

Addendum / Addenda

Project Description / Description de projet S77 S77-Modify Laser Lab Chilled Water System		
Solicitation No./N° de sollicitation 16-22099	Project No./N° de projet 4060	W.O. No./N° d'ordre de travail B043-BO43-FAC-00
Departmental Representative / représentant ministériel Allan Smith		Date October 27, 2016
Notice: This addendum shall form part of the tender documents and all conditions shall apply and be read in conjunction with the original plans and specifications.		Nota: Cet addenda fait partie intégrale des dossiers d'appel; toutes les conditions énoncées doivent être lues et appliquées en conjonction avec les plans et les devis originaux.

- A See attached Electrical Addendum #1 complete with Specifications
- B Replace the original Tender Drawings with the attached Drawings S-77_20160901_4060-G01 and S-77_20160901_4060-G02

END / FIN



Addendum / Addenda

No./N^o
1

Project Description / Description de projet Building S-77 Modify Laser Labs Chiller Water System		
Solicitation No./ No de sollicitation	Project No./N ^o de projet 4060	W.O. No./N ^o d'ordre de travail
Departmental Representative / représentant ministériel Allan Smith		Date Oct 21, 2016
<p>Notice: This addendum shall form part of the tender documents and all conditions shall apply and be read in conjunction with the original plans and specifications.</p>		<p>Nota: Cet addenda fait partie intégrale des dossiers d'appel d'offres; toutes les conditions énoncées doivent être lues et appliquées en conjonction avec les plans et les devis originaux.</p>

Refer to drawing 4060-G02 note 20.

Add. 'provide VFD and make all connections. VFD to be vertical, E-Clipse, c/w disconnect switch and suitable for motor rating. Standard of acceptance : ABB ACH550-VDR-022A-6. Refer to specification for additional information. '

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Common Work Results - Electrical Section 26 05 00

1.2 DESCRIPTION

- .1 This specification is to cover a complete Variable Frequency motor Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.
- .2 The drive manufacturer shall supply the drive and all necessary controls as herein specified. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of twenty years. All VFDs installed on this project shall be from the same manufacturer.

1.3 QUALITY ASSURANCE

- .1 Referenced Standards:
 - 1. Institute of Electrical and Electronic Engineers (IEEE)
 - .1 Standard 519-1992, IEEE Guide for Harmonic Content and Control.
 - .2 Underwriters laboratories
 - .1 UL508C
 - .3 National Electrical Manufacturer's Association (NEMA)
 - .1 ICS 7.0, AC Adjustable Speed Drives
 - .4 IEC 16800 Parts 1 and 2
 - .5 CSA 22.2
- .2 Qualifications:
 - .1 VFDs and options shall be UL listed and CSA approved as a complete assembly. VFDs that require the customer to supply external fuses for the VFD to be UL listed are not acceptable. VFDs requiring additional branch circuit protection are not acceptable. The base VFD shall be UL listed for 100 KAIC without the need for input fusing.

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 00 10 00.
- .2 Include schematic, wiring, interconnection diagrams.
- .3 Indicate:
 - .1 Outline dimensions, conduit entry locations and weight.
 - .2 Customer connection and power wiring diagrams.
 - .3 Complete technical product description include a complete list of options provided. **Any portions of the specifications not complied with must be**

clearly indicated or the supplier and contractor shall be liable to provide all components required to meet the specification.

- .4 Compliance to IEEE 519 – harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).
 - .1 The VFD manufacturer shall provide calculations; specific to the installation, showing total harmonic voltage distortion is less than 5%. Input filters shall be sized and provided as required by the VFD manufacturer to ensure compliance with the IEEE electrical system standard 519. All VFDs shall include a minimum of 5% equivalent impedance reactors, **no exceptions**.
- .4 Motors specified and supplied with mechanical equipment. Refer to Division 23.

1.5 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Section 00 10 00.
- .2 Include operation and maintenance data for each type and style of starter.
- .3 On completion of the installation, the supplier shall provide the following:
 - .1 Full commissioning report documenting all programmable settings, AC input voltage, DC Bus voltage, current draw at maximum speed, and a description of ambient conditions.
 - .2 One operator's manual for each VFD installed.
 - .3 One 8.5" x 11" wiring diagram for each VFD installed.

1.6 GENERAL DESIGN CHARACTERISTICS

- .1 The VFD shall be of the Pulse Width Modulated (PWM) type.
- .2 The VFD shall be rated for variable torque applications, with an overload rating of 110% for 60 seconds.
- .3 All VFD's shall be factory CSA/cUL Listed.
- .4 All packaged drive systems shall be CSA Listed.
- .5 The VFD shall have the capability of operating multiple motors. The minimum VFD continuous current rating shall be the sum of the full load current ratings of the connected motors.
- .6 The VFD shall have a minimum displacement power factor of 0.96 or higher at all output frequencies.
- .7 The VFD manufacturer shall have a minimum of ten years experience in the Canadian Market.

Part 2 Products

2.1 VARIABLE FREQUENCY DRIVES

- .1 The VFD package as specified herein shall be enclosed in a NEMA rated enclosure, completely assembled and tested by the manufacturer in an ISO9001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.
 - .1 Environmental operating conditions: 0 – 40⁰ C continuous. Altitude 0 to 3300 feet above sea level, up to 95% humidity, non-condensing. All circuit boards shall have conformal coating.
 - .2 The VFD shall operate within the following rated values.
 - .1 Output Frequency Range: 0.1 to 400 Hz.
 - .2 Overload Rating: VT – 110% for 60 seconds
 - .3 Input Voltage: 3 phase + ground , 600V +10% / -20%
 - .4 Input Frequency: 48-62 Hz
 - .3 The VFD shall be designed to include the following protective functions and display for maintainability:
 - .1 *Instantaneous Over Current Protection*: The VFD output shall be turned off if the operating current exceeds the specified level.
 - .2 *Motor Overload Protection*: cUL/CSA approved electronic thermal overload protection.
 - .3 *External Trip Input*: Programmable for either N/O or N/C operation.
 - .4 *Over Voltage Protection*: The VFD output shall turned off if the DC Bus voltage exceeds the specified level.
 - .5 *Ground Fault Protection*: The VFD output shall turned off in the event of a ground fault.
 - .6 *Line or Load Phase Loss Protection*: Programmable for enable - disable
 - .7 *Software Lock*: The VFD shall include a software function that prevents changes to the user-defined settings.
 - .8 *CPU or EEPROM Error*: The VFD output shall turned off in the event of an error in the CPU or EEPROM.
 - .4
- .2 All VFDs shall have the following features:
 - .1 All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.
 - .2 The keypad shall include Hand-Off-Auto selections and manual speed control. There shall be fault reset and “Help” buttons on the keypad. The Help button shall include “on-line” assistance for programming and troubleshooting.
 - .3 There shall be a built-in time clock in the VFD keypad. The clock shall have a battery back up with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the VFD shall automatically revert to hours of operation since initial power up. The clock shall also be programmable to control start/stop functions,

- constant speeds, PID parameter sets and output relays. The VFD shall have a digital input that allows an override to the time clock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings. Capacitor backup is not acceptable.
- .4 The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).
 - .5 The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430-150 for 4-pole motors.
 - .6 The VFD shall have 5% equivalent impedance internal reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% equivalent impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFDs with only one DC reactor shall add an AC line reactor.
 - .7 The VFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp, and 5% equivalent impedance internal reactors.
 - .8 The VFD shall provide a programmable proof of flow Form-C relay output (broken belt / broken coupling). The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false underload condition.
- .3 All VFDs to have the following adjustments:
- .1 Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed.
 - .2 Two (2) PID Setpoint controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed loop control. The VFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. There shall be two parameter sets for the first PID that allow the sets to be switched via a digital input, serial communications or from the keypad for night setback, summer/winter setpoints, etc. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain setpoint of an independent process (ie. valves, dampers, etc.). All setpoints, process variables, etc. to be accessible from the serial communication network.
 - .3 Two (2) programmable analog inputs shall accept current or voltage signals.
 - .4 Two (2) programmable analog outputs (0-20ma or 4-20 ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, and other data.
 - .5 Six (6) programmable digital inputs.
 - .6 Three (3) programmable digital Form-C relay outputs. The relays shall include programmable on and off delay times and adjustable hysteresis. The relays shall

- be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating 2 amps RMS. Outputs shall be true Form-C type contacts; open collector outputs are not acceptable.
- .7 Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close.
 - .8 Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.
 - .9 The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.
 - .10 The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows higher carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.
 - .11 The VFD shall include password protection against parameter changes.
- .4 The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (LED and alpha-numeric codes are not acceptable). All VFD faults shall be displayed in English words.
- .5 All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):
- .1 Output Frequency
 - .2 Motor Speed (RPM, %, or Engineering units)
 - .3 Motor Current
 - .4 Drive Temperature
 - .5 DC Bus Voltage
 - .6 Output Voltage
- .6 The VFD shall include a fireman’s override input. Upon receipt of a contact closure from the fireman’s control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed or operate in a specific fireman’s override PID algorithm that automatically adjusts motor speed based on override set point and feedback. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlock, and force the motor to run in one of the two modes above. “Override Mode” shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation.
- .7 Serial Communications
- .1 The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, BACnet, Johnson Controls N2 bus, and Siemens Building Technologies FLN. Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be “certified” by the governing authority (i.e. BTL Listing for BACnet). Use of non-certified protocols is not allowed.

