

The following changes to the tender documents are effective immediately and will form part of the contract documents:

1.1 PART 1 – PERTAINING TO DRAWINGS

A. Clarification – Drawing M01:

Revise Air Cooled Chiller Schedule as follows:

CH-1 Cooling Capacity = 871 kW (248 tons)

CH-2 Cooling Capacity = 219 kW (62 tons)

B. Clarification – Drawing G02:

Delete the Colour Code legend.

C. Clarification – Drawings M03:

Add Note: Each temperature sensor shall be mounted 1200 mm above floor level. Temperature sensor shall be adjacent to, and centred on, either the length or the width of a clear floor area of 800 mm x 1350 mm.

D. Clarification – Drawings M04:

Add Note: Each temperature sensor shall be mounted 1200 mm above floor level. Temperature sensor shall be adjacent to, and centred on, either the length or the width of a clear floor area of 800 mm x 1350 mm.

1.2 PART 2 – PERTAINING TO SPECIFICATIONS

A. Replace the following specifications in their entirety:

00 01 10	Table of Contents
01 73 00	Execution Requirements
01 74 11	Cleaning
01 74 21	Waste Management and Disposal
07 51 00	Built-Up Bituminous Roofing
07 62 00	Prefinished Metal Flashing and Trim

B. Replace the following Commissioning Check Sheet

DC-1 Secondary Fluid Cooler

1.3 PART 3 – QUESTIONS

A. Question 1: Can you confirm the capacities of the two chillers (CH-1, CH-2) and fluid cooler (DC-1). The capacities on the table for the chillers suggest approx. 81 tons (CH-1) and 21 tons (CH-2) but the flows and temperatures suggest closer to 270 tons (CH-1) and 70 tons (CH-2). This appears similar to DC-1.

Answer 1: Air Cooled Chiller Schedule has been revised in Addendum 1.

TABLE OF CONTENTS

SPECIFICATIONS

Section No.	Title	No. of Pages
	Division 00 – Procurement and Contracting Requirements	
00 01 07	Seals Page	1
	Division 01 – General Requirements	
01 11 00	Summary of Work	3
01 14 00	Work Restrictions	3
01 31 19	Project Meetings	4
01 32 16.19	Construction Progress Schedule	4
01 33 00	Submittal Procedures	5
01 35 29.06	Health and Safety Requirements	4
01 35 43	Environmental Procedures	1
01 41 00	Regulatory Requirements	1
01 45 00	Quality Control	2
01 52 00	Construction Facilities	1
01 56 00	Temporary Barriers and Enclosures	2
01 61 00	Common Product Requirements	4
01 73 00	Execution Requirements	3
01 74 11	Cleaning	2
01 74 21	Waste Management and Disposal	9
01 77 00	Closeout Procedures	2
01 78 00	Closeout Submittals	9
01 78 01	Operation and Maintenance Manual	3
01 79 00	Demonstration and Training	2
01 91 13	General Commissioning (Cx) Requirements	10
01 19 13 13	Commissioning Plan	
01 91 13 16	Commissioning Forms	3
01 92 00	Facility Operation	4
	Division 02 – Existing Conditions	
02 41 13	Selective Site Demolition	3
02 81 01	Hazardous Materials	3
02 82 00.03	Asbestos Abatement – Maximum Precautions	13
	Division 03 – Concrete	
03 10 00	Concrete Forming and Accessories	4
03 15 00	Concrete Accessories	2
03 20 00	Concrete Reinforcing	3
03 30 00	Cast-In-Place Concrete	7

TABLE OF CONTENTS

	Division 05 – Metals	
05 12 23	Structural Steel for Buildings	6
	Division 06 – Wood, Plastics and Composites	
06 10 00	Rough Carpentry	3
	Division 07 – Thermal and Moisture Protection	
07 21 16	Blanket Insulation and Vapour Barrier	3
07 51 00	Built-up Bituminous Roofing	15
07 62 00	Prefinished Metal Flashing and Trim	5
07 92 00	Sealants	5
	Division 09 – Finishes	
09 87 00	Coating Systems for Steel Pipes cc 13 02 28	6
09 98 50	Specialty Coatings for Concrete	5
	Division 22 – Plumbing	
22 10 10	Plumbing Pumps	3
22 13 16.16	Sanitary Waste and Vent Piping – Plastic	2
	Division 23 – Heating, Ventilation and Air-Conditioning (HVAC)	
23 05 00	Common Work Results for HVAC	4
23 05 15	Installation of Pipework	5
23 05 16	Expansion Fittings and Loops for HVAC Piping	2
23 05 17	Pipe Welding	4
23 05 19	Gauges and Meters	3
23 05 23.01	Valves – Bronze	4
23 05 23.05	Butterfly Valves	4
23 05 29	Hangers and Supports for HVAC Piping and Equipment	8
23 05 48	Vibration Controls for HVAC Piping and Equipment	4
23 05 53.01	Mechanical Identification	6
23 05 93	Testing, Adjusting and Balancing for HVAC	4
23 07 15	Thermal Insulation for Piping	7
23 08 01	Performance Verification Mechanical Piping Systems	2
23 08 02	Cleaning and Start-Up of Mechanical Piping Systems	4
23 09 33	Electric and Electronic Control System for HVAC	2
23 21 13.02	Hydronic Systems	6
23 21 14	Hydronic Specialties	4
23 21 23	Hydronic Pumps	4
23 25 00	HVAC Water Treatment Systems	5
23 64 26	Air Cooled Rotary Screw Chillers	8
23 64 30	Air Cooled Scroll Chillers	7

TABLE OF CONTENTS

23 65 12	Fluid Cooler	4
23 82 19	Fan Coil Units	3
	Division 25 – Integrated Automation	
25 01 11	EMCS Start-up, Verification and Commissioning	7
25 01 12	EMCS Training	3
25 05 01	EMCS General Requirements	8
25 05 02	EMCS Submittals and Review Process	4
25 05 03	EMCS Project Record Documents	4
25 05 54	EMCS Identification	3
25 05 60	EMCS Field Installation	11
25 08 20	EMCS Warranty and Maintenance	4
25 10 01	EMCS Local Area Network (LAN)	3
25 30 01	EMCS Building Controllers	11
25 30 02	EMCS Field Control Devices	18
25 90 01	EMCS Site Requirements, Applications and Systems Sequencing of Operations	11
	Division 26 - Electrical	
26 05 00	Common Work Results for Electrical	5
26 05 21	Wires and Cables (0-1000 V)	3
26 05 28	Grounding – Secondary	3
26 05 32	Outlet Boxes Conduit Boxes and Fittings	2
26 05 34	Conduit, Conduit Fastenings and Conduit Fittings	4
26 06 06	Short Circuit Coordination	2
26 28 16.02	Moulded Case Circuit Breakers	2
26 28 23	Disconnect Switches – Fused and Non-Fused	2
26 29 10	Motor Starters to 600V	3
26 95 00	Connections to Mechanical Equipment	2
26 96 00	Starting of Electrical Equipment and Systems	1
	Appendices	
Appendix A	Reference Documents	
	- AAFC Asbestos Inventory Spreadsheet (31 pages)	
	- Asbestos Management Plan, March 2016 (515 pages)	

