The following addendum supersedes information contained in drawings and specifications issued for the project to the extent referenced. This Addendum forms part of the Tender Documents and is subject to all of the conditions set out in the contract conditions.

1. REQUESTS FOR INFORMATION

.1 **Please confirm that EF-002/004/005/006/007/008/009/011 all exhaust into the single 350mmx350mm duct on the west wall of the apparatus bays (terminating at the north wall on GL1/ C & D.**

.1 .1 Response: Correct.

.2 **M001 Indicates that the Unit Heaters are supplied by Mechanical. No schedule has been provided for these units, please advise.**

.1 Response: Refer to attached UH schedule.

.3 **L2 HVAC does not indicate any internal duct insulation with any equipment. Is this correct?**

.1 Response: All return air plenums at fan coils shall have 25mm acoustic insulation. Fan coil supply ductwork shall be acoustically insulated up to first take off.

.4 **L1 HVAC has minimal internal duct insulation drawn, is this correct?**

.1 Response: Fan coils to have acoustic insulation until 1st branch.

.5 **EF-004/006/008 do not indicate F/D's when entering the apparatus bays, please confirm this is correct?**

.1 Response: Correct. Refer to Architectural drawings for fire separation location between administration and apparatus bay.

.6 **M001 indicates that the FFH are to be supplied by the mechanical trade, no schedule is provided. Please confirm this is correct.**

.1 Response: Refer to attached FFH schedule.

.7 **M002 Fan Schedule does not indicate any notes associated with the fans, please confirm that is correct.**

.1 Response: Refer to updated fan schedule attached.

.8 **In addition to the above, typically we see CF-001/002 and EF-001 come specified with VFD's, please confirm.**

.1 Response: Correct.

.9 **M002 ERV Schedule note #1 "provide with manufacture's control unit" please clarify which control is preferred, a time clock?**

.1 Response: Correct.

.10 **M002 Diffuser & Grilles Schedule note #4 "provide opposed blade dampers for return and exhaust grilles", please specify the correct grille that is desired as this note is attached to a square plaque diffuser.**

.1 Response: Note to be removed.

.11 **M402 Apparatus Bays – 3 exhaust rails are drawn, please confirm that the 4th is in fact required at the East wall between GL5 & GL2 and is only miss drawn.**

.1 Response: Correct.

.12 **Please confirm grille types for the UH's, the noted SD-50/44/41/53 are not scheduled.**

.1 Response: Grille type to be SD-3 Round Cone Diffuser.

.13 **Please confirm diffuser type for all SDP-1's shown on drawings as they are not scheduled.**

.1 Response: Diffuser type to be SD-2

.14 **Do the Transfer Air ducts drawn in Dorm 1 thru 4 require grilles? And internal insulation?**

.1 Response: All transfer ducts will have 25mm internal acoustic insulation and RG-1 type grilles on either end.

.15 **Please confirm desired grille type for the EG-1 drawn but not specified.**

.1 Response: All grilles tagged EG-1 to be RG-1.

.16 **The specifications call for K Copper inside the building. K copper is very expensive and getting hard or the suppliers to get. A suggestion as an alternate would be Aquarise CPVC. Can we use Aquarise CPVC as an alternate to the specified K Copper for the domestic water piping?**

.1 Response: Aquarise is an acceptable alternative for noncombustible buildings.

.17 Louvers serving Gear room to be 600x350.

.18 Duct drops to serve under locker ductwork to be 400x400.

.19 Ductwork downstream of EF-006/007/008 to be 200x100.

.20 Exhaust duct from SCBA-205 to connect to 350x350 duct in Apparatus bay.

2. DRAWINGS – MECHANICAL

2.1 Drawing No.: M002 Mechanical Schedules

.1 Add: Unit Heater (Electric) schedule

.1 Refer to attached Unit Heater (Electric) schedule for UH-001 through UH-004 specification

.2 Add: Force Flow Heater - Electric schedule

.1 Refer to attached Force Flow Heater - Electric schedule for FFH-1 and FFH-2 specification.

2.2 Drawing No.: M401 HVAC Plan Level 1

.1 Revise:

.1 HRV-1 – Refer to attached sketch for updated O/A and R/A locations.

.2 HRV-2 to be model HE-1XJINV. E/A and O/A louver locations to be swapped to match duct connections of updated model. Refer to attached sketch.

