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Basis of Design Narrative

MECHANICAL

Winnipeg Fire Paramedic Station (WFPS) 15, Winnipeg, MB

The following basis of design narrative is based on a schematic design and intended for the procurement of a mechanical and electrical design build contract. This specification is intended to describe the minimum performance requirements of the mechanical and electrical systems. Proposed deviations from the basis of design shall be described fully for review and acceptance by the Owner. Refer to design-build request for proposal for additional requirements.

I. Basis of Design:

1. Plan drawings by City of Winnipeg dated February 26, 2025.
2. Generally, this scope of work will include the construction of a new two storey fire station, with basement, for WFPS in Winnipeg, Manitoba. The work will include but not be limited to all building, site development, and site services.
3. The Project design minimums are to be based around, but not restricted, to the following:
 - a) Manitoba Building Code (2020)
 - b) Manitoba Plumbing Code (2020)
 - c) Manitoba Fire Code (2020)
 - d) Manitoba Energy Code for Buildings (2020)
 - e) NFPA 13 – Standard for the Installation of Sprinklers (2025)
 - f) CSA B64.10 – Selection and Installation of Backflow Preventors (2023)
 - g) CSA B52 – Mechanical Refrigeration Code (2023)
 - h) CSA B149.1 – Natural Gas and Propane Installation Code (2020)
 - i) ASHRAE 62.1 – Ventilation for Acceptable Indoor Air Quality (2016)
 - j) Efficiency Manitoba Commercial Building Standard
 - k) City of Winnipeg Green Building Policy: New City-Owned Buildings and major additions
 - l) Winnipeg Accessibility Design Standard
 - m) City of Winnipeg Universal Design Policy
 - n) City of Winnipeg Standard Construction Specifications
 - o) WFPS Station Standards – Version 4, January 2025
 - p) WFPS Program and Functional Requirements

II. Site Services

1. Incoming services installed by Civil services contractors up to 1500 mm (5 ft) from building.
2. Incoming services
 - a) Sanitary sewer line shall be 6 inch, location: south of building
 - b) Storm sewer line shall be 6 inch, location: south of building
 - c) Natural gas service and central gas meter, location: south of building

3. Site services for mechanical systems outside the building perimeter including incoming water service, sanitary waste, and storm drain, by Civil
4. Stormwater retention by Civil

III. Plumbing

A. General Description:

1. Provide domestic hot, cold, and recirculation piping to serve plumbing fixtures shown on architectural floorplans and as listed below.
2. Incoming water supply, meter, backflow prevention, and sprinkler tree to be located in Mechanical 008.
3. Arrange main water supply pipes within ceiling space of main floor and basement corridors. Provide isolation valves for each washroom / fixture group in accessible location within ceiling space.
4. Domestic cold-water piping to be sized for flush valve water closet fixtures
5. Thermally insulate all plumbing piping
6. Isolation valves shall be provided as follows:
 - a) At water main,
 - b) At each fixture group
 - c) At every piece of equipment
7. Water hammer arrestors to be provided at each fixture group
8. All components of domestic water systems to be lead free compliant
9. **Pressure Washer Water Supply:**
 - a) Provide 3/4 inch cold water supply connection on wall with ball isolation valve and threaded cap connection
 - b) Provide two within apparatus bay, exact location to be confirmed by Owner.
 - c) Portable pressure washer to be supplied by Owner
10. **Truck Filling Water Supply:**
 - a) Provide 1 1/2 inch cold water supply connection on wall with ball isolation valve and threaded cap connection
 - b) Provide two within apparatus bay, exact location to be confirmed by Owner. Co-locate each truck filling supply with each pressure washer supply.
11. **Gear Washer Water Supply and Drain:**
 - a) Provide 1 inch cold water supply pipe with two 3/4 inch water supply connections on wall with ball isolation valves and threaded cap connections. Provide 3 inch hub drain.
 - b) Gear washer to be provided by Owner (future), expected to be located in Hose Wash (to be confirmed).
12. **Coffee Maker Water Supply:**
 - a) Provide 1/2 inch cold water supply for coffee maker on kitchen counter. Terminate copper pipe below countertop with shutoff valve. Provide flexible hose up through hole in counter with quarter turn shut off valve at end of hose.

