piping on heating systems.
 - .4 Provide drain capability at low points, auto vents for high points.
 - .5 Locate isolation valves at branches, at connection to equipment, and at flow control and balancing valves to permit draining for service. Balancing valves do not count as isolation valves.
 - .6 Provide flexible connections and vibration isolation supports and hangers at connection to equipment. Do not support piping from equipment.
 - .7 Protect equipment and components against freezing. Where the terminal equipment will be exposed to temperatures below 0°C in normal or upset operating conditions, use water to glycol heat exchangers and provide pumps to circulate a secondary loop of propylene glycol and water solution freezing point that is below the winter design temperature freezing point.
 - .8 Provide for chemical cleaning of piping.
 - .9 Provide dielectric unions at connections between different materials.
 - .10 Provide stand by-pumps for primary systems.
 - .11 Provide means to add chemicals and glycol to systems in operation.
 - .12 Insulate as per table in ASHRAE 90.1. Surface temperature of insulation shall not exceed 70°C at any point.
- .7 Vibration Isolation: vibration isolation equipment manufacturer's recommendations.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install equipment to manufacturer's written instructions.
- .2 Air Distribution System:
 - .1 Ducts:
 - .1 Galvanized steel or aluminum ducts to SMACNA HVAC Duct Construction, Standards, Metal and Flexible.
 - .2 Insulate fresh air intakes and exhaust ducts a minimum of 3 m from exhaust louver.
 - .3 Insulate supply air ducts.
 - .2 Ventilation and Exhaust System:
 - .1 Galvanized steel or aluminum to SMACNA HVAC Duct Construction Standards, Metal and Flexible.
 - .2 Kitchen exhaust ductwork to be welded stainless steel in accordance with NFPA 96.
 - .3 During testing and balancing be prepared to change sheaves if required to provide required airflow as per Room Data Sheets.
 - .4 Insulate fresh air intake and exhaust ducts sufficiently to prevent sweating at coldest design exterior conditions.
- .3 Fluid Distribution Systems: to manufacturer's recommendations.
- .4 Duct Accessories: install fire dampers to local code requirements.
- .5 Piping:
 - .1 Install to conserve space in buildings and to keep furring to a minimum.
 - .2 Slope piping up in direction of flow to high point vents. Provide drain valves with hose thread and cap with chain at low points in system.
 - .3 Provide dielectric isolation of dissimilar metals.
 - .4 Provide expansion loops or swing joints to compensate for thermal expansion. Use expansion joints where space is limited.
- .6 General:
 - .1 Install equipment as per manufacturer's written direction.
 - .2 Vibration Isolation:
 - .1 Install vibration isolation at connections between piping and pumps
 - .2 Install vibration isolation between all motor driven fans and equipment and the services, ducts, piping and supports that connect to them.
 - .3 Install vibration isolation devices as recommended by equipment manufacturer.
 - .3 Install insulation as required.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application,

protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.

- .2 Manufacturer's Field Services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
- .4 Obtain reports, within 3 days of review, and submit, immediately, to the Contract Administrator.

- .2 Verification requirements in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified Wood.
 - .8 Low-emitting materials.

- .3 Performance Verification:
 - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:
 - .1 After delivery and storage of products.
 - .2 After installation and cleaning is complete.
 - .3 Coordinate with the timing of commissioning specified in Section 01 91 13 – General Commissioning (Cx) Requirements.

3.4 COMMISSIONING

- .1 Commission equipment to Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Test and adjust pumps, air handling units, fans. Prove that equipment operates in manufacturer's published operating range for selected model, and as specified in Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

3.5 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.

- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for:
 - .1 Chillers.
 - .2 Cooling Towers, Evaporative Coolers and Dry Condensers.
 - .3 Direct Expansion Systems.
 - .4 Refrigeration Piping.
 - .5 Sustainable requirements for construction and verification.
 - .1 Section 01 47 13 – LEED Requirements.
 - .2 Related Sections:
 - .1 Section 01 33 00 – Submittals Procedures.
 - .3 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction Waste Management and Disposal.
 - .6 Section 01 78 00 – Closeout Submittals.
 - .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .8 Section 23 30 00 – HVAC Distribution.
 - .9 Section 23 82 00 – Terminal and Packaged units.
 - .10 Section 23 84 00 – Other HVAC Systems and Equipment.
 - .11 Division 25 – Integrated Automation.
 - .12 Division 26 – Electrical.

1.2 REFERENCES

- .1 Air-Conditioning, Heating and Refrigeration Institute (AHRI)
 - .1 AHRI 275-2009, Application of Sound Rating Levels of Outdoor Unitary Equipment.
- .2 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings.
 - .2 ASHRAE 15-01, Safety Standard Refrigeration Systems.
- .3 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.5-2006, Refrigeration Piping and Heat Exchanger Components.
- .4 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B 280-08, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA B52-2005, Mechanical Refrigeration Code.
 - .2 CSA O80 Series-08, Wood Preservation.
- .6 Environment Canada (EC)

- .1 EPS 1/RA/2-96, Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.
 - .7 Manitoba Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .8 Manitoba Labour – Mechanical Engineering Branch
- 1.3 DESIGN REQUIREMENTS
- .1 Design Calculations:
 - .1 Provide equipment, piping and accessories to provide refrigeration capacity required to maintain indoor air conditions as specified.
 - .2 Follow design guidelines and select equipment to guidelines in the EC - Environmental Code of Practice.
 - .2 Chillers:
 - .1 Types based on life cycle cost analysis.
 - .2 Use environmentally friendly refrigerant.
 - .3 Liquid chilling systems for cooling loads over 90 kW.
 - .4 Minimum performance standard: to ASHRAE 90.1.
 - .3 Cooling Towers, Evaporative Coolers and Dry Condensers: use life cycle analysis to determine system type, or as recommended by chiller manufacturer and to suit project site conditions.
 - .4 Direct Expansion Systems: minimum performance standard: ASHRAE 90.1.
 - .5 Insulation: sufficient insulating value to prevent sweating of piping system at ambient temperature of 32°C at 50% RH, and provide minimum thermal performance of 0.9 RSI value.
- 1.4 SUBMITTALS
- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
 - .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for Chillers, Cooling Towers, Compressors and Auxiliary Equipment.
 - .4 Submit WHMIS MSDS in accordance with Section 01 47 13 – LEED Requirements. Indicate VOCs for adhesive and solvents during application and curing.
 - .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
 - .6 Certificates: submit certificates signed by manufacturer certifying that

materials comply with specified performance characteristics and physical properties.

- .7 Instructions: submit manufacturer's installation instructions.
- .8 Manufacturer's Field Services: submit reports within three days of receipt from manufacturer.
- .9 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals include data as follows:
 - .1 Indicate: brief description of heat generation equipment and components.
 - .2 Provide for units, manufacturer's name, type, year, number of units, and capacity.
 - .3 Submit complete start-up report indicating start-up and system verification sequences.

1.5 QUALITY ASSURANCE

- .1 Utilize Design and Installation personnel thoroughly familiar with systems of this type.
- .2 Provide multiple units from same manufacturer.
- .3 Pre-Installation Meeting:
 - .1 Convene a pre-installation meeting one week prior to beginning on-site installations.
- .4 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .5 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Maintain equipment condition and cleanliness by protecting all openings and surfaces from fouling by dust, water, debris, corrosion, or vermin during delivery, storage and handling.
- .2 Materials damaged in transit or during storage and handling are to be replaced prior to installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Sustainable Design: Refer to Section 01 47 13 – LEED Requirements.
- .2 Outdoor Steel Supports and Ladders: hot dipped galvanized steel.
- .3 Insulation: suitable type and thickness to meet design requirements, with vapour barrier.

2.2 CHILLERS

- .1 Compressor:
 - .1 Up to 280 kW: screw or reciprocating design.
 - .2 280 to 700 kW: screw or centrifugal design.
 - .3 700 kW and up: centrifugal design.
- .2 Controls: chiller manufacturer's standard. Include supply water temperature reset (based on return water temperature or outdoor air temperature) for systems over 175 kW.
- .3 Ventilation and Refrigerant Monitoring Requirements: CAN/CSA-B52 and ASHRAE 15.
- .4 Provide heat recovery option. Heat can be rejected to the domestic water heating system and/or the vehicle wash system as required.

2.3 COOLING TOWERS,
EVAPORATIVE COOLERS
AND DRY CONDENSERS

- .1 Equipment: CTI certified.
- .2 Equip cooling towers with capacity control, provision for free cooling and basic water heater. Provide automatic sump draining system which can be discharged into the vehicle wash water treatment system for re-use. Control the drain rate to prevent treatment system overload.

2.4 DIRECT
EXPANSION SYSTEMS

- .1 Equipment: AHRI rated.
- .2 Condensers: air cooled with separate circuit for compressor/evaporator combination.
- .3 Support: ensure support on roof structure for roof mounted units. Provide access for maintenance.
- .4 Controls (Operating and Safety): manufacturer's standard.
- .5 Outdoor Cabinet: tested and AGA certified.
- .6 Soundproofing: AHRI 275 at one metre, in free field.
- .7 Refrigeration Piping:
 - .1 Materials: CSA B52 and ASTM B 280.
 - .2 Connect equipment with isolation valves and unions, sized in accordance with manufacturers recommendations and ASHRAE sizing guidelines.

PART 3 - EXECUTION

3.1 MANUFACTURER'S
INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install equipment to manufacturer's written instructions.
- .2 Provide piping and insulation to meet local code requirements.
- .3 Locate chillers in mechanical rooms to CAN/CSA B52 and ASHRAE 15.
- .4 Ensure or provide necessary structural support for large, heavy equipment.
- .5 Install outdoor equipment on supports approved by manufacturer. Provide additional structural support required.
- .6 Provide for access to outdoor units for maintenance and repair.
- .7 Insulate refrigeration piping, to equipment manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

- .1 Field Tests: conduct tests required to Comply with CSA-B52 and the Steam and Pressure Plants Act/Regulation 108/87R. Pay all fees levied by the Authority Having Jurisdiction for inspection and witness testing.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
 - .4 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.
 - .5 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .6 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
 - .7 Obtain reports, within 3 days of review, and submit, immediately, to the Contract Administrator.

- .3 Verification requirements in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-Emitting materials.

- .4 Performance Verification:
 - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:
 - .1 After delivery and storage of products.
 - .2 When preparatory Work upon which product installation depends is complete.
 - .3 Twice during installation progress at 25% and 60% complete.
 - .4 After installation and cleaning is complete.

3.4 DEMONSTRATION

- .1 Demonstrate equipment to the Contract Administrator and designated maintenance staff and provide documentation of who was present and what was demonstrated.

- .2 After chiller has been in operation for two weeks, provide experienced and qualified manufacturer representatives to demonstrate chiller operating capability.

- .3 Provide training and instructions to operators, including control and safety systems.

3.5 COMMISSIONING

- .1 Commission equipment to 01 91 13 – General Commissioning (Cx) Requirements.

- .2 Test and adjust chiller to verify selected manufacturer's design capacity.

3.6 CLEANING

- .1 Perform cleaning in accordance with Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.

- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for:
 - .1 Unit Heaters, Hydronic and Gas Fired.
 - .2 Make Up Air Units.
 - .3 Infrared Radiant Heating.
 - .2 Sustainable requirements for construction and verification.
 - .1 Energy efficiency.
 - .2 Comfort and control.
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction Waste Management and Disposal.
 - .6 Section 01 78 00 – Closeout Submittals.
 - .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .8 Section 23 05 00 – Design Requirements – HVAC.
 - .9 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

1.2 REFERENCES

- .1 Air Moving and Control Association International, Inc. (AMCA)
 - .1 AMCA 210-99, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .2 American National Standards Institute (ANSI)
 - .1 ANSI Z83.19-2009/CSA 2.35-2009, Gas-Fired High-Intensity Infrared Heaters.
 - .2 ANSI Z83.20-2008/CSA 2.34-2008, Gas-Fired Low-Intensity Infrared Heaters.
- .3 Air-Conditioning Heating and Refrigeration Institute (AHRI)
 - .1 AHRI 430-2009, Central Station Air-Handling Units.
- .4 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .5 Canadian Standards Association (CSA International)
 - .1 CAN/CSA B149.1-05, Natural Gas and Propane Installation Code.
 - .2 CSA O80 Series-08, Wood Preservation.
- .6 Manitoba Workplace Safety and Health, Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

- .7 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2009, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 90B-2009, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

1.3 DESIGN REQUIREMENTS

- .1 Select equipment to maintain design space environmental requirements.
- .2 Select and design terminal and packaged units to meet full design load. Provide heating and cooling calculations to the Owner's Advisor for review.
- .3 Select and size equipment to operate at best efficiency points, to ASHRAE 90.1.
- .4 Do not use electric space heaters.
- .5 Use gas fired unit heaters when hydronic unit heaters are not practical.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for self-contained (packaged) heating, cooling or ventilation units.
 - .2 Submit WHMIS MSDS in accordance with Section 01 47 15 – Sustainable Requirements: Contractor's Verification. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Instructions: submit manufacturer's installation instructions.
- .7 Manufacturer's Field Services: submit reports within 3 days of receipt from manufacturer.
- .8 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout

Submittals include data as follows:

- .1 Indicate: brief description of self-contained (packaged) heating, cooling or ventilation units.
- .2 Provide for units, manufacturer's name, type, year, number of units, and capacity.
- .3 Submit complete start-up report indicating start-up and system verification sequences.
- .4 Submit manufacturer's standard warranty, executed by authorized company official.

1.5 QUALITY ASSURANCE

- .1 Utilize design and Installation personnel thoroughly familiar with system of this type.
- .2 Provide products from one manufacturer.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health requirements.
- .4 COR Certification:
 - .1 All members of the design/build team are to be COR certified to participate in the design, construction and commissioning.
- .5 Verification: contractor's verification in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Maintain equipment condition and cleanliness by protecting all openings and surfaces from fouling, by dust, water, debris, corrosion, or vermin during delivery, storage and handling.
- .2 Materials damaged in transit or during storage or handling are to be replaced prior to installation.

PART 2 - PRODUCTS

2.1 UNIT HEATERS

- .1 Hydronic:
 - .1 Casings: steel with gloss enamel finish.
 - .2 Coils: seamless copper tubing, silver brazed to copper or steel headers with evenly spaced aluminum fins mechanically bonded to tubing.
 - .3 Fan: factory balanced with anti-corrosive finish and fan guard.
 - .4 Motor: rated for continuous duty, with overload protection and resilient supports.
- .2 Gas Fired: CGA certified.
 - .1 Casings: steel with glossed enamel finish.
 - .2 Heat Exchanger: tubular, indirect fired, force vented, laboratory life cycle tested.
 - .3 Fan: factory balanced with anti-corrosive finish and fan guard.
 - .4 Motor: rated for continuous duty, with built in overload

protection and resilient supports.

2.2 MAKE UP AIR
UNITS

- .1 Units: CSA certified to AHRI 430, with AHRI seal.
- .2 Components: fan section with motor and drive, filter section, dampers heating coil, cooling coil, humidifier, and mixing box.
- .3 Controls: electronic, hardwire interlock with exhaust fan.
- .4 Casing:
 - .1 Material: galvanized steel reinforced and braced for rigidity.
 - .2 Lining: acoustically lined, reinforced with inner skin to prevent separation at design air velocity.
 - .3 Access: access doors, large enough to walk in for maintenance of internal parts.
- .5 Drain Pans: stainless steel. Do not use galvanized steel. Insulate to prevent sweating at design conditions. Locate drain connection in bottom at low point 75 mm minimum.
- .6 Fans:
 - .1 Type: centrifugal, selected to operate at stable part of performance curve at all times, with self aligning bearings.
 - .2 Motor: rated for continuous duty, with built in overload protection and resilient supports, complete with adjustable V-belt drive and guard.
- .7 Filter Box: material to match casing, filters to meet design air quality requirements.
- .8 Mixing Box: material to match casing, blade type and orientation designed to produce uniformly mixed air temperature within +/- 5°C of design across face of outlet.
- .9 Coils: AHRI certified.
 - .1 Capacity: to design requirements.
 - .2 Casings: 1.5 mm thick galvanized sheet steel. Supports of galvanized steel channel insulated sandwich construction.
 - .3 Glycol, Hot and Chilled Water Coils: Cleanable fins, pressure tested to 1.7 MPa.
 - .4 Direct Expansion Refrigerant Coils: arranged to prevent trapping of oil, with distributors to ensure even distribution of liquid refrigerant to circuits, pressure tested to Canadian Refrigeration Code, dehydrated and sealed with nitrogen charge before sending to site.
- .10 Humidifier: type and size to achieve design space humidity requirements. Locate injectors where air can absorb discharged vapour before it comes into contact with air distribution components or equipment. Perform psychrometric calculations to guidelines in ASHRAE Handbook Fundamentals.

2.3 INFRARED

- .1 System: CSA certified, to ANSI Z83.19, ANSI Z83.20.

RADIANT HEATING

- .2 Components: burners; vents, vacuum exhausters; infrared emitters, shields, hangers and fittings, burner control modules; and system controls. Capable of operation while withstanding water spray from sprinklers.
- .3 Burners: suitable for natural gas, pre-wired safety controls at burners. Electrically interlock burners and vacuum exhausters.
- .4 Vacuum Exhauster: direct driven, dynamically balanced fan wheel, isolating mounts, bird screen at discharge. Protect housing and mounting parts with heat and water resistant coating.
- .5 Provide access for burners and exhausts for servicing.
- .6 Controls: electronic, by heater manufacturer.
- .7 Combustion Tube: minimum 1.6 mm aluminized steel.
- .8 Reflectors: aluminized steel.
- .9 Provide combustion air without the use of supplementary supply blowers or fans.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install equipment to manufacturer's written instructions, NFPA 90A and NFPA 90B.
- .2 Supports:
 - .1 Locate outdoor equipment on supports recommended by manufacturer.
 - .2 Provide proper load bearing support.
 - .3 Steel supports and ladders used outdoors: metal coated to resist rusting, or wood treated to CSA O80.
- .3 Access: provide access to equipment for maintenance.
- .4 Unit Heaters:
 - .1 Install to manufacturer's written instructions.
 - .2 Hot Water Units:
 - .1 Install Ball valve on inlet and calibrated balancing valve with memory top on outlet of units. Install drain valve at low point. Install manual air vent at high point.
 - .2 Provide double swing pipe joints.
 - .3 Clean finned tubes and comb straight.
 - .4 Gas fired units: install B-vent exhaust gas flue to

- requirements of authorities having jurisdiction.
- .5 Provide supplementary suspension as required.
- .6 Mount thermostats on outside walls, using insulated backplates.
- .7 Set discharge patterns and fan speeds to suit application.

.5 Infrared Heaters:

- .1 Provide heaters in locations where there is high degree of air infiltration including: loading areas, shops, vehicle repair bays, vehicle storage, vehicle wash bays).
- .2 Due to high surface temperature during operation, do not use these units where atmosphere has high concentrations of: ignitable dust, flammable gases or flammable vapours. (e.g.: carpenter shop, battery room, degreasing operations).

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

- .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.
- .2 Manufacturer's Field Services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
- .4 Obtain reports, within 3 days of review, and submit, immediately to Contract Administrator.

.2 Verification requirements in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification include:

- .1 Materials and resources.
- .2 Storage and collection of recyclables.
- .3 Construction waste management.
- .4 Resource reuse.
- .5 Recycled content.
- .6 Local/regional materials.
- .7 Certified wood.
- .8 Low-emitting materials.

.3 Performance Verification:

- .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
- .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:

- .1 After delivery and storage of products.
- .2 After installation and cleaning is complete.
- .3 Coordinate with the timing of the commissioning specified in Section 01 91 13 – General Commissioning (Cx) Requirements.

3.4 COMMISSIONING

- .1 Commission equipment to Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Test and adjust unit heaters, make-up air units, and infrared radiant heating.

3.5 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Special cooling systems and devices.
- .2 Humidity control.
- .3 Dust and fume collectors.
- .4 Air curtains.
- .5 Paint spray booth ventilation systems.
- .6 Underfloor void ventilation system.
- .7 Fans and equipment in corrosive areas.
- .8 Vehicle exhaust collection systems.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 47 13 – LEED Requirements.
- .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
- .4 Section 01 74 11 – Cleaning.
- .5 Section 01 74 19 – Waste Management and Disposal.
- .6 Section 01 78 00 – Closeout Submittals.
- .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .8 Section 23 05 00 – HVAC Design Requirements.
- .9 Section 23 05 93 – Testing, Adjusting and Balancing of HVAC.
- .10 Section 23 30 00 – HVAC Distribution.
- .11 Section 23 82 00 – Terminal and Packaged Units.

1.3 REFERENCES

- .1 American Conference of Governmental Industrial Hygienists, Inc. (ACGIH)
 - .1 Industrial Ventilation: A Manual of Recommended Practice, 24th Edition.
- .2 Air Moving and Control Association International, Inc. (AMCA)
 - .1 AMCA 210-99, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .3 Air-Conditioning, Heating and Refrigeration Institute (AHRI)

- .1 AHRI 210/240-2008, Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
 - .2 AHRI 320-98, Water-Source Heat Pumps.
 - .3 AHRI 325-98, Ground Water-Source Heat Pumps.
 - .4 Canadian Standards Association (CSA)
 - .1 CAN/CSA C748-94 (2005), Performance of Direct-Expansion (Dx) Ground-Source Heat Pumps.
 - .2 CAN/CSA C656-05, Performance Standard for Single Package Central Air Conditioners and Heat Pumps.
 - .5 Environment Canada (EC)
 - .1 EPS 1/RA/2-96 Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.
 - .6 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA 250-2008, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - .7 National Fire Protection Association (NFPA)
 - .1 NFPA 91-1999, Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids.
- 1.4 DESIGN PERFORMANCE REQUIREMENTS
- .1 Size equipment for its intended service.
 - .2 Design systems to meet local government environmental requirements.
 - .3 Special Cooling Systems and Devices
 - .1 Dedicated air conditioning for meeting/training Rooms: One unit per space.
 - .2 Ground-loop or ground-water heat pumps: Select to suit building systems and project geographic location. Utilize published geographical ambient data published by ASHRAE.
 - .3 Snow melt-water cooling systems.
 - .4 Humidity devices: Provide humidifiers or dehumidifiers to maintain desired space humidity requirements. Use steam generator style to prevent Legionella production.
 - .5 Dust and Fume Collectors
 - .1 Dust Collectors:
 - .1 Type: suitable for material being collected.
 - .2 Reintroduce filtered air into room from which material is drawn.
 - .2 Fume Collectors:
 - .1 Select for anticipated fume materials.
 - .2 Design to Industrial Ventilation Manual of Recommended Practices. Design adsorption beds for at least six-months media life.
 - .6 Air Curtains: Select to maintain continuous curtain of air over the

entire opening, where indicated.

- .7 Paint Spray Booth Ventilation Systems
 - .1 Locate where indicated.
 - .2 Provide complete system, with paint arrestor filters, interlocks and controls.
 - .3 Size and select equipment based on design air volumes.

1.5 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit shop drawings for manufactured equipment in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Submit calculations showing that equipment and systems meet design requirements.
- .4 Submit operation and maintenance data for equipment and components for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
- .5 Test Reports: Submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Manufacturer's Field Services: Submit reports to the Contract Administrator within three days of receipt from manufacturer.

1.6 QUALITY ASSURANCE

- .1 Utilize design and Installation personnel thoroughly familiar with systems of this type.
- .2 Provide similar equipment from one manufacturer.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health.
- .4 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Maintain equipment conditions and cleanliness by protecting all openings and surfaces from fouling by dust, water, debris, corrosion, or vermin during delivery, storage and handling.
- .2 Materials damaged in transit or during storage or handling are to be replaced prior to installation.

PART 2 - PRODUCTS

2.1 SPECIAL COOLING SYSTEMS AND DEVICES

- .1 Snow meltwater cooling system to be designed as an auxiliary cooling system to supplement up to 100% of the facility's cooling load requirements while the snow meltwater is available at a temperature below 8°C.
- .2 Heat Pump:
 - .1 Heat Medium: Ground-loop or Ground Water source, EPS 1/RA/2 and CSA approved, to AHRI 325, AHRI 320, AHRI 210/240, with AHRI and CSA certification seal.
 - .2 Provide easy access drain pans under indoor coils.
 - .3 Acoustics: Ensure sound emissions do not exceed maximum design space Noise Criteria (NC) level for the conditioned space.
 - .4 Provide controls and accessories for designed operation.
 - .5 Performance: Base calculations on certified performance figures to CAN/CSA C446 and CAN/CSA C656.

2.2 HUMIDITY DEVICES

- .1 Humidifiers:
 - .1 Electrode Steam Generating Type
 - .1 CSA certified, ULC listed.
 - .2 Cabinet: House components, with factory finish and electrically interlocked door.
 - .3 Steam Cylinder: Factory sealed, disposable, with factory installed electrodes to suit water condition.
 - .4 Controls:
 - .1 Solid state panel.
 - .2 Solenoid valve on water and drain lines.
 - .3 Wall and Duct humidistats.
 - .4 Airflow proving switch.
 - .5 Adjustable flush cycle timer.
 - .6 Amperage meter.
 - .7 Cylinder replacement indicator light.
 - .5 Duct Distribution Header: Condensate drain and supply hose.
 - .2 Dehumidifiers:
 - .1 Type: Refrigeration type, sized to meet design dehumidification load.
 - .2 Controls: Electronic controls, humidistats, thermostat, water pressure switch and air vents where required.
 - .3 Provide access panels for serviceable interior parts.

2.3 DUST AND FUME COLLECTORS

- .1 Dust Collectors:
 - .1 Fans: Rated to AMCA 210.
 - .2 Type: Suitable for material being collected, capable of filtering to 5 microns.
 - .3 Provide clappers as required.
 - .4 Equip bag type units with air compressor, piping, manometer and necessary controls for automatic cleaning.
 - .5 Discharge: Rotary valve or sealed drum.

- .2 Fume Collectors:
 - .1 Select materials suitable for fumes being exhausted, to Industrial Ventilation Manual of Recommended Practices.
 - .2 Performance: Tested to ASHRAE 110.

2.4 AIR CURTAINS

- .1 Housing and Inlet Grille: Anodized aluminum.
- .2 Heating Coils: Mounted inside housing.
 - .1 Electric: Thermal overload protectors, fuse links, contacts, switches and thermostat control.
 - .2 Glycol, Hot Water Coils: Section D3040 - HVAC Distribution.
- .3 Fan: Two-speed operation.

2.5 PAINT SPRAY BOOTH VENTILATION SYSTEMS

- .1 Fan: Centrifugal, capacity to meet design requirements, rated to AMCA 210.
- .2 Motor: Size to suit application, voltage compatible with electrical supply.
- .3 System: Construct to NFPA 91 and the requirements of Manitoba Environment and Manitoba Labour – Workplace Safety and Health.
- .4 Controls: NEMA 250, Type 7 rated for mounting in hazardous areas.
- .5 Electrical Control Panel: NEMA 250, Type 12 rated enclosure with fused disconnect.

2.6 UNDERFLOOR VOID VENTILATION

- .1 The site for this facility may produce levels of methane in the soil which can be harmful to life safety and building integrity if not treated. The void below the underside of the floor slabs and the soil or prepared subgrade requires active ventilation to prevent:
 - .1 Accumulation of Methane in any local area or in general that will exceed 25% of the lower explosive limit for methane. Ventilation with outdoor air, distribution or exhaust pick-up ductwork and detection equipment are required in order to control fan performance.
 - .2 To limit the moisture accumulation in the underfloor void areas below the floor slab, ventilation will be required to also operate based on humidity level controls.
 - .3 Fans and other moving or rotating equipment shall be aluminum, stainless steel or FRP to prevent corrosion, and meet an AMCA Class B spark-resistant design.
 - .4 The crawlspace/void beneath the floor slab and within the perimeter foundation shall be maintained at a negative 25 Pa with respect to the building space pressure above the floor.
- .2 Design and installation shall be in conformance with the “Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities, and Guidelines for Construction on Landfill Sites” as issued by the City of Winnipeg in December, 2006.

- 2.7 FANS AND EQUIPMENT IN WET OR CORROSIVE AREAS
- .1 Ductwork, piping, valves, fans and control components for HVAC systems in wet or corrosive areas are to be constructed of aluminum, stainless steel, plastic or FRP to prevent degradation from exposure to water, chemical dust, fumes or galvanic corrosion in the following areas:
 - .1 Wash Bays
 - .2 Fertilizer, Pesticide, and Herbicide Storage
 - .3 Hazardous or Dangerous Goods Storage.
 - .2 Motors provided on mechanical equipment in wet, dusty, or corrosive environments shall be totally enclosed fan-cooled motors, or explosion proof design as required.
- 2.8 VEHICLE EXHAUST COLLECTION
- .1 Provide a collection system of piping/ducts overhead of the WFMA maintenance garage bays with a minimum of 2 ports of 75 mm or larger size for connection of hoses to vehicle tail pipes for each bay. Hoses are to be retractable and locations and lengths are to suit both diesel fuel and gasoline engine – driven equipment. Provide a fan to overcome system resistance and convey exhaust to outdoors.
- 2.9 HAZARDOUS MATERIAL AND DANGEROUS GOODS STORAGE
- .1 Provide fire code compliant storage, venting and fire safety for hazardous materials and dangerous goods that will be located within indoor spaces as listed in Appendix C4.
 - .2 Storage requirements shall consider accessibility, dispensing, spill containment, fire suppression, and ventilation for mitigation of odours and voc discharge into occupied spaces. Storage and provisions for use of the hazardous materials and dangerous goods within the facility shall be in accordance with the product manufacturer’s WHMIS information and Material Safety Data Sheets.
- 2.10 WORK HOOD FOR PLASTIC WELDING
- .1 Provide a 1.2m x 1.2m hood at 2.1m above the floor c/w solid back panel, interior light, and translucent strip plastic curtain on remaining 3 sides down to 200 mm above the floor.
 - .2 Design exhaust for capture of plastic welding fumes to outdoors in accordance with ACGIH recommendations.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Make required permit submissions to the authority having jurisdiction for systems and equipment.
- .2 Install systems to manufacturer's written recommendations.
- .3 Humidifiers

- .1 Weld ductwork for a minimum distance of 3 m downstream of humidifiers, and slope to drain point.
- .2 Provide a piped drain from welded ductwork low point to storm drainage rainwater leader, or where impractical, to a sanitary drain.

3.2 VERIFICATION

- .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
- .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:
 - .1 After delivery and storage of products.
 - .2 After installation and cleaning is complete.
- .3 Coordinate with commissioning activities specified under 01 91 13 – General Commissioning Requirements.

PART 1 - GENERAL

- 1.1 SUMMARY .1 Section Includes:
- .1 Materials and installation for:
 - .1 Controls and instrumentation.
 - .2 Energy monitoring and control system.
 - .2 Sustainable requirements for construction and verification.
 - .1 Energy metering, security interface, indoor air quality control, and performance optimization.
- .2 Related Sections:
- .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction Waste Management and Disposal.
 - .6 Section 01 78 00 – Closeout Submittals.
 - .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .8 Section 23 05 00 – Design Requirements - HVAC.
- 1.2 REFERENCES .1 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).
- 1.3 DEFINITIONS .1 Average Effectiveness Level (AEL): ratio between a 30 day test period less any system down time accumulated within that period, and the 30 day period.
- 1.4 DESIGN REQUIREMENTS .1 Provide stand alone, direct digital system for control, management, and monitoring. Must demonstrate seamless integration into the existing Metasys Extended Architecture Operator Interface acceptable to the Owner prior to any procurement.
- .2 Monitor HVAC Systems, lighting energy use, fire alarm status, security, generator, HVAC and overall energy consumption.
 - .3 Maintain design requirements identified in Section 23 05 00 – Design Requirements HVAC.
 - .4 System to be compatible with Johnson Controls MSEA Technology on the field device network using N2 Open or BACnet Protocol, BACnet preferred for new construction. System to function as Energy Monitoring and Control System (EMCS) and communicate with a Johnson Control Metasys interface at a central monitoring location. LON protocols are not acceptable.
 - .5 Provide digital controllers, programmable and independently operable

(stand alone). Provide system immune to voltage fluctuations and spikes, radio frequency interference, power failures, and surges.

- .6 Provide all drawings, graphics, in paper form and digital electronic form. Drawings and graphics are to be created using Microsoft Visio 2007 software and be able to read and modified by the Contract Administrator.
- .7 Incorporate a secure high speed communications network using N2 Open or BACnet protocol to link independent controllers, local terminals and the command and management centre. Ensure that communications link permits access and information transfer between points within network. Responsibility for integration of field points and controllability of the equipment rests with the controls contractor, except for packaged unit controls.
- .8 Provide connection point in mechanical rooms for portable computer to permit access to information and system communications network.
- .9 Provide for automated critical alarm communications to live operators at remote location. Provide operating instructions associated with the alarms for the Owner to coordinate alarm response.
- .10 Provide for operator access from remote location.
- .11 This controls system must be compatible with the existing version and architecture of the Owner's remote supervisory, monitoring and access system. BACnet devices are to be compatible and communicate using the BACnet PIC statement, and provide documentation that all devices proposed will communicate with each other and the existing ADX server. This must be accomplished with network automation engines (NAE/NIE/NCE) that do not require the Owner to upgrade the existing ADX server in order to access all user views, alarms and point monitoring. Coordinate all versions of software and get approval of all user views and graphics from the Owner.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for:
 - .1 Provide for purchased components.
 - .2 Submit customer drawings prepared for this project to document the system architecture and component interconnection requirements.
 - .3 Include complete technical information regarding operating ranges, input and output capabilities.
- .4 Test Reports: submit certified test reports from approved independent

testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Manufacturer's Field Services: submit reports within three days of receipt from manufacturer.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals include data as follows:
 - .1 Indicate: brief description of self-contained (packaged) heating, cooling or ventilation units.
 - .2 Provide for units, manufacturer's name, type, year, number of units, and capacity.
 - .3 Submit complete start-up report indicating start-up and system verification sequences.
 - .4 Submit manufacturer's standard warranty, executed by authorized company official.

1.6 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health regulations.
- .2 Verification: Contractor's verification in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification.

1.7 WARRANTY

- .1 For Work of this Section 25 01 00 – Controls and Instrumentation, 24 months warranty period prescribed in the RFP requirements is extended to 60 months.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Maintain equipment conditions and cleanliness by protecting all openings and surfaces from fouling by dust, water, debris, corrosion, or vermin during delivery, storage and handling.
- .2 Materials damaged in transit or during storage or handling are to be replaced prior to installation.

