

SCOPE OF WORK

1. PROVIDE THE NECESSARY ENGINEERING, INSTALLATION, SUPERVISION, EQUIPMENT, PROGRAMMING, MATERIALS, AND LABOUR FOR COMPLETE AND OPERATIONAL SYSTEMS TO CONTROL AND MONITOR THE MECHANICAL SYSTEMS AS DESCRIBED.
2. PROVIDE A NETWORK OF SENSORS, WELLS, SWITCHES, CONTROL VALVES, INTERFACE DEVICES, ACTUATORS, CONTROL DAMPERS, THERMOSTATS, TRANSDUCERS, RELAYS, VFDs, WIRING AND CONDUIT RACEWAYS AS REQUIRED TO SATISFY THE SEQUENCE OF OPERATIONS FOR EACH SYSTEM.
3. THE CONTROLS CONTRACTOR IS TO TEST/VERIFY THE OPERATION OF EACH SYSTEM AND COMPONENT AND PROVIDE START-UP SERVICES, AND INPUT SCHEDULES AND SETPOINTS AT START-UP.
4. JOHNSON CONTROLS TO BE USED FOR ALL CONTROLS SCOPE.

AHU-1 CONTROL SPECIFICATION

THE AIR HANDLING SYSTEM WILL BE SUPPLIED COMPLETE WITH A FACTORY WRED AND TESTED TERMINAL STRIP TO LINK TO THE BUILDING AUTOMATION CONTROL SYSTEM, INCLUDING ALL REQUIRED TEMPERATURE AND PRESSURE SENSORS, INPUT/OUTPUT BOARDS, MAIN MICROPROCESSOR AND OPERATOR INTERFACE.