13. Combine sanitary drain piping at ceiling basement level from individual plumbing fixtures and discharge at sanitary service location.
14. Sanitary drainage piping buried below grade to be plastic, piping above grade is plastic in non-visible locations and cast iron or copper in visible or publicly accessible locations where damage can be caused by contact. Insulated piping is considered non-visible.
15. Provide internal rainwater leaders to serve roof drains. Discharge to storm drain system. Emergency overflow roof drains may be provided in lieu of scuppers, according to MPC. Discharge overflow roof drains to grade with nozzles, if applicable. Coordinate with architect.
16. Provide 4 inch PVC air intake pipe for Compressor Room 135. Provide gooseneck with bugscreen on roof, with intake minimum 3 feet above roof level. Position intake pipe a minimum of 25 feet from all building exhausts and plumbing vents. Terminate in Compressor Room with open end near compressor, according to compressor manufacturer's instructions.

B. Plumbing Fixtures

1. Provide washroom fixtures and trim for all fixtures indicated on the architectural plans, according to WFPS Stations Standards, Section 9.0 Plumbing Fixtures, and as supplemented/superseded by the following:
 - a) **Kitchenette Sinks (SK-4):**
 - (1) Model: Franke CUX11021-ADA-CA
 - (2) Undermount
 - (3) 18-8 stainless steel, satin finished bowl
 - (4) Type 304 stainless steel
 - b) **Kitchenette Faucets (FCT-3):**
 - (1) Model: Delta 1959LF
 - (2) Bar and prep sink faucet, single handle deck mount
 - (3) Flow rate: 1.5 gpm
 - (4) Mounting: single hole, without escutcheon
 - (5) Finish: polished chrome
 - (6) CSA B651 compliant
 - c) **Hose Wash Sink (SK-5):**
 - (1) Two compartment stainless steel sink integrated in counter, according to architectural
 - d) **Hose Wash Sink Faucet (FCT-4):**
 - (1) Model: Delta 28C4243-S
 - (2) Wallmount gooseneck faucet with dual hooded levers
 - (3) Flow rate: 1.5 gpm
 - (4) Spray type: aerated
 - (5) Mounting: 8" centres
 - (6) Finish: polished chrome
 - e) **Kitchen Handwash Sink (SK-6):**
 - (1) Single compartment stainless steel sink integrated in counter, according to architectural
 - f) **Kitchen Handwash Faucets (FCT-5):**
 - (1) Model: Delta 1959LF
 - (2) Bar and prep sink faucet, single handle deck mount

- (3) Flow rate: 1.5 gpm
- (4) Mounting: single hole, without escutcheon
- (5) Finish: polished chrome
- (6) CSA B651 compliant

g) Laundry Sink (SK-7):

- (1) Model: Kohler Ballad K-5798-3
- (2) Topmount
- (3) 18-8 stainless steel, satin finished bowl
- (4) Type 304 stainless steel
- (5) Three faucet holes

h) Laundry Sink Faucet (FCT-6):

- (1) Model: Delta 27C1234
- (2) Deckmount gooseneck faucet with dual sanitary hood levers
- (3) Flow rate: 1.5 gpm
- (4) Spray type: aerated
- (5) Mounting: 8" centres
- (6) Finish: polished chrome

- 2. Final connections to plumbing fixtures with chrome plated copper tubing in exposed locations and flex hose in non-visible locations.
- 3. Drain piping for all exposed barrier free lavatory and sink piping to be insulated with pre-manufactured insulation kit, to CSA B651.

C. Plumbing Equipment

1. Bottle Filler (BF-1):

- a) Model: Elkay LZ8WSSMC
- b) Refrigerated surface mount bottle filling station, stainless steel
- c) Provide one, in Gym 007

2. Wall Hydrants (WH-1):

- a) Exterior wall hydrants, vacuum breaker, freeze-protected, c/w brass lock box
- b) Provide four, one on each side of building

3. Emergency Eyewash / Shower Combination (ES-1):

- a) Model: Guardian G1902P, or equivalent
- b) Provide with thermostatic mixing valve within stainless steel wall-mounted cabinet.
- c) Provide one, in Apparatus Bay 137

4. Washing Machine Boxes (WM-1):

- a) Model: Oatley Quadro, or equivalent
- b) PVC washing machine outlet box, to recess water supply valves and drains into wall.