1.9 MAINTENANCE SERVICE

- .1 Extended Services:
 - .1 Provide extended service contract to conditions in Section 01 78 00 – Closeout Submittals.
 - .2 Service contract: for 24 months from date of acceptance.
 - .3 During service contract period, monitor system operation off-site and perform repairs and system servicing within 8 hours of fault detection or service call.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Materials and resources in accordance with Section 01 47 17 – Sustainable Requirements: Contractor’s verification.

2.2 COMPONENTS

- .1 Sensors: use industry standard digital or analog signal ranges.
- .2 Motors and Relays: electric-electronic type, heavy duty construction, designed for industrial environment.
- .3 Computer: portable, complete with plug-in connection at control system panel.
 - .1 Processor: fastest commonly available processor speed.
 - .2 Random Access Memory (RAM): two times minimum capacity recommended by operating system manufacturer.
 - .3 Hard Disk Capacity: ensure minimum 80% free space after required operating system and software is installed
 - .4 Removeable Drives:
 - .1 CD-ROM, DVD-ROM reader drive.
 - .2 Diskette Drive: 1.44 USB Mb capacity.
 - .3 Backup Drive: high capacity USB, minimum 8 GB capacity per module.
 - .5 Video: colour screen, with video output connection; capable of simultaneous signal to screen and output.
 - .6 Communications:
 - .1 Modem: internal, 56 kbps minimum, with auto-dial/answer capability.
 - .2 Network: internal, 100 Mbps network interface card.
 - .7 Software:
 - .1 Operating System: capable of file-level security, multi-user and multi-function operation.
 - .2 Communication: capable of transmitting data over telephone lines to Central Control Monitoring System.
 - .8 Printer: minimum 600 dpi laser, 10,000 hour Mean Time Between Failure (MTBF) reliability for alarms. Locate as directed by Consultant.
- .4 Monitoring Software:
 - .1 Adjustable, multi-level and multi-user security.
 - .2 Dynamic colour schematic graphics of controlled mechanical systems.
 - .3 Historical and point trending/tracking reports.
 - .4 Dynamic analysis of control loop.
 - .5 Manual override of controlled points.
 - .6 Alarm generation and transmission

2.3 CONTROLS

- .1 Monitor status of and control following systems:
 - .1 Plumbing pumps, pit levels. Provide high level alarms and automatic pump duty alternation.
 - .2 HVAC systems and equipment including CO₂/CH₄/CO/NO_x/VOC sensors, ventilation, heating and cooling equipment, dampers, valves, fans, VAV boxes, condensers, burners, filters.
 - .1 VAV boxes to have a digital controller mounted directly to the VAV box Actuator.
 - .3 Lighting.
 - .4 Energy management and metering.
- .2 Thermostats: wall mounted, equipped with lockable lexan guards. Use remote space temperature sensors in public areas. All room temperature readings shall be monitored through the control system.
- .3 Carbon Monoxide, Nitrogen Oxides, and Volatile Organic Compounds Monitoring System:
 - .1 One control monitoring panel with remotely located CO (carbon monoxide) sensors/transmitters, electrochemical NO_x (nitrogen dioxide) sensor/transmitter sensing (CO, NO_x), and VOC (volatile organic compounds) sensor/transmitter combination.
 - .2 Sensor/Transmitter: to receive power from and send signals, corresponding to CO, NO_x values, to monitor.
 - .3 CO Sensor: compatible linear signal output corresponding to 0 to 100 ppm CO.
 - .4 NO_x Sensor/Transmitter:
 - .1 Compatible linear signal output corresponding to 0 to 10 ppm NO_x.
 - .2 DES 4 enclosure.
 - .3 Remotely calibrated with non-interactive zero and span.
 - .4 Protected against over voltage and polarity reversal.
 - .5 Monitoring range: up to 750 m².
 - .5 Provide special calibration and maintenance equipment and instructions.
- .4 Carbon dioxide (CO₂) Control:
 - .1 Provide carbon dioxide (CO₂) sensors in the spaces and within return air ductwork to control the introduction of outdoor air through ventilation system.
 - .1 Range of measurement: 0 to 3000 ppm with user selectable ranges.
 - .2 Accuracy: +/-25 ppm between 15-30°C indoor air temperature, repeatability +/- 5 ppm.
 - .3 Operating temperature from -10°C to 50°C at +/- 0.5°C accuracy on temperature reading.
 - .4 Outputs to be 4-20 mA, 0-10 V analog or RS232 digital.
 - .5 Metal housing for wall or duct mounting with mounting kit.
 - .6 CSA certified for operation on 12-24 VDC or 24 VAC power.

- .5 VOC control:
 - .1 Provide volatile organic compound (VOC) sensors in spaces where sources of VOC's are used, stored, or intermittently present.
 - .1 Range of measurement: 50 to 100 ppm full scale.
 - .2 Accuracy: +/-5 ppm between 15-30°C indoor air temperature, repeatability +/-2 ppm.
 - .3 Operating temperature from -20 to 50°C.
 - .4 Response time to be <1 minute at 95 ppm.
 - .5 Humidity range: 0 to 90% relative humidity, non-condensing.
 - .6 CSA certified for operation on 9 to 24 VDC.
 - .7 Output to be 0-5 VDC analog.
 - .8 Power consumption approximately 400 mW including integral heater load.
- .6 Methane (CH₄) Control:
 - .1 Provide non-explosive level monitoring sensors for methane level within air in crawlspace/void areas and within space at highest common level.
 - .1 Range of measurement: 0 to 100% of lower explosive limit (0 to 50,000 ppm).
 - .2 Accuracy of measurement: +/- 0.5% LEL between 15 and 30 degrees C range, +/-1% outside.
 - .3 Operating temperature range: -30°C to 50°C at +/- 0.5°C accuracy on temperature reading.
 - .4 Outputs to be 4-20 mA, 0-10 V analog or RS232 digital.
 - .5 Metal housing for wall mounting in non-hazardous areas.
 - .6 CSA Certified for operation on 12-24 VDC or 24 VAC power.
- .7 All variable speed/frequency drives must have a BACnet or N2 Open compatible interface built into the device.
- .8 Control Monitoring Panel:
 - .1 Cabinet: enclosed CES 4 cabinet, capable of monitoring a range up to 750 m².
 - .2 Components:
 - .1 Dual trip points for CO and NO₂ sensing.
 - .2 Relays for alarm actuation and ventilation control and/or auxiliary alarms.
 - .3 Indicators: LED, for power on, low alarms, high alarms and fail, plus audio indicator capable of being silenced for high alarms.
 - .4 Test button.
 - .5 Support for minimum 12 remote sensing points.

2.4 POINT SCHEDULE

- .1 Where factory packaged control systems with BACnet or N2 Open communications are not provided. Provide the following points on all types of equipment listed as a minimum, quantities will vary as defined during design:

System	Device Type	AI	AO	DI	DO
Outdoor air Reference	Air temperature sensor	X			
Air Handling Unit	Differential filter pressure	X			
	Mixed Air Temperature	X			
	Mixing dampers + position indicator	X	X		
	Heating coil discharge air	X			
	Heating coil control valve		X		
	Cooling coil discharge air	X			
	Cooling coil control valve		X		
	Low limit thermostat			X	
	Fan motor start/stop				X
	Fan motor amperage	X			
	Fan motor speed control		X		
	Fan differential pressure	X			
	Fan discharge temperature	X			
Make-Up Air Unit	Differential filter pressure	X			
	Motorized inlet dampers				X
	Damper position sensor/sw	X			
	Burner enable circuit				X
	Burner control valve		X		
	Low limit thermostat			X	
	Fan motor start/stop				X
	Fan motor amperage	X			
	Fan differential pressure	X			
	Fan discharge air temperature	X			
	Exhaust fan start interlock				X
	Exhaust fan running interlock			X	
Exhaust Fan	Fan motor start/stop				X
	Fan interlock start input			X	
	Fan motor amperage	X			
	Fan differential pressure	X			X
	Damper control output c/w limit sw.			X	
	Motor speed control input	X			
	Motor speed control output		X		
Boiler	Flow switch input			X	
	Pump start interlock				X
	Entering fluid temp.	X			
	Leaving fluid temp.	X			
	Burner control setpoint		X		
	Stack temperature	X			
	Condensate pH	X			
	Fuel flow rate	X			
	Alarm Indication			X	
Chillers	Flow Switch Input			X	
	Chiller Status			X	
	Entering Fluid Temp (Evaporator)	X			
	Leaving Fluid Temp (Evaporator)	X			
	Entering Fluid Temp (Condenser)	X			
	Leaving Fluid Temp (Condenser)	X			
	Chiller Discharge Setpoint (Evap)		X		
	Cooling Tower Status			X	
	Chiller Alarm Indication			X	
Space Condition Control	Thermostat/sensor	X			

System	Device Type	AI	AO	DI	DO
	Humidity	X			
	Carbon dioxide ppm	X			
	VOC ppm	X			
	NO ₂ ppm	X			
	CH ₄ ppm	X			
	VOC alarm contact			X	
	NO ₂ alarm contact			X	
	CH ₄ alarm contact			X	
	Outdoor pressure reference	X			
	Space pressure – office	X			
	Space pressure – shop	X			
	Space pressure – crawlspace/void	X			
	Lighting				X
Pumps	Level measurement	X			
	Low level cutoff			X	
	Pump motor start/stop				X
	Differential pressure	X			
	Motor amperage	X			
	Speed control input	X			
	Speed control output		X		
Domestic Water Production	Discharged water temperature	X			
	Energy demand of heater(s)	X			
Alarms	Low space temperature sensor	X			
	Alarm output contact				X
	Security system status			X	
	Fire alarm system status			X	
	- trouble			X	
Heat Exchanger Systems	Inlet temperature – hot	X			
	Outlet temperature – hot	X			
	Inlet temperature – cold	X			
	Outlet temperature – cold	X			
	Differential pressure – hot	X			
	Differential pressure – cold	X			
	Control valve output		X		
Zone Control Systems	Control reference temperature	X			
	Control valve output		X		
Vehicle Wash System	In-use contact			X	
	Service required contact			X	

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION .1 Install components to manufacturer's written instructions.
 .2 Exposed wiring: run in conduit or EMT.
 .3 Run control pipe and tubing parallel to building structure. Bundle tubing together and run in ladder trays where applicable.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product[s] and submit written reports, in acceptable format, to verify compliance of Work with Contract.
 - .2 Manufacturer's Field Services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
 - .4 Obtain reports, within 3 days of review, and submit, immediately, to Consultant.
- .2 Verification requirements in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified Wood.
 - .8 Low-emitting materials.
- .3 Performance Verification:
 - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:
 - .1 After delivery and storage of products.
 - .2 When preparatory Work upon which product installation depends is complete.
 - .3 Twice during installation progress at 25% and 60% complete.
 - .4 After installation and cleaning is complete.

3.4 DEMONSTRATION

- .1 Demonstrate equipment to the Owner and Owner's Advisor.
- .2 Provide instructors to train designated personnel. Include adjustment, operation, maintenance and safety requirements of equipment and system provided, specific to this installation.

- .3 Training Materials: provide training English and French (Bilingual) manual for trainees.
- .4 Training Schedule: two phases, over a 6 month period.
 - .1 Phase 1:
 - .1 Date: four day period prior to the 30 day test period.
 - .2 Duration: on job training during 30 day acceptance period.
 - .3 Topics: system architecture, communications, operation of computer and peripherals and detailed instruction in operator interface for control of HVAC systems, control logic for systems, and elementary preventive maintenance.
 - .2 Phase 2:
 - .1 Date: 12 weeks after system acceptance.
 - .2 Duration: minimum 4 days training
 - .3 Hardware Topics: general equipment layout, system component trouble shooting, component preventive maintenance, and maintenance and calibration of sensors and control devices.
 - .4 Software Topics: include application programs, programming of controllers and trouble shooting and debugging system. Provide additional information necessary to respond to concerns raised by trainees during operations period to date.

3.5 COMMISSIONING

- .1 Commission equipment of this Section to 01 91 13 – General Commissioning (Cx) Requirements. Controls, contractor to provide commissioning sheets for all points on field devices as well as head end equipment.
- .2 Verify operation of subsystems, including field components.
- .3 Conduct final operational test of not less than 30 consecutive days, 24 hours per day, on entire control system.
 - .1 Average effectiveness level (AEL): minimum 99%.
 - .2 Extend test period each day until required AEL is reached for 30 consecutive calendar days.
- .4 Advise Consultant when proper system operation is established. Consultant will perform point by point check of hardware and software items including graphics and displayed data.

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 26 05 02 - Electrical Service and Distribution
- .2 26 05 03 – Lighting, Power and Branch Wiring.
- .3 26 05 04 – Electrical Controls & Instrumentation.
- .4 27 05 13 – Communications Services
- .5 28 13 00 – Electronic Safety and Security.

1.2 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ANSI/ASME A13.1-96, Scheme For The Identification Of Piping Systems.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B651-04, Accessible Design for the Built Environment.
 - .2 CSA C22.1-09, Canadian Electrical Code Part I, Safety Standard for Electrical Installations and CE Code Handbook. Amendments for Provinces.
 - .3 CSA C22.2 No.0-M91(R2001), General Requirements - Canadian Electrical Code Part II.
 - .4 CAN/CSA-C22.3 No.3-98(R2003), Electrical Co-ordination.
 - .6 CAN3 C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .3 Manitoba Workplace Safety & Health/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Research Council of Canada
 - .1 Model National Energy Code of Canada for Buildings.
- .5 Underwriters' Laboratories of Canada (ULC)

1.3 DESIGN AND
PERFORMANCE
REQUIREMENTS

- .1 Underground Electrical Service: CSA C22.3 No.1 and CAN/CSA-C22.3 No.3.
- .2 Design equipment, components, and assemblies to operate satisfactorily at 60 Hz, within normal operating limits established within CAN3 C235.
- .3 Provide equipment designed to operate in extreme operating limits specified in CAN3 C235, without damage to equipment or failure of service.
- .4 Barrier-Free access: design equipment and components in

accordance with CAN/CSA-B651.

.5 Comply with the Model National Energy Code of Canada for Buildings..

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit requested documentation to the Authority having jurisdiction and the Contract Administrator.
- .3 Submit Workplace Safety and Health documentation including Workplace Hazardous Materials Information System (WHMIS) MSDS - Material Safety Data Sheets acceptable to Manitoba Workplace Safety and Health for applicable electrical equipment and material. Indicate applicable VOC content.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in the Province of Manitoba, Canada.
- .2 Indicate project layout, including details of lighting and power system structure, including wiring schematic diagrams. Indicate dimensions, capacities, weights and performance characteristics.
- .3 Indicate product and material data detailing of electrical and electronic equipment.

1.6 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate samples of equipment and components are to be submitted where requested.
- .3 After review and acceptance, samples will be returned for incorporation into work.

1.7 DESIGN DATA

- .1 Submit design data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit design calculations for the following:
- .1 Lighting level, interior and exterior, luminance plots.
- .2 Estimated electrical energy demand (summer, winter), showing connected load and diversified demand.
- .3 Voltage drop, as designed and at ultimate capacity.
- .4 Energy budget (LEED).
- .5 Lighting power density (W/m²).
- .6 Fault level calculations.

- .7 Coordination study.
 - .8 Site and floor plans showing security perimeter levels and their integration with the access control, intrusion detection and CCTV field devices and control devices.
-
- 1.8 TEST REPORTS
- .1 Submit certified test reports and certificates to the Contract Administrator from approved independent testing laboratories.
 - .1 Indicate compliance with specifications for specified performance characteristics and physical properties.
 - .2 Manufacturer's Field Services: submit copies of manufacturer's field inspection reports.
-
- 1.9 CERTIFICATES
- .1 Submit inspection reports and certificates of acceptance from authorities having jurisdiction to the Contract Administrator at Substantial Completion.
 - .2 Obtain and pay for necessary permits, licenses, inspections and fees required.
 - .3 Certificates: submit certificates signed by product or component manufacturers, certifying that products comply with specified performance characteristics and physical properties.
-
- 1.10 CLOSEOUT SUBMITTALS
- .1 Submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Include accurate as-built drawings. As-built drawings are to show raceway locations and raceway usage.
 - .3 Submit two electronic copies and two paper sets of drawings and specifications.
 - .4 Manufacturer's installation instructions: submit instructions for installation and operation of products, components, and assemblies.
 - .5 Submit operation and maintenance manuals for electrical and electronic equipment. Including details of design elements, component function and maintenance requirements to effectively operate, maintain or repair.
 - .6 Include technical data, product data, component illustrations, technical descriptions and parts list, wiring and schematic diagrams not considered proprietary, test and verification reports.
-
- 1.11 QUALITY ASSURANCE
- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.

- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
 - .3 COR Certification:
 - .1 All member of the design/build team are to be COR Certified to participate in the design, construction or commissioning.
- 1.12 WASTE MANAGEMENT AND DISPOSAL
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Maintain documentation on total waste in tonnes and the weight of reusable and recycled material in tonnes for submission and achieving the LEED® Credit 2.2 for Materials & Resources: Construction Waste Management – Divert 75% from Landfill.
- 1.13 WARRANTY
- .1 Refer to contractual documents for warranty duration.
 - .2 Refer to individual specification sections for an enhanced warranty period for particular systems if required.
- 1.14 COMMISSIONING
- .1 Submit commissioning plan and copies of testing and commissioning documentation in accordance with Sections 01 91 13 - General Commissioning (Cx) Requirements.
- 1.15 MATERIALS AND EQUIPMENT
- .1 Equipment:
 - .1 CSA approved and ULC certified where applicable.
 - .2 Where CSA or ULC designation is not available, obtain approval from local authority having jurisdiction.
 - .2 Ensure labels are visible and legible after equipment is installed.
 - .3 Factory assemble control panels and component assemblies.
- 1.16 FINISHES
- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and two coats of finish enamel.
 - .1 Paint outdoor electrical equipment "equipment" green finish to EEMAC Y1-1.
 - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.
 - .3 Paint recessed and surface panelboard enclosures in non service areas to match wall finish.

1.17 EQUIPMENT
IDENTIFICATION

- .1 Identify electrical equipment with nameplates.
- .2 Nameplates:
 - .1 Lamicaid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 3	3 mm high letters
Size 5	5 mm high letters
Size 6	6 mm high letters
Size 8	8 mm high letters
Size 10	10 mm high letters
Size 12	12 mm high letters

- .3 Wording on nameplates to be approved by Contract Administrator prior to manufacture.
- .4 Allow for average of twenty-five letters per nameplate.
- .5 Identification to be English.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .7 Main distribution and Sub distributions, Size 12: indicate name, system and voltage, calculated fault level, feeder length and size.
- .8 Disconnects, starters and contactors, Size 8: indicate equipment being controlled voltage and circuit.
- .9 Terminal cabinets and pull boxes, Size 8: indicate name, system and voltage.
- .10 Transformers, Size 12: indicate name, capacity, primary and secondary voltages, fed from feeds.
- .11 Receptacles, Size 3: circuit.

1.18 WIRING
IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour code: to CSA C22.1
- .4 Use colour coded wires for fire alarm and communication cables, matched throughout.

1.19 CONDUIT AND
CABLE

- .1 Colour code conduits, boxes and metallic sheathed cables.

IDENTIFICATION

- .2 Code with paint at points where conduit or cable enters wall, ceiling or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

System	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telecommunication Systems	Green	
Fire Alarm	Red	
Security	Orange	
- .4 Provide identification of equipment, components, and assemblies specified, using materials suitable to withstand anticipated operating environment.

1.20 FIELD QUALITY CONTROL

- .1 Confirm other related work is complete to receive work of this and related electrical sections.
- .2 Commission electrical systems.
- .3 Qualifications:
 - .1 Electricians: qualified, licensed electricians or apprentices in accordance with Provincial Act respecting manpower vocational training and qualifications.
 - .2 Apprentices: employees registered in provincial apprentices program permitted, under direct supervision of qualified licensed electrician, to perform specific tasks. Permitted activities determined based on level of training attained and demonstration of ability to perform specific duties.
- .4 Design-builder holding valid Master Design-builder license as issued by the Province of Manitoba.

1.21 INSTALLATION

- .1 Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, MSDS, and product datasheets.
- .2 Protect electrical equipment from dust and dirt. Plug or cap openings in conduit, fixtures and equipment during construction with Contract Administrator approved materials.
- .3 Set equipment and components plumb and level, accurate to position intended, and position hanger rods plumb.

1.22 HEAVE AND

- .1 Underground services and supports are to be designed to

SETTLEMENT

accommodate heave and settlement which is expected to occur on this Remediated site or the Design Build Team's site.

- .2 Provide connections to power door operators as required.

1.23 ACCESSIBLE DESIGN

- .1 Installation shall satisfy City of Winnipeg Accessible Design requirements.

- .2 Provide connections to power door operators as required.

1.24 EQUIPMENT HEIGHTS

- .1 City of Winnipeg Accessible Design requirements take precedence over this section.

- .2 Equipment mounting height, from finished floor to centerline of equipment item:
 - .1 Local switches: 1400 mm.
 - .2 Wall receptacles, general: 300 mm.
 - .3 Receptacles above top of counters or splashback: 175 mm.
 - .4 Receptacle above top of electric baseboard: 200 mm.
 - .5 Receptacles in mechanical rooms: 1400 mm.
 - .6 Panelboards: as required by Code or as indicated.
 - .1 1800 mm from the top of panel to floor.
 - .2 Bottom of panel, minimum 150 mm above floor.
 - .3 Where multiple panelboards are mounted together, align tops or trims of panelboards, with highest panelboard determining height.
 - .7 General telephone, interphone and cable TV outlets: 300 mm.
 - .8 Wall mounted telephone and interphone: 1400 mm.
 - .9 Fire alarm stations: 1400 mm.
 - .10 Wall mounted fire alarm, horns, wall mounted speakers and clocks: 2100 mm.
 - .11 Emergency lighting battery units: 2400 mm.
 - .12 Wall mounted dry type transformers: 2400 mm from bottom.
 - .13 Time switches: 1400 mm.
 - .14 Individual starters: 1500 mm from top. Where multiple starters are mounted together, align starter tops with highest starter determining height.

- .3 Attach electrical equipment, components and devices directly to structure and structural supporting elements.

1.25 MANUFACTURER'S SERVICES

- .1 Engage manufacturer's representative to review work, installation or application of products, protection required, and final product cleaning.
 - .1 Submit written reports to Design Build Team Engineer and Contract Administrator to verify compliance with project requirements.

- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

- .3 Schedule manufacturer site visits to review work, at following stages as minimum:
 - .1 After delivery and storage of products, when preparation is complete, but prior to installation.
 - .2 Twice during equipment installation.
 - .3 Upon completion of Work, after cleaning is complete.
- .4 Obtain manufacturer's review reports within 3 days of review, and submit to Design Build Team Engineer and Contract Administrator.

1.26 VERIFICATION

- .1 Measure phase current to panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Submit report, at completion of measurements, listing phase and neutral currents on panelboards, dry-type transformers and motor control centres, operating under normal load. Include hour and date on which load was measured, and voltage at time of test.

1.27 FIELD TESTS

- .1 Provide advance notice to Design Build Team Engineer and Contract Administrator of proposed testing schedule.
- .2 Perform tests at time of acceptance of work.
- .3 Conduct and pay for field tests:
 - .1 Power distribution, including phase voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and lighting control.
 - .4 Motors, heaters and associated control equipment, including sequenced operation.
 - .5 Fire alarm and communications (and their interface) systems.
 - .6 Telecommunications cabling.
- .4 Perform tests in presence of Design Build Team Engineer and Contract Administrator.
 - .1 Provide instruments, meters, equipment and personnel required to conduct required tests.
 - .2 Test systems to verify operation as specified.
- .5 Conduct di-electric tests, hi-pot tests, ground resistance tests, insulation resistance tests and ground continuity tests as required by nature of various systems and equipment.
- .6 Perform following tests on completed power systems:

- .1 Control and switching: test circuits for correct operation of devices, switches and controls.
 - .2 Polarity tests: test circuits for correct operation of devices, switches and controls.
 - .3 Voltage tests: test voltage at last outlet of each circuit; maximum potential drop 2% on 120 V, and 208 V branch circuits, 2% on 208 V feeder circuits, and 5% on 600 V feeder circuits. Correct deficiencies.
 - .4 Phase balance: measure load on each phase at switchboards, splitter, distribution panel board and lighting and power panel board.
 - .1 Submit results to Design Build Team Engineer in writing.
 - .2 Re-arrange phase connections as necessary to balance load on each phase as instructed by Design Build Team Engineer.
 - .3 After marking such changes, submit revised drawings showing modified connections to Design Build Team Engineer.
 - .5 Supply voltage: measure line voltage of each phase at load terminals of main breakers and report results in writing to Design Build Team Engineer. Perform test with majority of electrical equipment in use.
 - .6 Motor loading: measure line current of each phase of motors with motor operating under load, and report results in writing to Design Build Team Engineer.
 - .1 Upon indications of imbalances or overloads, thoroughly examine electrical connections and rectify defective parts or wiring.
 - .2 If electrical connections are correct, report overloads due to defects in driven machines in writing to Design Build Team Engineer.
 - .7 Insulation resistance tests:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
 - .8 Co-ordinate and carry out motor testing at same time as driven equipment is being tested. In addition to motor loading tests, provide labour and instruments to read and record motor load readings required to supplement tests on driven equipment through various load sequences, as required by driven equipment tests.
- .7 General operations: energize and operate electrical circuit and item. Repair, alter, replace, test and adjust as necessary for a complete and operating electrical system.
 - .8 Test systems and obtain written confirmation from manufacturers that components have been installed correctly and system functioning as intended. Submit certification for fire alarm, power distribution, communications systems, and security systems integrator.

- .9 Provide labour, instruments, apparatus and pay expenses required for testing. Design Build Team Engineer and Contract Administrator reserves right to demand proof of accuracy of instruments used.
- .10 Immediately prior to occupancy, test entire electrical system by performing loss and return of utility power test. Demonstrate operation of:
 - .1 Low voltage service equipment and metering.
 - .2 Exit and emergency lighting.
 - .3 Fire and intrusion alarm operation during power outage, including remote monitoring system.
 - .4 Access control and intrusion detection.
 - .5 CCTV system.
 - .6 System shut down and auto restart, including restabilization of systems after power return.
 - .7 User equipment shut-down and auto-restart.
 - .8 Attach report printouts as evidence of expected operation on systems.

1.28 TEST RESULTS

- .1 Submit test results to Design Build Team Engineer and Contract Administrator for review.
- .2 Testing methods and test results: to CSA, CEC and authorities having jurisdiction.
- .3 Remove and replace conductors found damaged, with new materials.
- .4 Provide required labour and tools, if during testing Design Build Team Engineer requests equipment be opened and removed from their housings to examine equipment, terminations and connections.

1.29 TRAINING

- .1 Train operating personnel in operation, care and maintenance of electrical equipment.
- .2 Arrange and pay for manufacturer's factory service engineer to provide training. Ensure operating personnel are conversant with its care and operation.
- .3 Obtain and submit written confirmation from operating personnel that satisfactory training has been received.
- .4 Provide one day training session for following systems.
 - .1 Fire Alarm.
 - .2 Card access and Intrusion system.
 - .3 Telecommunication systems.
 - .5 Electrical distribution, control & instrumentation.

1.30 CLEANING

- .1 Perform final cleaning of electrical equipment, systems and components.

- 1.31 PRODUCT STANDARDS .1 Where products are indicated, the following definitions apply:
- .1 Acceptable manufacturers: only products supplied by the indicated manufacturers are to be provided.
 - .2 Standard of acceptance: the listed product or manufacturer provides the required features. Alternate manufacturers can be utilized provided they also provide the same features as the listed product or manufacturer. The Design Build Team may be asked to submit proof that the alternate product meets the standard of acceptance.

PART 2 - PRODUCTS

- 2.1 SUSTAINABLE REQUIREMENTS .1 Use only low emitting adhesives, caulking, paint, coatings and sealants to meet LEED® Credits 4.1 and 4.2 under Indoor Environmental Quality: Low Emitting Materials.

- 2.2 SPRINKLER PROOF .1 All major electrical equipment are to be sprinkler proof. This shall include but not be limited to:
- .1 Main distribution, sub-distribution and surface mounted panelboards.
 - .2 Transformers.
 - .3 Motor control centres and discrete starters.

PART 3 - EXECUTION

- 3.1 FIELD QUALITY CONTROL .1 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Design Build Team's Verification, include:
- .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

- 3.2 CLEANING .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

1.1 SECTION
INCLUDES

- .1 Power Distribution.
- .2 Auxiliary Power.
- .3 Uninterruptible Power Supply.
- .4 Ground System.
- .5 Surge Protection.
- .6 Lightning Protection.
- .7 Service Rooms.
- .8 Underground Site Services.

1.2 RELATED
SECTIONS

- .1 Division 1.
- .2 Section 26 05 01 – Common Requirements – Electrical.
- .3 Section 26 05 03 – Lighting, Power, and Branch Circuit Wiring.
- .4 Section 26 05 04 – Electrical controls and Instrumentation.

1.3 DESIGN
PERFORMANCE
REQUIREMENTS

- .1 Power Distribution:
 - .1 Future loads:
 - .1 Include electrical loading for future Facilities in calculated demand. Do not include this in spare capacity.
 - .2 Winnipeg Fleet Management Agency – Future Facilities:
 - .1 FM-1 Shop and Office.
 - .2 Future shop and office area expansion.
 - .3 Refueling Centre.
 - .3 Streets Maintenance – Future Facilities:
 - .1 Sand & Salt Storage Facility.
 - .2 Calculated demand, is the demand for the current tenants of the site plus the demand of the future tenants.
 - .3 Spare capacity:
 - .1 Spare capacity shall be calculated as a percentage of calculated demand (Current tenants + future tenants)
 - .2 Main Distribution: 30% breaker space, 30% spare capacity of calculated demand.

- .3 Sub-distribution: 40% breaker space, 35% spare capacity of calculated demand.
- .4 Utilization panelboards: 50% breaker space, 40% spare capacity of calculated demand.
- .5 Transformers: sized to accommodate the spare capacity of the downstream distribution.
- .4 Voltage drop:
 - .1 Based on calculated demand, maximum voltage drop from consumers terminal to point of utilization shall be 3.6%.
 - .2 Maximum voltage drop for calculated demand plus 30% shall be 5% and satisfy CEC 8-102.
 - .3 Refer also to ASHRAE/IESNA 90.1-2004 voltage drop requirements.
- .5 Provide underground service from utility to pad mounted transformer to service entrance board.
- .6 Provide concrete pad for utility transformer.
- .7 Circuit breakers:
 - .1 Adjustable trip electronic breaker for main breaker and auxiliary power main sub-distribution with loss of phase protection.
 - .2 Provide adjustable electronic breakers as required in sub-distribution to achieve coordination.
 - .3 If service size requires ground fault protection, provide ground fault on sub-distributions and utilize instantaneous zone coordination.
 - .4 Series rated circuit breakers are not to be utilized.
- .8 Mechanical Equipment:
 - .1 Provide motor control equipment and starters.
 - .2 Use adjustable motor circuit interrupters (MCPs) with combination motor starters.
 - .3 Where there are more than five starters in one location, group in a motor control centre and install MCC in Electrical room or Mechanical room.
 - .4 Provide three phase motors for 0.37 kW (1/2 hp) capacity and larger.
 - .5 Provide soft start or variable speed drives for 208 volt 5 HP motors, and 600 volt, 10 HP motors or larger.
 - .6 Variable speed drives are to satisfy the

- communication requirements of 25 01 00, Integrated Automation.
- .7 Feed mechanical equipment from dedicated mechanical distributions.
 - .9 Feed non-linear loads for computer equipment from dedicated distributions and panel-boards, that is a dedicated computer distribution.
 - .10 Use K-13 rated transformers in applications where 50% or more of the connected load is non-linear.
- .2 Auxiliary Power.
- .1 Generator enclosure options:
 - .1 If Design Build Team provides a mechanical penthouse:
 - .1 Generator enclosure mounted on roof adjacent to Mechanical Penthouse.
 - .2 Self contained, insulated walk-in enclosure with sufficient heating to maintain enclosure temperature at 10 degrees Celsius.
 - .2 If Design Build Team does not provide a mechanical penthouse: Integrated into building adjacent to main mechanical room.
 - .2 Storage tank mounted at ground level with pump to generator day tank.
 - .3 Run time at full connected load:
 - .1 **Entire Site: 24 hours (1 day).**
 - .2 **Partial area of site, as indicated: 72 hours (3 days).**
 - .4 Generator run and common trouble annunciated at City of Winnipeg Central Monitoring Facility via Building Automation system.
 - .5 Future loads:
 - .1 No allowance for future Winnipeg Fleet Management Agency areas in generator demand.
 - .2 Include allowance for future Streets Maintenance areas in generator demand.
 - .6 Spare capacity:
 - .1 20% spare capacity on top of calculated demand.
 - .7 Areas and equipment requiring auxiliary power:
 - .1 No area shall be left in complete darkness upon failure of utility power. Average lighting level along the path of egress shall be the level required by

- emergency lighting.
- .2 Mechanical equipment necessary for maintaining the building heating.
- .3 Access control and intrusion detection system.
- .4 CCTV system.
- .5 Mechanical and Electrical systems which support the operation of the areas below.
- 6 Areas requiring auxiliary power to maintain normal operations during a **0 to 24 hour** utility power outage are:

Entire site.

- .6 Areas requiring auxiliary power to maintain normal operations during a **0 to 72 hour** utility power outage are:

Public Works- Bridge Operations Division (BO):

- BO Administrative Component- NOT REQUIRED.
- BO Heated Garage Component- NOT REQUIRED.
- BO Unheated Garage and Storage- NOT REQUIRED.
- BO Exterior Yard Component- NOT REQUIRED.

Public Works- Centralized Park Services Division (CS)

- CS Administrative Component- NOT REQUIRED.
- CS Heated Garage Component- NOT REQUIRED.
- CS Unheated Garage/Storage Component- NOT REQUIRED.
- CS Exterior Yard Components- NOT REQUIRED.

Public Works- East Area Parks, Parks and Open Spaces Division (EA)

- EA Administrative Component- NOT REQUIRED.
- EA Heated Garage Component- NOT REQUIRED.
- EA Unheated Garage/Storage Component- NOT REQUIRED.
- EA Exterior Yard Components- NOT REQUIRED.