TABLE OF CONTENTS

DRAWINGS

Drawing No.	Drawing Title
-------------	---------------

	General
--	----------------

G01	Cover Sheet
G02	Site Plan

	Structural
--	-------------------

S01	Structural Roof Plans
S02	Structural Details
S03	Structural Details
S04	Structural Details

	Mechanical
--	-------------------

M01	Legends, Abbreviations, Notes & Schedules
M02	Roof & Mechanical Room Demolition Plan
M03	Basement & First Floor New Layout Plan
M04	Second Floor & Third Floor New Layout Plan
M05	Mechanical Room & Roof New Layout Plan
M06	Primary & Secondary System Pump Partial Plans
M07	Details
M08	Primary & Secondary System Schematics
M09	Control Schematics

	Electrical
--	-------------------

E01	Laboratory Wing Electrical Sub Basement Power Plan
E02	Laboratory Wing Electrical Basement & First Floor New Layout Plans
E03	Laboratory Wing Electrical Second Floor & Third Floor New Layout Plans
E04	Laboratory Wing Electrical Mechanical Room & Roof New Layout Plans
E05	Laboratory Wing Electrical Motor Control Schedule
E06	Laboratory Wing Electrical Single Line Diagram

EXECUTION REQUIREMENTS

1. GENERAL

1.1 Action and Information Submittals

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Owner or separate contractor.
- .3 Include in request:
 - .1 Identification of project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed Work, and products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on Work of Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.
 - .9 Materials
- .4 Required for original installation.
- .5 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.2 Preparation

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.

EXECUTION REQUIREMENTS

- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.3 Execution

- .1 Execute cutting, fitting, and patching to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .12 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.4 Waste Management and Disposal

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

2. PRODUCTS

- .1 Not Used.

3. EXECUTION

- .1 Not Used.

EXECUTION REQUIREMENTS

END OF SECTION

CLEANING

1. GENERAL

1.1 Project Cleanliness

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building.
- .4 Dispose of waste materials and debris off site.
- .5 Clean interior areas prior to start of finishing work and maintain areas free of dust and other contaminants during finishing operations.
- .6 Store volatile waste in covered metal containers and remove from premises at end of each working day.
- .7 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .8 Use only cleaning materials recommended by manufacturer of surface to be cleaned and as recommended by cleaning material manufacturer.
- .9 Schedule cleaning operations so that resulting dust, debris, and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 Final Cleaning

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery, and equipment.
- .4 Remove stains, spots, marks, and dirt from electrical and mechanical fixtures.
- .5 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .6 Clean or replace filters of mechanical equipment.
- .7 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .8 Remove snow and ice from access to building.

CLEANING

2. PRODUCTS

2.1 Not Used

.1 Not Used.

3. EXECUTION

3.1 Not Used

.1 Not Used.

END OF SECTION

WASTE MANAGEMENT AND DISPOSAL

1. GENERAL

1.1 Waste Management Goals

- .1 Prior to start of Work conduct meeting with the Departmental representative to review and discuss PSPC's waste management goal and Contractor's proposed Waste Reduction Workplan for Construction, Renovation and /or Demolition (CRD) waste to be project generated.
- .2 PSPC's waste management goal: to divert a minimum 75 percent of total Project Waste from landfill sites. Prior to project completion provide the Departmental representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.
- .4 Protect environment and prevent environmental pollution damage.

1.2 Reference Standards

- .1 Standards:
 - .1 Canadian Construction Association (CCA)
 - .1 CCA 81-2001: A Best Practices Guide to Solid Waste Reduction.
 - .2 Public Works and Government Services Canada (PSPC)
 - .3 2002 National Construction, Renovation and Demolition Non-Hazardous Solid Waste Management Protocol.
 - .4 CRD Waste Management Market Research Report (available from PSPC's Environmental Services).
 - .5 Sustainable Development Strategy 2007-2009: Target 2.1 Environmentally Sustainable Use of Natural Resources.
 - .1 Real Property projects over \$1 million and in communities where industrial recycling is supported, implementation of CRD waste management practices will be completed, with waste materials being reused or recycled.
 - .2 Contractually ensure resources used in construction or maintenance are consumed and recovered in a sustainable manner.

1.3 Definitions

- .1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental representative.

WASTE MANAGEMENT AND DISPOSAL

- .2 Class III: non-hazardous waste - construction renovation and demolition waste.
- .3 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities
- .4 Cost/Revenue Analysis Workplan (CRAW): based on information from Waste Reduction Workplan, and intended as financial tracking tool for determining economic status of waste management practices (Schedule E).
- .5 Inert Fill: inert waste - exclusively asphalt and concrete.
- .6 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.
- .7 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .8 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .9 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .10 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .11 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .12 Separate Condition: refers to waste sorted into individual types.
- .13 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
- .14 Waste Diversion Report: detailed report of final results, quantifying cumulative weights and percentages of waste materials reused, recycled and landfilled over course of project. Measures success against Waste Reduction Workplan (WRW) goals and identifies lessons learned.
- .15 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.
- .16 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals,

WASTE MANAGEMENT AND DISPOSAL

implementation and reporting procedures, anticipated results and responsibilities. Waste Reduction Workplan (Schedule B) information acquired from Waste Audit.

1.4 Documents

- .1 Post and maintain in visible and accessible area at job site, one copy of following documents:
 - .1 Waste Reduction Workplan (Schedule B).
 - .2 Waste Source Separation Program.
 - .3 Schedule B completed for project.

1.5 Action and Informational Submittals

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following:
 - .1 1 electronic copy of completed Waste Reduction Workplan (WRW): Schedule B.
 - .2 1 electronic copy of Cost/Revenue Analysis Workplan (CRAW): Schedule E.
 - .3 1 electronic copy of Waste Source Separation Program (WSSP).
- .3 Prepare and submit on monthly basis, throughout project or at intervals agreed to by the Departmental representative the following:
 - .1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.
 - .2 Updated Waste Materials Tracking form (Schedule D).
 - .3 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.
- .4 Submit prior to final payment the following:
 - .1 Waste Diversion Report, indicating final quantities by material types salvaged for reuse, recycling or disposal in landfill and recycling centres, re-use depots, landfills and other waste processors that received waste materials (See Schedule C).
 - .2 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

1.6 Waste Reduction Work plan (WRW)

- .1 Prepare and submit WRW (Schedule B) at least 10 days prior to project start-up.

WASTE MANAGEMENT AND DISPOSAL

- .2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations.
- .3 WRW should include but not limited to:
 - .1 Applicable regulations.
 - .2 Specific goals for waste reduction, identify existing barriers and develop strategies to overcome them.
 - .3 Destination of materials identified.
 - .4 Deconstruction/disassembly techniques and schedules.
 - .5 Methods to collect, separate, and reduce generated wastes.
 - .6 Location of waste bins on-site.
 - .7 Security of on-site stock piles and waste bins.
 - .8 Protection of personnel, sub-contractors.
 - .9 Clear labelling of storage areas.
 - .10 Training plan for contractor and sub-contractors.
 - .11 Methods to track and report results reliably (Schedule D).
 - .12 Details on materials handling and removal procedures.
 - .13 Recycler and reclaimer requirements.
 - .14 Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.
 - .15 Requirements for monitoring on-site wastes management activities.
- .4 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .5 Post WRW or summary where workers at site are able to review content.
- .6 Monitor and report on waste reduction by documenting total volume (in tonnes) and cost of actual waste removed from project (Schedule D).

