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DATE (mmm dd yyyy)	ISSUED FOR	REV
OCT 01 2018	TENDER	0
KEY PLAN		
CONSULTANTS		
<div><div><div>IBI</div></div><div><div>IBI GROUP</div><div>100-175 Gaskin Boulevard</div><div>Toronto ON M9W 0C9 Canada</div><div>tel 416 679 1930 fax 416 675 4620</div><div>ibi@group.com</div></div></div> <div><p>This drawing has been prepared solely for the use of the Regional Municipality of Durham and there are no representations of any kind made by IBI Group to any party with whom IBI Group has not entered into a contract.</p></div> <div><div><div><div><div></div><div>LICENSED PROFESSIONAL ENGINEER</div><div>M. ALI ALKHAJANI</div><div>100140874</div><div>2016'S.F.P.</div><div>PROVINCE OF ONTARIO</div></div></div></div><div><div>North Arrow</div><div>Detail Symbol</div></div><div><div>DETAIL NUMBER</div><div>LOCATION OR DETAIL SHEET</div></div></div>		
<div><div><div>Project Manager</div><div>A. VAN VEEN</div></div><div><div>Project Leader</div><div>M. ALIKHANI</div></div><div><div>Date</div><div>JAN 31 2018</div></div><div><div>Client</div><div><div><div><div></div><div>DURHAM REGION</div></div><div>THE REGIONAL MUNICIPALITY OF DURHAM</div><div>WHITBYWORKS DEPARTMENTONTARIO</div></div></div></div><div><div>Architect/Engineer</div><div>M. ALIKHANI</div></div><div><div>Drawn</div><div>M. ALIKHANI</div></div><div><div>Checked</div><div>S. LIU</div></div></div> <div><div>Project</div><div>EXPAND GARAGE SCUGOG DEPOT</div><div>10 REGIONAL RD. 21, R.R.#14, PORT PERRY</div></div> <div><div>Drawing Title</div><div>MECHANICAL LEGEND AND SYMBOLS</div></div> <div><div>Check Scale (may be photo-reduced)</div><div><div>01 inch</div><div>010mm</div></div></div> <div><div>Project No.</div><div>24RX12.0113</div></div> <div><div>Drawing No.</div><div>02-M01-00-01</div></div>		



AIR HANDLING UNITS (AHU)		
Mark No.	AHU-101	
Service	Office Air conditioning	
Drawing Location	02-M51-03-01	
General		
Manufacturer	PMI	
Model	AW-1.3-50/HRP	
Supply Fan		
VFD		Yes
Airflow	L/S	2,265
Ext Static Pressure	pa	249
RPM	---	1,232
Motor	HP	5
Exhaust/ Return Fan		
VFD		Yes
Airflow	L/S	2,265
Ext Static Pressure	pa	125
RPM	---	1,435
Motor	HP	5
Heating		
Fuel	---	Natural Gas
Input Capacity	KW	130
Max /Min Outdoor Air	L/s	2265/1133
Unit Height	mm	1,400
Unit Width	mm	3,000
Unit Length	mm	5,850
Filters		
Maximum Velocity	m/s	2.0
Efficiency	---	MERV 8
Heat Pipe		
Fresh Air Ent DB	°C	-21.0
Fresh Air Leave WB	°C	-4.0
Exhaust Air Ent DB	°C	20.0
Exhaust Air Leave WB	°C	0.0
Electrical		
Volt/Ph/Hz	---	575/3/60
Starter	---	Yes
NOTE: Air Handling Unit c/w Roof Curb		

AIR CONDITIONING UNITS (AC)		
Mark No.	AC-101	
Service	IT ROOM	
Drawing Location	02-M51-01-01	
General Requirements		
Manufacturer	Mitsubishi	
Model	PKA-A24NH46	
Fan		
Capacity	l/s	330
Cooling		
	Ton	2
Sensible Capacity	kW	5
Total Capacity	kW	7.1
Condenser EAT (db)	°C	35
Motor/ Power		
MCA	A	0.5
MOCP	A	15
Volts/Phase/Hz	208/1/60	
Unfused Disconnect	Yes	
Notes:		
1. Starter is supplied with equipment.		
2. Commercial grade Condensate Pump to be supplied by Contractor		

TANKLESS DOMESTIC WATER HEATER (DWH)		
Mark No.	DWH4 - 01	
Service	Safety Showers	
Drawing Location	02-M21-01-01	
<b>Performance</b>		
Fuel Type	Natural Gas	
Manufacturer	A. O. Smith (Takagi)	
Model	T-M50 TANKLESS (NOTE 1-3)	
Dimensions	mm	640x640x30
<b>Water Side</b>		
Temperature Rise	°C	55
l/s	0.8	
Heat Exchanger	H&S COPPER ALLOY	
Model Mixing Valve	Takagi TM-RE50	
Temp Remote Controller	Yes	
<b>Natural Gas</b>		
Input	CFH	380
NG Pressure	kPa	35
<b>Electrical</b>		
Power	kW	
Volts/Phase/Hz	120/1/60	
<b>Control Sequence</b>		
Gas Air Intake/Exhaust c/w weather cap	5" TYPE BH VENT 5" PVC AIR INTAKE	
<b>Notes:</b> 1. Water Heaters c/w sealed combustion air kit, TM-V/C 50 vent cap and unit controller, water mixing valve and stainless steel vent. 2. Water Heater c/w wall mounting brackets and acid neutralizer		

CEILING FANS (CF)				
Mark No.	CF-101	CF-102	CF-103	CF-104
Service	Repair Bay	Repair Bay	Repair Bay	Repair Bay
Drawings	02-M51-01-01	02-M51-01-01	02-M51-01-01	02-M51-01-01
<b>Performance</b>				
Type	Variable Speed Ceiling Fan	Variable Speed Ceiling Fan	Variable Speed Ceiling Fan	Variable Speed Ceiling Fan
Capacity	l/s	9.676	9.676	9.676
RPM	—	310	310	310
Fan Diameter	mm	1422	1422	1422
Manufacturer	—	CANARM	CANARM	CANARM
Model	—	CP56	CP56	CP56
Weight	KG	8.5	8.5	8.5
<b>Motor</b>				
WATTA	—	97.0	97	97
RPM	—	310	310	310
Volts/Phase/Hz	—	120/1/60	120/1/60	120/1/60
<b>Operating Controls</b>				
BMS Start/Stop	—	None	None	None
Fire Alarm Start/Stop	—	None	None	None
Equipment Start/stop	—	Manual	Manual	Manual
<b>ELECTRICAL COORDINATION</b>				
<b>General Requirements</b>				
Normal Power	—	Yes	Yes	Yes
Emergency Power	—	Yes	Yes	Yes
Disconnect provided by	—	Div 26	Div 26	Div 26
<b>Notes:</b> Disconnect switch and starter supplied with equipment.				

INFRARED RADIANT HEATERS (IH)		
Mark No.	IH-101	IH-102 / 103
Service	Repair Garage-1	Repair Garage-2
Drawing Location	02-M51-01-01	02-M51-01-01
<b>Performance</b>		
Manufacturer	Superior	Superior
Model	UA-80	UA-40
Total Heating Capacity	kW	23.4
Length	mm	12,200
<b>Heating Section</b>		
Fuel	Natural Gas	Natural Gas
Gas Pressure	kPa	1.25
Flue Diameter	mm	100
Blower Fan	Yes	Yes
<b>Motor</b>		
Full load	Amps	1.00
RPM	—	120/1/60
Volts/Phase/Hz	120/1/60	120/1/60
Unfused Disconnect	Yes	Yes
<b>CONTROLS</b>		
Control Sequence	CS	-
<b>Operating Controls</b>		
BMS Start/Stop	No	No
<b>ELECTRICAL COORDINATION</b>		
<b>General Requirements</b>		
Normal Power	Yes	Yes
Emergency Power	Yes	Yes
Disconnect provided by	Manufacturer	Manufacturer
<b>Notes:</b> 1. Controls by controls contractor. 2. Heater Summer/Winter switch by manufacturer .		

GRILLES AND DIFFUSERS (GD)		
Mark No.	D	E
Service	Repair Bay Supply	Repair Bay Return
Drawing Location	02-M51-01-01	02-M51-01-01
<b>Performance</b>		
Type	Louvered Supply	Heavy Duty Gym Grille
Material	Steel	Steel
Finish	Metal	Metal
Size	As Shown	As Shown
Opposed Blade Damper	Yes	Yes
Manufacturer	EH Price	EH Price
Model	510D	96D



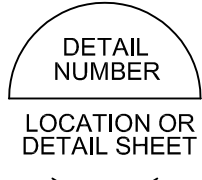
FORCED FLOW HEATERS (FFC)		
Tag No.	FFC - 101	FFC -102
Service	ELECTRICAL ROOM	IT ROOM
Drawing Location	02-M51-01-01	02-M51-01-01
Manufacturer	Dimplex	Dimplex
Model	RFI840D21	RFI840D21
Capacity	kW	4
PAN HP	HP	0.25
Volts/gh/Hz	208/1/60	208/1/60
Airflow	l/s	75
<b>Notes:</b> 1. Heaters are wall mounted, fully recessed 2. FFC 101 & 102 comes with 24V low voltage relay and 24V transformer kit for remote thermostat		


EXHAUST FANS (EF)			
Mark No.	EF-101	EF-102	EF-103
Service	Tailpipe Exhaust	Tailpipe Exhaust	Electrical Room
<b>Performance</b>			
Type	Centrifugal	Centrifugal	Centrifugal
Capacity	l/s	568	401
Total Static Pressure	Pa	1,490	1,660
RPM	—	3500	3500
Wheel Diameter	mm	750	300
Manufacturer	Niederman	Niederman	Greenheck
Model	NCF30/15	NCF30/15	AE-12-433-A4
<b>Motor</b>			
HP	3	3	1/4
RPM	3500	3500	1750
Volts/Phase/Hz	575/3/60	575/3/60	115/160
Emergency Power	YES	YES	YES
Disconnect Switch	MANUFACTURER	MANUFACTURER	MANUFACTURER
Remark	VFD	VFD	2-Speed

AIR COOLED CONDENSING UNITS (ACC)		
Mark No.	ACC-101	
Service	IT ROOM	
Drawing Location	02-M51-01-01	
<b>Performance</b>		
Associated Equipment	AC-101	
Capacity	kW	7
Refrigerant	R410A	
Ambient Air Temperature	°C	35
No. of Compressors	1	
Compressor Motor Rating	HP	0.1
Manufacturer	Mitsubishi	
Model	PUY-A24NH46	
<b>Motor / Power</b>		
MCA	A	18
MOCP	A	30
Volts/Phase/Hz	208/1/60	
Unfused Disconnect	Yes	
Notes:		
1. Starter is supplied with equipment.		
2. Condensing Unit to be equipped with ultra low ambient temperature control to -40°C.		
3. Air Cooled Condensing Unit to be install above snow level		
4. Air conditioning system to be connected to Emergency power		

NOTE:  
ALL EQUIPMENT TO BE CONNECTED TO EMERGENCY POWER.

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OCT 01 2018	TENDER	0
KEY PLAN		
CONSULTANTS		

 IBI GROUP 100-175 Galaxy Boulevard Toronto ON M9W 0C9 Canada tel 416 679 1930 fax 416 675 4620 ibigroup.com	
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North Arrow	Detail Symbol 

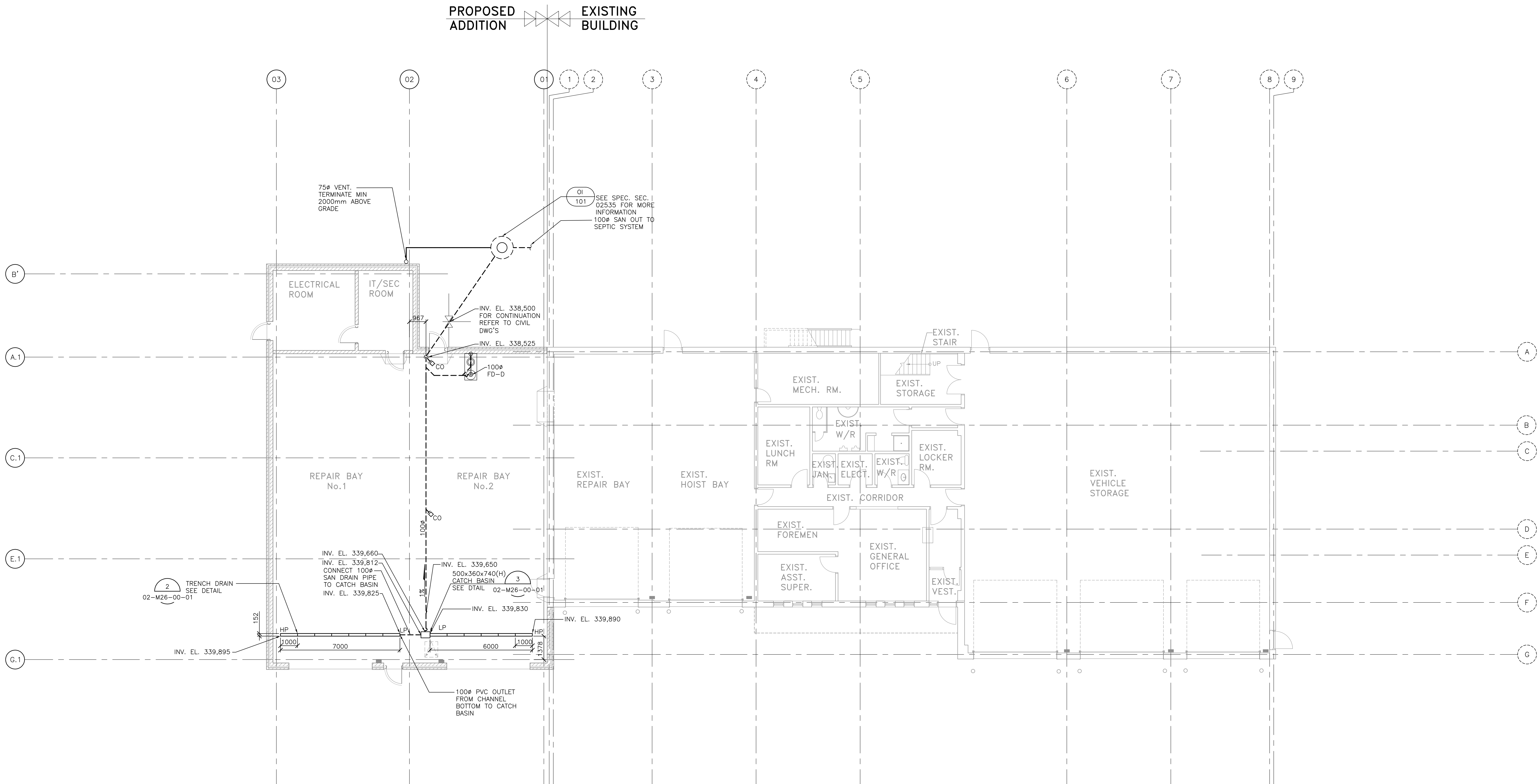
Project Manager A. VAN VEEN	Architect/Engineer M. ALIKHANI
Project Leader M. ALIKHANI	Drawn M. ALIKHANI
Date JAN 31 2018	Checked S. LUI
Client  THE REGIONAL MUNICIPALITY OF DURHAM WORKS DEPARTMENT ONTARIO	
Project EXPAND GARAGE SCUGOG DEPOT 10 REGIONAL RD. 21, R.R.#14, PORT PERRY	
Drawing Title MECHANICAL EQUIPMENT SCHEDULES	
Check Scale (may be photo-reduced) 0 1 Inch 0 10mm	
Project No. 24RX12.0113	Drawing No. 02-M10-00-01

RDD Contract No.