Public Works- Shared Amenities (SA)

- SA Administrative Component- **PROVIDE**
- SA heated Garage Component- **PROVIDE**
- SA Exterior Yard Components- **PROVIDE**

Public Works- Streets Maintenance Division- East Area (SM)

- SM Administrative Component- **PROVIDE**
- SM Heated Garage Component- **PROVIDE**
- SM Unheated Garage/Storage

- Component- **PROVIDE**
 - SM Exterior Yard Components- **PROVIDE**
Fleet Management Agency (FM)
 - FM Heated Garage Component. - NOT REQUIRED.
 - FM Unheated Garage/Storage Component- NOT REQUIRED.
 - FM Exterior Yard Components- NOT REQUIRED.

- .3 Uninterruptible Power Supply.
 - .1 Provide a UPS in each telecom room to power electronic equipment which does not have integral battery backup.
 - .2 Minimum 2kVA, sized to accommodate Design Build Team and Contract Administrator provided equipment.
 - .3 30 minute run time.
 - .4 Common trouble alarm annunciated on Building Management system.
 - .5 Network connection to allow all parameters to be remotely viewed and reported.

- .4 Ground System.
 - .1 Electrical ground system shall consist of ground rods installed at each corner of the building interconnected by uninsulated copper conductor and connected to the main electrical room and sub-electrical room ground buses. In the current "L" shaped building configuration this will require six ground rods.
 - .2 Connect main electrical room ground bus to main distribution point of common coupling.
 - .3 Telecommunication ground system shall consist of insulated ground bus, one in each telecommunication room interconnected in star configuration by insulated copper conductors. Connect main telecom room bus to main electrical room ground bus.

- .5 Surge Protection.
 - .1 Provide surge suppression where electrical and telecommunication services enter the building.
 - .2 This includes but is not limited to:
 - .1 Electrical Power Service Entrance
 - .2 Telephone Service Entrance
 - .3 Cable Television Service Entrance
 - .4 Site Power Distributions.
 - .5 Site Lighting.

- .6 Site Telecommunications and Security.
- .7 Intercom system call stations at gate.
- .3 Design surge protection bonding to minimize impedance of bonding at typical surge event frequency.
- .6 Lightning Protection
 - .1 Not required.
- .7 Service Rooms.
 - .1 Locate service rooms strategically to provide maximum flexibility for systems and easy access to floor area served.
 - .2 Provide additional enclosed service rooms over numbers shown in Program of Requirements/Room Data sheets as required.
 - .3 Electrical Service Rooms.
 - .1 Provide dedicated spaces to house electrical equipment.
 - .2 Locate main electrical room centrally.
 - .3 Provide space in main electrical room for future power factor correction unit.
 - .4 Telecommunication Service Rooms.
 - .1 Provide dedicated spaces to house telecommunication equipment.
 - .2 Provide space to accommodate equipment for future tenants.
 - .3 Provide space to house uninterruptible power supplies.
 - .5 Provide painted plywood backboards behind all wall mounted equipment. Plywood is to extend 300 mm beyond perimeter of equipment.
- .8 Underground Site Services.
 - .1 All site services are to be installed underground in rigid PVC raceway.
 - .2 Provide raceways for power, communications, electronic safety and security systems from service rooms to 3 meters inside the boundary of each of the future tenant areas. Mark on as-built drawings.
 - .3 See also 26 05 03, spare raceway.

1.4 SUBMITTALS

- .1 Submit product in accordance with Section 01330 - Submittal

Procedures.

- .2 Submit requested documentation to Design Build Team, Design Build Team Engineer and Contract Administrator.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Manitoba Workplace Safety and Health Standards for applicable electrical equipment and material. Indicate applicable VOC content.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate project layout, details of metering and monitoring systems, wiring schematic diagrams. Indicate dimensions, capacities, weights and performance characteristics.

1.6 DESIGN DATA

- .1 Submit design data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Load Calculations for equipment, lighting and circuits.
- .3 Submit fault level calculations and coordination study. Coordination study is to include main distribution, sub-distribution main breakers, transformer damage curves and auxiliary power system.

1.7 CLOSEOUT SUBMITTALS

- .1 Submit operation and maintenance manuals for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Include maintenance instructions and list of spare parts and suppliers.

1.8 TEST REPORTS

- .1 Submit certified test reports and certificates to Design Build Team Engineer and Contract Administrator from approved independent testing laboratories.
- .2 Indicate compliance with specifications for specified performance characteristics and physical properties.

1.9 QUALITY ASSURANCE

- .1 Supply each type of equipment from a single manufacturer.

PART 2 - PRODUCTS

2.1 POWER DISTRIBUTION

- .1 Service Entrance Board:
 - .1 Rated for 600/347 V, 3 phase, 4 wire.

- .2 Capacity and short circuit current ratings to suit the specific characteristics of scheduled loads, with allowance for spare capacity as indicated previously.
 - .3 Cubicles: Free standing, dead front with sprinkler hoods.
 - .4 Main Service Entrance: 100% rated moulded case breaker.
 - .5 Feeder Breakers: Moulded case.
 - .6 Utility metering compartment.
 - .7 Customer metering compartment.
- .2 Transformers:
- .1 Dry type ANN for indoor applications, Class H insulation and standard taps:
 - .1 BIL high pot standard for pressure rating.
 - .2 Impedance: 170 degrees standard.
 - .2 T-tap transformers are not allowed.
- .3 Sub-distribution Panels:
- .1 Suitable for bolt-on breakers only, complete with copper bus bars.
 - .2 Full size neutral bus
 - .3 Main breaker.
- .4 Panelboards:
- .1 Suitable for bolt-on breakers only, copper or aluminum bus bars.
 - .2 Full size neutral.
 - .3 Main breaker when located greater than 100 meters from source of supply or located in an adjacent building.
 - .4 Recessed when mounted in finished areas.
- .5 Motor Starters and Controls:
- .1 Manual Starters: Single and Three phase, quick-make, quick-break switching mechanism, one or three overload heaters, manual reset.
 - .2 Full Voltage Magnetic: Magnetic and combination magnetic starters, rapid action contactor and motor overload protective devices in each phase. Equip combination units with circuit breaker and operating lever on the outside.
 - .3 Soft start and variable speed drives: 12 pulse operation.
 - .4 Accessories: Push buttons, selector switches, pilot lights heavy duty oil tight.
 - .5 Electrically held contactors controlled by auxiliary devices: Heavy duty, to EEMAC - ICS-1970, Hands-off-auto illuminated by pilot lights of red, green, white, and ON-OFF. Control relays field convertible.
 - .6 Dedicated terminal strip for field wiring of grouped motor control conductors.
 - .7 Solid state timing relays.

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- 2.2 AUXILIARY POWER
- .1 Walk-in, insulated, heated enclosure designed for Manitoba Environment and provided by Generator Manufacturer.
 - .2 Leak detection connected to Building Management System for annunciation.
 - .3 Transfer switch to switch without interruption in electrical supply and include maintenance bypass.
- 2.3 UNINTERRUPTIBLE POWER SUPPLY
- .1 Standard of acceptance: Powerware, APC, Liebert.
 - .2 Extend warranty for UPS and batteries to five years.
 - .3 Inspect UPS's a minimum of yearly and provide status report to Contract Administrator.
- 2.4 GROUND SYSTEM
- .1 Grounding conductors minimum 2/0 copper.
 - .2 Electrical bonding conductors sized for fault level and CEC requirements.
 - .3 Telecommunications bonding conductors sized as per EIA/TIA recommendations.
 - .4 Ground bus:
 - .1 Material: Copper.
 - .2 Size: Minimum 32 mm x 4 mm x 600 mm.
 - .3 Uninsulated in electrical rooms.
 - .4 Insulated in telecom rooms.
 - .5 3 m copper clad steel rods.
 - .6 Galvanized inspection cans.
 - .7 Connect ground rods and underground connections using thermit weld process and pressure clamps.
 - .8 Ground exposed non-current carrying metallic parts of electrical equipment, raceway systems, grounding conductors in non-metallic raceways and neutral conductor of wiring systems to CSA C22.1.
- 2.5 SURGE PROTECTION
- .1 Line Voltage Surge Suppression:
 - 1 Hard wired, multi-circuit hybrid surge protection device for use at distribution panels.
 - .2 Mode Protection: L-N, L-L normal mode; L-G, N-G common mode.
 - .3 All units must be CSA certified and be certified as UL1449 3rd edition type 2 devices
 - .4 All SPD's shall carry a UL nominal discharge current rating of no less than 20,000A
 - .5 EMI/RFI Attenuation: Maximum 50 dB at 100 kHz.

- .6 Status Indicators: One per phase and neutral to ground modes (LED) and form C alarm contacts
 - 7. Service entrance locations shall use no less than 250kA per phase surge current rated devices.
 - 8. Sub distribution and computer equipment panelboards shall use no less than 100kA per phase surge current rated devices.
- .2 Communication surge suppression.
- CCTV:
- 1. Insertion loss 0.5dB at 40 Mhz
 - 2. 132A peak pulse current (10 x 1,000 uSec)
 - 3 Response Time: Maximum 5 nanosecond.
- Ethernet (Cat 5):
- 1. Insertion loss 0.5dB at 40 Mhz
 - 2. 97A peak pulse current (10 x 1,000 uSec)
 - 3. Response Time: Maximum 5 nanosecond.
 - 4. Maximum shunt capacitance <25pF
- .3 Standard of acceptance:
- .1 Low voltage surge protection device: Eaton SPD series.
 - .2 CCTV: Eaton ECCP series.
 - .3 Ethernet: Eaton EPCH series.
- 2.6 LIGHTNING PROTECTION
- .1 Not required.
- 2.7 SERVICE ROOMS
- .1 Electrical Service Rooms.
- .1 No additional requirements.
- .2 Telecommunication Service Rooms.
- .1 No additional requirements.
- 2.8 UNDERGROUND SITE SERVICES
- .1 Standard of acceptance: Rigid PVC manufactured by IPEX.
- PART 3 - EXECUTION
- 3.1 INSTALLATION
- .1 Install equipment in accordance with manufacturers instructions.
- 3.2 POWER DISTRIBUTION
- .1 Install distribution and sub-distribution electrical equipment in electrical rooms.
- .2 Install free standing distribution equipment on 100 mm high concrete housekeeping pads.

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- .3 Set and secure switchgear and service entrance equipment in place on channel base, rigid and plumb.
 - .4 Check factory connections in switchgear for mechanical security electrical continuity.
 - .5 Mount dry type transformers on 100 mm high concrete housekeeping pad; ensure adequate clearance for ventilation is available.
 - .6 Install transformers level and upright; loosen isolation pads until no compression is evident.
 - .7 Check trip units, heater settings, fuse sizes, test and commission, energize and set to working condition.
 - .8 Provide plastic laminated full size electrical distribution drawing and permanently mount in main electrical room.
 - .9 Provide plastic laminated 11x17 versions of as-constructed drawings, bound into a set and permanently mounted in main electrical room.
- 3.3 AUXILIARY POWER
- .1 Mount transfer switch in main Electrical room.
 - .2 Connect leak detection to Building Management System.
- 3.4 UNINTERRUPTIBLE POWER SUPPLY
- .1 Connect UPS to Building Management system for annunciation.
 - .2 Connect UPS to Network to allow remote monitoring.
- 3.5 GROUND SYSTEM
- .1 Install inspection cans flush with surface and locate where protected against vehicle traffic and snow removal equipment.
 - .2 Bond electrical equipment to electrical ground bus.
 - .3 Bond telecommunication equipment to telecommunication ground bus.
- 3.6 SURGE PROTECTION
- .1 Bond electrical and telecommunications surge protection to electrical ground system.
- 3.7 LIGHTNING PROTECTION
- .1 Not required.
- 3.8 SERVICE ROOMS
- .1 Electrical Service Rooms.
 - .1 No additional requirements.
 - .2 Telecommunication Service Rooms.
 - .1 No additional requirements.

3.9 UNDERGROUND
SITE SERVICES

- .1 Clean underground raceways before installation of cabling.
- .2 Provide pull card in raceways.
- .3 Solvent weld cap on end of future tenant raceways and identify usage and approximate termination location.

3.10 COMMISSIONING

- .1 Test, commission and set equipment into operation.
- .2 Demonstrate trip settings from coordination study have been applied to adjustable trip devices.
- .3 Demonstrate auxiliary power system can function at rated load for 10 minutes. Operate auxiliary power system for 1/3 of runtime on 50% rated load. Include test parameters in O&M manuals.
- .4 Demonstrate UPS run time.

PART 1 - GENERAL

1.1 SECTION
INCLUDES

- .1 Power Consumption and Rebates
- .2 Raceways.
- .3 Wiring: Service, Feeder and Branch.
- .4 Lighting.
- .5 Site Lighting.
- .6 Lighting Control.
- .7 Emergency lighting.
- .8 Wiring devices.
- .9 Electrical Equipment.
- .10 Wiring methods.

1.2 RELATED
SECTIONS

- .1 Division 1.
- .2 Section 26 05 01 – Common Requirements – Electrical.
- .3 Section 26 05 02 – Electrical Service and Distribution.
- .4 Section 26 05 04 – Electrical Controls and Instrumentation.

1.3 REFERENCES

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers/Illuminating Engineering Society of North America. /Illuminating Engineering Society (IES)
 - .1 ASHRAE/IESNA 90.1-2004, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA C22 No.111-00, General Use Snap Switches (Bi-national Standard, with UL 20).
 - .2 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .3 CSA W59-M1989(R2001), Welded Steel Construction (Metal Arc Welding) (Metric version).
- .3 Illuminating Engineering Society of North America
 - .1 IESNA Lighting Handbook 9th edition.

1.4 DESIGN
PERFORMANCE
REQUIREMENTS

- .1 Power Consumption and Rebates:
 - .1 All exterior luminaires and the emergency lighting are to be eligible for PowerSmart rebates.
 - .2 Lighting power densities are to satisfy ASHRAE/IESNA 90.1-2004.
- .2 Raceways:
 - .1 All power services are to be installed in conduit.
 - .2 All electronic safety and security systems are to be installed in conduit.
 - .3 All Communication systems are to be installed in:
 - .1 Cable tray:
 - 1. Above finished ceilings.
 - 2. Under raised floor areas.
 - 3. Telecommunication rooms.
 - .2 Raceway:
 - .1 Finished wall spaces.
 - .2 Where exposed.
 - .4 Surface raceways and outlet boxes:
 - .1 Are to be installed in Garage, Workshop Service areas, Electrical rooms, and Telecommunication rooms, raised floor areas.
 - .2 Horizontal sections of surface raceways are not be used below 4000 mm. Riser vertically up to cross branch and back down to device.
 - .5 Concealed conduit is to be installed within finished areas.
 - .6 Do not install raceways in slab or below slab.
 - .7 Minimum Conduit Size: 19 mm.
 - .8 Install termination fittings approved for the location on cable.
 - .9 Spare Raceways:
 - .1 From each Main Electrical Room and Sub-distribution Electrical Room provide two spare 78 mm raceways for future use.
 - .2 From each Telecommunication Room provide two spare 78 mm raceways for future use.
 - .3 Raceways are to be capped underground 3000 mm horizontally from building boundary and marked on as-built drawings.
 - .4 One of each service rooms raceways are to exit at the closest building boundary. The remaining raceways

are to exit on the other side of the building, 180° apart in direction of travel.

.5 These raceways are in addition to future tenant raceways.

.6 See also 26 05 02 Underground Site Services.

.3 Wiring: Service, Feeder and Branch.

.1 Aluminum NUAL conductors for feeders.

.2 Copper conductors for connection to equipment and for branch circuits.

.3 Minimum power wiring size #12 AWG.

.4 Minimum wire sizes, based on the use of copper conductors:

.1 Power and Lighting: No.12 AWG, colour coded conductors.

.2 Controls: No.14 AWG.

.3 Use RW90 for interior and RWU90 for exterior wiring.

.4 Conductors No. 10 and Larger: Stranded.

.5 Use Type AC90 armoured cable (BX) for:

.1 Connections from conduit to luminaires in accessible ceilings and stud partitions.

.2 Servicing devices in stud partition walls from outlet box in ceiling to device location.

.3 DO NOT loop between wiring devices.

.6 DO NOT use Type AC90 cables for any other application.

.4 Lighting:

.1 T5 and T5HO lamp luminaires:

.1 Predominant means of illuminating interior spaces.

.2 High bay luminaires used in areas with high ceiling space (Garage and Workshops, etc.)

.2 Compact fluorescent luminaires:

.1 Used for supplemental lighting.

.3 Interior spaces:

.1 Lighting to mid range of IESNA recommendations.

.2 Office area lighting to IESNA RP1, Recommended Practice for Office Area Lighting.

.3 Areas with Computer Workstations to IESNA VDT Lighting Standard.

.4 Luminaires in areas with a ceiling grid are to permit relocation of luminaire by one grid space in any direction without disconnection.

- .5 Task lighting above workbenches.
- .6 Strip lighting behind valance on underside of upper cabinets.
- .7 Additional lighting to adequately illuminate racking.
- .8 Interior lighting in all storage buildings.
- .9 Hazardous area and waterproof luminaires as required for area usage.
- .10 Refer to program of requirements for summary of luminaire types to be utilized.
- .11 Refer to room data sheets for additional requirements for a specific location.
- .4 Wire Guards:
 - .1 For service room luminaires.
 - .2 In workshop areas where accidental contact is likely.
- .5 Site Lighting:
 - .1 Low to medium mast luminaires for parking and walkway areas.
 - .2 High mast luminaires with lowering gear for yard areas.
 - .3 Feature lighting incorporated into the façade or soffit of the building to enhance the façade.
 - .4 All personal or vehicular entrances, of main building or sub-buildings are to be illuminated by building mounted luminaires.
 - .5 All luminaire pole bases are to be protected from vehicular damage either by bollards or by placement within a protected area such as median strips, curbs or landscaped area.
 - .6 Illumination levels:
 - Personal Vehicles parking area:
 - .1 Lighting to achieve IES requirement for enhanced security.
 - .2 5 Lux (0.5f.c) horizontal illumination.
 - .3 Uniformity ratio of 8:1, max to min.
 - .4 Coordinate lighting with trees to achieve illumination levels with mature trees in full foliage.
 - Motorized sliding gates:
 - .1 10 to 15 Lux horizontal (1.0 to 1.5 f.c)
 - .2 Uniformity ratio of 6:1, average to min.
 - Roadway areas:
 - .1 8 Lux (0.8 f.c.) horizontal illumination.
 - .2 Uniformity ratio of 5:1, average to min.
 - High speed intersections:
 - .1 Not applicable to this site.
 - Equipment parking areas:

- .1 8 to 10 Lux (0.8 to 1.0 f.c) horizontal illumination.
- .2 Uniformity ratio of 6:1, average to minimum.

- Equipment manoeuvring areas:
 - .1 8 Lux (0.8 f.c) horizontal illumination.
 - .2 Uniformity ratio of 6:1, average to min.

- Material handling areas (yard areas):
 - .1 20 Lux (2.0 f.c) horizontal illumination.
 - .2 Uniformity ratio of 4:1, average to min.

- .7 Coordinate locations of yard lighting with usage of area. Luminaire poles are not to impede equipment operation.

- .8 Spill lighting:
 - .1 To satisfy LEED requirements.

- .6 Lighting Control.
 - .1 Computerized lighting control.
 - .2 The response of the lighting control system to sensor or occupant controls shall be software configurable and it shall be possible to re-assign a sensor or occupant control.
 - .3 Lighting power consumption and usage annunciated at City of Winnipeg Central Monitoring Facility via the Building Automation System.
 - .4 Master controls at each main entrance to force the system into the following modes:
 - .1 Cleaning
 - .2 Unoccupied
 - .3 Normal day use
 - .4 Normal night use
 - .5 All entrances to spaces are to have occupant controls.
 - .6 Office areas with direct access to exterior lighting are to have daylight sensors and dim the applicable luminaires in response to available daylight.
 - .7 Intermittent use rooms are to be controlled by motion sensor, such as storage, meeting, training, washrooms, lockers, showers.
 - .8 Garage areas are to have motion sensors which automatically switch illumination from low level (1/3 of high level) to high level. Motion sensors are to be zoned to match either a vehicle aisle or an area of 120 sq. m (1200 sq. ft).
 - .9 Minimal usage of interior security lighting. Security lighting shall be of a level to provide effective operation of CCTV cameras.

- .10 24 hour operation (uncontrolled luminaires) shall not be utilized.
- .11 Exterior lighting shall be on/off by photocell.
- .12 Site lighting shall be low level/high level.
 - .1 Low level shall provide effective operation of CCTV cameras.
 - .2 High level shall be when yard is operational.
 - .3 Switching to high level shall also be possible from Access Control Proximity Card Reader installed at exterior location as directed by the Contract Administrator.
- .7 Emergency lighting.
 - .1 Centralized Inverter System with cabinets located in electrical room(s).
 - .2 Area of coverage:
 - .1 As required by the NBC.
 - .2 Washrooms, lockers, showers and areas where the public (contract staff unfamiliar with the facility) may congregate.
 - .3 Arranged so that failure of one lamp will not leave the area normally illuminated, in darkness.
 - .4 Arranged so that failure of power from a select circuit in areas which provide access to egress will cause Emergency Lighting to illuminate.
 - .5 LED exit signs.
 - .3 Provide emergency lighting for auxiliary power in accordance with CAN/ULC emergency power supplies for buildings.
- .8 Wiring devices.
 - .1 Receptacles:
 - .1 Each anticipated desk location shall have a minimum of two receptacles, one for computer, one for general usage.
 - .2 Maximum of 3 computers per 15A computer circuit. Receptacles connected to computer distributions (non-linear loads) shall be Orange.
 - .3 Each wall within a room shall have a minimum of one general use receptacle, coordinated with anticipated furniture/equipment layout. In open office areas maximum average spacing of receptacles along the wall shall be 5 meters. In workshop, garage areas and storage buildings, maximum average spacing 10 meters. Wall perimeter shall include the area below windows in the determination of receptacles spacing, however receptacles are generally not to be placed

- below windows but in the space between windows.
- .4 Cleaning receptacles shall be provided at 20 meter intervals in circulation spaces.
- .5 Counter and workbenches shall have general usage receptacles mounted above counter height at 1.2 m average spacing. 20/15A T-slot GFI receptacle when located adjacent to sinks. 20A/15A T-slot split wired receptacle otherwise.
- .6 Each column (if space not free span) shall be provided with a general use receptacle).
- .7 Telecommunication rooms shall be provided with:
 - .1 Receptacles attached to overhead cable tray, two dedicated receptacles per rack.
 - .2 Two dedicated receptacles on each backboard for wall mounted equipment.
- .8 Dedicated receptacles for anticipated loads such as coffee machines, microwaves, water coolers, vending machines, network printers, etc. Dedicated circuits when equipment will load circuit to greater than 50% capacity.
- .9 Exterior GFI receptacles adjacent to each entrance.
- .10 Employee vehicle parking receptacles shall be microprocessor controlled to vary duty cycle based on outdoor air temperature.
- .11 Parking receptacles for heavy equipment stored in unheated areas or outdoors, connected to "minimizer" type control panel which varies duty cycle as a function of temperature.
- .12 Provide 10 additional heavy equipment parking receptacles in locations as directed by the City of Winnipeg for heavy equipment not placed in designated parking areas and stalls.
- .13 All receptacles shall be duplex, commercial specification grade.
- .14 Receptacles in entry vestibules and Public Areas are to be tamper proof.
- .15 Weatherproof covers for:
 - .1 Exterior receptacles.
 - .2 Wash bay receptacles.
- .2 For each motorized overhead door provide pushbutton station:
 - .1 Interior of door: UP/DOWN/STOP station.
 - .2 Exterior of door: DOWN/STOP station.
- .3 Raised floor areas:
 - .1 Not required.
- .4 Provide receptacles for equipment shown on room data sheets that require receptacles.
- .9 Electrical Equipment.
 - .1 Provide direct connection for equipment shown on room data sheets which require direct connections.

- .10 Wiring Methods.
 - .1 Provide a dedicated, full size neutral for non-linear load circuits.
 - .2 Equip each computer circuit with an insulated ground conductor.
 - .2 Lugs, terminals and screws, used for termination of wiring suitable for conductor materials used.
 - .3 Provide independent supports for electrical equipment including fasteners, devices and hangers capable of supporting dead load of equipment and components plus 100 kg. Fibre, wood or plastic inserts are not acceptable.

- 1.5 QUALITY ASSURANCE
 - .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
 - .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
 - .3 COR Certification:
 - .1 All members of the design/build team are to COR Certified to participate in the design, construction and commissioning.

- PART 2 - PRODUCTS

- 2.1 POWER CONSUMPTION AND REBATES
 - .1 No additional requirements.

- 2.2 RACEWAYS
 - .1 General Areas: EMT with rain-tight connectors.
 - .2 Locations subject to mechanical damage: Rigid steel conduits with threaded connections.
 - .3 Incoming underground services : PVC ducts and fittings.

- 2.3 WIRING: SERVICE, FEEDER AND BRANCH
 - .1 Wiring: Service Feeder and Branch, Copper or aluminum for service entrance conductors.
 - .2 Copper for branch feeders and circuits. RW90 insulation as standard for interior installations.

- 2.4 LIGHTING
 - .1 CSA labelled, rated for 347 volts, except for dimmable sources.
 - .2 Accessories: Mounting hardware, ceiling trim rings and perimeter frames, end closure plates or gaskets, fittings to ensure fixture closure, for secure, accurate and a flush fit installation.

- .3 Luminaires:
 - .1 Office area General Use luminaires, standard of acceptance: Lithonia RT5 series.
 - .2 Office area Supplemental luminaires, standard of acceptance: Canlyte 8052-CCD.
 - .3 Workshop area High Bay luminaires, standard of acceptance Green Lights iMEK series with wire guard.
 - .4 Workshop area task lighting luminaires, standard of acceptance: Lithonia EJS-2 series with wire guard.
 - .5 Luminaires in other areas:
 - .1 Housing: Minimum 22 gauge cold rolled steel, die formed, with reinforcing as required to ensure rigidity.
 - .2 Spot weld, Fastening method, not be visible when the luminaire is installed in normal mounting position.
 - .3 Finish: Baked enamel, White interior minimum 85% reflective.
 - .5 All luminaires except for service spaces are to be provided with a diffuser, minimum 0.156" thick.
- .4 Lamp: T5 High Output rapid start lamps, minimum CRI 85 at 4100 K, minimum lamp life of 20,000 hours.
- .5 Ballasts: Electronic, rapid start:
 - .1 CSA certified, to ANSI C62.41/C62.45, with and without lamps in the ballast secondary circuits.
 - .2 Eligible for Manitoba Hydro PowerSmart rebates.
 - .3 Programmed rapid start when controlled by motion sensor.
 - .4 Dimmable when required for daylight harvesting or audio visual equipment is to be utilized in the space.
 - .5 Suitable for unheated areas as required.

2.5 SITE LIGHTING

- .1 Parking Lot and Front Entrance Walkway Lighting:
 - .1 Luminaires: LED in parking lot, Metal halide when building mounted.
 - .2 High visual cut off, die cast aluminum, formed and welded, epoxy painted socket housing, Alzack aluminum reflector.
 - .3 Lens: Heat tempered glass, shock and impact resistant, gasketed.
 - .4 Lamp: Horizontal, reflectors available for Type II, III, IV, or V distribution.
- 1 Site Lighting:
 - .1 Metal Halide.
 - .2 High mast with lowering gear.
 - .3 Standard of acceptance: Holophane HMS series with surveillance camera pole and HMSC luminaire.
- .2 Anchor base: Structural steel to CAN/CSA-G40.21. Grade 44 W.
- .3 Base: Precast reinforced concrete, extending 600 mm above finished

- grade, designed and anchored such to resist live (wind and gust) and dead loads within movement, displacement, or distortion.
- .4 Poles: Welded steel, to CSA W59, designed to receive underground conduit and wire.
- 2.6 LIGHTING CONTROL .1 Standard of acceptance: Lutron.
- 2.7 EMERGENCY LIGHTING .1 Standard of acceptance: Lumacell.
- 2.8 WIRING DEVICES .1 Duplex receptacles:
- .1 CSA type 5-15R, 125V, 15A, U ground, for No. 10 AWG wire for side wiring.
 - .2 High impact resistive nylon top face T-type triple wipe or four point double wipe, heavy-duty power contacts extending full length of blades.
 - .3 Colour: White, Orange for Computer Distribution.
 - .4 Standard of acceptance: Leviton 5262-W series.
- .2 Switches:
- .1 To CSA C22.2 No 111, 120-277 VAC, 15A, to accept No. 10 AWG wire.
 - .2 Colour: White.
 - .3 Standard of acceptance: Leviton 1201-2W, 1221-2W, 3031-2W series.
- .3 Cover Plates:
- .1 Wiring Device:
 - .1 Flush Mounted Outlets: Vertically brushed stainless steel, 1.0 mm thick.
 - .2 Surface Mounted Wiring Devices: Sheet steel.
 - .2 Devices Mounted in FS or FD Conduit Box: Sheet steel.
 - .3 Weatherproof: Cast aluminum, double lift, spring-loaded, with weather-tight gaskets.
- 2.9 ELECTRICAL EQUIPMENT .1 Hand dryers:
- .1 Quiet operation.
 - .2 Designed to dry hands in under 20 seconds.
 - .3 Standard of acceptance: Nova.
- .2 Hair dryers:
- .1 Similar configuration to hand dryers. Cast metal case.
 - .2 Quiet operation.
 - .3 Minimum 3000 W.
 - .4 Standard of acceptance: Nova.
- 2.10 WIRING METHODS .1 Provide a separate insulated bonding wire in conduit.

PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Install electrical devices and equipment in accordance with City of Winnipeg Accessible Design requirements.
 - .2 Provide electrical connections for equipment shown on the room data sheets or in the diagram of requirements, whether Design Build Team provided or Contract Administrator provided.
- 3.2 POWER CONSUMPTION AND REBATES
- .1 Apply for Manitoba Hydro PowerSmart rebates on behalf of the City of Winnipeg. Turn rebates over to the City of Winnipeg. Include PowerSmart documentation in O&M manuals.
- 3.3 RACEWAYS
- .1 Run exposed conduit parallel to building lines, and maintain maximum headroom.
 - .2 Run conduit within flanged portion of structural steel members.
 - .3 Group conduit wherever possible, on channels.
 - .4 Provide EMT raceways with steel couplings and set screw connectors for all interior raceways:
 - .5 Surface Conduit:
 - .1 Run parallel or perpendicular to building lines with smooth radius bends.
 - .2 Locate conduit behind infrared or gas fired heaters, with 1500 mm clearance.
 - .3 Run conduit within flanged space portion of structural steel.
 - .4 Group conduit wherever possible, on surface channels.
 - .5 Do not pass conduit through structural members, except as indicated.
 - .6 Do not locate conduit less than 75 mm when parallel to steam or hot water piping, with a minimum space of 25 mm at crossovers.
 - .6 Flexible Conduit:
 - .1 Dry locations: Flexible metal conduit.
 - .2 Damp or corrosive locations:
 - .1 Liquid tight, flexible metal conduit.
 - .3 Maximum Flexible Conduit Length: 500 mm.
 - .7 Surface Mount Conduit:
 - .1 In areas not subject to potential mechanical injury or damage.
 - .2 Only in shop, storage or wash bay areas, subject to the above.
 - .8 Conceal Conduit:
 - .1 In all areas.
 - .2 Except in mechanical and electrical service rooms.
 - .3 Except in unfinished areas.

- .9 Wet and Hazardous Locations: Provide heavy wall, rigid, threaded, galvanized steel conduit.
- .10 Corrosive Areas:
 - .1 Use epoxy coated conduit.
- .11 Install high-test fish cord in empty conduit for pulling wire conductors.
- .12 Steel Conduit Bending.
 - .1 Manual bending below 19 mm diameter:
 - .2 Mechanically bend conduit 19 mm diameter and above.
- .13 Conduit up to Ceiling Space from Each Flush Panel:
 - .1 Run two 25 mm spare conduit up from panel.
 - .2 Terminate conduit in space above ceiling, into junction boxes.
- .14 Do not install concealed conduit:
 - .1 In horizontal runs within masonry walls.
- .15 Locate conduit passing through cast-in-place concrete, to clear and to suit reinforcing steel:
 - .1 Install perpendicular to top of slab.
 - .2 Protect from damage where conduit stubs out of concrete.
 - .3 Install sleeves where they stub through slab or wall.
 - .4 Provide oversized sleeves where conduit passes through waterproof membrane.
 - .1 Install before membrane.
 - .2 Use sealable non-setting mastic between sleeve and conduit.
 - .5 Encase conduit completely in concrete.
- .16 Slope underground conduit to provide natural drainage to an accessible location. Waterproof conduit joints with heavy coat of bituminous paint or coating.
- .17 Provide two locknuts and insulating bushings on all conduit entering a pressed metal box.
- .18 Use steel set screw connectors for EMT. Use threaded fittings for rigid steel conduit.
- .19 Suspend individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
 - .1 Support two or more cable or conduit on channels supported by 6 mm diameter threaded rod hangars, where direct fastening to substrate construction is impractical.
- .20 Use U shaped channels, 40 x 40 x 2.5 mm thick, spaced at 3000 mm on centre for surface mounting of two or more conduit.
- .21 Ensure adequate support for raceways and cable where dropped vertically to equipment, where there is no substrate support.
- .22 Do not use wire lashing or perforated strap to support or secure raceways or cable.