- .2 The BACnet connection shall be an RS485, MS/TP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
 - .1 Data Sharing – Read Property – B.
 - .2 Data Sharing – Write Property – B.
 - .3 Device Management – Dynamic Device Binding (Who-Is; I-AM).
 - .4 Device Management – Dynamic Object Binding (Who-Has; I-Have).
 - .5 Device Management – Communication Control – B.
- .3 Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.
- .8 EMI / RFI filters. All VFDs shall include EMI/RFI filters. The VFD shall comply with standard EN 61800-3 for the First Environment, restricted level with up to 100' of motor cables. No Exceptions. Certified test lab test reports shall be provided with the submittals.
- .9 All VFDs through 60HP shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad. The VFD shall not be damaged by this condition.
- .10 OPTIONAL FEATURES – Optional features to be furnished and mounted by the drive manufacturer. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. The bypass enclosure door and VFD enclosure must be interlocked such that input power is turned off before either enclosure can be opened. The VFD and Bypass as a package shall have a UL listed short circuit rating of 100,000 amps and shall be indicated on the data label.
 - .1 A complete factory wired and tested bypass system consisting of an output contactor and bypass contactor, service (isolation) switch and VFD input fuses are required. Bypass designs, which have no VFD only fuses, or that incorporate fuses common to both the VFD and the bypass will not be accepted
 - .2 Door interlocked padlockable disconnect switch that will disconnect all input power from the drive and all internally mounted options.
 - .3 The systems tolerated voltage window shall allow the system to operate from a line of +30%, -35% nominal voltage as a minimum. The system shall incorporate circuitry that will allow the drive or bypass contactor to remain “sealed in” over this voltage tolerance at a minimum.
 - .4 Serial communications –VFD shall be capable of being monitored and or controlled via serial communications. Provide communications protocols for

- ModBus; Johnson Controls N2; Siemens Building Technologies FLN (P1) and BACnet in the bypass controller.
- .5 Run permissive circuit - there shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, time-clock control, or serial communications) the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD system input and allows motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close.
 - .6 There shall be an adjustable motor current sensing circuit for the VFD mode to provide proof of flow indication. The condition shall be indicated on the keypad display, transmitted over the building automation protocol and on a relay output contact closure.
 - .7 The digital inputs for the system shall accept 24VAC or 24VDC Customer Interlock Terminal Strip – provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command.
 - .8 The terminal strip shall allow for independent connection of up to four (4) unique safety inputs.
 - .9 The user shall be able to select the text to be displayed on the keypad when the safety opens. Example text display indications include “Firestat”, “Freezestat”, “Over pressure” and “Low pressure”. The user shall also be able to determine which of the four (4) safety contacts is open over the serial communications connection.
 - .10 Class 10, 20, or 30 (selectable) electronic motor overload protection shall be included.
 - .11 Standard of acceptance:
 - .1 ABB ACH550-VDR. **Approval does not relieve supplier of specification requirements.**

Part 3 Execution

3.1 INSTALLATION

- .1 Installation shall be the responsibility of the electrical contractor. The contractor shall install the drive in accordance with the requirements of the VFD manufacturer’s installation manual.
- .2 The contractor is to verify that the jobsite conditions for installation meet the factory recommendations and code required conditions for the VFD installation prior to installation. These shall include as a minimum:
 - .1 Clearance spacing.
 - .2 Compliance with environmental ratings of the VFD system.
 - .3 Separate conduit installation of the input wiring, the motor wiring, and control wiring. At no time does any of this wiring run in parallel with each other.
 - .4 All power and control wiring is complete.

- .3 The VFD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VFD system shall not be operated while the unit is covered.

3.2 ON-SITE STARTUP

- .1 The manufacturer shall provide start-up and commissioning of the variable frequency drive and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. The commissioning personnel shall be the same personnel that will provide the factory service and warranty repairs at the customer site. Sales personnel and other agents who are not factory certified technicians for drive repair shall not be acceptable as commissioning agents.
- .2 Start-up services shall include checking for verification of proper operation and installation of the VFD, its options and its interface wiring to the building automation system. Included in this service shall be as a minimum:
 - .1 Verification of contractor wire terminations and conduit runs to and from the VFD.
 - .2 Up to four hours of customer operator training on the operation and service diagnostics at the time of commissioning. On-site training is to be provided by the same factory trained application engineering and service personnel to demonstrate full programming and operating features and procedures. Date and time for this training is to be coordinated with the NRC Departmental Representative.
 - .3 Measurement for verification of proper operation of the following:
 - .1 Motor voltage and frequency. Verification of proper motor operation.
 - .2 Control input for proper building automation system interface and control calibration.
 - .3 Calibration check for the following set-points:
 - .1 minimum speed
 - .2 maximum speed
 - .3 acceleration and deceleration rates.
- .3 Commissioning agent to verify the programming of the VFD and to provide a written copy of the settings to the engineer.
- .4 Commissioning agent to lock out critical frequencies throughout the operating curve of the equipment as identified and required by the engineer. The agent shall record amperages at six (minimum) different frequencies from minimum to maximum speed.

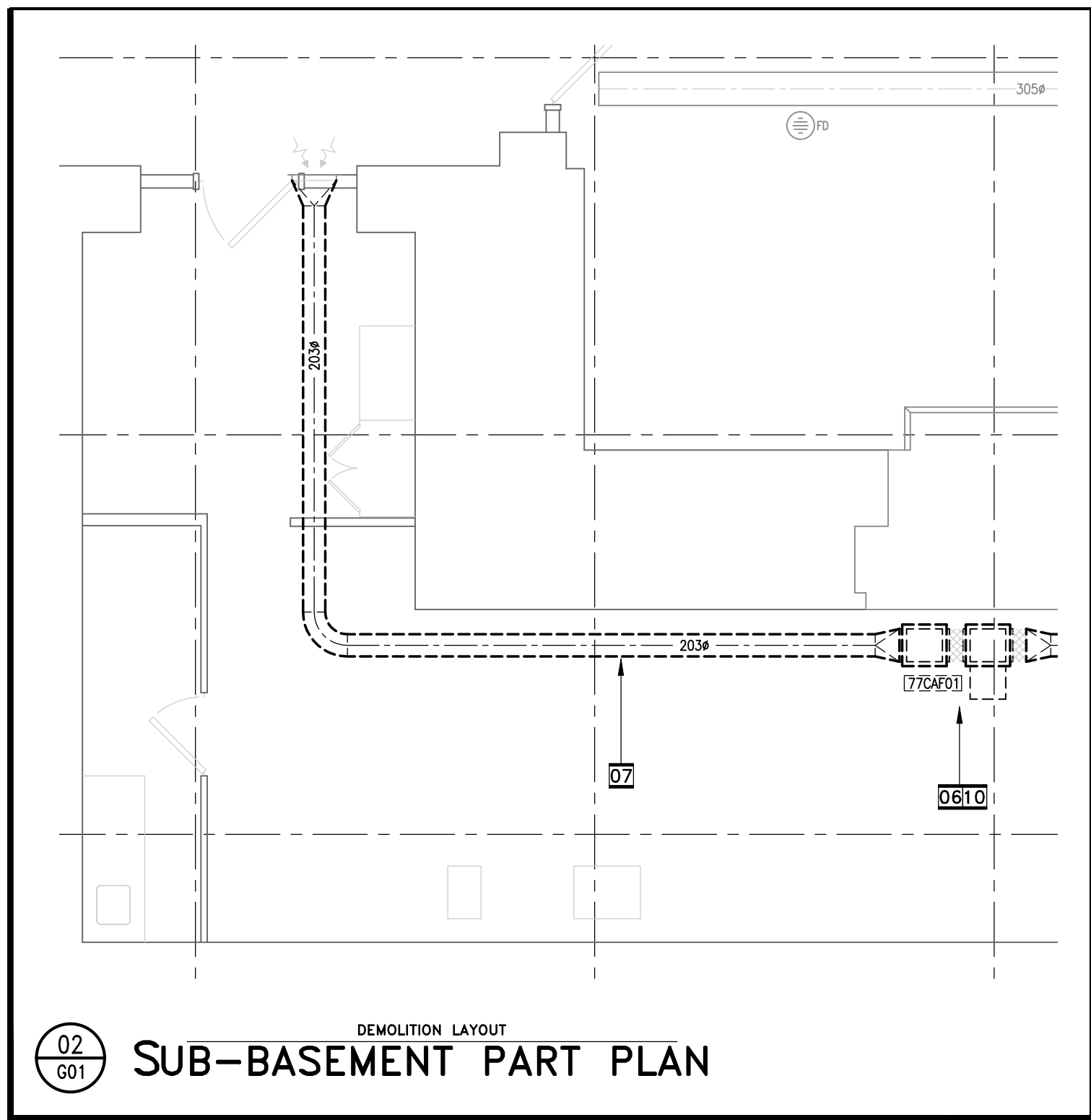
3.3 PRODUCT SUPPORT

- .1 Factory trained application engineering and service personnel that are thoroughly familiar with the VFD products offered shall be locally available at both the specifying and installation locations. A toll free 24/365 technical support line shall be available.
- .2 A computer based training CD or 8-hour professionally generated video (VCR format) shall be provided to the owner at the time of project closeout. The training shall include installation, programming and operation of the VFD, bypass and serial communication.