T-1038-2019



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NOTE:  
1. FOR STORM DRAINAGE REFER TO DWG. 02-M21-01-01  
2. CATCH BASIN TO BE CONNECTED TO DRAIN LINE WITH TRAP

**U/G DRAINAGE FLOOR PLAN**  
SCALE 1:100  
FIN. FLOOR EL. 340.060  
(UNLESS NOTED OTHERWISE)

DATE (month dd yyyy)	ISSUED FOR	REV
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KEY PLAN

CONSULTANTS

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**REGISTERED PROFESSIONAL ENGINEER**  
M. ALI KHANI  
100146574  
2016163175  
PROVINCE OF ONTARIO

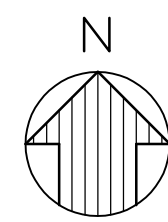
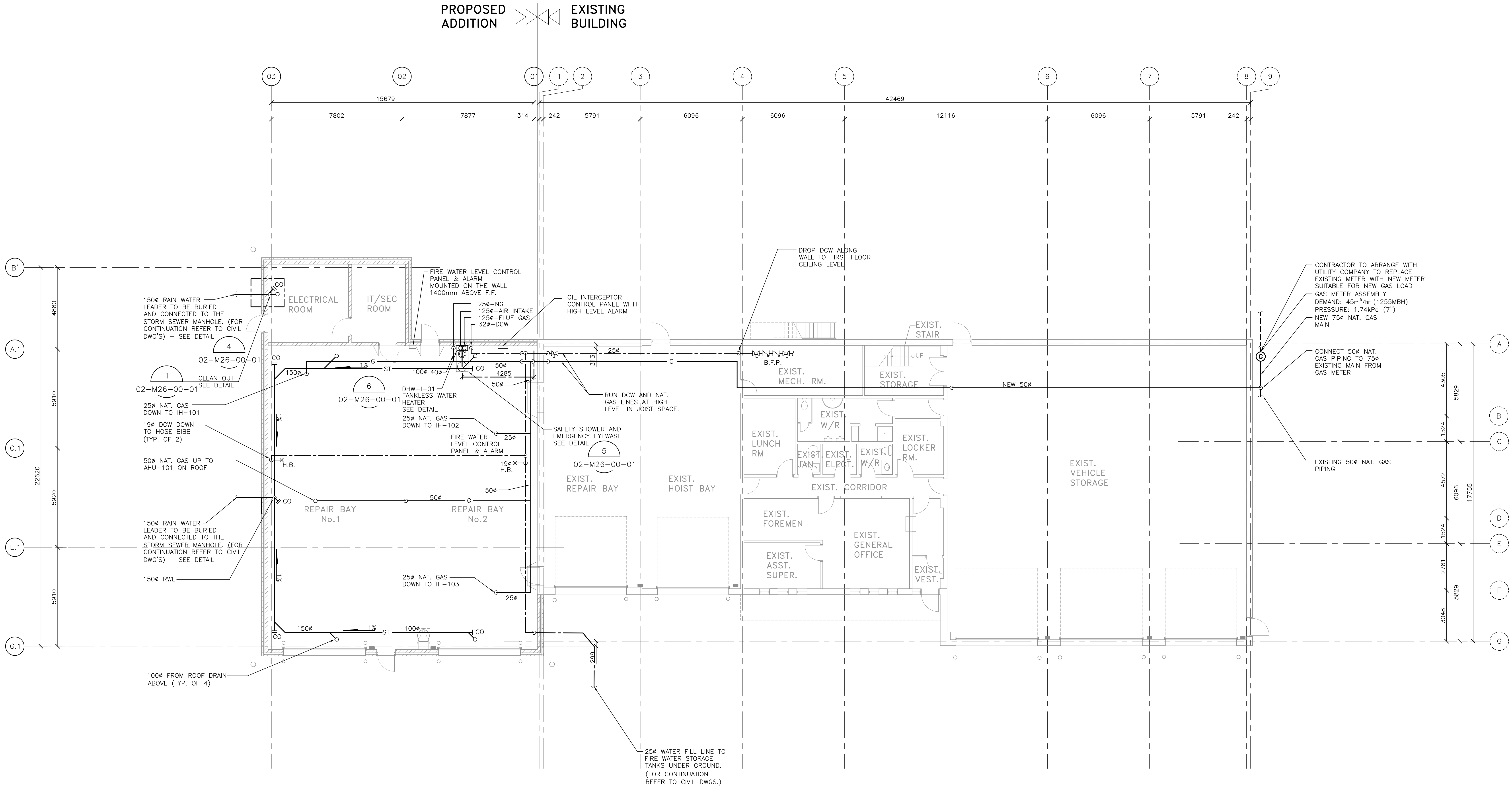
North Arrow

Detail Symbol

Project Manager A. VAN VEEN	Architect/Engineer M. ALI KHANI
Project Leader M. ALI KHANI	Drawn M. ALI KHANI
Date JAN 31 2018	Checked S. LIU
Client <b>THE REGIONAL MUNICIPALITY OF DURHAM</b> WORKS DEPARTMENT WHITBY, ONTARIO	
Project <b>EXPAND GARAGE SCUGOG DEPOT</b> 10 REGIONAL RD. 21, R.R.#14, PORT PERRY	
Drawing Title <b>MECHANICAL U/G DRAINAGE FLOOR PLAN</b>	
Check Scale (may be photo-reduced) 0 1 Inch 0 10mm	
Project No. 24RX12.0113	Drawing No. 02-M21-00-01

RDD Contract No.  
**T-1038-2019**

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**A/G PLUMBING & DRAINAGE FLOOR PLAN**

SCALE 1:100

FIN. FLOOR EL. 340.080  
(UNLESS NOTED OTHERWISE)

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OCT 01 2018	TENDER	0

**KEY PLAN**

**CONSULTANTS**

**IBI GROUP**  
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**Professional Engineer**  
M. ALIKHANI  
Durham Region  
PROVINCE OF ONTARIO

**North Arrow**

**Detail Symbol**

Project Manager	Architect/Engineer
A. VAN VEEN	M. ALIKHANI
Project Leader	Drawn
M. ALIKHANI	M. ALIKHANI
Date	Checked
JAN 31 2018	S. LIU
Client	

**THE REGIONAL MUNICIPALITY OF DURHAM**  
WORKS DEPARTMENT  
WHITBY, ONTARIO

**Project**  
EXPAND GARAGE  
SCUGOG DEPOT  
10 REGIONAL RD. 21, R.R.#14, PORT PERRY

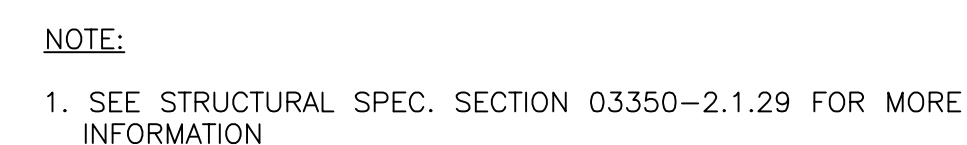
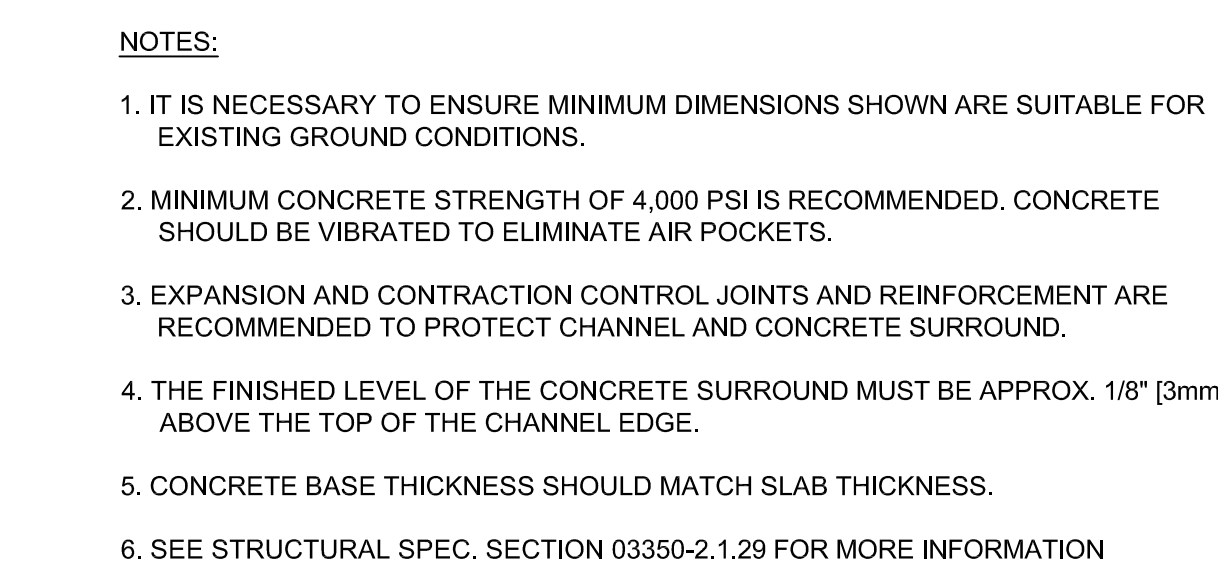
**Drawing Title**  
MECHANICAL  
A/G PLUMBING & STORM  
DRAINAGE FLOOR PLAN




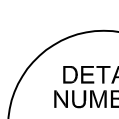
Check Scale (may be photo-reduced)  
0 1 Inch 0 10mm


**Project No.** 24RX12.0113  
**Drawing No.** 02-M21-01-01

RDD Contract No.  
**T-1038-2019**





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North Arrow	Detail Symbol 

 THE REGIONAL MUNICIPALITY  
OF DURHAM  
WORKS DEPARTMENT  
WHITBY ONTARIO

Drawing Title

MECHANICAL  
PLUMBING AND  
DRAINAGE DETAILS

Project No.	Drawing No.
24RX12.0113	02-M26-00-01

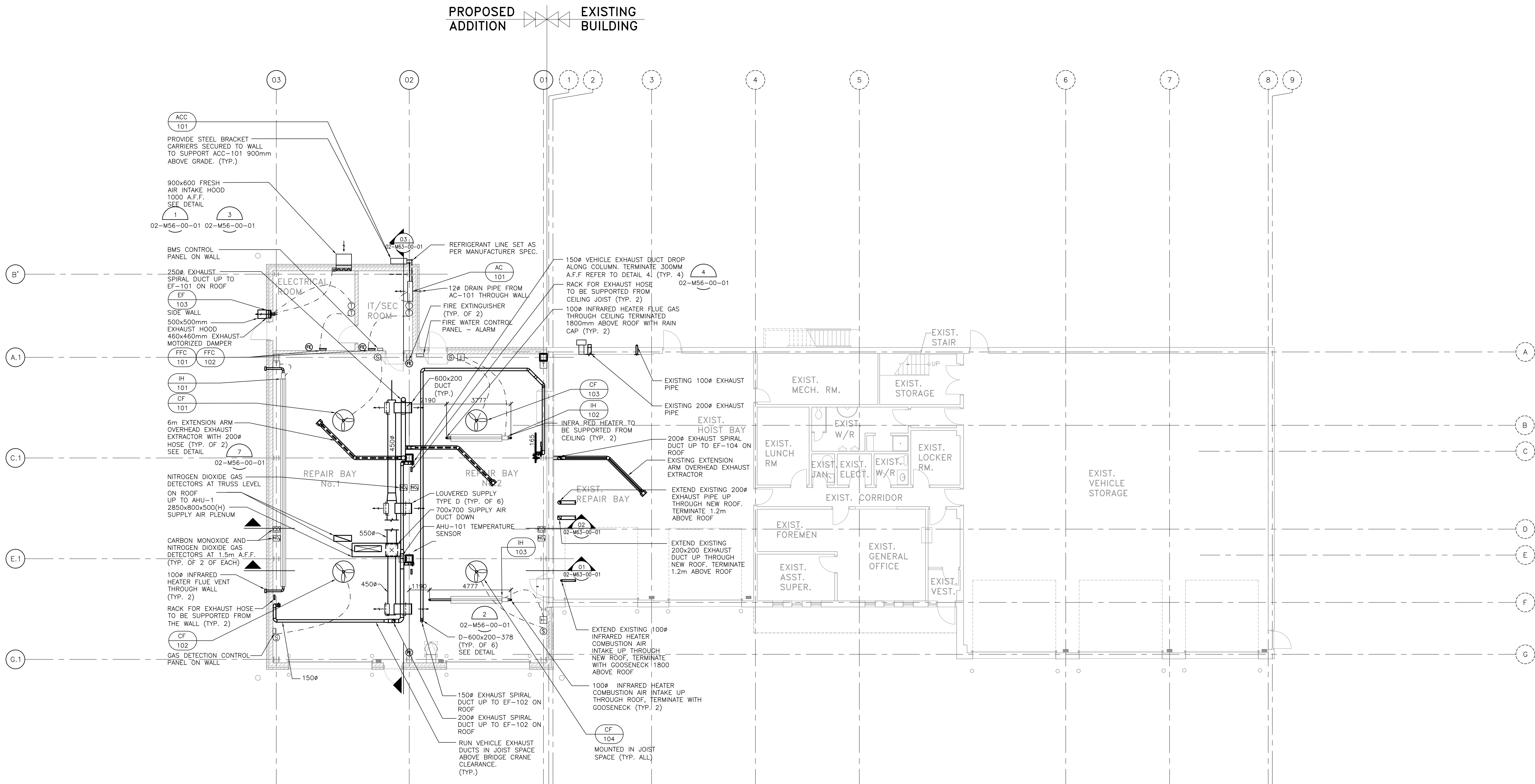
ROD Contract No.  
**T-1038-2019**







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NOTES:  
1. PROVIDE AUXILIARY STEEL TO SUPPORT CEILING FANS IN REPAIR BAYS.  
2. FOR ABOVE LEVEL SEE DWG. NO: 02-M51-03-01

**HVAC & FIRE PROTECTION FLOOR PLAN**  
SCALE 1:100 FIN. FLOOR EL. 340.060 (UNLESS NOTED OTHERWISE)

DATE (month dd yyyy)	ISSUED FOR	REV
OCT 01 2018	TENDER	0

KEY PLAN

CONSULTANTS

IBI GROUP
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North Arrow	Detail Symbol

Project Manager	Architect/Engineer
A. VAN VEEN	M. ALIKHANI
Project Leader	Drawn
M. ALIKHANI	M. ALIKHANI
Date	Checked
JAN 31 2018	S. LIU
Client	

THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT ONTARIO

Project
EXPAND GARAGE SCUGOG DEPOT 10 REGIONAL RD. 21, R.R.#14, PORT PERRY

Drawing Title
MECHANICAL HVAC & FIRE PROTECTION FLOOR PLAN

Check Scale (may be photo-reduced)
0 1 inch 0 10mm

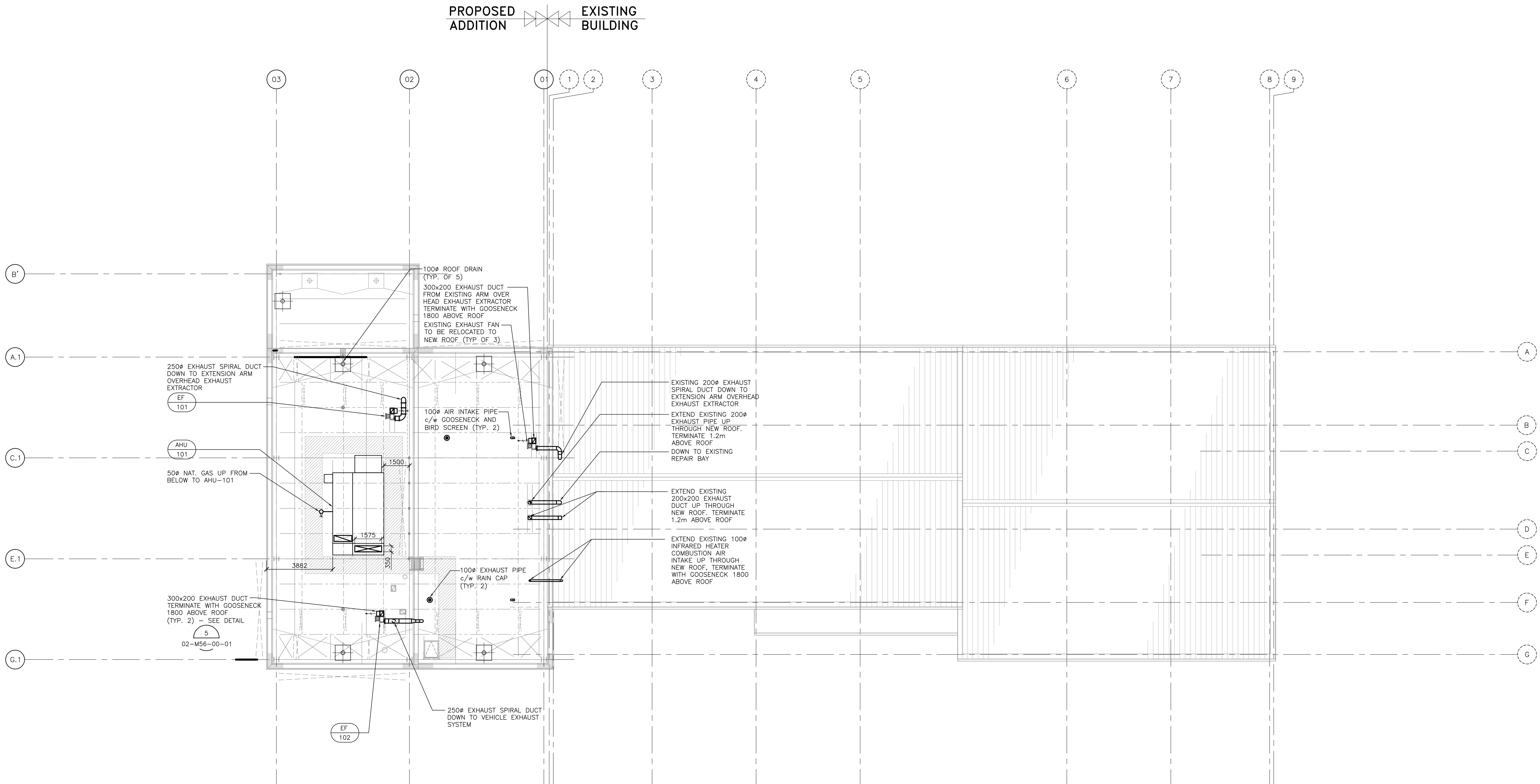
Project No.	Drawing No.
24RX12.0113	02-M51-01-01

RD Contract No.
T-1038-2019



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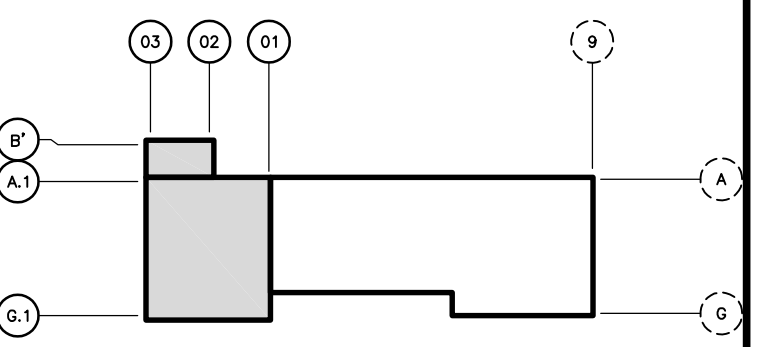


NOTES:  
1. FOR BELOW LEVEL SEE DWG. NO: 02-M51-01-01

N  
HVAC ROOF PLAN  
SCALE 1:100

DATE (month dd yyyy)	ISSUED FOR	REV
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KEY PLAN