1.7 Cost/Revenue Analysis Work plan (CRAW)

- .1 Prepare CRAW (see Schedule E) and include the following:
 - .1 Cost of current waste management practices.
 - .2 Implementation cost of waste diversion program.

WASTE MANAGEMENT AND DISPOSAL

- .3 Savings and benefits resulting from waste diversion program.

1.8 Waste Source Separation Program (WSSP)

- .1 As part of Waste Reduction Workplan, prepare WSSP prior to project start-up.
- .2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.
- .3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .5 Locate containers to facilitate deposit of materials without hindering daily operations.
- .6 Provide training for contractor in handling and separation of materials for reuse and/or recycling.
- .7 Locate separated materials in areas which minimizes material damage.
- .8 Clearly and securely label containers to identify types/conditions of materials accepted and assist workers in separating materials accordingly.
- .9 Monitor on-site waste management activities by conducting periodic site inspections to verify: state of signage, contamination levels, bin locations and condition, personnel participation, use of waste tracking forms and collection of waybills, receipts and invoices.
- .10 On-site sale of salvaged materials is not permitted unless authorized in writing by the Departmental representative and provided that site safety regulations and security requirements are adhered to.

1.9 Use of Site and Facilities

- .1 Execute Work with minimal interference and disturbance to normal use of premises.
- .2 Maintain security measures established by facility provide temporary security measures approved by the Departmental representative.

1.10 Waste Processing Sites

- .1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

1.11 Quality Assurance

- .1 After award of Contract, a mandatory site examination will be held for this Project for Contractor and/or sub-contractors responsible for construction, renovation demolition/deconstruction waste management.

WASTE MANAGEMENT AND DISPOSAL

- .1 Date, time and location will be arranged by the Departmental representative.
- .2 Waste Management Meeting: Waste Management Co-ordinator is to provide an update on status of waste diversion and management activities at each meeting. Written monthly Waste Diversion Report summary to be provided by Waste Management Coordinator (refer to the Waste Diversion Report form in Schedule C and Waste Materials Tracking form in Schedule D).

1.12 Storage, Handling and Protection

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by the Departmental representative.
- .2 Unless specified otherwise, materials for removal do not become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed and salvaged materials from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify the Departmental representative.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.
- .9 Separate and store materials produced during project in designated areas.
- .10 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off site processing facility for separation.
 - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.
 - .4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

1.13 Disposal of Wastes

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of oil, volatile materials, mineral spirits, paint thinner, waste into waterways, storm, or sanitary sewers.

WASTE MANAGEMENT AND DISPOSAL

- .3 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total tonnage generated.
 - .4 Tonnage reused or recycled.
 - .5 Reused or recycled waste destination.
- .4 Remove materials on-site as Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

1.14 Scheduling

- .1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

2. PRODUCTS

- .1 Not Used.

3. EXECUTION

3.1 Application

- .1 Do Work in compliance with WRW and WSSP.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 Diversion of Materials

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by the Departmental representative, and consistent with applicable fire regulations.
 - .1 Mark containers or stockpile areas.
 - .2 Provide instruction on disposal practices.
- .2 On-site sale of salvaged material is not permitted.

3.3 Waste Diversion Report

- .1 At completion of Project, prepare written Waste Diversion Report indicating quantities of materials reused, recycled or disposed of as well as the following:

WASTE MANAGEMENT AND DISPOSAL

- .1 Identify final diversion results and measure success against goals from Waste Reduction Workplan.
- .2 Compare final quantities/percentages diverted with initial projections in Waste Audit and Waste Reduction Workplan and explain variances.
 - .1 Supporting documentation.
 - .2 Waybills and tracking forms.
 - .3 Description of issues, resolutions and lessons learned.

3.4 Waste Reduction Work plan (WRW)

- .1 Schedule B

(1) Material Category	(2) Person(s) Responsible	(3) Total Quantity of Waste (unit)	(4) Reused Amount (units) Projected	Actual	(5) Recycled Amount (unit) Projected	Actual	(6) Material(s) Destination
Wood and Plastics Material Description							
Chutes							
Warped Pallet Forms							
Plastic Packaging							
Card-board Packaging							
Piping							
Electrical Wiring							
Wood							
Metal							
Other							

3.5 Canadian Governmental Departments Chief Responsibility for the Environment

- .1 Schedule G - Government Chief Responsibility for the Environment:

Province	Address	General Inquires	Fax
Saskatchewan	Saskatchewan Environment and Resource Management 3211 Albert Street Regina SK S4S 5W6	306-787-2700	306-787-3941

WASTE MANAGEMENT AND DISPOSAL

END OF SECTION

BUILT-UP BITUMINOUS ROOFING

1. GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 00: Rough Carpentry
- .2 Section 07 21 16: Blanket Insulation and Vapour Barrier
- .3 Section 07 92 00: Sealants

1.2 REFERENCE STANDARDS

- .1 ASTM International Inc.
 - .1 ASTM C726, Standard Specification for Mineral Fiber Roof Insulation Board.
 - .2 ASTM C728, Standard Specification for Perlite Thermal Insulation Board.
 - .3 ASTM C1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .4 ASTM C1177/C1177M, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .5 ASTM C1396/C1396M, Standard Specification for Gypsum Board.
 - .6 ASTM D41, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
 - .7 ASTM D226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 - .8 ASTM D312, Standard Specification for Asphalt Used in Roofing.
 - .9 ASTM D448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
 - .10 ASTM D450, Standard Specification for Coal-Tar Pitch Used in Roofing, Dampproofing, and Waterproofing.
 - .11 ASTM D1863, Standard Specification for Mineral Aggregate Used on Built-Up Roofs.
 - .12 ASTM D2178, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
 - .13 ASTM D4601, Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
 - .14 ASTM D6380, Standard Specification for Asphalt Roll Roofing (Organic Felt).
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-9Ma, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
 - .2 CAN/CGSB-51.33, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
- .3 CSA Group (CSA)
 - .1 CSA A123.2, Asphalt-Coated Roofing Sheets.
 - .2 CSA A123.3, Asphalt Saturated Organic Roofing Felt.
 - .3 CSA A123.4, Asphalt for Constructing Built-Up Roof Coverings Waterproofing Systems.

BUILT-UP BITUMINOUS ROOFING

- .4 CSA A123.16, Asphalt-Coated Glass Base Sheet.
- .5 CSA A123.17, Asphalt Glass Felt Used for Roofing and Waterproofing.
- .6 CSA A123.21, Standard Test Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane-Roofing Systems
- .7 CSA A231.1, Precast Concrete Paving Slabs.
- .8 CAN/CSA-ISO 9001, Quality Management Systems - Requirements.
- .9 CAN/CSA-ISO 14001, Environmental Management Systems - Requirements with Guidance for Use.
- .10 CSA O121, Douglas Fir Plywood.
- .11 CSA O151, Canadian Softwood Plywood.
- .4 Canadian Roofing Contractors' Association (CRCA)
 - .1 CRCA Roofing Specifications Manual
- .5 Factory Mutual (FM Global)
 - .1 FM Approvals - Roofing Products
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS)
- .7 National Research Council Canada (NRC) - Canadian Construction Materials Centre (CCMC)
 - .1 CCMC Registry of Product Evaluations
- .8 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702.2, Standard for Mineral Fibre Thermal Insulation for Buildings.
 - .3 CAN/ULC-S704, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .4 CAN/ULC-S706, Standard for Wood Fibre Thermal Insulation for Buildings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheets for bitumen, roofing felts, insulation and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements, 01 35 43 - Environmental Procedures, and indicate VOC content for:
 - .1 Primers.
 - .2 Asphalt.
 - .3 Sealers.
- .3 Provide shop drawings:
 - .1 Indicate flashing, control joints, tapered insulation details.