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| <u>3.4 WIRING: SERVICE,
FEEDER AND BRANCH</u> | .1 | Install in accordance with manufacturers recommendations. |
| <u>3.5 LIGHTING</u> | .1 | Install in accordance with manufacturers recommendations. |
| | .2 | Orientate luminaires with building lines. |
| <u>3.6 SITE
LIGHTING</u> | .1 | Aim luminaires in accordance with manufacturers aiming diagram. |
| | .2 | Allow for re-aiming of 25% of luminaires to provide additional illumination in areas as directed by the City of Winnipeg. |
| <u>3.7 LIGHTING
CONTROL</u> | .1 | Program system for local control, time clock control and master control. |
| <u>3.8 EMERGENCY
LIGHTING</u> | .1 | Measure voltage drop at each luminaire. |
| | .2 | Measure illumination level at night. |
| | .3 | Include results in O&M manual. |
| <u>3.9 WIRING
DEVICES</u> | .1 | Do not install outlets back to back in same wall or partition. |
| | .1 | Provide minimum 150 mm horizontal separation between boxes. |
| | .2 | Relocate outlets at no change in Contract cost. |
| | .3 | Locate light switches on latch side of doors. |
| | .4 | Locate disconnect devices on latch side of door. |
| | .2 | Provide riveted lamacoid on computer receptacle coverplates indicating "Computer Equipment Only". |
| <u>2.10 ELECTRICAL
EQUIPMENT</u> | .1 | Mount hair dryers at manufacturers recommended height. |
| <u>2.11 WIRING
METHODS</u> | .1 | Install lighting fixtures, outlets, plates and other visible items parallel to building lines. Line up exposed raceways, parallel and at right angles to building walls, partitions, and ceilings. |
| | .2 | Install cable drops for luminaires of sufficient length to allow the luminaire to be relocated to any location within a 3000 mm radius. |
| | .3 | Clamp cable before entering the luminaire and clip cable before entering the conduit system junction box. |
| | .4 | Secure equipment to be placed on concrete, glazed tile, and plaster/gypsum board surfaces using expansion screws. |
| | .5 | Secure equipment to hollow walls using toggle bolts. |

- .6 Secure surface mounted equipment:
 - .1 To suspended tee-bar ceilings using twist clip fasteners.
 - .2 Ensure that tee-bars are adequately supported to carry weight of equipment plus 50% safety factor, before installation.
- .7 Support equipment conduit or cable using clips, spring-loaded bolts, and cable clamps designed as accessories to basic channel members.
- .8 Do not use supports or equipment installed for other purposes for conduit or cable support.
- .9 Install fastenings and supports as required for each type of equipment cable and conduit, in accordance with manufacturers installation instructions.

3.2 COMMISSIONING

- .1 Test, verify and put Work of this Section into full operation.
- .2 Provide necessary maintenance personnel training.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES
- .1 Customer Metering.
 - .2 Motor Control.
- 1.2 RELATED SECTIONS
- .1 Division 1.
 - .2 Section 26 05 01 – Common Electrical Requirements.
 - .3 Section 26 05 02 – Electrical Service and Distribution.
 - .4 Section 26 05 03 – Lighting, Power and Branch Wiring.
- 1.3 STANDARDS
- .1 Canadian Standards Association CSA International
 - .1 CSA C22.1-02, Canadian Electrical Code.
 - .2 NEMA - National Electrical Manufacturers Association.
- 1.4 DESIGN PERFORMANCE REQUIREMENTS
- .1 Customer Metering.
 - .1 Provide customer metering on main distribution service entrance. To be annunciated at the City of Winnipeg Central Monitoring facility via the Building Automation System.
 - .2 Provide customer metering on all breakers within the main distribution.
 - .3 Provide customer metering on sub/distribution & panelboards to allow the power consumption of site and employee parking lot vehicle outlets to be annunciated at the City of Winnipeg Central Monitoring facility via the Building Automation System.
 - .2 Motor Control.
 - .1 No additional requirements.
- 1.5 QUALITY ASSURANCE
- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
 - .2 Health and Safety: Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health requirements.
 - .3 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction or commissioning.

PART 2 - PRODUCTS

2.1 CUSTOMER METERING

- .1 The customer meter for the building service entrance shall measure and display true line, RMS, maximum, minimum, peak, for the following variables:
 - .1 Voltage L-L, L-N.
 - .2 Current Amps (L,N)
 - .3 KWH.
 - .4 KW Demand.
 - .5 Power Factor KVAR.
 - .6 Frequency.
 - .7 RMS Current.
 - .8 Harmonic Distortion Voltage.
 - .9 Harmonic Distortion Current.
 - .10 K Factor.
- .2 Sub distribution meters shall measure and display true line, RMS, maximum, minimum, peak for the following variables:
 - .1 Voltage L-L, L-N.
 - .2 Current Amps (L,N)
 - .3 KWH.
 - .4 KW Demand.
 - .7 RMS Current.
- .3 Provide IP connections to Building computer network to allow display and recording of all variables in the main distribution service entrance meter via web browser.
- .4 Solid state meters, compatible with associated equipment, complete with required current and potential transformers.
- .5 Provide stand alone, solid state, digital meter readout, with local selector buttons to activate readouts.

2.2 MOTOR CONTROL

- .1 Local control for motors to be individual starters, grouped starters, unit constructed motor control centre.
- .2 Provide each unit with Hands-off-auto control with remote capability for system control by building management system.
- .3 Control Relays: 5 amp, normally open, normally closed contacts, volt coils.
- .4 Switches: Heavy duty standard or water tight as required by the area of service.
- .5 Indicating lights: LED.
- .6 Provide group control capability, to operate grouped equipment simultaneously.

PART 3 - EXECUTION

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| <u>3.1 INSTALLATION</u> | .1 | Install recording monitor devices to equipment. |
| | .2 | Connect communications equipment to manufacturers recommendations. |
| <u>3.1 CUSTOMER METERING</u> | .1 | Connect customer meter to Building Automation system and to computer network. |
| <u>3.1 MOTOR CONTROL</u> | .1 | No additional requirements. |
| <u>3.2 COMMISSIONING</u> | .1 | Test, verify and put Work of this Section into full operation. |
| | .2 | Provide necessary maintenance personnel training. |

PART 1 - GENERAL

<u>1.1 SECTION INCLUDES</u>	.1	Master/Slave Clock and System.
	.2	Voice and Data Systems.
	.3	Public Address Systems.
	.4	Intercom System.
	.5	Cable Television System.
	.6	Audio Visual System.
<u>1.2 RELATED SECTIONS</u>	.1	Division 1.
	.2	Section 26 05 01 – Common Requirements – Electrical.
<u>1.3 REFERENCES</u>	.1	American National Standards Institute (ANSI)
	.1	ANSI/ICEA S-83-596, Fibre Optic Premises Distribution Cable.
	.2	ANSI/ICEA S-90-661-2002, Category 3, 5 & 5e Individually Unshielded Twisted Pair Indoor Cable for Use in General Purpose and LAN Communication Wiring Systems.
	.3	ANSI/J-STD-607A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
	.4	ANSI/TIA/EIA-455-107A Return Loss for Fibre Optic Components.
	.5	ANSI/TIA/EIA-455-220A Minimum Bandwidth: Laser Effective Modal Bandwidth.
	.6	ANSI/TIA/EIA-568-C.0, Generic Telecommunications Cabling for Customer Premises.
	.7	ANSI/TIA/EIA-568-C.1, Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements.
	.8	ANSI/TIA/EIA-568-C.3, Optical Fibre Cabling Components Standard.
	.9	ANSI/TIA/EIA-598-B, Optical Fibre Cable Color Coding.
	.10	ANSI/TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure.
<u>1.4 DESIGN PERFORMANCE REQUIREMENTS</u>	.1	Master/Slave Clock System:
	.1	Locate clocks where indicated on room data sheets.
	.2	Locate master clocks where directed by the City of Winnipeg.
	.2	Voice and Data System:
	.1	Voice System
	.1	The City of Winnipeg Intends to utilize a Centrax Telephone System provided by MTS.

- .2 Install a system of copper cabling to MTS requirement.
 - .3 Horizontal cabling from telecommunication room to outlet Cat-5e minimum.
 - .4 Each telephone outlet shall have the capacity for two lines.
 - .5 System of Copper Trunk Cabling from telephone patch field to Telephone Utility Demarcation point.
 - .6 Size trunk cabling for 50% spare capacity.
 - .7 Size backbone cabling interconnecting sub-telecom room for 50% spare capacity, minimum 50 pair.
 - .8 Provide patch cords to allow patching of telephone system.
 - .9 Coordinate with Contract Administrator for outlets which require greater than two lines.
- .2 Data System
 - .1 System of Cat-6 horizontal cabling terminated on patch panels in telecommunication room(s).
 - .2 System of fibre optic cabling linking Main Telecom room to each Sub-telecom room, terminated in fibre patch panels.
 - .3 Provide 12 spare fibers in each fibre cable linking telecom rooms.
 - .4 Terminate all installed fibre strands on patch panels.
 - .3 Racking
 - .1 Size racking to accommodate Contract Administrator's active equipment.
 - .4 Raised Floor areas
 - .1 Provide a telecommunication consolidation point on 6m x 6m grid.
 - .2 Size consolidation point for 100% spare capacity of voice and data requirements.
 - .3 Minimum of two consolidation points per raised floor room.
 - .5 Maximum 40% conduit fill.
 - .6 Maximum 90 meters from data outlet to termination in telecommunication room.
- .3 Public Address System
 - .1 Not required.
 - .4 Intercom System
 - .1 Weatherproof Calling stations shall be located at Building Main Entrance, Building Rear Entrance, Each Entry Card Reader Pedestal at motorized sliding gates.
 - .2 Locate Master station as directed by the City of Winnipeg.
 - .3 Provide Remote stations which can receive and respond to calls at:
 - .1 Reception.

- .2 Streets foreman.
 - .3 Parks foreman.
 - .4 Bridge foreman.
 - .5 Fleet foreman.
 - .4 Master and Remote stations are to annunciate calling station.
 - .5 Cable Television System
 - .1 No design inputs.
 - .6 Audio Visual System
 - .1 Audio Visual Equipment will be provided and installed by the City of Winnipeg.
 - .2 Provide all equipment mounts, power outlets, telecommunication raceways and interconnecting cabling to enable the City to install and connect the equipment.
- 1.5 SHOP DRAWINGS
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- 1.6 TEST REPORTS
 - .1 Submit test and verification reports from approved independent testing laboratories certifying compliance with specifications.
- 1.7 DESIGN DATA
 - .1 Submit design data in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Submit Network Calculations for Cable Television Systems.
- 1.8 MAINTENANCE DATA
 - .1 Provide operations and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals. Include the following:
 - .1 Maintenance instructions.
 - .2 List of components.
 - .3 Operation and maintenance instructions.
 - .4 List of spare parts and supplies.
 - .5 List of devices address identification.
- 1.9 QUALITY ASSURANCE
 - .1 Utilize design and installation of personnel thoroughly familiar with systems of this type.
 - .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
 - .3 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

PART 2 - PRODUCTS

<u>2.1 SUSTAINABLE REQUIREMENTS</u>	.1	Use only low emitting adhesives, caulking, paint, coatings, and sealants to meet LEED® Credits 4.1 and 4.2 under Indoor Environmental Quality: Low Emitting Materials.
<u>2.2 MASTER/SLAVE CLOCK SYSTEM</u>	.1	Non-battery powered slave clocks.
	.2	Slave clocks 12" round analogue.
	.3	Microprocessor based master clock self-synchronizing either via GPS or network connection.
	.4	Confirm with Contract Administrator 12-hour or 24-hour format.
<u>2.3 VOICE AND DATA SYSTEMS</u>	.1	Two 100 mm rigid PVC service entrance raceways extended to underside of service entrance backboard.
	.2	Four post 19" equipment rack with vertical and horizontal cable management..
	.3	Cat 5 and Cat 6 patch panels and patch cords.
	.4	Fibre optic patch panels with cable management tray.
	.5	50/125 mm OM3 multi-mode fibre optic cable.
	.6	Duplex SC connectors.
	.7	RJ45 IDC connectors – blue for telephone, white for data.
	.8	Patch cords of varying length – adequate numbers for patching of installed cables.
	.9	Under raised floor telecommunication consolidation point.
<u>2.4 PUBLIC ADDRESS SYSTEM</u>	.1	Not required.
<u>2.5 INTERCOM SYSTEM</u>	.1	Standard of acceptance: Aiphone Industrial intercom system.
<u>2.6 CABLE TELEVISION SYSTEM</u>	.1	RG7 & RG59 cabling system.
	.2	System of couplers, amplifiers, splitters and taps.
<u>2.7 AUDIO VISUAL SYSTEM</u>	.1	Commercial equipment mounts, sized to match Contract Administrator

provided equipment.

PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Install telecommunication cabling telecommunication raceway system consisting of either conduit or cable tray. Free running of cabling is not allowed.
 - .2 Make communication terminations in accordance with manufacturers' recommendations.
 - .3 Ensure adequate clearances are maintained between power and communication systems wiring.
 - .4 Bond telecommunication raceway system using separate system of bonding.
 - .5 Provide telecommunication connections for equipment shown on the room data sheets or in the program of requirements, whether Design Build Team provided or Contract Administrator provided.
- 3.2 MASTER SLAVE/CLOCK SYSTEM
- .1 Install in accordance with manufacturer's recommendations.
 - .2 Install Master Clock in main telecommunication room.
- 3.3 VOICE AND DATA SYSTEM
- .1 Provide a minimum of three (3) telecommunications rooms for building. Locate as close as practical to centre of area served.
 - .2 Equipment in rooms to serve only that floor area on which room is located.
 - .3 Install and label horizontal cabling, trunk cabling and backbone cabling.
 - .4 Install equipment rack and cable management.
 - .5 Terminate horizontal cabling on RJ95 outlets at patch panel and outlet.
 - .6 Terminate fibre backbone cable.
 - .7 Terminate trunk cable(s) at patch panel and at IDC connectors. Bridge to telephone utility IDC's.
 - .8 Bond to telecommunication grounding system.
- 3.4 PUBLIC ADDRESS SYSTEM
- .1 Not required.
- 3.5 INTERCOM SYSTEM
- .1 Locate paging stations which receive and respond to calls in locations

as directed by the Contract Administrator.

- .2 Install motorized sliding gate calling stations adjacent to card reader in pedestal.

3.6 CABLE TELEVISION SYSTEM .1 Develop execution requirements.

3.7 AUDIO VISUAL SYSTEM .1 Install mounts, power outlets, raceways and telecommunication cabling c/w connections.

- .2 Install ceiling outlets flush with the underside of ceiling.

- .3 Install ceiling mounts at recommended height.

3.8 COMMISSIONING .1 Test, verify, and put into operation systems specified in this section, and necessary training.

- .2 Test and commission systems, provide test and verification reports, and put into operation.

.3 Master Slave/Clock System

- .1 Automatically regulates indicating clocks and program devices using master time clock; correct clocks on a 12 hour or similar basis.

.4 Voice Data System

- .1 Test and document copper cabling in accordance with TIA/EIA standards.
- .2 Test fibre optic cabling using OTDR.
- .3 Include testing results in O&M manual.

.5 Public Address System:

- .1 Not required.

.6 Intercom System:

- .1 Demonstrate function and clarity of system.

.7 Cable Television System:

- .1 Adjust taps.
- .2 Measure signal levels.
- .3 Confirm clear reception on all channels.
- .4 Include testing results in O&M manuals.

.8 Audio Visual System:

- .1 Demonstrate mounts are adequate for Contract Administrator provided equipment.

PART 1 - GENERAL

<u>1.1 SECTION INCLUDES</u>	.1	Fire Alarm Detection System.
	.2	Access Control and Intrusion Detection.
	.3	Closed Circuit Television Systems.
<u>1.2 RELATED SECTIONS</u>	.1	Division 1.
	.2	Section 26 05 01 – Common Requirements – Electrical.
	.3	Section 27 05 13 – Communications Systems.
<u>1.3 REFERENCES</u>	.1	Underwriters' Laboratories of Canada (ULC)
	.1	CAN/ULC-S524-06, "Installation of Fire Alarm Systems".
	.2	CAN/ULC-S537, Verification of Fire Alarm Systems.
<u>1.4 DESIGN PERFORMANCE REQUIREMENTS</u>	.1	Fire Alarm System:
	.1	In addition to NBC and CAN/ULC-S524 requirements provide the following:
	.1	Fire detectors.
	.1	In all areas not protected by sprinklers.
	.2	Smoke detectors.
	.1	In telecommunication rooms.
	.2	Both sides of fire smoke shutters.
	.3	Heat detectors.
	.1	In storage rooms.
	.2	In electrical rooms.
	.4	Signal devices.
	.1	Strobe coverage in workshop areas.
	.2	Strobe coverage in areas as dictated by the City of Winnipeg's accessible design requirements.
	.5	Annunciators:
	.1	Front entrance.
	.2	Rear entrance.
	.3	One additional location as directed by the Contract Administrator.
	.6	Isolation modules installed at boundaries between each of the major areas.
	.1	Wash.
	.2	Streets maintenance.

- .3 Bridge.
 - .4 Shared office (main level and second level)
 - .5 East area parks
 - .6 Centralized parks
 - .7 Future Fleet Management.
- .2 Initiation loops configured in DCLA.
 - .3 Alarm, supervisory and trouble to annunciated on Building Automation Systems for transmission to City of Winnipeg Central Monitoring Location.
 - .4 Logging: Automatically log all system events for future review. Log change of status, alarm and fault messages, with time of day and date.
 - .5 Provide addressable, microprocessor based, zoned, non-coded, electrically supervised, single stage, general evacuation type of fire alarm system with data communication link. Provide remote annunciators.
 - .6 Sprinkler System: Fully supervised by fire alarm system, and indicate sprinkler flow, tamper condition, pressure loss, as a minimum.
 - .7 Annunciate gas detection systems.
 - .8 Fire Hose Cabinets: Electrically monitored to signal trouble or tamper conditions.
 - .9 Provide alarm indication by sounding horns and operating strobe lights for visual indication in buildings designed for barrier free access.
 - .10 Annunciated at City of Winnipeg's Central Monitoring facility.
 - .11 Annunciated on Building Automation System.
 - .12 Provide modular design to permit minimum 25% future expansion.
 - .13 Do not load each circuit to more than 80% capacity.
- .2 Access Control and Intrusion Detection:
 - .1 Refer also to City of Winnipeg Access Control and Intrusion Detection requirements, located in Appendix C6.
 - .2 Access Control by Proximity Card Reader shall be provided at:
 - .1 The motorized sliding gates via long range card readers.
 - .2 The front and rear main entrances via long range card readers.
 - .3 At security perimeters as indicated in the Program of Requirements.

- .4 At telecommunication rooms.
- .5 At wash bays for wash equipment enable.
- .6 At ten other doors as selected by the City of Winnipeg.
- .3 Access Control by remote Push Button station shall be provided for each motorized sliding gate at:
 - .1 Locate where directed by Contract Administrator.
 - .2 Provide Push Button remote stations in:
 - .1 Reception.
 - .2 Streets foreman.
 - .3 Parks foreman.
 - .4 Bridge foreman.
 - .5 Fleet foreman.
- .4 Disarming of select components of the Access Control system shall be provided by:
 - .1 Card Readers installed for that purpose. Provide in four locations as selected by the City of Winnipeg.
 - .2 Time clock.
 - .3 City of Winnipeg Central Monitoring Stations.
- .5 Intrusion Detection shall be provided at:
 - .1 The entire building perimeter:
 - .1 Doors.
 - .2 Overhead doors.
 - .3 Windows
 - .4 Roof hatches and doors.
 - .2 Interior corridors.
 - .3 Spaces as indicated on the room data sheets.
- .6 Arming and disarming of the Intrusion Detection system shall be by:
 - .1 Keypads on the interior of the main entrances.
 - .2 Keypads located at ten other locations as selected by the City of Winnipeg.
 - .3 From the City of Winnipeg's Central Monitoring facility.
- .7 Disarming of select components of the Intrusion Detection system shall be provided by:
 - .1 Keypads at interior security perimeters.
 - .2 Timeclock.
 - .3 Proximity Card Readers located on interior adjacent to each overhead door. Interlock with overhead door controller so that overhead door cannot operate if overhead doors intrusion detection is armed.
- .8 Electric strikes shall be used as the standard means of securing Personal doors.
- .9 Annunciate the open/closed status of each motorized gate.
- .10 Each Access Control and Intrusion Detection point shall be annunciated at City of Winnipeg Central Monitoring facility via the Building Automation system.

- .3 Closed Circuit Television System
 - .1 Definitions:
 - .1 General View PTZ: CCTV camera which provides a wide angle general view of an area using PTZ style cameras.
 - .2 General View Fixed: General type view with fixed CCTV camera.
 - .3 Identification View PTZ: CCTV camera which provides a view capable of identifying people or vehicle number plates. The subjects face shall occupy 50% of the field of view in an identification view. PTZ style cameras.
 - .4 Identification View Fixed: Identification type view with fixed CCTV camera.
 - .2 Provide CCTV system, to provide visual surveillance of designated areas:
 - .1 All yard areas. A minimum of four General View PTZ cameras shall be mounted on poles/luminaire poles.
 - .2 Interior public spaces, general view, fixed.
 - .3 Front and rear reception/waiting areas, General View PTZ.
 - .4 Main corridors in shared amenities space, Identification View Fixed.
 - .5 Workshop areas tool and material storage areas: General View PTZ.
 - .6 General View PTZ at ten other locations as selected by the City of Winnipeg.
 - .7 At vehicles entering the site at motorized sliding gates, Identification View PTZ.
 - .3 Provide cameras, switches, video monitors, recorders and controls to enable security personnel to determine movement and identification-capable at an ambient light level of 1.5 FC.
 - .4 All cameras to be IP based and transmit in high definition.
 - .5 Video storage shall record video from all cameras for a period of 3.5 days.
 - .6 Provide Operating Station to view live video, manually control cameras and manually switch between cameras at:
 - .1 Reception.
 - .2 Streets foreman.
 - .3 Parks foreman.
 - .4 Bridge foreman.
 - .5 Fleet foreman.
 - .7 The Contract Administrator will select a location for investigation station to review recorded images.
 - .8 PTZ cameras shall be programmed to run with a tour designed to maximize surveillance, when the PTZ camera is not being manually controlled.

-
- 1.5 SHOP DRAWINGS
- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 With the 33% detailed design submission, the Design Build Team shall submit for approval draft floor and site plan drawings showing how the access control, intrusion detection and CCTV field devices and control devices integrate with the sites security perimeters. Incorporate the Contract Administrators revisions and re-submit. Include the final drawings showing the integration of security devices and security perimeters in the O&M manuals.
- 1.6 TEST REPORTS
- .1 Submit test and verification reports from approved independent testing laboratories certifying compliance with specifications.
- 1.7 MAINTENANCE DATA
- .1 Provide operations and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals. Include the following:
 - .1 Maintenance instructions.
 - .2 List of components.
 - .3 Operation and maintenance instructions.
 - .4 List of spare parts and supplies.
 - .5 List of devices address identification.
- 1.8 QUALITY ASSURANCE
- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
 - .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
 - .3 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.
- PART 2 - PRODUCTS
- 2.1 FIRE ALARM SYSTEM
- .1 Acceptable manufacturers: Siemens, GE (Edwards), Notifier.
 - .2 Intelligent smoke detector with detection signature configurable for installed location.
- 2.2 ACCESS CONTROL AND INTRUSION DETECTION
- .1 Refer also to City of Winnipeg Product requirements, located in Appendix C6.
 - .2 Card readers suitable for Manitoba Environment.

- .3 Stainless steel pedestals at Motorized Sliding.
- .4 On card readers which arm/disarm select components, armed/disarmed status of security partition/component shall be annunciated.
- .5 Electromagnetic Locking Hardware standard of acceptance:
 - .1 Personal Doors, Electric Strike: Rutherford Controls 2114/2314 series.
 - .2 Personal Doors, Magnetic Lock: Rutherford Controls 8310-IQ-LSS.
 - .3 Gates: Rutherford Controls 8380-RLS.
- .6 Motorized Sliding Gate remote manual pushbutton stations:
 - .1 Open pushbutton for each gate.
 - .2 Close pushbutton for each gate.
 - .3 Visually annunciate each gates open, in-transit or closed status.
 - .4 Lock Open pushbuttons to lock each pair of entrance/exit gates in the open position. Push to lock open, pus to return to normal operation.
 - .5 Visually annunciate the locked open status of gate pair.
 - .6 Remotely resettable to normal operation from the City of Winnipeg's Central Monitoring Station.

2.3 CLOSED CIRCUIT
TELEVISION SYSTEM

- .1 Cameras:
 - .1 High Definition HDTV 720p.
 - .2 Low light capable.
 - .3 High contrast compensation.
 - .4 Exterior camera housing nitrogen pressurized IP66 & vandal resistant.
 - .5 Motion detection and Audio detection recording trigger, selectable.
 - .6 Acceptable manufacturers: Panasonic, Bosch, Pelco.
- .2 Digital Video Recorder:
 - .1 On screen menu to allow selection of camera recording.
 - .2 Ability to transfer selected segment of recording to external DVD.
 - .3 Ability to tag selected segments and archive in DVR memory.
- .3 Operating Stations:
 - .1 Two 21" LCD monitors.
 - .2 One monitor for full screen view, one monitor user configured for one, flour or sixteen cameras.
 - .3 Camera controller.
- .4 Investigation Station:
 - .1 Two 21" LCD monitors.
 - .2 One monitor for live view of selected camera.
 - .3 One monitor for playback of selected recording.
 - .4 DVR and Camera controllers.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Locate control equipment, panels, and security terminations in closets as designated and connect to 110 VAC power source.
- .2 Locate devices as indicated on layout drawings, make connections to system wiring.
- .3 Locate and install fire detectors in accordance with standard, do not mount detectors within 1 m of supply air outlets.
- .4 Install systems wiring in EMT conduit, unless specified otherwise.
- .5 Install CCTV cameras, wire and align to suit user requirements look of fixed lens cameras.
- .6 Ensure adequate clearances are maintained between power and communication systems wiring.

3.2 FIRE ALARM SYSTEM

- .1 Locate main fire alarm panel in telecommunication room.
- .2 Wire circuits for alarm, trouble, and signals for proper alarm system operation from addressable components.
- .3 Separate raceways for each leg of loop, separated by 10 metre minimum.
- .4 Connect system to central monitoring agency.
- .5 Label panels, control equipment and wiring.
- .6 Manufacturer to conduct two inspections during first year operation. Submit written report to Design Build Team Engineer for each inspection.
- .7 Provide one (1) free re-burn to incorporate all temporary program changes during construction.

3.3 ACCESS CONTROL AND INTRUSION DETECTION

- .1 Mount control panels in telecommunication rooms.
- .2 All Access Control and Intrusion points are to be annunciated on Building Automation System for transmission to City of Winnipeg Central Monitoring location.
- .3 Update the City of Winnipeg's Central Monitoring Station to incorporate this site.
- .4 Configure the system so that each major user can restrict access to users of their areas. Propose draft access rights to the Contract Administrator for approval, incorporate revisions and implement.

- .5 Refer also to City of Winnipeg Execution requirements, located in Appendix C6.
- .6 Mount long range card readers on back pans which allow equipment to attain specified read range.
- .7 Mount motorized sliding gate Card Reader Pedestal so that card can be presented by vehicle driver, or intercom can be operated, without leaving vehicle.
- .8 Provide lamacoid adjacent to arm/disarm keypads or card readers indicating security perimeter or component that is armed/disarmed.

3.4 CLOSED CIRCUIT TELEVISION SYSTEM

- .1 Configure each Operating Station to receive views as advised by the Contract Administrator.
- .2 Review with Contract Administrator scenarios for camera tours. Implement selected options.
- .2 Document camera views in O&M manuals via screen capture.

3.5 COMMISSIONING

- .1 Test, verify, and put into operation systems specified in this section, and necessary training.
- .2 Test and commission systems, provide test and verification reports, and put into operation.
- .3 Fire Alarm System:
 - .1 Operating System: Commissioned by system manufacturer/supplier.
 - .2 Verify performance to CAN/ULC-S537.
 - .3 Measure dBA audio intensity throughout facility in all rooms and document in O&M manuals.
 - .4 Training:
 - .1 Manufacturer to provide on-site training and demonstrations, to train operational personnel in use and maintenance of fire alarm system, including operations and minor troubleshooting. Train for a minimum of two (2) days.
 - .2 Orient training to installed system, not a general training course.
 - .3 Contract Administrator retains the right to reject instructors based on their qualifications.
 - .4 Provide a training manual for each trainee, describing in detail, data included in each training program.
 - .5 Provide all equipment and materials required for classroom training.
- .4 Intrusion Alarm System
 - .1 Refer to Commissioning requirements, located in Appendix C6. Provided by City of Winnipeg.

- .5 Closed Circuit Television System
 - .1 Demonstrate correct functioning of all Cameras under both day and night conditions.
 - .2 Demonstrate recording and retrieval of camera images.
 - .3 Demonstrate tagging of segments for archiving.

PART 1 - GENERAL

1.1 SUMMARY

- .1 This Section covers performance requirements for mitigation of potential post-construction gas accumulations associated with the former Elmwood/Nairn Avenue Landfill.
- .2 This Section also covers the excavation, trenching, disposal of excess or unsuitable excavated material, shoring, foundations, bedding, backfilling and compaction required for the installation of Underground Works.
- .3 This Section also covers the excavation, disposal of surplus excavated material, shoring, and backfilling and compaction required for the construction of buildings and structures.

1.2 CITY SPECIFICATIONS, RELATED SECTIONS AND REFERENCES

- .1 City of Winnipeg Standard Construction Specifications:
 - .1 CW 1120 – Existing Service, Utilities and Structures
 - .2 CW 1130 – Site Requirements
 - .3 CW 2030 – Excavation Bedding and Backfilling
 - .4 CW 3110 – Sub Grade, Sub Base and Base Course Construction
 - .5 CW 3235 – Renewal of Existing Miscellaneous Concrete Slabs
 - .6 CW 3240 – Renewal of Existing Curbs
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures
 - .2 Section 01 47 13 – LEED Requirements
 - .3 Section 01 74 19 – Construction Waste Management and Disposal
 - .4 Section 31 32 19.01 – Geotextiles
 - .5 Section G1010 – Site Clearing
- .3 Canada Green Building Council (CaGBC) LEED® Green Building Rating System – LEED® Canada-NC Version 1.0.
- .4 *City of Winnipeg Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities and Guidelines for Construction on Landfill Sites (Appendix D).*

1.3 PERFORMANCE REQUIREMENTS

- .1 Examine geotechnical reports and information located in Appendix D: *Background Information* and Appendix B: *Schematic Drawings – Building and Site*:
 - .1 City of Winnipeg – letter report dated February 7, 2011, *Public Works East Yards – Geotechnical Investigation*, prepared by AECOM (Appendix D).
 - .2 *Former Elmwood / Nairn Avenue Landfill Site Final Preliminary Site Condition Assessment Report* as prepared

-
- by KGS Group (Appendix D).
- .3 Drawing 01-C-1002 titled: *Summary Diagram of Subsurface Investigations*, prepared by AECOM (Appendix B).
 - .2 Site work shall be performed in accordance with CW 1130 – Site Requirements.
 - .3 Coordinate work in accordance with:
 - .1 *City of Winnipeg Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities and Guidelines for Construction on Landfill Sites* (Appendix D).
 - .4 Excavation and trenching shall be performed in accordance with CW 2030 – Excavation Bedding and Backfill.
 - .5 Avoid accumulation of methane gas within underground utilities, trenches, under buildings and structures, and excavations, which are potential conduits for gas migration.
 - .1 Ensure open void utilities (e.g. sewers, culverts, communication conduits, etc.) are constructed of an appropriate material, and in a manner which ensures air and water tightness.
 - .2 Provide passive utility trench venting in strategic locations, extending from the bedding and initial backfill to (600 mm typ.) above the ground surface, allowing potential methane gas accumulations to escape to the atmosphere.
 - .3 Avoid conflict between vent placement and other site surface features.
 - .6 Where trenches or excavations cross the property line or where utility service connections approach a building:
 - .1 Construct a trench plug of low permeability material (compacted clay, bentonite, shrinkage compensating grout, or equivalent).
 - .2 Ensure that the trench plug transects vertically and horizontally through the granular material underlying and/or surrounding the excavation and utility.
- 1.4 SUBMITTALS
- .1 Coordination of Submittals: Shall be made in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Prior to beginning excavation submit for approval by the Contract Administrator, plans, drawings and documentation in support of:
 - .1 Design details for utility trench plugs and vent structures, including proposed locations, construction material specifications, and quality assurance procedures.
 - .2 Handling procedures for subsurface debris encountered during the course of excavation and trenching activities.

- 1.5 QUALITY ASSURANCE .1 Sustainable Requirements:
- .1 Design Build Team shall perform work in accordance with:
 - .1 Section 01 47 13 - LEED Requirements.
 - .2 Section 01 74 19 – Construction Waste Management and Disposal.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Materials and Products: in accordance with CW 2030 – Excavation Bedding and Backfilling and CW 3110 – Sub Grade, Sub Base and Base Course Construction.
- .2 Geotextiles: as per Section 31 32 19.01 - Geotextiles.

PART 3 - EXECUTION

- 3.1 EXCAVATION .1 Perform excavating, trenching, and backfilling activities in accordance with CW 2030 – Excavation Bedding and Backfill and CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.

- 3.2 FILL TYPES AND COMPACTION .1 Use types of fill and compact as indicated or specified in CW 2030 – Excavation Bedding and Backfill, and CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.
- .2 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

- 3.3 BEDDING AND SURROUND OF UNDERGROUND SERVICES .1 Place and compact granular material for bedding and surround of underground services as specified in CW 2030 – Excavation Bedding and Backfill.
- .2 New and existing utilities running across trenches and excavations shall have measures put in place to mitigate the potential for methane gas migration within the backfilled trench or excavation.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This Section outlines requirements for the application of herbicides for weed control, brush control, stump control and soil sterilization.
- 1.2 RELATED SECTIONS .1 Related sections include:
.1 Section 32 92 19_16 - Hydraulic Seeding.
.2 Section 32 92 23 - Sodding
.3 Section 32 92 10 - Trees, Shrubs and Ground Cover Plantings
- 1.3 REFERENCES .1 Department of Justice:
.1 Pest Control Products Act, RS, 1985, c. P-9 (current to March 3, 2006).
.2 Health Canada: (HC)/Pest Management Regulatory Agency (PMRA)
.1 National Standard for Pesticide Education, Training and Certification in Canada (1995).
- 1.4 PERFORMANCE REQUIREMENTS .1 For weed control in turf areas, achieve within 30 days of treatment, minimum of 90% kill of target plants without damaging grasses.
.2 For soil sterilization, achieve within three (3) months of treatment, 100% kill of vegetation.
- 1.5 SUBMITTALS .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Data Sheets and Reports:
.1 Submit manufacturer's instructions, including printed product literature, specifications and datasheet.
.2 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS) in accordance with Section 02 81 01 - Hazardous Materials.
.1 WHMIS acceptable to Human Resources Development Canada - Labour and Health Canada for herbicides and pesticides.
.2 Indicate VOC content.
.3 Provide copy of on-site stored products to local fire department.
.3 Quality Control Reports: within 7 days of work completion, submit written report containing following information:
.1 Full name and PCP Registration number of herbicide products used including adjuvants.
.2 Copies of Provincial Applicator's License and Pesticide Project Application Permit.
.3 Copy of equipment log indicating spray calibration used during pesticide application.
- 1.6 QUALITY ASSURANCE .1 Quality Assurance: in accordance with Section 01 45 00 - Quality

Control.

