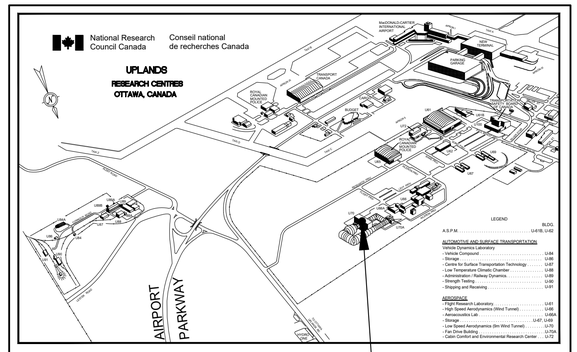
NATIONAL RESEARCH COUNCIL CANADA
Uplands Campus, Ottawa, Ontario, Canada

U-70, BOILER REPLACEMENT PROJECT

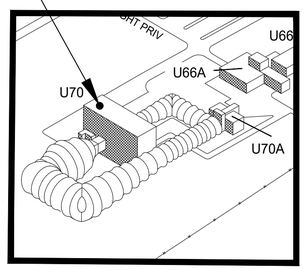
PREPARED BY: REAL PROPERTY PLANNING AND MANAGEMENT,
CONSTRUCTION ENGINEERING SERVICES,
1200 MONTREAL ROAD , M-19 (RM 340),
OTTAWA, ONTARIO, CANADA K1A 0R6

DRAWING SHEET LIST:



BUILDING U–70
RM B2

1 / A00 KEY PLAN LOCATION UPLANDS CAMPUS
SCALE – N.T.S.



ABBREVIATION LEGEND:

AFF.	ABOVE FINISHED FLOOR	E.E.W	EXISTING EYE WASH STATION	O. F.	OUTSIDE FRAME
AL.	ALUMINUM	EX.	EXPANSION	MIN.	OPPOSITE
A/V	AIR/VAPOUR	EXT.	EXTERIOR	POLY.	POLYETHYLENE
APPROX.	APPROXIMATELY	E.W.	EYE WASH	P. T.	PRESSURE TREATED
CEIL.	CEILING	FIN.	FINISH	REINF.	REINFORCING
CONC.	CONCRETE	F.EXT	FIRE EXTINGUISHER	REQ'D	REQUIRED
CONT.	CONTINUOUS	F. R.	FIRE RATED	R. O.	ROUGH OPENING
CONST.	CONSTRUCTION	GA.	GAUGE	SIM.	SIMILAR
COMP.	COMPLETELY	GALV.	GALVANIZED	SHE	SPRINKLER HEAD EXISTING
C/W	COMPLETE WITH	G. B.	GYPSUM BOARD	SHN	SPRINKLER HEAD NEW
DIA.	DIAMETER	G. C.	GENERAL CONTRACTOR	SHX	SPRINKLER HEAD REMOVED
DIAG.	DIAGONAL	HORIZ.	HORIZONTAL	SPEC	SPECIFICATION
DWG	DRAWING	I. D.	INSIDE DIAMETER	SQ.	SQUARE
E.A.P.	EXISTING ACCESS PANEL	INCL.	INCLUDING	S. S.	STAINLESS STEEL
E.F.D.	EXISTING FLOOR DRAIN	INSUL.	INSULATION	STRUCT.	STRUCTURAL
E.F.P.	EXISTING FLOOR PLATES	INT.	INTERIOR	SUSP.	SUSPENDED
EXIST.	EXISTING	MLD	MOTION LIGHT DETECTOR	T. & G.	TONGUE & GROOVE
EX.SHWR	EXISTING EMERGENCY SHOWER STATION	MIN	MINIMUM	T. & B.	TOP & BOTTOM
		mm	MILLIMETRE	T. O. F.	TOP OF FRAME
		N. I. C.	NOT IN CONTRACT	T. O. S.	TOP OF STEEL
		O. C.	ON CENTER	TYP.	TYPICAL
		O. D.	OUTSIDE DIAMETER	U/S	UNDERSIDE
				VERT	VERTICAL

ASPM A1 (841x594)

0 10 20mm 40 60 80 100 120 140 160 180 200mm

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GENERAL NOTES

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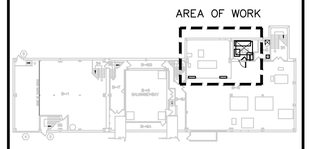
KEY PLAN / PLAN CLÉ



BASEMENT FLOOR KEY PLAN

No.	Date	Revision	By: Par:
1	13 05 2020	ISSUED FOR TENDER	SWH

Date Printed DD MM YYYY / Date imprimée

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A Detail no. / No. du détail
B Location drawing no. / sur dessin no.
C Drawing no. / dessin no.

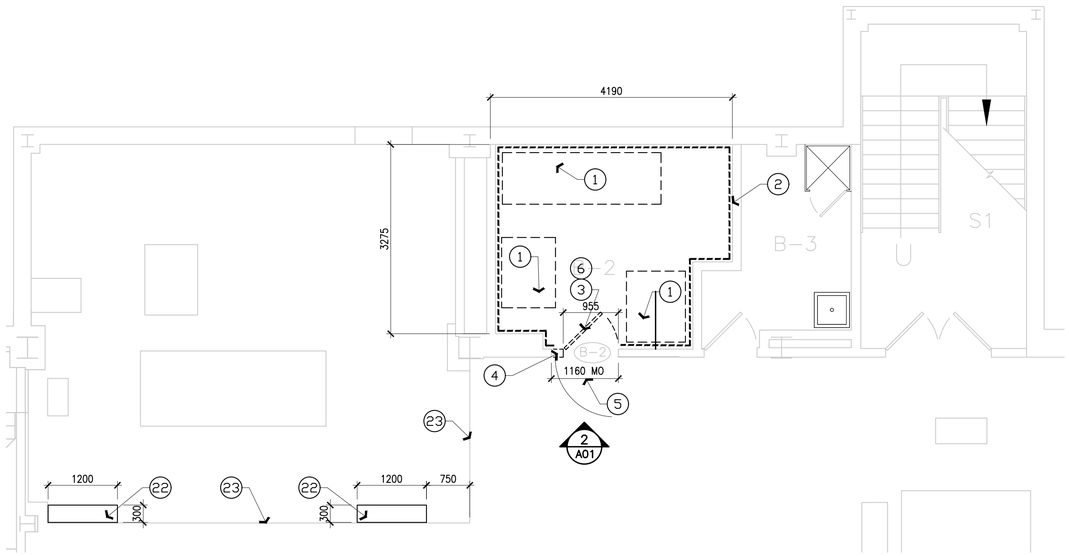
project / projet
U-70, NRC BOILER REPLACEMENT

RESEARCH ROAD, OTTAWA, ON

drawing / dessin
COVER SHEET

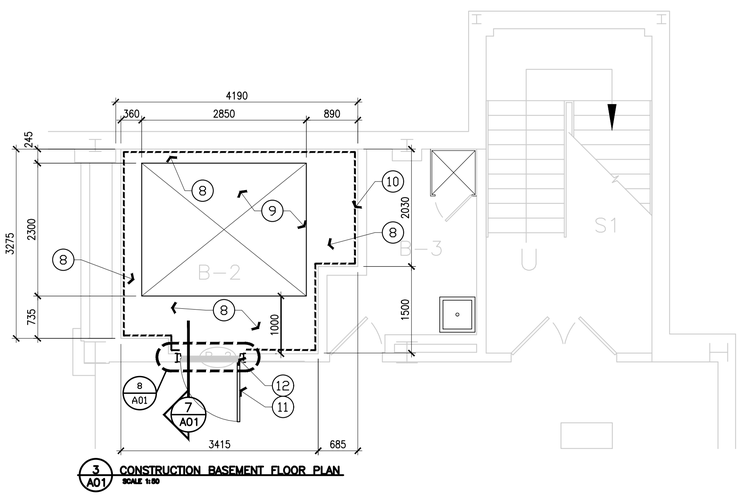
designed / conçu	date / date
SWH	MARCH 2020
drawn / dessiné	scale / échelle
SWH	AS NOTED
checked / vérifié	sheet / feuille
J-C. W.	1 of/de 2
approved / approuvé	W.O.no. / D.T.no.
MR	

dwg.no. / dessin no.
5751-A00

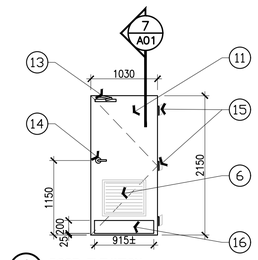


1 A01 **DEMOLITION BASEMENT FLOOR PLAN**
SCALE 1:50

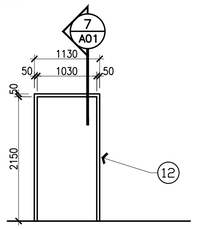
2 A01 **PICTURE OF MECHANICAL ROOM DOOR**
NTS



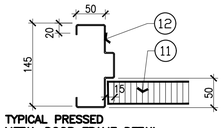
3 A01 **CONSTRUCTION BASEMENT FLOOR PLAN**
SCALE 1:50



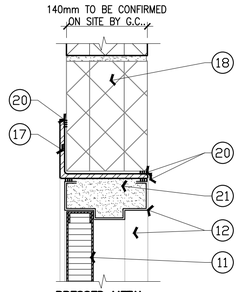
4 A01 **DOOR ELEVATION**
SCALE 1:20



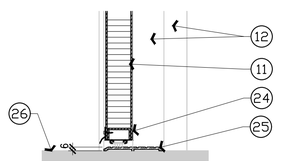
5 A01 **PREDD METAL DOOR FRAME ELEVATION**
SCALE 1:20