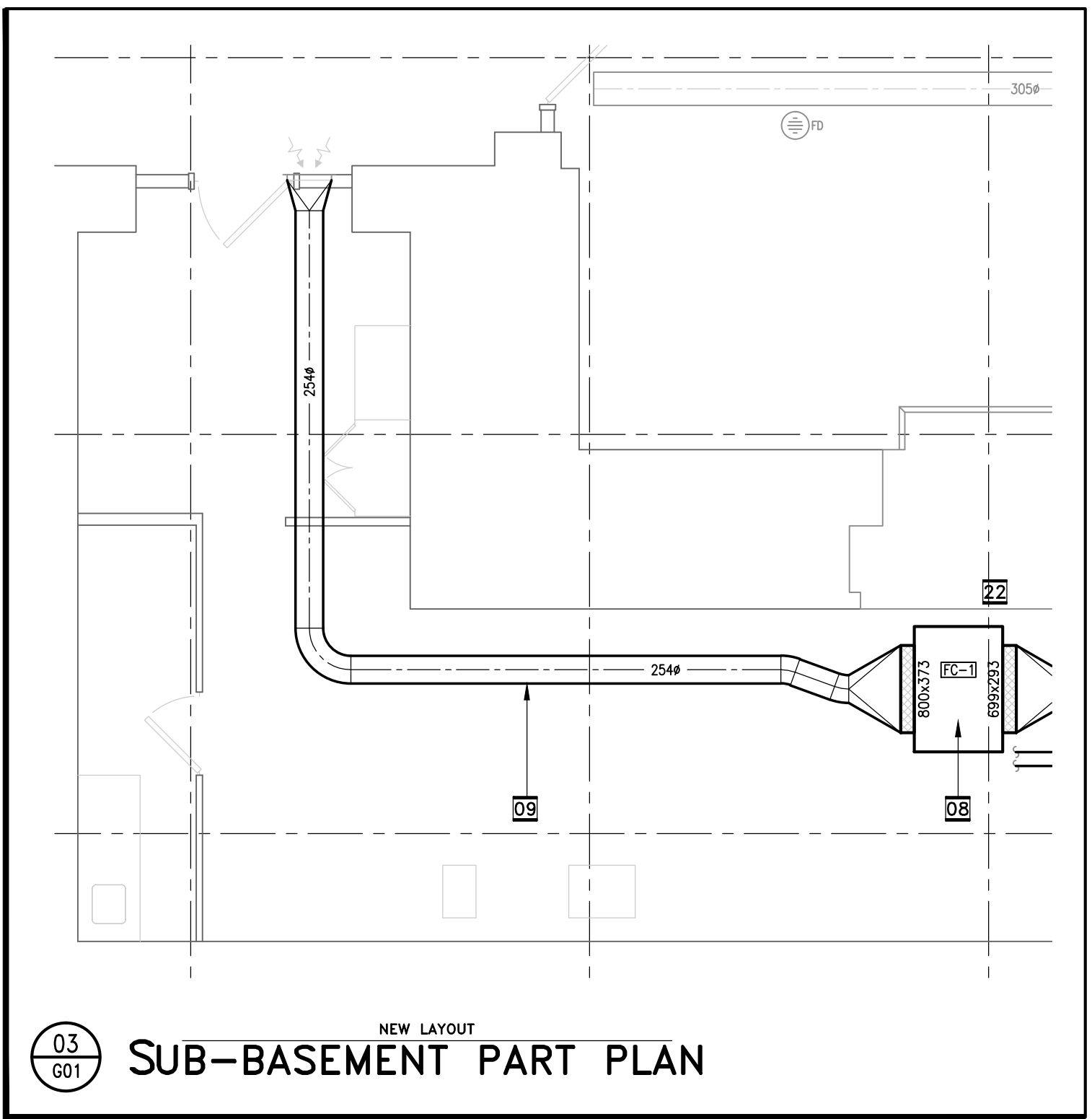
3.4 WARRANTY

- .1 Warranty shall be 24 months from the date of certified start-up. The warranty shall include all parts, labor, travel time and expenses

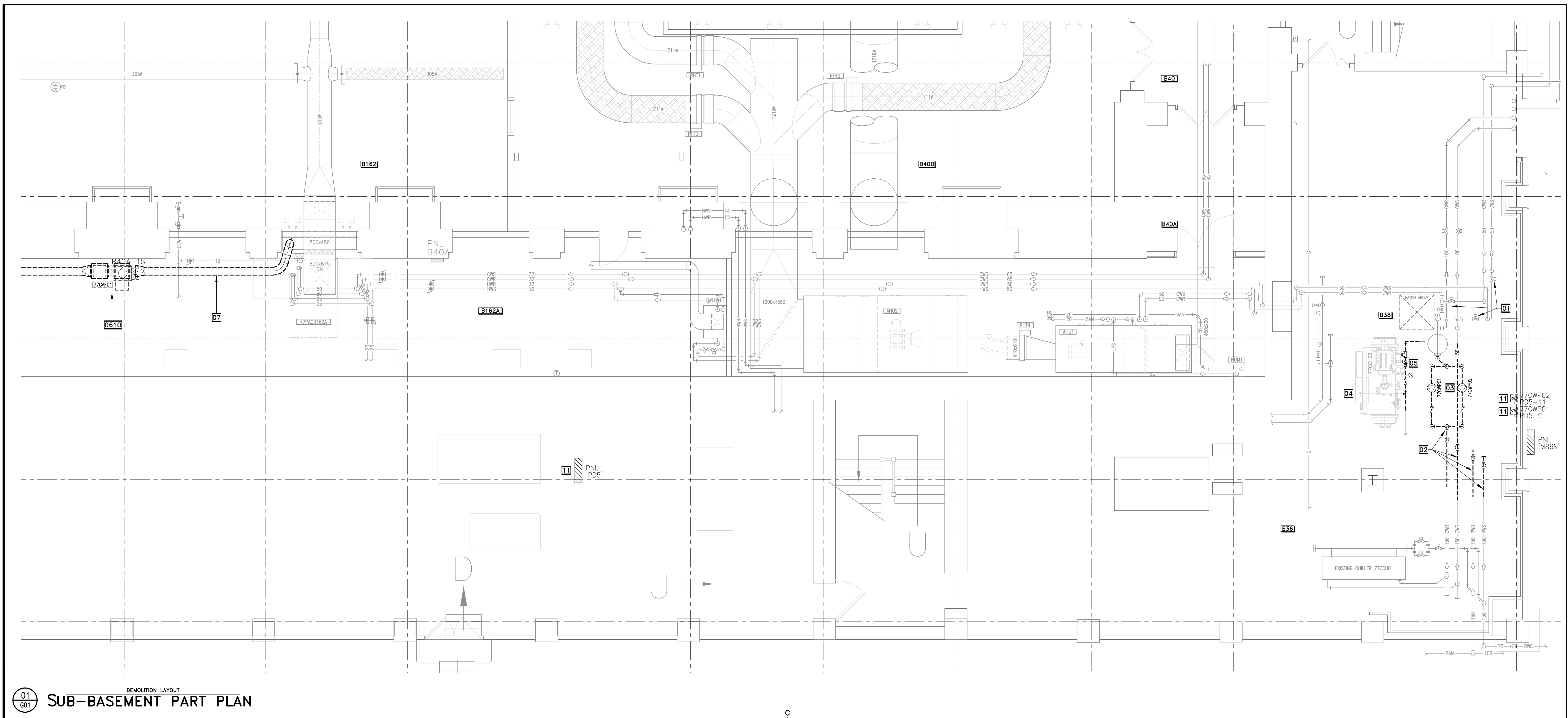
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02 601 SUB-BASEMENT PART PLAN



03 601 SUB-BASEMENT PART PLAN



01 601 SUB-BASEMENT PART PLAN

FAN COIL UNIT SEQUENCE OF OPERATION

1. EXISTING S77 PACKAGED AIR CONDITIONER 77PAC8162A.

A. GENERAL:

I. THIS UNIT IS A SELF-CONTAINED UNIT VENTILATOR THAT HAS BUILT IN CONTROLS. THE UNIT CONSISTS OF A COOLING COIL, REHEAT COIL AND HUMIDIFIER.