- .2 Safety Requirements:
 - .1 Comply with label directions on the use of herbicide products.
 - .2 Comply with applicable personnel safety standards for handling and use of pesticides.
- .3 Regulatory Requirements:
 - .1 Pesticide Certification Programs: comply with National Standard for Pesticide Education, Training and Certification, and Provincial, and local pesticide control regulations of locality in which operation is to be carried out.
 - .2 Obtain permits and licenses necessary to complete work.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and maintain packaged materials with manufacturer's seals and labels intact.
- .3 Provide storage facility with non-porous floor capable of preventing leaching of spilled pesticides.
- .4 Prevent damage, adulteration and soiling of material during delivery, handling and storage.
- .5 Store material in accordance with label directions, including those on maximum and minimum storage temperatures.
- .6 Store herbicide products in original containers as supplied by manufacturer and keep sealed until used.
- .7 Store herbicide products in sheltered, well ventilated, controlled access location.
- .8 Do not store herbicides near feeds and food stuffs, agricultural plants, seeds, fungicides, insecticides, fertilizers or other agricultural chemicals.
- .9 Identify storage building as pesticide storage facility for fire protection purposes.
- .10 Prominently post:
 - .1 List of medical and fire department telephone numbers.
 - .2 Locate list of products stored outside of storage building, and keep list up-to-date.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
- .2 Triple jet rinse empty herbicide containers with diluent and add rinsate to spray mixture in tank.

- .3 Puncture and crush triple rinsed containers making them unsuitable for further use and dispose of material at appropriate recycling drop point.
- .4 Crush paper and cardboard containers and dispose of material at appropriate recycling facility.
- .5 Dispose of containers in accordance with provincial requirements.
- .6 Do not rinse or wash spray tanks and equipment on site.
- .7 Dispose of wash water from spray tanks and equipment in non-crop, non-graze area away from water sources including wells and ponds.
- .8 Dispose of unwanted or contaminated pesticides through appropriate environmental management facilities that will dispose of pesticide in accordance with Pest Control Products Act.
- .9 Dispose of water soluble packaging (usually PVA - poly vinyl acetate) in accordance with manufacturer's instructions in sprayer tank. All safety precautions for handling and use of PVA packaging must be adhered to.
 - .1 Adhere to safety precautions for handling and use of PVA packaging.
- .10 Place materials defined as hazardous or toxic waste in designated containers.
- .11 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Herbicides:
 - .1 Select appropriate herbicides to achieve specified control requirement.
 - .2 Herbicide products used must be currently registered for such in accordance with Pest Control Products Act.
- .2 Adjuvants: compatible with herbicide product used.
 - .1 Choose adjuvants with lowest toxicity levels and residual effects.

2.2 EQUIPMENT

- .1 Tank Sprayer: do not use air-blast, mist or fog sprayer.
 - .1 Set pressure setting at minimal functional level to minimize spray drift.
 - .2 Provide with adjustable height boom, hose and handgun for spot treatments, strainers and nozzles to produce spray pattern compatible with job.
 - .3 Equip tank continuous agitation device.
 - .4 Ensure pressure gauge and regulator capable of maintaining uniform pressure between 100 and 450 kPa.

- .5 Ensure equipment operated on turf has low pressure, wide profile turf tires.
- .2 Backpack Sprayer:
 - .1 With hose and handgun for spot treatment.
- .3 Dry formulation applicator:
 - .1 Drop type capable of calibration.
 - .2 Ensure equipment operated on turf has low pressure, wide profile turf tires.
- .4 Equip spray tank loading pipe with check valve located within one metre of pump or hydrant to prevent siphoning from spray tank resulting in contamination of water source.

PART 3 - EXECUTION

3.1 NOTICE OF SPRAY OPERATION

- .1 Post areas to be treated with signs placed at each road access and 100 m intervals around perimeter.
- .2 Indicate on signs that spray program is being implemented.
- .3 Put signs in place prior to beginning of spray operation and retain in place for 24 hours after spray operation is completed.

3.2 ENVIRONMENTAL PROTECTION

- .1 Application may continue only when wind velocities range between 2 and 10 km/h.
- .2 Do not spray when air turbulence will prevent uniform application.
- .3 Do not apply herbicides or pesticides within 100 m of wells, rivers, streams, lakes, marshes or other environmentally sensitive areas unless otherwise sanctioned by provincial permit.
 - .1 Eliminate areas of steep grade from targeted areas as precipitation can facilitate leaching to non targeted areas before degradation of the chemical has occurred.
- .4 In case of herbicide or pesticide spill, notify Departmental Representative and Manitoba Conservation verbally immediately and subsequently in writing.
 - .1 Minor spill: use dry soil or other absorbent materials to remove excess liquid and sweep up powders or granular material.
 - .2 Spread contaminated soils or sweepings over large area of bare soil to facilitate degradation.
 - .3 Dispose of paper, cardboard or paper packaging contaminated during spill as dictated by Manitoba Conservation.
- .5 Do not allow drifting beyond target area.
 - .1 Use mechanical method to minimize herbicide drift.
- .6 Do not apply sterilants to slopes greater than 3 to 1 where killing

vegetation would lead to erosion.

.7 Mix concentrate and water at least 50 m away from any water supply.

3.3 APPLICATION OF HERBICIDES

.1 Application's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

.2 Calibrate equipment to achieve manufacturer's recommended application rates.

.3 Confine herbicide application to areas indicated to achieve specified control requirements.

.4 Space successive passes to provide uniform coverage of treated area..

.5 Apply spray at full leaf stage of plant growth and thoroughly wet foliage to point of runoff in accordance with label directions.

.6 Where roots of desirable vegetation run under treatment area, use contact herbicides.

.7 Ensure formulation and use rate of sterilant will not lead to leaching outside treatment area.

.8 Re-treat areas in accordance with label directions until specified control requirements are achieved.

.9 Use appropriate buffer zones and berms to avoid surface contamination of wells, ponds and streams.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Materials and installation of polymeric geotextiles used in retaining wall structures, filtration, drainage structures, roadbeds and Yard areas purpose of which is to:
- .1 Separate and prevent mixing of granular materials of different grading.
 - .2 Act as hydraulic filters permitting passage of water while retaining soil strength of granular structure.
- 1.2 CITY SPECIFICATIONS AND RELATED SECTIONS .1 City of Winnipeg Standard Construction Specifications:
- .1 CW 3170 – Earthwork and Grading
 - .2 CW 3130 – Supply and Installation of Geotextile Fabrics.
- .2 Related Sections
- 1. Section 31 23 33.01 – Excavating, Trenching and Backfilling.
 - 2. Section 32 91 19.13 – Topsoil Placement and Grading
 - 3. Section 33 46 20 – Foundation and Under-slab Drainage
 - 4. Section G2020 – Yard and Parking Lot
- 1.3 REFERENCES .1 CW 3130 - Supply and Installation of Geotextile Fabrics
- .2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-4.2 No. 11.2-[M89(April 1997)], Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
 - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
- 1.4 SUBMITTALS .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- 1.5 DELIVERY, STORAGE AND HANDLING .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

PART 2 - PRODUCTS

- 2.1 MATERIAL .1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls, as per CW 3130.

- .2 Securing pins and washers: to CAN/CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to CAN/CSA G164.
- .3 Factory seams: sewn in accordance with manufacturer's recommendations.
- .4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 As per CW 3130.
- .2 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling, and 33 46 20 - Foundation and Under-slab Drainage.

3.2 CLEANING

- .1 Remove construction debris from project site and dispose of debris in an environmentally responsible and legal manner.

3.3 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 General requirements for building foundations.
.2 Load testing of building foundation units.
- 1.2 REFERENCES .1 National Research Council Canada
.1 National Building Code of Canada 2010 (NBCC).
.2 Canadian Standards Association (CSA International)
- 1.3 SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures including, but not limited to, the following:
.1 Manufacturer's printed product literature, specifications, and datasheet.
.2 Schedule of planned sequence of installations.
.3 Design details.
.4 Construction tolerances.
.5 Equipment manufacturer's written data.
.6 Load testing plan and methods.
.7 Quality control plan.
- 1.4 DELIVERY, STORAGE AND HANDLING .1 Deliver, store, and handle materials in accordance with manufacturer's instructions.
.2 Protect materials from damage due to excessive bending stresses, impact, abrasion, or other causes during delivery, storage, and handling.
.3 Replace damaged materials as directed by the Consultant.
- 1.5 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse, recycling, and disposal in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
- 1.6 EXISTING CONDITIONS .1 Examine geotechnical reports and information located in the Appendices:
.1 City of Winnipeg – *Former Elmwood / Nairn Landfill Site Final Preliminary Site Condition Assessment Report* as prepared by KGS Group located in Appendix D4.
.2 City of Winnipeg – letter report dated February 7, 2011, *Public Works East Yards – Geotechnical Investigation*, prepared by AECOM located in Appendix D1.
.3 Figure 01-C-1002 – *Summary Diagram of Subsurface Investigations*, prepared by AECOM located in Appendix B4.

- .2 The above documents are provided for information purposes. The information provided is considered accurate at the location and time of investigation as outlined in the Appendices. However, variations in soil conditions may exist between test holes and fluctuation in groundwater levels can be expected seasonally and may occur as a result of construction activities. The nature and extent of variations may not become evident until construction commences. Design Build Team shall satisfy himself with the subsurface conditions and conduct their own assessment including additional investigation to verify the subsurface conditions.
- .3 Refer to the geotechnical reports listed above for a description of the fill on this site; obstructions for building foundation installation are to be anticipated and coring through or cutting concrete and other debris may be required.
- .4 Refer to the geotechnical reports listed above for a description of the groundwater conditions on this site.
- .5 The subsoil and the groundwater conditions on this site may necessitate use of sleeves for the installation of the building foundations.

1.7 DESIGN REQUIREMENTS

- .1 Structures to be designed to the NBCC, Part 4, Post-Disaster Importance Category.
- .2 Design dead and live loads to meet requirements of the NBCC, Part 4.
- .3 Design of structures shall conform to City of Winnipeg requirements in *Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities and Guidelines for Construction on Landfill Sites*; refer to Appendix D5.
- .4 The Consultant to provide the allowable design load capacity of building foundations.
- .5 Design foundations of the Streets Maintenance Heated Vehicle and Equipment Storage building for vehicle and equipment loading as shown on the following schematic plan in Appendix C7: *Figure C7– Schematic Plan for Streets Maintenance Heated Vehicle and Equipment Storage (SM-09)*.
- .6 Shallow foundations bearing on the existing fill material on this site will not be acceptable. Shallow foundations, if used, must bear on engineered fill placed on competent material.
- .7 If deep foundations are to be used, no shaft resistance from the existing fill should be accounted for in pile capacity calculations.
- .8 If deep foundations are to be used, it is the responsibility of the

Design Build Team to determine the length of deep foundation units.

- .9 Minimum safety factors for foundation design shall be as follows:
 - .1 Shallow foundations: minimum safety factor of 3.0 for bearing capacity with maximum 25 mm settlement.
 - .2 Deep foundation units: minimum safety factor of 2.25 for load capacity.
- .10 Design for quality and durability in accordance with Section 01 47 13, LEED Requirements.

1.8 SCHEDULING

- .1 Provide schedule of planned sequence of foundation installation to the Consultant for review prior to commencement of installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Material requirements for building foundations to meet the NBCC and applicable referenced codes and standards therein.
- .2 Materials to be selected to conform to local industry standards and practices and to be locally proven products.

2.2 EQUIPMENT

- .1 Provide equipment sized for the installation of the building foundations.
- .2 Non-impact methods of installation such as augering, jacking, vibratory hammers, or other means: provide full details of characteristics necessary to evaluate performance.
- .3 Impact methods of installation: provide full details of characteristics necessary to evaluate performance.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Protection:
 - .1 Protect adjacent structures, services, and work of other sections from hazards due to building foundation installation operations.
 - .2 Arrange sequencing of building foundation installation operations and methods to avoid damages to adjacent existing structures.
 - .3 When damages occur, remedy damaged items to restore to

original or better condition at own expense.

- .2 Ensure that ground conditions at building foundation unit locations are adequate to support pile driving operation and load testing operation.
- .3 Pre-boring of holes is acceptable to facilitate alignment control.

3.2 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage, and installation instructions and datasheets.

3.3 INSTALLATION

- .1 The Consultant to provide installation methods and procedures for the installation of the building foundation units.

3.4 OBSTRUCTIONS

- .1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, remove obstruction to facilitate construction activities or proceed as directed by the Consultant.

3.5 FIELD QUALITY CONTROL

- .1 If shallow foundations are used, perform compaction testing on sub grade, engineered fill, sub base, and base courses.
- .2 If driven piles are used for foundations, PDA testing of 2% to 5% of the total number of piles is required.
- .3 If the required test results are not achieved, the Design Build Team shall propose remedial measures and submit to the Contract Administrator.
- .4 A qualified Geotechnical Engineer to interpret results for predicting building foundation unit performance and capacity.
- .5 The Consultant to verify and submit test results to the Contract Administrator.

3.6 CLEANING

- .1 Clean up in accordance with Section 01 74 11, Cleaning.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 This Section outlines the materials, construction and installation requirements for chain link fences and gates, including motorized sliding gates, as per CW 3550, Chain Link Fencing and Drawing 01-C-4001 – Motorized Sliding Gate Miscellaneous Details and Cross Sections.
- 1.2 CITY SPECIFICATIONS, .1 CW 3550 - Chain Link Fencing.
- 1.3 SUBMITTALS .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Coordinate submittal requirements and provide submittals required by Section 01 47 13 - LEED Requirements.
- .3 Closeout submittals as per Section 01 78 00.

PART 2 - PRODUCTS

- 2.2 MATERIALS .1 Concrete mixes and materials: in accordance with CW 3550, Section 5.11.
- .1 Additives: fly ash to CAN/CSA-A23.5.
- .2 Chain-link fence fabric: in accordance with CW 3550, Section 5.6.
- .3 Chain link gates: as per CW 3550, Section 9.7.
- .4 Provide motorized sliding gates at two main vehicular entrances, two in each location, as per details on Drawing 01-C-4001.
- .1 Motorized sliding gates shall be Card Access controlled.
- .2 Provide Shop Drawings for motorized sliding gates showing construction details.
- .5 Organic zinc rich coating: to CAN/CGSB-1.181.
- Galvanizing: For chain link fabric: to CAN/CGSB-138.1 Grade 2.
- .1 For pipe: 550g/m² minimum to ASTM A 90.
- .2 For other fittings: to CAN/CSA-G164.
- .6 Grounding rod: 16mm diameter copperwell rod, 3 m long.

PART 3 - EXECUTION

- 3.1 GRADING .1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.
.1 Provide clearance between bottom of fence and ground surface of 30mm to 50mm.
- 3.2 ERECTION OF FENCE .1 Erect fence in accordance with CW 3550, Section 9.
.2 Install end posts at ends of fence and at buildings, and on both sides of gate openings.
.3 Install grounding rods.
- 3.3 INSTALLATION OF GATES .1 Install gates in locations as indicated on the Conceptual Site Drawings.
.2 Level ground between gate posts and set gate bottom approximately 40mm above ground surface.
.3 Install 1.2 metre high bollards, depth to prevent frost heaving, to protect gate and latch portal when the gate is open. Locate bollards on either side of the Card Access reader/intercom pedestal (two at each pedestal) for protection of pedestal.
.4 Install gate stops.
- 3.4 OPERATIONAL REQUIREMENTS .1 Operational requirements in accordance with Section 01 74 11 – Cleaning.
- 3.5 TOUCH UP .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas.
.1 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.
- 3.6 CLEANING .1 Clean and trim areas in compliance with CW 3550, Section 9.9

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 This Section includes outline specifications for materials and installation of standard manufactured catalogue items including: benches, picnic tables, waste containers, and bicycle storage system.
- 1.2 REFERENCES AND RELATED SECTIONS .1 Canada Green Building Council (CaGBC) LEED® Green Building Rating System – LEED® Canada-NC Version 1.
- 1.3 SUBMITTALS .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Shop Drawings in accordance with Section 01 33 00 - Submittal Procedures. Indicate dimensions, sizes, assemblies, anchorage and installation details for each furnishing specified.
- .3 Provide maintenance data for care and cleaning of site furnishings for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .4 Section 01 74 13 - LEED Requirements

PART 2- PRODUCTS

- 2.1 BENCHES AND PICNIC TABLES .1 Locate benches at least 8 m from building entrances, opening windows and air intakes.
- .2 Locate picnic tables in hard surfaced areas accessible to entrances in the Administrative and Staff component building.
- .3 Acceptable Materials: recycled plastic or metal.
- .4 Dimensions: Lengths of benches and picnic tables: min. 1.83 m.
- 2.2 TRASH CONTAINER .1 Provide minimum of four (4) trash containers, near benches and picnic tables, and major building entrances.
- .2 Acceptable Material: recycled plastic or metal to match benches.
- 2.3 ASH URNS .1 Provide ash urns with each trash container.
- .2 Acceptable Materials: to match trash containers.
- 2.4 BICYCLE RACKS .1 Provide secure and covered bicycle storage to accommodate at least 5% of building occupants (12 bicycles or more).
- .2 Acceptable Material: recycled wood or metal.

PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Assemble furnishings in accordance with manufacturer's instructions.
 - .2 Install furnishings true, plumb, anchored to hard surfacing.
 - .3 Touch-up damaged finishes.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This Section outlines requirements for topsoil, topsoil amendments, and growing medium, as well as the stripping of topsoil, should viable topsoil exist on site; the preparation of existing grades, placing of topsoil and finish grading.
- 1.2 SITE MATERIAL .1 Ensure that suitability and usefulness of on-site material is checked and verified by a certified professional or Soil Testing Laboratory.
- 1.3 REFERENCES AND RELATED SECTIONS .1 City of Winnipeg Standard Construction Specifications:
- .1 CW 3170 – Earthwork and Grading
 - .2 CW 3540 – Topsoil and Finish Grading
- .2 Related Sections
- .1 Section 31 32 19_01 – Geotextiles
 - .2 Section 32 92 16 - Hydraulic Seeding
 - .3 Section 32 92 23 - Sodding
 - .4 Section 32 93 10 - Trees Shrubs and Ground Cover Plantings.
 - .5 Section G1030 - Site Earthwork
- 1.3 REFERENCES .1 CW 3540 Topsoil and Finish Grading for Establishment of Turf Areas.
- 1.4 SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Erosion and Sedimentation Control Plan in accordance with Section 01 47 13 LEED Requirements.
- .3 Quality control submittals:
- .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

PART 2 - PRODUCTS

- 2.1 TOPSOIL .1 Topsoil for areas to receive Grass Seed Mixture: shall be either stockpiled site soil or imported topsoil, as per CW 3540.
- .2 Planting Soil Mixture for planting beds and tree pits: mixture of 70% topsoil with 20% peat moss and 10% sand by volume.

<u>2.2 GROWING MEDIUM</u>	.1	Peat moss and sand constituents of Growing Medium for areas to receive Legume and Grass Seed Mixture: as per CW 3540.
	.2	Compost shall be <i>unrestricted grade</i> : includes yard, agricultural and silvicultural wastes plus untreated wood products that have been treated by pathogen-free requirement procedures (PFRP), that is, maintained at 131°F (55°C) for 48 to 96 hours. This treatment ensures that the compost is free of disease-causing organisms.
<u>2.3 SOIL AMENDMENTS</u>	.1	Contractor is responsible for amendments to supply topsoil as specified.
	.2	Soil testing by recognized testing facility for PH, P and K, and organic matter.
<u>2.4 MULCH</u>	.1	Mulch shall be clean river run stone, 20mm to 30mm.
 <u>PART 3 - EXECUTION</u>		
<u>3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL</u>	.1	Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
	.2	Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
	.3	Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
<u>3.2 STRIPPING OF TOPSOIL</u>	.1	As per CW 3540
	.2	Strip topsoil to depths as determined by localized soil depth and chemistry testing.
<u>3.3 PREPARATION OF EXISTING GRADE</u>	.1	Prepare existing grade in accordance with Section G1030 – Site Earthwork.
<u>3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL</u>	.1	Place and spread topsoil in accordance with CW 3540.
	.2	For sod areas: spread topsoil to a minimum depth after settlement of 100 mm.

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- .3 For planting beds: spread planting soil mixture to a minimum depth after settlement of 300 mm.
- .4 For infiltration trenches spread minimum of 750 mm of prepared planting medium.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.
- 3.5 SOIL AMENDMENTS
- .1 For sod and seeded grass areas: apply and thoroughly mix soil amendments as recommended by soil test results into top 50mm of existing soil:
- .2 For planting beds and infiltration trenches: apply and thoroughly mix soil amendments as recommended by soil test results into full specified depth of soil mixture.
- 3.6 GROWING MEDIUM
- .1 For areas to receive Legume and Grass Seed Mixture: mix 35 mm peat moss and 15 mm sand into the top 75 mm of clean clay cover, following construction of rough grades.
- 3.7 VEGETATED INFILTRATION TRENCHES
- .1 Prepared planting medium for vegetated infiltration trenches: shall include a mixture of 30% topsoil, 50% sand and 20% compost
- .2 Gravel underdrain blanket: for the entire width of the infiltration swale shall extend 300 mm from minimum the 200 mm perforated sub-drain discharge pipe connected to the on-site stormwater system.
- .3 Filter fabric: shall be installed between prepared planting medium and gravel underdrain blanket.
- .4 Install river-run stone to 50mm depth around all plantings.
- 3.8 FINISH GRADING
- .1 Finish grading as per CW 3540.
- 3.9 ACCEPTANCE
- .1 Test topsoil for NPK to determine fertilizer requirements and application rates.
- 3.10 SURPLUS MATERIAL
- .1 Dispose of materials, except imported topsoil not required, off site.
- 3.11 CLEANING
- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This Section outlines requirements for hydraulic seeding including seed, mulch, slurry preparation and application, and maintenance.
- .1 Grass Seed Mixture: typically used in boulevard and higher maintenance landscaped areas, such as around the parking lot and in swales.
- .2 Legume and Grass Seed Mixture: typically used in undeveloped and low-maintenance landscaped areas, including slopes of stormwater retention pond.
- 1.2 RELATED SECTIONS .1 Section 31 31 19.13 - Chemical Control of Vegetation.
- .2 Section 32 91 19.13 - Topsoil Placement and Grading.
- .3 Section G1030 - Site Earthwork
- 1.3 SUBMITTALS .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures, for seed mix, mulch, tackifier and fertilizer
- 1.4 SCHEDULING .1 Schedule hydraulic seeding to coincide with preparation of soil surface, between dates recommended by the Provincial Agricultural Department for seeding grasses and legumes.
- 1.5 WASTE MANAGEMENT AND DISPOSAL .1 Divert unused fertilizer from landfill to official hazardous material collections site.
- .2 Do not dispose of unused fertilizer into sewer systems, lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Grass Seed Mixture: for boulevards, medians and lake areas, as per CW 3520, Section 5.3.2., or alternate native seed mix comprising three or more hardy, native grasses appropriate to site conditions.
- .2 Legume and Grass Seed Mixture: "Canada No. 1" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".
- .1 Mixture composition:
- .1 Birdsfoot trefoil 35%.
- .2 White Clover 25%.
- .3 Perennial ryegrass 15% cultivars as per CW 3520, Section 5.3.4.

- .4 Creeping Red fescue 25%
or alternate seed mix comprising two or more hardy native legumes
and two or more hardy native grass species appropriate to site
conditions.
- .3 Mulch, Tackifier and Water: as per CW 3520.
- .4 Fertilizer:
 - .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
 - .2 Complete synthetic, slow release fertilizer with 35% of
nitrogen content in water-insoluble form.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- .1 As per CW 3520.

3.2 PREPARATION OF SURFACES

- .1 As per Section 32 92 20 - Topsoil and Finish Grading.
- .2 Cultivate areas to receive the Legume and Grass Seed Mixture to a
depth of 75 mm.
 - .1 Mix 35 mm of peat moss and 15 mm sand with clean clay
base.
- .3 Ensure areas to be seeded are moist to depth of 100 mm before
seeding.

3.3 FERTILIZING PROGRAM

- .1 As per Section 31 92 20.

3.4 PREPARATION AND APPLICATION OF SLURRY

- .1 As per CW 3520

3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 As per CW 3520.
- .2 For legume and grass seed mixtures intended for periodic mowing,
only.
 - .1 Mow legume mixtures to 100 mm whenever height reaches
200 mm and as follows:
 - .1 Do not mow within period commencing 3 weeks
before and ending 3 weeks after first severe, average
fall frost date and 3 weeks after actual severe fall
frost.
 - .2 When mowing after first severe fall frost, mow at a
height of not less than 300 mm.
 - .3 Remove clippings which will smother plants.
- .3 Water all seeded areas during establishment period to maintain
optimum soil moisture level for germination and continued growth.
Control watering to prevent washouts.

3.6 ACCEPTANCE .1 As per CW 3520.

3.7 MAINTENANCE DURING WARRANTY PERIOD .1 Perform following operations from time of acceptance until end of warranty period:
.1 Repair and reseed dead or bare spots.
.2 Mow areas seeded, remove clippings, in accordance with following schedule:

Seed Mixture	Frequency Requirements for Cutting	Height of Cut
Turf Grass	Bi-weekly	60 mm
Legume mixture	Periodically height of 200 mm	100 mm

.3 Fertilize seeded areas as per Section 31 92 20.

3.8 CLEANING .1 As per CW 3520.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This Section outlines requirements for sod type, placement, preparation and maintenance.
- 1.2 REFERENCES AND RELATED SECTIONS .1 City of Winnipeg Standard Construction Specifications:
.1 CW 3170 – Earthwork and Grading
.2 CW 3510 - Sodding
.2 Related Sections
.1 Section 01 33 00 - Submittal Procedures.
.2 Section 01 74 19 – Construction Waste Management and Disposal
.3 Section 31 31 19.13 – Chemical Control of Vegetation.
.4 Section 32 91 19.13 – Topsoil Placement and Grading.
.5 Section 31 32 19.01 - Geotextiles
- 1.3 SUBMITTALS .1 Samples.
.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- 1.4 QUALITY ASSURANCE .1 Test Reports: certified sod test reports showing compliance with specified performance characteristics and physical properties.
- 1.5 SCHEDULING .1 In accordance with CW 3510
- 1.6 MATERIALS .1 Turf Grass Sod: as per CW 3510:
.1 Number One Kentucky Bluegrass - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of 95% Kentucky Bluegrass (100% Class 2 cultivars, 3 cultivars in equal proportion) and 5% Creeping Red Fescue.
.2 Sod establishment support: as per CW 3510
.1 Geotextile fabric: biodegradable, square mesh.
.2 Wooden pegs: 17 x 8 x 200 mm.
.3 Stenlog erosion control system.
.3 Fertilizer: As per Section 32 91 19_13 - Topsoil Placement and Grading.

1.7 SOURCE QUALITY CONTROL .1 Verification of sod, as per Section 01 33 00 - Submittal Procedures.

PART 2 - EXECUTION

2.1 PREPARATION .1 Topsoil and finish grading as per Section 31 91 19_13 – Topsoil Placement and Grading.

2.2 SOD PLACEMENT .1 As per CW 3510

2.3 MAINTENANCE DURING ESTABLISHMENT PERIOD .1 As per CW 3510

2.4 ACCEPTANCE .1 As per CW 3510

2.5 MAINTENANCE DURING WARRANTY PERIOD .1 As per CW 3510

- .1 Water sod areas at intervals to obtain optimum soil moisture conditions to depth of 100 mm.
- .2 Repair and re-sod dead or bare spots.
- .3 Cut grass to a height of 65 mm and remove clippings.
 - .1 Fertilize areas in accordance with a fertilizing program.
 - .2 Eliminate weeds by mechanical or chemical means.
 - .1 If chemical means are used, comply with Section 31 31 19.13 - Chemical Control of Vegetation.

2.6 CLEANING .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

PART 1 - GENERAL

- 1.1 SUMMARY .1 This Section includes:
- .1 Materials and installation methods for tree, shrub and ground cover plantings; tree support, mulching and maintenance.
 - .2 Materials and installation methods for native plant material for constructed wetland areas.
- 1.2 CITY SPECIFICATIONS, RELATED SECTIONS AND REFERENCES .1 City of Winnipeg Standard Construction Specifications
- .1 CW 3170 – Earthwork and Grading
 - .2 CW 3540 – Topsoil and Finish Grading
- .2 Related Sections:
- .1 Section G1030 – Site Earthwork
 - .2 Section 32 91 19.13 - Topsoil Placement and Grading
 - .3 Section 01 33 00 - Submittal Procedures
 - .4 Section 01 47 13 LEED Requirements
 - .5 Section 01 74 19 - Construction Waste Management and Disposal
- .3 City of Winnipeg Forestry Department: Tree Planting and Maintenance Specification (Draft).
- .4 City of Winnipeg By-law No 200/2006: By-law to promote orderly use of land and buildings
- .1 Part 5: Development and Design Standards Landscaping and Buffering, Preservation of Existing Trees
- .5 Agriculture and Agri-Food Canada (AAFC).
- .1 Plant Hardiness Zones in Canada-2000.
- .6 Canadian Nursery Landscape Association (CNLA).
- .1 Canadian Standards for Nursery Stock-2001.
- .7 Canada Green Building Council (CaGBC) LEED® Green Building Rating System – LEED® Canada-NC Version 1.0.
- 1.3 SUBMITTALS .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for:
- .1 Fertilizer
 - .2 Anti-desiccant
 - .3 Guying assembly including clamps, collar, guying wire, anchors and wire tightener
 - .4 Mulch

- 1.4 STORAGE AND PROTECTION
- .1 Supply and transport plant material to site.
 - .2 Coordinate the shipping of plant material and the excavation of tree pits and planting beds to ensure no more than 24 hours elapse between the plant material arriving on site and being installed.
 - .1 Protect plant materials against abrasion, exposure and extreme temperature change during transit.
 - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical.
- 1.5 WARRANTY
- .1 Warrant plant material as itemized on all Plant Lists, to remain free of defects in accordance with General Conditions (GC)-CCDC GC 12 for two (2) years.
- 1.6 DAMAGE CONTROL
- .1 Design Build Team shall take every precaution not to damage, injure or mark any existing structures or landscaping on the street right-of-way or adjacent properties.
 - .2 Should any damage be caused by the Design Build Team, their employees or equipment, restore or replace to the satisfaction of the Contract Administrator. This applies even if damage results from work done in the process of correcting deficiencies.
- PART 2 - PRODUCTS
- 2.1 SUSTAINABLE REQUIREMENTS
- .1 Materials and products in accordance with Section 01 47 19 - Sustainable Requirements: Verification.
- 2.2 PLANT MATERIAL
- .1 Trees shall be of the species and sizes noted on approved Plant Lists:
 - .1 Acceptable Tree Species for Boulevard Planting, available on the City of Winnipeg Urban Forestry Branch website (<http://www.winnipeg.ca/publicworks/Forestry/forestry.asp>).
 - .2 Vary plantings of acceptable tree species for boulevard and row plantings. Do not plant more than five trees of the same species adjacent in a row.
 - .2 All Nursery Stock supplied shall be from Canadian prairie nursery root or seed stock. Quality in accordance with the latest *Guide Specification for Nursery Stock* of the Canadian Nursery Trades Association.
 - .3 Nomenclature of specified Nursery Stock should conform to the International Code of Nomenclature for Cultivated Plants and in accordance with the approved scientific names given in the latest edition of standardized Plant Names.
- 2.3 PLANTING SOIL
- .1 Shall be as per Section 32 91 19.13 - Topsoil Placement and Grading.

<u>2.4 WATER</u>	1	Provide water free of impurities that would inhibit plant growth, including: oils, acids, alkalis, salts and other substances.
	.2	Further to clause 3.7 of CW 1120-R1, the Design Build Team shall pay for all costs associated with obtaining water in accordance with the City of Winnipeg Waterworks By-law. Sewer charges will not be assessed for water obtained from a City hydrant.
<u>2.5 STAKES AND GUYS</u>	.1	Shall be as per Tree Planting Detail and Shrub Planting Detail on Drawing 01-C1003.
<u>2.6 TRUNK PROTECTION</u>	.1	Shall be as per Tree Planting Detail and Shrub Planting Detail on Drawing 01-C1003.
<u>2.7 MULCH</u>	.1	Wood chips or hard stone chips varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves.
<u>2.8 FERTILIZER</u>	.1	N-P-K as recommended by soil test report.
<u>2.9 ANTI-DESICCANT</u>	.1	Wax-like emulsion.
<u>2.10 FLAGGING TAPE</u>	.1	Fluorescent colour.
<u>2.11 SOURCE QUALITY CONTROL</u>	.1	Imported plant material shall be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.
	.2	Obtain macrophytic vegetation for wetland stormwater retention basin from supplier of native plant materials recommended by Design Build Team Specialist Consultant on Native Wetland Plantings.
<u>PART 3 - EXECUTION</u>		
<u>3.1 PRE-PLANTING PREPARATION</u>	.1	Remove damaged roots and branches from plant material.
	.2	Apply anti-desiccant to conifers and deciduous trees in leaf, in accordance with manufacturer's instructions.
<u>3.2 EXCAVATION AND PREPARATION OF PLANTING BEDS</u>	.1	Establishment of sub-grade for planting beds: shall be as specified in Section G1030 – Site Earthwork.
	.2	Preparation of planting beds: shall be as specified in Section 32 91 19.13 - Topsoil Placement and Grading.
	.3	For individual planting holes:
	.1	Stake out location and confirm prior to excavating.
	.2	Excavate to depth and width as indicated on Planting Details on Drawing 01-C-1003.
	.3	Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
	.4	Scarify sides of planting hole.
	.5	Remove water which enters excavations prior to planting.

