RAFAT

8850 GEORGE BOLTON PARKWAY, CALEDON, ONTARIO L7E 2Y4

Shop Drawings Transmittal No:	23 75 00-02R0

Project Name:	Construction of Victoria Park Arena and Brampton Sports Hall of Fame	**Project No.**	NRFP2024-232
		DATE:	09 Jun 2025
		Submittal Required Return Date:	23 Jun 2025
Submittal No:	88		
Title:	SD-AHU		
To:	**Mark Falkenburger**		
Checked by:	**Veronica Soulaka**	**To Be Reviewed By the Following Consutlants**	Architecture49 & WSP
Submitted for:	Review and Approval		
Consultants Response			

RAFAT

SUBMITTAL REVIEW

For general compliance with the design concept and contract documents. Subcontractor is solely responsible for jobsite correlation and correctness of all ratings, sizings, type, style, dimensions, finish, quantities and satisfactory fitting to other work and equipment. This review does not change the intent of the contract document.

REVIEWED

RESUBMIT

REJECTED

wsp

- ☐ REVIEWED
- ☑ REVIEWED AS NOTED
- ☐ REVISE & RESUBMIT

BY Jerry Nweisser
DIVISION Buildings - Sustainability
DATE 7/8/2025
SUBMITTAL# 21-19
PROJECT CA-WSP-221-05263-00

THE REVIEW OF THIS DRAWING DOES NOT IN ANY WAY RELIEVE THE VENDOR OR CONTRACTOR OF RESPONSIBILITY FOR ITS ACCURACY OR FOR COMPLIANCE WITH THE CONTRACT DOCUMENTS.

wsp

☐	REVIEWED		
☐	REVIEWED AS NOTED	PROJECT NO.	209-00238
☐	REVISE AND RESUBMIT	REVIEWED BY:	Burong Zhang
☒	REVIEWED FOR IMPACT ON BASE STRUCTURE ONLY	DATE RECEIVED:	
☐	NOT REVIEWED	DATE RETURNED:	2025.07.14

THIS DRAWING HAS ONLY BEEN REVIEWED ON A SAMPLING BASIS FOR GENERAL CONFORMITY WITH STRUCTURAL CONTRACT DOCUMENTS. THE REVIEW BY WSP CANADA DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY TO MAKE THE WORK ACCURATE AND IN CONFORMITY WITH ALL CONTRACT DOCUMENTS; THIS INCLUDES SHOP DRAWING REVIEW, COORDINATION BETWEEN INTERFACING TRADES AND MANUFACTURE OF APPLICABLE PRODUCTS. ALL DIMENSIONS AND TOLERANCES TO BE VERIFIED BY THE CONTRACTOR IN THE FIELD BEFORE THE START OF THE WORK.

WSP-S:
The weight increase in AHU units has an impact (larger size) on the supporting steel members (see page 11).

SHOP DRAWING REVIEW

Project Name: Victoria Park Arena

Project No. CA-WSP-221-05263-00
Date Received: 2025-07-07

Shop Drawing:
Title: AHU- 1&2
Revision: 00
Submission No.: 21-19

This review by consultant is for sole purpose of ascertaining conformance with general design concept. This review does not mean that consultant approves detail design inherent in shop drawings, responsibility for which remains with contractor, and such review does not relieve contractor of responsibility for errors or omissions in shop drawings or of contractor's responsibility for meeting all requirements of contract documents. Be responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication process or to techniques of construction and installation, and for coordination of the work of subtrades.

☐ **Reviewed**	**Mechanical Review Required** ☒		**Electrical Review Required** ☒	
☒ **Reviewed as Noted**	**Reviewed by:**	Jerry Nweisser	**Reviewed by:**	Brad Li
☐ **Revise & Resubmit**	**Review Date:**	2025-07-08	**Review Date:**	2025-07-07

Item	Comments
1.	Architect to confirm the exterior finish of the AHU. Contractor to confirm that the unit complies with specification 23 75 00, subsection 2.25: *"Paint for outdoor units shall be tested to ASTM B117 for 5000-hour salt spray endurance."*
2.	Structural engineer to confirm that the weight increase for AHU-1 & 2 is acceptable.
3.	Only AHU-1 and AHU-2 were reviewed as part of this submittal. AHU-3 was not reviewed under this package and is instead addressed under Submittal 21-15.

End of Review

54 Audia Court, Unit 2
Concord, ON L4K 3N5
(905)-738-1400

Submittal 24-280-019

PROJECT NAME	PROJECT ADDRESS	DATE SUBMITTED
VICTORIA PARK ARENA 24-280	20 Victoria Crescent, Brampton, ON L6T 1E4	May 16, 2025

TO	FROM
Abdullah Hissamuddin	PAUL LEDDY
COMPANY	COMPANY
RAFAT GENERAL CONTRACTOR INC.	Consult Mechanical Inc.
EMAIL	EMAIL
abdullah.hissam@rafat.ca	paul.l@consultmechanical.com
ADDRESS	ADDRESS
8850 GEORGE BOLTON PKWY BOLTON, ON L7E 2Y4	54 Audia Court, Unit 2 Concord, ON L4K 3N5

Title

Air Handling Unit R. 1

Description

AHU 1,2 and 3 Submittal from HTS

Package Items

SPEC	SUBSECTION	ITEM	TYPE

Submittal # 87315 **APPROVAL REQUIRED**

Project	22104386-MECH-1- Brampton Victoria Park Arena
Leader	Nevin Wong
Job Site	Brampton Victoria Park Arena
Submission Date	2025-06-06
Sold To	CONSULT MECH
Submitted By	Nevin Wong

Contacts

Role	Customer	Our Rep
Mechanical Contractor	Con-Sult Mechanical Inc.*	Jaden Sebu
General Contractor	Rafat General Contracing Inc	
Mechanical Contractor	Con-Sult Mechanical Inc.*	Nevin Wong
Designer	WSP MMM Group	Alex Forsea

Deliverables

Track #	288994	288991	
Tag	AHU-1, AHU-3	AHU-2	
Description	RG Dual Core	Haakon Hydronic Air Handler	
Quantity	2	1	
Manufacturer	Tempeff	Haakon Industries	
Model #	RG 4000, RG 5500	Pentpak	
Specification	23 33 65	23 33 65	
Production Lead Time	28 - 32 Weeks	Production Slot Reservation	
Revision #	0	0	

Attention:

1) HTS will provide equipment in accordance with the attached shop drawings.
2) Upon approved submittal and customer release, HTS will release equipment to fabrication per the published lead times. Any storage fees associated with project schedule changes will be the responsibility of the purchaser.
3) HTS can provide freight and logistics to the purchaser as an added benefit of doing business with HTS. When freight is received by the purchaser, any noticeable damage must be recorded. Otherwise, HTS is not responsible for subsequent damage claims.

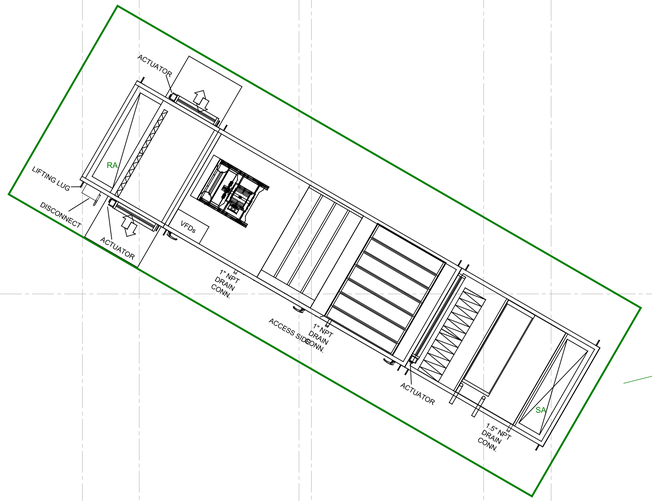
Approval Stamps

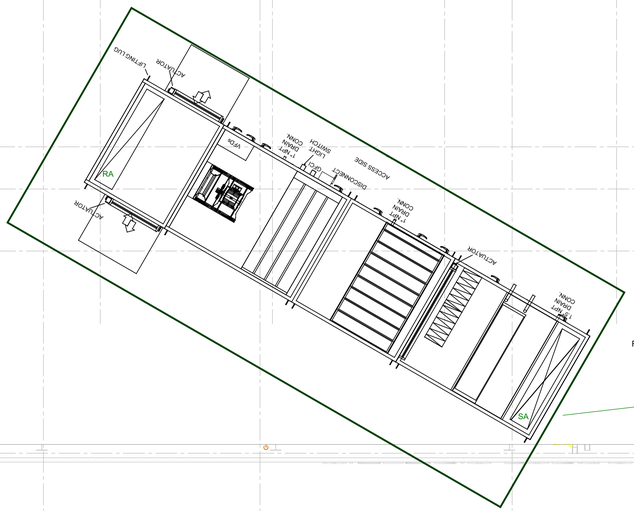
HTS Toronto

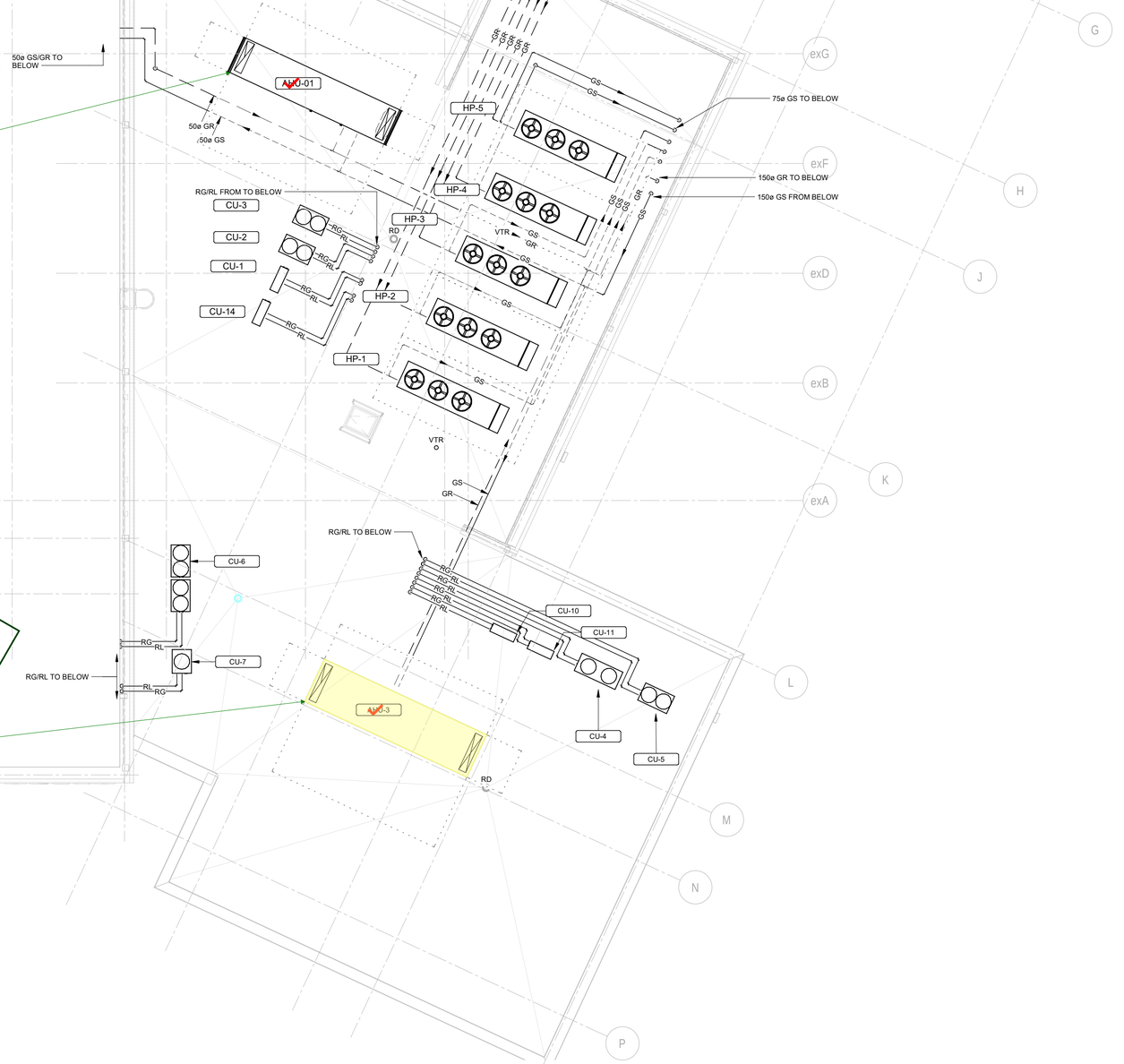
115 Norfinch Drive
Toronto, ON M3N 1W8
T 1.800.850.0567
F 416.661.0100

hts.com/ontario

Compliance Review







ARCHITECTURE 49

CONSULTANT - SUB CONSULTANT:

wsp

SEAL:

CLIENT:

BRAMPTON
CITY OF BRAMPTON

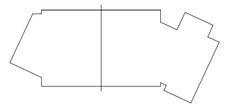
CLIENT REF. #:

PROJECT:

Victoria Park Arena

20 Victoria Crescent, Brampton, ON L6T 1E4

KEY PLAN:



ISSUED FOR - REVISION:

REV	DATE	DESCRIPTION
13	2024/11/08	ISSUED FOR CONSTRUCTION
12	2024/05/29	ISSUED FOR TENDER
11	2023/10/27	ISSUED FOR TENDER
10	2023/09/22	ISSUED FOR TENDER
9	2022/08/15	ISSUED FOR BUILDING PERMIT
8	2022/08/05	ISSUED FOR TENDER - FINAL
7	2022/04/13	ISSUED FOR TENDER
6	2022/03/25	ISSUED FOR BUILDING PERMIT
5	2022/03/02	ISSUED FOR TENDER REVIEW
4	2021/11/26	REISSUED FOR 90% REVIEW
3	2021/11/19	ISSUED FOR TENDER REVIEW
2	2021/09/27	ISSUED FOR PROGRESS REVIEW
1	2021/08/30	ISSUED FOR 60%DD

PROJECT NO: 209-00238-00

DATE: 2024/11/08

ORIGINAL SCALE: 1 : 100

IF THIS BAR IS NOT 1" LONG, ADJUST YOUR PLOTTING SCALE. 1"

DESIGNED BY: MK

DRAWN BY: SG/VO

CHECKED BY: MK

DISCIPLINE:

TITLE:

ROOF LEVEL - EAST

SHEET NUMBER:

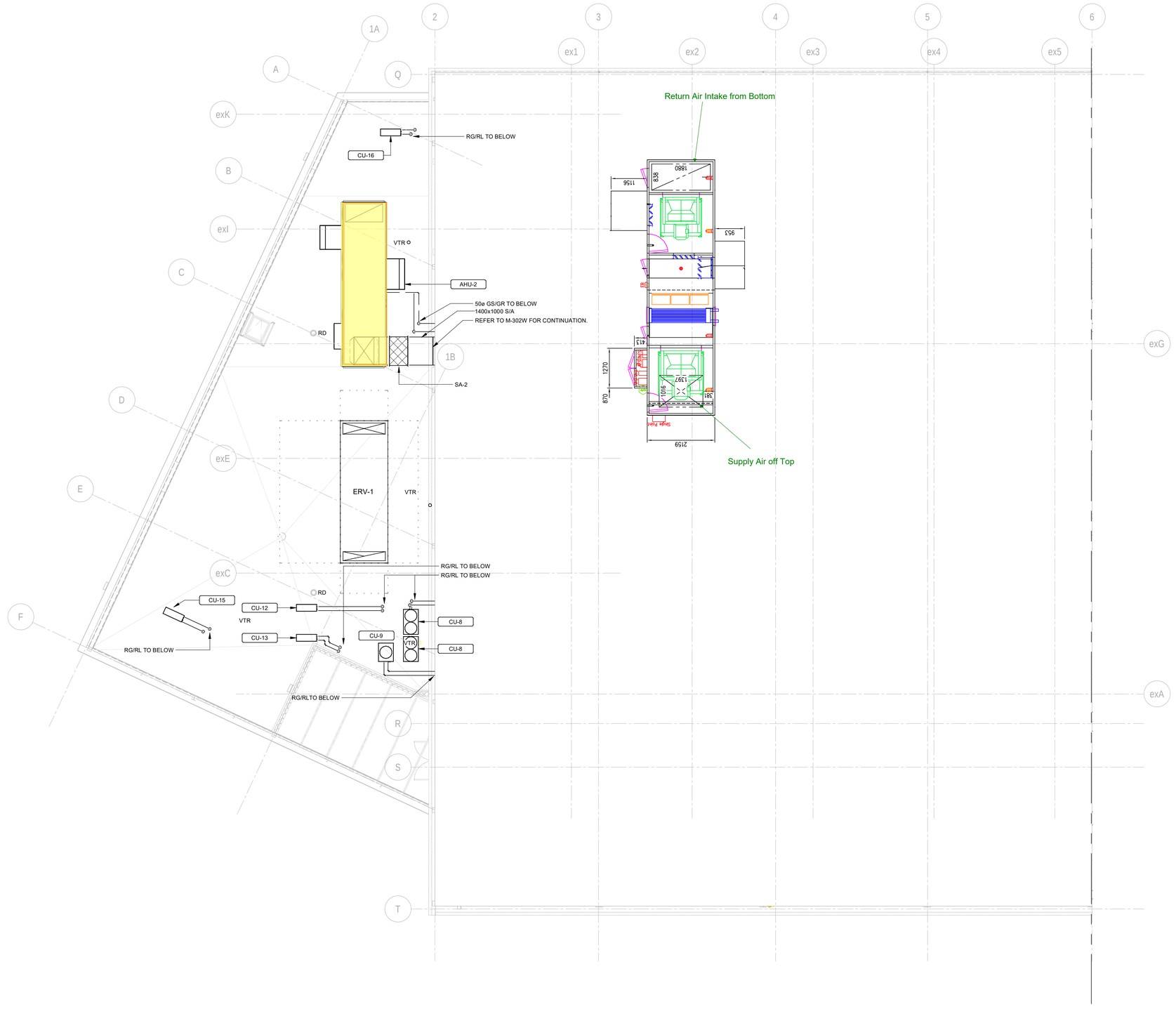
M-303E

SHEET #: OF

ISSUE: ISSUED FOR CONSTRUCTION

REV # 13

DATE OF: 2024/11/08



ARCHITECTURE 49

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wsp

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BRAMPTON
CITY OF BRAMPTON

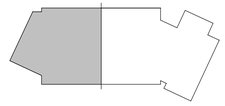
CLIENT REF. #:

PROJECT:

Victoria Park Arena

20 Victoria Crescent, Brampton, ON L6T 1E4

KEY PLAN:



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ORIGINAL SCALE: 1 : 100

IF THIS BAR IS NOT 1" LONG, ADJUST YOUR PLOTTING SCALE.

1"

DESIGNED BY: MK

DRAWN BY: SG/VO

CHECKED BY: MK

DISCIPLINE:

TITLE:

ROOF LEVEL - WEST

SHEET NUMBER:

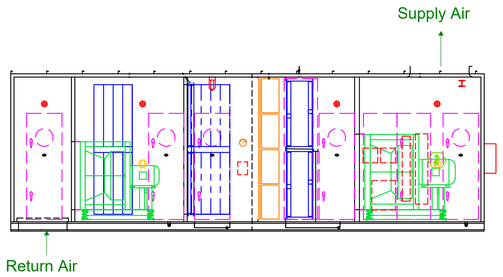
M-303W

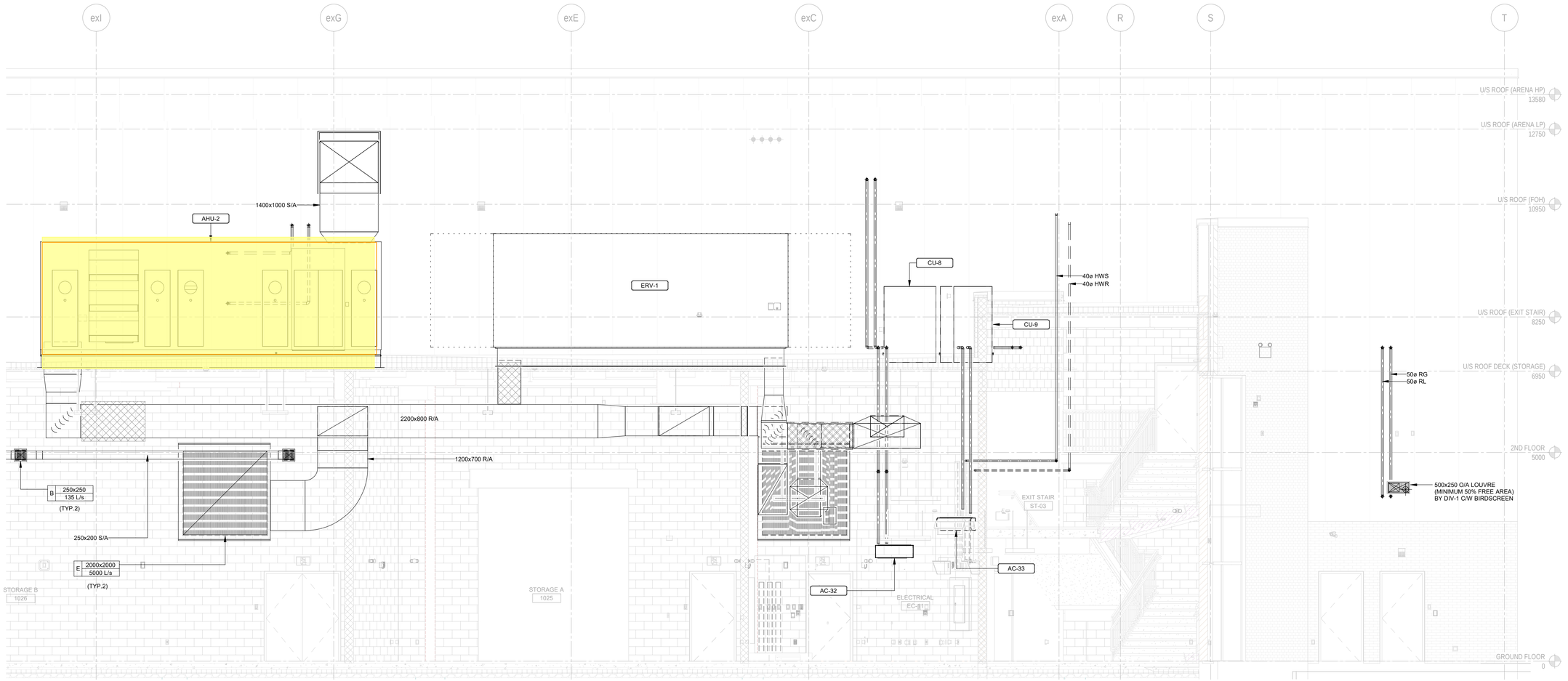
SHEET #: OF

ISSUE: ISSUED FOR CONSTRUCTION

REV # 13

DATE OF: 2024/11/08





1 M-502 SECTION-2

1 : 50

ARCHITECTURE 49

CONSULTANT - SUB CONSULTANT:

wsp

SEAL:

CLIENT:

BRAMPTON
CITY OF BRAMPTON

CLIENT REF. #:

PROJECT:

Victoria Park Arena

20 Victoria Crescent, Brampton, ON L6T 1E4

KEY PLAN:

DISCLAIMER: COPYRIGHT:

ISSUED FOR - REVISION:

REV	DATE	DESCRIPTION
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PROJECT NO: 209-00238-00

DATE: 2024/11/08

ORIGINAL SCALE: 1 : 50

IF THIS BAR IS NOT 1" LONG, ADJUST YOUR PLOTTING SCALE. 1"

DESIGNED BY: MK

DRAWN BY: SG/VO

CHECKED BY: MK

DISCIPLINE:

TITLE: SECTION DETAILS-2

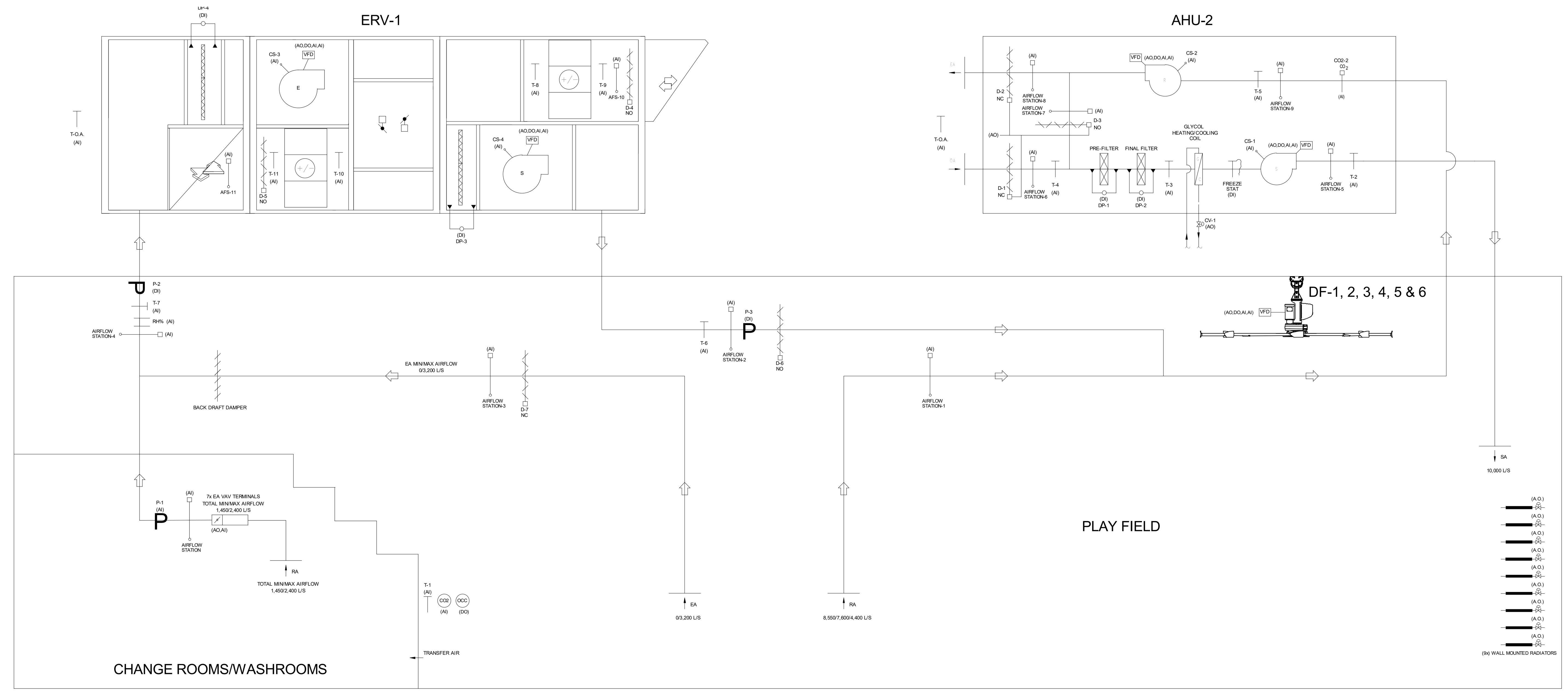
SHEET NUMBER: M-502

SHEET #: OF

ISSUE: ISSUED FOR CONSTRUCTION

REV # 11

DATE OF: 2024/11/08



PLAY FIELD ¨AHU-2, ERV-1, DF-1 TO DF-6 & WALL FINS RADIATORS¨ CONTROL DIAGRAM

AHU-2 AND ERV-1 SEQUENCE OF OPERATION:

1. AHU-2 & ERV-1 SYSTEMS ARE ENABLED THROUGH B.A.S. ON A PROGRAMABLE TIME SCHEDULE OR LOCALLY AT THE MAIN CONTROL PANEL. ONCE ENABLED, THE SYSTEM SHALL OPERATES IN ACCORDANCE WITH THE FOLLOWING CONTROL SEQUENCES.

2. AHU-2:
2.1. AHU-2 SHALL OPERATE AS A CONSTANT AIR VOLUME SYSTEM.
2.2. ONLY THE RETURN AIR FAN SHALL SLIGHTLY MODULATE TO VARY RETURN AIRFLOW TO MAINTAIN NEUTRAL SPACE PRESSURE (RA = SA - EA)

3. ERV-1:
3.1. ERV-1 SHALL OPERATE AS A VARIABLE AIR VOLUME SYSTEM AND SHALL BE ABLE TO MODULATE AIRFLOW DOWN TO 1,450 L/S.
3.2. THE CHANGE OVER DAMPERS SHALL OPERATE UNDER ITS OWN SET OF CONTROL (BY UNIT MANUFACTURER) FOR OPTIMUM ENERGY RECOVERY EFFICIENCY.
3.3. DUCT STATIC PRESSURE SENSOR P1 INSTALLED AT $\frac{2}{3}$ OF THE LONGEST EXHAUST AIR DUCT SHALL MODULATE THE EXHAUST AIR FAN TO MAINTAIN A SETPOINT OF 200PA (ADJUSTABLE).
3.4. IN STANDARD OPERATING CONDITION (NOT ECONOMIZER MODE) THE SUPPLY/OUTDOOR AIR FAN SHALL BE INTERLOCKED/SYNCHRONIZED WITH THE EXHAUST AIR FAN SUCH THAT IT IS ENABLED OR DISABLED IN SIMILAR FASHION AS THE EXHAUST AIR FAN AND THE SUPPLY/OUTDOOR AIRFLOW IS MATCHED WITH THE EXHAUST FAN AIR FLOW.
3.5. IN ECONOMIZER MODE THE SUPPLY/OUTDOOR AIR FAN SHALL BE TURNED OFF AND THE MOTORIZED DAMPER D-6 SHALL BE CLOSED.