II. A MANUAL CHANGE OVER FROM HOUSE CHILLED WATER TO PLANT CHILLED WATER WILL BE COMPLETED AS PER COOLING REQUIREMENTS (SUMMER/WINTER). AN INDICATOR ON THE EMCS OWS SHALL INDICATE THIS PROCESS.

III. THE DEHUMIDIFICATION CYCLE OF THIS PAC UNIT SHALL BE DISABLED AND THE EMCS SHALL BE RESPONSIBLE FOR CONTROLLING THE SPACE HUMIDITY WITH THE ASSOCIATED FANCOIL UNIT FCU-1.

IV. THE EMCS SHALL MONITOR THE FOLLOWING POINTS ASSOCIATED TO 77PAC162A

ROOM AIR HUMIDITY RH1 (SENSOR LOCATED IN RETURN AIR PLENUM)

SUPPLY FAN STATUS SFS

DISCHARGE AIR TEMPERATURE DAT

DISCHARGE AIR HUMIDITY DAH

2. NEW S77 RM B162 FAN COIL UNIT FCU-1 (77FCUB162A)

A. GENERAL:

I. THIS FAN COIL UNIT SERVES AS A PRESSURIZATION BOOSTER FAN, AS WELL AS A DEHUMIDIFICATION UNIT FOR 77PAC162A SERVING ROOM 162. THE EMCS SHALL MONITOR AND CONTROL THE FOLLOWING POINTS ASSOCIATED TO FCU-1.

FAN COIL STATUS SFA

FAN COIL START/STOP SF

COOLING VALVE CONTROL CCV

DISCHARGE AIR TEMPERATURE DAT

MAKE-UP AIR HUMIDITY (CORRIDOR AIR) MAH

B. STOPPED MODE:

I. WHEN THE SYSTEM IS STOPPED, THE SUPPLY FAN SF IS STOPPED. THE COOLING VALVE VLV IS CLOSE.

C. START-UP MODE:

I. THE FANCOIL (SF) WILL BE STARTED FIRST BY AN OWS MANUAL COMMAND OR BY AN AUTOMATIC START/STOP SCHEDULE PROGRAM. THE FANCOIL WILL NOT START UNLESS THE EMCS SENSORS FAN STATUS FROM 77PAC162A.

II. A CURRENT SENSOR IS INSTALLED ON THE LOAD SIDE OF THE SUPPLY FAN SFA. THE DDC SYSTEM USES THE SENSOR TO CONFIRM THE SUPPLY FAN IS IN THE DESIRED STATE (I.E. ON OR OFF) AND GENERATES AN ALARM IF STATUS DEVIATES FROM DDC START/STOP CONTROL.

3. NORMAL OPERATION:

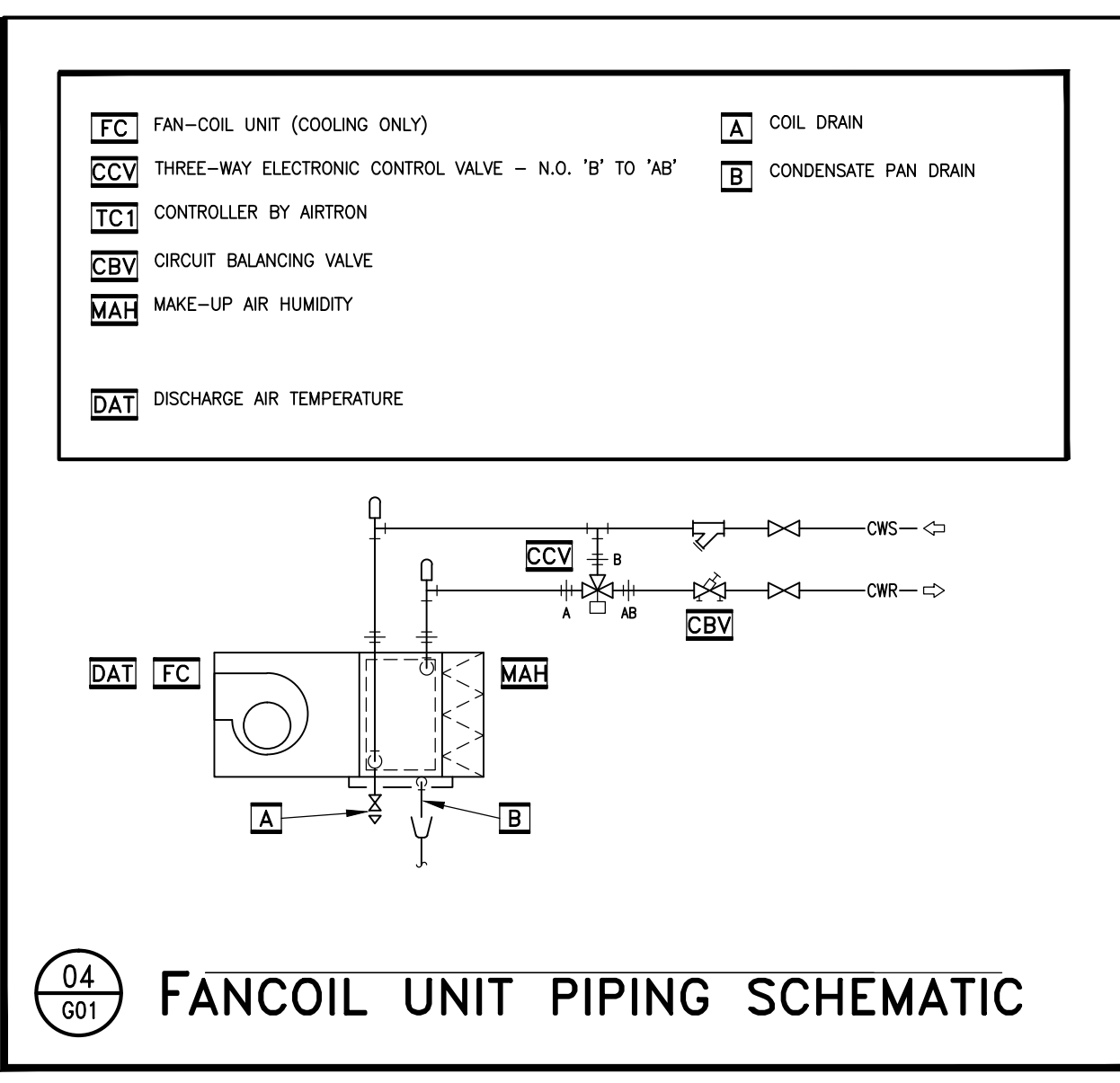
A. THE EMCS SHALL MONITOR THE PRE-CONDITIONED AIR HUMIDITY FROM THE CORRIDOR MAH IN THE CORE OF THE BUILDING.

B. MODULATE THE CCV TO MAINTAIN AN OPERATOR ADJUSTABLE, MAXIMUM MAKE-UP AIR TEMPERATURE SET POINT. WHEN THE LAB ROOM HUMIDITY RISES ABOVE ITS OPERATOR ADJUSTABLE SET POINT, SLOWLY RESET THE MAKE-UP AIR TEMPERATURE SET POINT DOWN UNTIL THE MAH SP IS SATISFIED. THE 77PAC8162A UNIT WILL REHEAT THE MAKE-UP AS NEEDED.

C. POWER FAILURE: ON A RETURN TO NORMAL POWER FOLLOWING A POWER FAILURE, THE SYSTEM WILL BE RESTARTED AUTOMATICALLY, IF SO SCHEDULED.

4. SCHEDULE:

A. THE UNIT SHALL OPERATE 24/7.



00 DEMOLITION + NEW NOTES

01 PRIOR TO ANY DEMOLITION WORK, ENSURE CHANGE-OVER VALVES ARE SET TO ALLOW FOR PLANT CHILLED WATER FLOW TO BE AVAILABLE TO ATTOSECOND LAB ADJACENT.

02 REMOVE ALL PIPING SHOWN WITH BROKEN LINES IN PREPARATION FOR NEW CHILLER AND PUMP INSTALLATION.

03 AFTER DISCONNECTION BY ELECTRICAL TRADES, REMOVE EXISTING CHILLED WATER PUMPS AT THIS LOCATION.

04 EXISTING SMART CHILLER 77CCH02 PRE-POSITIONED BY NRC.

05 EXISTING DOMESTIC COLD WATER PIPING IS TOO CLOSE TO CHILLER. REMOVE SECTIONS SHOWN WITH BROKEN LINES IN PREPARATION FOR RELOCATION. FITTING ARRANGEMENTS SHOWN IS DIAGNOSTIC.