- .4 Prepare areas for wetland establishment – shallow shelves within the stormwater retention basins - in accordance with recommendations of Design Build Team Specialist Consultant for Wetland Native Plantings.
- 3.3 PLANTING
- .1 Plant trees and shrubs in accordance with standard nursery practice and the planting details on Drawing 01-C-003.
- .2 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.
- 3.4 TRUNK PROTECTION
- .1 Install trunk protection on deciduous trees prior to installation of tree supports.
- 3.5 TREE SUPPORTS
- .1 Use single stake tree support for deciduous trees less than 3 m and evergreens less than 2 m in height
- .2 Use 3 guy wires and anchors for deciduous trees greater than 3 m and evergreens greater than 2 m in height.
- 3.6 MULCHING
- .1 Ensure soil settlement has been corrected prior to installing mulch.
- .2 Spread mulch to a minimum depth of 75 mm but not more than 125 mm.
- 3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD
- .1 Perform maintenance operations from time of planting to end of the establishment maintenance period.
- .2 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
- .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
- .3 Remove weeds monthly.
- .4 Replace or re-spread damaged, missing or disturbed mulch.
- .5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Contract Administrator prior to application.
- .6 Remove dead or broken branches from plant material.
- .7 Keep trunk protection and guy wires in proper repair and adjustment.
- .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
- 3.8 MAINTENANCE DURING WARRANTY PERIOD
- .1 The Design Build Team shall maintain all plant material for a period of two (2) years from Date of Acceptance. Maintenance requirements shall be as per Section 3.7. Start warranty when plant

material installation has been completed and there is no sign of wilting, pest infestation, transplant shock or any conditions deleterious to longevity and appearance. Defective plants shall be replaced within thirty (30) days of notification and shall be further maintained for a period of two years.

3.9 VERIFICATION .1

Verification requirements in accordance with Section 01 47 13 - LEED Requirements.

PART 1 – GENERAL

- 1.1 SUMMARY .1 This Section outlines requirements for the supply and installation of watermain distribution piping, fittings, hydrant assemblies, valves, water services, connections to existing watermains, valve relocations, hydrant relocations, appurtenances, testing, restorations and related work.
- 1.2 DEFINITIONS .1 Municipal Service: shall refer to infrastructure installed and constructed for the purposes of delivering potable water to the proposed site, including all piping, fittings, valves, hydrants, and related appurtenances.
- .2 Building Service: shall refer to the water distribution branch providing water service directly to and entering the footprint of the proposed building.
- 1.3 REFERENCES AND RELATED SECTIONS .1 City of Winnipeg Standard Construction Specifications
.1 CW 2110 – Watermains
- .2 City of Winnipeg Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities AND Guidelines for Construction on Landfill Sites.
- .3 Related Sections
.1 01 33 00 – Submittal Procedures.
.2 01 74 19 – Construction Waste Management And Disposal.
.3 31 23 33.01 – Excavating, Trenching and Backfilling.
- 1.4 PERFORMANCE REQUIREMENTS .1 Work shall be performed in accordance with CW 2110 – Watermains.
- .2 The design shall include methods and specifications intended to achieve acceptable performance as the site settles, and help minimize future maintenance requirements.
- .3 The design shall consider the chemical and physical effects of fill materials present at the site on the integrity of the municipal services.
- .4 In order to minimize the potential for underground gas migration within excavations and trenches, buried municipal services shall be installed in a common trench system wherever possible.
- .5 Locate watermains, valves, hydrants, services, and related appurtenances to minimize the impact of trench settlement on surface features.

- .6 Minimize the number of offsite watermain connections to:
 - .1 Reduce the impact of service interruptions to existing users.
 - .2 Minimize the requirement for installation of gas barriers and trench gas migration plugs.
- .7 Service connections to buildings shall be constructed such that
 - .1 Differential settlement between the service and the structural slab floor does not negatively impact the integrity, operation or performance of the utility.
 - .2 Any utility or conduit entering through the floor shall be sealed to prevent infiltration of methane gas into the building.

1.5 SUBMITTALS

- .1 Submit designs, shop drawings, plans and details in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to beginning excavation submit for approval by the Contract Administrator, plans, drawings and documentation in support of:
 - .1 Plan/Profile drawings clearly indicating pipe alignments, depth, grades, pipe size, class, material, and any other information pertinent to the design of the water distribution piping system.
 - .2 Indicate trench/excavation type (i.e. open-cut, trenchless), bedding classes, and location of trench gas barriers.
 - .3 Design and detail drawings for watermain distribution piping appurtenances, including building service connection details.
- .3 Testing, laboratory results, and quality control documentation shall be made available to the Contract Administrator upon request.

1.6 QUALITY ASSURANCE

- 1 Sustainable Requirements:
 - .1 Contractor shall perform work in accordance with:
 - .1 Section 01 47 13 – LEED Requirements.
 - .2 Section 01 74 19 – Construction Waste Management and Disposal.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Materials and products in accordance with CW 2110 – Watermains.
- .2 Valves to open counter clockwise (right hand close), with a black operating nut, as per City of Winnipeg Standard Construction Specifications SD-008.
- .3 Pipe bedding and backfill to be installed in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.
- .4 Pipe gaskets to be oil and gas resistant, and elastomeric compounds to be rated as “excellent”.

PART 3 - EXECUTION

3.1 INSTALLATION .1 Do trenching work in accordance with Section 31 23 33.01 -
Excavating Trenching and Backfilling.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 This Section outlines requirements for supply and installation of sanitary sewer, sewer services, manholes, fittings, and appurtenances, and connections to existing manholes and combined sewers.
- 1.2 REFERENCES AND RELATED SECTIONS .1 City of Winnipeg Standard Construction Specifications:
.1 CW 2130 – Gravity Sewers.
.2 *City of Winnipeg Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities and Guidelines for Construction on Landfill Sites.*
.3 Related Sections:
.1 01 33 00 - Submittal Procedures.
.2 01 74 19 – Construction Waste Management And Disposal.
.3 31 23 33.01 - Excavating, Trenching and Backfilling.
.4 Canada Green Building Council (CaGBC) LEED® Green Building Rating System – LEED® Canada-NC Version 1.0.
- 1.3 DEFINITIONS .1 Waste Management Plan (WMP): Shall refer to processes, documents, and work plans prepared in accordance with Section 01 74 19 – Construction Waste Management and Disposal
- 1.4 PERFORMANCE REQUIREMENTS .1 Work shall be performed in accordance with CW 2130 – Gravity Sewers, and Section 31 23 33.01 – Excavating, Trenching and Backfilling.
.2 The design shall include methods and specifications intended to achieve acceptable performance as the site settles, and help minimize future maintenance requirements.
.3 The design shall consider the chemical and physical effects of fill materials present at the site on the integrity of the building and services.
.4 In order to minimize the potential for underground gas migration within excavations and trenches, buried municipal services shall be installed in a common trench system wherever possible.
.5 Locate sewer mains, manholes, and appurtenances to minimize the impact of trench settlement on surface features.
.6 Minimize the number of offsite sewer system connections to:
.1 Reduce the impact of service interruptions to existing areas and users.
.2 Minimize the requirement for installation of gas barriers and trench gas migration plugs.

- .7 Service connections to buildings shall be constructed such that:
 - .1 Differential settlements between the service and the structural slab floor do not negatively impact the integrity, operation or performance of the utility.
 - .2 Any utility or conduit entering through the floor shall be sealed to prevent infiltration of methane gas into the building.

1.5 SUBMITTALS

- .1 Submit designs, shop drawings, plans and details in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to beginning excavation submit for approval by the Contract Administrator plans, drawings and documentation in support of:
 - .1 Plan/Profile drawings clearly indicating pipe alignments, depth, grades, pipe size, class, material, and any other information pertinent to the design of the water distribution piping system.
 - .2 Indicate trench/excavation type (i.e. open-cut, trenchless), bedding classes, and location of trench gas barriers.
 - .3 Design and detail drawings for sanitary sewer appurtenances, including building service connection details.
- .3 Testing, laboratory results, and quality control documentation shall be made available to the Contract Administrator upon request.

1.6 QUALITY ASSURANCE

- .1 Sustainable Requirements:
 - .1 Contractor shall perform work in accordance with:
 - .1 Section 01 47 13 - LEED Requirements.
 - .2 Section 01 74 19 – Construction Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Materials and products in accordance with CW 2130 – Gravity Sewers.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

PART 1 - GENERAL

- 1.1 SUMMARY .1 This Section outlines requirements for supply and installation of land drainage sewers, catch basins, manholes, fittings, and appurtenances, and connections to existing catch basins, manholes, and sewers.
- 1.2 REFERENCES AND RELATED SECTIONS .1 City of Winnipeg Standard Construction Specifications:
.1 CW 2130 – Gravity Sewers.
.2 *City of Winnipeg Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities and Guidelines for Construction on Landfill Sites.*
.3 Related Sections:
.1 01 33 00 - Submittal Procedures.
.2 01 74 19 – Construction Waste Management And Disposal.
.3 31 23 33.01 - Excavating, Trenching and Backfilling.
.4 Canada Green Building Council (CaGBC) LEED® Green Building Rating System – LEED® Canada-NC Version 1.0.
- 1.3 PERFORMANCE REQUIREMENTS .1 Work shall be performed in accordance with CW 2130 – Gravity Sewers, and Section 31 23 33.01 – Excavating, Trenching and Backfilling.
.2 The design shall include methods and specifications intended to achieve acceptable performance as the site settles, and help minimize future maintenance requirements.
.3 The design shall consider the chemical and physical effects of fill materials present at the site on the integrity of the building and services.
.4 In order to minimize the potential for underground gas migration within excavations and trenches, buried municipal services shall be installed in a common trench system wherever possible.
.5 Locate sewer mains, manholes, catchbasins, catchpits, valves, gates, culverts, and appurtenances to minimize the impact of trench settlement on surface features.
.6 Minimize the number of offsite land drainage system connections to:
.1 Reduce the impact of service interruptions to existing areas and users.
.2 Minimize the requirement for installation of gas barriers and trench gas migration plugs.
.7 Service connections to buildings shall be constructed such that:
.1 Differential settlement between the service and the structural slab floor does not negatively impact the integrity, operation or performance of the utility.

- .2 Any utility or conduit entering through the floor shall be sealed to prevent infiltration of methane gas into the building.
- .8 The land drainage system (LDS) shall be designed in such a way that failure of the LDS piping system to handle a storm of greater intensity than the design storm should not result in property damage due to runoff.
- .9 A double backflow prevention system shall be employed on the downstream end of the LDS system. The backflow preventors shall consist of two flap-gate structures installed to prevent backflow of wastewater from the combined sewer system into the stormwater pond.
- .10 The inlet structure upstream of the combined sewer connection shall be a 375 mm diameter restricted inlet system.
- .11 The LDS pipe section downstream of the inlet structure shall be maximum 375 mm diameter.

1.4 SUBMITTALS

- .1 Submit designs, shop drawings, plans and details in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to beginning excavation submit for approval by the Contract Administrator, plans, drawings and documentation in support of:
 - .1 Plan/profile drawings clearly indicating pipe alignments, depth, grades, pipe size, class, material, and any other information pertinent to the design of the land drainage piping system.
 - .2 Indicate trench/excavation type (i.e. open-cut, trenchless), bedding classes, and location of trench gas barriers.
 - .3 Design and detail drawings for land drainage system appurtenances, including building service connection details.
- .3 Testing, laboratory results, and quality control documentation shall be made available to the Contract Administrator upon request.

1.5 QUALITY ASSURANCE

- .1 Sustainable Requirements:
 - .1 Design Build Team shall perform work in accordance with:
 - .1 Section 01 47 13 – LEED Requirements.
 - .2 Section 01 74 19 – Construction Waste Management and Disposal.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Storage and Protection:
 - .1 Prevent damage to fencing, trees, landscaping, natural features, benchmarks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, and root systems of trees which are to remain.
 - .2 Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed, reference and replaced it by licensed land surveyor at the contractor's expense.
 - .3 Temporarily cover catch basins and maintenance holes to prevent entry of earth, debris, construction materials, or other

deleterious substances. Ensure adequate surface drainage in affected area is maintained.

- .4 Provide traffic control as required, in accordance with applicable regulations.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Materials and products in accordance with CW 2130 – Gravity Sewers.
- .2 The inlet structure upstream of the combined sewer connection shall be a 150mm diameter restricted inlet system (Hickenbottom, Inc., or approved equal).

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Clean pipes and fittings of debris and water before installation.
- .2 Handle defective materials, off-cuts, packaging, crating, extra materials, and debris in accordance with the Waste Management Plan (WMP).

3.2 INSTALLATION

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Do not allow contents of sewer or sewer connection to flow into trench.

3.3 BACKFILL

- .1 Backfill methods and materials as per Section 31 23 33.01 – Excavating, Trenching and Backfilling.

3.4 RESTORATION

- .1 Restorations shall be performed in accordance with CW 2130 – Gravity Sewers.

PART 1 - GENERAL

- 1.1 SUMMARY .1 This Section shall outline requirements for removal from the site of trees, stumps, roots, logs, brush, rubbish, debris, concrete, asphalt, refuse, surface litter and materials described above, and the disposal of same in a manner specified within this document.
- 1.2 CITY SPECIFICATIONS, RELATED SECTIONS AND REFERENCES .1 City of Winnipeg Standard Construction Specifications:
.1 CW 1130 – Site Requirements
.2 CW 3010 – Clearing and Grubbing.
.2 Related Sections:
.1 01 33 00 - Submittal Procedures.
.2 01 47 13 – LEED Requirements
.3 01 74 19 - Construction Waste Management and Disposal
.3 Canada Green Building Council (CaGBC) LEED® Green Building Rating System – LEED® Canada-NC Version 1.0.
- 1.3 DEFINITIONS .1 Site Work: Shall cover examination of existing site features, dewatering and site drainage, clearing and grubbing, materials management, waste management, and site cleanup.
- 1.4 PERFORMANCE REQUIREMENTS .1 Site work will be performed in accordance with CW 1130 – Site Requirements.
.2 Clearly define limits of stripping and site clearing, topsoil stockpile areas, and waste material stockpile areas to minimize site disturbance outside of the intended construction area.
.3 Perform clearing and grubbing in accordance with CW 3010 – Clearing and Grubbing, including removal and disposal of construction waste items consistent with the description in Part 1.1 – Summary, of this Section.
.4 Maintain existing surface drainage to protect excavations, low areas, and depressions from flooding, rainfall, and surface run-off.
.5 Do not direct drainage water from ground surface or excavations into existing sewer system without written approval from the Contract Administrator, and in accordance with local sewerage by-laws.
- 1.5 SUBMITTALS .1 Coordination of Submittals: In accordance with Section 01 33 00 - Submittal Procedures.
.2 Prior to beginning work on site submit for approval by the Contract Administrator, plans, drawings and documentation in support of:
.1 Schedule and staging of site clearing activities.
.2 Stripping, clearing, and construction limits, indicating areas, objects, surface and sub-surface features which are to remain undisturbed or require protection during construction.

- .3 Material stockpile locations.
- 1.6 QUALITY ASSURANCE .1 Sustainable Requirements:
 - .1 Design Builder Team shall perform work in accordance with:
 - .1 Section 01 47 13 - LEED Requirements.
 - .2 Section 01 74 19 - Construction Waste Management and Disposal.
- PART 2 - PRODUCTS .1 In accordance with City of Winnipeg Standard Construction Specifications CW 3010 – Clearing and Grubbing
- PART 3 - EXECUTION
- 3.1 PREPARATION .1 Coordinate pre-construction activities in accordance with City of Winnipeg Standard Construction Specifications CW 1130 – Site Requirements.
 - .2 Review site with Contract Administrator and verify items designated to remain.
 - .3 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
 - .4 Notify utility authorities before beginning work to strip, clear or grub site.
- 3.2 INSTALLATION .1 Site clearing work in accordance with City of Winnipeg Standard Construction Specification CW 3010 – Clearing and Grubbing.
- 3.3 RESTORATION .1 Leave ground surface in a condition suitable for commencement of building construction and site construction operations.
- 3.4 QUALITY CONTROL .1 Verification requirements in accordance with:
 - .1 Section 01 47 13 - LEED Requirements.
 - .2 Section 01 74 19 – Construction Waste Management and Disposal and the Waste Management Plan (WMP).
- 3.5 CLEANING .1 Clean and reinstate areas affected by Work.
 - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
 - .3 Objects removed from site to be managed in accordance with the Waste Management Plan (WMP).

PART 1 - GENERAL

- 1.1 SUMMARY .1 This Section outlines requirements for removal of existing site material and placement of clean fill materials required for the preparation of Yard and parking lot areas, as well as lake excavations, side slopes, and drainage works.
- 1.2 CITY SPECIFICATIONS, RELATED SECTIONS AND REFERENCES .1 City of Winnipeg Standard Construction Specifications:
.1 CW 3110 – Sub-Grade, Sub-Base, and Base Course Construction.
.2 CW 3170 – Earthwork and Grading
.2 Related Sections:
.1 01 33 00 - Submittal Procedures.
.2 01 47 13 – LEED Requirements.
.3 01 74 19 – Construction Waste Management and Disposal.
.4 23 33.01 Excavation Trenching and Backfilling
.5 G1010 – Site Clearing
.3 Canada Green Building Council (CaGBC) LEED® Green Building Rating System – LEED® Canada-NC Version 1.0.
- 1.3 DEFINITIONS .1 Site Work: covers examination of existing site features, dewatering and site drainage, clearing and grubbing, materials management, waste management, and site cleanup.
- 1.4 PERFORMANCE REQUIREMENTS .1 Examine preliminary geotechnical soil report titled: *Former Elmwood/Nairn Avenue Landfill Site Final Preliminary Site Condition Assessment Report* as prepared by KGS Group, located in Appendix D and other relevant reports/information located in Appendices B, C and D.
.2 Design Build Team Engineering Consultant to:
.1 Develop settlement projections intended to achieve acceptable performance as the site settles, and help minimize future maintenance requirements.
.2 Incorporate rip-rap, retaining walls, engineered fill, hydraulic geotextile filters where steeper slopes are necessary to stabilize soil, protect slope and control erosion of final site contours.
.3 Site earthwork shall be performed in accordance with CW 3170 – Earthwork and Grading.
- PART 2 – PRODUCTS .1 Materials and products in accordance with CW 3170 – Earthwork and Grading.
- PART 3 - EXECUTION
- 3.1 PREPARATION .1 Prior to commencing earthwork and grading, the Design Build Team

shall perform site clearing operations in accordance with Section G1010 – Site Clearing.

- 3.2 EXCAVATION
- .1 Excavation and placement operations shall be performed in accordance with CW 3170 – Earthwork and Grading.
 - .2 Install dewatering system to keep sub-grade dry and convey groundwater away from excavations.
 - .1 Maintain until de-watering is no longer required.
 - .2 Outfall dewatering system to include an acceptable sediment trapping device, in accordance with Erosion Control Plan.
- 3.3 BACKFILLING AND CONTOURING
- .1 Backfilling and contouring activities shall be performed in accordance with City of Winnipeg Standard Construction Specification CW 3170 – Earthwork and Grading.
- 3.4 FIELD QUALITY CONTROL
- .1 Field quality control methods shall be performed in accordance with City of Winnipeg Standard Construction Specification CW 3170 – Earthwork and Grading.
 - .2 Verification requirements shall be in accordance with Section 01 47 13 – LEED Requirements.
- 3.5 CLEANING
- .1 Clean and reinstate areas affected by the Work.
 - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

PART 1 - GENERAL

- 1.1 SUMMARY .1 This Section outlines requirements for Yard and Employee Parking Lot preparation, sub base and base course installation, and surfacing construction, including reinforced concrete building aprons, concrete sidewalks, pre-cast paving stones, asphalt circulation and marshalling areas, permeable pavements, heavy-duty and light-duty granular surfacing, surface drainage, sub-drains, and related appurtenances.
- 1.2 CITY SPECIFICATIONS, RELATED SECTIONS AND REFERENCES .1 City of Winnipeg Standard Construction Specifications:
.1 CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.
.2 CW 3150 – Gravel Surfacing.
.3 CW 3230 – Full-Depth Patching of Existing Pavement Slabs and Joints.
.4 CW 3310 – Portland Cement Concrete Pavement Works.
.5 CW 3410 – Asphaltic Concrete Pavement Works.
.2 Related Sections:
.1 31 23 33.01 – Excavating, Trenching and Backfilling.
.2 32 14 13 – Precast Concrete Unit Paving
.3 32 93 10 – Trees, Shrubs and Ground Cover Plantings.
.4 G1010 – Site Work.
.5 G1030 – Site Earthwork.
.3 Canada Green Building Council (CaGBC) LEED® Green Building Rating System – LEED® Canada-NC Version 1.0.
.4 American Society for Testing and Materials (ASTM) D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
- 1.3 PERFORMANCE REQUIREMENTS .1 Examine preliminary geotechnical soil report titled: *Former Elmwood/Nairn Avenue Landfill Site Final Preliminary Site Condition Assessment Report* as prepared by KGS Group, and other relevant reports, all located in Appendix D - *Background Information*.
.2 Engineering Consultant: engage the services of qualified Professional Engineer who is registered and licensed in Province of Manitoba, Canada to develop and design methods and structures intended to achieve acceptable performance of the surface as the site settles, and help minimize future maintenance requirements.
.3 Excavation for all Yard areas and parking lot shall be performed in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.
.4 Grading and surface drainage routes shall be designed to avoid ponding on all parking lot surfaces.
.5 Where permeable pavements are used in parking lots:
.1 Permeable pavements shall be installed in accordance with

- Section 32 14 13 – Precast Concrete Unit Paving.
- .2 Wherever possible, achieve 0.5% to 1.0% grade on surface, base, sub-base and sub-grade to allow effective stormwater exfiltration.
 - .3 Sub Base Reservoir Under-drain System shall be used to maximize the performance of the pavement drainage, and shall be placed at the low end of the parking grade, or where deemed appropriate by the designer.
 - .4 The Under-drain piping system shall be perforated pipe. The downstream end of the system shall be connected to the land drainage system, and shall be adequately sized to handle stormwater in excess of the permeable pavement's exfiltration capacity.
- .6 Wherever possible, overland drainage, permeable pavements, porous materials, Parking Lot Stormwater Infiltration Swales, and other Green Technologies shall be used to:
- .1 Promote infiltration and minimize peak discharge rates into the land drainage system.
 - .2 Minimize maintenance requirements associates with catchbasins, catch pits, and other drainage structures.
 - .3 Minimize sizing requirements for the land drainage system.
 - .4 Comply with LEED® Sustainable Site design.
- .7 Parking Lot Stormwater Infiltration Swales:
- .1 Shall be designed to accommodate overland drainage from the parking lot and adjacent surfaces.
 - .2 Shall have a water level control inlet to allow water to bypass the infiltration process and enter the land drainage system in the event of stormwater ponding in excess of the design storage volume/elevation.
 - .3 Each infiltration swale shall have a perforated pipe running the entire length of the swale (minimum), shall be adequately sized to handle stormwater runoff, and shall be tied to the land drainage system.
 - .4 Infiltration Swales soil shall be as specified in Section 32 91 19.13 – Topsoil Placement and Grading.
 - .5 Infiltration Swales shall be vegetated with material as specified in Section 32 93 10 – Trees, Shrubs and Ground Cover Plantings.
 - .6 Infiltration Swales shall be designed and constructed with the intent of minimizing future maintenance requirements.

1.4 SUBMITTALS

- .1 Submit designs, shop drawings, plans and details in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to beginning Surface Works submit for approval by the Contract Administrator plans, drawings and documentation as follows:

- .1 Plan/Profile drawings clearly indicating road alignments, grades, drainage plans, material selections, and any other information pertinent to the design of the roadway system.
- .2 Design and detail drawings for gravel surfacing, pavement mix design, and pavement structure.
- .3 Testing, laboratory results, and quality control documentation shall be made available to the Contract Administrator upon request.
- .4 LEED® Credits – submittals as per Section 01-74-13 LEED Requirements

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Parking lot sub-structure materials and methods as per CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.
- .2 Asphalt pavement materials and methods as per CW 3410 – Asphaltic Concrete Pavement Works.
- .3 Concrete pavement materials and methods as per CW 3310 – Portland Cement Concrete Pavement Works.
- .4 Gravel surfacing materials and methods as per CW 3150 – Gravel Surfacing.
- .5 Concrete curb and gutter materials and methods as per CW 3310 – Portland Cement Concrete Pavement Works.
- .6 Materials and methods for the repair and restoration of concrete slabs, curb, gutter, asphalt pavement and approaches as per CW 3230 – Full-Depth Patching of Existing Pavement Slabs and Joints.
- .7 Permeable pavement materials and methods as per Section 32 14 13 – Precast Concrete Unit Paving.
- .8 Asphalt Cuttings for Base Material: as per CW 3110, Section 2.3 I
- .9 Recycled Concrete Base Course Material
 - .1 Recycled concrete base course material will consist of sound durable particles produced by crushing, screening, and grading of recovered concrete materials, free from soft material that would disintegrate through decay or weathering.
 - .2 Recycled concrete base course material shall be well graded and conform to the following grading requirements:

 Recycled Concrete Base Course Material Grading Requirements

CANADIAN METRIC SIEVE SIZE	PERCENT OF TOTAL DRY WEIGHT PASSING EACH SIEVE
20 000	100%
5 000	40% - 70%

2 500	25% - 60%
315	8% - 25%
80	6% - 17%

- .3 Recycled concrete base course material when subjected to the abrasion test will have a loss of not more than 35% when tested in accordance with grading B of ASTM C131, Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .4 The amount of deleterious material shall be limited to a maximum of two percent of the total dry weight.

2.2 SCHEDULE

- .1 Construct asphalt, reinforced concrete, concrete sidewalk/bulnose, heavy-duty and light-duty granular, permeable paving stone and pre-cast paver surfaces in accordance with Drawing 01-C-1004 – Conceptual Site Plan and Details Surfacing Materials.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Site clearing shall be performed in accordance with G1010 – Site Work.

3.2 INSTALLATION

- .1 Excavation activities shall be performed in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.
- .2 For installation of sub-base, base course and surfacing materials the Design Build Team shall excavate minimum depths below finish grade consistent with the Conceptual Site Plan drawings.
- .3 Sub-grade, sub-base, and base course construction shall be performed in accordance with CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.
- .4 Installation of concrete pavements, curb, and gutter shall be performed in accordance with CW 3310 – Portland Cement Concrete Pavement Works.
- .5 Installation of asphalt pavements shall be performed in accordance with CW 3410 – Asphaltic Concrete Pavement Works.
- .6 Installation of Precast Concrete Pavers, for sidewalks, patios, and Permeable Pavement System shall be performed in accordance with Section 32 14 13 – Precast Concrete Unit Paving, and the manufacturer’s recommended installations methods.

3.3 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 19 – Construction Waste Management and Disposal, trim slopes, and correct defects to the satisfaction of the Contract Administrator.
- .2 Reinstate topsoil and grass to elevation which existed before excavation.
- .3 Reinstate pavements, sidewalks, curbs and gutters disturbed by

excavation to thickness, structure and elevation which existed before excavation, in accordance with CW 3230 – Full-Depth Patching of Existing Pavement Slabs and Joints.

- .4 Clean and reinstate areas affected by Work to the satisfaction of the Contract Administrator.
- .5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

Appendix C2

LEED® Requirements

Appendix C2-1

LEED® Canada-NC 1.0 Project Checklist

Table C2-1
LEED® Canada-NC 1.0 Project Checklist
Public Works East Yard Project



Recommended Optional No

10	1	3	Sustainable Sites	Potential 14 Points
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Required					
1			Prereq 1	Erosion & Sedimentation Control	0
			Credit 1	Site Selection	1
		X	Credit 2	Development Density	1
		X	Credit 3	Redevelopment of Contaminated Site	1
1			Credit 4.1	Alternative Transportation , Public Transportation Access	1
1			Credit 4.2	Alternative Transportation , Bicycle Storage & Changing Rooms	1
	1		Credit 4.3	Alternative Transportation , Alternative Fuel Vehicles	1
1			Credit 4.4	Alternative Transportation , Parking Capacity	1
		X	Credit 5.1	Reduced Site Disturbance , Protect or Restore Open Space	1
1			Credit 5.2	Reduced Site Disturbance , Development Footprint	1
1			Credit 6.1	Stormwater Management , Rate and Quantity	1
1			Credit 6.2	Stormwater Management , Treatment	1
1			Credit 7.1	Heat Island Effect , Non-Roof	1
1			Credit 7.2	Heat Island Effect , Roof	1
1			Credit 8	Light Pollution Reduction	1

Recommended Optional No

4	1		Water Efficiency	Potential 5 Points
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1			Credit 1.1	Water Efficient Landscaping , Reduce by 50%	1
1			Credit 1.2	Water Efficient Landscaping , No Potable Use or No Irrigation	1
	1		Credit 2	Innovative Wastewater Technologies	1
1			Credit 3.1	Water Use Reduction , 20% Reduction	1
1			Credit 3.2	Water Use Reduction , 30% Reduction	1

Recommended Optional No

3	2	3	Energy & Atmosphere	Potential 17 Points
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Required					
			Prereq 1	Fundamental Building Systems Commissioning	0
			Prereq 2	Minimum Energy Performance	0
			Prereq 3	CFC Reduction in HVAC&R Equipment	0
	1		Credit 1	Optimize Energy Performance	1 to 10
		X	Credit 2.1	Renewable Energy , 5%	1
		X	Credit 2.2	Renewable Energy , 10%	1
		X	Credit 2.3	Renewable Energy , 20%	1
1			Credit 3	Best Practice Commissioning	1
1			Credit 4	Ozone Protection	1
1			Credit 5	Measurement & Verification	1
	1		Credit 6	Green Power	1

Recommended Optional No

3	6	5	Materials & Resources	Potential 14 Points
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Required					
		X	Prereq 1	Storage & Collection of Recyclables	0
		X	Credit 1.1	Building Reuse: Maintain 75% of Existing Walls, Floors, and Roof	1
		X	Credit 1.2	Building Reuse: Maintain 95% of Existing Walls, Floors, and Roof	1
			Credit 1.3	Building Reuse: Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	Construction Waste Management: Divert 50% from Landfill	1
	1		Credit 2.2	Construction Waste Management: Divert 75% from Landfill	1
	1		Credit 3.1	Resource Reuse: 5%	1
		X	Credit 3.2	Resource Reuse: 10%	1
	1		Credit 4.1	Recycled Content: 7.5% (post-consumer + ½ post-industrial)	1
	1		Credit 4.2	Recycled Content: 15% (post-consumer + ½ post-industrial)	1
	1		Credit 5.1	Regional Materials: 10% Extracted and Manufactured Regionally	1
	1		Credit 5.2	Regional Materials: 20% Extracted and Manufactured Regionally	1
		X	Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1
1			Credit 8	Durable Building	1

Recommended	Optional	No	Indoor Environmental Quality		Potential 15 Points
13	2				

Required					
			Prereq 1	Minimum IAQ Performance	0
			Prereq 2	Environmental Tobacco Smoke (ETS) Control	0
1			Credit 1	Carbon Dioxide (CO₂) Monitoring	1
1			Credit 2	Ventilation Effectiveness	1
1			Credit 3.1	Construction IAQ Management Plan: During Construction	1
1			Credit 3.2	Construction IAQ Management Plan: Testing Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials: Adhesives & Sealants	1
1			Credit 4.2	Low-Emitting Materials: Paints and Coating	1
1			Credit 4.3	Low-Emitting Materials: Carpet	1
	1		Credit 4.4	Low-Emitting Materials: Composite Wood and Laminate Adhesives	1
1			Credit 5	Indoor Chemical & Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems: Perimeter Spaces	1
1			Credit 6.2	Controllability of Systems: Non-Perimeter Spaces	1
1			Credit 7.1	Thermal Comfort: Compliance	1
1			Credit 7.2	Thermal Comfort: Monitoring	1
1			Credit 8.1	Daylight & Views: Daylight 75% of Spaces	1
	1		Credit 8.2	Daylight & Views: Views 90% of Spaces	1

Recommended	Optional	No	Innovation & Design Process		Potential 5 Points
1	2	2			

	1		Credit 1.1	Innovation in Design	1
	1		Credit 1.2	Innovation in Design	1
		X	Credit 1.3	Innovation in Design	1
		X	Credit 1.4	Innovation in Design	1
1			Credit 2	LEED® Accredited Professional	1

Recommended	Optional	No	Project Totals (pre-certification estimates)		Potential 70 Points
34	14	13			

Certified 26-32 points Silver 33-38 points Gold 39-51 points Platinum 52-70 points

Appendix C2-2

Potential LEED® Strategies

**Table C2-2
LEED Commentary/Potential Strategies
Public Works East Yards**

LEED Canada-NC, Version 1.0 Rating System
Certification Level Points Required
Certified 26-32 Points
Silver 33-38 Points
Gold 39-51 Points
Platinum 52-70 Points

Note:
Commentary and Potential Strategies listed below are intended for guidance only. Strategies must comply with LEED® Canada-NC, Version 1.0 requirements, and shall be confirmed by the Bidder.