BUILT-UP BITUMINOUS ROOFING

- .2 Provide layout for tapered insulation.
- .4 Manufacturer's Certificate: certify that products meet or exceed specified requirements.
 - .1 Provide proof of manufacturer's CCMC listing.
 - .2 Provide proof of manufacturer's ISO 9001 registration and compliance.
 - .3 Provide proof of manufacturer's ISO 14001 registration and compliance.
- .5 Test and Evaluation Reports: submit laboratory test reports certifying compliance of bitumens, roofing felts and membrane with specification requirements.
 - .1 Compatibility of materials: submit written declaration to Departmental Representative as described in PART 2, PERFORMANCE CRITERIA.
- .6 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.
- .7 Source Quality Control Submittals: provide three copies of roofing materials purchase order as described in DELIVERY, STORAGE AND HANDLING.
- .8 Manufacturer's field report: in accordance with Section 01 45 00 - Quality Control.
- .9 Reports: indicate procedures followed, ambient temperatures and wind velocity during application.

1.4 QUALITY ASSURANCE

- .1 Roofing and sheet metal work shall be performed by a qualified roofer in good standing of the CRCA, employing skilled experienced workers working under competent supervision. Submit proof of membership in good standing of the CRCA upon Consultant's request.
 - .1 Provide a certificate or letter of authorization issued by roofing system manufacturer stating Contractor is registered, approved, authorized or licensed by roof system manufacturer to apply their Products and furnish manufacturer's warranties if required.

1.5 FIRE PROTECTION

- .1 Fire Extinguishers:
 - .1 Maintain one cartridge operated type or stored pressure rechargeable type with hose and shut-off nozzle.
 - .2 ULC labelled for A, B and C class protection.
- .2 Maintain fire watch for 1 hour after each day's roofing operations cease.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials in original containers, sealed, with labels intact.
 - .1 Ensure shelf life of materials has not expired.
 - .2 Deliver fasteners in boxes or kegs and keep in protective storage until used.
 - .1 Do not oil or grease fasteners.
 - .3 Supply three copies of purchase orders to Departmental Representative. Include following data:

BUILT-UP BITUMINOUS ROOFING

- .1 Purchase order number.
- .2 Supplier's name and address.
- .3 Purchaser's name and address.
- .4 Contract number and job number.
- .5 Material and governing specification including type, grade, colour, class and quantity.
- .6 Bills of lading for liquid asphalt showing Equiviscous Temperature (EVT), Flash Point Temperature (FP) and Final Blowing Temperature (FBT).
- .7 Shipping instructions.
- .8 Destination.
- .4 Identification for delivery: indicate on containers or wrappings of and materials:
 - .1 Manufacturer's name and brand.
 - .2 Compliance with applicable standard.
 - .3 Mass where applicable.
- .3 Storage and Handling Requirements:
 - .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
 - .2 Provide and maintain dry, off-ground weatherproof storage.
 - .3 Store materials on supports to prevent deformation.
 - .4 Remove only in quantities required for same day use.
 - .5 Store materials in accordance with manufacturers written instructions.
 - .6 Store insulation protected from sunlight and weather and deleterious materials exposure.
 - .7 Remove damaged and rejected materials from site.

1.7 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Apply built-up bituminous membranes only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
 - .2 Do not install built-up bituminous membranes when air and substrate temperature remains below 5 degrees C in accordance with manufacturer's recommendations or when wind chill gives equivalent cooling effect.
 - .3 Install built-up bituminous membranes on dry substrate, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into system.

1.8 WARRANTY

- .1 Warrant work of this Section for a period of ten (10) years against roof leaks as a result of material defects in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Consultant and at no expense to Owner. Defects include but are not limited to; leaking, buckling, opening of seams, bond failure and extensive colour fading.

BUILT-UP BITUMINOUS ROOFING

- .2 In addition to above, provide to Owner an OIRCA written warranty covering defects of workmanship for a period of two (2) years commencing from date of Substantial Performance of the Work and agree to Make Good promptly any defects which occur or become apparent within warranty period in conjunction with membrane manufacturer's warranty.

Part 2 Products

2.1 PLANT AND EQUIPMENT

- .1 Do not use direct fired equipment.
- .2 Use only kettles equipped with thermometers or gauges in good working order.
- .3 Locate kettles in safe place outside of building or, if approved by Departmental Representative, on noncombustible substrate at location to avoid danger of igniting combustible material below.
 - .1 When locating kettles, give consideration to direction of prevailing winds, building fans and air handling units to minimize possibility of smoke and fumes entering surrounding occupied buildings.
 - .2 If wind direction causes smoke and fume problems, relocate kettles on daily basis when directed by Departmental Representative.
- .4 Maintain supervision while kettles are in operation and provide metal covers for kettles to smother flames in case of fire.
 - .1 Provide suitable fire extinguishers.
- .5 Maintain efficiency of kettles and equipment by frequent cleaning.
 - .1 Remove all carbonized bitumen.
- .6 Use only fibreglass roofing mops.

2.2 DESCRIPTION - ROOFING SYSTEM

- .1 Four ply asphalt fiberglass felt built-up conventional membrane roof system.

2.3 PERFORMANCE CRITERIA

- .1 Compatibility between components of system and adjacent materials is essential.
 - .1 Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.
- .2 Roofing System: to CSA A123.21 for wind uplift resistance.

2.4 MATERIALS

- .1 Adhesives: Manufacturers recommended adhesives specifically formulated for installation of materials outlined below, tested and listed by ULC and Factory Mutual, and meeting the wind resistance rating indicated in this Section.
- .2 Deck Sheathing Board: Glass mat faced, mould resistant roof sheathing boards having a treated gypsum core manufactured in accordance with ASTM C1177/C1177M-08, and as follows:
 - .1 Thickness: 13mm (1/2")