.3 HRV-3 to be model HE-1.5JINV

3. SPECIFICATIONS – MECHANICAL

3.1 Section: 25 00 05 Common Work Results for Integrated Automation

.1 Item No.: 3.4

The following addendum supersedes information contained in drawings and specifications issued for the project to the extent referenced. This Addendum forms part of the Tender Documents and is subject to all of the conditions set out in the contract conditions.

.1 Add: Sequence of operations. Refer to attached specification section

3.2 Section: 23 05 01 Acceptable Manufacturer

.1 Item No.: 2.1

.1 Add: ESC Automation with Delta systems for Approved Controls contractors

.2 Add: Prep Energy for Approved Controls contractors

.3 Add: Peakflow Energy Solutions for Balancing and Commissioning.

END OF MECHANICAL ADDENDUM NO. 4

The AME Consulting Group Ltd.

Angela Robinson, P.Eng., LEED Green Assoc.
Project Manager- Victoria, BC

Permit to Practice No: 1000236
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. C. ROBINSON
2022-09-15

PROFESSIONAL'S SEAL & SIGNATURE

UNIT HEATER (ELECTRIC)

EQUIPMENT TAG	QTY	LOCATION	MANUFACTURER	TYPE	MOUNTING TYPE	MODEL	AIR FLOW (LPS)	ESP (in.wg)	MOTOR (HP)	AIR COIL EAT (DEG C)	AIR COIL LAT (DEG C)	HGT CAP (KW)	LINE AMPS (A)	ELEC (V/PH/HZ)	NOTES
UH-001	1	APPARATUS BAY	NEPTRONIC	DUCTED	CEILING HUNG	CMU12B080DD	330.4	0.2	FRAC	-9.0	11.1	8	49.66	208/1/60	ALL
UH-002	1	APPARATUS BAY	NEPTRONIC	DUCTED	CEILING HUNG	CMU12B080DD	330.4	0.2	FRAC	-9.0	11.1	8	49.66	208/1/60	1
UH-003	1	APPARATUS BAY	NEPTRONIC	DUCTED	CEILING HUNG	CMU12B080DD	330.4	0.2	FRAC	-9.0	11.1	8	49.66	208/1/60	1
UH-004	1	APPARATUS BAY	NEPTRONIC	DUCTED	CEILING HUNG	CMU12B080DD	330.4	0.2	FRAC	-9.0	11.1	8	49.66	208/1/60	1

NOTES:

1 PROVIDE MANUFACTURER DUCT MOUNTED TEMPERATURE SENSOR
2 PROVIDE MANUFACTURER DIGITAL WALL MOUNTED UNIVERSAL ROOM SENSOR WITH BUILT IN TEMPERATURE SENSOR
3
4
5
6
7

FORCE FLOW HEATER - ELECTRIC

EQUIPMENT TAG	LOCATION/SERVICE	MANUFACTURER	MODEL	MOUNTING TYPE	CAPACITY (KW)	POWER (VOLT/PHASE/HZ)	APPLICABLE NOTES
FFH-1	STAIR	OUELLET	OAC02000-T	WALL MOUNTED	2	208/1/60	1
FFH-2	STAIR	OUELLET	OAC02000-T	WALL MOUNTED	2	208/1/60	1