5. Hose Bibs (HB-1):

- a) Exposed-type anti-contamination wall faucet with ¾ inch male hose connection and anti-siphon vacuum breaker.
- b) Exterior finish to be brass, operating handle to be cast-iron, coloured blue or red (for cold or hot), and inlet connection shall be ½" F.P.T.
- c) Provide one hot/cold pair in Hose Tower/Storage 133 with 25 foot hose and reel



6. Backflow Preventors:

- a) Provide backflow prevention devices where required by CSA B64.10-23, including the following locations:
 - (1) Incoming water supply
 - (2) Fire protection water supply
 - (3) Truck filling water supply connection (x2)
 - (4) Pressure washer water supply connection (x2)
 - (5) Commercial dishwasher
 - (6) Gear washer
 - (7) Clothes washers
 - (8) Coffee maker with direct water supply connection
- b) Truck filling, pressure washer, and gear washer water supply connections may be protected by a common backflow preventor, where convenient

7. Floor Drains:

- a) Open strainer: all washrooms and showers, mechanical room general open areas, janitor's room, bottom of Hose Tower drain pit (pit by architectural/structural)
- b) Funnel type: mechanical rooms near hot water tanks and equipment with condensate drain

8. Trench Drains:

- a) Model: Watts Dead Level DX, or equivalent
- b) Pre-sloped polypropylene or HDPE modular trench drain system with ductile iron frame
- c) Heavy-duty ductile iron grates that lock down to frame, conforming to ASTM specification A536-84
- d) Provide one trench drain in Apparatus Bay 137, location and length according to architectural

9. Downspout Nozzles (DS-1):

- a) Model: Zurn Z119, or equivalent
- b) Nickel bronze body, wall flange, outlet nozzle
- c) Only required if overflow roof drains are provided in lieu of scuppers

10. Trap Seal Primers:

- a) Provide electronic type trap seal primers for all floor drains

11. Domestic Water Heaters:

- a) Gas fired, direct vented, domestic hot water tanks
- b) Efficiency to MECB
- c) Provide with hot water recirculation pump and expansion tank
- d) Recirc pump to be controlled/monitored by building automation system (BAS)
- e) Locate within Mechanical 006

12. Sump Pumps:

- a) Provide duplex sump pump system with basin for weeping tile drainage. Duplex controller alarm status to be monitored by BAS.

13. Oil and Grit Interceptor:

- a) Provide oil and grit interceptor to serve trench drain in Apparatus Bay 137. Install interceptor in Apparatus Bay floor, near wall, away from high traffic areas, in accessible location for cleaning.

14. Grease Interceptor:

- a) Provide grease interceptor to serve all fixtures and drains in the kitchen. Install interceptor in Apparatus Bay floor, near wall, away from high traffic areas. Interceptor to ASME A112.14.3 and CSA B481.1.

D. Plumbing Materials:

1. Domestic water: copper or PEX
2. Sanitary waste:
 - a) Above ground: up to 2.5 inch copper or PVC, 3 inch or over PVC
 - b) Below ground: PVC
3. Insulation: fiberglass-free ASJ pipe insulation, thickness to MECB
4. Roof drains: control flow drains, cast iron lacquered body, flashing clamping flange, cast iron dome. Provide trap when connecting roofs at different levels.

IV. HVAC

A. General Description:

1. Natural gas forced-air furnaces to serve most of the building. Furnaces to be installed in Mechanical / Storage 201. Zoning according to mechanical plans.
2. Fan coils with air-source heat pumps and electric auxiliary heating to serve Training 004 and Dining Room 113.
3. Natural gas make-up air units with DX cooling to serve Apparatus Bay 137 and Kitchen 112.
4. Rooftop unit with packaged DX cooling and economizing to serve Apparatus Bay 137.
5. One ERV to serve rooms north of Apparatus Bay 137, one ERV to serve remainder of building.
6. Corridor ceilings to be used as common return-air plenum for all furnaces.
7. Equipment efficiencies to meet or exceed those required by MECB, unless stated otherwise

B. Energy Supply:

1. Equipment to be natural gas, except where noted otherwise
2. Steel natural gas piping to CSA B149.1
3. Provide natural gas connections to the following Owner supplied equipment:
 - a) Natural gas range
 - b) Natural gas BBQ on patio
4. Route natural gas distribution piping within building. Allow for expansion loops in long runs of piping.