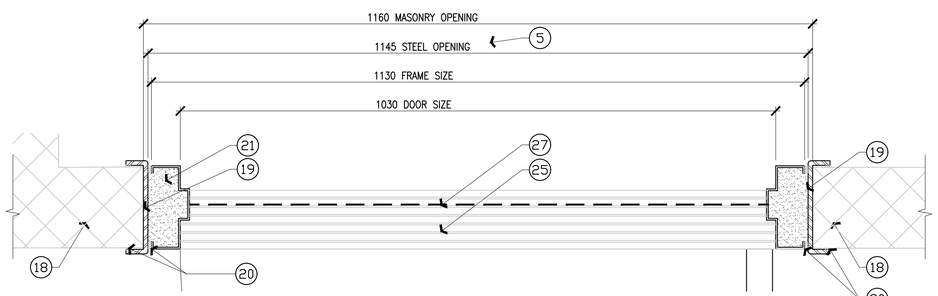
6 A01 **TYPICAL PRESSED METAL DOOR FRAME DETAIL**
SCALE 1:5



7 A01 **PRESSED METAL DOOR FRAME HEAD DETAIL**
SCALE 1:5



8 A01 **PRESSED METAL DOOR FRAME SILL DETAIL**
SCALE 1:5



8 A01 **DOOR FRAME JAMB PLAN**
SCALE 1:5

CONSTRUCTION NOTES
SHEET A0X ONLY

1. REFER TO STRUCTURAL FOR DEMOLITION OF EXISTING HOUSEKEEPING PADS.
2. ON ALL WALLS IN MECHANICAL ROOM B–2:
   REMOVE ALL FLAKING/LOOSE PAINT, REMOVE ALL REDUNDANT SCREWS, UNISTRUT ETC. FOLLOW ALL FEDERAL, PROVINCIAL AND LOCAL REGULATIONS FOR LEAD PAINT ABATEMENT. COORDINATE WITH SPECIFICATION SECTION 02 83 00 – LEAD PRECAUTIONARY MEASURES.
3. REMOVE AND DISPOSE OF DOOR FRAME AND DOOR.
4. REFER TO STRUCTURAL FOR DEMOLITION OF 150mm (WIDE) OF 140mm CONCRETE BLOCK.
5. GENERAL CONTRACTOR TO CONFIRM STEEL OPENING BEFORE ISSUE OF SHOP DRAWINGS.
6. REMOVE AND RETAIN EXISTING FIRE RATED DOOR GRILLE AND REINSTALL IN NEW FR DOOR.
7. REMOVE FIRE EXTINGUISHER AND MOUNTING PLATE, HANDOVER TO DEPARTMENTAL REPRESENTATIVE AND REINSTALL AT END OF PROJECT AT A LOCATION DIRECTED BY NRC DEPARTMENTAL REPRESENTATIVE.
8. INSTALL EPOXY FLOOR SYSTEM BY STONEHARD STONKOTE GS4 (OR APPROVED EQUIVALENT), COMPLETE WITH INTEGRAL COVE BASE WITH METAL COVE TERMINATION STRIP. TEXTURED ULTRA–SLIP RESISTANT SURFACE, C/W TROWEL EPOXY MORTAR–BASE. REFER TO WALL TYPE DETAILS ON DWG A1. REFER TO SPECIFICATION. COLOUR STEEL GRAY.
9. REFER TO STRUCTURAL FOR NEW CONCRETE HOUSE KEEPING PAD, 2300mm X 2850mm.
   INSTALL EPOXY FLOOR SYSTEM BY STONEHARD STONKOTE GS4 (OR APPROVED EQUIVALENT). TEXTURED ULTRA–SLIP RESISTANT SURFACE. COLOUR SAFETY YELLOW.
10. ON ALL WALLS IN MECHANICAL ROOM B–2:
    PATCH WALLS PROVIDE A GYPSUM SKIM COAT AND PREP WALLS TO RECEIVE ONE COAT PRIMER AND TWO COAT PAINT FINISH. WALL HEIGHT 3000mm±.
11. NEW 90 MINUTE FIRE RATED INSULATED DOOR.
12. NEW 90 MINUTE FIRE RATED 'KNOCK DOWN' DOOR FRAME.
13. NEW HEAVY DUTY DOOR CLOSURE, REFER TO SPECIFICATIONS.
14. NEW LOCKSET, REFER TO SPECIFICATIONS.
15. NEW HINGES X 3, REFER TO SPECIFICATIONS.
16. NEW STAINLESS STEEL KICK PLATES X 2, EACH SIDE OF DOOR. REFER TO SPECIFICATION.
17. L 152X102X7.9 LINTEL, REFER TO STRUCTURAL.
18. EXISTING 140mm CONCRETE BLOCK.
19. BENT PLATE, REFER TO STRUCTURAL.
20. PERIMETER SEALANT, BOTH SIDE OF DOOR FRAME, BENT PLATE AND STEEL LINTEL.
21. GROUT SOLID FRAME TO ENSURE FR RATED ASSEMBLY.
22. NEW CONCRETE STEP, REFER TO STRUCTURAL. INSTALL EPOXY FLOOR SYSTEM ON ALL EXPOSED SIDES WITH STONEHARD STONKOTE GS4 (OR APPROVED EQUIVALENT). TEXTURED ULTRA–SLIP RESISTANT SURFACE. COLOUR STEEL GREY. C/W 75mm NOSING SAFETY STRIP COLOUR SAFETY YELLOW.
23. EDGE OF EXISTING CONCRETE SLAB.
24. DOOR SHOE: FIRE RATED, EXTRUDED ALUMINUM WITH VINYL FLOOR SWEEP.
25. 100mm X 6mm FIRE RATED, ALUMINUM THRESHOLD. MAKE REMOVABLE.
26. EXISTING CONCRETE SLAB.
27. FINISH PAINT LINE FOR EPOXY FLOOR COATING.

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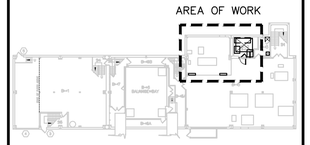
KEY PLAN / PLAN CLÉ



BASEMENT FLOOR KEY PLAN

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1	13 05 2020	ISSUED FOR TENDER	SWH

Date Printed DD MM YYYY / Date imprimée

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A Detail no. / No. du détail
B Location drawing no. / sur dessin no.
C Drawing no. / dessin no.

project / projet
U70, NRC BOILER REPLACEMENT

RESEARCH ROAD, OTTAWA, ON

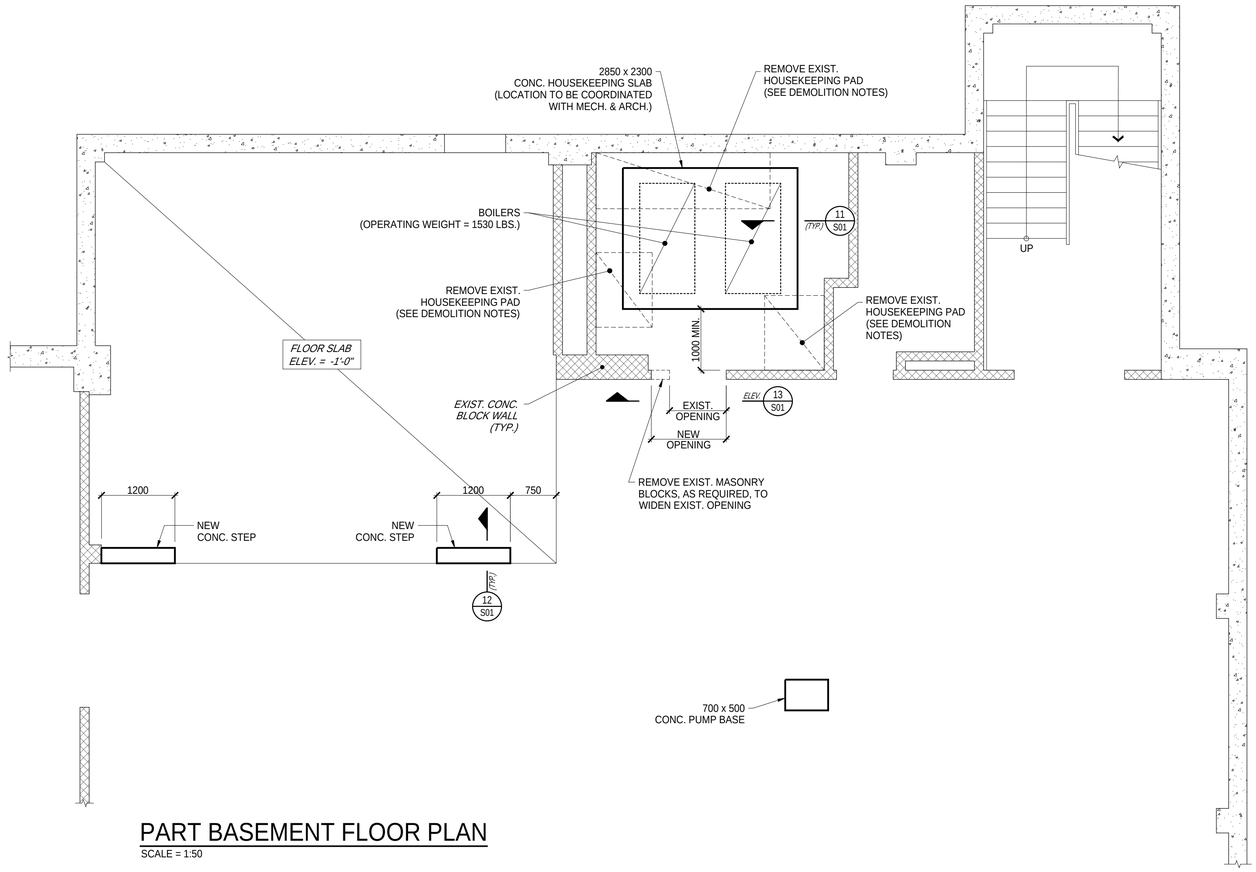
drawing / dessin
MECHANICAL ROOM B-2 FLOOR PLAN AND DOOR DETAILS

designed / conçu: SWH	date / date: MARCH 2020
drawn / dessiné: SWH	scale / échelle: AS NOTED
checked / vérifié: J-C. W.	sheet / feuille: 2 of/de 2
approved / approuvé: MR	W.O.no. / D.T.no.

dwg.no. / dessin no.: 5751-A01

ASPM A1 (841x594)

0 10 20mm 40 60 80 100 120 140 160 180 200mm



PART BASEMENT FLOOR PLAN

SCALE = 1:50

DEMOLITION NOTES:

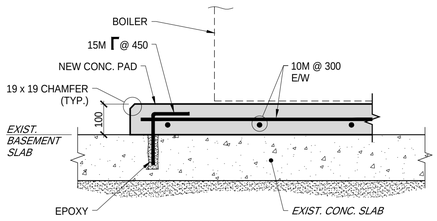
1. DEMOLISH & REMOVE EXISTING 100 THICK CONCRETE HOUSEKEEPING PADS.
2. DO NOT DAMAGE EXISTING CONCRETE FLOOR SLAB.
3. WHERE EXISTING DOWELS FALL OUTSIDE NEW HOUSEKEEPING PADS, REPAIR FLOOR.

GENERAL NOTES:

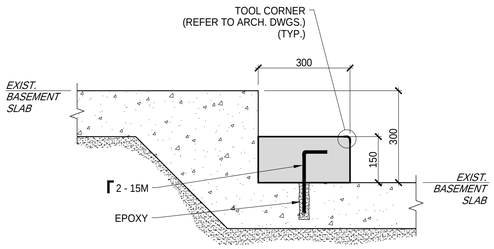
- COORDINATE LOCATION OF NEW HOUSEKEEPING PADS WITH MECHANICAL AND WITH NRC DEPARTMENTAL REPRESENTATIVE.