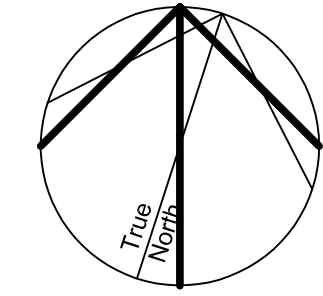
CONSULTANTS

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tel 416 679 1930 fax 416 675 4620  
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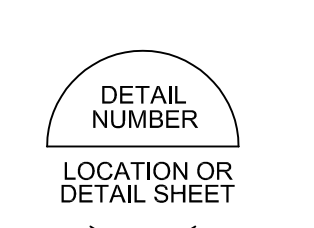
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North Arrow



Detail Symbol



Project Manager A. VAN VEEN	Architect/Engineer M. ALIKHANI
Project Leader M. ALIKHANI	Drawn M. ALIKHANI
Date JAN 31 2018	Checked S. LIU
Client	



Project  
**EXPAND GARAGE  
SCUGOG DEPOT**  
10 REGIONAL RD. 21, R.R.#14, PORT PERRY

Drawing Title  
**MECHANICAL  
HVAC  
ROOF PLAN**

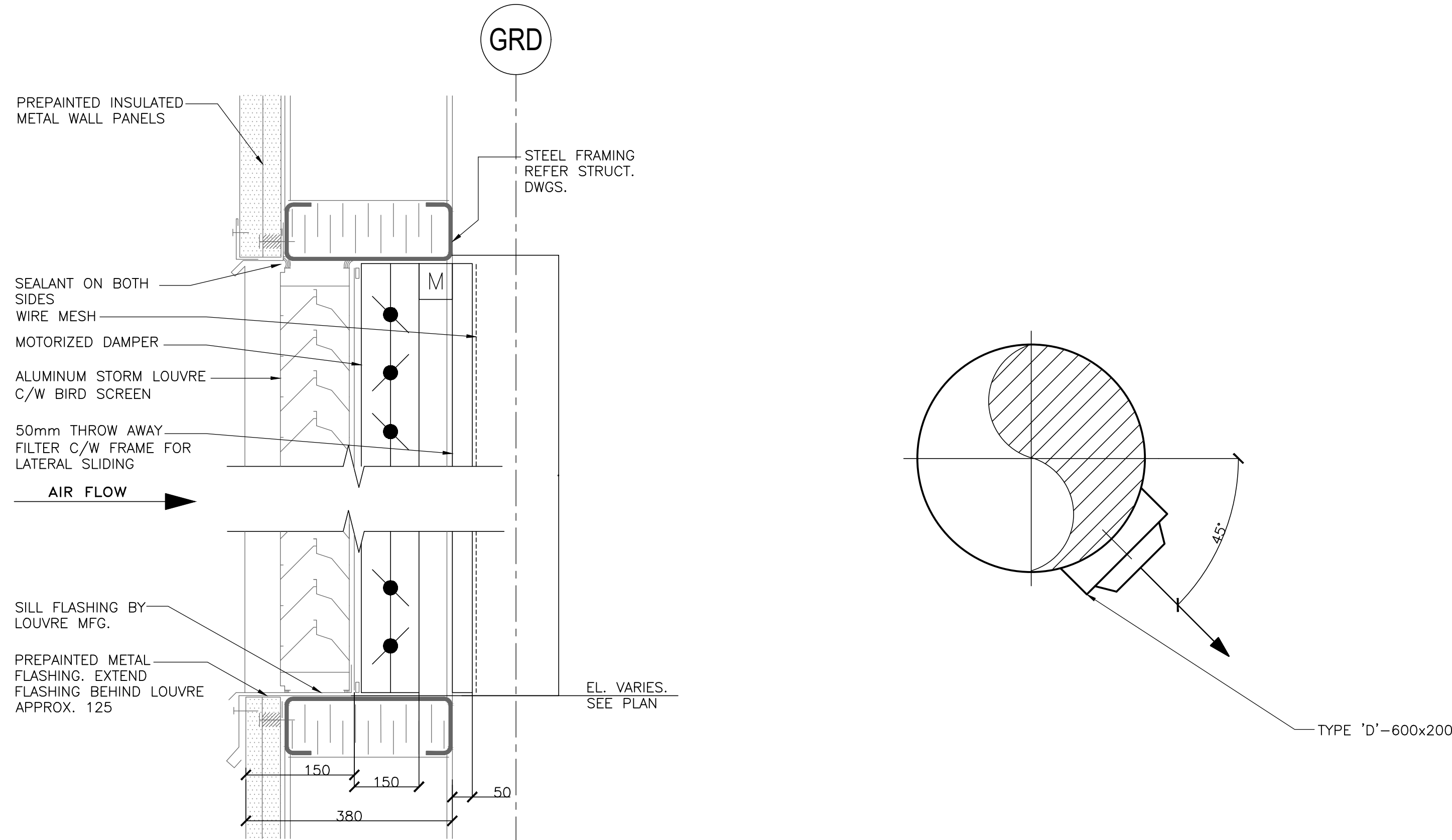
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Project No. 24RX12.0113	Drawing No. 02-M51-03-01
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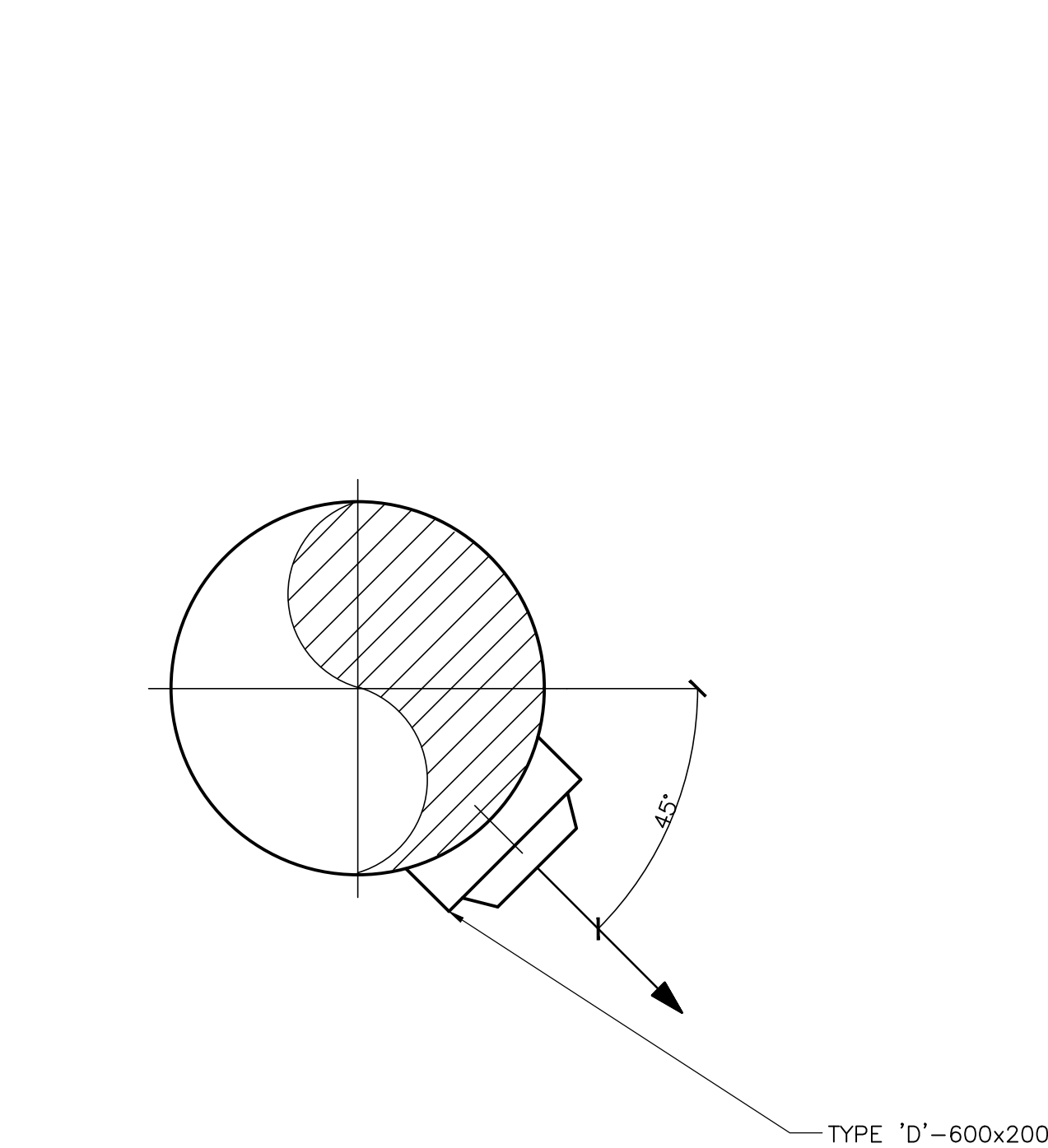
RDD Contract No.  
**T-1038-2019**



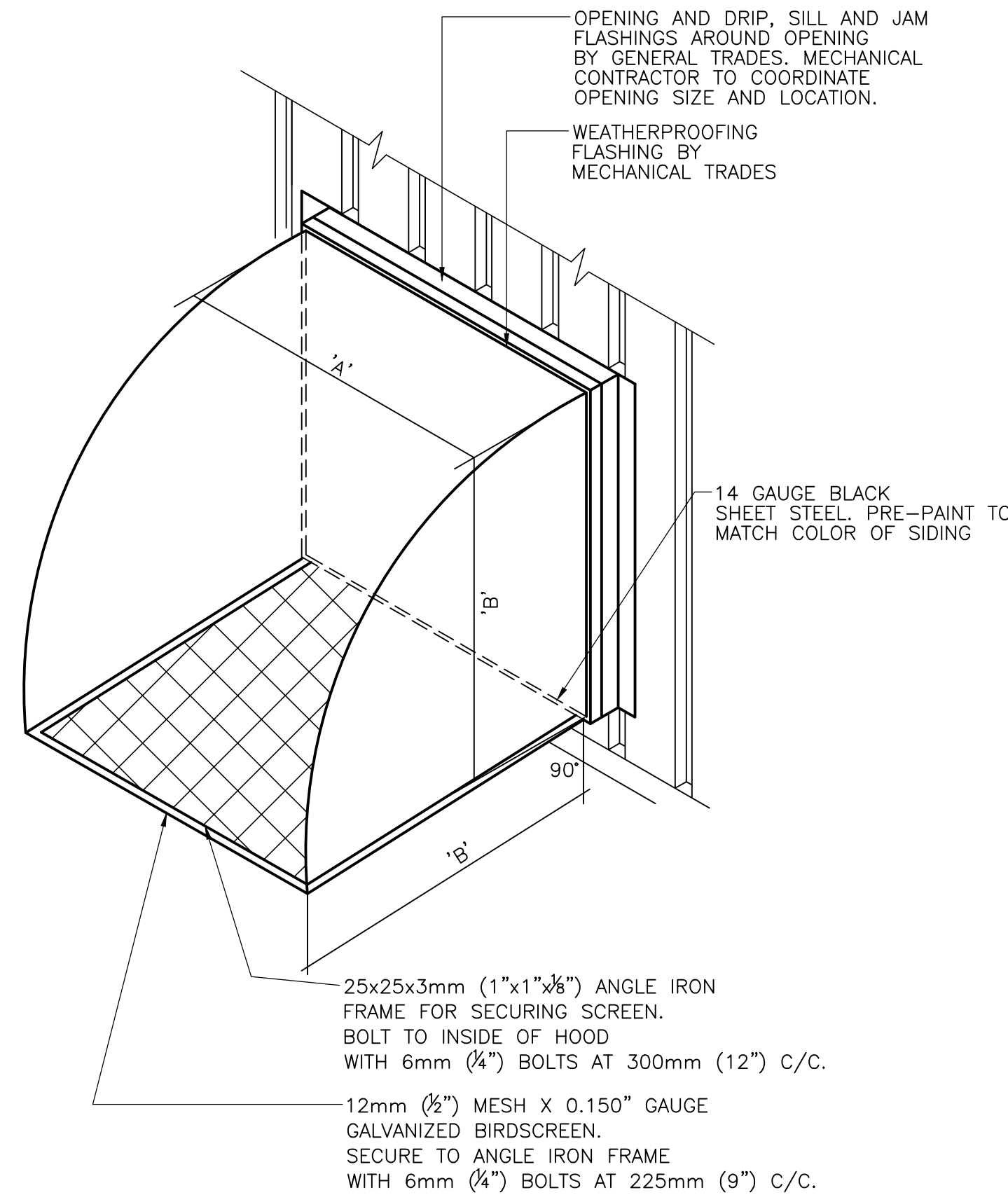
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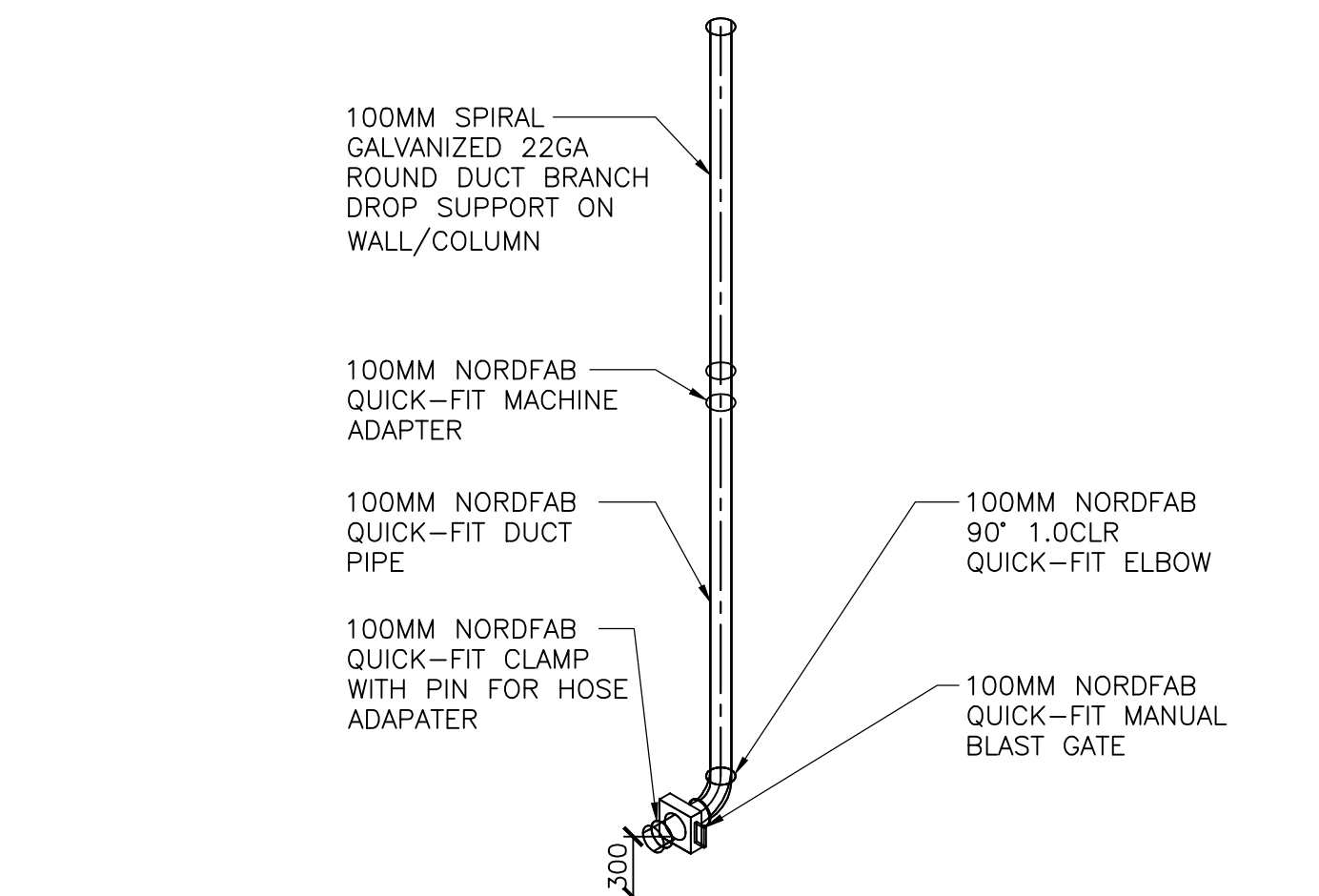
1  
02-M56-00-01  
DETAIL  
TYPICAL LOUVRE ARRANGEMENT