Credit No.	Required	Recommended	Optional	Not Req	LEED Credit Description	Commentary/Potential Strategy for the East Yard Site
Sustainable Sites (SS)						
Prereq 1	Y				Erosion & Sedimentation Control	An "Erosion & Sedimentation Control Plan" must be implemented by the Bidder to control dust and prevent soil run-off during construction.
Credit 1		1			Site Selection	The City has selected a site that appears to comply with the requirements of this credit. We believe that the site is <u>not</u> classified as Agricultural or Forest Land Reserve, in a flood plain, ecologically sensitive land, habitat for endangered species, parkland or located on or close-to wetlands. The 200 year flood plain elevation is 229.48m. The Thomas Street elevation measured at the manhole cover is 230.4m.
Credit 2				X	Development Density	The intent of this credit is to densify the development (to a minimum 2 storey equivalent and a minimum of 60,000 sq ft of building per acre of land). The Public Works East Yard site cannot be made to comply due to the building types and large yard requirements.
Credit 3				X	Redevelopment of Contaminated Site	The intent of this credit is to rehabilitate an environmentally damaged site. This would require in writing that this is classified a "contaminated site" by a "relavent" regulatory agency and that remediation take place. We do not believe that the methane removal strategy is considered remediation and that the site does NOT meet the requirment for classification as a contaminated site according to LEED.
Credit 4.1		1			Alternative Transportation, Public Transportation Access	The building must be located within 400 metres of 2 or more public bus lines, offering frequent service. It appears that the building will be located within 400m of Nairne and Kent bus stops, and bus routes 45 & 47 are "frequent" during rush hours.
Credit 4.2		1			Alternative Transportation, Bicycle Storage & Changing Rooms	Provide secure bike racks and showers for 5% of occupants.
Credit 4.3			1		Alternative Transportation, Alternate Fuel Vehicles	At this time, the City does not plan to provide hybrid/alternative-fuel vehicles, or alternate fuel dispensing at this time. The Bidder can confirm with the City if hybrid fleet vehicles, if a biofuel fueling station is to be installed at the Thomas site, and if "fleet" vehicles qualify to satisfy this credit. Also question was asked if "electric charging" facilities qualify for alternative-fuel refueling.
Credit 4.4				X	Alternative Transportation, Parking Capacity	The intent of this credit is to reduce the number of parking stalls to Code minimums, to discourage driving and encourage bus/bike use, and provide preferred parking for car-pools, van-pools and car co-ops. About 113 parking spots are required by Code. The City indicated that building occupancy is normally about 52 persons during normal business hours, but up to 250 persons operating out of this building on 3 shifts, during emergency operations. Parking is a must for employees during emergency operations and they can't take a bus to work during night-time hours. Reduced parking doesn't appear to work for this building.
Credit 5.1		1			Reduced Site Disturbance, Protect or Restore Open Space	Minimize site disturbance during construction to within 40 feet of building perimeter, 5 feet of primary roadways and 25 feet of constrution areas with permeable surfaces.
Credit 5.2		1			Reduced Site Disturbance, Development Footprint	Provide "open space" that exceeds the local zoning requirements by 25%. If there is no zoning requirement designate open space are adjacent the building that is equal to the development footprint. The preliminary concept plans are indicating about 33% landscaped space on the site.
Credit 6.1		1			Stormwater Management, Rate and Quantity	Design post-development 1.5 year, 25 hr peak discharge rate and quantity to not exceed the pre-development 1.5 year 24 hour peak discharge rate and quantity. Design site imperviousness to less than or equal to 50%. Gravel surfaces may be a possibilty. The City does not want to permeable paving blocks due to maintance concerns.
Credit 6.2		1			Stormwater Management, Treatment	Prove that the stormwater treatment system is designed to remove 80% of the average annual site total area Total Suspended Solids (TSS) and 40% of the average annual site area Total Phosphorous (TP) prior to discharge for all storms less than or equal to the 2 year/24 hr storm. Retention ponds with wetland style with bullrushes will remove about 85% TSS. This credit should be achievable.
Credit 7.1		1			Heat Island Reduction - Non-Roof	Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat. EITHER: Provide shade (trees) and/or use light coloured and/or open grid pavement for at least 30% of the site's parking lots, walkways, etc. OR: Use an open-grid pavement system for a minimum of 50% of the parking lot area. Paved parking areas in front of the office can be shaded from trees (50% of the impervious area), and the concrete aprons elsewhere can be mixed to meet high albedo requirement (the other 50% of the impervious areas). The remaining yard traffic areas will be gravel. Open-grid pavement is not acceptable to COW due to snow cleaning difficulty.
Credit 7.2		1			Heat Island Reduction - Roof	Install a light coloured (high albedo) roof surface that is ENERGY STAR compliant and minimum emissivity = 0.9 for minimum 75% of surface that meets the City's durability requirements.
Credit 8		1			Light Pollution Reduction	The intent of this credit is that exterior lighting must be designed to <u>not</u> be wasted to the sky and the exterior lighting of the base building must comply with IESNA guidelines. The exterior light fixtures must provide shielding such that no light from the luminaires cross the property boundaries.
Sub-Total		10.0	1	0		
Water Efficiency (WE)						

Credit No.	Required	Recommended	Optional	Not Req	LEED Credit Description	Commentary/Potential Strategy for the East Yard Site
Credit 1.1		1			Water Efficient Landscaping, Reduce by 50%	Limit the use of potable water for landscape irrigation. Options include planting indigenous plant on the site (which do not require irrigation), use the retention pond as a water source for irrigation water, and collecting rain water or re-cycled vehicle wash water in a poly storage tank w. water treatment system for irrigation. If excess rainwater can be collected, the City may be interested in using it to fill watering trucks which are used for irrigation on city boulevards.
Credit 1.2		1			Water Efficient Landscaping, No Potable Use or No Irrigation	Eliminate the use of potable water for landscape irrigation. The same strategies as the previous credit can be used, except water storage/retention and associated systems would have to be larger. Planting 100% indigenous plants with NO requirement for irrigation water may be a preferred option.
Credit 2			1		Innovative Wastewater Technologies	The intent of this credit is to reduce the generation of wastewater and reduce potable water demand. EITHER: Reduce water for sewage conveyance by a min. 50% OR: Treat 100% of wastewater to tertiary standards. Due to the large use of water for vehicle washing for this facility, a vehicle wash-water recycling system is required. Additional strategies include installation of low flow plumbing fixtures for all washrooms, showers and kitchen sinks (e.g. 3/6 LPF dual flush or 4.5 LPF pressure-assist toilets, and low flow lavatory/shower/sink fixtures and use electronic operators on lavatory fixtures).
Credit 3.1		1			Water Use Reduction, 20% Reduction	Due to the large use of water for vehicle washing for this facility, a vehicle wash-water recycling system is required. Additional strategies include installation of low flow plumbing fixtures for all washrooms, showers and kitchen sinks (e.g. 3/6 LPF dual flush or 4.5 LPF pressure-assist toilets, and low flow lavatory/shower/sink fixtures and use electronic operators on lavatory fixtures).
Credit 3.2		1			Water Use Reduction, 30% Reduction	Same strategies as above.
Subtotal		4	1	0		
Energy & Atmosphere (EA)						
Prereq 1	Y				Fundamental Building Systems Commissioning	Fundamental Building commissioning to be provided. Coordinate with the City's Commissioning Agency.
Prereq 2	Y				Minimum Energy Performance	The design of the space must comply with ASHRAE 90.1-2004. To comply with this standard air handling equipment must be selected/specified to meet minimum equipment efficiency performance, ducts may need to be insulated, hot water tanks must meet minimum insulation/standby-loss requirements and hot water piping must be insulated to specified levels.
Prereq 3	Y				CFC Reduction in HVAC&R Equipment	Zero use of CFC based refrigerants. (e.g. R-22 refrigeration shall not be used)
Credit 1			10		Optimize Energy Performance	Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associated with excessive energy use.
Credit 2.1				X	Renewable Energy, 5%	Install an on-site energy system such as photovoltaics, wind power, biogas utilization system
Credit 2.2				X	Renewable Energy, 10%	Same as 2.1 except larger system.
Credit 2.3				X	Renewable Energy, 20%	Same as 2.1 except much larger system.
Credit 3		1			Best Practice Commissioning	The City will be engaging a 3rd party Commissioning Agent to ensure that the entire building is designed, constructed and performs in accordance with the design intent regarding energy systems. The Bidder shall make provision to accommodate the requirements of the Commissioning Agent.
Credit 4		1			Ozone Protection	Comply with LEED credit requirement to reduce ozone depletion and support early compliance with the Montreal Protocol.
Credit 5		1			Measurement & Verification	Provide adequate metering & monitoring systems, as well as a Measurement & Verification plan for the ongoing accountability and optimization of building energy and water consumption performance over time.
Credit 6			1		Green Power	Strategy would be for COW to enter into a contract to purchase Green power (such as wind generated power) for 50% of electrical supply. Availability of a "green power contract" with Manitoba Hydro would have to be investigated, and willingness to accept would have to be coordinated with the City.
Subtotal		3	11	0		
Materials & Resources (MR)						
Prereq 1	Y				Storage and Collection of Recyclables	Provide easily accessible areas dedicated to recycling collection. Drawings to show locations.
Credit 1.1				X	Building Reuse: Maintain 75% of Existing Walls, Floors, and Roof	Re-use existing building components. Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport. Not applicable to new construction.
Credit 1.2				X	Building Reuse: Maintain 95% of Existing Walls, Floors, and Roof	Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport. Not applicable to new construction.
Credit 1.3				X	Building Reuse: Maintain 50% of Interior Non-Structural Elements	Same as 1.1, and 1.2.
Credit 2.1		1			Construction Waste Management, Divert 50% From Landfill	Bidder must have a "Construction Waste Management Plan" to recycle or salvage at least 50% of their construction and packaging debris from the construction of the Building and site works. Need to incorporate a plan to monitor (by weight or volume) and enforce on the construction site. The City noted that this will save cost in landfill tipping fees, and benefit the City in reduced volume to landfill.
Credit 2.2			1		Construction Waste Management, Divert 75% From Landfill	Construction contractor must have a "Construction Waste Management Plan" to recycle or salvage at least 75% of their construction and packaging debris from the construction of the Buildings and site works.

Credit No.	Required	Recommended	Optional	Not Req	LEED Credit Description	Commentary/Potential Strategy for the East Yard Site
Credit 3.1			1		Resource Reuse, 5%	Use salvaged, refurbished or reused materials for at least 5 % of the building materials required. The City investigated what furnishing can be salvaged and brought over to the new facility, and what materials might be salvaged from the demolition of old offices (e.g. millwork, whiteboards, doors/door-frames, masonry, steel framing). The City feels that little could be salvaged from existing buildings; possibly carpet, and they may possibly buy used furniture, if applicable to this credit (or credit MR 3.3). At this time, this credit looks unlikely.
Credit 3.2				X	Resource Reuse, 10%	Same as above except 10%. The same strategies could be used as in the previous credit, only a higher % content is required. Similar to the previous credit this is unlikely to be achieved.
Credit 3.3		1			Resource Reuse, 30% Furniture and Furnishings	Use salvaged, refurbished or used furniture and furnishings for 30% of the total furniture and furnishings budget. The City may purchase used furniture/cubical systems to achieve this credit. Achieving this credit would have to be coordinated with the City.
Credit 4.1			1		Recycled Content, 7.5% (post-consumer + 1/2 post-industrial)	Use materials with recycled content for construction (minimum 7.5% of total value of materials). The primary strategy may be to use re-cycled crushed concrete as a base material . Other strategies might include concrete with fly-ash content, steel with recycled content, drywall with recycled content and the use of salvaged wood for construction.
Credit 4.2			1		Recycled Content, 15% (post-consumer + 1/2 post-industrial)	Same as above, except 15%. Same strategy as previous credit, only higher % content.
Credit 5.1			1		Regional Materials, 10% Extracted and Manufactured Regionally	Use materials manufactured and harvested within 500 miles of Winnipeg. Use minimum 10% of building materials, 80% of the mass would be extracted, processed and manufactured within the 500 miles. This might include steel (from Selkirk), wood products (Manitoba or NW Ontario), concrete (from Winnipeg), drywall (from Winnipeg) and millwork (e.g. Kitchen Craft).
Credit 5.2			1		Regional Materials, 20% Extracted and Manufactured Regionally	Same as above except 20%. Same strategy as previous credit, except higher content.
Credit 6				X	Rapidly Renewable Materials	Use rapidly renewable materials for 5% of the total value of all new materials. Strategies might include: specify millwork to be made from strawboard, specify engineered wood products, bamboo flooring, etc. Since this project will primarily be constructed from concrete and steel products, which will be the majority of the material costs, it is unlikely to get 5% of total of the total value, and therefore unlikely to achieve this credit.
Credit 7		1			Certified Wood	Specify and use Certified Wood for 50% of all wood used. Wood to be certified by "Forest Stewardship Council".
Credit 8		1			Durable Building	Implement a "Building Durability Plan".. Design components for extended service lives, and such that components with shorter service lives can be readily replaced. The intent is to minimize materials use and construction waste over a building's life resulting from premature failure of the building and its constituent components and assemblies.
Subtotal		4	6	0		
Indoor Environmental Quality (EQ)						
Prereq 1	Y				Minimum IAQ Performance	Design HVAC systems to supply adequate outdoor air per ASHRAE 62.1-2004. This is a Code requirement in Manitoba.
Prereq 2	Y				Environmental Tobacco Smoke (ETS) Control	Building must prohibit smoking inside the building. Designated smoking areas must be more than 7.5 metres from entries, outdoor air intakes and operable windows and should be indicated on design drawings.
Credit 1		1			Carbon Dioxide (CO2) Monitoring	Install CO2 monitoring system that automatically adjusts outdoor air ventilation to maintain indoor air quality. Provide capacity for indoor air quality (IAQ) monitoring to help sustain long-term occupant comfort and well-being
Credit 2		1			Ventilation Effectiveness	Design ventilation system to provide an air change effectiveness of 0.9 or greater in all regularly occupied spaces.
Credit 3.1		1			Construction IAQ Management Plan, During Construction	Builder to have an "Indoor Air Quality Plan" during construction that includes: a) following SMACNA standards for construction b) protecting materials from moisture damage b) install Merv 8 filters in return grilles during construction c) replace all new MERV 13 filters just prior to occupancy d) take photos to prove that these things were done.
Credit 3.2		1			Construction IAQ Management Plan, Testing Before Occupancy	Requires a building flush out period prior to occupancy (there are options; see LEED ref manual: 4,300 m3 of outdoor air per m2 of floor area). Also there is a way to achieve this credit by air quality testing (by Pinchin?) prior to occupancy without the flush-out period.
Credit 4.1		1			Low-Emitting Materials, Adhesives and Sealants	Spec and use low VOC adhesives and sealants.
Credit 4.2		1			Low-Emitting Materials, Paints and Coatings	Spec and use low VOC paints and coatings.
Credit 4.3		1			Low-Emitting Materials, Carpet Systems	Spec and use low VOC carpet systems.
Credit 4.4			1		Low-Emitting Materials, Composite Wood and Laminate Adhesives	Spec and use low VOC wood and laminate adhesives.
Credit 5		1			Indoor Chemical and Pollutant Source Control	a) Install entrance grilles and grates to capture dirt from entering the building. b) Install floor to ceiling walls and provide exhaust systems in areas that have hazardous gases c) Provide MERV 13 filtration to occupied spaces according to ASHRAE 52.2-1999.
Credit 6.1		1			Controllability of Systems: Perimeter Spaces	Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces (i.e. training rooms or conference areas) to promote the productivity, comfort and well-being of building occupants.
Credit 6.2		1			Controllability of Systems: Non-Perimeter Spaces	Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces (i.e. classrooms or conference areas) to promote the productivity, comfort and well-being of building occupants.
Credit 7.1		1			Thermal Comfort, Compliance	Design HVAC systems to comply with ASHRAE 55-2004. This will require humidification systems in the building to maintain RH levels in the winter.
Credit 7.2		1			Thermal Comfort, Monitoring	Provide a monitoring and control system to maintain conditions within ASHRAE 55-2004. This would require a DDC or electronic monitoring and control system.
Credit 8.1		1			Daylight and Views, Daylight 75% of Spaces	a) Provide 75% of occupants with a minimum Daylight Factor of 2% by arranging cubicles near windows, closed offices with glass windows on the interior. Provide skylights as required. b) Provide light shelves and blinds (glare control devices) to ensure daylight effectiveness. c) Prove that we achieve DLF of 2% with a computer simulation.
Credit 8.2			1		Daylight and Views, Daylight 90% of Spaces	Same as above, except for 90% of occupants.
Subtotal		13	2	0		
Innovative & Design Process (ID)						

Credit No.	Required	Recommended	Optional	Not Req	LEED Credit Description	Commentary/Potential Strategy for the East Yard Site
Credit 1.1			1		Innovation in Design	Bidder's discretion. May want to pursue an innovation credit related to the vehicle wash-water recycling.
Credit 1.2			1		Innovation in Design	Bidder's discretion.
Credit 1.3				X	Innovation in Design	
Credit 1.4				X	Innovation in Design	
Credit 2		1			LEED Accredited Professional	LEED AP to be involved through entire process.
Subtotal		1	2	0		
Project Total		35	23	0	70 Possible Points	

Appendix C3

MET-Rate Activity Summary Table

MET-Rate Activity Summary

Location or Division	Activity	Number of Persons		Comments
		Male	Female	
SM-01	Seated, working at desk	12		Routine office duties
SM-02	Seated, working at desk		2	Routine office duties
SM-03	Seated, working at desk	2		Routine office duties
SM-04	Seated, working at desk	1		Routine office duties
SM-05	Seated, working at desk	1		Routine office duties
SM-09	Shop/Light work	2		Custodial duties
CS-01	Seated, working at desk	1		Routine office duties
CS-02	Standing/walking	1		Routine office duties
CS-03	Seated, working at desk	4		Routine office duties
CS-04	Standing/walking	1		Routine office duties
CS-06	Seated, working at desk	1		Routine office duties
CS-08	Seated, working at desk	2		Routine office duties
CS-10	Shop/Light work	1		Woodworking
EA-01	Seated, working at desk	7		Routine office duties
EA-02	Seated, working at desk	1		Routine office duties
EA-05	Shop/Light work	2		Equipment repair
BO-01	Seated, working at desk	2		Routine office duties
BO-03	Standing/walking	8		Equipment check over/Loading
FM-01	Shop/Light work	2	1	Vehicle Repairs/Service
FM-01	Seated, working at desk	1		Foreman
	Total	52	3	

Appendix C4

Hazardous Material Storage Summary Table

Hazardous Materials Storage Summary Table

Area, space or Division Used In	Area, space or Division Stored In	Product Name and/or Number	Product dispensed on site (Y/N)	Container Size (Litres / kg)	Container Type and Dimensions (mm) (pail, can, bag, etc.)	Quantity Total (Litres/kg)	Ideal Minimum Storage Temp °C	Ideal Maximum Storage Temp °C	WHMIS Product Class TDS Product Code UN Number MSDS Sheets	Comments	
FM Garage	FM-01	Used Gasoline	N	200 L	Drum (1.2m x 1.2m x 1.2m)	under 200 L	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	Used Diesel	N	200 L	Drum (1.2m x 1.2m x 1.2m)	under 200 L	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	New & Used Coolant/Anti-Freeze	Y	200 L	Drum (1.2m x 1.2m x 1.2m)	under 200 L	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	Varrol 3139 Solvent	Y	20 L	Pail	2 pails / 40L	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	Oxygen (welding gases)	Y	1.35 m³	Tank	1	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	Oxygen (welding gases)	Y	0.62 m³	Tank	1	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	Acetylene (welding gases)	Y	1.78 m³	Tank	2 on site at any time	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	Argon (compressed gas)	Y	1.35 m³	Tank	2 on site at any time	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	Blue Shield	Y	1.35 m³	Tank	1	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	Blue Shield	Y	0.62 m³	Tank	1	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	Propane for forklift	N	13.6 kg	Tank	2 on site at any time	ambient temp	ambient temp		MSDS Available on request	
FM Garage	FM-01	Batteries	N	1.2m x 1.2m	Pallets	1 on site at any time	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-10	Can Dry Absorbent	Y	22.7 Kg	Bags	2 Bags / 22.7 kg	-	-		MSDS Available on request	
Outside of Facility	SM-09	Crystal Lok	N	4L	Pail	5	-	-		MSDS Available on request	
SM Garage	SM-09	Survey Marking Paint	N	400g	Aerosol Can	50	0	50		MSDS Available on request	
SM Garage	SM-09	Kleen-Flo	N	500ml	Plastic Jug	24	-	-		MSDS Available on request	
SM Garage	SM-09	Maximum Engine Oil - 5W33,10W30,10W40	Y	200L	Drum (1.2m x 1.2m x 1.2m)	6	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Duron-E-15W40	Y	200L	Drum (1.2m x 1.2m x 1.2m)	2	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Duron1DW30	Y	200L	Drum (1.2m x 1.2m x 1.2m)	2	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Petro Canada Anti-Freeze	Y	4L	-	-	-	-		-	
SM Garage	SM-09	Windshield Washer Fluid	Y	200L	Drum (1.2m x 1.2m x 1.2m)	2	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	WD-40	Y	311 g	Aerosol Can	12 Cans / 3.1 kg	-	-		MSDS Available on request	Store in a cool, dry, well ventilated area
SM Garage	SM-09	Petro Canada ATF3M	Y	200L	Drum (1.2m x 1.2m x 1.2m)	2	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Hydrex MV 22,36,60	Y	200L	Drum (1.2m x 1.2m x 1.2m)	2	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Duratran Fluid	Y	200L	Drum (1.2m x 1.2m x 1.2m)	2	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Nemco Rad Anti-Freeze	Y	4L	Plastic Jug	24	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Giance Glass Cleaner	Y	500g	Aerosol Can	20	0	50		MSDS Available on request	
SM Garage	SM-09	Prodro to 4+ 10W, 30, 50	Y	200L	Drum (1.2m x 1.2m x 1.2m)	2	ambient temp	ambient temp		MSDS Available on request	
Outside of Facility	SM-12	CPD White Cure	N	?	?	?	?	?		MSDS Available on request	
SM Garage	SM-09	D-15 Insect Repellent	N	500g	Aerosol Can	12	0	50		MSDS Available on request	
SM Garage	SM-09	Fast Orange Hand Cleaner	Y	200g	Plastic Bottle	12	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Citr/Kleen XPC	N	4L	Plastic Jug	6	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	NP-1 Grease	Y	400g	Tubes	30	ambient temp	ambient temp		MSDS Available on request	
Outside of Facility	SM-12	Nemco Form Oil	N	20L	Pail	10				MSDS Available on request	
SM Garage	SM-09	Chain Oil	N	500ml	Plastic Bottle	2	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Sanitary Hand Cleaner	Y	100ml	Plastic Bottle	8	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Opti-2 Two Cycle Oil	N	100ml	Plastic Bottle	48	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	950 Sealant	N	600ml	Tubes	48	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Rust-Oleum Spray Paint	N	426g	Aerosol Can	24	0	50		MSDS Available on request	
Outside of Facility	SM-12	SS-1	N	200L	Drum (1.2m x 1.2m x 1.2m)	2	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Deep Woods Off Repellent	N	500g	Aerosol Can	24	0	50		MSDS Available on request	
SM Garage	SM-09	Rock Drill EP Grease	N	400g	Tubes	10	ambient temp	ambient temp		MSDS Available on request	
SM Garage	SM-09	Croc Bloc Sunscreen	N	100ml	Plastic Bottle	48	0	50		MSDS Available on request	

2011 Herbicide/Pesticide List - City of Winnipeg - Parks and Open Space Division

Product Name	Product #	Target Species	Application Method	WHMIS Product Class TDS Product Code UN Number MSDS Sheets	Comments
Aminol 240	25684	Broadleaf weeds	Tractor Mounted Boom Sprayer/Backpack		
Arbotect 20 - S	16694	Fungi	Pressurized Canister - Root Injection		
Banner Maxx Fungicide	27003	Fungi	Backpack/ Hand Spray Bottle		
Barneel	18837	Broadleaf weeds	Tractor Mounted Boom Sprayer		
Captan	14823	Insects/Fungi	Backpack/ Hand Spray Bottle		
Chontrol Pest Paste	29293	European Buckthorn	Backpack/ Hand Spray Bottle		
Civitas	29825	Fungi	Backpack/ Hand Spray Bottle		
Clearview	29752	Broadleaf weeds	Tractor Mounted Boom Sprayer/Backpack		
Daconil 2787 Flowable Fungicide	15724	Fungi	Backpack/ Hand Spray Bottle		
Daconil Ultra Fungicide	28354	Fungi	Backpack/ Hand Spray Bottle		
Diamondback Herbicide-Shield	21262	Broadleaf weeds	Ground Application		
Dormant Oil		Insects	Backpack/ Hand Spray Bottle		
DyClear	28761	Broadleaf weeds	Tractor Mounted Boom Sprayer/Backpack		
Ecoclear*	25528	Vegetation	Backpack/ Hand Spray Bottle	MSDS Available on request	
Eertava Liquid Fungicide	23663	Fungi	Root Injection		
Factor 540*	27988	Broadleaf weeds	Tractor Mounted Boom Sprayer/Backpack	MSDS Available on request	
Fungihex DC	27686	Fungi	Backpack/ Hand Spray Bottle		
Giant Destroyer Green Earth	12269	Rodents	Ground Application - Gas cartridge in burrow		
Rotenone Insect Spray	21349	Insects	Backpack/ Hand Spray Bottle		
Instrata TM Fungicide	28861	Fungi	Backpack/ Hand Spray Bottle		
Lontrel 360	23545	Broadleaf weeds	Tractor Mounted Boom Sprayer/Backpack		
Malathion	4709	Insects	Backpack/ Hand Spray Bottle		
Melstar	12708	Fungi	Backpack/ Hand Spray Bottle		
Milestone	28517	Broadleaf weeds	Tractor Mounted Boom Sprayer/Backpack		
Neem Oil		Insects	Hand Spray Bottle		
No Dam. Par II	27884	Fungi	Backpack/ Hand Spray Bottle		
Premium 2-Way XP*	27779	Broadleaf weeds	Tractor Mounted Boom Sprayer/Backpack	MSDS Available on request	
Premium 3-Way XP*	27846	Broadleaf weeds	Tractor Mounted Boom Sprayer/Backpack	MSDS Available on request	
Primo Maxx Plant Growth Reg.	26989	Plant Growth Regulation	Backpack/ Hand Spray Bottle		
Round Up Ultra II	28486	Vegetation	Tractor Mounted Boom Sprayer/Backpack/Hand Spray Bottle		
Rovral	15213	Fungi	Backpack/ Hand Spray Bottle		
Rovral Green GT	24379	Fungi	Backpack/ Hand Spray Bottle		
Rozal	21160	Rodents	Ground Application - Bait in Burrow		
Safen Insecticidal Soap	14669	Insects	Backpack/ Hand Spray Bottle		
Scimitar CS Insecticide	28499	Insects	Backpack/ Hand Spray Bottle		
Terrador Flowable Fungicide	27691	Fungi	Backpack/ Hand Spray Bottle		
Transline*	11388	Broadleaf weeds		MSDS Available on request	
Weathermax	27487	Vegetation	Tractor Mounted Boom Sprayer/Backpack/Hand Spray Bottle		

*These herbicides are expected to comprise 95% of inventory that might stay on hand in the insulated chemical storage area (see Room Data Sheet CS-14)

Appendix C5
Equipment Summary Table

Equipment Summary Table

Area, space, or Division Used In	Item Description	Vendor	Quantity	Fixed or Permanently Located (Y / N)	Size and Dimensions (other than hand tools)				Air Requirements					Electrical Requirements					Applicable Safety Requirements	Dust Control / Air Quality Requirements	Comments	
					Length (m)	Width (m)	Height (m)	Weight (kg)	Min Volume (L/sec)	Min Pressure (kPa)	Max Pressure (kPa)	Fixed Connect. (Y / N)	Hose Length (m)	Voltage	Single / 3-Phase	kW	Amp	HP				Direct Connect. (Y / N)
BO-02	Table Saw	Craftsman	1	N	0.91	1.22	0.91	34	-	-	-	-	-	120	Single	-	15	3	N			
BO-02	Drill Press	Craftsman	1	Y	0.81	0.61	1.65	79	-	-	-	-	-	120	Single	-	12	1.5	N			
BO-02	25 cm Compound Mitre Saw	Ryobi	1	N	0.61	0.41	0.43	14	-	-	-	-	-	120	Single	-	14	-	N			
BO-02	15 cm Bench Grinder	Craftsman	1	Y	0.43	0.47	0.31	14	-	-	-	-	-	120	Single	-	15	1	N			
BO-02	Chop Saw	Rigid	1	N	0.47	0.31	0.51	26	-	-	-	-	-	120	Single	-	15	-	N			
CS-10	Paint Mixer	Red Devil	1	Y	1	0.4	0.4	20	-	-	-	-	-	120	Single	-	15	-	N			
CS-10	Table Grinder	Delta	1	Y	0.6	0.3	0.5	30	-	-	-	-	-	120	Single	-	15	-	N			
CS-10	Large Vise	-	1	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
CS-10	Air Compressor	Devilbiss	1	Y	2	1	1.5	160	-	-	-	-	-	220	3	-	-	-	Y			
CS-10	Portable Washer	Hotsy	1	N	1.25	1	1	75	-	-	-	-	-	Gas	-	-	-	-	-			
CS-10	Table Saw	SawShop	1	Y	2.5	2	1.5	120	-	-	-	-	-	220	3	-	-	-	Y			
CS-10	Compound Saw	Bosch	1	Y	2	0.7	0.4	45	-	-	-	-	-	120	Single	-	-	-	N			
CS-10	Radial Arm Saw & Table	Delta	1	Y	11	0.9	0.5	200	-	-	-	-	-	220	3	-	-	-	Y			
CS-10	Drill Press - Standup	Delta	1	Y	0.4	0.4	2	80	-	-	-	-	-	120	Single	-	-	-	N			
CS-10	Wood Planer	-	1	Y	1.3	0.8	1.1	100	-	-	-	-	-	120	Single	-	-	-	N			
CS-10	Wood - Edger	-	1	Y	1.5	0.4	1.2	90	-	-	-	-	-	120	Single	-	-	-	N			
CS-10	Sanding Wheel	-	1	Y	0.7	0.8	1.5	75	-	-	-	-	-	120	Single	-	-	-	N			
CS-10	Vac System for Carpenter shop	-	1	Y	-	-	-	-	-	-	-	-	-	220	3	-	-	-	Y			
CS-10	61 cm Planer	Delta	1	Y	1.2	0.9	1.27	445	-	-	-	N	15	220	3	-	-	7.5	N	Noise, master power shut-off	dust collector hood - 127 mm takeoff	Air hose is for cleaning
CS-10	Plastic Welder/Heat Gun	HEJET model: HJ-500-S	1	N	-	-	-	-	-	-	-	-	-	120	-	-	5	8.3	N			Used for repairing a range of plastics using different types of plastic welding rod
CS-10	Workhood	-	1	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		Exhaust air to outdoors	For plastic welding
EA-05	Magkist Washer	Magkist	1	N	1.5	0.75	1	80	-	-	-	-	-	120	Single	-	15	-	N			
EA-05	HiTec Washer	HiTec	1	N	1.25	0.75	0.8	75	-	-	-	-	-	120	Single	-	15	-	N			Can be used as Spare
EA-05	Air Compressor	-	1	Y	6	0.8	1.5	150	-	-	-	-	-	220	3	-	-	-	Y			
EA-05	Air Compressor - Upright	Magnaforce	1	N	1	1	2	125	-	-	-	-	-	120	Single	-	-	-	-			
EA-05	Table Vise	-	1	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
EA-05	Roll away Tool Box	-	1	N	0.8	0.8	1.5	80	-	-	-	-	-	-	-	-	-	-	-			
EA-05	Storage rack for Blades	Home made	1	Y	0.2	0.3	2.25	35	-	-	-	-	-	-	-	-	-	-	-			
EA-05	Sliding Compound Saw	Delta	1	NA	-	-	-	-	-	-	-	-	-	120	Single	-	15	-	N			
EA-05	Work Bench	-	2	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
EA-05	Drill Press - Table top	-	1	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
EA-05	Table Saw	-	1	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
EA-05	Chop Saw	-	1	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
EA-05	Radial Arm Saw & Table	Black & Decker	1	Y	3	1.2	1.2	120	-	-	-	-	-	120	Single	-	15	-	N			
EA-05	Table Saw	General International	1	Y	2.5	1.2	1.2	175	-	-	-	-	-	120	Single	-	15	-	N			
SM-09	13 mm Impact	Ingersoll Rand	3	N	-	-	-	-	680	550	825	N	9	-	-	-	-	-	-			10 mm hose (min.)
SM-09	Air Greaser	Ingersoll Rand	1	N	0.5	0.5	0.75	5	680	550	825	N	9	-	-	-	-	-	-			10 mm hose (min.)