CONCRETE:

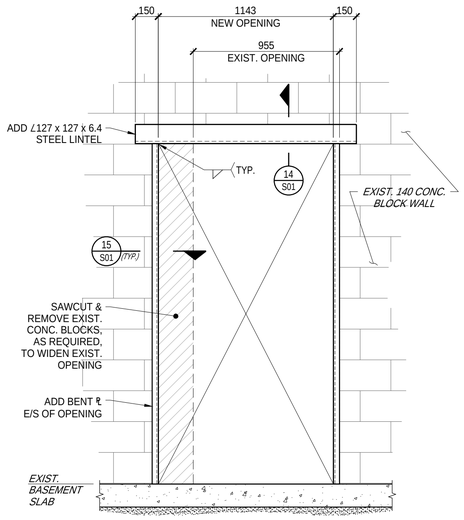
- CONCRETE SHALL HAVE A 28-DAY COMPRESSIVE STRENGTH OF 25 MPa.
- FOR EACH CONCRETE POUR, THE CONTRACTOR SHALL TAKE THREE CONCRETE COMPRESSION TEST CYLINDERS. ONE SHALL BE TESTED AT 7 DAYS AND TWO AT 28 DAYS.
- REINFORCING STEEL SHALL CONFORM TO CSA G30.18-09, GRADE 400.
- CONCRETE HOUSEKEEPING PADS SHALL RECEIVE A WOOD FLOAT FINISH.
- ALL CONCRETE WORK SHALL CONFORM TO CSA A23.1-14 AND CSA A23.2-14.
- NOTIFY THE ENGINEER BEFORE EACH CONCRETE POUR.



11 / S01 **SECTION** (TYPICAL)
SCALE = 1:10

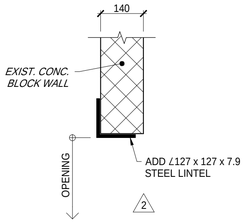


12 / S01 **SECTION** (TYPICAL CONCRETE STEP)
SCALE = 1:10



13 / S01 **ELEVATION**
SCALE = 1:20

- FOR NEW DOOR, REFER TO ARCHITECTURAL DRAWINGS.



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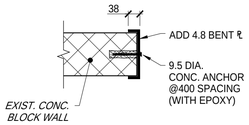

15 / S01 **SECTION**
SCALE = 1:10

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

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Leibe Engineering Associates
Consulting Engineers / Ingenieurs-Conseils
22 Antares Drive, Suite 201
Ottawa, Ontario, K2E 7Z6
tel: (613) 723-7765 fax: (613) 723-0095

LICENSED PROFESSIONAL ENGINEER
R. LEIBE
26371500
PROVINCE OF ONTARIO
MARCH 9, 2020

No.	Date	Revision	By: Par:
2	MAY 12/2020	ISSUED FOR TENDER	R.L.
1	MAR 27/2020	ISSUED FOR TENDER	R.L.
0	MAR 9/2020	ISSUED FOR TENDER	R.L.

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C Drawing no dessin no.

project / projet
BUILDING U-70
BOILER REPLACEMENT
UPLANDS CAMPUS

drawing / dessin
STRUCTURAL:
PART BASEMENT PLAN
AND DETAILS

designed / conçu	date / date
R.L.	MARCH, 2020
drawn / dessiné	scale / échelle
D.M.D.	AS SHOWN
checked / vérifié	sheet / feuille
R.L.	S01 of/de S01
approved / approuvé	W.O.no. / D.T.no.

dwg.no. / dessin no.
5751-S01

LEA20014

ASPM A1 (841 x 594)

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm

SYMBOLS

SYMBOL	DESCRIPTION
BLR–XX	BOILER
HWP–XX	HEATING WATER PUMP
UNH–XX	UNIT HEATER
VSD–XX	VARIOUS SPEED DRIVE
	TYPICAL EXISTING
	TYPICAL NEW
	TYPICAL DEMOLITION / REMOVALS
HWS	HEATING WATER SUPPLY
HWR	HEATING WATER RETURN
G	NATURAL GAS
CD	CONDENSATE DRAIN
	PIPE DOWN
	PIPE UP
	PIPE CAP
	UNION
	BALL VALVE
CBV	CIRCUIT BALANCING VALVE
	CONTROL VALVE
	STRAINER
BFP	REDUCED PRESSURE BACKFLOW PREVENTER
	TEMPERATURE / PRESSURE RELIEF VALVE
	THERMOMETER
	PRESSURE GAUGE WITH SHUT–OFF BALL VALVE
	IN LINE PUMP
FFD–	FUNNEL FLOOR DRAIN
	TEMPERATURE SENSOR
	EXISTING DUCT
	CIRCULAR AIR DUCT UP
	CIRCULAR AIR DUCT DOWN
CTE	CONNECT TO EXISTING
	DETAIL
	LOCATION OF DETAIL

DRAWING LIST

M01	U70–M–LEGEND AND DRAWING LIST
M02	U07–M–BSMT HYDRONIC PIPING & HVAC DEMOLITION
M03	U70–M–BSMT & FL02–HYDRONIC PIPING & HVAC NEW–WORK
M04	U70–M–HYDRONIC DIAGRAM AND CONTROL SCHEMATIC DEMOLITION & NEW WORK
M05	U70–M–DETAILS AND EQUIPMENT SCHEDULES

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WSP
300–2611 QUEENSVIEW DRIVE
OTTAWA ONTARIO CANADA K2B 8K2
TEL: 1–613–829–2800 | FAX: 1–613–829–8299 | WWW.WSPGROUP.COM

KEY PLAN PLAN CLÉ

No.	Date	Revision	By: Par:
C	16 03 2020	ISSUED FOR TENDER	P.B
B	06 09 2019	ISSUED FOR 99%	P.B
A	28 06 2019	ISSUED FOR 66%	P.B

Date Printed Date imprimée

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project projet

U62 Boiler Replacement

NRC, Building U62, 1920 Research Road, Ottawa,ON

drawing dessin

U70–M–LEGEND AND DRAWING LIST

designed conçu: A.Z/B.B	date:
drawn dessiné: A.Z/B.B	scale échelle: AS SHOWN
checked vérifié: P.B	sheet feuille: of/de
approved approuvé: P.B	W.O.no. / D.T.no.

dwg.no. dessin no.

5751–M01

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm

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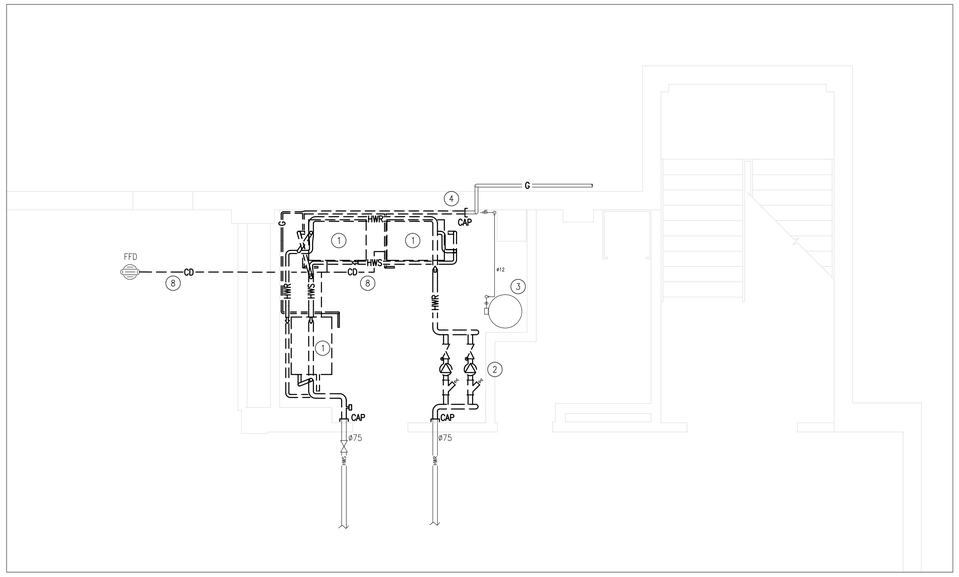
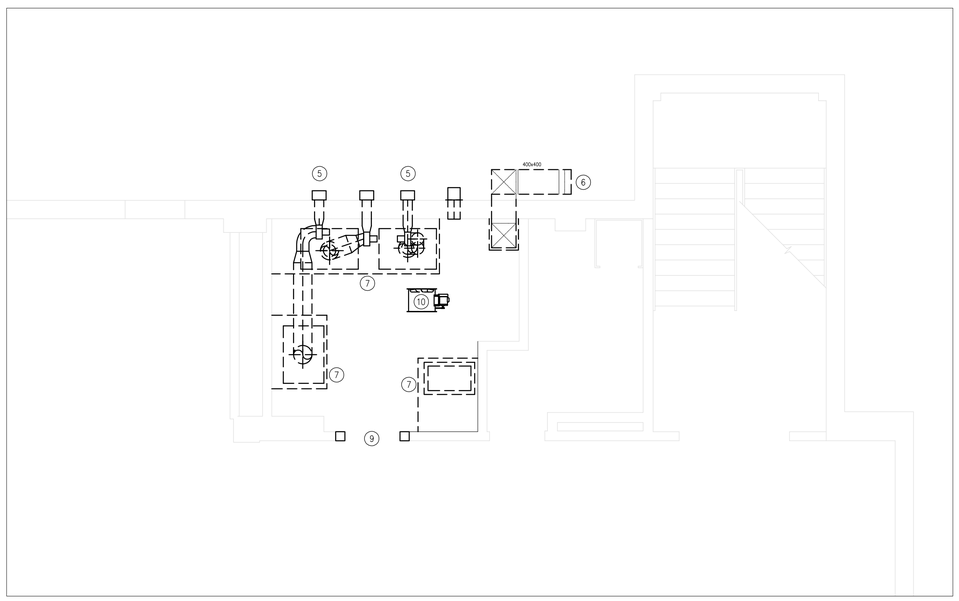


1 M02 BSMT–HYDRONIC PIPING DEMOLITION

SCALE = 1:50



2 M02 BSMT–HVAC DEMOLITION

SCALE = 1:50

GENERAL DRAWING NOTES:

1. CLEAN, DEGREASE AND APPLY AN EPOXY COATING TO SEAL FLOOR IN ENTIRE MECHANICAL ROOM BEFORE ANY NEW WORK IS DONE.
2. ASBESTOS CONTAINING MATERIAL (ACM). NOTE THAT ALL PIPING CONTAINS ACM. REFER TO DSR REPORT PREPARED BY NRC. ACM REMOVAL INCLUDED IN SCOPE OF WORK. A ACM CONSULTANT WILL BE RETAINED BY NRC TO PERFORM SITE REVIEWS AND AIR MONITORING.

DEMOLITION NOTES: (·)

1. REMOVE EXISTING BOILERS COMPLETE WITH ALL PIPES, CONTROLS, SUPPORTS AND ACCESSORIES.
2. REMOVE EXISTING HYDRONIC CIRCULATION PUMPS COMPLETE WITH ALL PIPES, CONTROLS, SUPPORTS AND ACCESSORIES.
3. EXISTING DHW TANK TO BE TEMPORARILY REMOVED TO ALLOW FLOOR TO BE EPOXY PAINTED.
4. DEMOLISH NATURAL GAS PIPING BACK TO MAIN AS INDICATED AND TEMPORARILY CAP THE PIPE FOR FUTURE CONNECTION.
5. REMOVE ALL EXISTING FLUE EXHAUST DUCTWORK AND CONNECTED FANS FOR ALL BOILERS COMPLETE WITH ALL, ELECTRICAL CONNECTIONS, CONTROLS, SUPPORTS AND ACCESSORIES.
6. DEMOLISH EXISTING COMBUSTION 400x400 DUCT COMPLETE WITH ALL CONNECTIONS AND SUPPORTS.
7. REMOVE EXISTING CONCRETE HOUSEKEEPING PADS UNDER BOILERS AND PUMPS.
8. REMOVE BOILER DRAIN PIPING BACK TO EXISTING FUNNEL FLOOR DRAIN IN ADJACENT MECHANICAL ROOM.
9. DEMOLISH AND ENLARGE DOOR OPENING TO ACCOMMODATE NEW BOILERS.
10. DEMOLISH CEILING SUSPENDED EXHAUST FAN COMPLETE WITH ALL CONNECTIONS, CONTROLS, SUPPORTS AND ACCESSORIES.