4. DURING HEATING SEASON THE GLYCOL HEATING/COOLING COIL CONTROL VALVE CV-1 SHALL MODULATE TO MAINTAIN SUPPLY AIR TEMPERATURE T2 SETPOINT OF 22°C (ADJUSTABLE), AND ROOM TEMPERATURE SENSOR T-1 SHALL MODULATE THE WALL FIN RADIATORS CONTROL VALVES TO MAINTAIN A SETPOINT OF 22°C (ADJUSTABLE).

5. DURING COOLING SEASON THE ROOM TEMPERATURE SENSOR T1 SHALL MODULATE THE GLYCOL HEATING/COOLING COIL CONTROL VALVE TO MAINTAIN A SETPOINT OF 24°C (ADJUSTABLE).

6. DEMAND CONTROLLED VENTILATION:
DURING OCCUPIED MODE, DEMAND CONTROLLED VENTILATION SHALL MONITOR SPACE WITH CO2 SENSORS. THE DEMAND CONTROLLED VENTILATION SHALL INCREASE ZONE OUTDOOR AIRFLOW TO SATISFY VENTILATION REQUIREMENTS AS PER THE FOLLOWING SEQUENCE:

7.2. STAGE-1: THE WALL MOUNTED CO2 SENSORS SHALL MODULATE THE EXHAUST AIR VAV TERMINALS AT THE CHANGE ROOMS FROM THE MINIMUM EXHAUST AIR FLOW OF (1,450L/S) TO THE MAXIMUM AIR FLOW OF (2,400L/S) TO ALLOW MORE EXHAUST AND OUTDOOR AIR (AS THE SUPPLY/OUTDOOR AIR FAN FLOW RATE SHALL TRACK THE EXHAUST AIR FAN FLOW RATE AS INDICATED ABOVE) TO LOWER THE INDOOR CO2 CONCENTRATION BELOW 1000 PPM (ADJUSTABLE). DURING THIS STAGE THE MOTORIZED DAMPER D-7 SHALL REMAIN CLOSED.
7.3. IF THE EXHAUST AIR VAV TEMINALS ARE AT THE MAXIMUM AIRFLOW POSITION AND THE INDOOR CO2 CONCENTRATION IS STILL ABOVE 1000 PPM (ADJUSTABLE) STAGE-2 SHALL INITIATE.
7.4. STAGE-2: THE WALL MOUNTED CO2 SENSORS SHALL MODULATE THE EXHAUST AIR DAMPER D-7 TO ALLOW MORE EXHAUST AND OUTDOOR AIR TO LOWER THE INDOOR CO2 CONCENTRATION BELOW 1000 PPM (ADJUSTABLE). ONCE D-7 START TO MODULATE, RESET THE DUCT STATIC PRESSURE SENSOR AT 250PA (ADJUSTABLE) (50 PA HIGHER OR MORE) TO INSURE THAT ALL VAV BOXES HAVE SUFFICIENT PRESSURE/AIRLFOW.

8. ECONOMIZER MODE (FREE COOLING):
8.1. IN COOLING MODE WHEN OUTDOOR AIR ENTHALPY IS LESS THAN RETURN AIR ENTHALPY (AS DETERMINED BY THE OUTDOOR AIR TEMPERATURE AND ENTHALPY STATION), ENABLE ECONOMIZER (FREE COOLING) OPERATION AS FOLLOW:
8.2. ERV-1: SUPPLY/OUDTOOR AIR FAN SHALL BE TURNED OFF.
8.3. OUTDOOR AIR DAMPER D-6 IS CLOSED.
8.4. EXHAUST AIR DAMPER D-7 IS CLOSED.
8.5. ALL EXHAUST AIR VAV TERMINALS SHALL BE SET AT MINIMUM POSITION (TOTAL EXHAUST AIRFLOW 1,450L/S)
8.6. AHU-2:
8.6.1. THE RETURN AIR FAN SHALL MODULATE THE RETURN AIRFLOW TO (8,550L/S) (RA=SA-EA) AT AIRFLOW STATION-1.
8.6.2. OUTDOOR AIR DAMPER D-1, EXHAUST AIR DAMPER D-2 AND RETURN AIR DAMPER D-3 SHALL MODULATE TO ALLOW MORE OUTDOOR AIR SUPPLIED TO THE SPACE.
8.6.3. MINIMUM POSITION OF OUTDOOR AIR DAMPER D-1 SHALL BE SET AT 30% OPEN (3,000 L/S), IF THE MINIMUM OUTDOOR AIR REQUIREMENT IS HIGHER THAN (3,000 L/S), ERV-1 SUPPLY FAN SHALL BE BACK TO NORMAL OPERATION TO MAINTAIN THE MINIMUM OUTDOOR AIR REQUIREMENT.

8.5. WHEN PLAY FIELD IS UN-OCCUPIED AS DETERMINED BY MOTION DETECTOR PAIR FOR A TIME PERIOD OF 30 MINUTES (ADJUSTABLE), ALL EXHAUST AIR VAV TERMINALS SHALL BE SET AT MINIMUM POSITION (1,450L/S). ADJUSTABLE ROOM SET POINT SHALL RESET TO 3°C (ADJUSTABLE) ABOVE OCCUPIED ROOM SET POINT FOR COOLING AND 6°C (ADJUSTABLE) BELOW OCCUPIED ROOM SETPOINT FOR HEATING.

9. FOUR (4) MOTION DETECTORS PROVIDED FOR LIGHTING CONTROL - PROVIDED BY DIVISION 26. REFER TO ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.

10. AHU-2 SAFETIES
10.1. FREEZE PROTECTION: ON A DROP IN TEMPERATURE BELOW 4 °C, THE FAN WILL BE DE-ENERGIZED THROUGH HARD-WIRED INTERLOCK AND O/A DAMPER CLOSED. ALARM DISPLAYED ON BAS. FREEZESTAT TO BE MANUALLY RESET.
10.2. SMOKE DETECTION: UPON DUCT SMOKE DETECTOR THE FAN WILL BE DE-ENERGIZED AND O/A DAMPER CLOSE. ALARM ON BAS. REFER TO DIV. 26
10.3. HIGH STATIC PRESSURE: AT HIGH STATIC PRESSURE SENSED BY P-2, THE S/A FAN WILL BE DE-ENERGIZED WITH O/A DAMPER CLOSE. TO BE MANUALLY RESET.
10.4. FIRE ALARM SYSTEM: AT RECEIVING GENERAL ALARM INPUT FROM BUILDING FIRE ALARM SYSTEM, THE AIR HANDLING UNIT STOPS. REFER TO DIV. 26
10.5. NO SIMULTANEOUS HEATING AND COOLING
10.6. FAN SPEED MODULATION WILL BE DISABLED UNTIL FAN RUN STATUS IS RECEIVED.
10.7. SUPPLY AIR TEMPERATURE CONTROL WILL BE DISABLED UNTIL FAN RUN STATUS IS RECEIVED.
10.8. DAMPER CONTROL WILL BE DISABLED UNTIL FAN RUN STATUS IS RECEIVED.

11. MONITORING, ALARMING AND TRENDING
11.1. BAS MONITORS SIGNALS AS SHOWN IN THE DIAGRAM, AND GENERATE ALARMS AS BELOW: ALARMS AND STATUS TO BE DISPLAYED AT THE OPERATOR TERMINAL GRAPHICAL DISPLAYS.
11.1.1. SD: SMOKE DETECTOR (NORMAL/ALARM)
11.1.2. FZ: FREEZESTAT (NORMAL / ALARM)
11.1.3. CS: CURRENT DRAW ABOVE OR BELOW THE MOTOR SOFTWARE PROGRAMMED PARAMETER
11.1.4. P-1: SUPPLY DUCT STATIC PRESSURE: HI/LO ALARM
11.1.5. P-2: STATIC PRESSURE HIGH LIMIT SWITCH TRIP
11.1.6. DP-1, DP-2, DP-3 & DP-4: DIRTY FILTER ALARM
11.1.7. SPACE CO2 LEVEL HIGH
11.2.4. ALL TEMPERATURE SENSORS (T-1, 2, 3, 4, 5, 6, 7, 8, 9, 10 & 11) HIGH OR LOW
11.2.5. ALL AIRFLOW STATIONS FLOW RATES: AFS-1, 2, 3, 4, 5, 6, 7, 8, 9, 10 & 11.
11.2.6. ALL VAV TERMINALS FLOW RATES
11.3. TRENDING POINTS:
11.3.1. T-1: SPACE TEMPERATURE
11.3.2. T-2: SUPPLY AIR TEMPERATURE
11.3.3. T-3: MIXING AIR TEMPERATURE
11.3.4. T-5: RETURN AIR TEMPERATURE
11.3.5. T-6: OUTDOOR AIR TEMPERATURE
11.3.6. T-7: EXHAUST AIR TEMPERATURE
11.3.7. T.O.A: OUTDOOR AIR TEMPERATURE
11.3.8. AFS-1: R/A FLOW RATE
11.3.9. AFS-2: O/A FLOW RATE
11.3.10. AFS-3: GENERAL E/A FLOW RATE
11.3.6. AFS-4: E/A FLOW RATE
11.3.7. AFS-5: S/A FLOW RATE
11.3.8. CO2-1 - SPACE CO2 LEVEL (QUANTITY REFER TO FLOOR PLANS)
11.3.9. CO2-2 - RETURN AIR CO2 LEVEL
11.3.10. P-1: EXHAUST AIR DUCT STATIC PRESSURE
11.3.11. VFD: SUPPLY FAN SPEED
11.3.12. VFD: RETURN FAN SPEED
11.3.13. VFD: EXHAUST FAN SPEED
11.3.14. VFD: O/A FAN SPEED
11.3.15. GLYCOL HEATING/COOLING COIL VALVE OPENING %

NOTES:

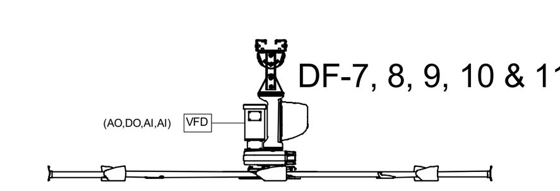
1. ON INITIAL START-UP, DAMPERS D-1, D-2 AND D-7 SHALL BE IN THE FULLY CLOSED POSITION. DAMPER D-3, D-4, D-5 AND D-6 SHALL BE IN THE FULLY OPEN POSITION.
2. UPON ACTIVATION OF THE FREEZE STAT, THE SUPPLY AND RETURN FANS SHALL STOP AND NOT AUTOMATICALLY RE-START. PROVIDE AN ALARM AT THE B.A.S.
3. REFER TO PLANS, SCHEDULES AND DETAILS FOR QUANTITIES OF CO2 SENSORS, TEMPERATURE SENSORS, COIL CONTROL VALVES AND OTHER DEVICES.
4. CONTROL POINTS ARE DEFINED FOR EACH VFD AS:
4.1. DO - ENABLE/DISABLE
4.2. AO - FAN SPEED VARIABLE
4.3. AI - MOTOR CURRENT
4.4. AI - DRIVE POSITION

5. OUTDOOR AIR TEMPERATURE (T-O.A.) AND ENTHALPY ARE PROVIDED BY BUILDING OUTDOOR AIR TEMPERATURE AND ENTHALPY STATION.

DESTRATIFICATION FANS COOLING AND HEATING SEQUENCE OF OPERATION:

1. FANS SHALL BE ENABLED THROUGH B.A.S. ON A PROGRAMABLE TIME SCHEDULE OR LOCALLY AT THE MAIN CONTROL PANEL. ONCE ENABLED, FANS SHALL OPERATES IN ACCORDANCE WITH THE FOLLOWING CONTROL SEQUENCES.

2. THE BUILDING AUTOMATION SYSTEM SHALL MONITOR THE FOLLOWING POINTS:
2.1. SPACE TEMPERATURE SENSOR – THERMOSTAT FOR SPACE OR DRY BULB TEMPERATURE SENSOR MOUNTED NEAR THERMOSTAT
2.2. FAN OPERATING SPEED
2.3. FAN ON/OFF
2.4. AIR HANDLING UNIT OPERATING MODE
3. THE AIR HANDLING UNIT SHALL BE CAPABLE OF OPERATING IN THE FOLLOWING MODES:
3.1. OCCUPIED COOLING
3.2. OCCUPIED HEATING
3.3. UNOCCUPIED COOLING
3.4. UNOCCUPIED HEATING
4. IN EACH OPERATING MODE, THE AUTOMATION SYSTEM SHALL CONTROL THE SYSTEM AS INDICATED IN THE FOLLOWING DESCRIPTIONS:
4.1. OCCUPIED HEATING
4.1.1. WHEN THE BUILDING ENTERS OCCUPIED HEATING MODE, THE THERMOSTAT SHALL BE SET TO [70°F (21°C)] (ADJUSTABLE).
4.1.2. THE FANS SHALL BE CONTROLLED ON.
4.1.3. THE FAN SPEED SHALL BE ADJUSTED TO THE WINTER OPERATING SPEED, [20%] OF MAXIMUM RPM.
4.1.4. IF THE SPACE TEMPERATURE FALLS BELOW [68°F (20°C)], THE MECHANICAL HEATING (WALL FINS RADIATORS) SHALL BE ACTIVATED TO MAINTAIN THE SPACE TEMPERATURE AT [72°F (22°C)].
4.2. UNOCCUPIED HEATING
4.2.1. WHEN THE BUILDING ENTERS UNOCCUPIED HEATING MODE, THE THERMOSTAT SHALL BE SET TO [61°F (16°C)] (ADJUSTABLE).
4.2.2. THE FANS SHALL BE CONTROLLED ON.
4.2.3. THE FAN SPEED SHALL BE ADJUSTED TO THE WINTER OPERATING SPEED, [20%] OF MAXIMUM RPM.
4.2.4. IF THE SPACE TEMPERATURE FALLS BELOW [61°F (16°C)], THE MECHANICAL HEATING SHALL BE ACTIVATED TO MAINTAIN THE SPACE TEMPERATURE AT [61°F (16°C)].
4.3. OCCUPIED COOLING
4.3.1. WHEN THE BUILDING ENTERS OCCUPIED COOLING MODE, THE THERMOSTAT SHALL BE SET TO [79°F (26°C)] (ADJUSTABLE).
4.3.2. THE FANS SHALL BE CONTROLLED ON.
4.3.3. THE HIGH VOLUME LOW SPEED FANS SHALL BE CONTROLLED TO THE SUMMER MINIMUM SPEED [30%] OF MAXIMUM RPM.
4.3.4. IF THE SPACE TEMPERATURE EXCEEDS [75°F (24°C)], THE FAN SPEED SHALL BE INCREASED BY [15%] FOR EVERY 1°F (0.6°C) OF TEMPERATURE INCREASE UP TO A MAXIMUM SPEED OF [90%] OF MAXIMUM RPM.
4.3.5. IF THE SPACE TEMPERATURE EXCEEDS [79°F (26°C)], THE MECHANICAL COOLING SHALL BE ACTIVATED TO MAINTAIN THE SPACE TEMPERATURE AT [79°F (26°C)] (ADJUSTABLE).
4.4. UNOCCUPIED COOLING
4.4.1. WHEN THE BUILDING ENTERS UNOCCUPIED COOLING MODE, THE THERMOSTAT SHALL BE SET TO [81°F (27°C)] (ADJUSTABLE).
4.4.2. THE HIGH VOLUME LOW SPEED FANS SHALL BE CONTROLLED OFF.
4.4.3. IF THE SPACE TEMPERATURE EXCEEDS [81°F (27°C)] THE MECHANICAL COOLING SHALL BE ACTIVATED TO MAINTAIN THE SPACE TEMPERATURE AT [81°F (27°C)] .