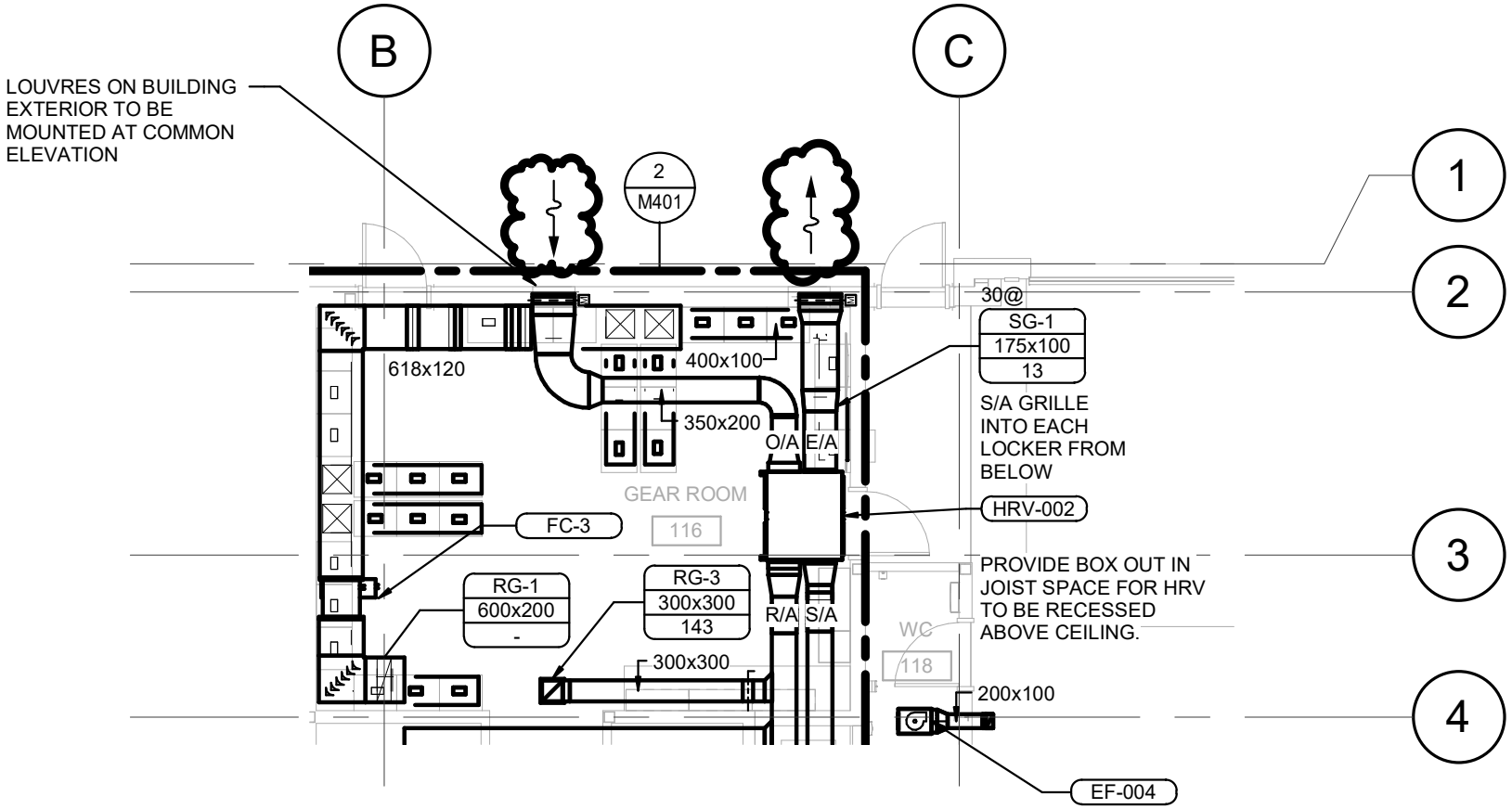
NOTES: 1 - PROVIDE MANUFACTURER SURFACE MOUNTING BOX

FANS

EQUIPMENT TAG	QTY	SERVICE	LOCATION	TYPE	MANUFACTURER	MODEL	AIR FLOW (L/S)	E. S. P. (PA)	FAN (RPM)	DRIVE TYPE	SOUND LEVEL (SONES)	ELEC V/PH/CYC	WEIGHT (KG)	NOTES
EF-001	1	NEDERMAN EXHAUST SYSTEM	APPARATUS BAY	INLINE CENTRIFUGAL FAN	NEDERMAN	NCF 80/20	2,372	1,020	3550	DIRECT	-	208/3/60	670	4
EF-002	1	APPARATUS BAY GENERAL EXHAUST	APPARATUS BAY	INLINE CABINET FAN	GREENHECK	SQ-120-A	779	75	1725	DIRECT	13.6	120/1/60	136	1
EF-004	1	APPARATUS BAY WASHROOM EXHAUST	WC 118	CEILING FAN	PANASONIC	FV-0511VQ1	24	75	1093	DIRECT	0.4	120/1/60	-	1
EF-005	1	LAUNDRY ROOM BOOSTER	LAUNDRY ROOM	CEILING FAN	PANASONIC	FV-1115VQ1	47	75	900	DIRECT	<0.3	120/1/60	-	1
EF-006	1	WORKSHOP GENERAL EXHAUST	WORKSHOP	CEILING FAN	PANASONIC	FV-1115VQ1	47	75	900	DIRECT	<0.3	120/1/60	-	1