BUILT-UP BITUMINOUS ROOFING

- .2 Long Edges: Square.
- .3 Location: Roof substrates over steel decks and sheathing for parapets.
- .3 Pre-manufactured Vapour Barrier: Modified bituminous, self adhering vapour barrier, designed specifically for installation to deck sheathing board; and having a non-slip surface, as recommended by the roofing manufacturer.
- .4 Roof Insulation:
 - .1 Primary Flat Insulation: Polyisocyanurate closed cell rigid foamed plastic boards conforming to CAN/ULC-S704-11, Type 2, Class 3, faced with glass reinforced organic felt paper, perforated, maximum board size 1220mm x 2440mm (4' x 8') for mechanically attached application, maximum board size of 1220mm x 1220mm (4' x 4') for hot asphalt application. In accordance with CAN/ULC-S770-09, having square edges, minimum LTTR Value 5.6/1", total thickness as indicated on Drawings, perpendicular from edge of roof to a minimum thickness of 50mm (2"); manufactured to a tolerance not exceeding 3mm (1/8") from nominal size in any dimension:
 - .2 Tapered Insulation Acceptable Materials: Tapered to maximum 13mm (1/2") low edge.
 - .3 Drain Sump:
 - .1 One-piece, pre-manufactured, polyisocyanurate, 1220mm x 1220mm (4' x 4') Gemini Drain Set, with minimum 13mm (1/2") per foot of slope, by Atlas Roofing Corporation and represented by Building Resource Inc. Install at all drains.
 - .4 Tapered Edge Strip:
 - .1 Pre-manufactured, polyisocyanurate, tapered from 0 to 50mm (0 to 2") in a 610mm x 2440mm (2' x 8') board by Atlas Roofing Corporation and represented by Building Resource Inc. Install at all parapets, and other areas as needed and shown on the drawings.
- .5 Insulation Overlay Board: Fibreboard cover board for normal traffic roofs and slopes less than 6%; cellulosic cover board for roof slope less than 6%: 13 mm (1/2") asphalt coated fibreboard conforming in accordance with CAN/ULC S706, fully adhered to primary insulation.
- .6 Built-Up Membrane System
 - .1 Fibreglass Felt: Asphalt coated fibreglass felt in accordance with CSA A123.17-05 (R2009) and ASTM D2178 - 04, Type IV, and as follows:
- .7 Base Sheet: Asphalt coated glass fibre felt, to ASTM D4601 - 04, Type II, factory coated, nominal 1.1 kg/m²; and as follows:
- .8 Bituminous Materials
 - .1 Asphalt: Conforming to CSA A123.4 – 04 (R2008), Type 3 on cants and vertical surfaces; Type 2 elsewhere.
 - .2 Asphalt Primer: Unfilled asphalt conforming to CGSB 37-GP-9Ma.
 - .3 Roofing Cement: Cut back asphalt plastic cement conforming to CAN/CGSB-37.5.
 - .4 Bituminous Primer for SBS Membranes: As recommended by membrane manufacturer.
- .9 Accessories

BUILT-UP BITUMINOUS ROOFING

- .1 Metal Flashing: Refer to Section 07 62 00.
- .2 Strip Flashing Base Sheet: Styrene butadiene styrene (SBS), modified asphalt membrane 1/8" thickness reinforced with 180g/m² non-woven polyester, coated on both sides with SBS polymerized asphalt in accordance with in accordance with CGSB 37-GP-56M, classification Type 2, Class C, Grade 2; for mopped application and as follows:
- .3 Strip Flashing Cap Sheet: Styrene butadiene styrene (SBS) modified asphalt membrane 1/8" thickness with 180 g/m² non-woven polyester reinforcement, coated on both sides with SBS polymerized asphalt in accordance with CGSB 37-GP-56M classification Type 2, Class C, Grade 2; for torch application; top side self protected with coloured granules and as follows:
- .4 Aggregate Ballast: aggregate ballast in accordance with CGSB 8.2-M88 or ASTM D448-08 of the following type and size:
 - .1 1/4" to 5/8" size, water washed pea gravel, well graded, opaque, non-porous material, free of fines, moisture, ice, snow or long splinters.
- .5 Sealant:
 - .1 Multi-component, chemical curing epoxidized polyurethane conforming to ASTM C920-11, 'Dymonic' by Tremco (Canada) Ltd. Colour as selected later by Consultant.
- .6 Primers: As recommended by sealant manufacturer to suit applicable conditions.
- .7 Fasteners:
 - .1 Roofing Nails: Large head galvanized steel roofing nails of sufficient length to penetrate a minimum of 25mm (1") into wood nailers and conforming to CSA B111, Table 12.
 - .2 Sheet Metal Fasteners: Galvanized steel screw with a hex-head, colour to match sheet metal flashing.
 - .3 Washers: Of same material as sheet metal, 0.040" thick with rubber packings. Colour of metal washers to match metal fastener heads and sheet metal flashing.
- .8 Roof Penetration Sealing System:
 - .1 Modular Curb: Precast, grey polyester resin curb, 50mm (2") high and sized to leave a minimum of 25mm (1") between the curb and the penetration. Basis of Design Product: ChemCurb by ChemLink.
 - .2 Adhesive and Sealant: One component polyether based, meeting ASTM C920, Type S, Grade NS, Class 25. Basis of Design Product: ChemLink M1 Structural Sealant.
 - .3 Pourable Sealer: One component polyether based, 1-Part; ASTM C-920, Type S, Grade S, Class 25, ASTM C-719, 25%+/- (movement), ASTM D-412 175 PSI (tensile), ASTM C-661 30 +/- 3 (hardness), ASTM D-679 45 minutes (tack free). Basis of Design Product: ChemLink One Part Pourable Sealer.
- .9 Walkway Pavers and Insulation Pads:
 - .1 Precast Concrete Paving Slabs: 610mm x 760mm x 50mm (24" x 30" x 2") thick precast concrete paving slabs having 5% to 7% air-entrainment, minimum 6,500 psi compressive strength, passing the salt scaling test, standard diamond texture finish, chamfered edges, patio quality and conforming to CSA A231.1-06/A231.2-06 (R2010).

BUILT-UP BITUMINOUS ROOFING

- .2 Insulation Pads: 508mm x 508mm x 52mm (20"x 20" x2") thick rigid, extruded polystyrene insulation, minimum compressive strength of 35 psi and conforming to CAN/ULC-S701, Type 4.

Part 3 Execution

3.1 QUALITY OF WORK

- .1 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- .2 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual and CRCA Roofing Specification Manual, particularly for health and fire safety precautions.
- .3 Do priming in accordance with manufacturer's written recommendations.
- .4 The interface of the walls and roof assemblies will be fitted with durable rigid material providing connection point for continuity of air barrier.
- .5 Assembly, component and material connections will be made in consideration of appropriate design loads.

3.2 SUBSTRATE EXAMINATION

- .1 Verification of Conditions: examine substrates and immediately inform of Departmental Representative in writing of defects.
- .2 Evaluation and Assessment: prior to beginning of work ensure:
 - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris.
 - .2 Curbs have been built.
 - .3 Drains have been installed at proper elevations relative to finished roof surface.
 - .4 Plywood and lumber nailer plates have been installed to walls and parapets as indicated.

3.3 PREPARATION - HEATING OF ASPHALT

- .1 Heat asphalt in kettle or tanker sufficiently to provide correct EVT range at point of application.
- .2 In cold weather insulate hauling equipment and re-circulation lines to minimize heat loss.
- .3 Do not heat asphalt above its Final Blowing Temperature (FBT) in tanker.
- .4 Heating asphalt above its FBT may be permissible in kettle as long as asphalt is used up within four hours.
- .5 Equip kettle and tanker with working thermometers.

3.4 PROTECTION OF IN-PLACE CONDITONS

- .1 Cover walls, walks, slopped roofs and adjacent work where materials hoisted or used.
- .2 Use warning signs and barriers.
 - .1 Maintain in good order until completion of work.

BUILT-UP BITUMINOUS ROOFING

- .3 Clean off drips and smears of bituminous material immediately.
- .4 Dispose of rain water off substrates and away from face of building until drains or hoppers installed and connected.
- .5 Protect from traffic and damage.
 - .1 Comply with precautions deemed necessary by Departmental Representative.
- .6 Place plywood runways over work to enable movement of material and other traffic.
- .7 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed work and materials out of storage.
- .8 Install insulation promptly to avoid possibility of condensation beneath vapour retarder.