VIEWING AREA, ATRIUM AND HALL OF FAME DESTRATIFICATION FANS ¨DF-7 TO DF-11¨ CONTROL DIAGRAM

DESTRATIFICATION FANS COOLING AND HEATING SEQUENCE OF OPERATION:

1. FANS SHALL BE ENABLED THROUGH B.A.S. ON A PROGRAMABLE TIME SCHEDULE OR LOCALLY AT THE MAIN CONTROL PANEL. ONCE ENABLED, FANS SHALL OPERATES IN ACCORDANCE WITH THE FOLLOWING CONTROL SEQUENCES.

2. THE BUILDING AUTOMATION SYSTEM SHALL MONITOR THE FOLLOWING POINTS:
2.1. SPACE TEMPERATURE SENSOR – THERMOSTAT FOR SPACE OR DRY BULB TEMPERATURE SENSOR MOUNTED NEAR THERMOSTAT
2.2. FAN OPERATING SPEED
2.3. FAN ON/OFF
2.4. VRF OPERATING MODE
3. THE VRF SHALL BE CAPABLE OF OPERATING IN THE FOLLOWING MODES:
3.1. OCCUPIED COOLING
3.2. OCCUPIED HEATING
3.3. UNOCCUPIED COOLING
3.4. UNOCCUPIED HEATING
4. IN EACH OPERATING MODE, THE AUTOMATION SYSTEM SHALL CONTROL THE SYSTEM AS INDICATED IN THE FOLLOWING DESCRIPTIONS:
4.1. OCCUPIED HEATING
4.1.1. WHEN THE BUILDING ENTERS OCCUPIED HEATING MODE, THE THERMOSTAT SHALL BE SET TO [68°F (20°C)] (ADJUSTABLE).
4.1.2. THE FANS SHALL BE CONTROLLED ON.
4.1.3. THE FAN SPEED SHALL BE ADJUSTED TO THE WINTER OPERATING SPEED, [20%] OF MAXIMUM RPM.
4.1.4. IF THE SPACE TEMPERATURE FALLS BELOW [68°F (20°C)] (ADJUSTABLE), THE MECHANICAL HEATING (IN-FLOOR RADIANT HEATING AT VIEWING ARE AND WALL FINS RADIATORS AT ATRIUM AND HALL OF FAME) SHALL BE ACTIVATED TO MAINTAIN THE SPACE TEMPERATURE AT [72°F (22°C)].
4.2. UNOCCUPIED HEATING
4.2.1. WHEN THE BUILDING ENTERS UNOCCUPIED HEATING MODE, THE THERMOSTAT SHALL BE SET TO [61°F (16°C)] (ADJUSTABLE).
4.2.2. THE FANS SHALL BE CONTROLLED ON.
4.2.3. THE FAN SPEED SHALL BE ADJUSTED TO THE WINTER OPERATING SPEED, [20%] OF MAXIMUM RPM.
4.2.4. IF THE SPACE TEMPERATURE FALLS BELOW [61°F (16°C)], THE MECHANICAL HEATING SHALL BE ACTIVATED TO MAINTAIN THE SPACE TEMPERATURE AT [61°F (16°C)].
4.3. OCCUPIED COOLING
4.3.1. WHEN THE BUILDING ENTERS OCCUPIED COOLING MODE, THE THERMOSTAT SHALL BE SET TO [79°F (26°C)] (ADJUSTABLE).
4.3.2. THE FANS SHALL BE CONTROLLED ON.
4.3.3. THE HIGH VOLUME LOW SPEED FANS SHALL BE CONTROLLED TO THE SUMMER MINIMUM SPEED [30%] OF MAXIMUM RPM.
4.3.4. IF THE SPACE TEMPERATURE EXCEEDS [75°F (24°C)], THE FAN SPEED SHALL BE INCREASED BY [15%] FOR EVERY 1°F (0.6°C) OF TEMPERATURE INCREASE UP TO A MAXIMUM SPEED OF [90%] OF MAXIMUM RPM.
4.3.5. IF THE SPACE TEMPERATURE EXCEEDS [79°F (26°C)], THE MECHANICAL COOLING SHALL BE ACTIVATED TO MAINTAIN THE SPACE TEMPERATURE AT [79°F (26°C)] (ADJUSTABLE).
4.4. UNOCCUPIED COOLING

ARCHITECTURE 49

CONSULTANT - SUB CONSULTANT:

wsp

SEAL:

CLIENT:

BRAMPTON
CITY OF BRAMPTON

CLIENT REF. #:

PROJECT:

Victoria Park Arena

20 Victoria Crescent, Brampton, ON L6T 1E4

KEY PLAN:

DISCLAIMER:

ISSUED FOR - REVISION:

REV	DATE	DESCRIPTION
12	2024/11/08	ISSUED FOR CONSTRUCTION
11	2024/05/29	ISSUED FOR TENDER
10	2023/10/27	ISSUED FOR TENDER
9	2023/09/22	ISSUED FOR TENDER
8	2022/08/15	ISSUED FOR BUILDING PERMIT
7	2022/08/05	ISSUED FOR TENDER - FINAL
6	2022/04/13	ISSUED FOR TENDER
5	2022/03/25	ISSUED FOR BUILDING PERMIT
4	2022/03/02	ISSUED FOR TENDER REVIEW
3	2021/11/26	REISSUED FOR 90% REVIEW
2	2021/11/19	ISSUED FOR TENDER REVIEW
1	2021/09/27	ISSUED FOR PROGRESS REVIEW

PROJECT NO: 209-00238-00
DATE: 2024/11/08
ORIGINAL SCALE: 1 : 2
IF THIS BAR IS NOT 1" LONG, ADJUST YOUR PLOTTING SCALE 1"
DESIGNED BY: MK
DRAWN BY: SG/VO
CHECKED BY: MK
DISCIPLINE:

TITLE:

CONTROL DIAGRAMS #2 - MECHANICAL

SHEET NUMBER:

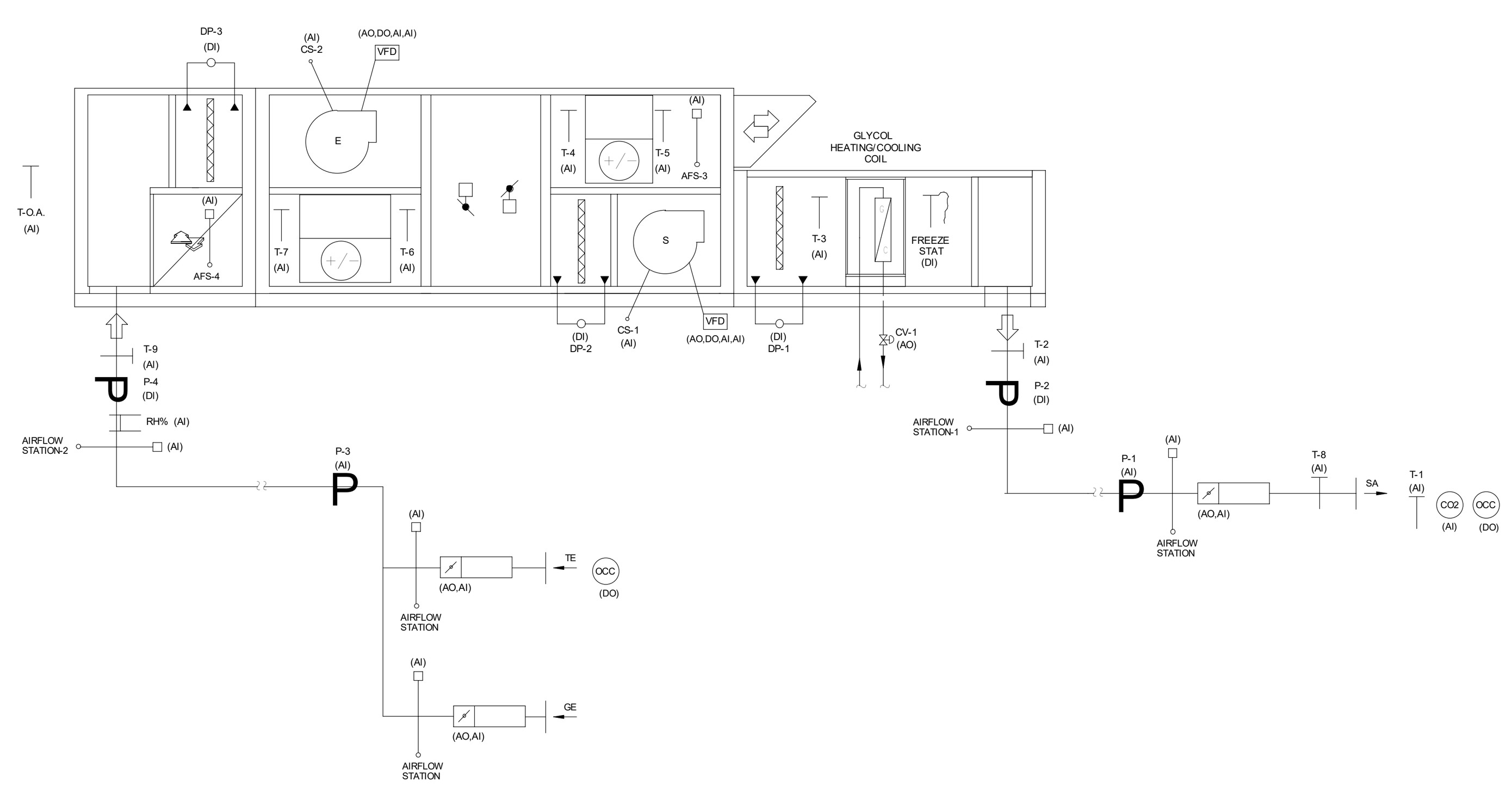
M-701

SHEET #: OF

ISSUE: ISSUED FOR CONSTRUCTION
REV #: 12
DATE OF: 2024/11/08

BIM 360://209-00238-00 - Victoria Park Arena - R20M-VPA.rvt
2024-11-08 12:49:28 PM

AHU-1 & AHU-3



ENERGY RECOVERY VENTILATORS CONTROL DIAGRAM

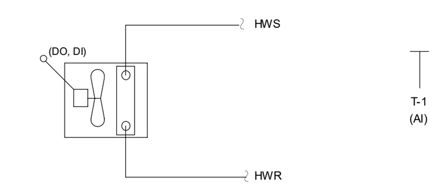
APPLIES TO "AHU-1" AND "AHU-3"

AHU-1 & AHU-3 SEQUENCE OF OPERATION:

1. SYSTEM SHALL BE ENABLED THROUGH B.A.S. ON A PROGRAMABLE TIME SCHEDULE OR LOCALLY AT THE MAIN CONTROL PANEL. ONCE ENABLED, THE SYSTEM SHALL OPERATES IN ACCORDANCE WITH THE FOLLOWING CONTROL SEQUENCES.
2. AHU-1 & AHU-3 SHALL OPERATE AS A VARIABLE AIR VOLUME SYSTEM AND SHALL BE ABLE TO MODULATE AIRFLOW DOWN TO 460 L/S FOR AHU-1 & 740L/S FOR AHU-3.
3. THE CHANGE OVER DAMPERS SHALL OPERATE UNDER ITS OWN SET OF CONTROL (BY UNIT MANUFACTURER) FOR OPTIMUM ENERGY RECOVERY EFFICIENCY.
4. DUCT STATIC PRESSURE SENSOR P1 INSTALLED AT $\frac{2}{3}$ OF THE LONGEST SUPPLY AIR DUCT SHALL MODULATE THE SUPPLY AIR FAN TO MAINTAIN A SETPOINT OF 250PA (ADJUSTABLE).
5. DUCT STATIC PRESSURE SENSOR P3 INSTALLED AT $\frac{2}{3}$ OF THE LONGEST EXHAUST AIR DUCT SHALL MODULATE THE EXHAUST AIR FAN TO MAINTAIN A SETPOINT OF 250PA (ADJUSTABLE).
6. IN HEATING MODE, HEATING/COOLING COIL CONTROL VALVE CV-1 SHALL MODULATE TO MAINTAIN 22 °C SUPPLY AIR TEMPERATURE (ADJUSTABLE).
7. IN COOLING MODE, WHEN OUTDOOR AIR ENTHALPY IS HIGHER THAN EXHAUST AIR ENTHALPY THE COOLING/HEATING COIL CONTROL VALVE CV-1 SHALL MODULATE TO MAINTAIN 12.8 °C SUPPLY AIR TEMPERATURE (ADJUSTABLE). IN SHOULDER SEASON, WHEN OUTDOOR AIR TEMPERATURE ENTHALPY IS LOWER THAN THE EXHAUST AIR ENTHALPY THE UNIT SHALL SWITCH TO ECONOMIZER MODE (NO HEAT RECOVERY) AND NO MECHANICAL COOLING.
8. DURING NORMAL OPERATION, UNIT SHALL PROVIDE MINIMUM OUTSIDE AIR TO SUPPLY VAV TERMINALS AND MINIMUM EXHAUST AIR FROM EXHAUST VAV TERMINALS AS SHOWN ON DRAWINGS. UNIT SHALL MAINTAIN MINIMUM OUTSIDE AIRFLOW UNTIL CALL FOR ADDITIONAL EXHAUST THROUGH OCCUPANCY SENSORS LOCATED IN WASHROOMS. WHEN OCCUPANT IS DETECTED IN THE WASHROOM, ASSOCIATED EXHAUST AIR VAV TERMINAL AND OUTDOOR AIR VAV TERMINAL SHALL MODULATE TO TO MAXIMUM AIRFLOW SETTING.
9. DEMAND CONTROLLED VENTILATION:
   - 9.1. DURING OCCUPIED MODE, DEMAND CONTROLLED VENTILATION SHALL MONITOR SPACE WITH CO2 SENSORS. THE DEMAND CONTROLLED VENTILATION SHALL INCREASE ZONE OUTDOOR AIRFLOW TO SATISFY VENTILATION REQUIREMENTS AS PER THE FOLLOWING SEQUENCE:
   - 9.2. THE WALL MOUNTED CO2 SENSORS SHALL MODULATE THE OUTDOOR AIR VAV TERMINALS AT THE SPACE TO ALLOW MORE OUTDOOR AIR TO LOWER THE INDOOR CO2 CONCENTRATION BELOW 1000 PPM (ADJUSTABLE). THE GENERAL EXHAUST AIR VALVE TERMINAL AT THE RESPECTIVE SPACE SHALL BE SYNCHRONIZED WITH THE OUTDOOR AIR VAV TERMINAL SO THE EXHAUST AIRFLOW IS MATCHED WITH THE OUTDOOR AIRFLOW TO MAINTAIN A NEUTRAL (OR SLIGHTLY POSITIVE: 50L/S OFFSET) SPACE PRESSURE.
10. UNOCCUPIED MODE:
    - 10.1. WHEN THE BUILDING ENTER UNOCCUPIED MODE AHU-1 & AHU-3 SHALL BE TURNED OFF.
    - 10.2. DURING THE UNOCCUPIED MODE, THE OCCUPANCY SENSOR IN ANY OF THE SERVED SPACE SHALL ENABLE AHU-1/AHU-3 BACK TO NORMAL OPERATION WHENEVER OCCUPANCY IS DETECTED.
11. AHU-1 & AHU-3 SAFETIES
    - 11.1. FREEZE PROTECTION: ON A DROP IN TEMPERATURE BELOW 4 °C, THE FAN WILL BE DE-ENERGIZED THROUGH HARD-WIRED INTERLOCK AND O/A DAMPER CLOSED. ALARM DISPLAYED ON BAS. FREEZESTAT TO BE MANUALLY RESET.
    - 11.2. HIGH STATIC PRESSURE: AT HIGH STATIC PRESSURE SENSED BY P-2, THE S/A FAN WILL BE DE-ENERGIZED WITH O/A DAMPER CLOSE. TO BE MANUALLY RESET.
    - 11.2. HIGH STATIC PRESSURE: AT HIGH STATIC PRESSURE SENSED BY P-4, THE E/A FAN WILL BE DE-ENERGIZED WITH E/A DAMPER CLOSE. TO BE MANUALLY RESET.
    - 11.3. FIRE ALARM SYSTEM: AT RECEIVING GENERAL ALARM INPUT FROM BUILDING FIRE ALARM SYSTEM, THE AIR HANDLING UNIT STOPS. REFER TO DIV. 26
    - 11.4. NO SIMULTANEOUS HEATING AND COOLING
    - 11.5. FAN SPEED MODULATION WILL BE DISABLED UNTIL FAN RUN STATUS IS RECEIVED.
    - 11.6. SUPPLY AIR TEMPERATURE CONTROL WILL BE DISABLED UNTIL FAN RUN STATUS IS RECEIVED.
    - 11.7. DAMPER CONTROL WILL BE DISABLED UNTIL FAN RUN STATUS IS RECEIVED.
12. MONITORING, ALARMING AND TRENDING
    - 12.1. BAS MONITORS SIGNALS AS SHOWN IN THE DIAGRAM, AND GENERATE ALARMS AS BELOW: ALARMS AND STATUS TO BE DISPLAYED AT THE OPERATOR TERMINAL GRAPHICAL DISPLAYS.
      - 12.1.1. FZ: FREEZESTAT (NORMAL / ALARM)
      - 12.1.2. CS: CURRENT DRAW ABOVE OR BELOW THE MOTOR SOFTWARE PROGRAMMED PARAMETER
      - 12.1.3. P-1: SUPPLY DUCT STATIC PRESSURE: HI/LO ALARM
      - 12.1.4. P-2: STATIC PRESSURE HIGH LIMIT SWITCH TRIP
      - 12.1.3. P-3: EXHAUST DUCT STATIC PRESSURE: HI/LO ALARM
      - 12.1.4. P-4: STATIC PRESSURE HIGH LIMIT SWITCH TRIP
      - 12.1.5. DP-1, DP-2, DP-3 & DP-4: DIRTY FILTER ALARM
      - 12.1.6. SPACE CO2 LEVEL HIGH (FOR EACH SPACE AS INDICATED ON DRAWING)
      - 12.2.4. ALL TEMPERATURE SENSORS (T-1, 2, 3, 4, 5, 6, 7, 8, 9 & 10) HIGH OR LOW
      - 12.2.5. ALL AIRFLOW STATIONS FLOW RATES: AFS-1, 2, 3 & 4.
      - 12.2.6. ALL VAV TERMINALS FLOW RATES
    - 12.3. TRENDING POINTS:
      - 12.3.1. T-1: SPACE TEMPERATURE
      - 12.3.2. T-2: SUPPLY AIR TEMPERATURE
      - 12.3.3. T-3: SUPPLY AIR TEMPERATURE BEFORE HEATING/COOLING COIL
      - 12.3.4. T-4: OUTDOOR AIR TEMPERATURE AFTER HEAT RECOVERY
      - 12.3.5. T-5: OUTDOOR AIR TEMPERATURE BEFORE HEAT RECOVERY
      - 12.3.6. T-6: OUTDOOR AIR TEMPERATURE AFTER HEAT RECOVERY
      - 12.3.7. T-7: OUTDOOR AIR TEMPERATURE BEFORE HEAT RECOVERY
      - 12.3.8. T-8: OUTDOOR AIR TEMPERATURE AT THE VAV OUTLET
      - 12.3.9. T-9: EXHAUST AIR TEMPERATURE BEFORE HEAT RECOVERY
      - 12.3.10. T-10: EXHAUST AIR TEMPERATURE AFTER HEAT RECOVERY
      - 12.3.11. T.O.A: OUTDOOR AIR TEMPERATURE
      - 12.3.12. AFS-1: O/A FLOW RATE
      - 12.3.13. AFS-2: E/A FLOW RATE
      - 12.3.14. CO2-1 - SPACE CO2 LEVEL (QUANTITY REFER TO FLOOR PLANS)
      - 12.3.15. P-1: SUPPLY AIR DUCT STATIC PRESSURE
      - 12.3.12. P-3: EXHAUST AIR DUCT STATIC PRESSURE
      - 12.3.13. VFD: SUPPLY FAN SPEED
      - 12.3.14. VFD: EXHAUST FAN SPEED
      - 12.3.15. GLYCOL HEATING/COOLING COIL VALVE OPENING %

NOTES:

1. THE RETURN AIR FAN SHALL BE INTERLOCKED WITH THE SUPPLY FAN SUCH THAT IT IS ENABLED OR DISABLED IN SIMILAR FASHION AS THE SUPPLY FAN.
2. UPON ACTIVATION OF THE FREEZE STAT, THE SUPPLY AND RETURN FANS SHALL STOP AND NOT AUTOMATICALLY RE-START. PROVIDE AN ALARM AT THE B.A.S.
3. REFER TO PLANS, SCHEDULES AND DETAILS FOR QUANTITIES OF CO2 SENSORS, TEMPERATURE SENSORS, VAV AIR TERMINALS AND OTHER DEVICES.
4. CONTROL POINTS ARE DEFINED FOR EACH VFD AS:
   - 4.1. DO - ENABLE/DISABLE
   - 4.2. AO - FAN SPEED VARIABLE
   - 4.3. AI - MOTOR CURRENT
   - 4.4. AI - DRIVE POSITION
5. OUTDOOR AIR TEMPERATURE (T-O.A.) AND ENTHALPY ARE PROVIDED BY BUILDING OUTDOOR AIR TEMPERATURE AND ENTHALPY STATION.
6. REFER TO FLOOR PLAN FOR MINIMUM (ADJUSTABLE) AND DESIGN MAXIMUM POSITIONS OF EACH VAV BOX.
7. REFER TO PLANS, SCHEDULES AND DETAILS FOR QUANTITIES OF VAV BOXES, TEMPERATURE SENSORS, AND OTHER DEVICES.
8. AIRFLOW STATIONS PROVIDED WITH VAV TERMINAL. MONITOR AIRFLOW AT INLET TO VAV TERMINAL.
9. THE AIRFLOW STATION AT THE OUTDOOR AIR INLETS MUST MEASURE THE MINIMUM OUTDOOR AIR INTAKE FLOW WITH AN ACCURACY OF +/–10% OF THE DESIGN MINIMUM OUTDOOR AIRFOW RATE, AS DEFNED BY THE VENTILATION REQUIREMENTS ABOVE. AN ALARM MUST INDICATE WHEN THE OUTDOOR AIRFOW VALUE VARIES BY 15% OR MORE FROM THE OUTDOOR AIRFOW SETPOIN

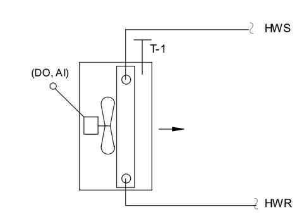


UNIT HEATER CONTROL DIAGRAM

SEQUENCE:

1. ENABLING/DISABLING FAN THROUGH UNIT HEATER MOTOR STARTER TO MAINTAINS SPACE TEMPERATURE SETPOINT 22.2°C (ADJUSTABLE) AS DETECTED BY TEMPERATURE SENSOR T-1 .
2. WHEN OUTDOOR TEMPERATURE RISES ABOVE 10°C (ADJUSTABLE), BAS SHALL SHUT OFF ALL UNIT HEATERS.
3. ALARMS ON BAS: SPACE HIGH TEMPERATURE; SPACE LOW TEMPERATURE

NOTE: REFER TO PLANS, SCHEDULES AND DETAILS FOR QUANTITIES OF HEATERS.

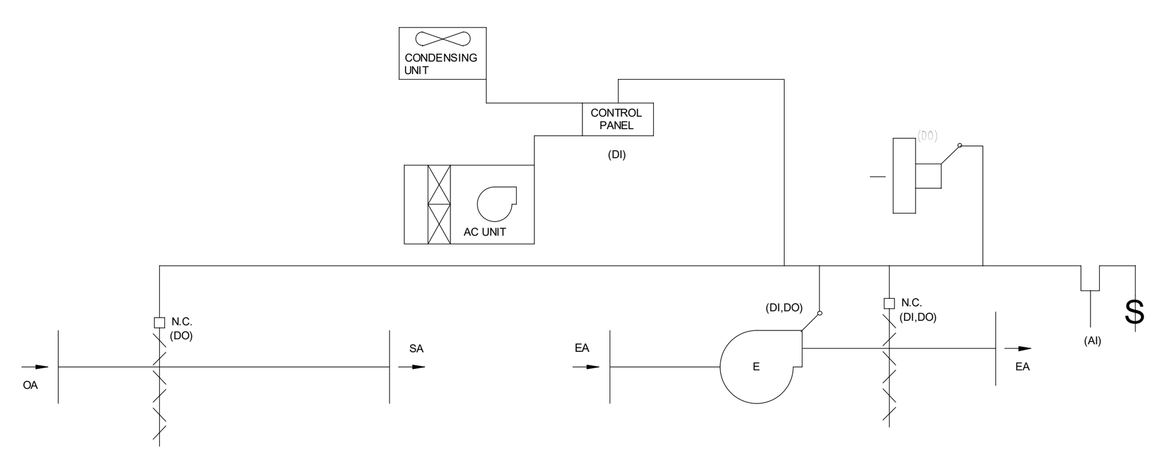


CABINET UNIT HEATER CONTROL DIAGRAM

SEQUENCE:

1. BUILT-IN TEMPERATURE SENSOR T-1 MAINTAINS ROOM TEMPERATURE SETPOINT OF 22.2°C (ADJUSTABLE).
2. WHEN OUTDOOR TEMPERATURE RISES ABOVE 10°C (ADJUSTABLE), BAS SHALL SHUT OFF ALL CABINET HEATERS THROUGH UNIT HEATER MOTOR STARTER.
3. ALARMS ON BAS: SPACE HIGH TEMPERATURE; SPACE LOW TEMPERATURE

NOTE: REFER TO PLANS, SCHEDULES AND DETAILS FOR QUANTITIES OF HEATERS.

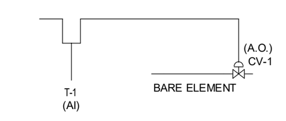


SPLIT AIR CONDITIONING UNIT WITH UNIT HEATER AND VENTILATION FANS CONTROL DIAGRAM (ELECTRICAL ROOMS)

APPLIES TO "AC-33 & AC-34" & "EF-2 & EF-4"

SEQUENCE:

1. ON A CALL FOR COOLING TEMPERATURE SENSOR SET AT 28°C (ADJUSTABLE)
   - 1.1. STAGE-1: ENERGIZES EXHAUST FAN, OPENS THE EXHAUST & FRESH AIR DAMPERS. IF THE SET TEMPERATURE IS STILL NOT ACHIEVED, ENABLE STAGE-2
   - 1.2. STAGE-2: DAMPERS ARE CLOSED AND FAN IS STOPPED, THE AIR CONDITIONING UNIT SHALL BE ENABLED TO MAINTAIN THE ROOM TEMPERATURE SET POINT.
3. ON A CALL FOR HEATING, A/C UNIT IS DISABLED, DAMPERS ARE CLOSED AND FAN IS STOPPED, SPACE TEMPERATURE SENSOR T-1 MAINTAINS SETPOINT 18°C (ADJUSTABLE) BY ENABLING/DISABLING THE UNIT HEATERS FAN AND HOT WATER CONTROL VALVE.
4. ON A CALL FOR VENTILATION, THE FAN STARTER SHALL ENERGIZE EXHAUST FAN, OPENS THE EXHAUST & FRESH AIR DAMPERS.
5. SPACE TEMPERATURE SENSOR T-1 MONITORS TEMPERATURE AND REGISTERS AN ALARM AT BAS WHEN TEMPERATURE EXCEEDS 30°C (ADJUSTABLE) OR DROPS BELOW 10°C (ADJUSTABLE).
6. PROVIDE AC UNIT STATUS (DI) AND ALARM (DI) AT BAS.



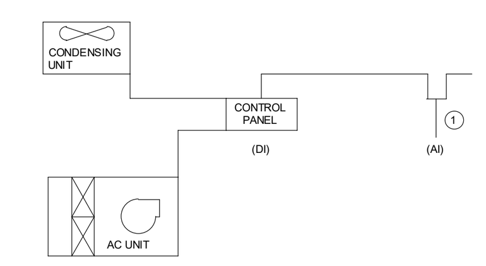
WALL FIN RADIATOR

SEQUENCE OF OPERATION:

1. SPACE TEMPERATURE T-1 SENSOR SHALL MODULATE WALL FIN HEATER VALVE CV-1 TO MAINTAIN SETPOINT.

NOTES:

1. REFER TO PLANS, SCHEDULES, AND DETAILS FOR LOCATION AND QUANTITIES OF WALL FIN HEATERS, TEMPERATURE SENSORS, AND OTHER DEVICES.
2. TEMPERATURE SENSOR T-1 IS LOCATED UNDER THE CELL BED.

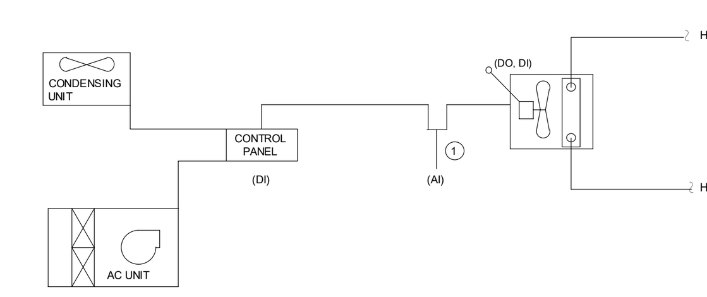


SPLIT AIR CONDITIONING UNIT CONTROL DIAGRAM (IT ROOM, COMMS ROOM & ELEVATOR MACHINE ROOM)

APPLIES TO "AC-30, AC-31 & AC-32"

SEQUENCE:

1. SYSTEM IS ENABLED THROUGH B.A.S. ON A PROGRAMABLE TIME SCHEDULE OR LOCALLY AT THE MAIN CONTROL PANEL. ONCE ENABLED, THE SYSTEM SHALL OPERATES IN ACCORDANCE WITH THE FOLLOWING CONTROL SEQUENCES.
2. AIR CONDITIONER SHALL OPERATE AND MAINTAIN ROOM TEMPERATURE SET POINT 24°C (ADJUSTABLE).
3. SPACE TEMPERATURE SENSOR T-1 MONITORS TEMPERATURE AND REGISTERS AN ALARM AT BAS WHEN TEMPERATURE EXCEEDS 30°C (ADJUSTABLE).
4. PROVIDE AC UNIT STATUS (DI) AND ALARM (DI) AT BAS.