2  
02-M56-00-01  
DETAIL  
GARAGE SUPPLY GRILLE

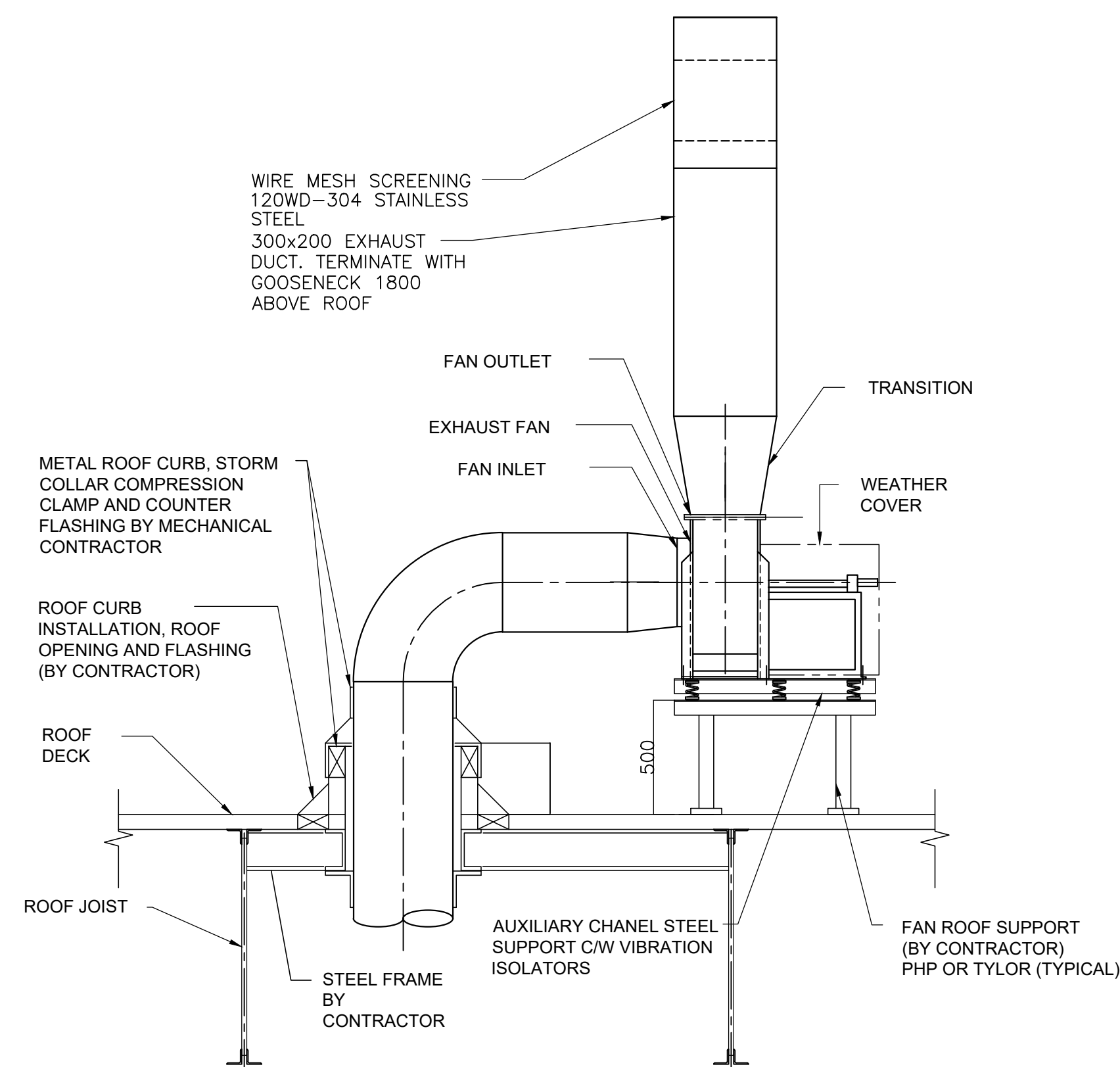


3  
02-M56-00-01  
DETAIL  
TYPICAL FRESH AIR INTAKE WALL HOOD

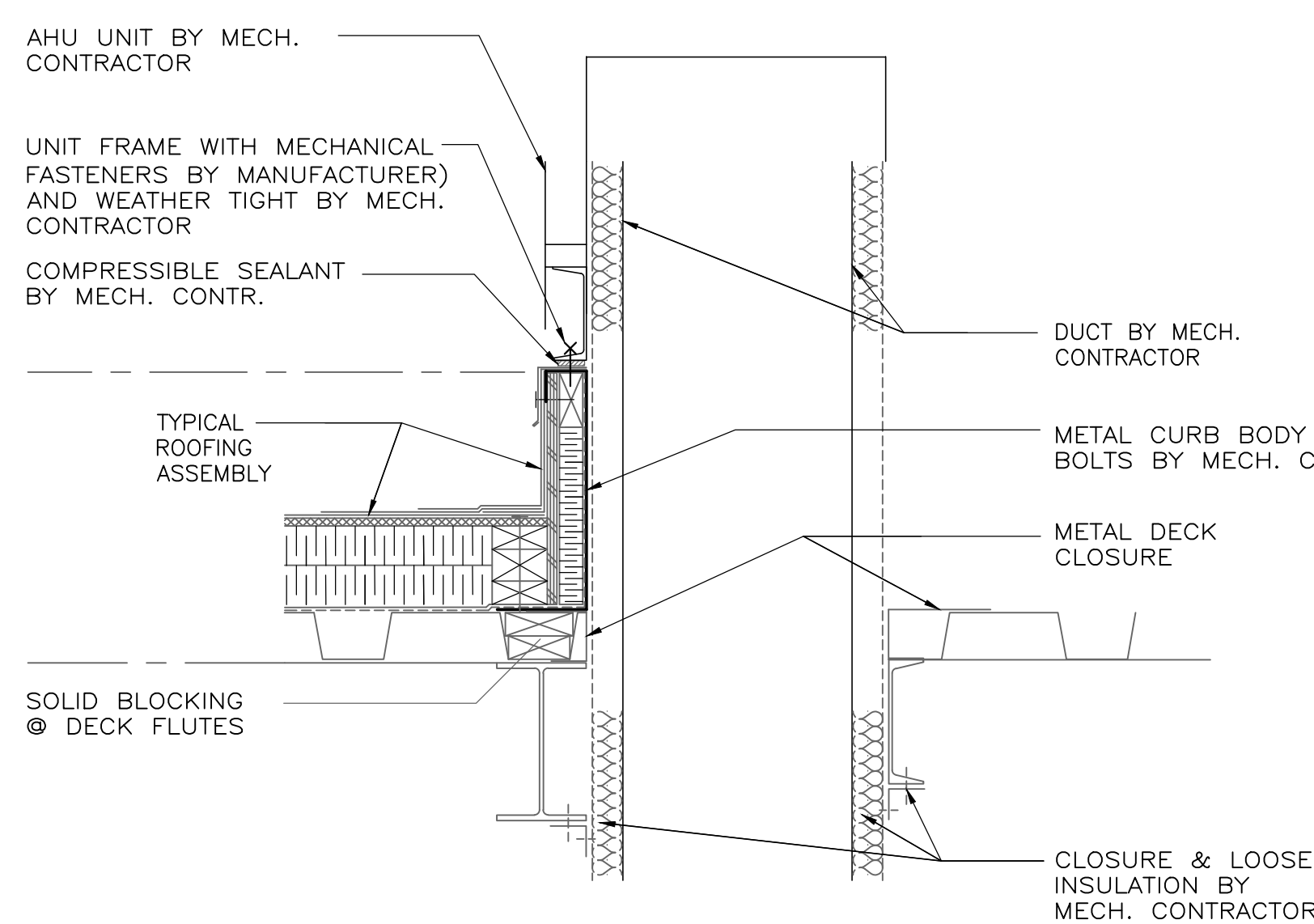


- NOTES:
1. PROVIDE THE FOLLOWING FITTINGS AND ACCESSORIES FOR ABOVE GROUND LOW LEVEL VEHICLE EXHAUST CAPTURE SYSTEM:
    - (x4) MACHINE ADAPTER OF 100#
    - (x4) 90° ELBOW OF 100MM 1.0CLR
    - (x4) 100# MANUAL BLAST GATE OF
    - (x4) 100# CLAMP WITH PIN OF
    - (x2) 100# HOSE ADAPTER OF
    - (x2) 100# 5M LONG NF4 HIGH TEMP EXHAUST HOSES, SILICON COATED FABRIC WITH GALV. STEEL HELIX WITH TWO CLAMPS
    - (x2) 100# EXHAUST NOZZLE
    - (x2) 100# EXHAUST NOZZLE
    - (x4) 100# EXHAUST NOZZLE
    - (x2) 100# DUAL EXHAUST ADAPTER W/ QUICK CONNECT
    - (x4) 100# QUICK COUPLER
    - (x4) 100# BRIDGE CLAMP W/ RUBBER SLEEVES
    - (x1) 100# 2.5M LONG NF4 HIGH TEMP EXHAUST HOSE, FIELD CUT INTO 600mm LENGTHS FOR EACH NOZZLE ASSEMBLY
- CONTRACTOR TO VERIFY QUANTITIES AND FITTING WITH MANUFACTURER AND SUBMIT A SHOP DRAWING FOR ENGINEER'S REVIEW.

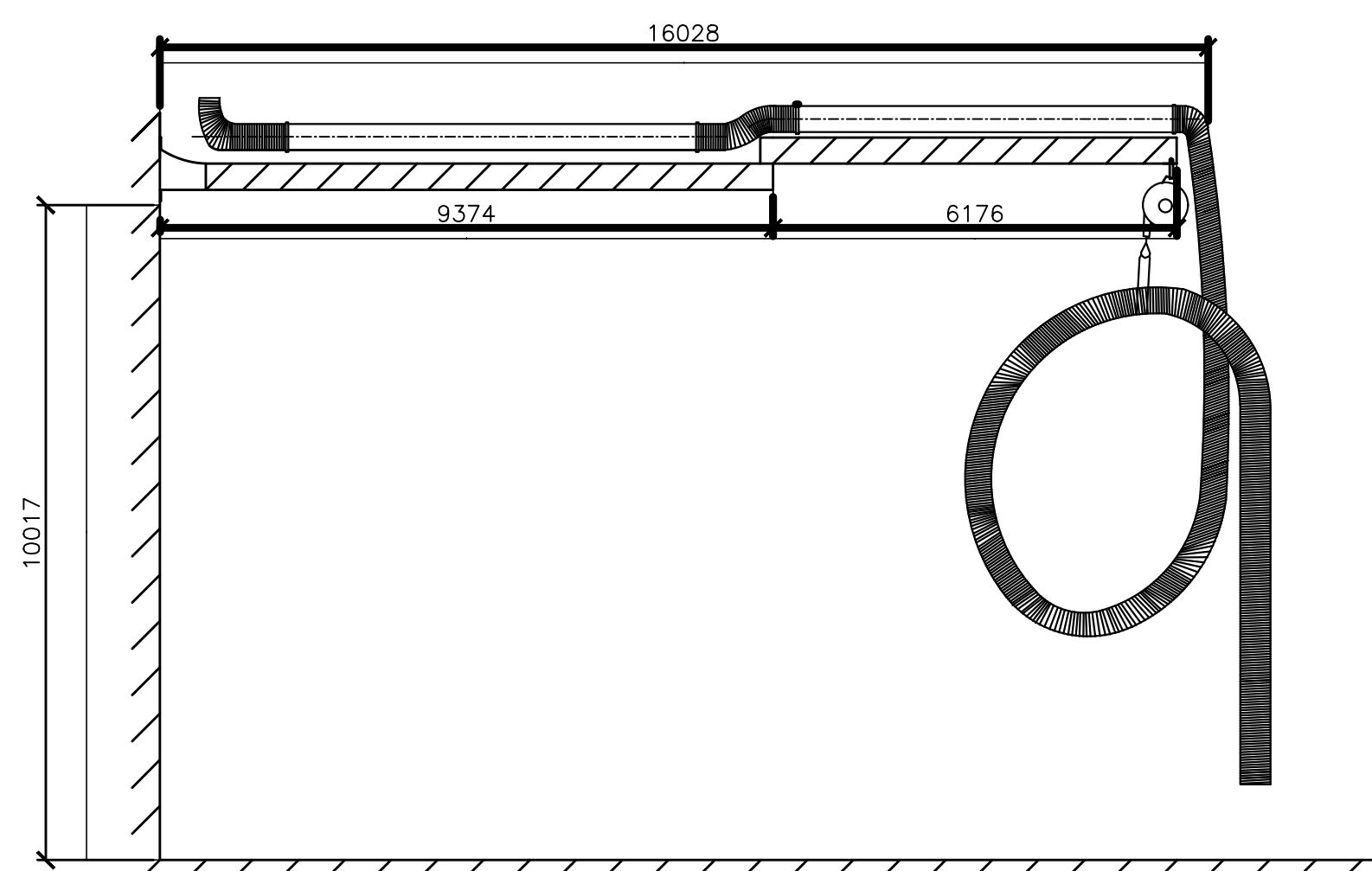
4  
02-M56-00-01  
DETAIL  
EXHAUST AIR DROP OUTLET DETAIL



5  
02-M56-00-01  
DETAIL  
VEHICLE EXHAUST SYSTEM



6  
02-M56-00-01  
DETAIL  
ROOF CURB FOR MECH AHU UNIT



7  
02-M56-00-01  
DETAIL  
FIXED EXHAUST EXTRACTION SYSTEM ON DOUBLE ARTICULATING BOOM

- NOTES:
1. PROVIDE THE FOLLOWING FITTINGS AND ACCESSORIES FOR ABOVE GROUND HIGH LEVEL VEHICLE EXHAUST CAPTURE SYSTEM:
    - FIXED EXHAUST ON A DOUBLE ARTICULATED PIVOTING BOOM, BOOM LENGTH 6000mm SET UP FOR 200# HOSE, FOR 200# HOSE, MODEL: FEB-6-200 PLYMOVENT OR ACCEPTED EQUAL.
    - BLACK EXHAUST HOSE, 200# TEMP RESISTANCE UP TO 288°C c/w INTERNAL STEEL HELIX, MAX SPIKE TEMP 677°C, MODEL: SWE2-200-8 PLYMOVENT OR ACCEPTED EQUAL.
    - RUBBER BAND 200# TO PROVIDE A COVER OVER HOSE CLAMP.
    - STAINLESS STEEL HOSE CLAMP FOR EXHAUST HOSES 200#.
    - STACKER NOZZLE 150-250 c/w ROTATING HANDLE RECEIVER, 200# HOSE CONNECTION WITH 250# LARGE END OPENING.
    - TELESCOPIC POLE HANDLE FOR STACKER NOZZLE WITH MALE FITTING RECEIVER ON STACKER NOZZLE, MODEL TH-90 OR ACCEPTED EQUAL.
    - SPRING CLIP FOR USE WITH STACKER OR STAINLESS STEEL CONE NOZZLES, MODEL SC-90 OR ACCEPTED EQUAL.
    - SPRING RECOIL CONSTANT FORCE BALANCER FOR 13-16kg LIFTING CAPACITY, CABLE LENGTH 4500mm WITH CAPABILITY OF LATCH & LOCK OR CONSTANT PULL, MODEL: BRC-450-16 OR ACCEPTED EQUAL.
    - MICRO SWITCH KIT FOR BRC-450 BALANCER, SINGLE THROW, DOUBLE POLE SWITCH, MODEL BRC-SC OR ACCEPTED EQUAL.
    - RUBBER HOSE SADDLE BELT FOR 200# HOSE, INCLUDES HOSE CLAMP AND STEEL RING.
    - AUTOMATIC MOTORIZED DAMPER ASSEMBLY, 200#, 24v OPERATIONAL VOLTAGE, CONNECT TO TRANSFORMER OR THROUGH A PLYMOVENT SA-24, ES-90 OR IE-1C CONTROL BOX, ACTIVATE WITH MSR OR BRC MICRO SWITCH, MODEL: MD-200/8" OR ACCEPTED EQUAL.
    - TRANSFORMER, 115-230 TO 24v STEP DOWN TRANSFORMER, WALL MOUNTED, MODEL: TR-24-100 OR ACCEPTED EQUAL.
    - DCV FAN CONTROLLER, 3-PHASE c/w PID REGULATOR, EMC FILTER, NEMA 12/IP55 ENCLOSURE, CE AND CUL APPROVED, MODEL VFD-3-575 OR ACCEPTED EQUAL.
    - PRESSURE TRANSMITTER FOR 0-10" SP APPLICATIONS, MODEL TG-2500 OR ACCEPTED EQUAL.

PARTS NOTED ABOVE FROM "PLYMOVENT" ARE THE BASIS OF DESIGN, ANY SUBSTITUTES SHALL BE AN APPROVED EQUIVALENT. CONTRACTOR TO VERIFY QUANTITIES AND FITTING WITH MANUFACTURER AND SUBMIT A SHOP DRAWING FOR ENGINEER'S REVIEW.