- A. SUPPLY AIR FAN TO BE CONTROLLED BY BUILDING SCHEDULE. RETURN FAN TO BE CONTROLLED VIA FAN TRACKING.
- B. THE BAS MICROPROCESSOR SHALL HAVE A BUILT-IN TIME SCHEDULE PROGRAMMABLE FROM THE UNIT KEYPAD INTERFACE. THERE SHALL BE ONE START/STOP PER DAY AND A SEPARATE HOLIDAY SCHEDULE. THE CONTROLLER SHALL ACCEPT UP TO SIXTEEN HOLIDAYS EACH WITH UP TO A 5-DAY DURATION.
- C. PROVIDE SPACE TEMPERATURE SENSORS FOR NIGHTTIME SETBACK AND SETUP. SPACE SENSORS SHALL BE AVAILABLE TO SUPPORT FIELD SELECTABLE FEATURES. SENSORS SHALL INCLUDE TENANT OVERRIDE SWITCH, OR ZONE SENSOR WITH TENANT OVERRIDE SWITCH AND HEATING/COOING SET POINT ADJUSTMENT.
- D. USER INTERFACE (UI)
 1. THE DISPLAY SHALL BE LCD WITH BLACK CHARACTERS ON BRIGHT BACKGROUND.
 2. THE KEYPAD SHALL BE EQUIPPED WITH INDIVIDUAL TOUCH-SENSITIVE MEMBRANE KEY SWITCHES. ALL CONTROL SETTINGS SHALL BE PASSWORD PROTECTED FROM CHANGES BY UNAUTHORIZED PERSONNEL.
 3. BOTH A UNIT-MOUNTED AND REMOTE-MOUNTED UI SHALL BE PROVIDED. ONE REMOTE UI CAN COMMUNICATE WITH UP TO 8 SEPARATE UNITS. BOTH THE UNIT-MOUNTED AND REMOTE-MOUNTED UI ARE ALWAYS ACTIVE. THE CONTROL CONTRACTOR IS RESPONSIBLE FOR WIRING BETWEEN THE UNIT AND THE REMOTE UI. THE MAXIMUM WIRING DISTANCE TO THE REMOTE UI IS 2100 FEET. THE REMOTE UI SHALL HAVE AN 8 LINE X 30 CHARACTER DISPLAY.
- H. THE DISPLAY SHALL PROVIDE THE FOLLOWING INFORMATION:
 1. SUPPLY, RETURN, OUTDOOR AND SPACE AIR TEMPERATURE.
 2. DUCT AND BUILDING STATIC PRESSURE- THE CONTROL CONTRACTOR IS RESPONSIBLE FOR PROVIDING AND INSTALLING SENSING TUBES.
 3. FAN STATUS AND AIRFLOW VERIFICATION.
 4. FAN VFD SPEED.
 5. OUTSIDE AIR DAMPER POSITION.
 6. COOLING, HEATING AND CHANGEOVER STATUS.
 7. OCCUPIED, UNOCCUPIED, AND DIRTY FILTER STATUS.
 8. DATE AND TIME SCHEDULES.
 9. UP TO 4 CURRENT ALARMS AND 8 PREVIOUS ALARMS WITH TIME AND DATE.
- I. THE KEYPAD SHALL PROVIDE THE FOLLOWING SET POINTS AS A MINIMUM:
 1. SIX CONTROL MODES INCLUDING OFF MANUAL, AUTO, HEAT/COOL, COOL ONLY, HEAT ONLY AND FAN ONLY.
 2. MINIMUM OF FOUR OCCUPANCY MODES INCLUDING AUTO, OCCUPIED, UNOCCUPIED AND BYPASS (TENANT OVERRIDE WITH ADJUSTABLE DURATION).
 3. CONTROL CHANGEOVER BASED ON RETURN AIR TEMPERATURE, OUTDOOR AIR TEMPERATURE, OR SPACE TEMPERATURE.
 4. PRIMARY COOLING AND HEATING SET POINT TEMPERATURE BASED ON SUPPLY OR SPACE TEMPERATURE.
 5. NIGHT SETBACK AND SETUP SPACE TEMP.
 6. COOLING AND HEATING CONTROL DIFFERENTIAL (OR DEAD BAND).
 7. COOLING AND HEATING SUPPLY TEMPERATURE RESET OPTIONS BASED ON ONE OF THE FOLLOWING: RETURN AIR TEMPERATURE, OUTDOOR AIR TEMPERATURE, SPACE TEMPERATURE, AIRFLOW, OR EXTERNAL (1-5VDC) SIGNAL.
 8. RESET SCHEDULE TEMPERATURE.
 9. HIGH SUPPLY, LOW SUPPLY AND HIGH RETURN AIR TEMPERATURE ALARM LIMITS.
 10. AMBIENT COMPRESSOR AND HEAT LOCKOUT TEMPERATURES.
 11. DUCT STATIC PRESSURE.
 12. RETURN FAN TRACKING SETTINGS THAT INCLUDE MINIMUM/MAXIMUM VFD SPEED, WITH AND WITHOUT REMOTE EXHAUST OPERATION.
 13. MINIMUM OUTDOOR AIRFLOW RESET BASED ON EXTERNAL RESET (1-5 VDC), PERCENT OF CFM CAPACITY, AND FIXED OUTDOOR DAMPER POSITION.
 14. CURRENT TIME AND DATE.
 15. OCCUPIED/UNOCCUPIED TIME SCHEDULES WITH ALLOWANCES FOR HOLIDAY/ EVENT DATES AND DURATION.
 16. THREE TYPES OF SERVICE MODES INCLUDING TIMERS NORMAL (ALL TIME DELAYS,) TIMERS FAST (ALL TIME DELAYS 20 SECONDS,) AND NORMAL.

SEQUENCE OF OPERATIONS

AIR HANDLING UNIT AHU-1

OCCUPIED - HEATING SEASON:

AIR HANDLING UNIT 'AHU-1' SHALL BE ACTIVE TO PROVIDE CONTINUOUS VENTILATION. THE HYDRONIC HEATING COILS SHALL MODULATE TO RAISE THE SUPPLY AIR TEMPERATURE TO THE ADJUSTABLE HEATING SETPOINT. THE CO₂ SENSOR SHALL MODULATE THE FRESH AIR DAMPER BETWEEN THE PRESET MINIMUM AND MAXIMUM POSITIONS. SPACE HEATING IS TO BE PROVIDED BY BASEBOARD HEATERS. THESE HEATERS ARE ACTIVATED BY LOCAL ADJUSTABLE THERMOSTATS. ALL THERMOSTATS ARE TO HAVE 24/7 PROGRAMMABILITY TO ALLOW UNOCCUPIED TEMPERATURE SET-BACK ADJUSTMENTS.