06 AFTER DISCONNECTION BY ELECTRICAL TRADES, REMOVE EXISTING BOOSTER FAN AT THIS LOCATION.

07 REMOVE ALL DUCTING ASSOCIATED WITH BOOSTER FAN, SHOWN WITH BROKEN LINES.

08 PROVIDE NEW FANCOIL UNIT FCU-1 TO REPLACE BOOSTER FAN. PROVIDE CHILLED WATER S&R CONNECTIONS AND CONDENSATE DRAIN CONNECTION PER MANUFACTURER'S RECOMMENDATIONS AND PIPING SCHEMATIC ON DRAWING G01.

09 WRING BY ELECTRICAL CONTRACTOR. RUN 20mm CONDENSATE PIPING TO ADJACENT FLOOR DRAIN AND PROVIDE TRIP PROTECTION PLATES OVER PIPING ACROSS FLOOR. CONTROL INTERFACE PROVIDED BY AIRTRON PER SEQUENCE ON THIS DRAWING.

10 PROVIDE NEW 254# SPIRAL DUCTING TO REPLACE THAT REMOVED.

11 EXISTING BOOSTER FAN TO BE REPLACED BY DIV23. DIV26 TO DISCONNECT EXISTING MOTOR AND REMOVE MANUAL SWITCH. RETAIN WIRING AND CONDUIT ON SITE FOR RECONNECTION TO NEW MOTOR AT THE SAME LOCATION.

12 DISCONNECT AND REMOVE MOTOR STARTER C/W ALL WIRING BACK TO SOURCE AND MAKE SAFE. REWIND CONDUITS ON SITE FOR NEW PUMP WIRING. RETURN STARTER TO NRC FOR FUTURE REUSE. TURN BREAKER TO 'OFF' POSITION AND MARK 'SPARE'.

Mechanical Legend

ITEM	DESCRIPTION
CWS	CHILLED WATER SUPPLY
CWR	CHILLED WATER RETURN
RWS	RIVER WATER SUPPLY
RWD	RIVER WATER DRAIN
RNT	SANITARY DRAIN
RNT	REFRIGERANT VENT
HWS	FORCED HEATING WATER SUPPLY
HWR	FORCED HEATING WATER RETURN

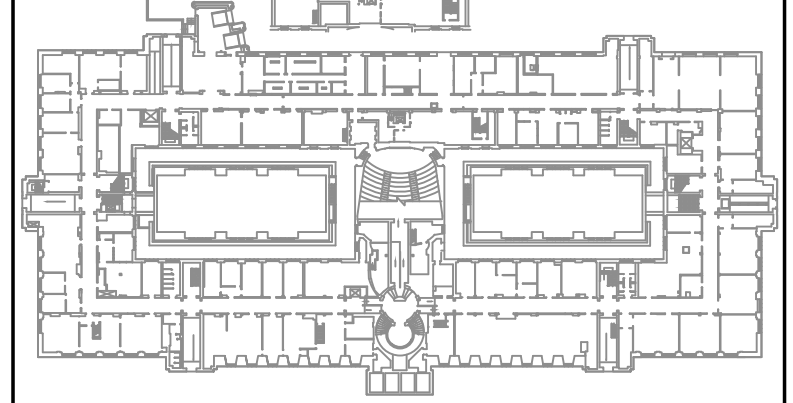
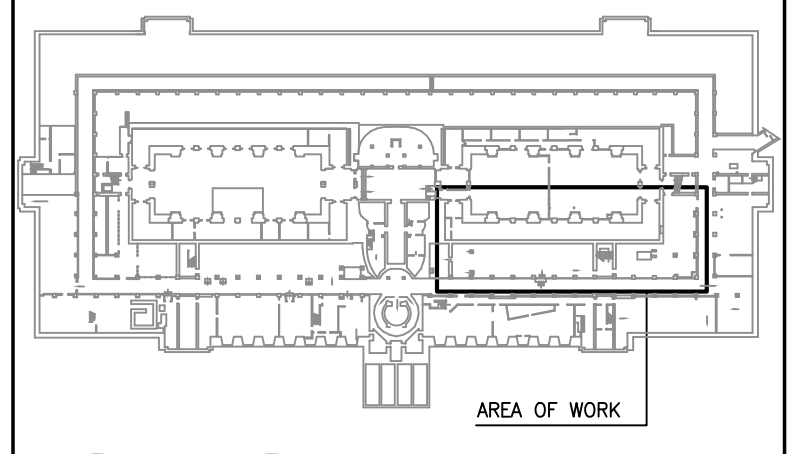
National Research Council Canada / Conseil national de recherches Canada

Administrative Services and Property Management Branch / Division des services administratifs et gestion de l'immobilier

NRC - CNRC

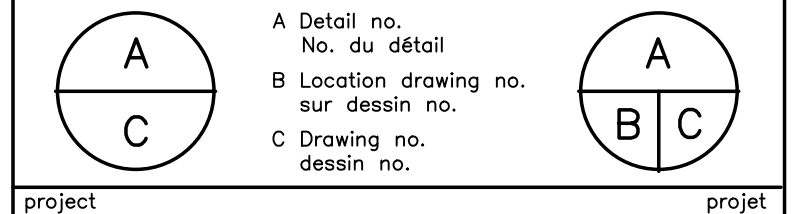
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 ...motivation is key™



00	OCTOBER 2016	ISSUED FOR TENDER	RC
No.	Date	Revision	By: / Par:
Date Printed		Date imprimée	

- Verify all dimensions and site conditions and be responsible for same
- Vérifier toutes les dimensions et l'état des lieux et en assumer la responsabilité



project: BUILDING S-77 MODIFY LASER LABS CHILLED WATER SYSTEM

SUSSEX DRIVE CAMPUS

drawing: SUB-BASEMENT PART PLAN

DEMOLITION LAYOUT DETAILS & LEGEND

designed	conçu	date	date
R CRAIG		September	2016
drawn	dessiné	scale	échelle
RODDERS CAS/CYC		1:50	
checked	vérifié	sheet	feuille
R CRAIG		G01 of/de	02
approved	approuvé	W.O.no.	D.T.no.
B VALLIERES			
dwg.no.	dessin no.		
4060-G01			

Water-Cooled Chillers

ITEM NUMBER	SYSTEM REFERENCE	MODEL NUMBER	UNIT TYPE	CAPACITY				CHILLED FLUID				CONDENSER FLUID				ELECTRICAL	NOTES		
				TON	No.	EA	RLA EA	GPM	EFT	F	IP	FT	MEDIUM	CONN.	in			GPM	EFT
CH-1	77CCH02	MA030-18F04	MAGNETIC CENTRIF	80	1	68	190.0	48.0	38.0	9.0	WATER	4.0	233.0	85.0	16.0	WATER	4.0	575/3/60	MCA, BSA, MOCP 15.5A

NOTE THAT CHILLER IS EXISTING IN-PLACE

Circulating Pumps

ITEM NUMBER	SYSTEM REFERENCE	MODEL NUMBER	PUMP TYPE	PUMP		PUMP MOTOR		ELECTRICAL	VIBRATION	NOTES	
				GPM	FT	HP	RPM				V/Ph/Hz
CP-1	77CWP03	MS-40121	IN-LINE	225.0	140.0	1760	20	1760	575/3/60	-	C/W SUCTION DIFFUSER & TRIPLE-DUTY VALVE
CP-2	77CWP04	MS-40121	IN-LINE	225.0	140.0	1760	20	1760	575/3/60	-	C/W SUCTION DIFFUSER & TRIPLE-DUTY VALVE

Fancoil Units

ITEM NUMBER	SYSTEM REFERENCE	MODEL NUMBER	UNIT TYPE	FAN		FAN MOTOR		ELECTRICAL	COOLING CAPACITY		COOLING	HEATING		NOTES	
				CFM	in	Amp	RPM		V/Ph/Hz	TOTAL		SENSIBLE	MEDIUM		GPM
FC-1	77FCU162A	FM12	HORIZONTAL	500	0.30	9.6	-	115/1/60	42.21	16.14	WATER	8.7	7.87	-	FAN SELECTED ON LOW SPEED