DATE (mm dd yyyy)	ISSUED FOR	REV
MAY 15 2019	TENDER	0
KEY PLAN		
CONSULTANTS		

**IBI GROUP**  
100-175 Galaxy Boulevard  
Toronto ON M9W 0C9 Canada  
tel 416 679 1930 fax 416 675 4620  
ibigroup.com

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North Arrow

Detail Symbol

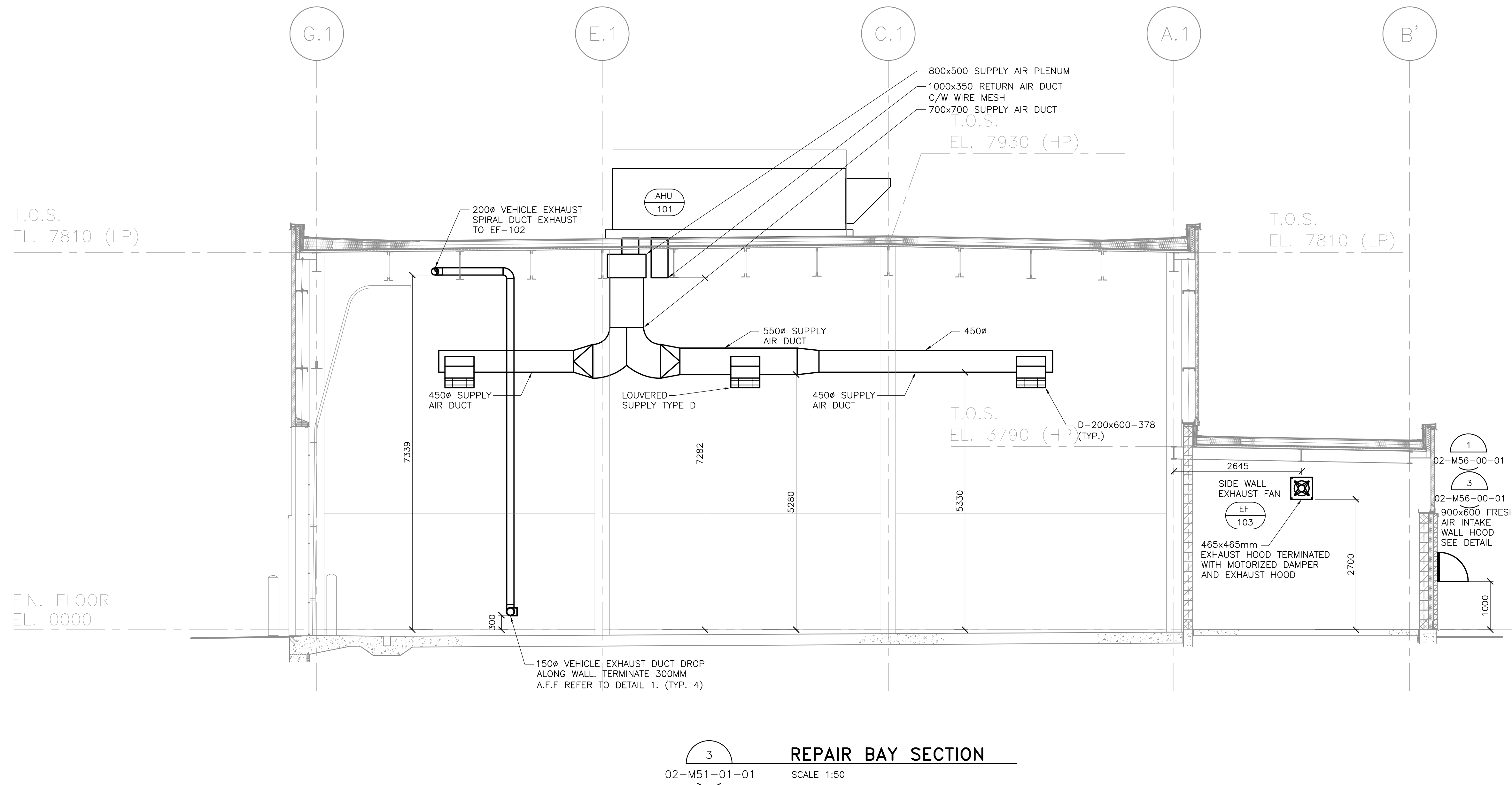
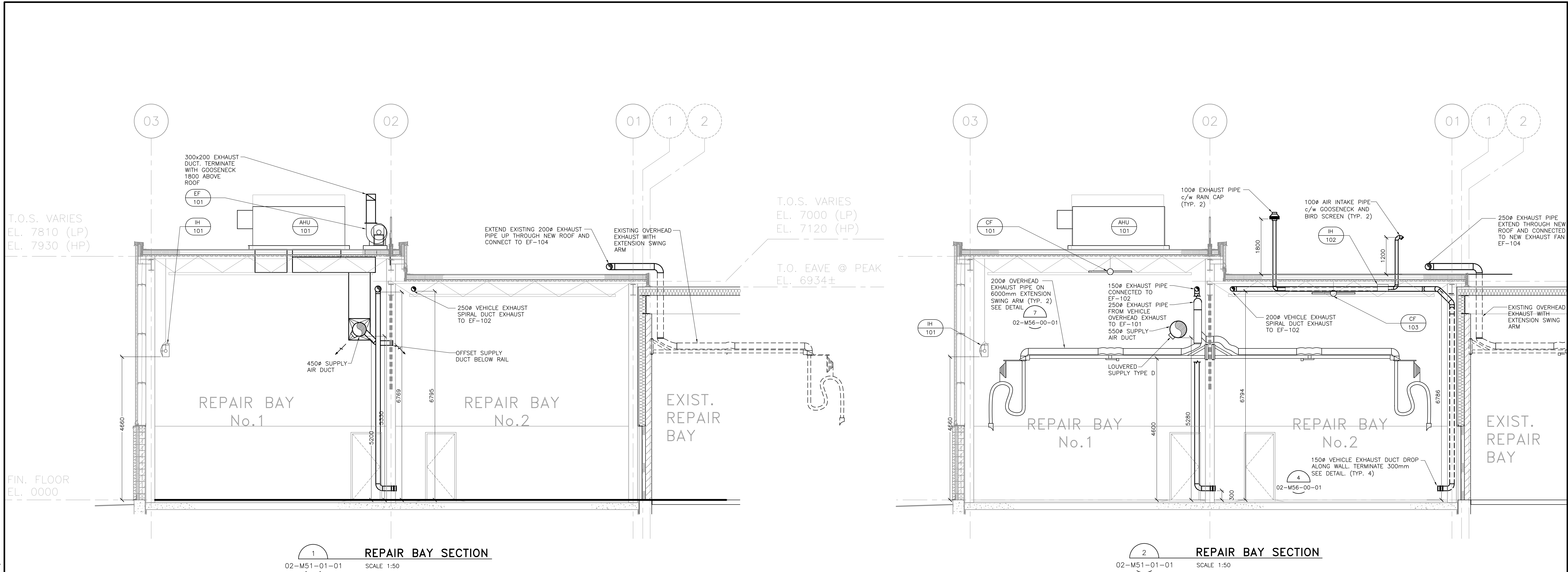
LOCATION OR DETAIL SHEET

Project Manager A. VAN VEEN	Architect/Engineer M. ALIKHANI
Project Leader M. ALIKHANI	Drawn M. ALIKHANI
Date JAN 31 2018	Checked S. LIU
Client	
THE REGIONAL MUNICIPALITY OF DURHAM WORKS DEPARTMENT ONTARIO	
Project EXPAND GARAGE SCUGOG DEPOT 10 REGIONAL RD. 21, R.R.#14, PORT PERRY	
Drawing Title MECHANICAL HVAC DETAILS	
Check Scale (may be photo-reduced) 0 1 inch 0 10mm	
Project No. 24RX12.0113	Drawing No. 02-M56-00-01

R00 Contract No.  
**T-1038-2019**



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DATE (mm dd yyyy)	ISSUED FOR	REV
OCT 01 2018	TENDER	0

KEY PLAN

CONSULTANTS

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**PROFESSIONAL ENGINEER**  
M. ALIKHANI  
104874  
REGISTERED  
PROVINCE OF ONTARIO

North Arrow

Detail Symbol

DETAIL NUMBER  
LOCATION OR DETAIL SHEET

Project Manager	Architect/Engineer
A. VAN VEEN	M. ALIKHANI

Project Leader	Drawn
M. ALIKHANI	M. ALIKHANI

Date	Checked
JAN 31 2018	S. LIU

Client

**THE REGIONAL MUNICIPALITY OF DURHAM**  
WORKS DEPARTMENT ONTARIO

Project  
**EXPAND GARAGE SCUGOG DEPOT**  
10 REGIONAL RD. 21, R.R.#14, PORT PERRY

Drawing Title  
**MECHANICAL HVAC SECTIONS**

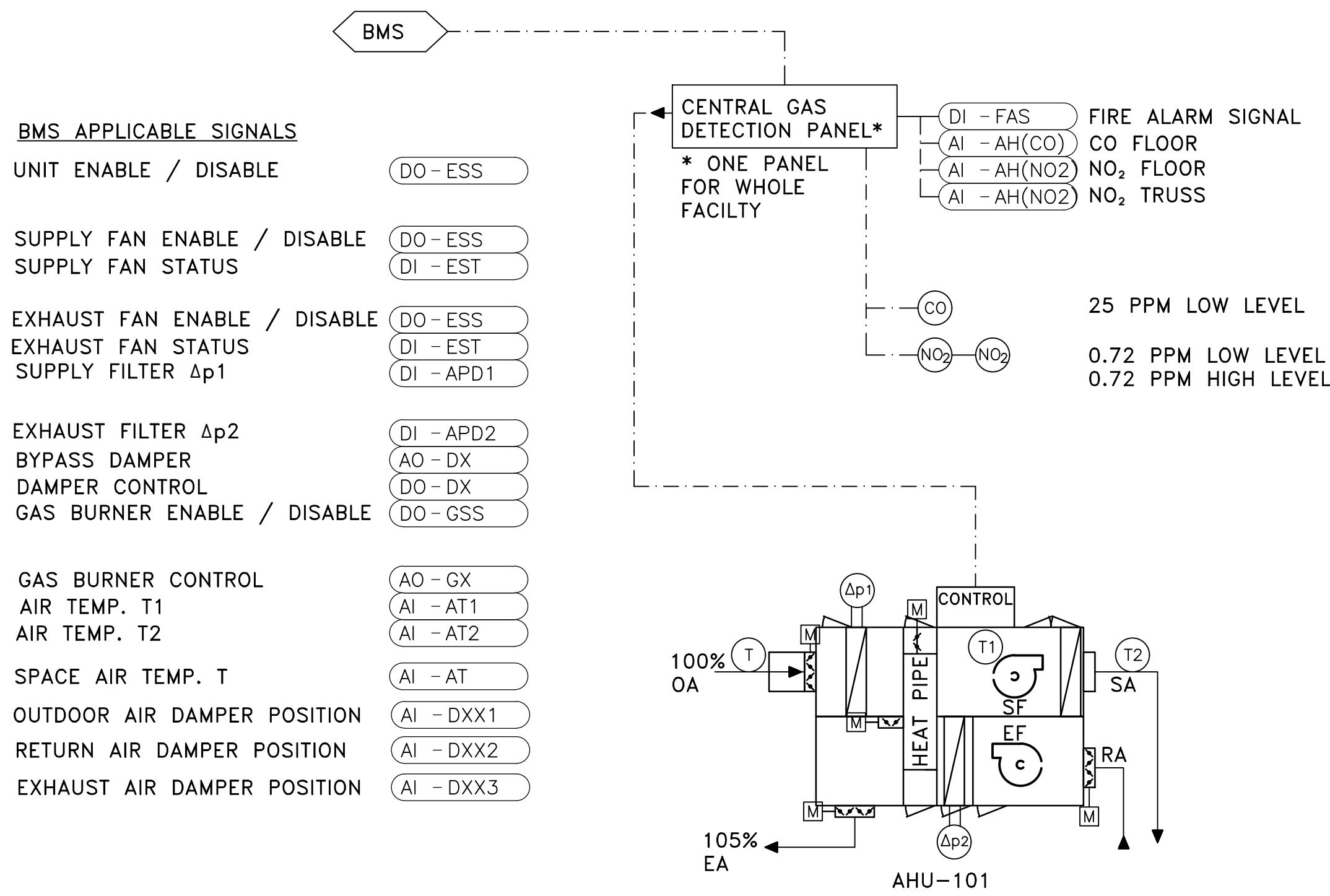
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Project No.	Drawing No.
24RX12.0113	02-M63-00-01

RDD Contract No.  
**T-1038-2019**



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#### SEQUENCE OF OPERATION

##### AHU-101

###### 1.0 GENERAL

AHU-01 IS A VARIABLE VOLUME SYSTEM, 100% OUTSIDE AIR AND 100% EXHAUST AIR, UNIT WITH SUPPLY FAN, EXHAUST FAN, HEAT PIPE, FILTER, DIRECT GAS FIRED BURNER, VFD ON SUPPLY AND RETURN AIR FANS AND STANDALONE CONTROLLER. EXTERNAL TAIL PIPE EXHAUST FANS EF-101 AND EF-102 WORKS IN CONJUNCTION WITH AHU-101

###### 2.0 MODE CONTROL

- SUMMER AND WINTER MODE CONTROL IS DETERMINED BY THE OUTSIDE AIR TEMPERATURE.  
SUMMER - OA > 18° C (65° F), WINTER - OA ≤ 18° C (65° F)
- THE BAS AUTOMATICALLY INITIATE THE OCCUPIED AND UN-OCCUPIED MODES ACCORDING TO ITS PROGRAMMED SCHEDULE.

###### 3.0 OCCUPIED MODE AND UN-OCCUPIED MODE

- AHU STARTS IN OCCUPIED MODE AND STOPS IN UN-OCCUPIED MODE
- SIGNAL FROM GAS DETECTION SYSTEM STARTS AHU AT FULL SPEED (2265 L/S SUPPLY AND 2380 L/S EXHAUST) WHEN CO AND NO2 LEVEL EXCEED HIGH LIMIT IN REPAIR GARAGES,

###### 4.0 SUMMER, OCCUPIED MODE

THE MINIMUM OUTSIDE AIR DAMPER OPENS, EXHAUST AIR DAMPER OPENS, WHEN THE END SWITCH PROOF THE DAMPERS OPEN, SUPPLY FAN AND EXHAUST FAN ARE ENERGIZED AND RUN CONTINUOUSLY. GAS BURNER IS DE-ENERGIZED

WHEN BOTH EXHAUST FANS EF-101 AND 102 ARE OFF, VFD OF SUPPLY FAN RUNS AT FULL SPEED TO PROVIDE 2265 L/S (4800 CFM), VFD OF RETURN FAN RUNS AT FULL SPEED TO PROVIDE 2380 L/S (5040 CFM), BURNER IS OFF

WHEN EITHER OR BOTH EXHAUST FANS EF-05 AND 06 ARE STARTED, VFD OF SUPPLY FAN REMAINS AT FULL SPEED 2265 L/S (4800 CFM), VFD OF RETURN FAN REDUCE FAN SPEED TO PROVIDE 1910 L/S (4040 CFM), BURNER IS OFF

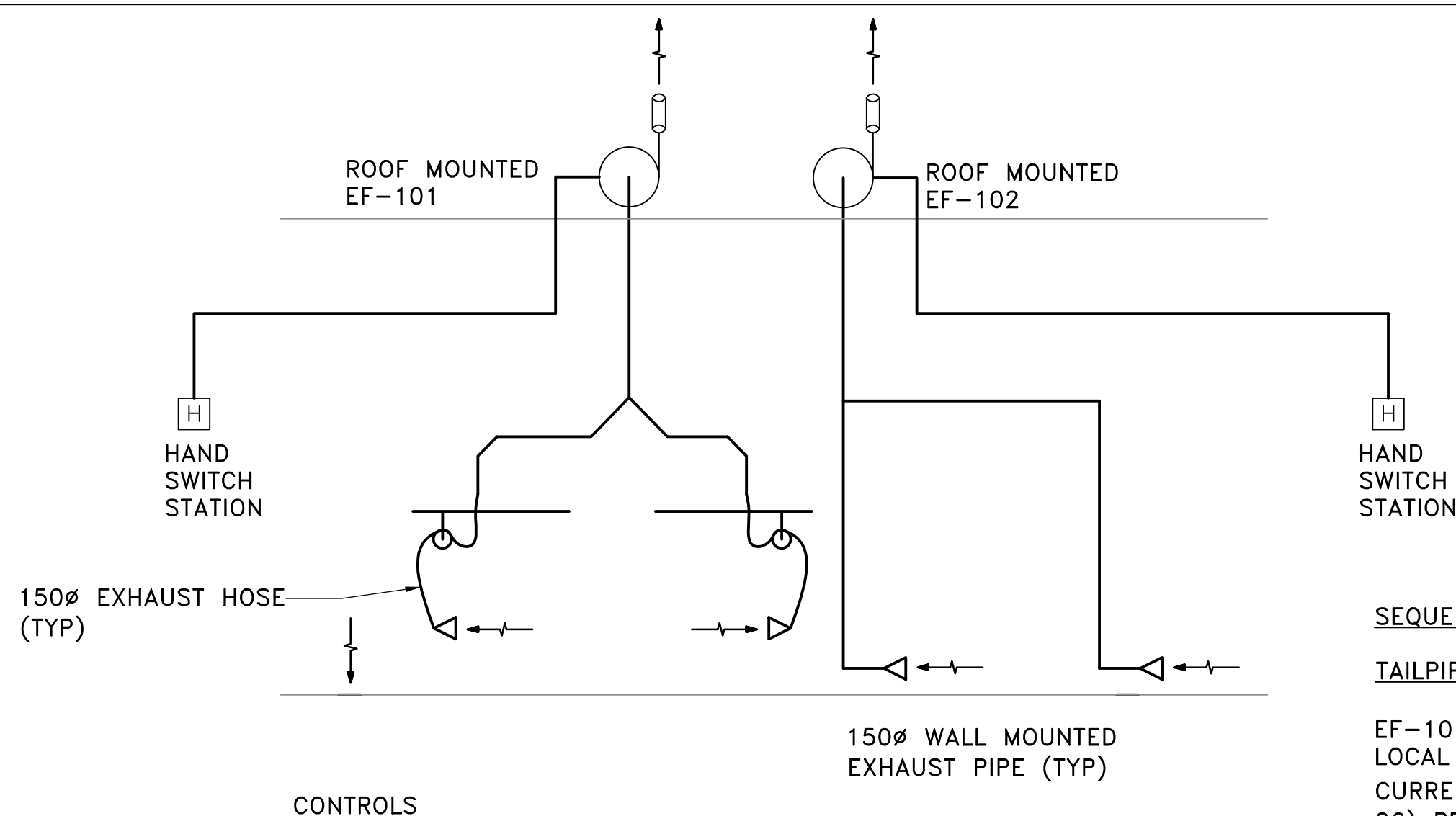
###### 5.0 WINTER, OCCUPIED MODE

OUTSIDE AIR DAMPER AND EXHAUST AIR DAMPER OPEN, WHEN THE DAMPERS ARE FULLY OPEN AS PROOF THROUGH THE END SWITCHES, THE SUPPLY FAN AND EXHAUST FAN ARE ALLOWED TO START.

WHEN BOTH EXHAUST FANS EF-101 AND EF-102 ARE OFF, VFD OF SUPPLY FAN RUNS AT REDUCED SPEED TO PROVIDE 1135 L/S (2400 CFM), VFD OF RETURN RUNS AT REDUCED SPEED TO PROVIDE 1190 L/S (2520 CFM), BURNER MODULATES TO MAINTAIN DISCHARGE AIR TEMPERATURE OF 18°C (65°F) AND RESET WITH SPACE TEMPERATURE SENSOR TO MAINTAIN SPACE TEMPERATURE OF 20°C (68°F).

WHEN EITHER OR BOTH EXHAUST FANS EF-101 AND EF-102 ARE STARTED, VFD OF SUPPLY FAN RUNS TO PROVIDE 1135 L/S (2400 CFM), VFD OF RETURN FAN RUNS AT REDUCED SPEED TO PROVIDE 717 L/S (1520 CFM), BURNER MODULATES TO MAINTAIN DISCHARGE AIR TEMPERATURE OF 18°C (65°F) AND RESET WITH SPACE TEMPERATURE SENSOR TO MAINTAIN SPACE TEMPERATURE OF 20°C (68°F).