3.5 PRIMING DECK

- .1 Apply deck primer to concrete roofing substrate at the rate specified on the container.

3.6 VAPOUR RETARDER (CONCRETE / GYPSUM BOARD)

- .1 Embed two piles of felts in hot bitumen spread at rate of 1.2 kg/m².
- .2 Apply one ply only for concrete or gypsum board deck.

3.7 INSULATION: FULLY ADHERED, BITUMEN APPLICATION

- .1 Embed insulation in 1 to 1.5 kg/m² mopping of bitumen.
- .2 Place boards in parallel rows with ends staggered, and in firm contact with one another.
- .3 Cut end pieces to suit.

3.8 TAPERED INSULATION: APPLICATION

- .1 Mop insulation to felt vapour retarder and top layer of insulation to bottom layer with hot asphalt at rate of 1 kg/m².
- .2 Install tapered insulation as top insulation layer, in accordance with shop drawings.
 - .1 Stagger joints between layers 150 mm minimum.

3.9 OVERLAY BOARD: ADHESIVE APPLICATION:

- .1 Adhere overlay board to insulation with vulcanized adhesive at rate of one litre per m².
- .2 Place boards in parallel rows with end joints staggered.
 - .1 Cap joints approximately 25 mm.
- .3 Cut ends to suit and apply adhesive in continuous ribbons at 300 mm on centre.

3.10 (EXPOSED) CONVENTIONAL MEMBRANE ROOFING (CMR) APPLICATION

- .1 Membrane application:
 - .1 Starting at low point, perpendicular to slope, embed four plies of roofing felts in hot asphalt over insulation.
 - .2 Overlap sheets 3/4 of their width plus 15 mm for four ply membrane and lap ends 150 mm.
 - .3 Apply asphalt at rate of 1.2 kg/m².

BUILT-UP BITUMINOUS ROOFING

- .4 Extend felts up to top of cant strip.
- .5 Install water cut-offs at end of day, and remove before resuming work.
- .6 Apply uniform flood coat at rate of 3 kg/m² and while bitumen is still hot, apply protective gravel at rate of 20 kg/m².
- .7 Ensure that there are no skips in flood coat. If some are found, sweep gravel aside and reflood area.
- .8 Apply asphalt flood coat at rate of 0.8 - 1.2 kg/m² followed by asphalt emulsion at rate of 1.2 L/m.
- .2 Flashing application:
 - .1 Build flashings out of four layers of felt strippings cemented together and to back-up wall with asphalt.
 - .2 On exterior walls extend membrane flashing up inside face of parapet and over top to outside face of wall.
 - .3 On interior walls, build base flashing up to cavity wall or through wall flashing.
 - .4 Keep nails 200 mm above top of cant strip.
- .3 Gravel surfacing:
 - .1 Inspect entire area to ensure no wrinkles, buckles or fishmouths exist.
 - .2 Apply bitumen and gravel surfacing only after placement of roofing felts and membrane flashings.
 - .3 Apply flood coat of hot bitumen at 3 kg/m² into which, while hot, embed aggregate at minimum rate of 20 kg/m². Ensure aggregate is dry and free from frost.
 - .4 Where double pour is required:
 - .1 Remove loose aggregate and
 - .2 Repeat application of bitumen and gravel at same rate and quantity as first application for total aggregate mass of 30 kg/m² and 5 kg/m² of asphalt.
 - .5 When modified double pour and gravel is required:
 - .1 First pour: 2 kg/m² of asphalt with an application of 10 kg/m² of gravel.
 - .2 Second pour: 3 kg/m² of asphalt with an application of 20 kg/m² of gravel.

3.11 CANTS

- .1 Install prefabricated cants over rigid insulation.
- .2 Apply hot bitumen to receiving surface and embed cant firmly by hand.
- .3 Angle cut cants to fit tightly on back and bottom where roof to wall angle varies from 90 degrees.

3.12 WALKWAYS

- .1 Install walkway concrete paving slabs on top of insulation pads. Place gravel around pavers so as to cover insulation pads completely. Refer to drawings for layout.

3.13 FIELD QUALITY CONTROL

- .1 Inspection:

BUILT-UP BITUMINOUS ROOFING

- .1 Inspection and testing of BUR application may be carried out by testing laboratory designated by Departmental Representative.
- .2 Costs of tests will be paid by Owner.

3.14 CLEANING

- .1 Clean work in accordance with Section 01 74 00 - Cleaning.
- .2 Clean to Departmental Representative's approval, soiled surfaces, spatters, and damage caused by work of this Section.
- .3 Check drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site.

END OF SECTION

PREFINISHED METAL FLASHING AND TRIM

1. GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 10 – Rough Carpentry
- .2 Section 07 51 00 – Built-up Bituminous Roofing
- .3 Section 07 92 00 – Sealants

1.2 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A 653/A 653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint
 - .2 CAN/CGSB-1.181-99, Ready Organic Zinc-Rich Coating
 - .3 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature including product specifications and technical data sheets for sheet metal flashing fasteners and accessory materials. Include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings indicating material, sheet thickness, finish, flashing dimensions and fastenings. Include anchorage, expansion joints and other provisions for thermal movement.
 - .2 Submit manufacturer's catalogue cut sheets for manufactured items.
- .4 Samples:
 - .1 Submit duplicate 100 x 100 mm samples of each type of sheet metal material, finishes and colour.

1.4 QUALITY ASSURANCE

- .1 Erection of metal flashing systems shall be by workmen especially trained and experienced in this type of work. Have a senior, qualified representative at the job site to direct the work of this Section at all times.

1.5 DELIVERY, STORAGE AND HANDLING

PREFINISHED METAL FLASHING AND TRIM

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Handle and store flashing materials to prevent creasing, buckling, scratching, or other damage.

1.6 WARRANTY

- .1 Warrant the work of this Section against defects in materials and workmanship in accordance with General Conditions, but for a period of two (2) years. Agree to promptly make good defects which become evident during warranty period without cost to the Owner.
- .2 Without restricting the generality of the Warranty, defects shall include deformation, buckling, leakage, weather tightness, failure of anchors and fastenings, failure of paint coating and sealants.
- .3 Promptly make good defects and/or failures in the work of this Section upon written notification by the Owner that such exist. Remedy shall include labour, materials, equipment and services required to make good defective work, and to replace components and finishes and Owner's property damaged or disturbed in the course of remedying defects

Part 2 Products

2.1 MATERIALS

- .1 Sheet Metal Materials: Prefinished galvanized sheet steel to ASTM A653/A653M-11 Grade A with G90 designation zinc coating to ASTM A653/A653M-11, factory precoated with Series 8000 paint finish, minimum 26 gauge. Standard colour range to Consultant's later selection.
- .2 Hold-down, fastener clips - 20 ga. galv. steel sheet as above, unpainted.
- .3 Nails, bolts screws and rivets: Material - galvanized steel, stainless steel or same metal as material to be fastened. Type - to approved samples.
- .4 Bituminous Paint: Conforming to CAN/CGSB-1.108-M, Type 2.
- .5 Field Touch-Up Paint: Zinc rich anti-corrosion primer, conforming to CAN/CGSB-1.181-92, 'Galvafruid, Grade SB' by W.R. Meadows of Canada Limited and top coating of type and colour to match finish sheet.
- .6 Underlay for metal flashing: Asphalt laminated 3.6 to 4.5 kg kraft paper.
- .7 Sealant: Multi-component, chemical curing epoxidized polyurethane type sealant conforming to CAN/CGSB-19.24-M90, 'DYmeric 240' by Tremco (Canada) Ltd., or approved equal. Colour as selected later by Consultant. Provide primers, bond breakers and cleaning agents as recommended by the sealant manufacturer.
- .8 All other materials not specifically described but required for a complete and proper installation of the work of this Section shall be new first quality of their respective kinds and subject to the approval of the Consultant.