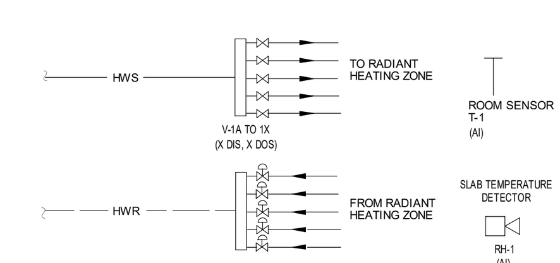


SPLIT AIR CONDITIONING UNIT WITH UNIT HEATER CONTROL DIAGRAM (STORAGE ROOMS)

APPLIES TO "AC-35 & AC-36"

SEQUENCE:

1. SYSTEM IS ENABLED THROUGH B.A.S. ON A PROGRAMABLE TIME SCHEDULE OR LOCALLY AT THE MAIN CONTROL PANEL. ONCE ENABLED, THE SYSTEM SHALL OPERATES IN ACCORDANCE WITH THE FOLLOWING CONTROL SEQUENCES.
2. ON A CALL FOR COOLING, THE AIR CONDITIONER SHALL OPERATE AND MAINTAIN ROOM TEMPERATURE SET POINT 24°C (ADJUSTABLE).
3. ON A CALL FOR HEATING, THE UNIT HEATER SHALL OPERATE AND MAINTAIN ROOM TEMPERATURE SET POINT 20°C (ADJUSTABLE).
4. SPACE TEMPERATURE SENSOR T-1 MONITORS TEMPERATURE AND REGISTERS AN ALARM AT BAS WHEN TEMPERATURE EXCEEDS 30°C (ADJUSTABLE) OR DROPS BELOW 10°C (ADJUSTABLE).
5. PROVIDE AC UNIT STATUS (DI) AND ALARM (DI) AT BAS.



ARCHITECTURE 49

CONSULTANT - SUB CONSULTANT:

wsp

SEAL:

CLIENT:

BRAMPTON

CITY OF BRAMPTON

CLIENT REF. #:

PROJECT:

Victoria Park Arena

20 Victoria Crescent, Brampton, ON L6T 1E4

KEY PLAN:

ISSUED FOR - REVISION:

REV	DATE	DESCRIPTION
13	2024/11/08	ISSUED FOR CONSTRUCTION
12	2024/07/03	ISSUED FOR ADDENDUM #3
11	2024/05/29	ISSUED FOR TENDER
10	2023/10/27	ISSUED FOR TENDER
9	2023/09/22	ISSUED FOR TENDER
8	2022/08/15	ISSUED FOR BUILDING PERMIT
7	2022/08/05	ISSUED FOR TENDER - FINAL
6	2022/04/13	ISSUED FOR TENDER
5	2022/03/25	ISSUED FOR BUILDING PERMIT
4	2022/03/02	ISSUED FOR TENDER REVIEW
3	2021/11/26	REISSUED FOR 90% REVIEW
2	2021/11/19	ISSUED FOR TENDER REVIEW
1	2021/09/27	ISSUED FOR PROGRESS REVIEW

PROJECT NO: 209-00238-00

DATE: 2024/11/08

ORIGINAL SCALE: 1 : 2

IF THIS BAR IS NOT 1" LONG, ADJUST YOUR PLOTTING SCALE. 1"

DESIGNED BY: MK

DRAWN BY: SG/VO

CHECKED BY: MK

DISCIPLINE:

TITLE:

CONTROL DIAGRAMS #3 - MECHANICAL

SHEET NUMBER: M-702

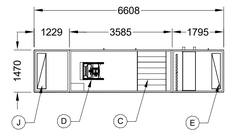
SHEET #: OF

ISSUE: ISSUED FOR CONSTRUCTION

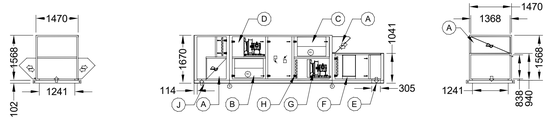
REV #: 13

DATE OF: 2024/11/08

A	O/A & E/A OPENING
B	HEAT RECOVERY CORE #1
C	HEAT RECOVERY CORE #2
D	RETURN/EXHAUST FAN
E	S/A OPENING
F	COMIBINATION HEATING/COOLING COIL
G	SUPPLY FAN
H	PREFILTER
I	S/A OPENING
J	R/A OPENING



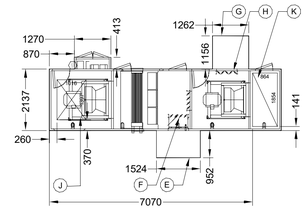
TOP VIEW

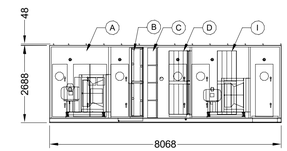


SIDE VIEW

1 M305 AHU-1 DETAILS
SCALE N.T.S

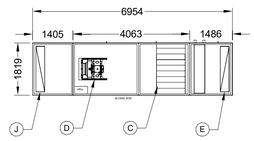
A	SUPPLY FAN
B	COOLING COIL
C	FILTERS
D	R/A DAMPER
E	O/A HOOD
F	O/A DAMPER
G	E/A HOOD
H	E/A DAMPER
I	RETURN FAN
J	S/A OPENING
K	R/A OPENING

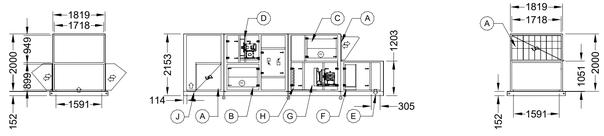




2 M305 AHU-2 DETAILS
SCALE N.T.S

A	O/A & E/A OPENING
B	HEAT RECOVERY CORE #1
C	HEAT RECOVERY CORE #2
D	RETURN/EXHAUST FAN
E	S/A OPENING
F	COMIBINATION HEATING/COOLING COIL
G	SUPPLY FAN
H	PREFILTER
I	S/A OPENING
J	R/A OPENING

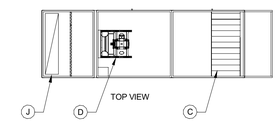




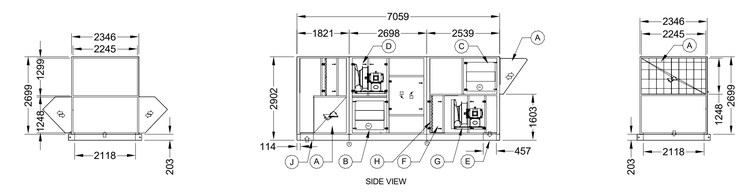
SIDE VIEW

3 M305 AHU-3 DETAILS
SCALE N.T.S

A	O/A & E/A OPENING
B	HEAT RECOVERY CORE #1
C	HEAT RECOVERY CORE #2
D	RETURN/EXHAUST FAN
E	S/A OPENING
F	COMIBINATION HEATING/COOLING COIL
G	SUPPLY FAN
H	PREFILTER
I	S/A OPENING
J	R/A OPENING



TOP VIEW



SIDE VIEW

4 M305 ERV-1 DETAILS
SCALE N.T.S

ARCHITECTURE 49

CONSULTANT - SUB CONSULTANT:

wsp

SEAL:

CLIENT:

BRAMPTON
CITY OF BRAMPTON

CLIENT REF. #:

PROJECT:

Victoria Park Arena

20 Victoria Crescent, Brampton, ON L6T 1E4

KEY PLAN:

ISSUED FOR - REVISION:

REV	DATE	DESCRIPTION
13	2024/11/08	ISSUED FOR CONSTRUCTION
12	2024/05/29	ISSUED FOR TENDER
11	2023/10/27	ISSUED FOR TENDER
10	2023/09/22	ISSUED FOR TENDER
9	2022/08/15	ISSUED FOR BUILDING PERMIT
8	2022/08/05	ISSUED FOR TENDER - FINAL
7	2022/04/13	ISSUED FOR TENDER
6	2022/03/25	ISSUED FOR BUILDING PERMIT
5	2022/03/02	ISSUED FOR TENDER REVIEW
4	2021/11/26	REISSUED FOR 90% REVIEW
3	2021/11/19	ISSUED FOR TENDER REVIEW
2	2021/09/27	ISSUED FOR PROGRESS REVIEW
1	2021/08/30	ISSUED FOR 60%DD

PROJECT NO: 209-00238-00
DATE: 2024/11/08
ORIGINAL SCALE: 1 : 100
IF THIS BAR IS NOT 1" LONG, ADJUST YOUR PLOTTING SCALE. 1"
DESIGNED BY: MK
DRAWN BY: SG/VO
CHECKED BY: MK

DISCIPLINE:

TITLE:

AHU & ERV DETAILS

SHEET NUMBER:

M-804

SHEET #: OF

ISSUE: ISSUED FOR CONSTRUCTION
REV # 13
DATE OF: 2024/11/08

SCHEDULE OF AIR HANDLING UNITS

SYSTEM	MANUFACTURER	UNIT MODEL NO.	UNIT WEIGHT (KG)	AIRFLOW (L/s)	DUAL CORE ENERGY RECOVERY															COOLING/HEATING COIL																									SUPPLY FAN							EXHAUST/RETURN FAN							V/Ø/Hz	REMARKS
					SUMMER								WINTER							COOLING											HEATING																															
					ENTERING AIR TEMP				LEAVING AIR TEMP		TOTAL HEAT RECOVERY	TOTAL EFFICIENCY	ENTERING AIR TEMP				LEAVING AIR TEMP		TOTAL HEAT RECOVERY	TOTAL EFFICIENCY	FLUID				CAPACITY (KW)		FACE VELOCITY (m/s)	AIR TEMP (°C)				APD (Pa)	NO. ROWS	FLUID				CAPACITY (KW)	FACE VELOCITY (m/s)	AIR TEMP (°C)				APD (Pa)	NO. ROWS	FAN TYPE	SUPPLY AIR (L/s)	ESP (Pa)	R.P.M.	MOTOR HP	VFD	FILTER		FAN TYPE	EXHAUST AIR (L/s)	ESP (Pa)	R.P.M.	MOTOR HP	VFD	FILTER		
					SUPPLY		EXHAUST		SUPPLY				SUPPLY		EXHAUST		SUPPLY											E.A.T.		L.A.T.											E.A.T.		L.A.T.												PRE	FINAL								
					Db	Wb	Db	Wb	Db	Wb			Db	Wb	Db	Wb	Db	Wb			MEDIUM	E.W.T	L.W.T	FLOW	SENSIBLE	TOTAL		Db°C	Wb°C	Db°C	Wb°C			MEDIUM	E.W.T	L.W.T	FLOW	TOTAL		Db°C	Wb°C	Db°C	Wb°C																		
					°C	°C	°C	°C	°C	°C	KW	%	°C	°C	°C	°C	°C	°C	KW	%		°C	°C	L/S									°C	°C	L/S																										
AHU-1	TEMPEFF DUAL CORE	RG4000	3341	2,000	30.00	23.00	23.89	17.22	25.30	21.61	11.30	77.60 76.7	-21.00	-21.00	22.22	12.22	18.10	9.10	94	90.50	P.GLYCOL 42%	6.67	13.33	1.95	31	49	2.47	25.4	19.8	12.8	12.7	373	10	42% P.GLYCOL	23.61	21.2	1.95	16	2.47	15.6	-	22.1	-	176.7	10	PLENUM	2000	575	1760	8 7.5	YES	MERV 8 (2")	MERV 13 (12")	PLENUM	2000	375	1765	3.00 5	YES	MERV 8 (2")	575/3/60	SEE NOTES BELOW
AHU-2	HAAKON	-	7500	10,000	REFER TO ENERGY RECOVERY VENTILATOR/ERV-1 SCHEDULE																P.GLYCOL 42%	6.67	13.33	14.4	165	359	2.53	25.3	21.7	11.8	11.7	369	12	42% P.GLYCOL	23.61	22.11	14.4	81	2.53	16.6	-	23.2	-	176.7 369	12	PLENUM	10000	375	1465 1150	25	YES	MERV 8 (2")	MERV 13 (12")	PLENUM	10000	150	1620 1150	10.00	YES	MERV 8 (2")	575/3/60	SEE NOTES BELOW
AHU-3	TEMPEFF DUAL CORE	RG5500	4941 5042	2,550	30.00	23.00	23.89	17.22	25.16	21.61	14.90	79.30	-21.00	-21.00	22.22	12.22	19.06	9.50	123	92.70	P.GLYCOL 42%	6.67	13.33	2.3	39	58	2.35	25.3	19.3	12.8	12.7	371	20	42% P.GLYCOL	23.61	21.2	2.3	21	2.35	15.6	-	22.3	-	174	10	PLENUM	2550	500	1770	8 7.5	YES	MERV 8 (2")	MERV 13 (12")	PLENUM	2550	300	1760	5.00	YES	MERV 8 (2")	575/3/60	SEE NOTES BELOW

WSP-S:
The weight increase in AHU units has an impact (larger size) on the supporting steel members, as shown on SCN-04 .

NOTES:
1. EACH AHU SHALL HAVE ONE 575V/3□/60Hz POWER FEED TO THE UNIT, AND A SEPARATE 120V/1□/60Hz POWER FEED TO MARINE LIGHTS AND RECEPTACLE. Comply
2. EACH FAN TO BE COMPLETE WITH INTERNAL VIBRATION ISOLATION SPRINGS & FLEXIBLE CONNECTION. Comply
3. EACH UNIT SHALL BE IN CONFORMANCE WITH ASHRAE 90.1 - 2010 EFFICIENCY. Comply
4. AHU-1 & AHU-3 SHALL BE OPERATRE AS A VAV SYSTEM, SUPPLY FAN AND EXHAUST FAN SHALL BE ABLE TO TURN DOWN AIRFLOWS TO 460 L/S FOR AHU-1 & 740L/S FOR AHU-3.
5. EACH UNIT C/W 450mm HIGH PREFABRICATED ROOF CURB. Comply
6. C/W EXHAUST/OUTDOOR AIR HOODS. Comply
7. REFER TO THE AHUS DETAILS DRAWING FOR THE UNIT LAYOUT.
8. PLENUM FANS SHALL BE C/W FULLY GUARDED FAN WHEEL, INLET SCREENS AND BELT GUARDS. Comply
9. UNIT C/W 2-PIPE CHANGE OVER COIL Comply
10. SUPPLY AND RETURN/EXHAUST FANS SHALL BE C/W AIRFLOW MEASUREMENT STATIONS Comply
11. AHU-2 C/W OUTDOOR AIR/EXHAUST AIR/ MIXING AIR DAMPERS & OUTDOOR AIR/EXHAUST AIR HOODS. Comply
12. REFER TO SPECIFICATION FOR ADDITIONAL REQUIREMENTS.