EF-007	1	DECON ROOM GENERAL EXHAUST	DECON	CEILING FAN	PANASONIC	FV-0511VQ1	24	75	1093	DIRECT	0.4	120/1/60	-	1
EF-008	1	SCBA ROOM GENERAL EXHAUST	SCBA	CEILING FAN	PANASONIC	FV-1115VQ1	47	75	900	DIRECT	<0.3	120/1/60	-	1
EF-009	1	MECH. ROOM GENERAL EXHAUST	MECH. ROOM	CEILING FAN	PANASONIC	FV-1115VQ1	47	75	900	DIRECT	<0.3	120/1/60	-	1
EF-010	1	KITCHEN RANGE HOOD	DAYROOM	UNDER-CABINET RANGE HOOD	BROAN	SAHALE	142	25	-	DIRECT	5	120/1/60	61	1
EF-011	1	SCBA-2 ROOM EXHAUST (COMPRESSOR)	SCBA-2	INLINE CABINET FAN	GREENHECK	SQ-100-B	330	75	1140	DIRECT	5.8	120/1/60	113	1
EF-012	1	ELEC. ROOM COOLING FAN	ELEC. ROOM	CEILING FAN	PANASONIC	FV-1115VQ1	47	75	900	DIRECT	<0.3	120/1/60	-	1
CF-001	1	DESTRATIFICATION FAN	APPARATUS BAY	CEILING FAN	BIG ASS FANS	POWERFOIL X3.0				DIRECT		208/3/60		2,6
CF-002	1	DESTRATIFICATION FAN	APPARATUS BAY	CEILING FAN	BIG ASS FANS	POWERFOIL X3.0				DIRECT		208/3/60		2,6