EAT DB/WB 75.2/72.9 degF LAT DB/WB 43.5/43.5 degF EWT/LWT 38.0/48.0 degF

NEW LAYOUT NOTES

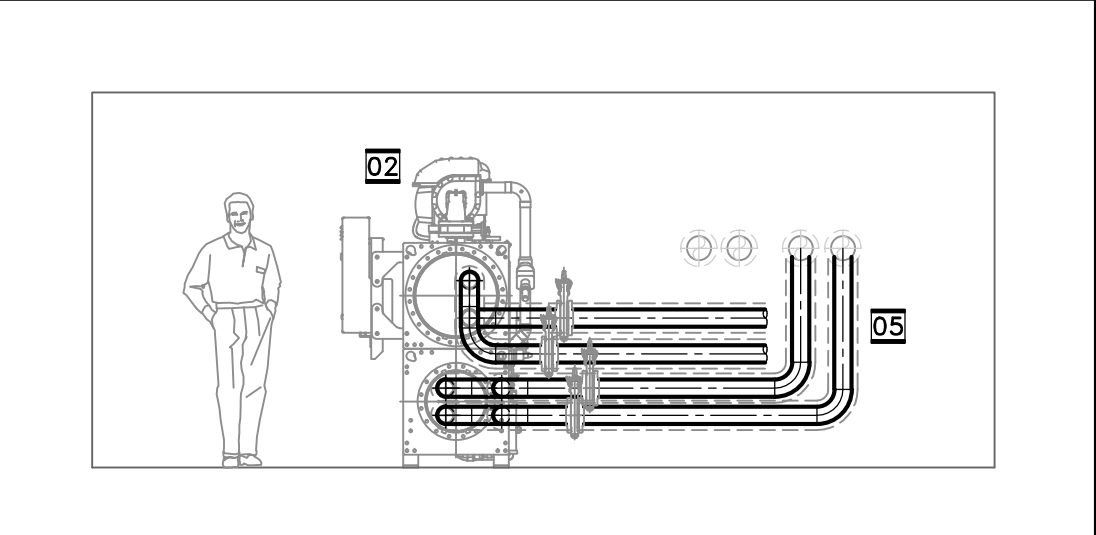
- NOTE THIS AREA IS TO BE LEFT CLEAR FOR POSSIBLE FUTURE PRIMARY CHILLED WATER HEAT EXCHANGER AND PUMP ARRANGEMENT.
- EXISTING SMART CHILLER 77CCH02 PRE-POSITIONED BY NRC.
- PROVIDE NEW IN-LINE CHILLED WATER PUMPS C/W SUCTION DIFFUSERS AND TRIPLE-DUTY VALVES. REFER TO EQUIPMENT SCHEDULE. INSTALL TO MANUFACTURER'S RECOMMENDATIONS. WIRING BY ELECTRICAL TRADES.
- PROVIDE NEW NOMINAL 150 DIA. CHILLED WATER SAN PIPING GENERALLY AS INDICATED TO ALLOW FOR NEW CHILLED WATER PUMPS.
- PROVIDE NOMINAL 100 DIA. PIPING CONNECTIONS TO CHILLER C/W BUTTERFLY ISOLATION VALVES. CONNECT PIPING TO CHILLER PER SMART CHILLER RECOMMENDATIONS.
- REINSTALL DOMESTIC COLD WATER PIPING GENERALLY AS INDICATED INCLUDING ALL RETAINED VALVES & FITTINGS.
- PROVIDE REFRIGERANT VENT PIPING CONNECTING TO EXISTING CHILLER 77CCH01. PROVIDE LINE-SIZE PIPING FROM INDIVIDUAL VENT CONNECTIONS, RISING TO MAIN VENT PIPE AT HIGH LEVEL.
- PROVIDE REFRIGERANT VENT PIPING CONNECTING TO EXISTING CHILLER 77CCH02. PROVIDE LINE-SIZE PIPING FROM INDIVIDUAL VENT CONNECTIONS, RISING TO MAIN VENT PIPE AT HIGH LEVEL.
- ROUTING FOR COMBINED VENT PIPE IS DIAGRAMMATIC. CONTRACTOR TO FIND ROUTE WHICH WILL ALLOW VENT TO RUN HORIZONTALLY WITH NO DROPS. COMBINED VENT PIPING SHALL BE BLACK STEEL THROUGHOUT.
- RISE COMBINED VENT THROUGH FLOOR SLAB ABOVE INTO MECHANICAL ROOM 39A.
- PROVIDE VALVED 50 DIA. CHILLED WATER SAN BRANCHES TO SERVE LAB B162.
- RUN 50 DIA. BRANCHES OVER CHILLER AT HIGHEST LEVEL POSSIBLE AND THEN DROP TO PASS THROUGH INTO ROOM B40A NEXT TO EXISTING SIMILAR PIPING.
- RISE TO JOIN EXISTING PIPING SUSPENDED ON UNISTRUT.
- MODIFY AND EXTEND UNISTRUT TO ALLOW FOR ADDITION OF NEW 50 DIA. BRANCHES AS INDICATED.
- PROVIDE 50 DIA. CHILLED WATER SAN BRANCHES TO ALLOW FOR MANUAL VALVED CHANGE-OVER OF CHILLED WATER SUPPLY TO SERVE VERTICAL AC UNIT. PROVIDE NEW VALVES AS SHOWN, AND PROVIDE NEW VALVES ON EXISTING PIPING AS REQUIRED TO ALLOW FOR CHANGE-OVER.
- PROVIDE 20 DIA. CHILLED WATER SAN PIPING TO SERVE NEW FANCOIL UNIT.
- RUN COMBINED VENT THROUGH EXTERNAL WALL AT APPROX. 1500 AFF. AND TERMINATE WITH 180deg BEND.
- PROVIDE 254# INSULATED SPIRAL DUCTING DOWNSTREAM OF NEW FAN COIL UNIT TO REPLACE THAT REMOVED.
- PROVIDE 254# INSULATED SPIRAL DUCTING DOWNSTREAM OF NEW FAN COIL UNIT TO REPLACE THAT REMOVED.
- NEW PUMP C/W VFD TO BE SUPPLIED BY DIV.23. DIV.26 TO INSTALL VFD ON WALL AND MAKE ALL FINAL CONNECTIONS. PROVIDE TWO NEW 50A BREAKERS IN PANEL 'P05' AND CONNECT TO TWO VFDs. RUN 3/4"Ø+GND IN EXISTING CONDUITS BETWEEN P05 AND ROOM B38. RUN 3/4"Ø+GND IN FLEXIBLE CONDUIT TO NEW LOCATION AND MAKE ALL FINAL CONNECTIONS.
- PROVIDE 600V, 100A, 3PH DISCONNECT SWITCH BESIDE NEW CHILLER CONTROL CABINET. PROVIDE UNISTRUT TO SUPPORT INSTALLATION. PROVIDE NEW 600V, 100A, 3PH BREAKER IN PANEL 'M09' AND MAKE ALL FINAL CONNECTIONS. RUN 3/4"Ø+GND-35mm² EMT CONDUIT FROM PANEL TO DISCONNECT SWITCH AND FROM DISCONNECT SWITCH TO CONTROL CABINET.
- EXISTING BOOSTER FAN TO BE REPLACED BY DIV.23. DIV.26 TO PROVIDE NEW MANUAL STARTER. EXTEND EXISTING WIRING AND CONDUIT AND MAKE ALL FINAL CONNECTIONS. PROVIDE NEW 20A, 1P BREAKER IN PANEL 'B40A' CIRCUIT#20 AND CONNECT TO NEW FAN. REDIRECT EXISTING WIRES INSIDE PANEL FROM COT#18 TO CIRCUIT#20 TO SUIT. TURN BREAKER COT#18 TO 'OFF' POSITION AND MARK 'SPARE'. NEW MANUAL START TO C/W PILOT LIGHT, OVER CURRENT PROTECTION AND HANDLE GUARD. STANDARD OF ACCEPTANCE: SQUARE D F50P.

ADDITIONAL EQUIPMENT REFERENCE NOTES

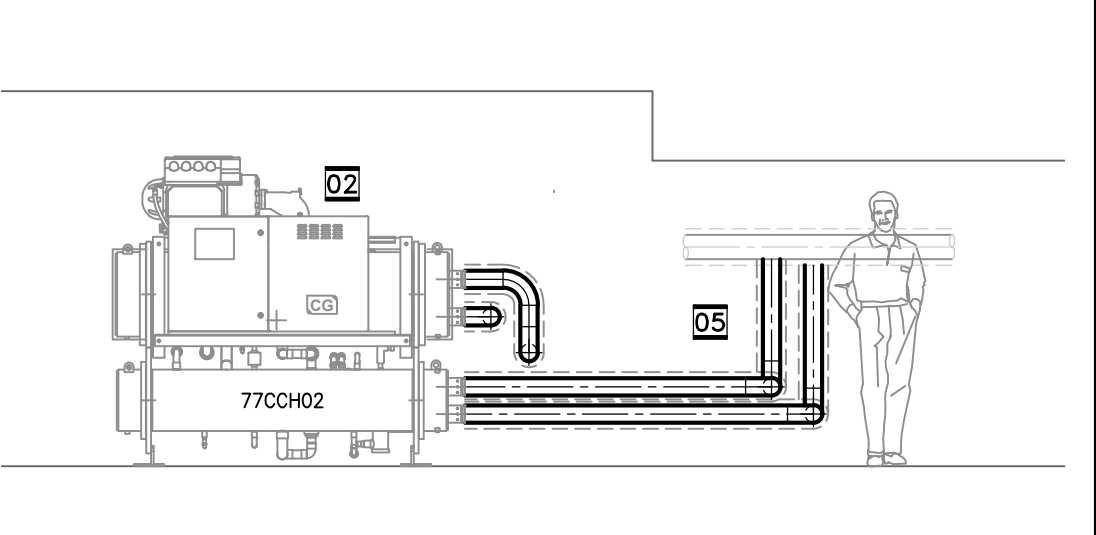
77CWP03	CP-1 VARIABLE SPEED DRIVE
77CWP04	CP-2 VARIABLE SPEED DRIVE
77BFD10	SECONDARY CHILLED WATER BACKFLOW PREVENTER
77PPE06	SECONDARY CHILLED WATER EXPANSION TANK
77CWP06	SECONDARY CHILLED WATER CHEMICAL POT FEEDER