### 1 CS402 ROOFTOP AIR HANDLING UNIT (AHU-101) 02-M74-00-01



#### SEQUENCE OF OPERATION

##### TAILPIPE EXHAUST FANS EF-101 AND EF-102

EF-101 AND EF-102 ARE CONTROLLED BY LOCAL MANUAL PUSH BUTTON.  
(BY DIV 26) PROVIDE RUN SIGNAL TO AHU-101 WHEN CURRENT SWITCH IS PROOFED EITHER OR BOTH EXHAUST FANS ARE RUNNING

#### CONTROL NOTES

- AHU CONTROLLED BY BMS (BUILDING MANAGEMENT SYSTEM) AND OPERATOR. ALL POINTS WILL BE PROVIDED ON GRAPHICS AT BMS.
- ALL ANALOG INPUT AHU POINTS WILL HAVE ASSOCIATED HIGH AND LOW ALARM.
- EACH ANALOG OUTPUT POINT WILL HAVE AN ASSOCIATED SET POINT.
- ONE T<sub>1</sub> TEMPERATURE SENSOR, CONTROLS AHU. ALL SET VALUES ARE FIELD ADJUSTABLE.
- ONE CO DETECTOR AT +1.2M A.F.F. MONITORS CARBON MONOXIDE LEVEL AT 25 PPM, MAXIMUM LEVEL (ADJUSTABLE)
- A PAIR OF NO<sub>2</sub> DETECTOR CONTROLS, AT TWO HEIGHTS: +1.4M A.F.F. AND TRUSS LEVEL, NO<sub>2</sub> TO MAXIMUM 3PPM, MAX. LEVEL, MAINTAINING AHU IN OPERATION.
- BMS (DDC) CONTROLLERS CONTROL UNITS ACCORDING TO OCCUPIED/UNOCCUPIED MODE (IN OCCUPIED MODE UNITS ARE ON ACCORDING TO ITS SEQUENCE OF OPERATION). BALANCE THE UNIT TO MAINTAIN 3% NEGATIVE PRESSURE INSIDE AS SPECIFIED.
- IN HIGH LEVEL GAS ALARM, INDEPENDENT OF ITS STATUS, AHU WILL BE ACTIVATED
- BALANCING DAMPER ON COMMON SUPPLY HEADERS TO BE OPENED ONLY ONE OF THE JOINT AHUS OPERATES.

NOTE: LIMITS INDICATED ARE AS PER VALUES INDICATED BY SENTENCE # 6.2.2.3.7. FROM OBC LATEST EDITION & EH40/2005 WORKPLACE EXPOSURE LIMITS, OSHA STANDARD 29 CFR 1910.1000 TABLES Z-1, Z-2 FOR TWA (TIME WEIGHTED AVERAGE) OF 8 HOURS AND 40 HOURS WORKWEEK.

#### 6.0 HEAT PIPE OPERATION

HEAT PIPE OPERATION BASED ON SUMMER AND WINTER MODE. IN WINTER MODE, THE TILT ANGLE OF THE HEAT PIPE VARIED TO PRE-HEAT THE SUPPLY AIR, AND PREVENT THE EXHAUST SIDE OF THE HEAT PIPE FROM FREEZING, THE BAS CONTROLS THE HEAT PIPE TILT ANGLE TO LIMIT HEAT TRANSFER AND KEEP THE EXHAUST AIR ABOVE THE FROST THRESHOLD. IN SUMMER NODE, THE TILE ANGLE IS VARIED TO PRE-COOL THE SUPPLY AIR.

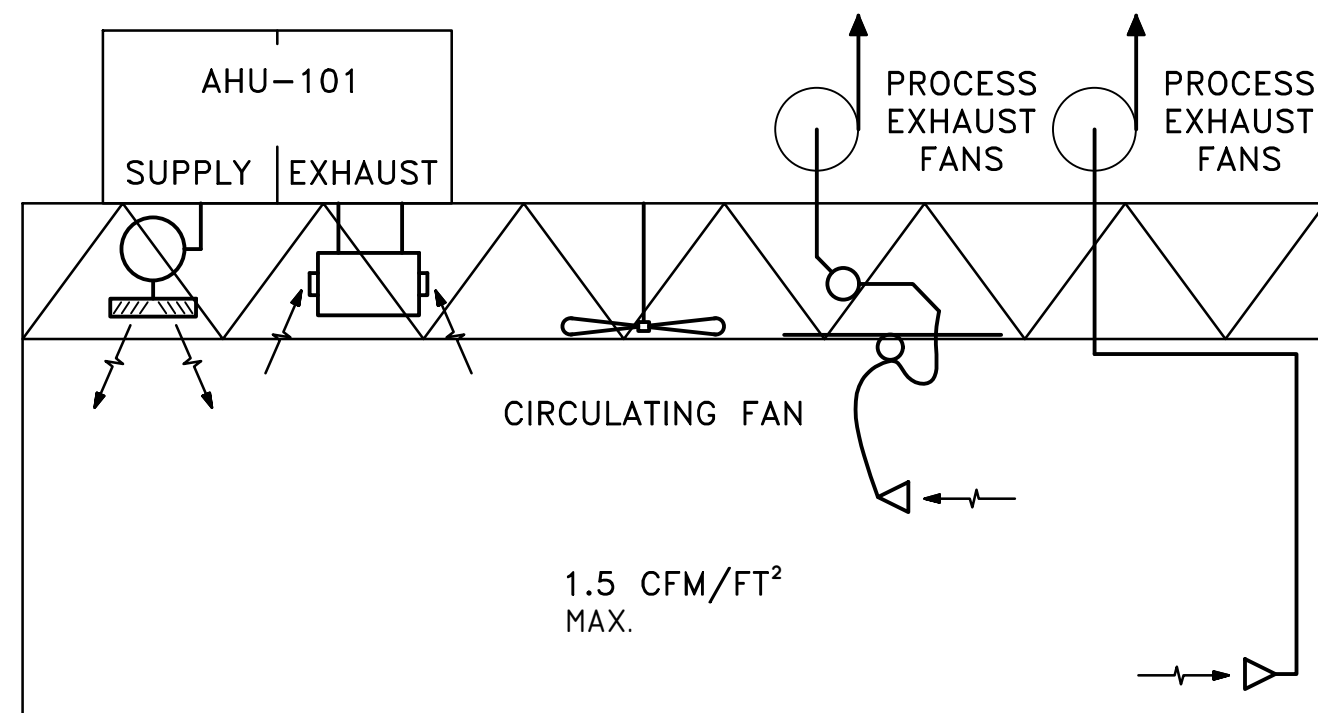
#### 7.0 SAFETIES:

- THE SUPPLY FAN AND BURNER IS DISABLED WHEN LOSS OF FAN AIR FLOW.
- THE BURNER IS DISABLED WITHOUT PROOF OF AIRFLOW AS PROVEN BY THE BURNER PRESSURE DIFFERENTIAL SWITCH.
- DISCHARGE SENSOR PREVENTS THE BURNER DISCHARGE TEMPERATURE FROM EXCEEDING 39°C
- SIGNAL FROM FIRE ALARM SYSTEM STOPS THE UNIT IN FIRE CONDITION BY BAS SYSTEM.
- HIGH TEMPERATURE SENSOR STOPS THE FAN SYSTEM AND ALARM AT BAS WHEN THE LIMIT SETTING IS EXCEEDED.

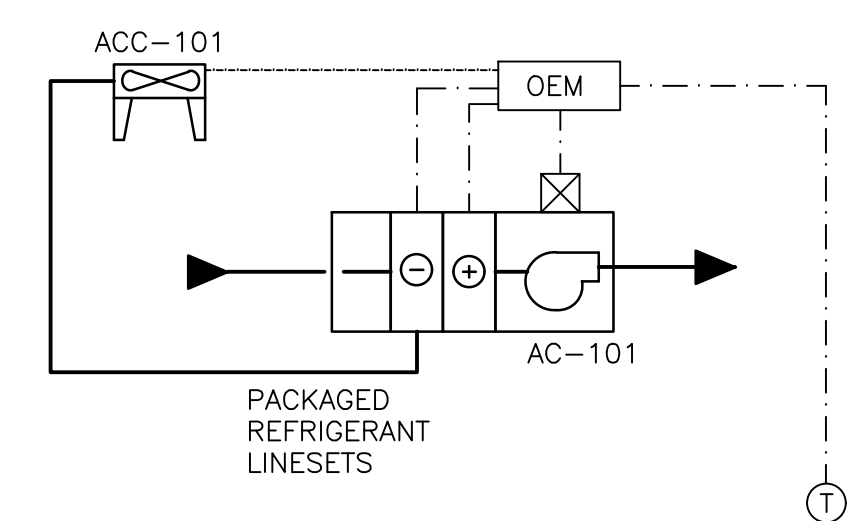
#### 8.0 HEAT RECOVERY UNIT STOP:

- THE OUTSIDE AIR DAMPER AND EXHAUST AIR DAMPER CLOSE.
- SUPPLY AND EXHAUST FANS STOP.
- THE GAS BURNER ASSEMBLY IS DE-ENERGIZED.

#### 9.0 HARDWIRE CONTACTS OF EF-101 AND EF-102 TO AHU-101 CONTROLLER.



#### AIR DISTRIBUTION SCHEMATIC

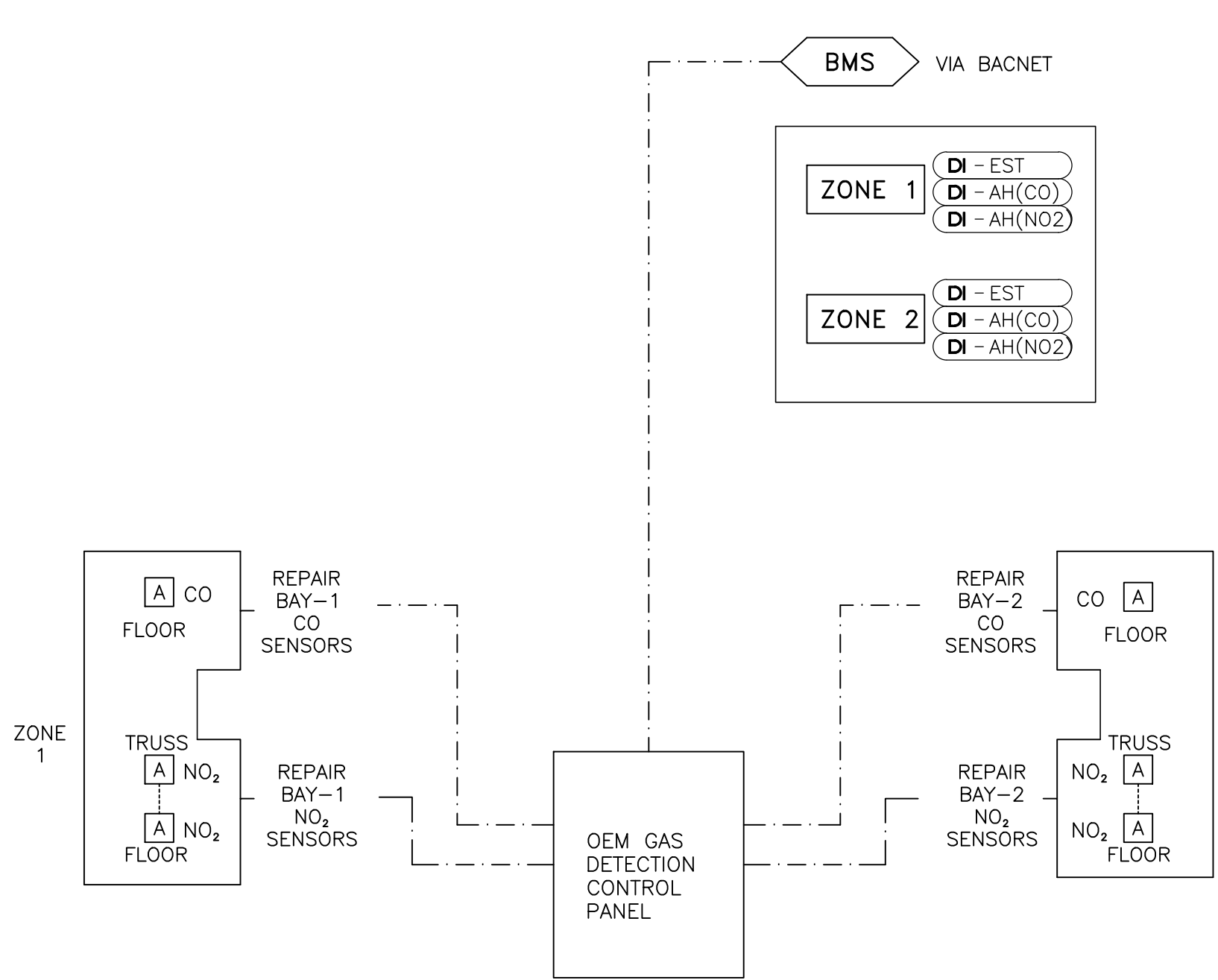


#### SEQUENCE OF OPERATION

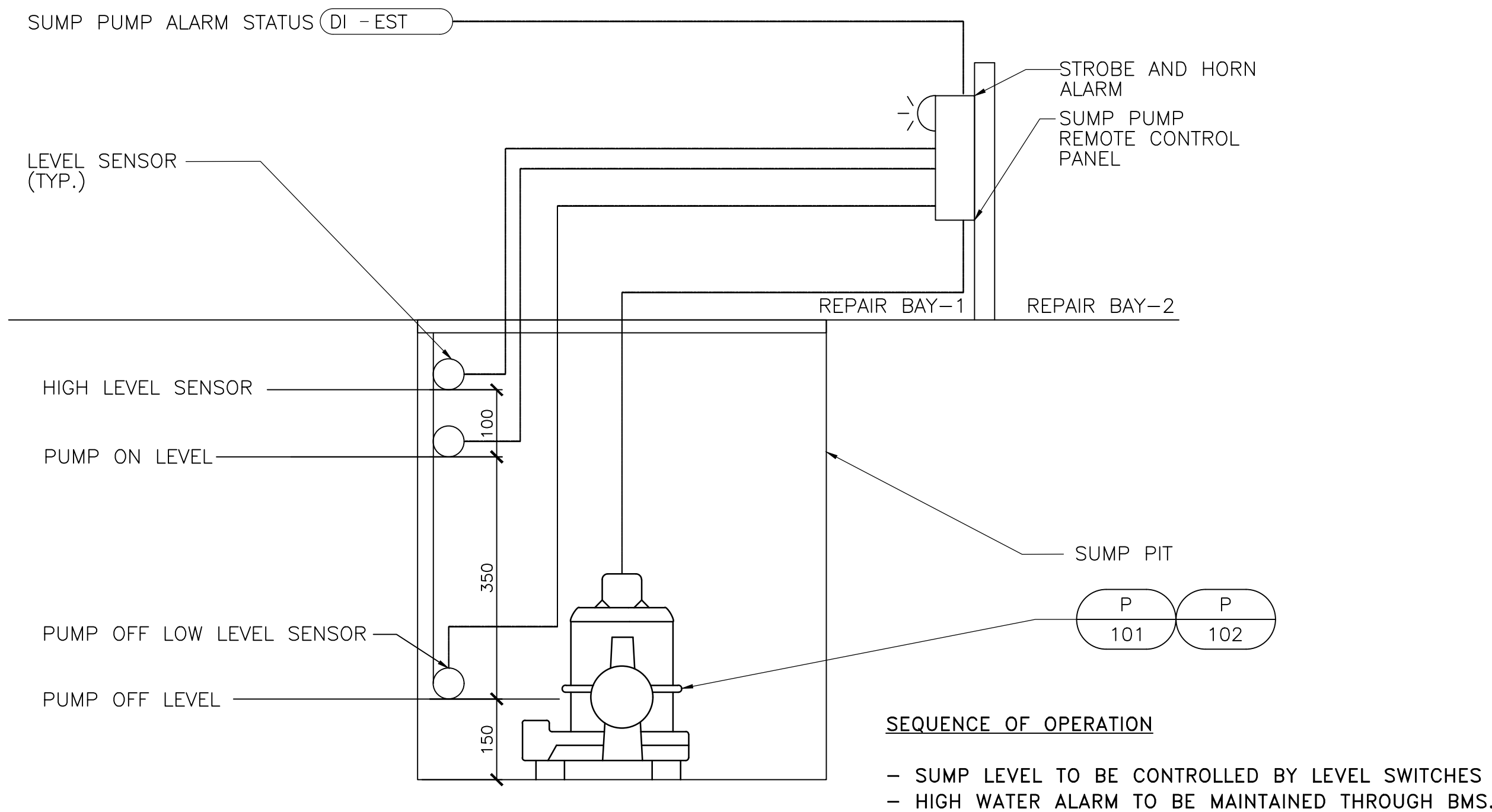
##### AC-101 - SPLIT A/C UNITS

AC-101 CONTROLS WITH LOCAL THERMOSTAT TO MAINTAIN SPACE TEMPERATURE OF 21°C (70°F) IN THE WINTER AND 22°C (72°F) IN THE SUMMER