BO - Bridge Operations
 EA - East Area Parks
 CS - Centralized Park Services
 SM - Streets Maintenance

Appendix C6

City of Winnipeg Access Control and Intrusion Detection Requirements

Electronic security installation requirements in City of Winnipeg buildings

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Intrusion Alarm

1. System partitioning

System should be logically separated (partitioned) to effectively protect the building's perimeter and all offices and sub-divisions areas. Partition design should meet the following specifications:

- a. Separate perimeter partition, which can be armed as "Stay" or "Away". If absolutely necessary the perimeter partition may have multiple designated points of entry with dedicated arming stations.
- b. Separate interior partitions for all areas with different functionality. An interior partition must have a single designated point of entry with a dedicated arming station. Interior partitions should have a possibility to be armed as "Stay" or "Away"
- c. Separate partitions for all points of entry inside the interior partitions, which should stay armed during the business hours and used only under special conditions (e.g. fire exit doors). This type of partitions should have separate audible notification devices (e.g. sirens, bells, horns, etc), a provision for arming and disarming, and a provision for local temporary silencing of the audible notification (if the partition is armed and disarmed remotely).
- d. Each partition should have dedicated output points for Arm, Burg, System Trouble, Zone Fault, and Zone Tamper
- e. Each partition should have a single or multiple audible notification devices (e.g. sirens, bells, horns, etc). The audible notification devices signal should not lose more than 40% of SPL at the most distant point due to attenuation, refraction, reverberation, etc.
- f. Perimeter partition should have external weather resistant audible and visual notification devices (e.g. sirens, light strobes, etc)

2. Head end

The system's head end should meet the following requirements:

- a. Hardware type used is DSC Maxsys PC4020 Series
- b. The system head end should be located at a secure room accessible for authorized personnel only
- c. The head end room should be located on approximately equal distance from all most outlying field devices
- d. Cables from all field devices should be home-run to the head end location
- e. Only ULC listed and Department of Labour approved enclosures should be used
- f. All enclosures (including card access, power supply, and auxiliary interface enclosures) should have tamper switches and locks. No padlocks are accepted. Locks on all enclosures should be keyed identically.
- g. All enclosures (including card access, power supply, and auxiliary interface enclosures) should be installed at serviceable heights (min 3ft – max 6ft)
- h. All enclosures (including card access, power supply, and auxiliary interface enclosures) should be interconnected with electrical conduits. The size of conduits should allow for 40% future expansion
- i. Only original DSC power supply transformers should be used

- j. All power supplies (including card access power supplies) loads should not exceed 70% of nominal
 - k. All power supply transformers for any type of DSC controllers should be installed in a separate dedicated enclosures located in the same room as the controller or expander panels
 - l. All security equipment (including card access and auxiliary interface equipment) power supplies should be fed from a separate building power circuit connected to an emergency power source
 - m. No PC4020 controller should accommodate more than four logical partitions
 - n. PC4020 is not allowed to be a power source for anything other than the ComBus (Communication Bus) (exclusive for the primary keypad).
 - o. PC4204CX modules should be used to power up sirens, motion detection devices, keypads and other remote ComBus devices. PC4204CX load should not exceed 70% of nominal.
 - p. A dedicated PC4204CX should be used to power up all audible notification devices. PC4204CX load should not exceed 70% of nominal.
 - q. Each PC4020 should communicate back to the central monitoring location an AC Fail condition
 - r. Maximum distance from a head end controller to a ComBus communicating device (e.g. Alarm Keypad) is 750 feet.
 - s. A sub-panel with a ComBus repeater PC4204CX should be used on greater distances
 - t. All sub-panels should meet all requirements for the head end panel (except for the distancing requirement)
 - u. Battery backup should be installed for every controller supplied with battery backup terminals
3. Field devices and cabling
- a. General cable and field device requirements:
 - Use premium quality (e.g. Belden) stranded cables
 - All cables should be run in conduit
 - No cable splices are accepted
 - All status changing field devices should have DEOL (Double End of Line) supervision
 - All field device terminations and connections must be soldered
 - All cables should be uniquely and clearly labelled on both sides of the run. Labels should be permanent and not be susceptible to disconnection from the cable if exposed to thermal or mechanical influence.
 - An as-built indicating all cable runs and identifying the cables should be submitted as well as the system layout diagram created with accordance to DSC design specifications.
 - b. Arming Stations
 - An arming station consists of a card access card reader, an LCD4501 intrusion alarm keypad enclosed inside a universal Honeywell guard TG511A1000

- Arming stations should always be installed on the secure side of partitions
 - An arming station should provide for a “Stay” and “Away” indication if applicable to a partition
 - A 7/8” hole must be made in the front cover of TG511A1000 aligned with a 1/2” hole made in the front cover of LCD4501 to allow users access to the right scroll button of LCD4501
 - Arming station devices should be installed at the same height defined by an architect to meet the accessibility requirement, and not more than 6” apart.
 - 22AWG-6c cable should be used for an LCD4501 connection
- c. Doors
- Normal or narrow gap GE Security 1076 series recessed type 1” door contacts should be used on all protected doors
 - If two security partitions share a door, a DPDT contact should be used
 - If a door monitored by both intrusion alarm and card access system door position switches, a DPDT contact should be used
 - Door magnets should be installed within 1/4” alignment with the door contacts
 - Door magnets must always be secured by a bracket or a woodblock
 - All monitored doors should comply with a “double hit” by-law. In other words, a door should always be monitored by a secondary detection device (e.g. a motion detector, a set of optical beams, etc) in addition to a door contact
 - Any door contact cabling should be recessed at any transition point from the wall, ceiling, basement, etc.
 - 22AWG-4c cable should be used for each door switch connection
 - Overhead door position switches should be installed on the door rails 8-10’ off the ground
- d. Motion detection
- All interior spaces with windows, glass walls, or other possible points of entry should be protected by motion detection devices
 - Motion detection devices should be installed to have at least 20% of detection zones overlapping
 - Motion detection devices should be selected to address potential issues with detection obstructions and serviceability, and provide for maximum coverage and efficiency (e.g. motion sensors designed to provide a 90 degrees coverage of a space should be installed precisely in the corner without any offsets)
 - No swivel mounts are allowed for motion sensors installation
 - Approved motion sensing devices are:
 1. Linear and angular detection: Honeywell DT7550C model (up to 50’), Optex CX-702 (50’ and more)
 2. Ceiling mount 360 degrees detection: FX-360 (up to 40’), SX-360Z (up to 60’)

3. Photo-electric beams: Optex AX-70/130/200TN, Optex RN4 10-25/25-75/75-150 (for higher sensitivity and security areas)
- 22AWG-6c cable should be used for each door switch connection

Card Access

1. System coverage

The card access system should monitor key building perimeter access points, the points of the separation of public and staff areas, and the points of higher sensitivity and security. The system should also provide for the arming and disarming functionality of the security system.

2. Head end

The system's head end should meet the following requirements:

- a. Johnson Controls Cardkey/Pegasys platform hardware should be used
- b. CK721 network controllers should be located in the same room as the intrusion alarm equipment if the manufacturer recommended distance requirements are met
- c. If sub-panel installation is required, it should be located at a secure room accessible for authorized personnel only
- d. Only designated JCI enclosures SEC-ENC1616/2024/2424/2430/3042WDP enclosures should be used
- e. Enclosures should be built as per JCI specifications (see Appendix 2)
- f. Tamper switches should be connected to both CK721 and intrusion alarm system tamper inputs
- g. Only Altronix power supplies in original enclosures are acceptable for energizing electrical locking devices (unless a specialized power supply must be used with a locking device). Battery backup should be installed for every power supply
- h. All power supplies should be located at the same room as controller enclosures
- i. All power supplies (including card access power supplies) loads should not exceed 70% of nominal

3. Field devices and cabling

- a. General cable and field device requirements:
 - Use premium quality (e.g. Belden) stranded cables
 - All cables should be run in conduit
 - No cable splices are accepted
 - All status changing field devices should have DEOL (Double End of Line) supervision
 - All field device terminations and connections must be soldered
 - All cables should be uniquely and clearly labelled on both sides of the run. Labels should be permanent and not be susceptible to disconnection from the cable if exposed to thermal or mechanical influence.

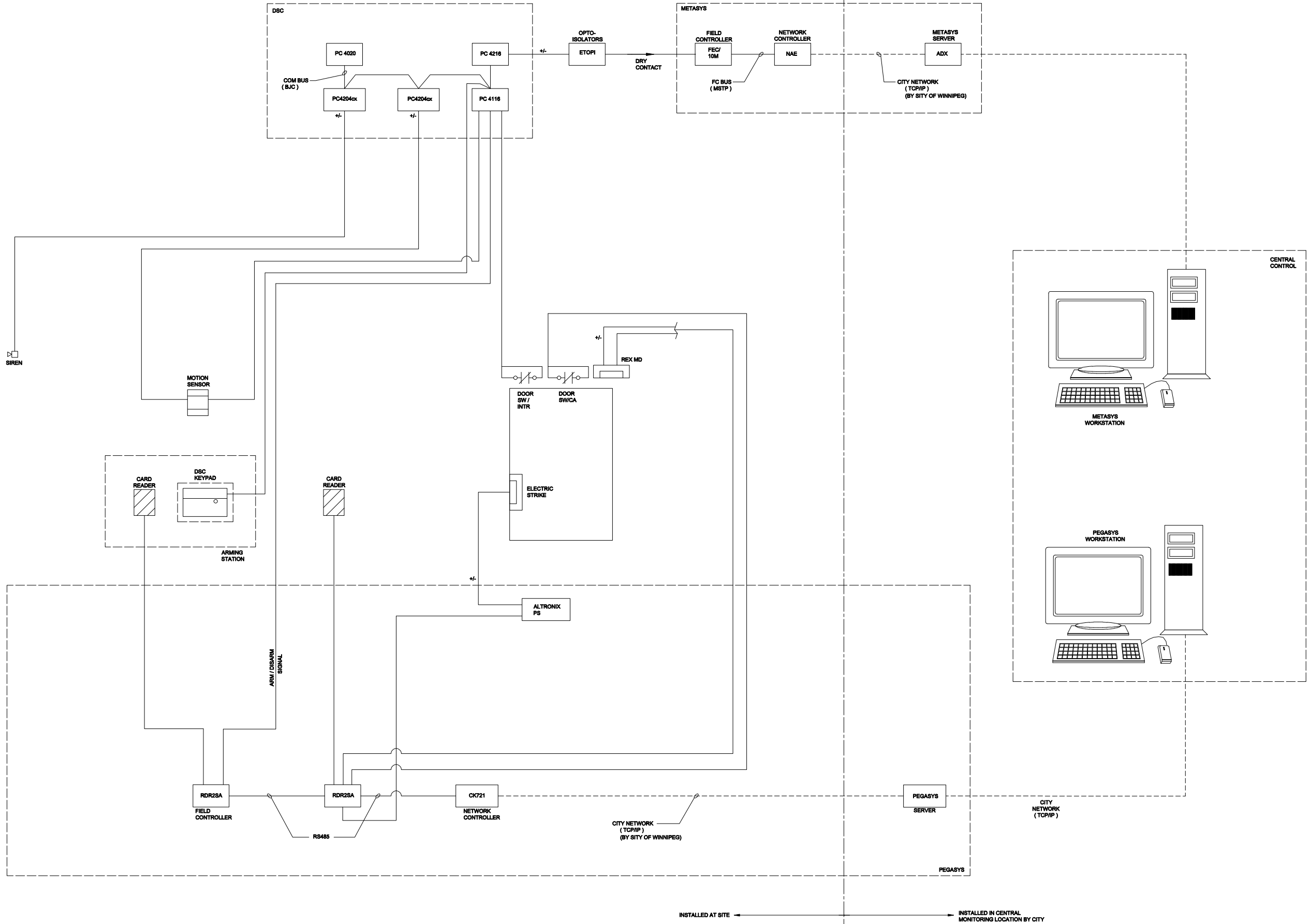
- An as-built indicating all cable runs and identifying the cables should be submitted as well as the system layout diagram created with accordance to Cardkey/Pegasys design specifications.
- b. Doors
- A regular card access door must have a electric locking device, a reader, a door position switch, and a request-to-exit motion sensor
 - A card-in/card-out doors installation involving usage of electromagnetic locking devices should be accompanied by a separate permit. In addition to the Building Code requirements each door should have a local vandal-proof audible notification device energized when an emergency egress protocol is used. The audible notification device signal should be only cancelled from the centralized monitoring station.
 - Approved request-to-exit device is Kantech Systems T-Rex-LT
 - Approved card reader models are Indala Curve FP2511A-10200 and Indala Curve FP2521A-10200
 - MOV of appropriate nominal should be connected in parallel with the electric locking device

B1 SIZE 27.91 x 38.28" (717.0mm x 1000.0mm)

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CITY OF WINNIPEG
 Design and Construction of the Public Works East Yard Complex
 at the former Elmwood/Narin Landfill Site
 Block Diagram
 Access Control and Intrusion Detection

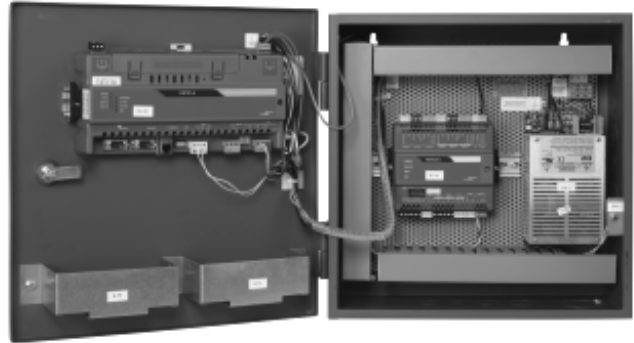
PROJECT NUMBER 060146003	DRAWING NUMBER Figure: C6	ISSUE/REVISION A
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Security Control Panel Assembly Mounted in a 16 in. x 16 in. Enclosure

Description

The 16 in. x 16 in. Security Control Panel is a pre-wired, preassembled standard control panel and enclosure that contains a S321-IP or CK721-A network controller and/or S300-DIN-RDR2SA two-door interface modules. Such a pre-designed solution saves both time and money. Various models are available to accommodate a variety of common applications.

The control panel is shipped complete, mounted in a 16 in. x 16 in. steel enclosure. The panel is equipped with the required number of 120 VAC/24 VDC power supplies. The power supply has Uninterrupted Power Supply (UPS) capability with the addition of gel cell batteries (S300-BAT), which are sold separately. Wiring for the batteries is factory provided. These enclosures are designed specifically for security control requirements, with battery brackets that do not need to be removed to install the batteries, a lift-off door, a pre-wired door tamper switch, and a lockable door with key. Space is reserved on specific models for the addition of future components.



Security Control Panel Mounted in a 16 in. x 16 in. Enclosure

Features

- consistent layout for all standard control panel solutions – simplifies installation and commissioning
- prebuilt, pre-wired, and pretested in an ISO-9002 manufacturing facility – provides products of consistently high quality

Repair Information

If the Security Control Panel Assembly fails to operate within its specifications, replace the failed component. For a replacement, contact the nearest Johnson Controls® representative.

Note: Refer to the *Security Enclosure Components Catalog Page (LIT-1900572)* to order components separately.

Components Included with the Security Control Panel Assembly

Quantity	Description
1	Enclosure: 16 in. W x 16 in. H x 6.62 in. D (406 mm W x 406 mm H x 168 mm D), Type 1 with keyed lock, door tamper switch, and battery support brackets
1	S321-IP or CK721-A network controller and/or S300-DIN-RDR2SA two-door interface module
1	S300-DIN-L-PS 24 VDC, 5 A power supply

Selection Chart

Product Code Number	Description
SPA10000-1A10	16 in. W x 16 in. H x 6.62 in. D security control panel with CK721-A controller and power supply
SPA1B100-1A10	16 in. W x 16 in. H x 6.62 in. D security control panel with CK721-A controller, S300-DIN-RDR2SA module, and power supply
SPB10000-1A10	16 in. W x 16 in. H x 6.62 in. D security control panel with S300-DIN-RDR2SA module and power supply
SPC10000-1A10	16 in. W x 16 in. H x 6.62 in. D security control panel with S321-IP controller and power supply

Technical Specifications

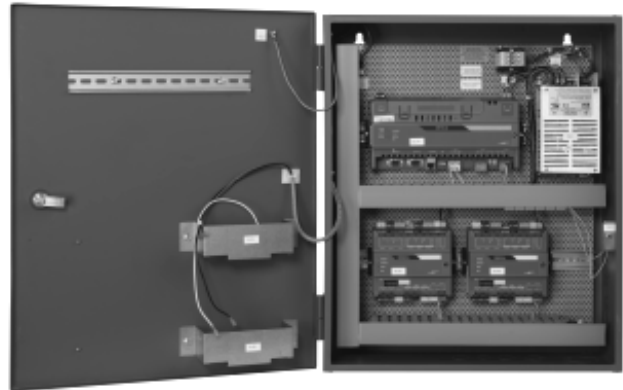
Security Control Panel Assembly Mounted in a 16 in. x 16 in. Enclosure	
Wire Size	Ground wire: 14 AWG; 24 VDC controller wires: 18 AWG
Enclosure Rating	NEMA Type 1
Ambient Operating Condition	32 to 122°F (0 to 50°C) 5 to 95% RH, noncondensing
Dimensions (Width x Height x Depth)	16 in. W x 16 in. H x 6.62 in. D (406 mm W x 406 mm H x 168 mm D)
Ambient Storage Condition	-4 to 158°F (-20 to 70°C) 5 to 95% RH maximum, noncondensing
Agency Compliance	Enclosure UL 50 Rated, CSA Approved

Security Control Panel Assembly Mounted in a 20 in. x 24 in. Enclosure

Description

The 20 in. x 24 in. Security Control Panel is a pre-wired, preassembled standard control panel and enclosure that contains a CK721-A network controller and/or S300-DIN-RDR2SA two-door interface modules. Such a pre-designed solution saves both time and money. Various models are available to accommodate a variety of common applications.

The control panel is shipped complete, mounted in a 20 in. x 24 in. steel enclosure. The panel is equipped with the required number of 120 VAC/24 VDC power supplies. The power supply has Uninterruptible Power Supply (UPS) capability with the addition of gel cell batteries (S300-BAT), which are sold separately. Wiring for the batteries is factory provided. These enclosures are designed specifically for security control requirements, with battery brackets that do not need to be removed to install the batteries, a lift-off door, a pre-wired door tamper switch, and a lockable door with key. Space is reserved on specific models for the addition of future components.



Security Control Panel Assembly Mounted in a 20 in. x 24 in. Enclosure

Features

- consistent layout for all standard control panel solutions – simplifies installation and commissioning
- space reserved for future component additions – allows easy upgrading to meet future expansion needs
- prebuilt, pre-wired, and pretested in an ISO-9002 manufacturing facility – provides products of consistently high quality

Repair Information

If the Security Control Panel Assembly fails to operate within its specifications, replace the failed component. For a replacement, contact the nearest Johnson Controls® representative.

Note: Refer to the *Security Enclosure Components Catalog Page (LIT-1900572)* to order components separately.

Components Included with the Security Control Panel Assembly

Quantity	Description
1	Enclosure: 20 in. W x 24 in. H x 6.62 in. D (508 mm W x 610 mm H x 168 mm D), Type 1 with keyed lock, door tamper switch, and battery support brackets
1	CK721-A network controller and up to two S300-DIN-RDR2SA two-door interface modules
1	S300-DIN-L-PS 24 VDC, 5 A power supply

Selection Chart

Product Code Number	Description
SPA1B100-1B10	20 in. W x 24 in. H x 6.62 in. D security control panel with CK721-A controller, S300-DIN-RDR2SA module, and one power supply
SPA1B200-1B10	20 in. W x 24 in. H x 6.62 in. D security control panel with CK721-A controller, two S300-DIN-RDR2SA modules, and one power supply

Technical Specifications

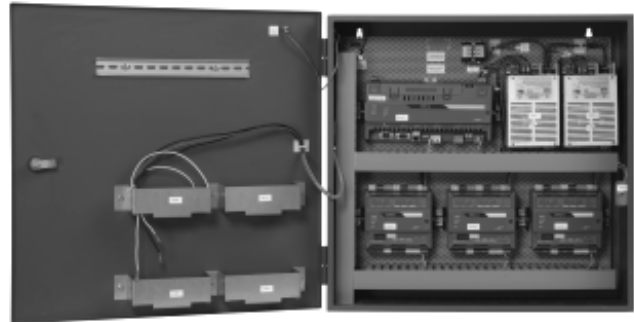
Security Control Panel Assembly Mounted in a 20 in. x 24 in. Enclosure	
Wire Size	Ground wire: 14 AWG; 24 VDC controller wires: 18 AWG
Enclosure Rating	NEMA Type 1
Ambient Operating Condition	32 to 122°F (0 to 50°C) 5 to 95% RH, noncondensing
Dimensions (Width x Height x Depth)	20 in. W x 24 in. H x 6.62 in. D (508 mm W x 610 mm H x 168 mm D)
Ambient Storage Condition	-4 to 158°F (-20 to 70°C) 5 to 95% RH maximum, noncondensing
Agency Compliance	Enclosure UL 50 Rated, CSA Approved

Security Control Panel Assembly Mounted in a 24 in. x 24 in. Enclosure

Description

The 24 in. x 24 in. Security Control Panel is a pre-wired, preassembled standard control panel and enclosure that contains a CK721-A network controller and/or S300-DIN-RDR2SA two-door interface modules. Such a pre-designed solution saves both time and money. Various models are available to accommodate a variety of common applications.

The control panel is shipped complete, mounted in a 24 in. x 24 in. steel enclosure. The panel is equipped with the required number of 120 VAC/24 VDC power supplies. The power supply has Uninterrupted Power Supply (UPS) capability with the addition of gel cell batteries (S300-BAT), which are sold separately. Wiring for the batteries is factory provided. These enclosures are designed specifically for security control requirements, with battery brackets that do not need to be removed to install the batteries, a lift-off door, a pre-wired door tamper switch, and a lockable door with key. Space is reserved on specific models for the addition of future components.



Security Control Panel Assembly Mounted in a 24 in. x 24 in. Enclosure

Features

- consistent layout for all standard control panel solutions – simplifies installation and commissioning
- space reserved for future component additions – allows easy upgrading to meet future expansion needs
- prebuilt, pre-wired, and pretested in an ISO-9002 manufacturing facility – provides products of consistently high quality

Repair Information

If the Security Control Panel Assembly fails to operate within its specifications, replace the failed component. For a replacement, contact the nearest Johnson Controls® representative.

Note: Refer to the *Security Enclosure Components Catalog Page (LIT-1900572)* to order components separately.

Components Included with the Security Control Panel Assembly

Quantity	Description
1	Enclosure: 24 in. W x 24 in. H x 6.62 in. D (610 mm W x 610 mm H x 168 mm D), Type 1 with keyed lock, door tamper switch, and battery support brackets
1	CK721-A network controller and up to three S300-DIN-RDR2SA two-door interface modules
1 or 2	S300-DIN-L-PS 24 VDC, 5 A power supply

Selection Chart

Product Code Number	Description
SPA1B100-1C10	24 in. W x 24 in. H x 6.62 in. D security control panel with CK721-A controller, S300-DIN-RDR2SA module, and one power supply
SPA1B200-1C10	24 in. W x 24 in. H x 6.62 in. D security control panel with CK721-A controller, two S300-DIN-RDR2SA modules, and one power supply
SPA1B300-2C10	24 in. W x 24 in. H x 6.62 in. D security control panel with CK721-A controller, three S300-DIN-RDR2SA modules, and two power supplies

Technical Specifications

Security Control Panel Assembly Mounted in a 24 in. x 24 in. Enclosure	
Wire Size	Ground wire: 14 AWG; 24 VDC controller wires: 18 AWG
Enclosure Rating	NEMA Type 1
Ambient Operating Condition	32 to 122°F (0 to 50°C) 5 to 95% RH, noncondensing
Dimensions (Width x Height x Depth)	24 in. W x 24 in. H x 6.62 in. D (610 mm W x 610 mm H x 168 mm D)
Ambient Storage Condition	-4 to 158°F (-20 to 70°C) 5 to 95% RH maximum, noncondensing
Agency Compliance	Enclosure UL 50 Rated, CSA Approved

Security Control Panel Assembly Mounted in a 24 in. x 30 in. Enclosure

Description

The 24 in. x 30 in. Security Control Panel is a pre-wired, preassembled standard control panel and enclosure that contains a CK721-A network controller and/or S300-DIN-RDR2SA two-door interface modules. Such a pre-designed solution saves both time and money. Various models are available to accommodate a variety of common applications.

The control panel is shipped complete, mounted in a 24 in. x 30 in. steel enclosure. The panel is equipped with the required number of 120 VAC/24 VDC power supplies. The power supply has Uninterrupted Power Supply (UPS) capability with the addition of gel cell batteries (S300-BAT), which are sold separately. Wiring for the batteries is factory provided. These enclosures are designed specifically for security control requirements, with battery brackets that do not need to be removed to install the batteries, a lift-off door, a pre-wired door tamper switch, and a lockable door with key. Space is reserved on specific models for the addition of future components.



Security Control Panel Assembly Mounted in a 24 in. x 30 in. Enclosure

Features

- consistent layout for all standard control panel solutions – simplifies installation and commissioning
- space reserved for future component additions – allows easy upgrading to meet future expansion needs
- prebuilt, pre-wired, and pretested in an ISO-9002 manufacturing facility – provides products of consistently high quality

Repair Information

If the Security Control Panel Assembly fails to operate within its specifications, replace the failed component. For a replacement, contact the nearest Johnson Controls® representative.

Note: Refer to the *Security Enclosure Components Catalog Page (LIT-1900572)* to order components separately.

Components Included with the Security Control Panel Assembly

Quantity	Description
1	Enclosure: 24 in. W x 30 in. H x 6.62 in. D (610 mm W x 762 mm H x 168 mm D), Type 1 with keyed lock, door tamper switch, and battery support brackets
1	CK721-A network controller and up to four S300-DIN-RDR2SA two-door interface modules
1 or 2	S300-DIN-L-PS 24 VDC, 5 A power supplies

Selection Chart

Product Code Number	Description
SPA1B100-1D10	24 in. W x 30 in. H x 6.62 in. D security control panel with CK721-A controller, S300-DIN-RDR2SA module, and one power supply
SPA1B200-1D10	24 in. W x 30 in. H x 6.62 in. D security control panel with CK721-A controller, two S300-DIN-RDR2SA modules, and one power supply
SPA1B300-2D10	24 in. W x 30 in. H x 6.62 in. D security control panel with CK721-A controller, three S300-DIN-RDR2SA modules, and two power supplies
SPA1B400-2D10	24 in. W x 30 in. H x 6.62 in. D security control panel with CK721-A controller, four S300-DIN-RDR2SA modules, and two power supplies

Technical Specifications

Security Control Panel Assembly Mounted in a 24 in. x 30 in. Enclosure	
Wire Size	Ground wire: 14 AWG; 24 VDC controller wires: 18 AWG
Enclosure Rating	NEMA Type 1
Ambient Operating Condition	32 to 122°F (0 to 50°C) 5 to 95% RH, noncondensing
Dimensions (Width x Height x Depth)	24 in. W x 30 in. H x 6.62 in. D (610 mm W x 762 mm H x 168 mm D)
Ambient Storage Condition	-4 to 158°F (-20 to 70°C) 5 to 95% RH maximum, noncondensing
Agency Compliance	Enclosure UL 50 Rated, CSA Approved

Security Control Panel Assembly Mounted in a 30 in. x 42 in. Enclosure

Description

The 30 in. x 42 in. Security Control Panel is a pre-wired, preassembled standard control panel and enclosure that contains a CK721-A network controller and/or S300-DIN-RDR2SA two-door interface modules. Such a pre-designed solution saves both time and money. Various models are available to accommodate a variety of common applications.

The control panel is shipped complete, mounted in a 30 in. x 42 in. steel enclosure. The panel is equipped with the required number of 120 VAC/24 VDC power supplies. The power supply has Uninterrupted Power Supply (UPS) capability with the addition of gel cell batteries (S300-BAT), which are sold separately. Wiring for the batteries is factory provided. These enclosures are designed specifically for security control requirements, with battery brackets that do not need to be removed to install the batteries, a lift-off door, a pre-wired door tamper switch, and a lockable door with key. Space is reserved on specific models for the addition of future components.



Security Control Panel Assembly Mounted in a 30 in. x 42 in. Enclosure

Features

- consistent layout for all standard control panel solutions – simplifies installation and commissioning
- space reserved for future component additions – allows easy upgrading to meet future expansion needs
- prebuilt, pre-wired, and pretested in an ISO-9002 manufacturing facility – provides products of consistently high quality

Repair Information

If the Security Control Panel Assembly fails to operate within its specifications, replace the failed component. For a replacement, contact the nearest Johnson Controls® representative.

Note: Refer to the *Security Enclosure Components Catalog Page (LIT-1900572)* to order components separately.

Components Included with the Security Control Panel Assembly

Quantity	Description
1	Enclosure: 30 in. W x 42 in. H x 6.62 in. D (762 mm W x 1067 mm H x 168 mm D), Type 1 with keyed lock, door tamper switch, and battery support brackets
1	CK721-A network controller and up to eight S300-DIN-RDR2SA two-door interface modules
2 or 3	S300-DIN-L-PS 24 VDC, 5 A power supplies

Selection Chart

Product Code Number	Description
SPA1B400-2E10	30 in. W x 42 in. H x 6.62 in. D security control panel with CK721-A controller, four S300-DIN-RDR2SA modules, and two power supplies
SPA1B600-3E10	30 in. W x 42 in. H x 6.62 in. D security control panel with CK721-A controller, six S300-DIN-RDR2SA modules, and three power supplies
SPA1B800-3E10	30 in. W x 42 in. H x 6.62 in. D security control panel with CK721-A controller, eight S300-DIN-RDR2SA modules, and three power supplies

Technical Specifications

Security Control Panel Assembly Mounted in a 30 in. x 42 in. Enclosure	
Wire Size	Ground wire: 14 AWG; 24 VDC controller wires: 18 AWG
Enclosure Rating	NEMA Type 1
Ambient Operating Condition	32 to 122°F (0 to 50°C) 5 to 95% RH, noncondensing
Dimensions (Width x Height x Depth)	30 in. W x 42 in. H x 6.62 in. D (762 mm W x 1067 mm H x 168 mm D)
Ambient Storage Condition	-4 to 158°F (-20 to 70°C) 5 to 95% RH maximum, noncondensing
Agency Compliance	Enclosure UL 50 Rated, CSA Approved

Appendix C7

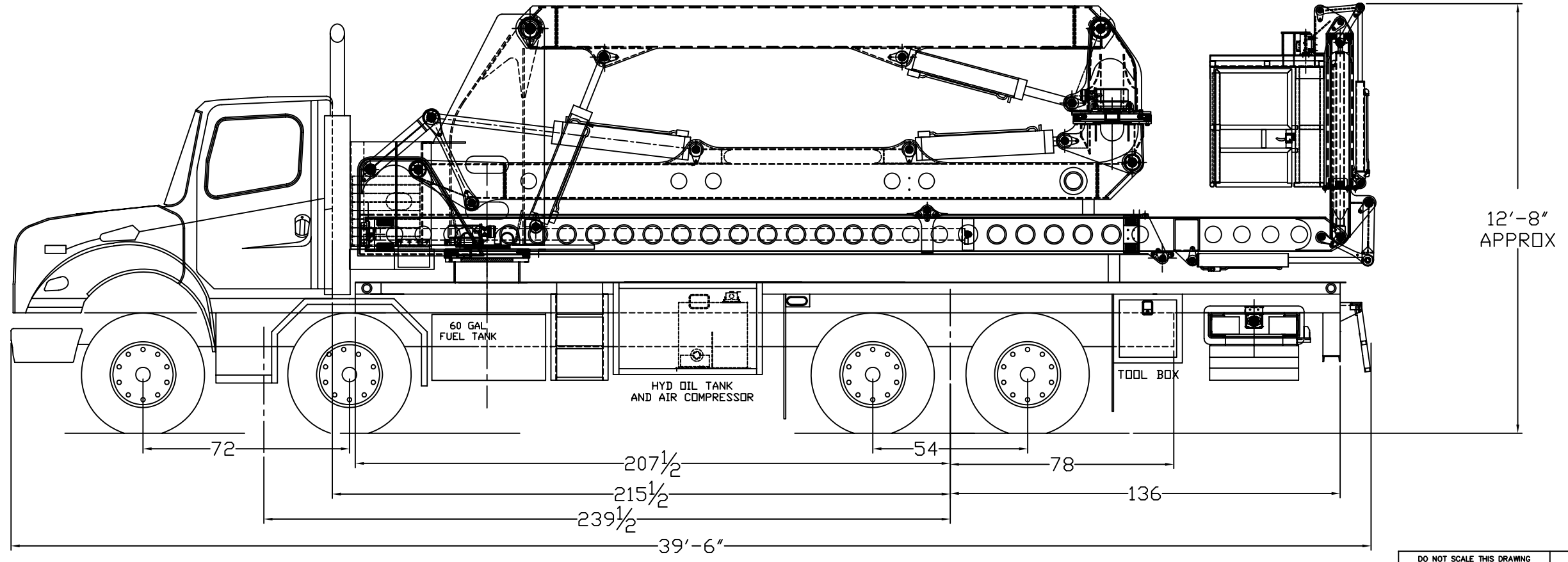
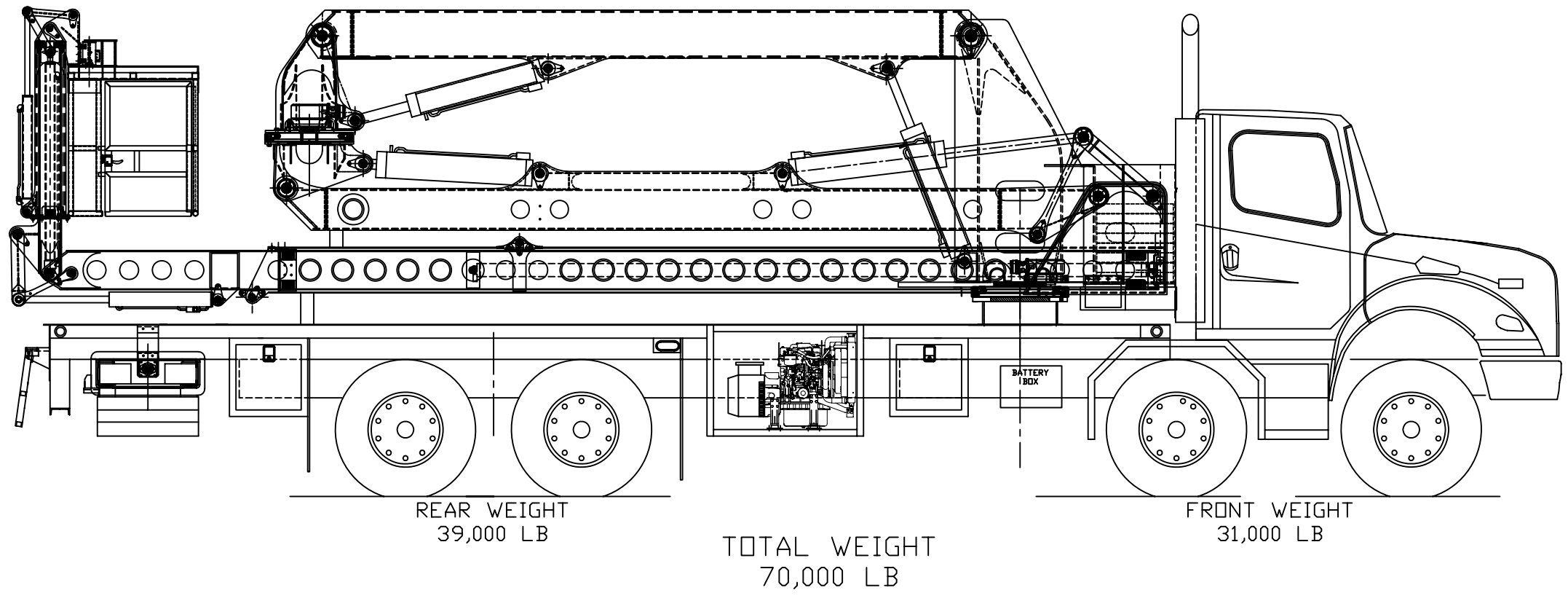
Schematic Plan for Streets Maintenance Heated Vehicle and Equipment Storage (SM-09)

Appendix C8

Conceptual Plans for Bridge Operations Yard Building

Appendix C9

Bridge Operations Crane Truck



DO NOT SCALE THIS DRAWING

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS ± .005 HOLES \pm .010
FRACTIONS ± 1/32 WELDS ± 1/16 ANGLES ± 1/2"
REMOVE ALL BURRS AND BREAK ALL SHARP CORNERS

ASPEN AERIALS INC.
4308 WEST 1ST STREET - DULUTH, MN 55807

**THE MOUNTING INSTALLATION
A62 WINNIPEG 8X4**

REV	DESCRIPTION	BY	DATE	NEW RELEASE AUTHORIZATION	DATE	DRW

DRAWN BY CLARK DATE 09-29-05 DRW
MATERIAL BOM SIZE B DRAWING NO.
SCALE 1/24 WINNIPEG