NOTES:

1. BACKDRAFT DAMPER IF <300; MOTORIZED DAMPER IS >300
2. HIGH EFFECIENCY MOTOR (MINIMUM)
3. 1/2 INCH INSULATED CABINET
4. C/W RADIO RECEIVER REFER TO SPECIFICAITONS FOR FULL DETAILS OF REQUIREMENTS
6. C/W VARIABLE SPEED DRIVE



1 / MSK-003

HRV-002 REVISED AIR STREAMS

SCALE: 1 : 100

AME Group
consulting mechanical engineers

VICTORIA
T. 250-382-5999
F. 250-382-5998
721 JOHNSON ST
VICTORIA, BC V8W 1M8

VANCOUVER
T. 604-684-5995
F. 604-684-5993
200 - 638 SMITHE ST
VANCOUVER, BC V6B 1E3

CALGARY
T. 403-252-2333
F. 403-253-3324
710 - 1122 4TH STREET SW
CALGARY, AB T2R 1M1

COPYRIGHT RESERVED
This drawing and design is the property of the designer to be used only for the project named below. This page or any portion thereof shall only be reproduced with express written permission.

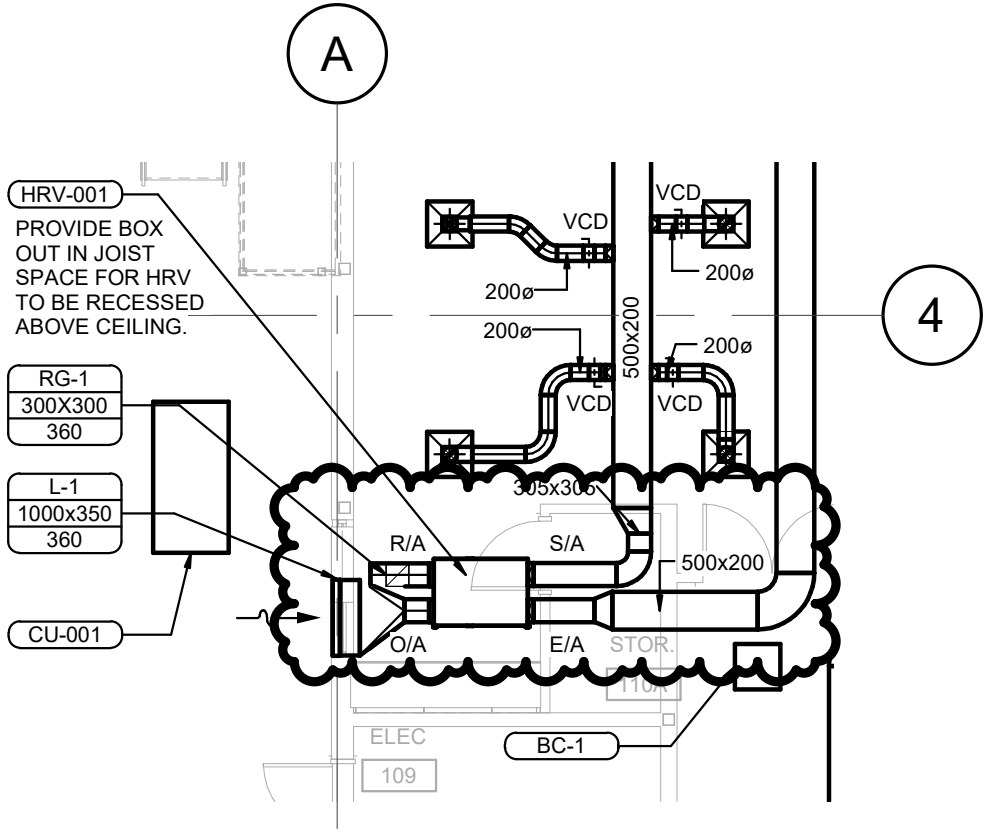
PROJECT TITLE
DASHWOOD FIRE HALL REPLACEMENT

DRAWING TITLE
HRV-002 REVISED AIR STREAMS

DRAWN BY	SW	SCALE	1 : 100
CHECKED BY	AR	DATE	9-12-2022

PROJECT NO. 145a-004-20

DRAWING NO. MSK-003



1
MSK-004

HRV-001 REVISED LOCATION

SCALE: 1 : 100

AME Group
consulting mechanical engineers

VICTORIA
T. 250-382-5999
F. 250-382-5998
721 JOHNSON ST
VICTORIA, BC V8W 1M8

VANCOUVER
T. 604-684-5995
F. 604-684-5993
200 - 638 SMITHE ST
VANCOUVER, BC V6B 1E3

CALGARY
T. 403-252-2333
F. 403-253-3324
710 - 1122 4TH STREET SW
CALGARY, AB T2R 1M1

COPYRIGHT RESERVED
This drawing and design is the property of the designer to be used only for the project named below. This page or any portion thereof shall only be reproduced with express written permission.

PROJECT TITLE
DASHWOOD FIRE HALL REPLACEMENT

DRAWING TITLE
HRV-001 REVISED LOCATION

DRAWN BY	SW	SCALE	1 : 100
CHECKED BY	AR	DATE	9-12-2022

PROJECT NO.
145a-004-20

DRAWING NO.
MSK-004

1. GENERAL

1.1 General

.1 This Section specifies general conditions for Divisions 25 and is to be read, interpreted, and coordinated with all other sections of Division 25 and Section 21 05 01 – Common Work Results for Mechanical.

1.2 Related Requirements

.1 This section of the Specification forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

.2 Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification Sections apply to work specified in this section.

.3 Division 26 – Electrical.

1.3 References

.1 Work, materials, and equipment shall comply with the most restrictive of local, provincial, and National authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids of the following codes:

.2 British Columbia Codes:

.1 British Columbia Electrical Code

.2 British Columbia Safety Authority

1.4 General Scope

.1 'Provide' shall mean 'supply and install'.

.2 Provide complete, fully tested, and operational systems to meet the requirements described herein and in complete accord with applicable codes and ordinances.

.3 Contract documents and drawings of this Division are diagrammatic and approximately to scale unless detailed otherwise. They establish scope, material, and installation quality but are not detailed installation instructions.

.4 Follow manufacturers' recommended installation instructions, details, and procedures for equipment, supplemented by requirements of the Contract Documents.

.5 Install equipment to provide: service access, maintain service clearances and for ease of maintenance.

.6 Connect to equipment specified in other Sections and to equipment supplied and installed by other Contractors or by the Owner.

1.5 Coordination of Work

.1 Products furnished but not installed under this division

.1 Division 22 – Plumbing

.1 Temperature Sensor Wells and Sockets

.2 Domestic water sub metering

.2 Division 23 – Heating, Ventilation and Air Conditioning

.1 Control Valves

.2 Flow Switches

.3 Pressure and Temperature Sensor Wells and Sockets

.4 Energy meters

.5 Automatic Damper Actuators

.6 Airflow Stations

.7 Terminal Unit Controls

.2 Products installed but not furnished under this division

.1 Division 22 – Plumbing

.1 Low-voltage wiring between 120VAC transformer and hands-free plumbing fixtures.