UNOCCUPIED - HEATING SEASON:

AIR HANDLING UNIT 'AHU-1' SHALL ACTIVATE AS REQUIRED IN 100% RECIRCULATION MODE (FRESH AIR DAMPER AT MINIMUM POSITION) AND AHU FANS WILL REDUCE TO MINIMUM VENTILATION RATES. THE HEATING COIL SHALL MODULATE AS REQUIRED TO ACHIEVE THE 16°C ADJUSTABLE NIGHTTIME SETBACK TEMPERATURE. HEATING DEVICES (BASEBOARD HEATERS) SHALL ACTIVATE AS REQUIRED TO MAINTAIN PRESET ZONE SETBACK TEMPERATURES. UNOCCUPIED HOURS ARE M-F 18:00 TO 6:00 HRS AS WELL AS ALL DAY SATURDAY, SUNDAY, AND HOLIDAYS.

OCCUPIED - COOLING SEASON:

AIR HANDLING UNIT 'AHU-1' SHALL BE ACTIVE TO PROVIDE CONTINUOUS VENTILATION. THE STAGED DX COOLING SYSTEM SHALL MODULATE TO TEMPER THE SUPPLY AIR TEMPERATURE TO THE ADJUSTABLE COOLING SETPOINT. THE CO₂ SENSOR SHALL MODULATE THE FRESH AIR DAMPER BETWEEN THE PRESET MINIMUM AND MAXIMUM POSITIONS. ALL HEATING DEVICES SHALL BE INACTIVE.

UNOCCUPIED - COOLING SEASON:

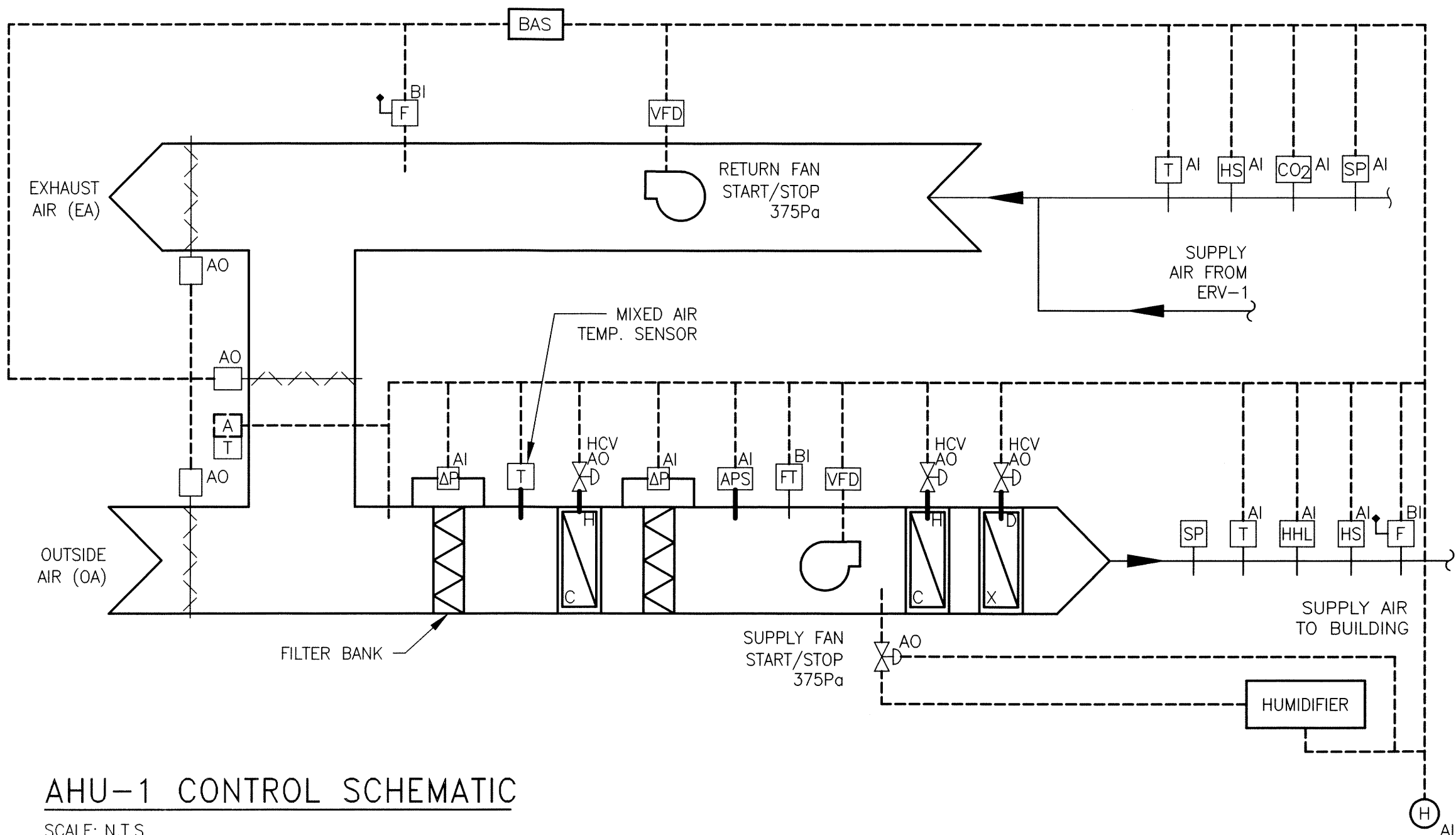
AIR HANDLING UNITS AND DX COOLING SHALL BE INACTIVE. THE FRESH AIR DAMPER IS TO BE CLOSED.