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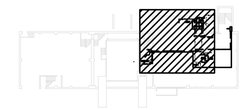
KEY PLAN PLAN CLÉ



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project projet

U62 Boiler Replacement

NRC, Building U70, 1920 Research Road, Ottawa,ON

drawing dessin

U70–M–BSMT–HYDRONIC PIPING & HVAC DEMOLITION

designed conçu: A.Z/B.B	date:
drawn dessiné: A.Z/B.B	scale échelle: AS SHOWN
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dwg.no. dessin no.

5751-M02

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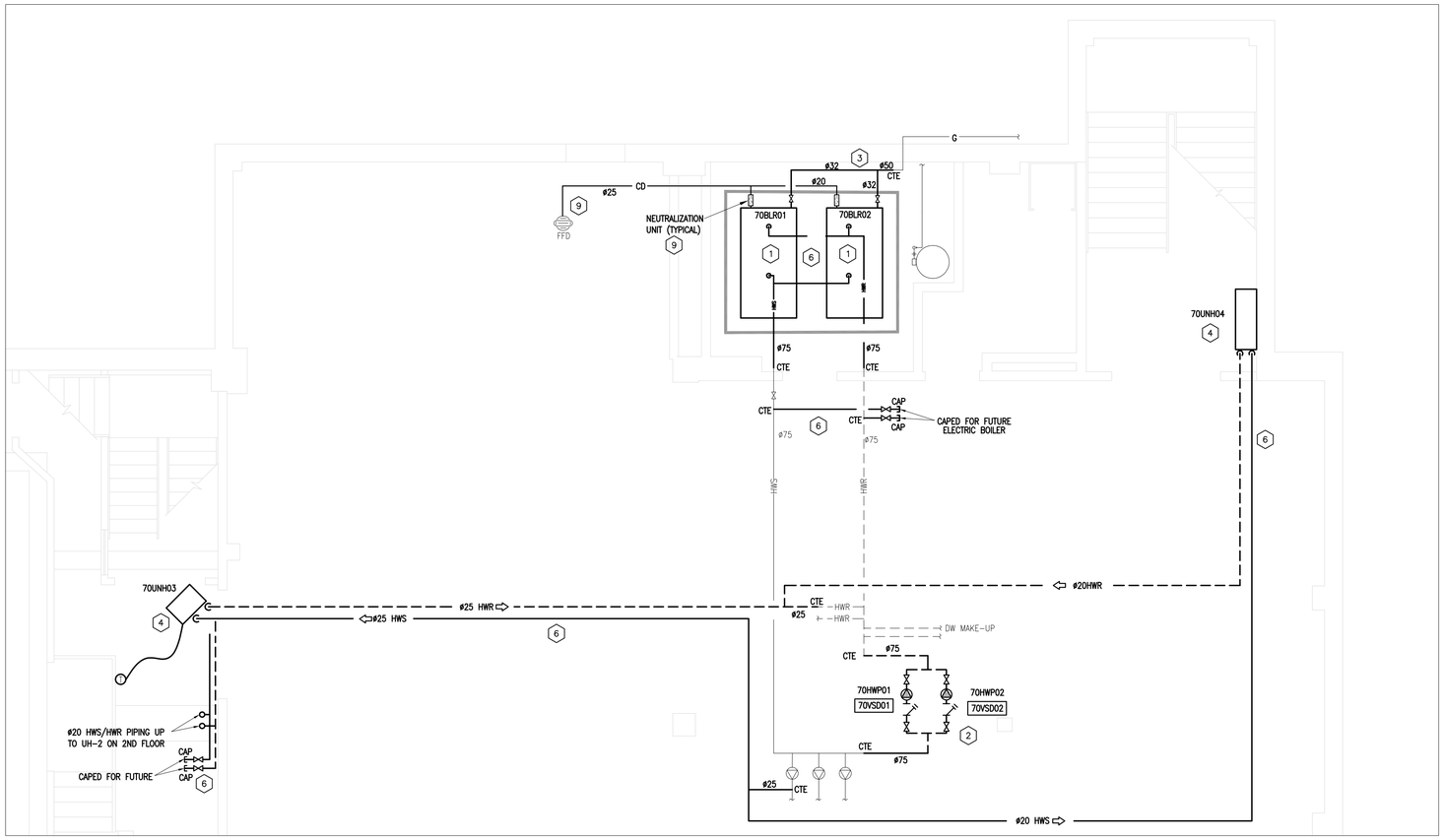
ASPM A1 (841x594)

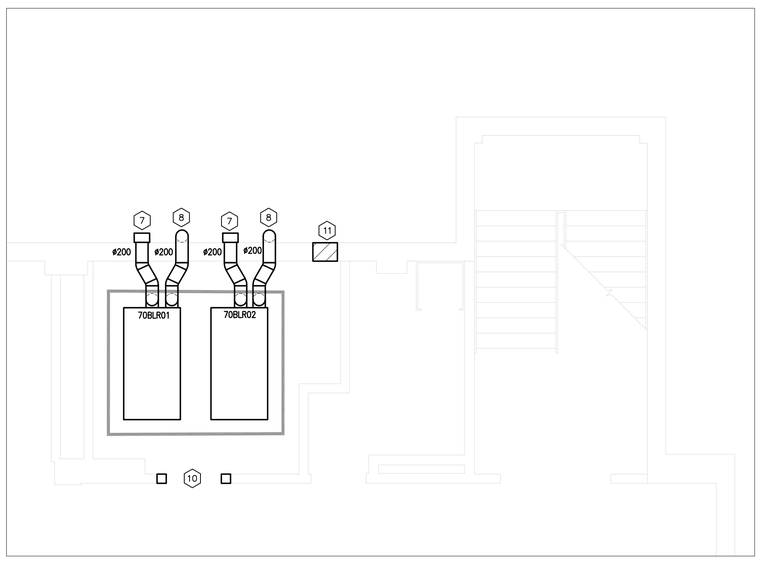


NEW WORK NOTES: (1)

1. PROVIDE NEW BOILERS COMPLETE WITH ALL PIPES, CONTROLS, SUPPORTS AND ACCESSORIES. REFER TO M04 FOR DETAILS.PROVIDE NEW CONCRETE HOUSEKEEPING PAD FOR NEW BOILERS.
2. PROVIDE NEW PRIMARY CIRCULATION PUMPS COMPLETE WITH ALL PIPES, CONTROLS, SUPPORTS AND ACCESSORIES. RELOCATE EXISTING WATER METER AND TWO BACK FLOW PREVENTER TO SUIT NEW PUMPS. EXTEND EXISTING CONCRETE HOUSEKEEPING PAD TO SUIT NEW PUMPS.
3. PROVIDE NATURAL GAS PIPING AND CONNECT EACH BOILER TO EXISTING SYSTEM AS INDICATED.
4. PROVIDE NEW UNIT HEATERS AT BASE OF STAIRS COMPLETE WITH ALL PIPES, CONTROLS, SUPPORTS AND ACCESSORIES.
5. PROVIDE NEW UNIT HEATER IN 2ND FLOOR CORRIDOR COMPLETE WITH ALL PIPES, CONTROLS, SUPPORTS AND ACCESSORIES.
6. PROVIDE HWS AND HWR PIPES AND CONNECT THE NEW UNIT HEATERS TO EXISTING SYSTEM AS INDICATED.
7. PROVIDE 200 DIA. VENT DUCTWORK FROM EACH BOILER. USE EXISTING OPENINGS IN WALL.
8. PROVIDE 200 DIA. COMBUSTION AIR VENT FROM EACH BOILER. USE EXISTING OPENINGS IN WALL.
9. PROVIDE NEUTRALIZATION UNITS FOR NEW BOILERS AND PIPE DRAIN TO EXISTING FUNNEL FLOOR DRAIN IN ADJACENT MECHANICAL ROOM.
10. REINSTATE DOOR AFTER BOILER INSTALLATION.
11. CLEAN PENETRATION OF ANY LOOSE MATERIALS AND COATINGS, INSTALL 4 CONCRETE FASTENERS (TAPCONS) INTO THE PENETRATION WALLS (ONE AT TOP, BOTTOM, AND SIDES) TO PROVIDE A MECHANICAL SECUREMENT FOR THE NEW CONCRETE. FASTENERS TO BE MIN. 3/8" DIAMETER X±3" LONG, WITH 1½" EMBEDMENT. FORM AND POUR NEW ACCEPTABLE CONCRETE. COAT EXTERIOR PATCH TO MATCH EXISTING WALL FINISH.

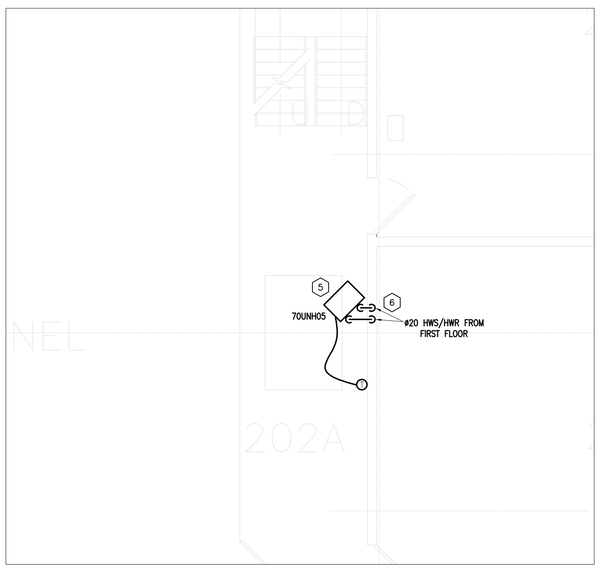
1 M03 BSMT–HYDRONIC PIPING NEW–WORK

SCALE = 1:50



2 M03 BSMT–HVAC NEW–WORK

SCALE = 1:50



3 M03 FL02–HYDRONIC PIPING NEW–WORK

SCALE = 1:50

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ASPM A1 (841x594)

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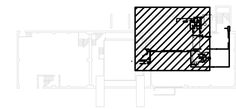