.2 Division 23 – Heating, Ventilation and Air Conditioning

.1 Refrigerant Leak Detection System

.3 Division 26 – Electrical

.1 Duct smoke detectors

.3 Products not furnished or installed under but integrated with the work of this division

.1 Division 23 – Heating, Ventilation and Air Conditioning

.1 Variable frequency drives

.2 Division 26 – Electrical

.1 Fire alarm panel

1.6 Submittals

.1 Comply with Division 01 – Submittal Procedures and Closeout Procedures, Section 21 05 01 Common Work Results for Mechanical – Submittals and in addition the following:

.2 Provide submittals on all hardware, software, and installation. No work may begin on any segment of this project until submittals have been successfully reviewed for conformity with the design intent. Provide drawings as files on optical disk (file format: .dwg, .dxf, pdf, or comparable). When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Submittals shall include a complete bill of materials of equipment to be used indicating quantity, manufacturer, model number, and other relevant technical data and the following:

.1 BAS Hardware:

.1 Manufacturer's description and technical data, performance curves, product specification sheets, and installation/maintenance instructions for:

.1 Control Panels

.2 Transducers/Transmitters

.3 Sensors (including accuracy data)

.4 Actuators

.5 Valves

.6 Relays/Switches

.7 Operator Interface Equipment

.8 Wiring

.9 Other relevant items

.2 Wiring diagrams and layouts for each control panel. Show all termination numbers.

.3 Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware.

.2 Central System Hardware and Software:

.1 Manufacturer's description and technical data, product specification sheets and installation/maintenance instructions for:

.1 Central Processing Unit

.2 Monitors, Printers

.3 Interface Equipment between CPU and Control Panels

.4 Operating System Software and/or Operator Interface Software

.5 Color Graphic Software and/or Third-Party Software

.6 Other relevant items

.2 Provide a schematic drawing of the central system. Label all cables and ports with computer manufacturers' model numbers and functions. Show all interface wiring to the control system.

.3 Riser diagrams of wiring between central control unit and all control panels.

.4 A list of the color graphic screens to be provided. For each screen, provide a conceptual layout of pictures and data and show or explain which other screens can be directly accessed.

.3 Controlled Systems

.1 A schematic diagram of each controlled system. The schematics shall have all control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.

.2 A schematic wiring diagram for each BAS. Each schematic shall have all elements labeled. Where a control element is the same as that shown on the BAS schematic, it shall be labeled with the same name. All terminals shall be labeled.

.3 An instrumentation list for each controlled system. Each element of the BAS shall be listed in table format. The table shall show element name, type of device, manufacturer, model number, and product data sheet number.

.4 A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.

.1 Submitted sequence of operations shall not be direct copy of sequences in this section. Submittal shall include sufficient information to clarify items including but not limited to; deadbands, deadband intervals, ramp up/down times, loop types (PID/PI), comparisons for resets, Equipment starting stopping, capacity staging and control, delays, interlocks, loss of power results, interfacing with packaged equipment, etc.

.5 A point list for each system controller including both inputs and outputs (I/O), point number, the controlled device associated with the I/O point, and the location of the I/O device. Software flag points, alarm points, etc.

.4 Quantities of items submitted shall be reviewed but are the responsibility of the Division 25 Contractor.

.5 Instrumentation and Data Point Summary Table. Contractor shall submit in table format with the following information for each instrument and data point. The table is to be reviewed and approved by the owner's representative prior to hardware and software installation and programming.

.1 Point name

.2 Point description: provide building designation, system type, equipment type, engineering units, and functionality; include a description of its physical location

.3 Expected range (upper and lower limit)

.4 Instrumentation (as applicable): manufacturer, model number, range, and accuracy specification

.5 Type

.1 AI: analog input

.2 BI: binary input

.3 NAI: network analog input

.4 NBI: network binary input

.5 CP: Configuration Property

.6 P: Programmed (e.g., soft or virtual point in control sequence such as a PID input or output)

.7 C: Calculated value; a soft or virtual point. If calculated value, provide logic diagrams or code and any constants used in formula. If time-based integrated values are required, provide time periods: minutes, daily, weekly, monthly, and yearly. Also, indicate if it is a running average.

.6 Input resolution

.7 Graphic display resolution

.8 Data trend interval

.3 Provide Record drawings and maintenance data in compliance with Division 01 - Closeout Submittals and the following:

.1 Submit project record documents upon completion of installation. Co-ordinate quantity to suit number of O&M manuals required. The documents shall be submitted for approval prior to final completion and shall include:

.2 Project Record Drawings. As-built versions of the submittal shop drawings provided as files on optical media and as 11" x 17" prints.

.3 Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Section 25 08 00 Commissioning of Integrated Automation "BAS Demonstration" and "BAS Acceptance".

.4 Operation and Maintenance (O & M) Manual.

.5 As-built versions of submittal product data.

.6 Names, addresses, and 24-hour telephone numbers of installing contractors and service representatives for equipment and control systems.

.7 Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing set points and variables.