2.2 FABRICATION

PREFINISHED METAL FLASHING AND TRIM

- .1 Fabricate metal flashings and other sheet metal work to applicable CRCA 'FL' series specifications and as detailed.
- .2 Form flashings, counter flashings, scuppers and copings as required to suit each condition. Use prefinished sheet steel in all locations. Form pieces in 8'-0" maximum lengths. Make allowance for expansion at joints.
- .3 Fabricate sheet metal components with lines, arrises and angles sharp and true and plane surfaces free from objectionable wave, warp or buckle.
- .4 Mitre and seal corners with sealant. Form drip edging at 45 deg angle, secure with a continuous 20 ga. hold-down clip.
- .5 Exposed edges of sheet metal shall be folded back to form a 1/2" wide hem on the side concealed from view. Prefabricate corner pieces for flashings and copings. The workmanship and methods employed for forming, anchoring, cleating and the provision for expansion and contraction of sheet metal work shall be to the approval of the Consultant.
- .6 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .7 Fabricate scuppers and overflow scuppers to applicable CRCA 'FL' Series details and as detailed.
- .8 Apply two coats of bituminous paint to metal surfaces to be in contact with masonry, concrete, mortar or dissimilar metals.

2.3 FINISHING

- .1 Provide 8000 series finished sheet for all work. Colour: As selected by the consultant from the manufactures standard product line.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

- .1 Inspect substrate surfaces on which the work of this Section is erected for any irregularities detrimental to the application and performance of the Work. Confirm conditions satisfactory before proceeding. Report to Consultant in writing, defects of work prepared by other trades and unsatisfactory site conditions. Commencement of work implies acceptance of surfaces and conditions.

3.3 INSTALLATION

- .1 Metal flashing shall be in compliance with best sheet metal trade practice and shall in no way be contrary to sheet metal practice that will qualify for the Guarantee Certificate specified. Install with "S" lock expansion joints or standing seams incorporated on end of flashing length and all joints sealed with mastic.

PREFINISHED METAL FLASHING AND TRIM

- .2 Provide continuous starter strips to present true, non-waving leading edge. Provide clips and anchor to backup in an approved manner to provide rigid, secure installation. Conceal fastenings in completed flashing. Lap, lock and seal all seams.
- .3 Provide underlay under sheet metal. Secure in place and lap joints 100mm (4").
- .4 Install sheet metal flashings, cap flashings and copings as indicated on drawings using flat lock seams. Make joints to permit thermal movement. Make surfaces free from buckling, warp, wave, dents, oil canning or other defects. Make corners square and surfaces straight and in true planes. Equally space joints in cap flashings to suit wall panel module. Space seams not farther apart than 2439mm (8').
- .5 All sheet and strip flashing to be held in place by 14 gauge galvanized iron clips of a size and type to be determined by the construction requirements, except where specifically detailed on the drawings.
- .6 Caulk flashing at cap flashing with sealant.
- .7 Lock end joints and caulk with sealant.
- .8 Use rubber-asphalt sealing compound for joints between sheet metal and bitumen.
- .9 Supply rigid flashing, copings and sheet metal back-up to other trades where required to be built into other work at doors, windows, block openings, curbs and where shown on drawings.
- .10 Take careful note of fans, vents, etc., on mechanical drawings to determine whether flashing and counter flashing is required or whether units are self-counter flashing.
- .11 Caulking shall be installed as per written manufacturer's recommendations.
- .12 Exposed fastenings will be permitted where indicated or where concealed fastening is not possible. Obtain Consultant's approval of exposed fastenings and methods of making same.
- .13 If exposed screws or bolts are used, use cupped neoprene washers.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

FLUID COOLER

Static Verification



REVISION #: _____

NAME: Craig Serediak
COMPANY: AECOM
ADDRESS: 200-2100 8th Street East
Saskatoon, SK - Saskatchewan S7H 0V1

CUSTOMER: AAFC
PROJECT: 60630931
FILE NUMBER: 1
DATE: 21 / 05 / 2021

NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	DC-1
SERVICE		LOCATION	

FLUID COOLER	SPECIFIED	SHOP DRAWINGS	INSTALLED
MANUFACTURER			
MODEL NO.			
SERIAL NO.			
TYPE	PG		
NOMINAL CAPACITY	761.7 MBH		
VIBRATION ISOLATORS			
ENTERING WATER TEMP (°C)	12.8		
LEAVING WATER TEMP (°C)	7.2		
AMBIENT WET BULB TEMP(°C)			
NUMBER OF FANS	8		
MOTOR RPM	990		
MOTOR (KW)	20		
MOTOR MAXIMUM AMPS	28.1		

EXPANSION TANK	SPECIFIED	SHOP DRAWINGS	INSTALLED
MANUFACTURER			
MODEL NO.			
TYPE			
TOTAL VOLUME (L)			
ACCEPTANCE VOLUME (L)			
MAXIMUM OPERATING PRESSURE (KPA)			
MAXIMUM OPERATING TEMP (EC)			
FILL PRESSURE (KPA)			
PRV SET-POINT (KPA)			
LABELS			

FLUID COOLER

Static Verification



REVISION #: _____

NAME: Craig Serediak
COMPANY: AECOM
ADDRESS: 200-2100 8th Street East
Saskatoon, SK - Saskatchewan S7H 0V1

CUSTOMER: AAFC
PROJECT: 60630931
FILE NUMBER: 1
DATE: 21 / 05 / 2021

NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	

EXPANSION TANK	STATUS	COMMENTS
INSTALLATION AND MOUNTING CORRECT		
SERVICE SPACE		
PIPING SUPPORT AND LAYOUT		
ISOLATING VALVES INSTALLED		
RELIEF VALVE INSTALLED		
COMPRESSED AIR FILL SYSTEM INSTALLED		
PRESSURE GAUGE INSTALLED		
GAUGE GLASS INSTALLED		
BACKFLOW PREVENTER INSTALLED		
AIR SEPARATOR INSTALLED		
MAKEUP VALVE INSTALLED		
SYSTEM CONNECTION (SUCTION / DISCHARGE OF PUMPS)		
BACKFLOW PREVENTER INSTALLED, CERTIFIED AND TAGGED		
PRV INSTALLED		
COMPRESSED AIR INLET INSTALLED		
PRESSURE RELIEF VALVE INSTALLED		
PRESSURE GAUGE INSTALLED		
INLET/OUTLET PIPE SIZES CORRECT		
PIPE LAYOUT PERMITS TANK REMOVAL		
DRAIN LINE OPERATION		
GAUGE GLASS OPERATION		
PRESSURE RELIEF VALVE SET		
BACKFLOW PREVENTER OPERATION CHECKED		
EXPANSION TANK LEVEL AND SYSTEM PRESSURE SET		
EXPANSION TANK LEVELS VERIFIED FOR COLD TO HOT WATER		