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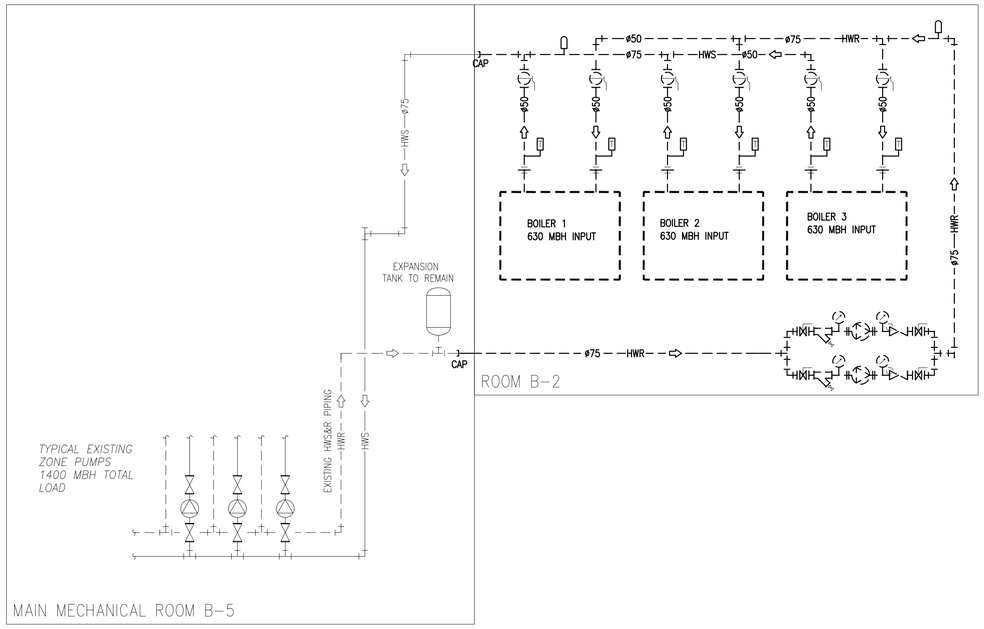
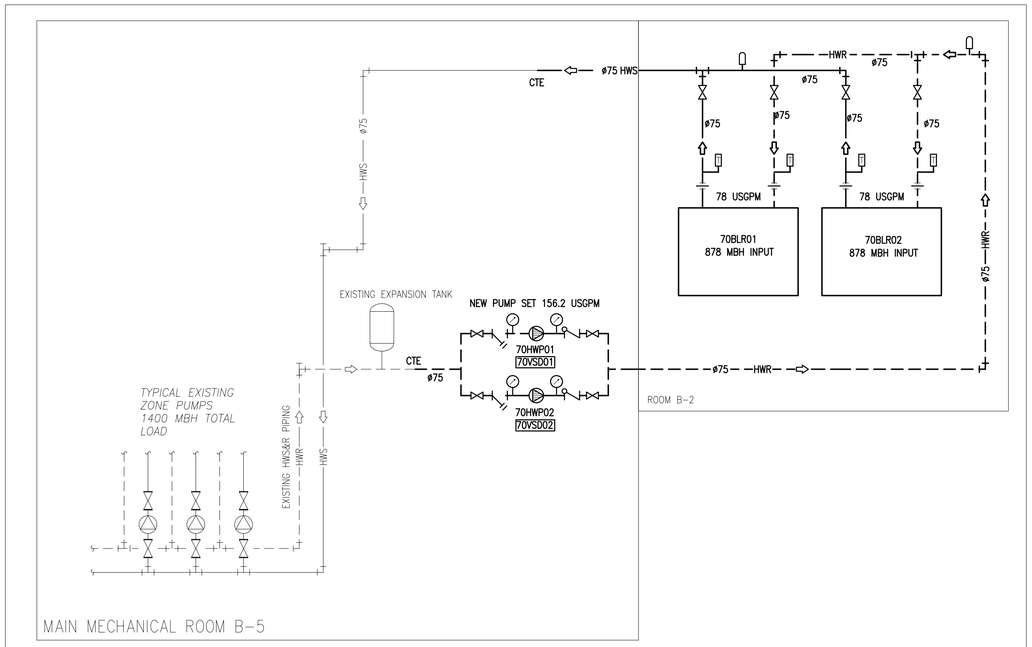


1 M04 HYDRONIC DIAGRAM DEMOLITION

SCALE = N.T.S



2 M04 HYDRONIC DIAGRAM NEW WORK

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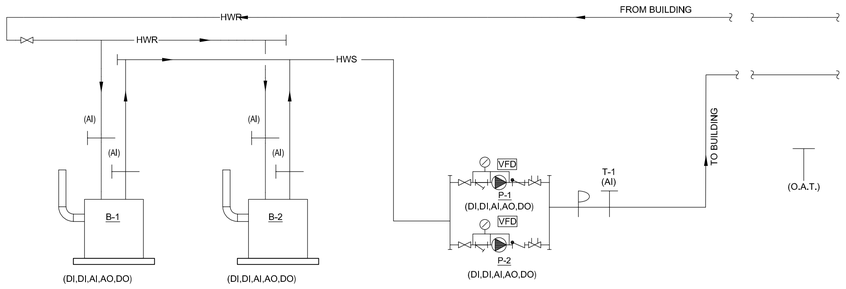

BAS POINTS LIST				
POINT REF	TYPE	DEVICE TYPE	NEW OR EXIST.?	POINT DESCRIPTION
BOILERS (TYPICAL TO ALL)				
BOILERS INTERNAL ALARMS AND SAFETIES	AI/AO/DI/DO	BOILERS INTERNAL ALARMS AND SAFETIES	N	BOILER 1, 2, 3INTERNAL ALARMS AND SAFETIES
B#_TSUPPLY	AI	TEMPERATURE SENSOR	N	SUPPLY WATER TEMPERATURE
B#_TRETURN	AI	TEMPERATURE SENSOR	N	SUPPLY WATER TEMPERATURE
P#_SS	DO	CONTACT	N	PRIMARY PUMP (P1/P2/P3) EQUIPMENT START/STOP
P#_STATUS	DI	CURRENT SENSOR	N	PRIMARY PUMP (P1/P2/P3) EQUIPMENT STATUS
PRIMARY PUMPS P-1, P-2 (TYPICAL TO ALL)				
P#_SS	DO	CONTACT	N	PRIMARY PUMP (P1/P2/P3) EQUIPMENT START/STOP
P#_STATUS	DI	CURRENT SENSOR	N	CURRENT SENSOR
P#_VFD	DI/DO	VFD SPEED	N	VFD SPEED
P#_VFDALARM	DI	VFD ALARM	N	VFD ALARM
UNIT HEATERS (TYPICAL TO ALL)				
UH#_HCV	AO	CONTROL VALVE ACTUATOR	N	UNIT HEATER CONTROL VALVE POSITION
ROOM#_T	AI	TEMPERATURE SENSOR	N	ROOM TEMPERATURE

THE POINTS LISTED BELOW ARE REQUIRED TO BE MAPPED BACK TO BAS

POINT DESCRIPTION	UNIT	REMARK
BURNER STARTS		
BOILER OUTPUT VALUE	%	FOR EACH ONE OF THE TWO (2) BOILERS
FUEL CONSUMPTION	L	FOR EACH ONE OF THE TWO (2) BOILERS
RETURN WATER TEMPERATURE	°C	FOR EACH ONE OF THE TWO (2) BOILERS
FLUE GAS TEMPERATURE	°C	FOR EACH ONE OF THE TWO (2) BOILERS
BOILER WATER TEMPERATURE	°C	FOR EACH ONE OF THE TWO (2) BOILERS
WATER TEMPERATURE SETPOINT	°C	WRITEABLE COMMON SUPPLY
BURNER HOUR RUN STAGE 1	HOUR	FOR EACH ONE OF THE TWO (2) BOILERS
BOILER PUMP ON		FOR EACH ONE OF THE TWO (2) BOILERS
BOILER PUMP OFF		FOR EACH ONE OF THE TWO (2) BOILERS
FLUE GAS HIGH LIMIT		FOR EACH ONE OF THE TWO (2) BOILERS
BOILER OUTPUT STATUS		FOR EACH ONE OF THE TWO (2) BOILERS
LON COMMUNICATION STATUS		FOR EACH ONE OF THE TWO (2) BOILERS
GENERAL ALARM		FOR EACH ONE OF THE TWO (2) BOILERS
BOILER SYSTEM ENABLE FROM BAS		

BOILER SEQUENCE OF OPERATION:

NOTE: THE EXISTING CONTROLS VENDOR IS AINSWORTH. THE CONTRACTOR SHALL RETAIN THE SERVICES OF AINSWORTH FOR ALL CONTROLS WORK.

1. THE RADIATION BOILER STAGING AND OPERATION SHALL BE CONTROLLED BY A LOCAL BOILER SYSTEM CONTROLLER. LEAD/LAG BOILERS SHALL BE RELATED TO EQUALIZED RUN TIMES (ADJUSTABLE). THE SEQUENCE OF OPERATION SHALL BE IN ACCORDANCE WITH EXISTING.
2. THE CONTROLLER SHALL MONITOR STATUS, TROUBLE AND ALARMS FOR THE BOILERS AND PUMPS.
3. THE CONTROLLER SHALL ENABLE OR DISABLE THE CIRCULATION PUMPS P-1 AND P-2 AND COMMUNICATE WITH THE PUMP VFD CONTROLLER. PROVIDE LOW VOLTAGE WIRING CONNECTION BETWEEN BETWEEN THE VFD CONTROLLER AND EACH OF THE VFDS.
4. EACH BOILER OPERATES ON IT'S OWN SYSTEMS OF CONTROL AND SAFETIES. ALL BOILER OPERATION SHALL BE MONITORED AT THE BAS.
5. HOT WATER SUPPLY TEMPERATURE SETPOINT (ACCORDING TO THE RESET SCHEDULE BELOW, ADJUSTABLE) SHALL BE MAINTAINED THROUGH BOILER'S INTEGRAL CONTROL PANEL, AND SHALL BE RESET THROUGH THE LOCAL RADIATION BOILER SYSTEM CONTROLLER.
6. THE BOILERS SHALL BE PROGRAMMED BY THE MANUFACTURER TO STAGE BOILERS BASED ON DEMAND AND OPERATING EFFICIENCY. PROVIDE BOILER STAGING CONTROL MODULE AS REQUIRED.
7. THE TWO PUMPS (P-1 AND P-2) SHALL OPERATE IN A DUTY/STANDBY ARRANGEMENT AND A WATER FLOW OF 9.84 L/S (156 GPM). WHEN THE RADIATION BOILER SYSTEM IS ENABLED, THE DUTY PUMP SHALL START AND RUN CONTINUOUSLY. THE BOILER SHALL FIRE UNDER ITS OWN CONTROLS AS NOTED ABOVE. IF THE DUTY BOILER STATUS DOES NOT CHANGE TO "ON" OR IF FLOW IS NOT PROVEN WITHIN 5 MINUTES (ADJUSTABLE), THE LAG BOILER SHALL BE ENABLED.
8. HEATING WATER SUPPLY TEMPERATURE WILL BE RESET FROM THE BAS BY OUTDOOR AIR TEMPERATURE AS PER THE FOLLOWING SCHEDULE (ADJUSTABLE):

RESET SCHEDULE	
OUTDOOR AIR TEMPERATURE (OAT)	HOT WATER SUPPLY TEMPERATURE (HWST, ADJUSTABLE)
15°C>OAT> 5°C	60°C
5°C>OAT>-27°C	60°C<HWST<82.2°C
< -27°C	82.2°C

9. PROVIDE TEMPERATURE SENSORS AND FLOW SENSORS TO RECORD TEMPERATURE AND WATER FLOW IN B.A.S.
10. WHEN A CRITICAL BOILER ALARM IS RECEIVED FROM THE BOILER SYSTEM CONTROLLER, THE SECOND BOILER HEATING WATER SUPPLY PUMP AND BOILER WILL BE ENERGIZED.
11. ALL BOILERS SHALL BE TURNED OFF IN SUMMER.
12. PROVIDE CURRENT SENSING RELAYS FOR PUMP STATUS. CURRENT SENSORS SHALL BE PROVIDED AT THE MOTOR.
13. PROVIDE THE FOLLOWING POINTS FOR CONTROL AND SUPERVISION OF EACH BOILER THROUGH INTEGRAL CONTROL PANEL FOR THE BOILER INTO THE BOILER SYSTEM CONTROLLER ;
    - LOW FIRE (DO)
    - HIGH FIRE (AO)
    - LOW FIRE STATUS (DI)
    - HIGH FIRE STATUS (DI)
    - SUPPLY WATER TEMPERATURE (AI)
14. DURING A LOSS OF POWER, THE BOILER SYSTEM SHALL CONTINUE TO OPERATE.