.8 Documentation of all programs created using custom programming language including set points, tuning parameters, and object database.

.9 Graphic files, programs, and database on magnetic or optical media.

.10 List of recommended spare parts with part numbers and suppliers.

.11 Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.

.12 Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.

.13 Licenses, guarantees, and warranty documents for equipment and systems.

.14 Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.

1.7 Acceptable Control System Primary Manufacturers

.1 Refer to Section 23 05 01 for acceptable manufacturers list.

.2 Quality Assurance

.1 Installer and Manufacturer Qualifications

.1 Installer shall have an established working relationship with BAS Manufacturer of not less than three years.

.2 Installer shall have successfully completed BAS control system training. Upon request, Installer shall present certification of completed training including hours of instruction and course outlines.

1.8 Identification

.1 All components of the Building Management System shall be identification tagged.

1.9 Warranty

.1 Warrant work as follows:

.1 Warrant labor and materials for specified BAS free from defects for a period of 12 months after final acceptance. BAS failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.

.2 Provide updates to operator workstation software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.

.2 Special warranty on instrumentation:

.1 All instrumentation shall be covered by manufacturer's transferable [one-year] "No Fault" warranty. If manufacturer warranty is not available, the BAS installer shall provide the same.

1.10 Substantial & Total Performance

.1 Comply with Section 21 05 01 Common Work Results for Mechanical – Substantial and Total Performance.

.2 A certificate of Substantial Performance will not be granted unless the controls systems have been commissioned and are capable of operation with alarm controls functional and automatic controls in operation. Commissioning checklists must be submitted prior to the request by the Contractor to have a substantial completion inspection.

1.11 Ownership of Proprietary Material

.1 Project-specific software and documentation shall become Owner's property. This includes, but is not limited to graphics, record drawings, database, application programming code, and documentation.

2. PRODUCTS

2.1 Not used

3. EXECUTION

3.1 Examination

.1 The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the Consultant for resolution before rough-in work is started.

3.2 Co-ordination

.1 Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.

.2 Coordinate final graphics floor plans, room names and numbering with Architectural drawings including any changes made during construction. These graphics should be provided to the Engineers and the Owner for sign off before the graphics are completed.

.3 The contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.

.4 Duct smoke detectors required for air handler shutdown are supplied under Division 26. The contractor shall interlock smoke detectors to air handlers for shutdown.

.5 Smoke dampers required for duct smoke isolation are provided under Division 23 and actuators under Division 25. Division 25 shall interlock these dampers to the air handlers as described in the Sequences of Operation."

.6 Fire/smoke dampers and actuators required for fire rated walls are provided under Division 23. Fire/smoke dampers powered by Div 26. Wiring for end-switch by Div 25.

.7 Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the BAS specified in this section. These controls shall be integrated into the system and coordinated by this Contractor as follows:

.1 Each supplier of a controls product is responsible for the configuration, programming, start-up, and testing of that product to meet the sequences of operation described in this section.

.2 The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.

.3 The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.

.4 The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

3.3 General Workmanship

.1 Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

.2 Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

.3 Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electrical Code (NEC).

.4 Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

.5 All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

.6 All work, materials, and equipment shall comply with the rules and regulations of applicable local, provincial, and federal codes and ordinances as identified in Part 1 of this specification.

.7 The scheduling of fans through existing or temporary time clocks or BAS shall be maintained throughout the BAS installation.

.8 Modify existing starter control circuits, if necessary, to provide hand/off/auto control of each starter controlled. If new starters or starter control packages are required, these shall be included as part of this contract.

3.4 Sequence of Operations

.1 Heat Recovery Ventilator (HRV-1,2,3)

.1 Unit fans to run continuously during occupied hours.

.2 Domestic Hot Water System

.1 The system consists of 2 electric domestic hot water tanks (DWH-001 & DWH-002) and domestic hot water return pump P-001. Integral controls fire each unit.

.2 Domestic hot water recirculation pump is energized on-off via BAS. During occupied hours pump operates continuously and turned off during night mode. Have pump energized at 5 am for morning cycle.

.3 VRF System

.1 System to operate based on manufacturer's packaged control system.

.2 Adjustable thermostat in each space per the Div. 23 specification.

.3 BACnet interface to include:

.1 Scheduling

.2 Alarms

.3 Setpoint alterations

.4 Exhaust Fans, Scheduled

.1 General:

.1 Refer to Mechanical Equipment Schedule for exhaust fans to be controlled by the DDC system or by line voltage control devices. All fans controlled by DDC shall be Controls Contractor scope. Line voltage control devices to be wired by Electrical Contractor. Refer to Equipment Schedules to determine supplier responsible for supply of control device..