Exhaust filter not included per unit layout design

ARCHITECTURE 49

CONSULTANT - SUB CONSULTANT:

wsp

SEAL:

CLIENT:

BRAMPTON
CITY OF BRAMPTON

CLIENT REF. #:

PROJECT:

Victoria Park Arena

20 Victoria Crescent, Brampton, ON L6T 1E4

KEY PLAN:

ISSUED FOR - REVISION:

REV	DATE	DESCRIPTION
13	2024/11/08	ISSUED FOR CONSTRUCTION
12	2024/05/29	ISSUED FOR TENDER
11	2023/10/27	ISSUED FOR TENDER
10	2023/09/22	ISSUED FOR TENDER
9	2022/08/15	ISSUED FOR BUILDING PERMIT
8	2022/08/05	ISSUED FOR TENDER - FINAL
7	2022/04/13	ISSUED FOR TENDER
6	2022/03/25	ISSUED FOR BUILDING PERMIT
5	2022/03/02	ISSUED FOR TENDER REVIEW
4	2021/11/26	REISSUED FOR 90% REVIEW
3	2021/11/19	ISSUED FOR TENDER REVIEW
2	2021/09/27	ISSUED FOR PROGRESS REVIEW
1	2021/08/30	ISSUED FOR 60%DD

PROJECT NO: 209-00238-00
DATE: 2024/11/08
ORIGINAL SCALE:
IF THIS BAR IS NOT 1" LONG, ADJUST YOUR PLOTTING SCALE.
1"
DESIGNED BY: MK
DRAWN BY: SG/VO
CHECKED BY: MK

DISCIPLINE:

TITLE:

MECHANICAL EQUIPMENT SCHEDULES #1

SHEET NUMBER:

M-900

SHEET #: OF

ISSUE: ISSUED FOR CONSTRUCTION
REV # 13
DATE OF: 2024/11/08

1 GENERAL

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets for heat recovery ventilators, including accessories, and all required power and control wiring schematics.

.2 Submit with delivery of each unit a copy of the factory inspection report, and include a copy of each report with O&M Manual project close-out data.

.3 Submit a site inspection and start-up report from manufacturer's representative as specified in Part 3 of this Section.

.4 Supply a spare filter set for each ventilator and store at site where directed prior to Substantial Performance of the Work.

.5 Submit a signed extended warranty direct from manufacturer to Owner covering the energy recovery wheel from material and workmanship defects for an additional 4 years after Contract warranty expires.

.6 Supply reviewed copies of ventilator/curb assembly shop drawings or product data to trade who will cut roof openings for ventilators, and ensure openings are properly located.

1.02 QUALITY ASSURANCE

.1 Heat recovery ventilator manufacturers are to be current members of Air Movement and Control Association International Inc. (AMCA), and fans are to be rated (capacity and sound performance) and certified in accordance with requirements of following standards:

.1 ANSI/AMCA Standard 210, Laboratory Method of Testing Fans for Certified Aerodynamic Performance Rating;

.2 AMCA Standard 211, Product Rating Manual for Fan Air Performance;

.3 ANSI/AMCA Standard 300, Reverberant Room Method for Sound Testing of Fans;

.4 AMCA Standard 311, Product Rating Manual for Fan Sound Performance;

.5 AMCA Standard 99-2408, Operating Limits for Centrifugal Fans;

.6 AHRI Standard 1060, Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment;

.7 ASHRAE 84, Method of Testing Air-to-Air Heat/Energy Exchangers;

.8 UL 1812, Ducted Heat Recovery Ventilators;

.9 CSA or ETL certification for all electrical components.

.2 Acceptable manufacturers are:

.1 Tempeff Dual CoreTM as basis of design;

.2 Or equivalent.

2 PRODUCTS

Provide Heat Recovery Unit

Comply

2.01 UNIT CONSTRUCTION

.1 Fabricate unit with galvanized steel panels secured with mechanical fasteners. All access doors shall be sealed with permanently applied bulb-type gasket.

.1 Panels and access doors shall be constructed as a 2-inch (50-mm) nominal thick; with injected polyurethane foam insulation. R value shall be 6.5 per inch of wall thickness. The outer panel shall be constructed of G90 galvanized steel. The inner liner shall be constructed of G90 galvanized steel. Module to module assembly shall be accomplished with self adhering foam gaskets. Manufacturer shall supply test data demonstrating less than L/240 deflection for an unsupported under 30” W.C pressure. Units that cannot demonstrate this deflection are unacceptable.

.2 Access Doors shall be flush mounted to cabinetry, with minimum of two hinges, locking latch and full size handle assembly.

2.02 SUPPLY / RETURN FANS

Direct drive fans used

.1 Provide belt-drive airfoil plenum supply and return fan(s). Fan assemblies including fan, motor and sheaves shall be dynamically balanced by the manufacturer on all three planes and at all bearing supports. Manufacturer must ensure maximum fan RPM is below the first critical speed.

.2 Bearings shall be self-aligning, grease lubricated, ball or roller bearings with extended copper lubrication lines to access side of unit. Grease fittings shall be attached to the fan base assembly near access door. If not supplied at the factory, contractor shall mount copper lube lines in the field.

1" springs due to not enough loading for 2" springs

.3 Fan and motor shall be mounted internally on a steel base. Provide access to motor, drive, and bearings through hinged access door. Fan and motor assembly shall be mounted on 2" deflection spring vibration type isolators inside cabinetry.

Not Applicable

2.03 BEARINGS AND DRIVES

.1 Bearings: Basic load rating computed in accordance with AFBMA - ANSI Standards, L-50 life at 200,000 hours – all fans, heavy duty pillow block type, self-aligning, grease-lubricated ball bearings.

.2 Shafts shall be solid, hot rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.

Comply

2.04 ELECTRICAL

.1 The air handler(s) shall bear an ETL listing label for the entire assembly. Units with only components bearing third party safety listing are unacceptable.

.2 On RG sizes 1000 through 18000 all controls shall be located on the side of the unit for ease of servicing. Alternate manufacturers who supply units with controls on roof must supply a permanently installed ladder to access controls, and appropriate safety rails on roof of unit, meeting all applicable OSHA standards.

.3 Wiring Termination: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. All wires shall be number tagged and cross-referenced to the wiring diagram for ease of troubleshooting.

.4 Controls must include Self Diagnostics with fault error and PLC error code. On board fault detection and diagnostics that senses and alerts when the damper is not operating correctly.

.5 Fan motors shall be 1800 rpm, open drip-proof (TEFC) type. Motors shall be premium efficiency. Electrical characteristics shall be as shown in schedule.

.6 Supplier shall provide and mount [ABB] or [Danfoss] variable speed drive with electrical characteristics as shown on project schedule.

.7 Air handler manufacturer shall provide and mount a damper hand-off-auto (HOA) switch.

Comply

2.05 COOLING AND HEATING COIL SECTIONS

.1 Provide access to coils from connection side of unit for service and cleaning. Enclose coil headers and return bends fully within unit casing. Unit shall be provided with coil connections that extend a minimum of 5" beyond unit casing for ease of installation. Drain and vent connections shall be provided exterior to unit casing. Coil connections must be factory sealed with grommets on interior and exterior and gasket sleeve between outer wall and liner where each pipe extends through the unit casing to minimize air leakage and condensation inside panel assembly. If not factory packaged, Contractor must supply all coil connection grommets and sleeves. Coils shall be removable through side and/or top panels of unit without the need to remove and disassemble the entire section from the unit.

.1 Identify fin, tube & casing material type and thickness.

.2 Show coil weights (shipping & operating).

.3 State air and fluid flow amounts with its associated pressure drops. For steam coils, indicate steam pressure and condensate load.

.4 Indicate entering & leaving air and water temperatures. For refrigerant coils, indicate saturated suction temperature (SST).

.2 Water Coils:

.1 Certification - Acceptable water coils are to be certified in accordance with ARI Standard 410 and bear the ARI label. Coils exceeding the scope of the manufacturer's certification and/or the range of ARI's standard rating conditions will be considered provided the manufacturer is a current member of the ARI Air-Cooling and Air-Heating Coils certification programs and that the coils have been rated in accordance with ARI Standard 410. Manufacturer must be ISO 9002 certified.

.2 Headers shall consist of seamless copper tubing to assure compatibility with primary surface. Headers to have intruded tube holes to provide maximum brazing surface for tube to header joint, strength, and inherent flexibility. Header diameter should vary with fluid flow requirements.

.3 Fins shall have a minimum thickness of 0.0075” of aluminum plate construction. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Bare copper tubes shall not be visible between fins.

.4 Coil tubes shall be 5/8 inch (16mm) OD seamless copper, 0.020" nominal tube wall thickness, expanded into fins, brazed at joints. Soldered U-bends shall be provided to minimize the effects of erosion and premature failure having a minimum tube wall thickness of .025”.

.5 Coil connections shall be N.P.T. threaded carbon steel with connection size to be determined by manufacturer based upon the most efficient coil circuiting. Vent and drain fittings shall be furnished on the connections, exterior to the air handler. Vent connections provided at the highest point to assure proper venting. Drain connections shall be provided at the lowest point to insure complete drainage and prevent freeze-up.

.6 Coil casings shall be a formed channel frame of galvanized steel. Water heating coils, 1 & 2 row only (sans 5M type) shall be furnished as uncased to allow for thermal movement and slide into a pitched track for fluid drainage.

2.06 PARTICULATE FILTERS

.1 Filter section with filter racks and guides with hinged and latching access doors on either, or both sides, for side loading and removal of filters.

.2 Filter media shall be UL 900 listed, Class I or Class II.

Final filters are 2" MERV 13 .3 Flat arrangement with 2”, 50mm deep pleated panel filters. MERV 8 Pre filters and MERV 13 on the supply air side and MERV 8 Prefilter on the return air side.

Comply **2.07 ENERGY RECOVERY**

.1 Dual Core™ Energy Recovery

.1 Unit shall be equipped with Dual CoreTM energy recovery technology. The unit shall be 90% efficient (sensible +-5%) at equal airflow in winter and up to 80% sensible in summer. It shall also provide up to 70% latent recovery. Unit shall accomplish this recovery without a defrost cycle that will reduce the effectiveness of the device. Devices employing defrost cycles that bypass the energy recovery device, or reduce the effectiveness are not acceptable. Energy recovery device shall not require frost protection in applications down to -40 degrees.

.2 Energy Cores shall be Generation 3, comprised of precisely corrugated 0.7mm (0.0276”) thick 1100 Series aluminum. Thinner aluminum is unacceptable to prevent deformation should cleaning be required to maintain indoor air quality. Spacing between plates shall be minimum 9 mm (0.35”) to assure that frost growth will not restrict airflow or reduce performance. Heat exchangers shall be a minimum or 995 mm (39”) long to assure minimum 60 second dwell time. Time between switchovers shall be minimum 60 seconds. Technologies employing shorter heat exchangers are not acceptable due to high cross leakage, and excessive cycling. Maximum allowable face velocity across heat exchangers shall be 490 fpm. Heat exchanger face velocities exceeding 490 fpm are not acceptable.

.3 Heat exchangers shall be sectioned for a maximum section weight of 40 kg (88 lbs) so that the heat exchangers can be easily removed for cleaning to maintain indoor air quality. Sections weighing more are not acceptable. Heat exchanger that require special equipment to remove for cleaning (cranes, hoist etc.) are not acceptable. Heat exchangers shall be durable enough to handle high pressure power washing without deformation.

.4 Unit Cross-leakage shall be maximum 1-3% as defined and tested in accordance with ASHRAE 84 Test Methods. Cross leakage exceed this amount is unacceptable. Manufacturer shall produce testing data reflecting this performance in accordance with ASHRAE 84 test method. Testing must use the tracer gas method prescribed by ASHRAE 84.

.5 Switchover damper section shall be comprised of multi section low leakage dampers operated by fast acting electric actuators. Pneumatic actuators are not acceptable. 800 CFM-7,000 CFM shall have damper switching times of 0.75 seconds. 7000 CFM-75,000 CFM shall have damper switching times of 1.25 seconds. Dampers that do not switch within the specified times without objectionable noise are not acceptable. This switch over must limit any internal cross leakage below 3%. Test report must be provided showing that the damper configuration meets this requirement. Testing must use the tracer gas method prescribed by ASHRAE 84.

.1 Single blade damper sections are not acceptable. Each damper shall control one of the 4 airways, upper-horizontal, lower-horizontal, forward-vertical and rear-vertical. Dampers shall be capable of orienting to close off outside air to the building without needing external shut off dampers.

.2 Dampers shall also be capable of orienting to allow 100% recirculation of air without using heat recovery device for off peak or unoccupied heating modes. Units incapable of these operations without extra ductwork are not acceptable. Re-circ design must be capable of pre-warming both heat exchangers simultaneously for morning warm-up cycle. Strategies that only warm one heat exchanger is unacceptable.

.3 Damper seals shall be ½” heavy thickness EPDM bulb seal. Single blade seals are unacceptable due to high leakage and poor sealing.

.4 Damper bearings shall be heavy duty greasable pillow block flange bearings. Bronze or plastic bearings are not acceptable due to high cycle requirements. Bearings shall have a minimum diameter:

.1 800-7000 CFM: ¾” Bearings, maximum of 4 shafts per unit

.2 7,000 – 21,000 CFM: 1” Bearings, maximum of 4 shafts per unit

.3 21,000 CFM and larger – 1” Bearings, maximum of 6 shafts per unit

.5 Damper shafts shall be large diameter shafts meeting:

.1 800-7,000 CFM ¾” Chromium Shafts, maximum of 4 shafts per unit

.2 7,000 – 21,000 CFM - 1” Chromium Shafts, maximum of 4 shafts per unit

.3 21,000 CFM and larger – 2’ Diameter Steel shafts, maximum of 6 shafts per unit

.6 Technologies employing smaller diameter shafts, or more shafts per unit are unacceptable as that would be considered light duty, and insufficient to withstand the demanding nature of the application.

.7 Damper manufacturer must provide written documentation that the dampers are capable of a minimum duty cycle of 500,000 cycles annually. Damper Manufacturer shall provide a written warranty on damper manufactures letterhead confirming the warranty.

.6 Recovery cycles shall be controlled by internal programmed thermostats measuring both supply and exhaust air and optimizing performance of both heat recovery and free cooling modes.

Comply

2.08 EXTERNAL SHUT-OFF DAMPERS

.1 External Damper Leakage: Leakage rate shall be less than two tenths of one percent leakage at 2 inches static pressure differential. Leakage rate tested in accordance with AMCA Standard 500.

.2 External Shut-off dampers shall be located on outer face of heat exchangers to retain energy when unit is shut down. Dampers located on warm (inner) side of heat exchangers are not acceptable.

3 EXECUTION

By contractor

3.01 INSTALLATION OF HEAT RECOVERY VENTILATORS

.1 Provide heat recovery ventilators.