PROVIDE SUFFICIENT MORNING START-UP PRE-COOING OR HEATING AS PER AN ADJUSTABLE SCHEDULE FOR BOTH COOLING AND HEATING SEASONS. UNOCCUPIED HOURS ARE M-F 18:00 TO 6:00 HRS AS WELL AS ALL DAY SATURDAY, SUNDAY, AND HOLIDAYS.

OUTDOOR AIR RESET:

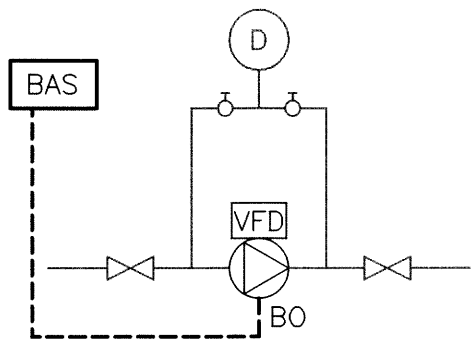
SYSTEM DESIGNED FOR HOT WATER HEATING IN SASKATOON CLIMATE WITH 54.4°C HOT WATER SUPPLY AND 32.2°C RETURN. FOR OUTDOOR TEMPERATURES LOWER THAN -40°C HOT WATER SUPPLY SHOULD BE INCREASED TO 68°C.

HEATING SYSTEM SHUTOFF FOR OUTDOOR AIR TEMPERATURES ABOVE 15°C.



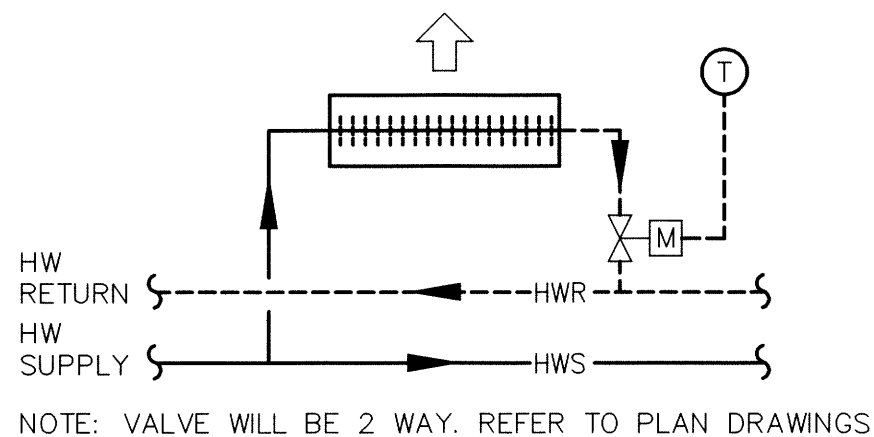
AHU-1 CONTROL SCHEMATIC

SCALE: N.T.S.



PUMP CONTROL

SCALE: N.T.S.