3 M04 CONTROL DIAGRAM NEW WORK

SCALE = N.T.S

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C
0 10 20mm 40 60 80 100 120 140 160 180 200mm

GAS BOILER SCHEDULE

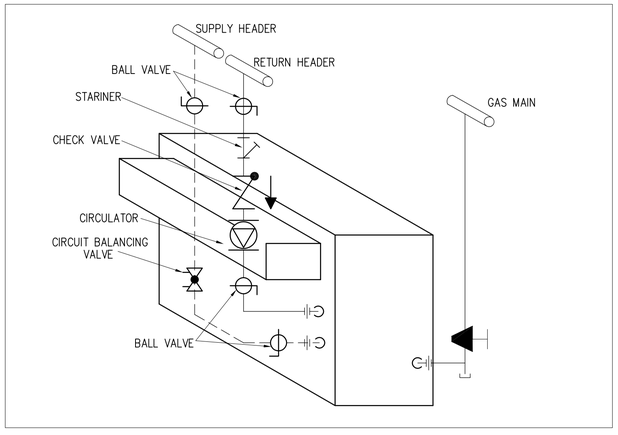
TAG	BASIS OF DESIGN		CAPACITY		BOILER EFFICIENCY	FLOW RATE	EWT	LWT	WATER CONNECTION	WATER CONTENT	VENT SIZE		ELECTRICAL.	DIMENSION	WEIGHT	NOTE
	MAKE	MODEL	INPUT KW	OUTPUT KW	%	L/S	℃	℃	mm	Lit	FLUE (mm)	COMBUSTION (mm)	VAC/MCA	LxWxH (mm)	Kg	
70BLR01	VIESSMANN	VITROCROSSAL 200 CM2-246	257	249	89	5.0	71	82	65	292	200	150	120/1/60-15	1852x930x1676	344	C/W BAS GATEWAY UTILIZING BACNET PROTOCOL.
70BLR02	VIESSMANN	VITROCROSSAL 200 CM2-246	257	249	89	5.0	71	82	65	292	200	150	120/1/60-15	1852x930x1676	344	C/W BAS GATEWAY UTILIZING BACNET PROTOCOL.

UNIT HEATER SCHEDULE

TAG	MAKE	MODEL	DIMENSIONS L x W x D (mm)	HEATING (KW)	EWT (℃)	LWT (℃)	WATER FLOW (L/S)	WATER P.D Kpa	AIR FLOW (L/S)	MOTOR (hp)	VOLTAGE	WEIGHT (Kg)	NOTE
70UNH03	SIGMA	025H	550 x 337.5 x 387.5	5.8	82.2	69	0.12	1.2	278.5	0.05	120/1/60	16.3	COMPLETE WITH MOUNTING HARDWARE
70UNH04	SIGMA	SSFA-02	650 x 700 x 237.5	5.1	82.2	69	0.11	0.9	278.5	0.1	120/1/60	16.3	CABINET HEATER TYPE F FLOOR MOUNTED WITH PEDESTAL, AND UNIT MOUNTED THERMOSTAT
70UNH05	SIGMA	025H	550 x 337.5 x 387.5	5.8	82.2	69	0.12	1.2	278.5	0.05	120/1/60	16.3	COMPLETE WITH MOUNTING HARDWARE

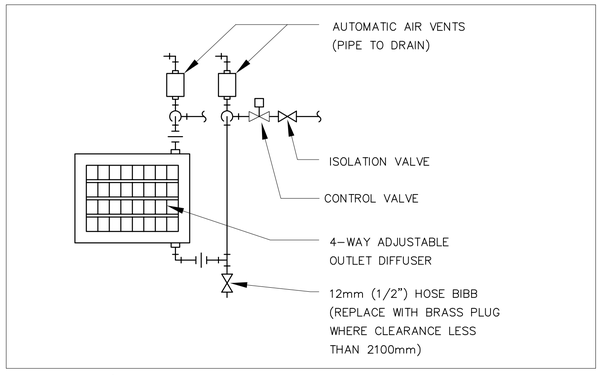
PUMP SCHEDULE

UNIT TAG	SERVICE	LOCATION	BASIS OF DESIGN		FLOW	HEAD	MOTOR RPM	HORSE POWER	VOLTAGE/PH/Hz
			MANUFACTURER	MODEL NO.	L/S	Kpa			
70HWP01	HEATING PRIMARY	BASEMENT	ARMSTRONG	SERIES 4380	10	44.8	2698	1.5	575/3/60
70HWP02	HEATING PRIMARY	BASEMENT	ARMSTRONG	SERIES 4380	10	44.8	2698	1.5	575/3/60



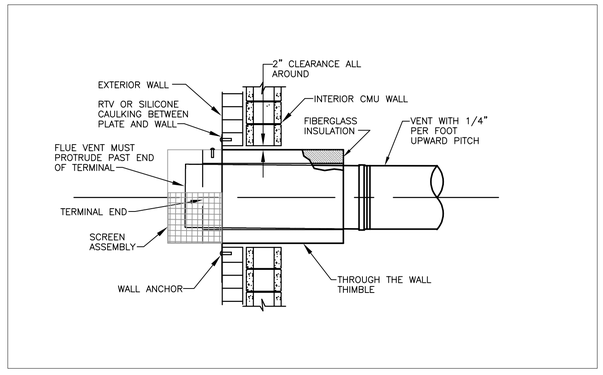
1 M05 TYPICAL BOILER PIPING

SCALE = N.T.S



2 M05 TYPICAL HORIZONTAL UNIT HEATER CONNECTION

SCALE = N.T.S



3 M05 BOILER FLUE VENT THROUGH WALL DETAIL

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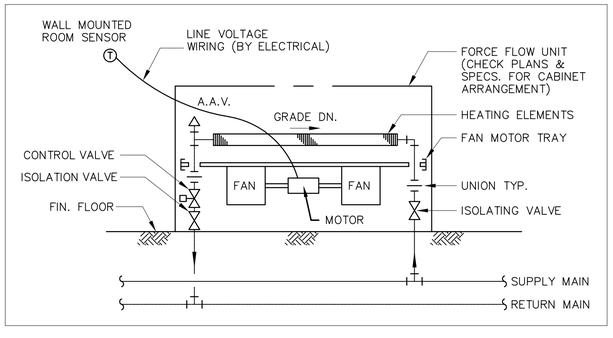

4 M05 TYPICAL FLOOR MOUNTED FORCED FLOW HEATER PIPING

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300-2611 QUEENSVIEW DRIVE
OTTAWA ONTARIO CANADA K2B 8K2
TEL.: 1-613-829-2800 | FAX: 1-613-829-8299 | WWW.WSPGROUP.COM

KEY PLAN PLAN CLÉ

No.	Date	Revision	By: Par:
C	16 03 2020	ISSUED FOR TENDER	P.B
B	06 09 2019	ISSUED FOR 99%	P.B
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Date Printed / Date imprimée

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A Detail no. No. du détail
B Location drawing no. sur dessin no.
C Drawing no. dessin no.

project / projet
U62 Boiler Replacement

NRC, Building U62, 1920 Research Road, Ottawa,ON

drawing / dessin
U70-M-DETAILS AND EQUIPMENT SCHEDULES

designed / conçu	A.Z/B.B	date / date	
drawn / dessiné	A.Z/B.B	scale / échelle	AS SHOWN
checked / vérifié	P.B	sheet / feuille	of/de
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dwg.no. / dessin no.
5751-M05

ASPM A1 (841x594)

C
0 10 20mm 40 60 80 100 120 140 160 180 200mm

POWER SYMBOLS

SYMBOL	DESCRIPTION
	MOTOR CONNECTION
	MOTOR MANUAL STARTER
	DISCONNECT SWITCH
	COMBINATION MAGNETIC STARTER
	MAGNETIC STARTER
	HARDWIRE CONNECTION
VFD	VARIABLE FREQUENCY DRIVE
CP	CONTROL PANEL (SUPPLY AND INSTALL BY MECHANICAL CONTRACTOR), LINE VOLTAGE WIRING BY ELECTRICAL CONTRACTOR
	ELECTRICAL PANELBOARD,SURFACE MOUNTED
	ELECTRICAL PANELBOARD,RECESS MOUNTED
	TRANSFORMER
	ELECTRIC BASEBOARD HEATER
UH	ELECTRIC UNIT HEATER
FFH	ELECTRIC FORCE FLOW HEATER
WP	WEATHERPROOF

DRAWING LIST

DRAWING NO.	DRAWING TITLE
5751-E001	U70_E_DRAWING LIST AND SYMBOLS
5751-E100	U70_E_BASEMENT ELECTRICAL LAYOUTS
5751-E200	U70_E_SCHEDULES AND DETAILS

LINEWORK LEGEND:

SYMBOL	DESCRIPTION
N	SYMBOLS WITH SUFFIX 'N' INDICATES EXISTING EQUIPMENT OR OUTLETS REMOVED & RE-INSTALLED IN NEW LOCATIONS
RR	SYMBOLS WITH SUFFIX 'RR' INDICATES EXISTING EQUIPMENT OR OUTLETS TO BE REMOVED & RE-INSTALLED IN SAME LOCATIONS
R	SYMBOLS WITH SUFFIX 'R' INDICATES EXISTING EQUIPMENT OR OUTLETS TO BE REMOVED & RELOCATED IN NEW LOCATIONS
	EXCEPT AS NOTED OTHERWISE, ALL EXISTING EQUIPMENT TO REMAIN IS SHOWN IN THIN SOLID LINES.
	EXCEPT AS NOTED OTHERWISE, ALL EXISTING EQUIPMENT TO BE DEMOLISHED OR RELOCATED IS SHOWN IN THICK DASHED LINES. RELOCATED ITEMS ARE WITH SUFFIX 'R', 'RR' OR 'N'
	EXCEPT AS NOTED OTHERWISE, ALL NEW EQUIPMENT IS SHOWN IN THICK SOLID LINES.
R	EXCEPT AS NOTED OTHERWISE, ALL NEW EQUIPMENT SHOWN IN THICK SOLID LINES WITH "R" INDICATES RELOCATED.