GENERAL NOTES

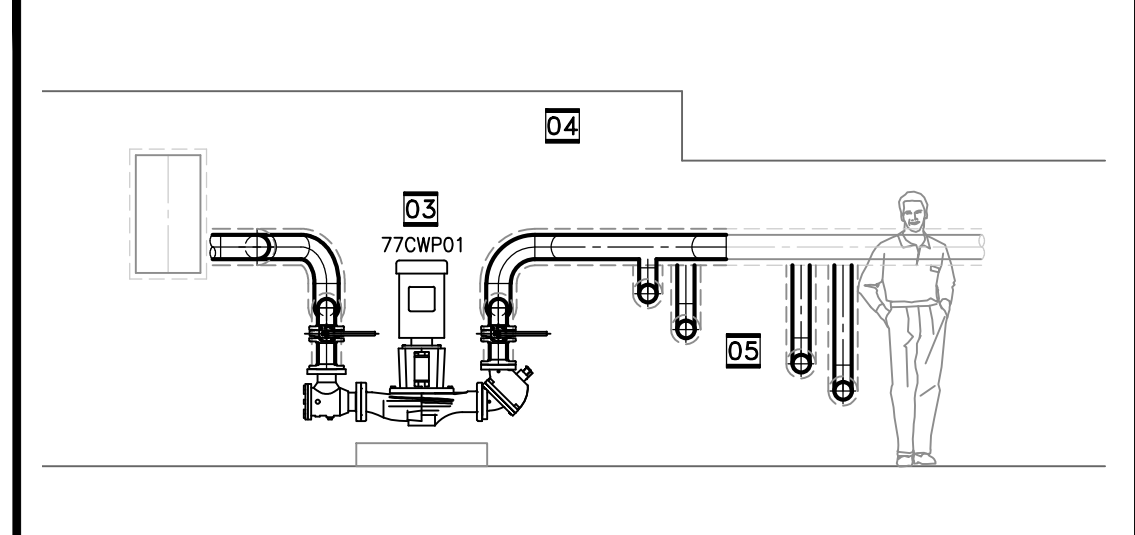
- IT SHALL REMAIN THE RESPONSIBILITY OF THE CONTRACTOR TO SELECT APPROPRIATE EQUIPMENT FOR THIS PROJECT TAKING INTO ACCOUNT ALL INTERFERENCES.
- NEW PIPING MATERIALS SHALL MATCH THOSE EXISTING FOR EACH SYSTEM.
- NEW INSULATION MATERIALS SHALL MATCH THOSE EXISTING FOR EACH SYSTEM.