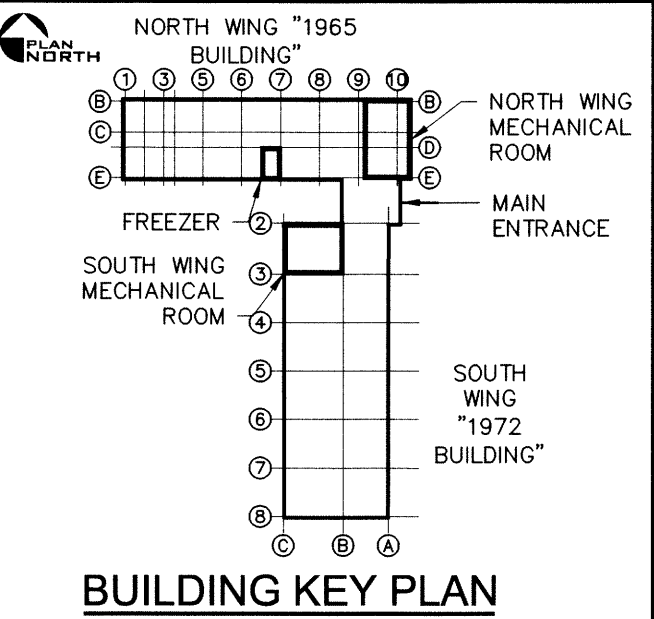
CONVECTOR UNIT CONTROLS

SCALE: N.T.S.

TYP.

LEGEND

- CONTROL WIRING
- /--- MOTORIZED DAMPER
- HWS HEATING SUPPLY PIPING
- HWR HEATING RETURN PIPING
- CO₂ CARBON DIOXIDE SENSOR
- VFD VARIABLE FREQUENCY DRIVE
- APS AIR PROVING SWITCH
- HHL HIGH HUMIDITY LEVEL SENSOR
- BAS BUILDING AUTOMATED SYSTEM
- Ⓢ DIFFERENTIAL PRESSURE GAUGE
- Ⓢ TEMPERATURE SENSOR - WALL MOUNT
- Ⓢ TEMPERATURE SENSOR - DUCT MOUNT
- SP STATIC PRESSURE SENSOR
- FT FREEZE STAT
- HS HUMIDITY SENSOR
- Ⓢ FIRE STAT
- DX COOLING COIL
- HEATING COIL
- DIFFERENTIAL PRESSURE SENSOR
- FLOW SENSING TUBE(S)
- 2-WAY MODULATING CONTROL VALVE
- THERMALLY INSULATED DUCT
- AO ANALOG OUTPUT
- AI ANALOG INPUT
- BO BINARY OUTPUT
- BI BINARY INPUT



BUILDING KEY PLAN

LEGEND

0	ISSUED FOR TENDER	23-JUN-2017
REV	Description	Date

A	A detail no. du detail	A
B	B location drawing no. sur dessin no.	B
C	C drawing no. dessin no.	C

project project
MECHANICAL UPGRADE
115 PERIMETER ROAD
SASKATOON, SK
ENVIRONMENT CANADA
335 River Rd
Ottawa ON, K1V 1C7

drawing dessin
MECHANICAL
HVAC DETAILS AND
CONTROL SCHEMATIC

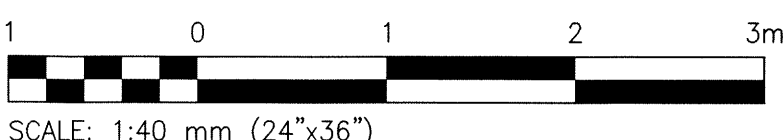
Designed By	GDK	Conçu par
Date	2017/06/01	(yyyy/mm/dd)
Drawn By	BJB	Dessiné par
Date	2017/06/06	(yyyy/mm/dd)
Reviewed By	ADR	Examiné par
Date	2017/06/23	(yyyy/mm/dd)
Approved By	AMB	Approuvé par
Date	2017/06/23	(yyyy/mm/dd)
Tender		Soumission

Project Manager	Administrateur de projets
EC PMDI Proj no.	Consultant Proj no.
	17-0006-001
Drawing no.	No. du dessin

M106



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SCALE: 1:40 mm (24"x36")