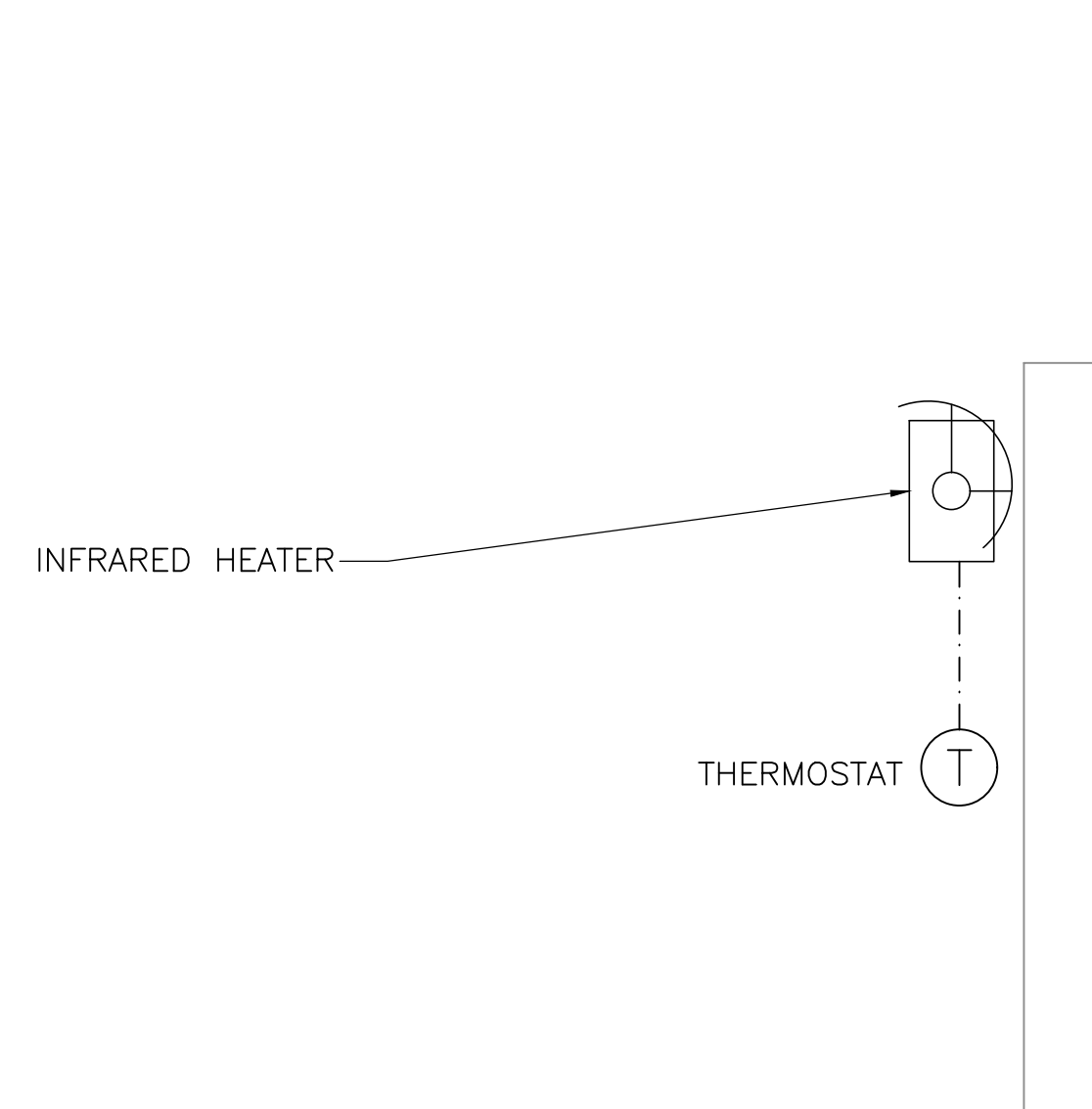
### 3 CS751 SPLIT A/C -ELECTRICAL ROOM 02-M74-00-02 (AC-101/ACC-101)



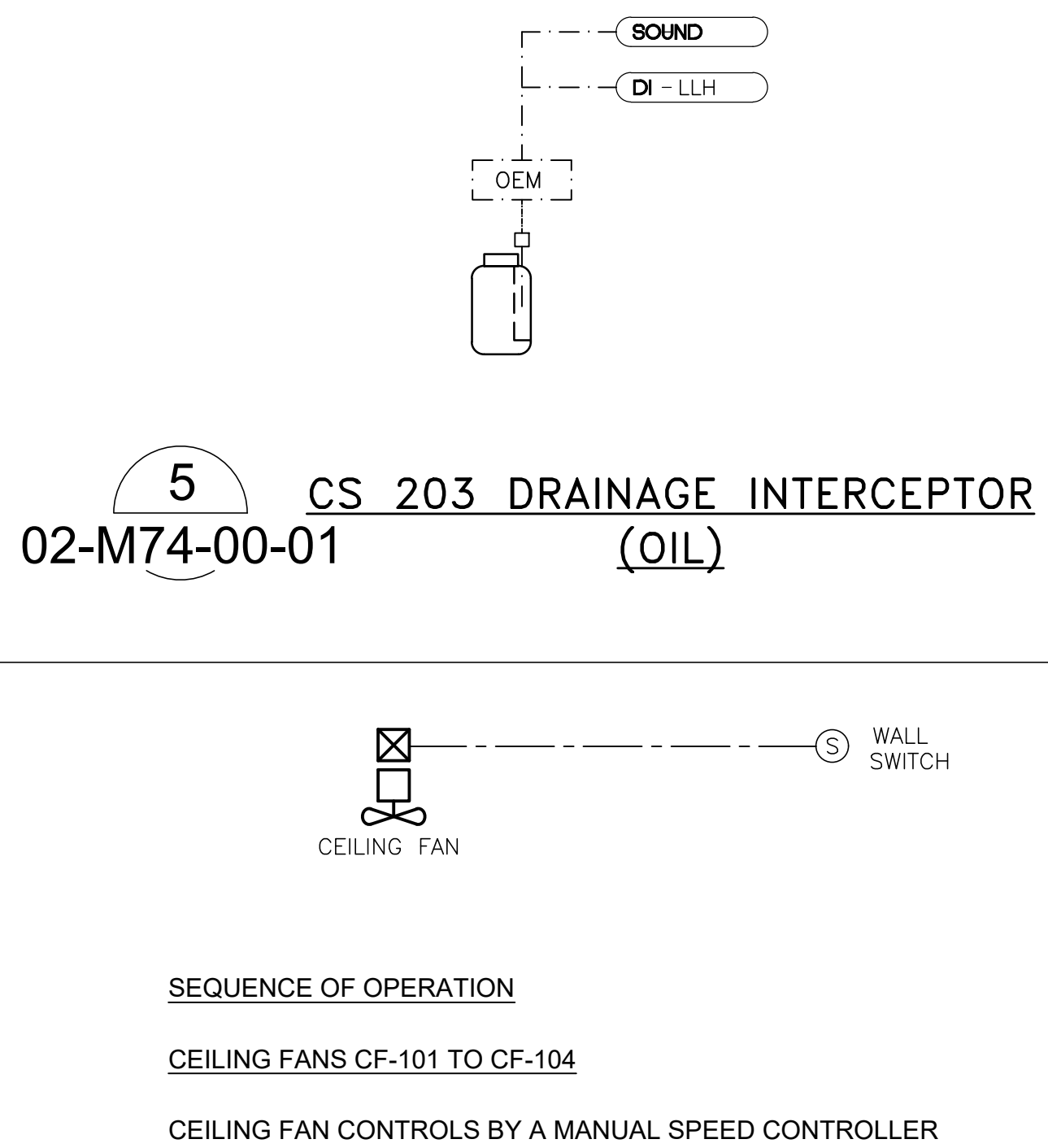
### 4 CS857 GAS DETECTION SYSTEM 02-M74-00-01



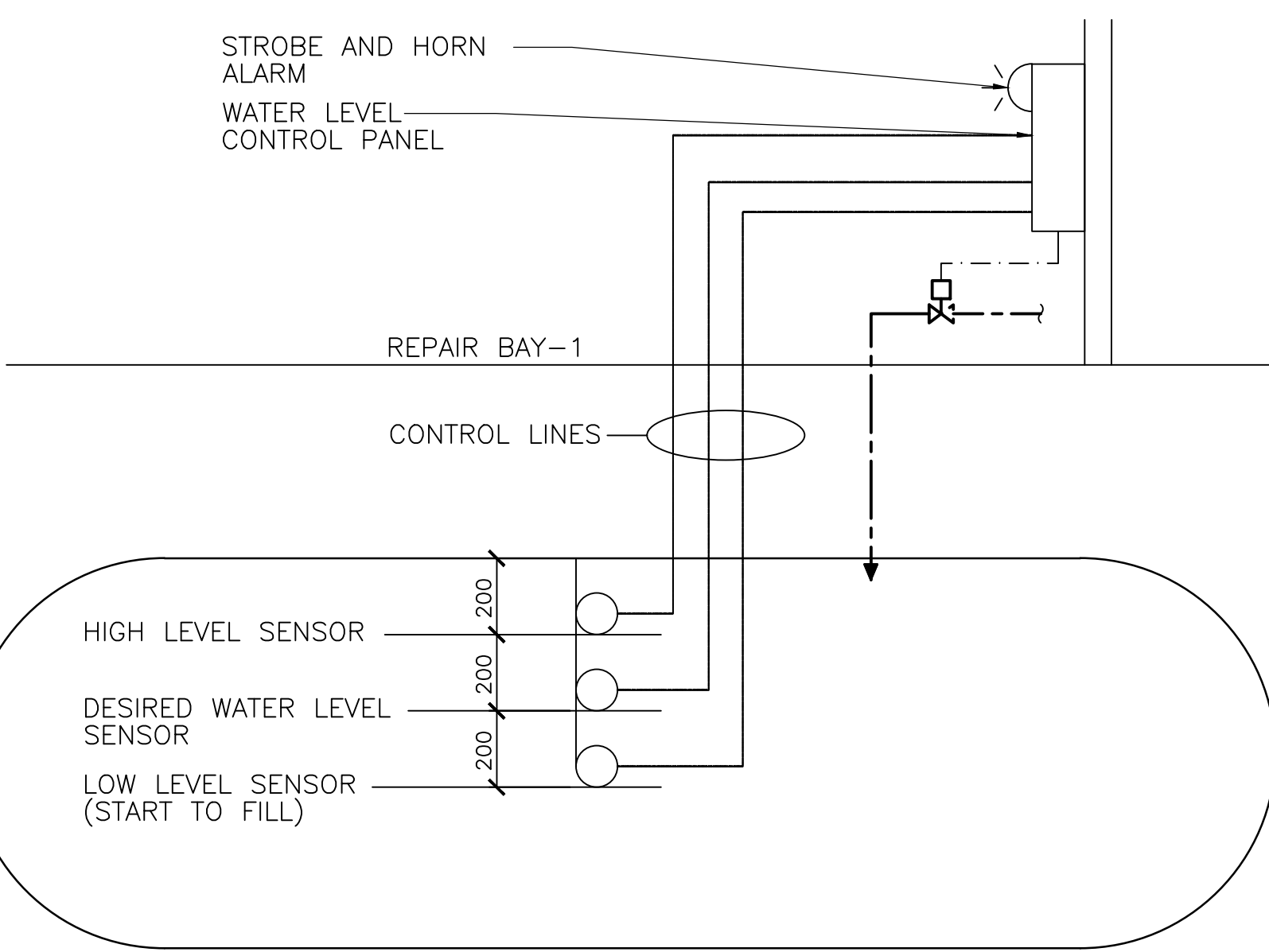
### 6 SUMP PUMP CONTROL SCHEMATIC 02-M74-00-01



### 7 INFRARED HEATER CONTROLS 02-M74-00-02



### 5 CS811 CEILING FAN 02-M74-00-01



### 8 FIRE WATER STORAGE TANK CONTROL SCHEMATIC 02-M74-00-02

RDD Contract No.

T-1038-2019

DATE (mm/dd/yyyy)	ISSUED FOR	REV
MAY 15 2019	TENDER	0
KEY PLAN		
CONSULTANTS		

<b>IBI GROUP</b> 100-175 Galaxy Boulevard Toronto ON M9W 0C9 Canada tel 416 679 1930 fax 416 675 4620 ibigroup.com	
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<b>REGISTERED PROFESSIONAL ENGINEER</b> S. J. LIU 10095170 16/05/2019 PROVINCE OF ONTARIO	<b>Detail Symbol</b> DETAIL NUMBER LOCATION OR DETAIL SHEET
North Arrow	

Project Manager A. VAN VEEN	Architect/Engineer M. ALIKHANI
Project Leader M. ALIKHANI	Drawn M. ALIKHANI
Date JAN 31 2018	Checked S. LIU
Client	

<b>THE REGIONAL MUNICIPALITY OF DURHAM</b> WHITBY WORKS DEPARTMENT ONTARIO	
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Project  
**EXPAND GARAGE SCUGOG DEPOT**  
10 REGIONAL RD. 21, R.R.#14, PORT PERRY

Drawing Title  
**MECHANICAL CONTROLS SCHEMATICS**

Check Scale (may be photo-reduced)

0 1 inch 0 10mm

Project No.

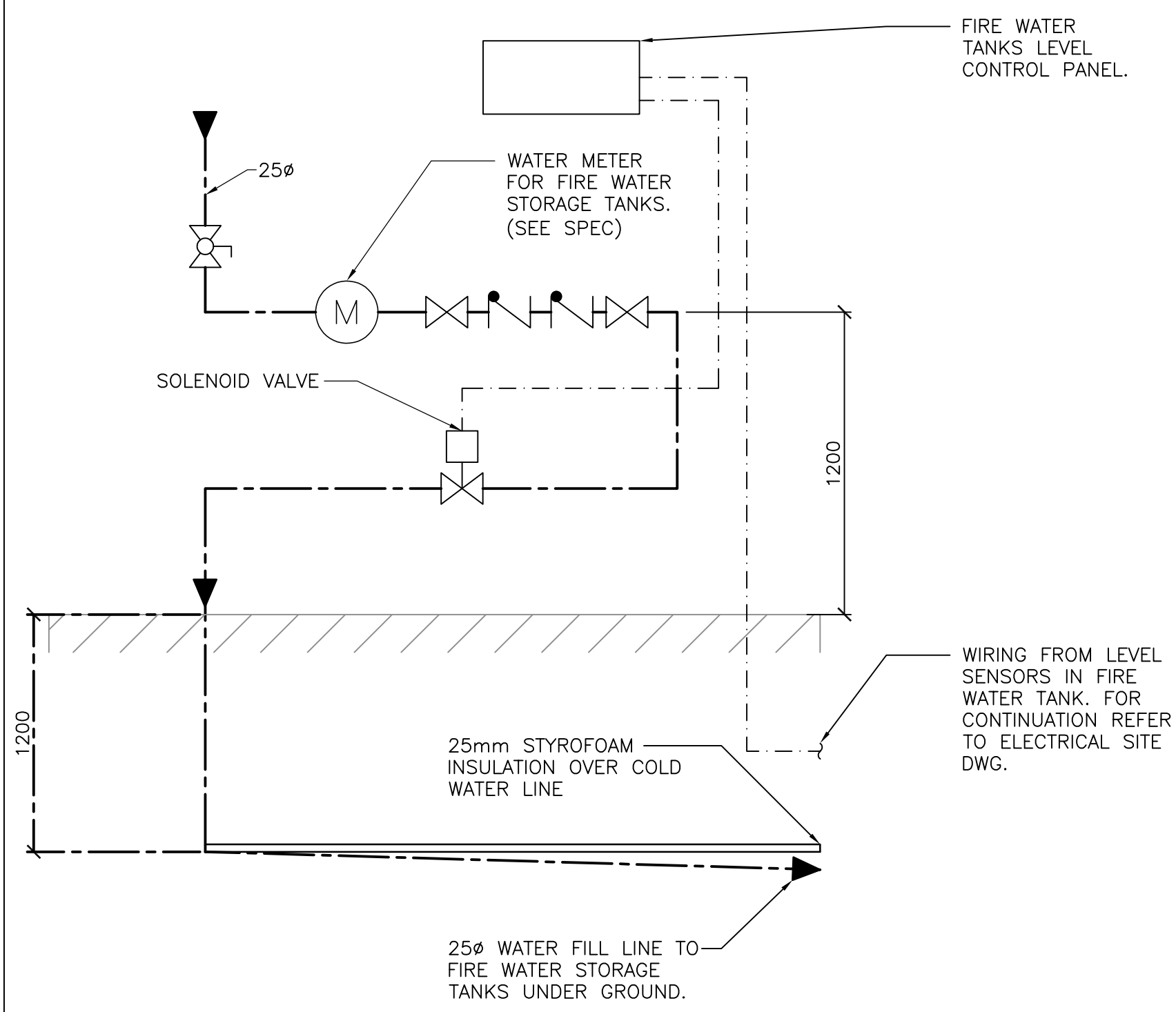
24RX12.0113

Drawing No.