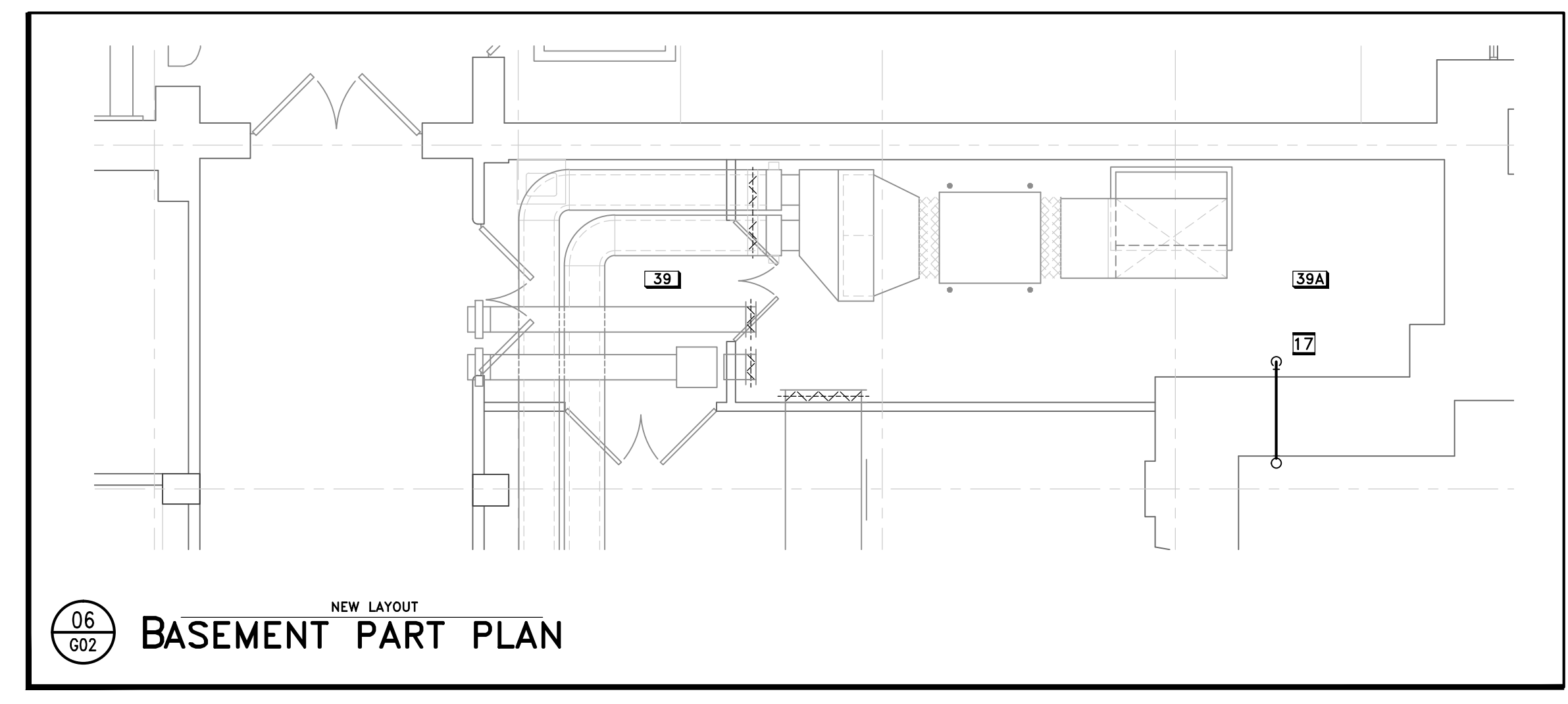
02 SECTION THROUGH ROOM B38



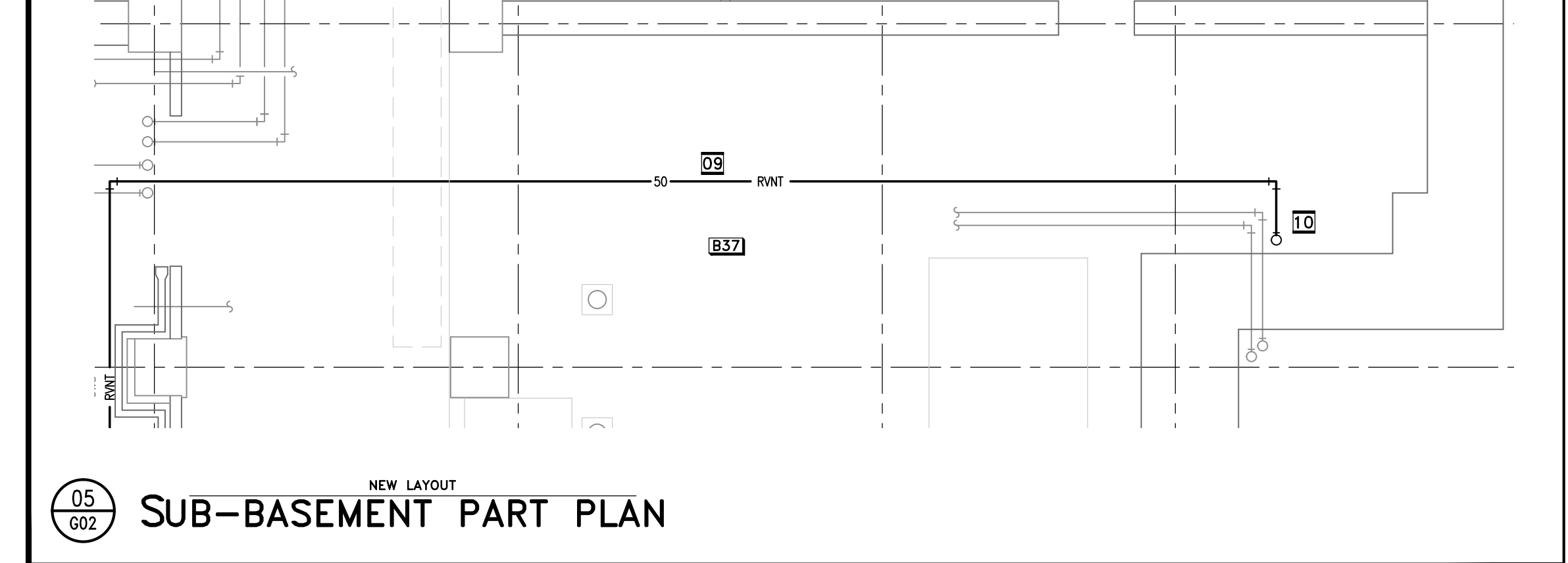
03 SECTION THROUGH ROOM B38



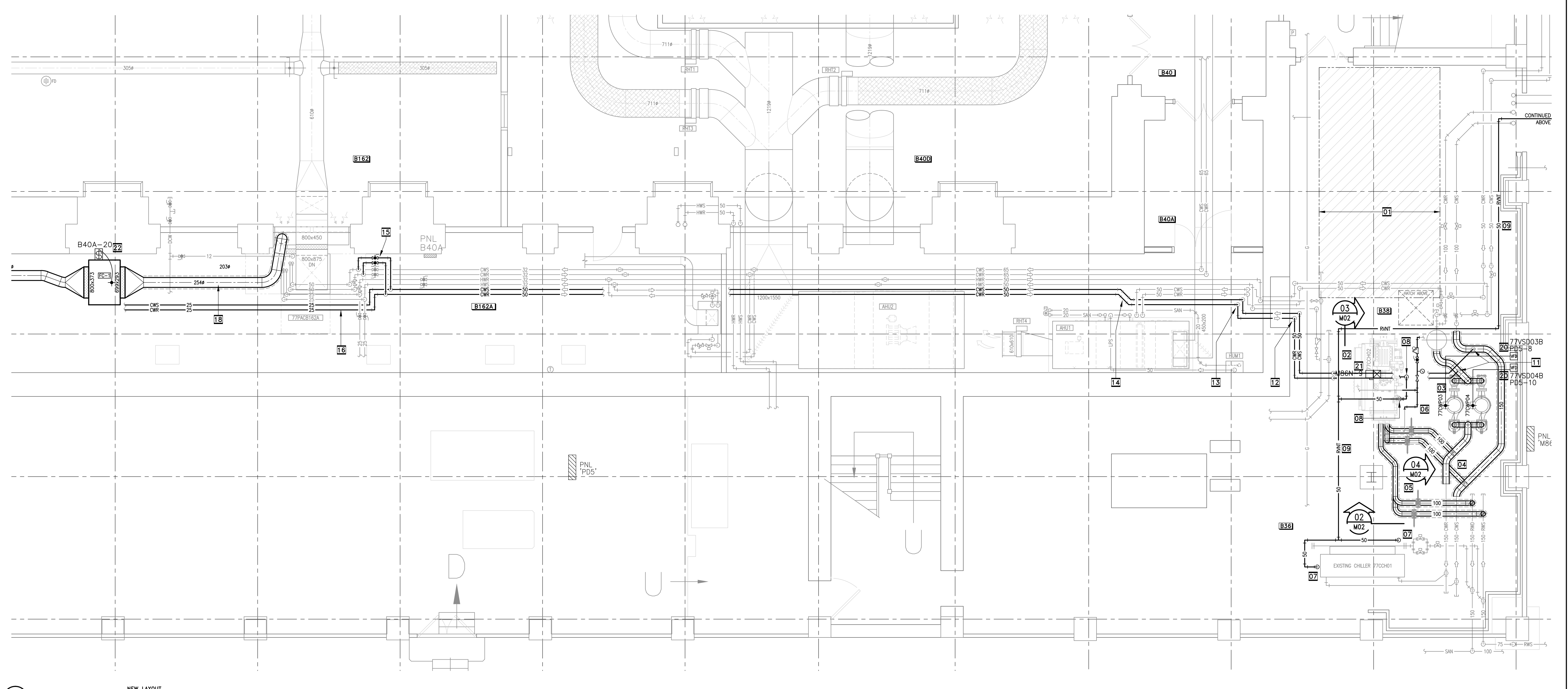
04 SECTION THROUGH ROOM B38



06 BASEMENT PART PLAN

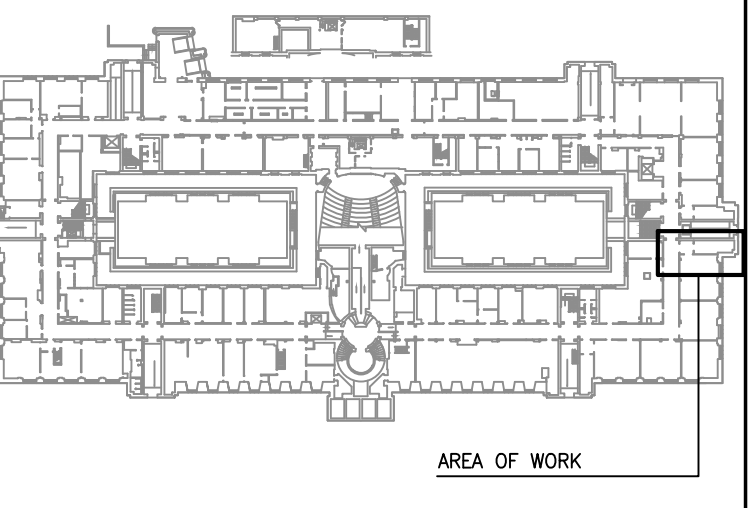
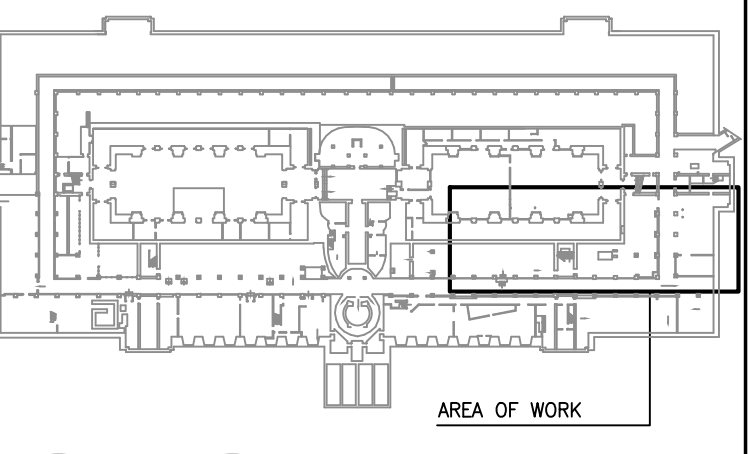


05 SUB-BASEMENT PART PLAN



01 SUB-BASEMENT PART PLAN

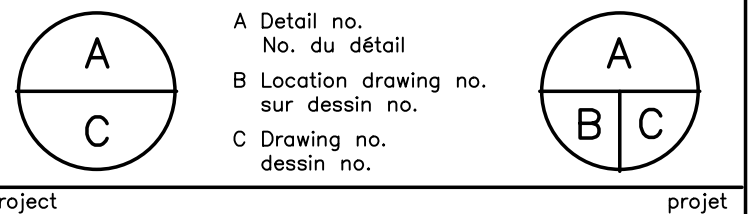
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 cell 613.266.2134
 3 Rochester St. Carleton Place ON K7C 2P9 Canada
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 ...motivation is key™



keyplan - basement

No.	Date	Revision	By	Date
00	OCTOBER 2016	ISSUED FOR TENDER	RC	

- Verify all dimensions and site conditions and be responsible for same
- Vérifier toutes les dimensions et l'état des lieux et en assumer la responsabilité



project: BUILDING S-77 MODIFY LASER LABS CHILLED WATER SYSTEM
 SUSSEX DRIVE CAMPUS

drawing: SUB-BASEMENT PART PLANS
 BASEMENT PART PLAN
 NEW LAYOUT
 DETAILS AND SCHEDULES

designed	conçu	date	date
R CRAIG		September 2016	
drawn	dessiné	scale	échelle
RODDERS CAS/CYC		1:50	
checked	vérifié	sheet	feuille
R CRAIG		G02 of/ de	02
approved	approuvé	W.O.no.	D.T.no.
B VALLIERES			

dwg.no. 4060-G02