C. Heating Systems

1. Provide high efficiency direct vented natural gas fired furnaces to condition entire building, except for Apparatus Bay and connected rooms. Expected quantity of three, zoned as shown on mechanical plans. Install furnaces in Mechanical 201. Provide common outdoor air and relief air ducts for full economizing functionality.
2. Provide one fan coil unit with electric heating element to serve Training Room 004.
3. Provide one fan coil unit with electric heating element to serve Dining Room 113.
4. Provide two gas fired direct vented natural gas unit heaters to condition Apparatus Bay 137.
5. Radiant electric heating panels to be provided (by electrical) for:
 - a) Gear Lockers / Drying Room 134
 - b) Shower 117
 - c) Shower 119
 - d) Shower 121
6. Ceiling mounted electric unit heater to be provided (by electrical) for:
 - a) Storage 002
 - b) Mechanical Room 008
 - c) Electrical 009
 - d) Hose Tower / Storage 133
 - e) Compressor Room 135
 - f) Storage 136
 - g) Mechanical / Storage 201
7. Electric forced-flow heater to be provided (by electrical) for Vestibule 101.
8. Electric baseboard heaters to be provided (by electrical) for:
 - a) WC 005.
 - b) Stair ST01
 - c) Stair ST02
 - d) Laundry / Storage 115

D. Cooling Systems

1. **Condensing Units:**
 - a) Provide one air cooled condensing unit for each ERV. Stage 1 cooling to be variable capacity, where equipment tonnage allows. Install condensing units on roof.
2. **Heat Pumps:**
 - a) Provide five air-source heat pumps, one for each furnace and one for each fan coil. Outdoor units to be installed on roof.
3. **Split A/C Units:**
 - a) Provide ductless split A/C unit with wall-mounted indoor evaporator unit to serve IT Room 003. Install outdoor condensing unit on roof. 1 ton cooling capacity expected – confirm internal heat loads with Owner.

E. Ventilation Systems

1. Make-up Air Units:

- a) Provide make-up air unit to serve Apparatus Bay 137 and connected rooms. Direct fired natural gas, variable airflow, packaged DX cooling, MERV 8 filters. Install on roof.
- b) Provide make-up air unit to serve kitchen. Indirect gas fired, constant airflow, packaged DX, MERV 8 filters. Install on roof.

2. Energy Recovery Ventilators:

- a) Provide one reversing core ERV (no heat, no cooling) to serve:
 - (1) Storage 136
 - (2) Compressor Room 135
 - (3) Gear Lockers / Drying Room 134
 - (4) Hose Tower / Storage 133
- b) Provide a second reversing core ERV (indirect gas heat, DX cooling) to serve:
 - (1) Remainder of spaces in building requiring ventilation, that are not the Apparatus Bay

3. Exhaust Fans:

- a) Provide direct drive variable speed upblast style general exhaust fan on roof to serve Apparatus Bay 137 and connected rooms.
- b) Provide NFPA 96 compliant upblast, grease rated, exhaust fan to serve kitchen exhaust good. Install exhaust fan on roof.

4. Compressor Room:

- a) Provide exhaust duct from Owner supplied compressor to louvre on exterior wall, with motorized damper.
- b) Provide air intake duct from louvre on exterior wall, with motorized damper, down to floor level near compressor, according to manufacturer's instructions.

5. Ceiling Fans:

- a) Provide 56-inch ceiling fans, rated for high-moisture environments, variable speed, reversible direction:
 - (1) Four in Apparatus Bay
 - (2) One in Hose Tower / Storage

6. Vehicle Exhaust System:

- a) Provide a Plymovent SBTA track style vehicle exhaust system with magnetic tailpipe grabber for each of two Apparatus Bays. Provide with wireless automatic controller with one pressure sensor per hose drop and a relay for monitoring status by the Building Automation System.