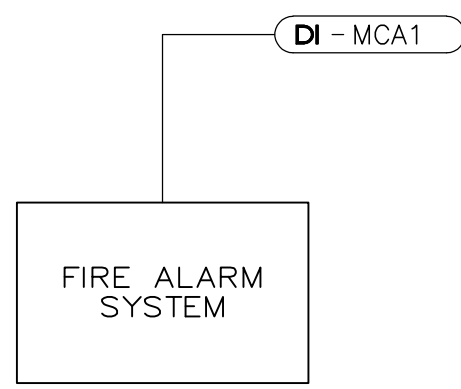
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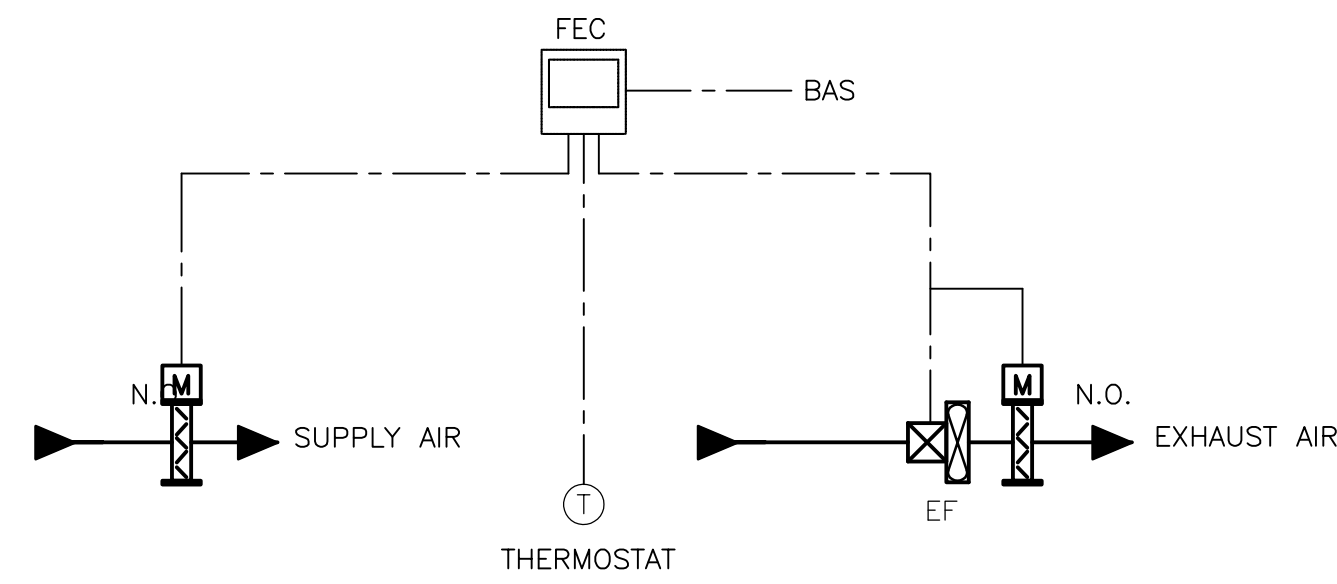
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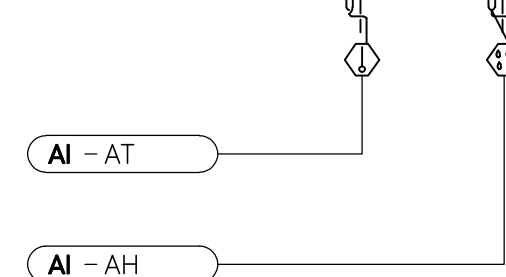
9 FIRE WATER FILL  
01-M74-01-01 CONTROL VALVE DETAIL



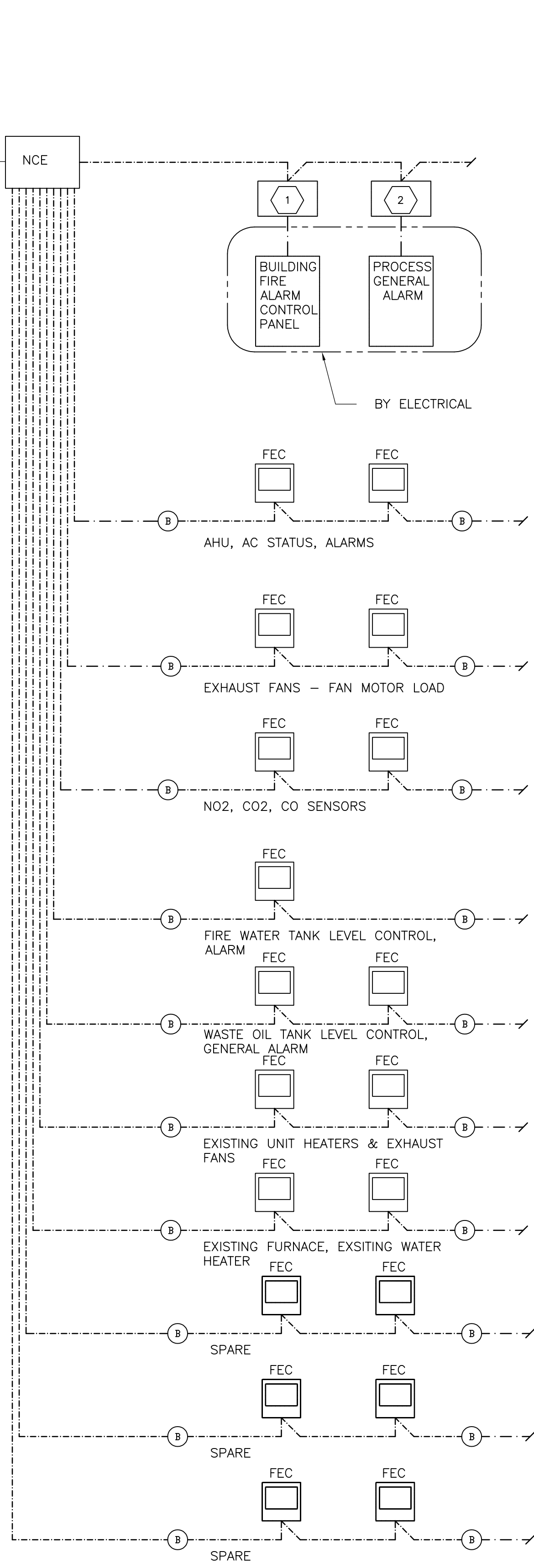
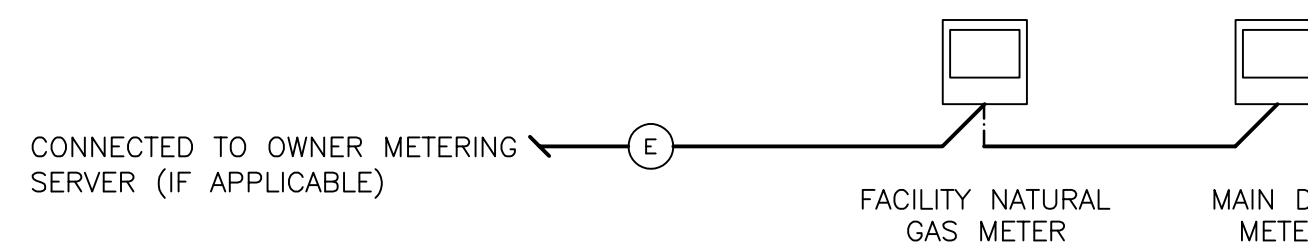
10 FIRE ALARM INTERFACE  
01-M74-01-01



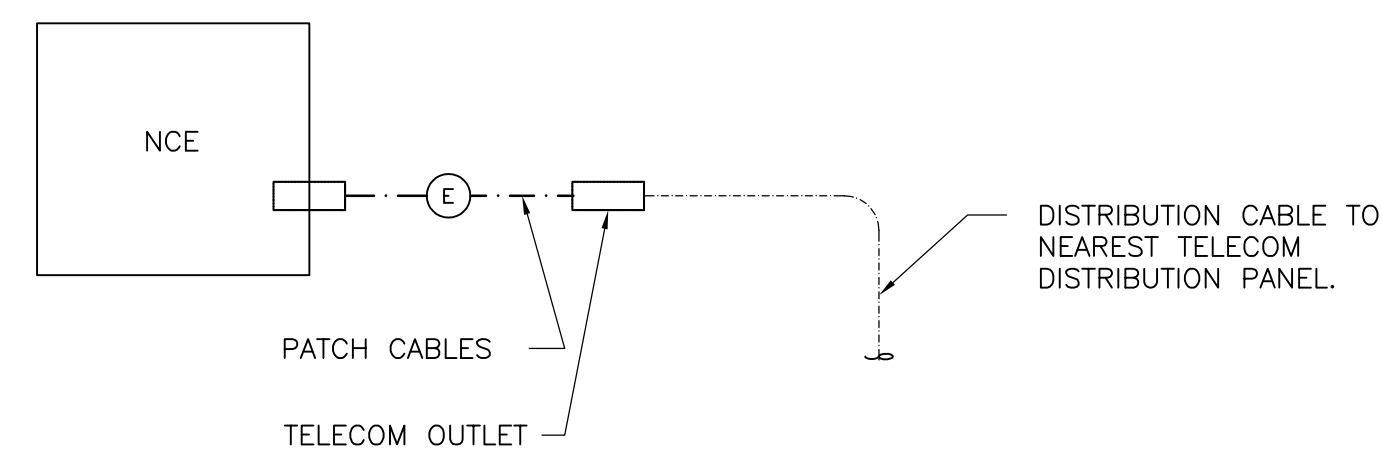
11 CS803 TYPICAL SERVICE ROOM  
01-M74-01-01 VENTILATION (ELEC. RM)



12 OUTDOOR AIR CONDITIONS  
01-M74-01-01



13 B.M.S. ARCHITECTURE  
01-M74-00-02



B.M.S. ETHERNET CONNECTION

LEGEND:

- BUILDING CONTROLLER UNIT (BCU)
- FIELD EQUIPMENT CONTROLLER (FEC)
- NETWORK CONTROL ENGINE (NCE)
- FUTURE BCU
- FUTURE FEC
- ETHERNET CABLING (DIV. 27)
- ETHERNET CONNECTION
- BACNET NETWORK (DIV. 25)
- CONTROL WIRING

GENERAL NOTES:

- FOR GENERAL SYSTEM ARCHITECTURE INTENT ONLY. DEVELOPMENT OF SYSTEM ARCHITECTURE, INCLUDING QUANTITY AND TYPE OF DEVICES BY CONTROLS CONTRACTOR.
- NOT ALL ECU UNITS ARE SHOWN FOR CLARITY. THIS DRAWING TO BE DEVELOPED AND COMPLETED BY THE CONTROLS CONTRACTOR AS PART OF THE SHOP DRAWING SUBMISSION AND RECORD DRAWINGS. OBTAIN A COPY OF THE AUTOCAD FILE FROM THE CONSULTANT AT THE START OF THE PROJECT.
- REFER TO SPECIFICATIONS FOR ALL CONTROL SEQUENCES.
- CONTRACTOR SHALL PROVIDE NECESSARY CONTROL PROTOCOL CONVERTERS FOR SEAMLESS COMMUNICATION INTERFACES

EQUIPMENT NOTES:

- HARD WIRE TO DRY CONTACT AT FIRE ALARM SYSTEM PANEL AT MAIN BUILDING ENTRANCE.
- PROVIDE DRY CONTACTS IN BMS CONTROL PANEL FOR PROCESS GENERAL ALARMS

ROD Contract No.  
T-1038-2019

DATE (month dd yyyy)	ISSUED FOR	REV
OCT 01 2018	TENDER	0

KEY PLAN
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CONSULTANTS
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North Arrow	Detail Symbol

Project Manager A. VAN VEEN	Architect/Engineer M. ALIKHANI
Project Leader M. ALIKHANI	Drawn M. ALIKHANI
Date JAN 31 2018	Checked S. LIU
Client	

	THE REGIONAL MUNICIPALITY OF DURHAM WORKS DEPARTMENT ONTARIO
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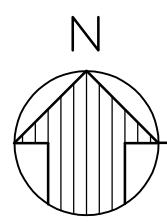
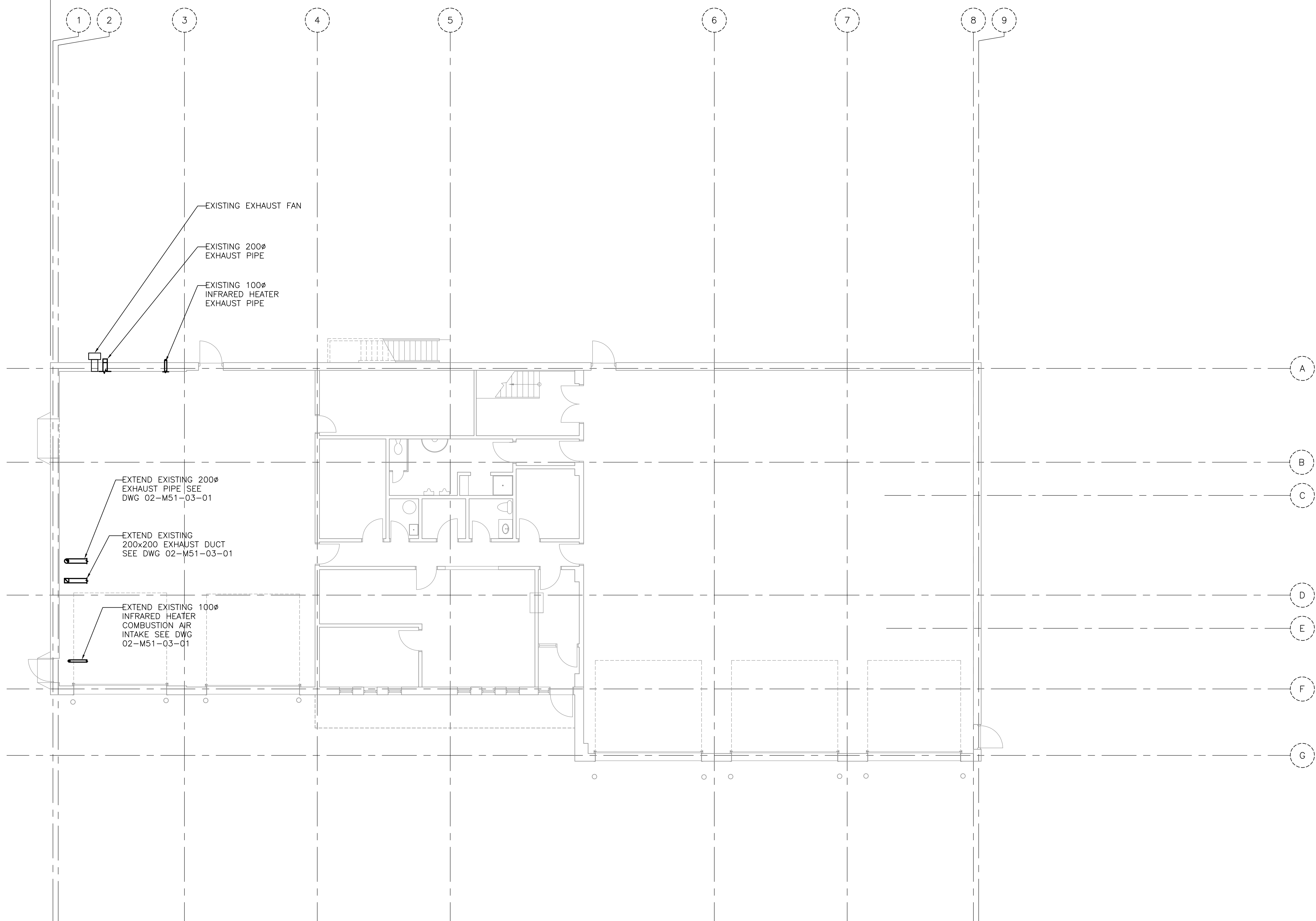
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Drawing Title MECHANICAL CONTROLS SCHEMATICS & BMS ARCHITECTURE	
Check Scale (may be photo-reduced) 0 1 inch 0 10mm	
Project No. 24RX12.0113	Drawing No. 02-M74-01-01



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PROPOSED  
ADDITION

EXISTING  
BUILDING



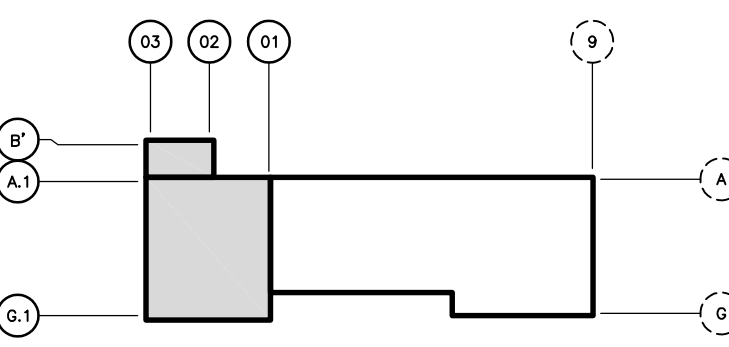
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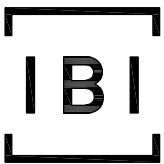
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(UNLESS NOTED OTHERWISE)

DATE (month dd yyyy)	ISSUED FOR	REV
OCT 01 2018	TENDER	0

KEY PLAN

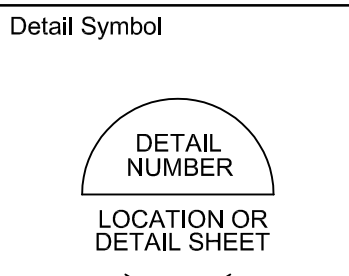
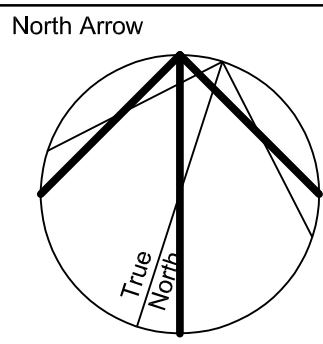


CONSULTANTS

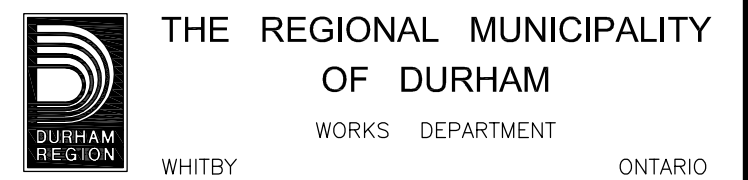


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Project Manager A. VAN VEEN	Architect/Engineer M. ALIKHANI
Project Leader M. ALIKHANI	Drawn M. ALIKHANI
Date JAN 31 2018	Checked S. LIU
Client	



Project  
**EXPAND GARAGE  
SCUGOG DEPOT**  
10 REGIONAL RD. 21, R.R.#14, PORT PERRY

Drawing Title  
**MECHANICAL  
DEMOLITION  
FLOOR PLAN**

Check Scale (may be photo-reduced)  
0 1 Inch 0 10mm

Project No. 24RX12.0113	Drawing No. 02-M80-00-00
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RDD Contract No.

**T-1038-2019**