GENERAL NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARIZING THEMSELVES FULLY WITH ALL EXISTING CONDITIONS BEARING UPON SCOPE OF WORK IDENTIFIED IN THE PROJECT DRAWINGS AND SPECIFICATIONS AND FOR INCLUSION OF ALL REQUIRED COSTS FOR THIS SCOPE OF WORK IN THE TENDER BID PRICE. CONTRACTOR SHALL BE RESPONSIBLE FOR:
   - UNDERSTANDING OF EXISTING SYSTEMS' CONNECTIVITY REQUIREMENTS, REARRANGEMENT OF EXISTING, PROVISION OF NEW SERVICES AND PROVISIONS TO MAINTAIN EXISTING SYSTEM CONNECTIVITY REQUIREMENTS.
   - INCLUDE ALL COSTS ASSOCIATED WITH DEMOLITION WORK AND ANY REQUIRED RE-FEEDING OF EXISTING SERVICES TO BE MAINTAINED AFTER COMPLETION OF DEMOLITION AND NEW WORK.
   - DISCONNECT ALL EXISTING BRANCH CIRCUITS AND REMOVE ALL WIRING, CONDUITS, JUNCTION BOXES, PULL BOXES, AND ASSOCIATED SUPPORT PROVISIONS ASSOCIATED WITH OBSOLETE DEVICES AND EQUIPMENT IN THE AREAS AFFECTED BY THE SCOPE OF WORK OF THIS PROJECT. CUTTING BACK AND ABANDONING OF CONDUITS AND/OR WIRING IN EXISTING WALL AND/OR CEILING SPACE SHALL NOT BE PERMITTED. ENSURE THAT FIRE ALARM, WIRELESS, NETWORK/INTERNET/INTRANET DEVICES, AND OTHER VITAL SERVICES ARE NOT AFFECTED, OR RE-FEED THESE DEVICES AS REQUIRED TO MAINTAIN PROPER OPERATION. WHERE EXISTING SOURCES ARE TO BE RETAINED, LABEL THE CORRESPONDING EXISTING BREAKERS AS SPARE.
2. SHUTDOWN REQUEST IS TO BE SUBMITTED TO THE OWNER AS IDENTIFIED IN SPECIFICATIONS IN ADVANCE. CLEARLY IDENTIFY ALL OF THE AFFECTED AREAS AND LOADS, SHUTDOWNS TO BE AFTER HOURS, SUBJECT TO THE OWNER'S APPROVAL. PROVIDE TEMPORARY POWER SUPPLY FOR ANY LOAD AS REQUESTED OR IDENTIFIED BY THE OWNER.
3. PULL ALL DEMOLISHED CIRCUITS BACK TO SOURCE PANEL. PROVIDE NEW CIRCUITS TO NEW DEVICES WITH SIZES PER PANEL SCHEDULE. UPDATE PANEL DIRECTORY AND MARK ALL UNUSED CIRCUITS "SPARE".
4. PROVIDE TEMPORARY HEAT DETECTOR IN CONSTRUCTION AREA. REMOVE DETECTOR ONCE PERMANENT DETECTORS ARE INSTALLED AND VERIFIED.

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NRC BOILER REPLACEMENT

RESEARCH ROAD, OTTAWA, ON

drawing / dessin

U70_E_DRAWING LIST AND SYMBOLS

designed / conçu: J.A.	date / date: MAY 2019
drawn / dessiné: J.A.	scale / échelle: AS NOTED
checked / vérifié: A.B.	sheet / feuille: of/de
approved / approuvé: A.B.	W.O.no. / D.T.no.: A1-

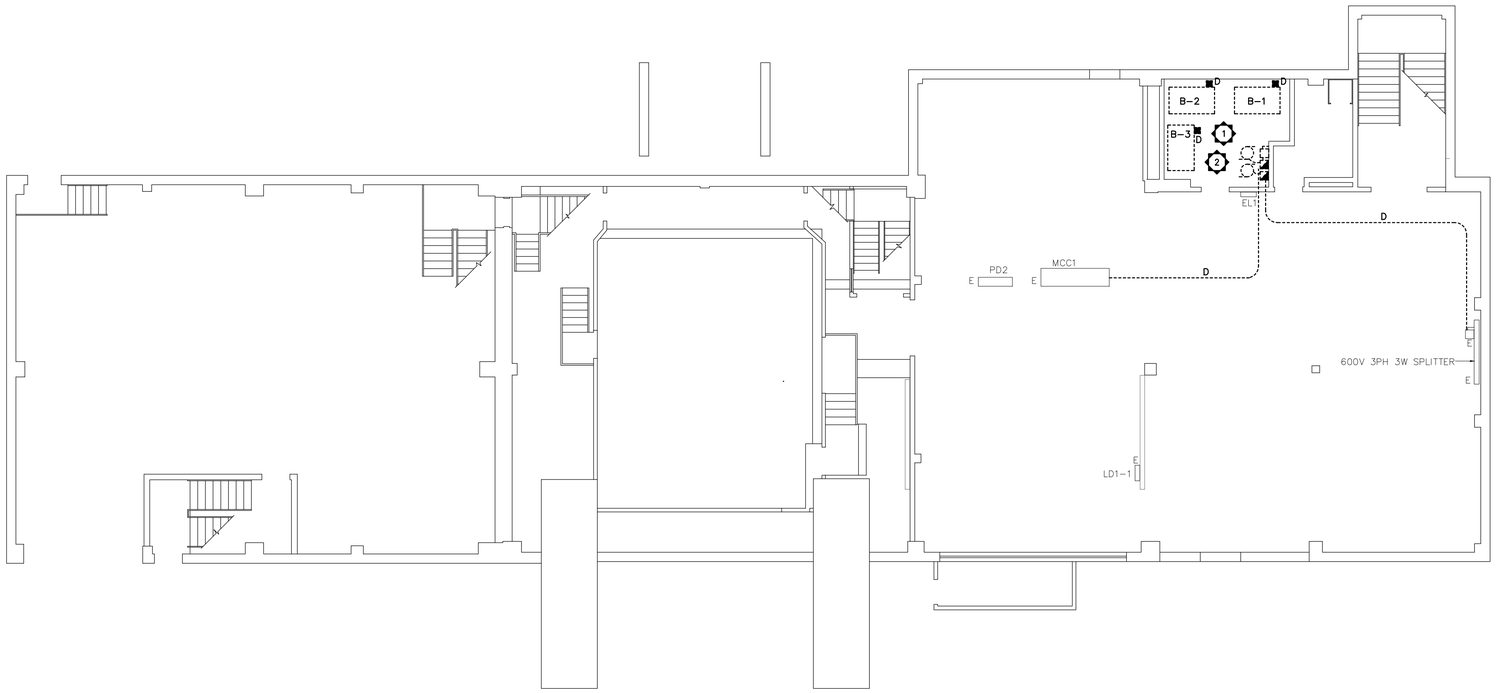
dwg.no. / dessin no.: 5751-E001

ASPM A1 (841x594)

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm

WSP PROJECT NO. 191-06540-00

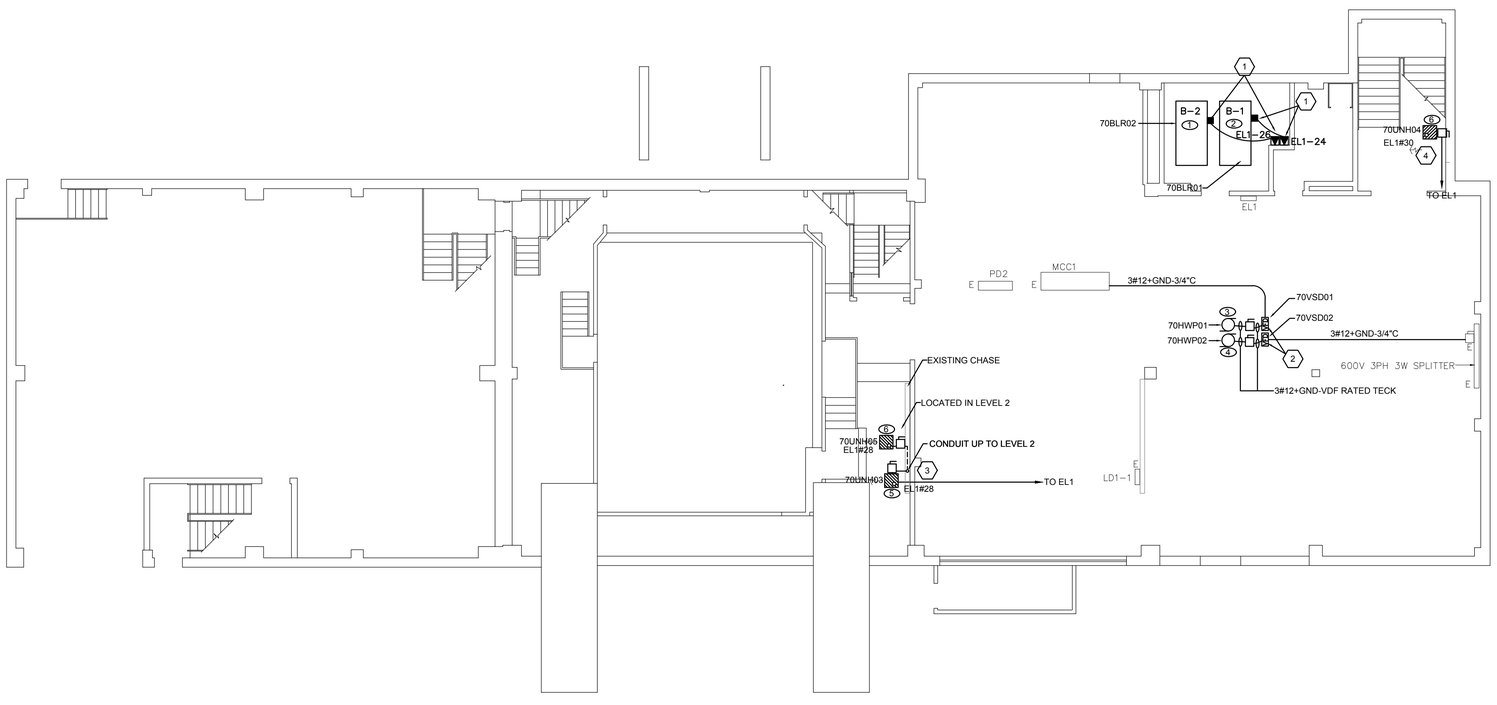


1 / E100 BASEMENT FLOOR LAYOUT – DEMOLITION

SCALE: 1:100

DEMOLITION SPECIFIC NOTES:

1. DISCONNECT EXISTING HARDWIRE CONNECTIONS FROM EXISTING BOILERS (B-1, B-2, AND B-3) DUE TO REPLACEMENT. REMOVE ALL EXISTING CONDUITS AND WIRING BACK TO SOURCE PANEL EL1.
2. DISCONNECT POWER CONNECTIONS TO EXISTING PUMPS P7 AND P8 INCLUDING ASSOCIATED DISCONNECTS AND STARTERS. PULL CIRCUIT BACK TO SOURCE PANEL.