7. Air Filtration Units:

- a) Provide one industrial strength self-contained air cleaner suspended from ceiling in Apparatus Bay 137. Air cleaner to contain variable speed blower and three filters: MERV-8 pre-filter, MERV-16 high-efficiency particulate filter, and a carbon/potassium permanganate filter. Provide with wall mounted controller.

F. Materials

1. Ductwork:
 - a) Galvanized steel, typical
 - b) Carbon steel for kitchen grease exhaust ducting
2. Duct Insulation:
 - a) Insulation with vapour barrier jackets, thickness according to MECB
 - b) Exterior applications: Provide insulation with vapour barrier jacket. Cover the insulation with caulked aluminum jacket or exterior rated aluminum flexible self-adhesive jacket with seams located on bottom side of horizontal duct section.
 - c) External insulation on duct work exposed in Mechanical Equipment Rooms or Finished Spaces below 10 feet above finished floor: Provide canvas jacket ready for finish painting or interior rated aluminum flexible self adhesive jacket.
3. Louvers: Fixed blade extruded aluminum, drainable, with birdscreen
4. Motorized dampers: Insulated, thermally broken
5. Kitchen hood: stainless steel, to NFPA 96
6. Grilles and diffusers:
 - a) Supply: square cone diffusers for ACT and drywall ceilings
 - b) Supply: round cone diffusers for Apparatus Bay make-up air supply
 - c) Exhaust/Return: eggcrate
7. Provide combination fire/smoke dampers to MFC
8. Provide minimum 3 feet of acoustic duct lining on all ducts penetrating Dormitory Rooms, Lieutenant's Quarters, Captain's Office, and Training Room.
9. Provide acoustically insulated cross-talk silencers for transfer ducts for Dormitory Rooms, Lieutenant's Quarters, Captain's Office, and Training Room.
10. Provide acoustically insulated return air elbows and minimum 3 feet of acoustically insulated duct on discharge of all fan coils.
11. Provide silencer on MAU supply duct serving Kitchen 112.
12. Refrigeration piping to CSA B52. Refrigeration piping insulation shall be flexible foamed plastic closed cell pipe insulation. All outdoor piping shall be insulated and jacketed with UV resistant PVC jacketing.

G. Installation

1. Ducts and fittings to be designed to SMACNA HVAC Duct Construction Standards - Metal and Flexible.
2. Firestopping to MFC.

V. Controls

A. Building Automation System

1. Provide control system compatible with The City of Winnipeg's Johnson Controls system, including Johnson Advanced Field Equipment Controllers (FACs)
2. All packaged controls, field controllers, wiring, devices and actuators, and supervisory controller to be provided by the contractor.
3. Contractor to provide all programming and graphics for a complete system. The contractor will migrate the system, including graphics, into the existing City of Winnipeg Metasys User Interface (MUI).
4. Contractor to commission controls system.
5. The Contractor will connect the supervisory controller to the City of Winnipeg ADX server.
6. An operator work station (OWS) will not be provided as part of the contract.
7. Contractor to provide home-run cables from Supervisory Controller to patch panel in IT Room.
8. Contractor to provide home-run cable from Compressor Room to patch panel in IT Room for future equipment connection.

B. General

1. All mechanical equipment shall be monitored and controlled by the BAS
2. All electrical heaters shall be activated by the BAS via low voltage space thermostats, connected to the BAS
3. Only the alarm status of the sump pit control panel, vehicle exhaust system, and CO/NO2 detector system shall be monitored (no control output)
4. Kitchen range exhaust fan and make-up air unit shall be interlocked
5. Apparatus bay general exhaust fan and make-up air unit shall be interlocked

C. Apparatus Bay

1. Provide CO/NO2 detection system to monitor air quality and trigger exhaust fan
2. Exhaust fan to vary speed to accommodate several modes of activation, and combination of the modes:
 - a) Manual by twist timer (without hold)
 - b) Automatic by CO/NO2 detection
 - c) Automatic by Vehicle Exhaust fan

VI. Fire Protection

A. General

1. Provide sprinklers throughout building to NFPA 13
2. Provide fire department connection at the front entrance
3. Portable fire extinguisher and cabinets to be provided by architectural

B. Fire Suppression

1. Provide commercial kitchen grease exhaust hood suppression system

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