Static Verification



NAME: Craig Serediak

COMPANY: AECOM

ADDRESS: 200-2100 8th Street East
Saskatoon, SK - Saskatchewan S7H 0V1

CUSTOMER:	AAFC
PROJECT:	60630931
FILE NUMBER:	1
DATE:	21 / 05 / 2021

NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	

EXPANSION TANK	STATUS	COMMENTS
OPERATIONAL TESTS COMPLETE		
PIPE & COMPONENT INSULATION COMPLETE		
AIR VENTING SYSTEM COMPLETE		
SYSTEM CHECKED FOR WATER NOISE		
SYSTEM BALANCING REPORT ATTACHED		
OPERATED FOR 12 HOURS CONTINUOUSLY		
STRAINERS CLEANED		
WORN PARTS & SEALS REPLACED IN PUMPS USED FOR CLEANING		
NO LEAKAGE FROM MECHANICAL SEALS		
NET POSITIVE SUCTION HEAD CHECKED/CALCULATED		
AIR FLOW FOR MOTOR COOLING		

GENERAL COMMENTS:	

POSITION/TITLE	SIGNATURE	DATE
Building Operations and Maintenance Staff		
Cx Authority/ Commissioning Provider		
Design Consultants		
Contractors/Subcontractor		
Manufacturer's Representatives		

FLUID COOLER

Start-Up



REVISION #: _____

NAME: Craig Serediak
COMPANY: AECOM
ADDRESS: 200-2100 8th Street East
Saskatoon, SK - Saskatchewan S7H 0V1

CUSTOMER: AAFC
PROJECT: 60630931
FILE NUMBER: 1
DATE: 21/05/2021

SHEET INTENTIONALLY LEFT BLANK FOR INDIVIDUAL TO POPULATE AS NEEDED

GENERAL COMMENTS: To be completed at receipt of specific vendor information.

POSITION/TITLE	SIGNATURE	DATE
Building Operations and Maintenance Staff		
Cx Authority/ Commissioning Provider		
Design Consultants		
Contractors/Subcontractor		
Manufacturer's Representatives		

FLUID COOLER

Functional Performance Testing



REVISION #: _____

NAME: Craig Serediak
 COMPANY: AECOM
 ADDRESS: 200-2100 8th Street East
 Saskatoon, SK - Saskatchewan S7H 0V1

CUSTOMER: AAFC
 PROJECT: 60630931
 FILE NUMBER: 1
 DATE: 21/05/2021

Secondary Fluid Cooler DC-1				
PRE-OPERATIONAL TESTING (POT) CHECK SHEET				
TAG	DESCRIPTION	PID	SYSTEM	SUB-SYSTEM CODE
1 - PREREQUISITES				
STEP	PROCEDURE	VERIFIED	ISSUE DESCRIPTION	PUNCH
1.1	Job hazard analysis is available and has been reviewed by all workers involved			
1.2	Site wide notice has been made that testing will be performed on this system			
1.3	Necessary commissioning tools are available (radio, tag, tape, harness, etc.)			
1.4	Ensure Cooler is turned over to commissioning			
1.5	Mechanical, civil and electrical acceptance documentation available and verified: - Rotating equipment alignment report - Cable continuity check report - Oil and grease certification - Mechanical inspection notice with corresponding punch list - Work package acceptance sheet to commissioning			
1.6	Pre-commissioning documentation available: - Instrument calibration and configuration report - I/O check - Pre-operational verifications - Final alignment report - Electrical motor bump test certificate			
1.7	Testing of instruments back to HMI.			
2 - OPERATIONAL TEST				
STEP	PROCEDURE	VERIFIED	ISSUE DESCRIPTION	PUNCH CATEGORY
2.1	Verify that no construction is ongoing in and around the Cooler associated and auxilliary equipment			
2.2	Blue Commissioning chain/red tape installed around the area for control. Red tape if guarding removed to restrict access.			
2.3	Walk down system and ensure it is clear of tools, debris and material.			
2.4	Ensure all guards, covers, hatches, etc. are in place and secured as required.			
2.5	Check that all hold-down and joint bolts in the base frame			
2.6	Check oil and grease for correct levels, and they meet manufacturer specifications			
2.7	Check inlet and outlet piping flange bolts to ensure proper torque.			
2.8	Check manual valves to ensure they function properly.			

FLUID COOLER

Functional Performance Testing



REVISION #: _____

NAME: Craig Serediak
 COMPANY: AECOM
 ADDRESS: 200-2100 8th Street East
Saskatoon, SK - Saskatchewan S7H 0V1

CUSTOMER: AAFC
 PROJECT: 60630931
 FILE NUMBER: 1
 DATE: 21/05/2021

2.9	Ensure fluid source is available to supply the Cooler			
2.10	Remove locks and energize the fans on the Cooler			
2.11	Verify all controls are available on the HMI.			
2.12	Ensure all personnel is clear of the equipment. Start the Cooler fans locally to bump & verify Rotation.			
2.13	Test run the Cooler for 1 hour.			
2.14	Record vibration/temperature information on attached sheet.			
2.15	Record motor operating characteristics on attached sheet.			
2.16	Record Temperature for chiller supply line and return line on attached sheet			
2.17	Record Pressure differential between chiller supply line and return line on attached sheet			
2.18	Record flow rate from Cooler on attached sheet			
2.19	Record sound data in attached sheet			
2.20	Ensure equipment is safe before you leave, housekeeping in good order.			

GENERAL COMMENTS:

FLUID COOLER
Functional Performance Testing



REVISION #: _____

NAME: Craig Serediak
COMPANY: AECOM
ADDRESS: 200-2100 8th Street East
Saskatoon, SK - Saskatchewan S7H 0V1

CUSTOMER: AAFC
PROJECT: 60630931
FILE NUMBER: 1
DATE: 21/05/2021

3 - APPROVAL AND SIGN-OFFS		
POSITION/TITLE	SIGNATURE	DATE
Building Operations and Maintenance Staff		
Cx Authority/ Commissioning Provider		
Design Consultants		
Contractors/Subcontractor		
Manufacturer's Representatives		

Coupled Motor Data Run in Sheet

EQ / Motor Tag:		HP:		RPM:		Efficiency:	
Serial Number:		Voltage:		HZ:		SF:	
Make / Model:		FLA:		PF:		Insulation:	
NOTES:	Record VFD HZ @ percentage intervals. Record 15-minute intervals once 100% is maintained Above 150 HP require 4 hour run minimum.						

Pre-Start Up Checks:

Direction of rotation							
Winding Resistance	AB	AC	BC	OverLoad Resistance	A-G	B-G	C-G

[illegible]

Cooler Data Sheet

Entering Temp. degC		Exiting Temp. degC		Pressure kPa		Flow Rate L/s		Sound dBA at 10ft	
Required	Sensor Reading	Required	Sensor Reading	Required	Sensor Reading	Required	Sensor Reading	Required	Sensor Reading
12.8		7.2		57.1		10.7		70	