2 / E100 BASEMENT FLOOR LAYOUT – NEW WORK

SCALE: 1:100

NEW WORK SPECIFIC NOTES:

1. PROVIDE 15A 120V MOTOR RATED SWITCH OR MANUAL STARTER AND HARDWIRE CONNECTION FOR THE NEW GAS FIRED BOILER. FEED BOILER FROM EXISTING CIRCUIT BREAKER IN EXISTING PANEL EL1 MADE AVAILABLE FROM THE DEMOLITION OF EXISTING BOILERS SHOWN ON DEMOLITION LAYOUT.
2. PROVIDE VARIABLE FREQUENCY DRIVE FOR PUMPS 70HWP01 AND 70HWP02. PROVIDE NEW 600V 15A 3PH POWER FEEDERS FROM EXISTING SOURCE MADE AVAILABLE IN DEMOLITION OF TWO EXISTING PUMPS. COORDINATE WITH MECHANICAL TRADES FOR EXACT LOCATIONS OF PUMPS AND PROVIDE UNISTRUTS AND BRACKET SUPPORTS PRIOR TO ROUGH-INS.
3. PROVIDE 15A 120V POWER CONNECTION FOR THE TWO NEW UNIT HEATERS (ONE LOCATED IN LEVEL 0 LINK AND ONE LOCATED IN LEVEL 2 LINK) FROM EXISTING ELECTRICAL PANEL EL1. RUN CONDUIT/CIRCUIT FROM ELECTRICAL PANEL TO LEVEL 0 HEATER AND FROM LEVEL 0 HEATER TO EXISTING CHASE TO NEW HEATER IN LEVEL 2. FINAL CONDUIT ROUTE TO BE DETERMINED ON SITE. COORDINATE WITH MECHANICAL CONTRACTOR ON SITE FOR FINAL LOCATION OF UNIT HEATER PRIOR TO ELECTRICAL ROUGH-INS.
4. PROVIDE 15A 120V POWER CONNECTION FOR THE NEW UNIT HEATER LOCATED IN MAIN STAIR AS SHOWN FROM EXISTING ELECTRICAL PANEL EL1. FINAL CONDUIT ROUTE TO BE DETERMINED ON SITE. COORDINATE WITH MECHANICAL CONTRACTOR ON SITE FOR FINAL LOCATION OF UNIT HEATER PRIOR TO ELECTRICAL ROUGH-INS.

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm

ASPM A1 (841x594)

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project / projet

NRC BOILER REPLACEMENT

RESEARCH ROAD, OTTAWA, ON

drawing / dessin

U70_E_BSMT
ELECTRICAL LAYOUT

designed / conçu: J.A.	date / date: MAY 2019
drawn / dessiné: J.A.	scale / échelle: AS NOTED
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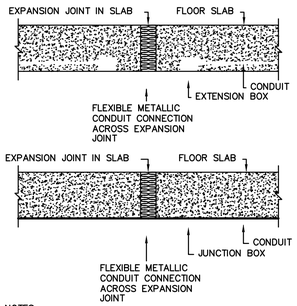
approved / approuvé: A.B.	W.O.no. / D.T.no.: A1-

dwg.no. / dessin no.: 5751-E100

WSP PROJECT NO. 191-06540-00

EQUIPMENT SCHEDULE

MOTOR TAG #	DESIGNATION	DESCRIPTION	ROOM NO.	SIZE HP	SIZE KW	VOLTAGE 600/3	VOLTAGE 460/3	VOLTAGE 208/1	VOLTAGE 120/1	FED FROM PANEL	BREAKER SIZE	WIRE SIZE	FLA	CCT NO.	MOTOR RATED SW: SUPPLIED BY	MOTOR RATED SW: INSTALLED BY	MOTOR RATED SW: POWER FEEDERS BY	COMBINATION STARTER: SUPPLIED BY	COMBINATION STARTER: INSTALLED BY	COMBINATION STARTER: POWER FEEDERS BY	CONTROL PANEL: SUPPLIED BY	CONTROL PANEL: INSTALLED BY	CONTROL PANEL: POWER FEEDERS BY	VARIABLE FREQUNCY DRIVE: SUPPLIED BY	VARIABLE FREQUNCY DRIVE: INSTALLED BY	VARIABLE FREQUNCY DRIVE: POWER FEEDERS BY	DISCONNECT SWITCH: SUPPLIED BY	DISCONNECT SWITCH: INSTALLED BY	DISCONNECT SWITCH: POWER FEEDERS BY	CONTROL WIRING	REMOTE CONTROLS: TIME CLOCK	INTERLOCKS: STARTS MOTOR #	INTERLOCKS: STARTED BY MOTOR #	COMMENTS
1	70BLR01	BOILER	BOILER	-	-	-	-	-	X	EL1	15A 1P	2#12+GND-3/4"C	-	24	E	E	E	-	-	-	M	M	E	-	-	-	-	-	-	M	-	-	③ ④	-
2	70BLR02	BOILER	BOILER	-	-	-	-	-	X	EL1	15A 1P	2#12+GND-3/4"C	-	25	E	E	E	-	-	-	M	M	E	-	-	-	-	-	-	M	-	-	③ ④	-
3	70HWP01	BOILER PUMP	SEE PLAN	1.5	-	X	-	-	-	MCC1 SW#4	15A 3P	3#12+GND-3/4"C		SW#4	-	-	-	-	-	-	-	-	-	E	E	E	-	-	-	M	-	-	-	① ②
4	70HWP02	BOILER PUMP	SEE PLAN	1.5	-	X	-	-	-	600V 3PH 4W SPLITTER	15A 3P	3#12+GND-3/4"C			-	-	-	-	-	-	-	-	-	E	E	E	-	-	-	M	-	-	-	① ②
5	70UNH03	UNIT HEATER #1	SEE PLAN	-	-	-	-	-	X	EL1	15A 1P	2#12+GND-3/4"C		32	-	-	-	-	-	-	-	-	-	-	-	-	E	E	E	M				
6	70UNH04	UNIT HEATER #2	SEE PLAN	-	-	-	-	-	X	EL1	15A 1P	2#12+GND-3/4"C		32	-	-	-	-	-	-	-	-	-	-	-	-	E	E	E	M				
6	70UNH05	UNIT HEATER #3	SEE PLAN	-	-	-	-	-	X	EL1	15A 1P	2#12+GND-3/4"C		30	-	-	-	-	-	-	-	-	-	-	-	-	E	E	E	M				



NOTES:
1. REFER TO STRUCTURAL DRAWINGS FOR EXPANSION JOINT LOCATIONS.

1 / E200 CONDUIT INSTALLATION AT EXPANSION JOINTS
SCALE: N.T.S.

FED FROM: SPLITTER/25KVA TRANSFORMER
VOLT: 120/240V 1PH 3W
PANEL TYPE:
FRAME SIZE:125A

PANEL IDENTIFICATION: EL1
LOCATION: BOILER RM
MOUNTING: SURFACE
MAINS: MLO

CCT NO	LOCATION	LOAD	CABLE	CCT LOAD WATTS	BKR SIZE AMPS	A	B	BKR SIZE AMPS	CCT LOAD WATTS	CABLE	LOAD	LOCATION	CCT NO
1A		EXIT LIGHTS			15A			15A			EMERG LIGHTS		2A
3B		FIRE PANEL			15A			15A			EMERG LIGHTS		4B
5A		FIRE PANEL			15A			15A			EMERG LIGHTS		6A
7B		STAIR LIGHTS			20A			15A			DDC SYSTEM		8B
9A		EMER LIGHTS			20A			20A			RECEPTACLES		10A
11B		HEATER			20A						RECEPTACLES		12B
13A		SPLIT PLUG			15A			20A			HEATERS		14A
15B													16B
17A		SEC SYSTEM			20A			15A			HONEYWELL		18A
19B		EXIT LIGHTS			15A			15A			BOILER		20B
21A		SPARE			20A			20A			USED		22A
23B		SPARE			20A			15A	*	2#12+GND	BOILER	BOILER RM	24B
25A		SPARE			20A			15A	*	2#12+GND	BOILER	BOILER RM	26A
27B		SPARE			20A			15A	*	2#12+GND	UNIT HEATER	SEE PLAN	28B
29A		SPARE			20A			15A	*	2#12+GND	UNIT HEATER	SEE PLAN	30A
31B		SPARE			20A			15A			SPARE		32B
33A		SPARE			20A			15A			SPARE		34A
35B		SPARE			20A			15A			SPARE		36B
37A		SPARE			20A			15A			SPARE		38A
39B		SPACE									SPACE		40B
41A		SPACE									SPACE		42A
TOTAL WATTS/PHASE				A	B								

NOTE
* INDICATES NEW WORK

NOTE:
SIZES OF WIRES SHOWN ON PANEL ARE MINIMUM REQUIREMENTS ONLY. CONTRACTOR TO REFER TO VOLTAGE DROP TABLE FOR ACTUAL WIRE SIZING.

MAXIMUM BRANCH WIRING DISTANCE FOR 120 VOLT SYSTEM AT 2% VOLTAGE DROP

WIRE SIZE	BREAKER SIZE (AMPERES)	15	20	30	40	50	60	70	80	100
	MAX. LOAD AT 80% (AMPERES)	12	16	24	32	40	48	56	68	80
NO.12	-----	16.8	12.2	-----	-----	-----	-----	-----	-----	-----
NO.10	-----	25.9	19.0	12.9	-----	-----	-----	-----	-----	-----
NO.8	-----	39.6	30.4	20.5	15.2	-----	-----	-----	-----	-----
NO.6	-----	62.4	47.2	32.0	23.6	19.0	16.0	-----	-----	-----
NO. 4	-----	99.0	73.1	50.2	38.1	30.4	24.3	21.3	19.0	-----
NO. 2	-----	-----	114.3	77.2	57.9	47.2	38.8	33.5	28.9	22.8
NO. 1	-----	-----	-----	96.0	73.1	57.9	47.2	42.6	36.5	27.4
NO.1/0	-----	-----	-----	-----	85.3	68.5	56.3	48.7	41.9	33.5
NO2/0	-----	-----	-----	-----	102.8	80.7	67.0	57.9	50.2	40.3
NO3/0	-----	-----	-----	-----	-----	95.2	79.2	68.5	59.4	47.2
NO4/0	-----	-----	-----	-----	-----	-----	92.9	79.2	70.1	56.3
250 MCM	-----	-----	-----	-----	-----	-----	102.8	86.8	76.2	60.9
300 MCM	-----	-----	-----	-----	-----	-----	-----	100.5	88.3	70.1

NOTE: DISTANCES INDICATED IN METRES FROM PANEL TO LOAD FOR SINGLE PHASE.

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