.2 Run Conditions – Scheduled:

.1 The fan shall run according to a user defined and adjustable schedule.

.2 Default schedule shall be 24/7, 7 days per week.

.3 Fan:

.1 The fan shall run and stop as scheduled.

.2 The fan shall start after the damper status has proven.

.3 The controller shall monitor the fan status.

.4 Exhaust Air Damper (if present):

.1 The exhaust air damper shall open anytime the fan runs and shall close anytime the fan stops. The damper shall close 30 sec (adj.) after the fan stops.

.2 The controller shall monitor the damper status unless damper is hardwire interlocked to the fan starter, in which case the damper end switch to start fan only when damper is fully open.

.5 Nederman Exhaust systems

.1 General:

.1 The Nederman exhaust systems provide point of source exhaust for the vehicles within the Apparatus Bay and consist of a Magnarail exhaust header and associated flexible ducting, and general exhaust fans.

CO2/NOx sensors will be located in the Apparatus Bay for additional levels of monitoring and protection.

.2 Run Conditions

.1 The systems shall be turned on whenever:

.1 The Owner supplied and installed vehicle transmitter is detected at the control panel.

.2 OR when CO or NOx levels exceed minimum level setpoint within the Apparatus Bay. Minimum level setpoint shall be 1 ppm for NOx and 50 ppm for CO.

.3 A wall mounted timer switch shall also be provided, so that occupants can activate the system manually, for up to 60 minutes.

.3 Fans

.1 The exhaust fans shall be operated together with a control signal through the Nederman controller or directly through a set of dry contacts at each VFD through the BMS. The Nederman controller shall be mounted on the wall within the Apparatus Bay. A signal will be sent to each of the VFDs controlling the exhaust fans at the roof level.

.2 When commanded to run the fans will ramp up to their balanced speed.

.4 Gas Detection

.1 The BMS will monitor the CO and NOx gas levels within the Apparatus Bay at two locations. The BMS will provide a start/stop command through a set of dry contacts at each VFD to override and start the exhaust systems.

.5 Alarms:

.1 Provide typical fan failure alarm if status does not match command.

.2 High CO alarm at 200 ppm (adj.) sensed in Inspection Bay.

.3 High NOx alarm at 9 ppm (adj.) sensed in Inspection Bay.

3.5 Training

.1 Provide training sessions period for personnel designated by the Owner. The number of training sessions required should be agreed with the Engineers and Owner prior to commencement of training

.2 Provide two additional training sessions at 6 and 12 months following building's turnover. Each session shall be one day in length and must be coordinated with the building owner.

.3 Train the designated staff of the owner to enable them to do the following:

.1 Day-to-day Operators:

.1 Proficiently to operate the system

.2 Understand BAS architecture and configuration

.3 Understand BAS system components

.4 Understand system operation, including BAS control and optimizing routines (algorithms)

.5 Operate the workstation and peripherals

.6 Log on and off the system

.7 Access graphics, point reports, and logs

.8 Adjust and change system set points, time schedules, and holiday schedules

.9 Recognize malfunctions of the system by observation of the printed copy and graphical visual signals

.10 Understand system drawings and Operation and Maintenance manual

.11 Understand the job layout and location of control components

.12 Access data from BAS controllers and ASCs

.13 Operate portable operator's terminals

.2 Advanced Operators:

.1 Make and change graphics on the workstation

.2 Create, delete, and modify alarms, including annunciation and routing of these

.3 Create, delete, and modify point trend logs and graph or print these both on an ad-hoc basis and at user-definable time intervals

.4 Create, delete, and modify reports

.5 Add, remove, and modify system's physical points

.6 Perform BAS field checkout procedures

.7 Perform BAS unit operation and maintenance procedures

.8 Perform workstation and peripheral operation and maintenance procedures

.9 Perform BAS diagnostic procedures

.10 Maintain, calibrate, troubleshoot hardware

.11 Adjust, calibrate, and replace system components

.3 System Managers/Administrators:

.1 Maintain software and prepare backups

.2 Interface with job-specific, third-party operator software

.3 Add new users and understand password security procedures

.4 These objectives will be divided into three logical groupings. Participants may attend one or more of these, depending on level of knowledge required.

.5 Provide course outline and materials. The instructor(s) shall provide one copy of training material per student.

.6 The instructor(s) shall be factory-trained instructors experienced in presenting this material.

END OF SECTION