.2 Supply an assembled roof curb for each outdoor roof mounted ventilator and hand to roof trade at site on roof. Carefully locate and size roof openings. Provide gasket material supplied with curb on perimeter of curb and secure ventilator in place.

.3 For ventilators with auxiliary hydronic coils, connect each coil to system valved hydronic piping with flexible connectors in accordance with Section entitled HVAC Piping and Pumps. Provide trapped condensate drainage piping connection to cooling coil condensate drain pans in accordance with Section entitled Drainage Waste and Vent Piping and Valves.

.4 Coordinate power wiring connection and provision of a disconnect switch for each ventilator in accordance with electrical work Specification where power wiring is specified.

.5 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system manufacturer certification requirements.

.6 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

.7 Include for a ½ day on-site heat recovery ventilator operation demonstration and training session. Training is to be a full review of all components including, but not limited to, a full heat recovery ventilator internal inspection, construction details, operation, maintenance, abnormal events, and setting up controls.

.8 Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets for all custom made air handling units. Include following:

.1 computer generated and certified fan performance curves;

.2 computer generated psychometric chart for each cooling coil;

.3 certified sound power data for discharge, radiated, and return positions by octave band;

.4 hardware for section-to-section site connections as applicable;

.5 dimensioned layouts;

.6 product data sheets for fan motors.

.2 Submit manufacturer's colour chart to indicate standard colour range of paint finishes. Supply 4 L (3.5 qt) of touch-up paint with each custom made air handling unit.

.3 Submit spare air filters as specified in Part 2 of this Section.

.4 Supply reviewed copies of exterior roof mounting air handling unit/curb assembly shop drawings or product data sheets to trade who will cut roof openings for ductwork, and ensure openings are properly sized and located.

.5 Submit with delivery of each unit a copy of factory test and inspection report as specified in Part 2 of this Section, and include a copy of each report with O&M Manual project close-out data.

.6 Submit a site inspection and start-up report from manufacturer's representative as specified in Part 3 of this Section.

1.02 QUALITY ASSURANCE

.1 Custom made air handling equipment is to be rated (capacity, performance, efficiency and sound) and certified in accordance with requirements of following American National Standards Institute/Air-Conditioning, Heating and Refrigeration Institute Standards, and Air Movement and Control Association International Inc. Standards:

.1 AHRI 410, Forced-Circulation Air-Cooling and Air-Heating Coils;

.2 ANSI/AHRI 430, Performance Rating of Central Station Air-Handling Units;

.3 AMCA Standard 211, Product Rating Manual for Fan Air Performance;

.4 AMCA Standard 311, Certified Ratings Program – Product Rating Manual for Fan Sound Performance;

.5 AMCA Standard 99-2408, Operating Limits for Centrifugal Fans.

.2 Custom made air handling equipment is also to be in accordance with requirement of following Codes, Standards, and Regulations:

.1 CAN/CSA C22.2 No. 236/UL 1995, Heating and Cooling Units;

.2 ANSI/ASHRAE/IES 90.1, Energy Standard for Buildings Except Low Rise Residential Buildings;

.3 CSA or ETL certification and labelling for all electrical components;

.4 Filter media shall be ULC listed.

.5 Unit shall be factory ETL(c) approved

.6 After construction, units shall be cleaned thoroughly before shipping. All floor surfaces and wall surfaces shall be thoroughly degreased and cleaned. After cleaning, units shall be shrink wrapped using a heavy gauge heat shrinkable plastic wrap.

.7 During storage, contractor shall store units in a dry heated environment. Fan wheels shall be rotated monthly during storage. Units shall be regularly inspected for moisture and any job site moisture shall be immediately removed.

.8 governing local Codes and Regulations.

.3 Acceptable unit manufacturers are Haakon Industries (Canada) Ltd., Engineered Air, MAFNA Air Technologies Inc., Scott Springfield Mfg. Inc., and Racan Carrier Co., with acceptable components as follows:

.1 fans: Twin City Fan and Blower, Loren Cook Co., Greenheck Fan Corp., and CML Northern Blower Inc.;

.2 heat transfer coils: Aerofin Canada Services Inc., Heatcraft Inc., and Daikin;

.3 electric heating coils: Indeeco, Thermolec Manufacturing Ltd., Chromalox, and Caloritech Inc.;

.4 filters: Camfil Farr Canada Inc. and AAF International.

2 PRODUCTS

Comply

2.01 DESCRIPTION

.1 Provide factory assembled air handling unit in configuration as indicated on drawings. Unit shall include all specified components installed at the factory. Field fabrication of units and their components will not be accepted.

.2 The unit shall be designed to be supported by a roof curb.

.3 Units too large to fit on a standard tractor trailer may be shipped to site in sections. Otherwise units shall be shipped in one piece.

Comply **2.02 PRE-DELIVERY FACTORY INSPECTION AND TESTING**

.1 When each is completely assembled and ready for shipment, including assembly of shipping sections, following factory testing is to be performed:

.1 pressure test at 1.5 times the rated total static pressure for 4” thick casing units (with leakage not to exceed 0.5%, witnessed by Consultant, and all normal travel expenses incurred for 2 people to attend test in manufacturer’s plant are to be included in Contract;

.2 at time of factory pressure test, an inspection by Consultant for defects and conformance to unit construction requirements of Contract.

.2 Defects found which cannot be corrected while Consultant is at manufacturer’s plant, and/or failure of pressure test will result in rejection of unit(s), and unit(s) must be corrected and again examined by Consultant at a later date but prior to shipment, and Consultant’s expenses for re-inspection are to be included in Contract.

.3 Factory tests and inspections are to be scheduled with Consultant with a minimum of 7 working days' notice. Make travel and accommodation arrangements on behalf of Consultant, and ensure travel tickets, itinerary, etc., are in hands of Consultant well before factory visit departure date.

Comply **2.03 CASING**

.1 Walls and shall be constructed of 16 gauge galvanized steel 2" thick acoustic thermal panels. The inner liner shall be 22 gauge solid galvanized steel. Insulation shall be 2" thick 4.0 lb. density mineral fiber. All permanently joined flanged panel surfaces shall be sealed with an individual strip of 1/8" X 3/8" tape sealer. Wall and roof seams shall be turned inward to provide a clean flush exterior finish. All panel seams shall be sealed during assembly to produce an airtight unit.

.2 Outdoor units shall have roof panels broken outward to provide a lapped joint watertight seal. Outdoor roofs shall be sloped a minimum of 5/8" away from the access side.

.3 On outdoor units, screws and other similar fastening devices shall not penetrate the roof deck or the top of standing seems.

Comply **2.04 INSULATION**

.1 All insulation used in air handling unit walls, roof and base shall have a Flame spread rating of less than 25 and a Smoke Developed rating of less than 50 per ASTM E84 and UL 723 and Can/ULC S102-M88.

.2 Insulation shall meet NFPA 90A and 90B.

Comply **2.05 STRUCTURAL BASE CONSTRUCTION**

.1 Units shall be constructed from a minimum C6x8.2 lb./sq.ft. channel structural steel perimeter base, with intermediate tubular steel supports. Perimeter structural steel base shall be designed to directly support the weight of the walls. Intermediate tubular structural steel and channel iron shall support the weight of all internal components (i.e. fans, coils, enthalpy wheels, etc.). The structural steel base shall be either I-beam construction or C-channel (not box channel) so that the base will shed all water. Base shall be provided with lifting lugs, minimum four (4) per shipping split. Formed metal bases formed from sheet metal will not be acceptable. Base shall prevent wall panel joints from separating during lifting, transportation and rigging.

.2 Lifting lugs shall be located and engineered to properly support the loads within. Manufacturers shall provide a load point calculation along with detailed lifting lug information as part of the shop drawing package.

.3 A 0.12” thick aluminum checker plate floor shall be installed on the base. Floor seams shall be continuously welded providing a completely flat unit floor. Standing seems will not be accepted in any section. A 1-1/2" perimeter collar shall be provided to ensure the unit is internally watertight. The collar shall be alternately screwed down and tack welded to the unit base on one (1) foot centers. Caulk joint to be watertight.

.4 The base shall be insulated with 3" thick, 1-1/2 lb. density fibreglass insulation and sheeted with a 22 gauge galvanized steel liner. The base liner shall be broken, tack welded and sealed for rigidity and vapour barrier integrity.

Comply **2.06 ACCESS DOORS**

.1 Access door construction and thickness shall match the rest of the unit casing. Corners shall be welded for rigidity. Spot welding of corner seems will not be accepted. 4.0 lb. density insulation shall be sandwiched between the outer and inner skins. A 10" round double pane tempered glass window shall be provided in each door.

.2 Provide Two chrome plated “Ventlok” Model #310 high pressure latches operable from either side of the door. Hinges shall be continuous piano type stainless steel. Door openings shall be fully gasketed with continuous 1/2" closed cell hollow round black gasket with a metal encapsulated reinforced backing that mechanically fastens to the door opening perimeter. Door frames shall be framed from 16 gauge galvanized steel with the outside of the door flush to the unit. Minimum door width shall be as shown on the plans but in no case shall an access door be less than 18". Door height shall be the maximum permitted by the height of the unit up to 72".

.3 Doors shall open against positive pressure.

Comply **2.07 EXTERIOR UNITS**

.1 In addition to features specified above, exterior units are to be completely weatherproof with roof areas sloped down in 2 directions where greater than 3.6 m (12') wide, and sloped down in one direction if less than 3.6 m (12') wide, with drip shields located over access doors.

.2 Roof mounted units complete with a rigid, insulated, 450 mm (18") high curb assembly with continuous 50 mm x 100 mm (2" x 4") pressure treated wooden nailing strip, minimum 25 mm (1") wide continuous compressible closed cell neoprene gasket material between top of curb and unit base, and exterior lighting fixture(s) as specified in this Section.

.3 Fresh air intakes sections complete with drain pan bases with drain connections, and fresh air intakes and exhaust air outlets for exterior units complete with rain-tight hoods with aluminum mesh bird screen.

2.08 ACOUSTICAL PERFORMANCE

Refer to sound power schedule for unit sound levels

.1 The casing shall have been tested for acoustical performance by an independent laboratory that is accredited. Manufacturers shall submit sound data in compliance with the following:

.2 Test methods and facilities used to establish sound transmission loss values shall conform explicitly with the ASTM designation E90-85 and E413-73.

.1 Sound Transmission Loss DB ASTM E-90 & E413-73

	1	2	3	4	5	6	7	8	
2" wall	18	19	27	33	43	52	52	52	STC=37
4" wall	20	20	28	41	51	56	55	57	STC=40

.3 Test methods and facilities used to establish sound absorption values shall conform explicitly with the requirements of the ASTM Standard Test Method for Sound Absorption Coefficients by the Reverberation Method: ASTM C423-84A and E795-83.

.1 Sound Absorption ASTM C423-84A & E795-83

	1	2	3	4	5	6	7	8	
2" wall	.10	.23	.75	1.08	1.05	.99	.97	.95	STC=37
4" wall	.40	.65	1.38	1.28	1.09	1.05	1.02	1.02	STC=40

Comply

2.09 FANS

.1 All fans shall be tested in accordance with AMCA Standards 210-70 and 310 Test Codes for Air Moving Devices. Backward inclined fans shall bear the AMCA sticker for both air and sound performance.

.2 Fan Wheels and Shafts: Provide air foil blades on all fan wheels. Provide solid shafts keyed to the fan wheel. Coat fan shaft with rust inhibitor. Hollow shafts will not be acceptable.

Not applicable for direct drive fans

.3 Fan bearings shall be self-aligning pillow block, grease lubricated, extra heavy-duty anti-friction ball or spherical roller type selected for an L10 life of 200,000 hours at design operating conditions.

.4 Fan and motor shall be mounted on an all welded, structural steel, prime coated internal isolation base. The outlet of the fan shall be separated from the unit casing by means of a factory installed flexible connection. The internally mounted motor shall be provided on a slide rail base to allow proper adjustment of belt tension.

Not applicable for direct drive fans

.5 Provide an OSHA approved fully enclosed metal belt guard having side of galvanized steel and expanded metal face. Belt guard shall be sized to allow either sheave to be increased by two sizes.

Not applicable for direct drive fans

.6 Provide fixed pitch sheaves rated at 150% of motor nameplate H.P. On air handling units with variable speed drives, mount the VSD on the unit. Factory wire between the VSD and fan motors. Ensure all casing penetrations are sealed to be airtight. Provide a terminal block within the VSD for field termination of line side wiring.

.7 Provide plenum fan inlets on the fan wall and air outlets from the casing with a smooth bellmouth fitting with radius to match casing thickness, and free of protruding structural members and flanges.

.8 Plenum fan assembly must have an enclosed safety screen as per OSHA Standards.

.9 Provide I beam hoist rail above fan section access doors to remove motors 25hp and above. An extendable arm shall also be provided to transport the motor to the unit exterior.

Comply

2.10 MOTORS

.1 Motors shall be designed for severe duty in accordance with IEEE 841 standards and shall meet NEMA MG1 Part 31. Motors shall be operable at 575 Volts, 60 Hz, 3-phase.

.2 Motor enclosure shall be (open drip proof) (totally enclosed fan cooled) and rated to IP55. A nonmetallic cooling fan shall be provided. Frame, end bells and fan cowl shall be manufactured of heavy duty cast iron. The end plates shall be sealed to the frame joints. Enclosure shall be epoxy coated and rated for ASTM B117-90 96-hour salt spray test.

.3 Motor windings shall have class F insulation with class B temperature rise ratings. Windings shall be 200C inverter spike resistant wire. Motor windings shall withstand 2000V transients. Motor service factor shall be 1.15 on sine wave power and 1.0 on VFD power.

.4 Bearings shall be regreasable without disassembly and provide for the elimination of purged grease. Bearing life shall be a minimum of L10 at 50000 hours. Bearing seals shall be Inpro or equivalent.

.5 Motors shall be balanced to less than 0.08 inches per second (filter out) and the vibration test data shall be shipped with the motor.

.6 Nameplates shall be stainless steel and contain both NEMA data and bearing data.

.7 Motors used with variable frequency drives shall be provided with a brush system to electrically ground the shaft and discharge any induced voltage on the motor shaft, with a direct path to ground.

.8 Motor shall be provided with a 5-year warranty.

.9 Acceptable motor manufacturers are Reliance-Baldor, US Motors, and TECO-Westinghouse.

Comply

2.11 AIRFLOW MEASURING PROBES

.1 Provide on each fan, air flow measuring probes.

.2 Each airflow probe shall contain multiple, averaged velocity pressure taps located symmetrically around the throat of the fan inlet and a single static pressure tap located on the fan housing. The entire airflow monitoring probe must be located outside the inlet throat as to not obstruct airflow.

.3 The probes shall be capable of producing steady, non-pulsating signal of the velocity pressure, independent of the upstream static pressure without adversely affecting the performance of the fan. The sensing probes shall be accurate ±3% of actual fan airflow. The fan inlet sensing rings shall be FreeFlo Sensing Ring as manufactured by Haakon Industries Ltd or.

Comply

2.12 AIRFLOW DISPLAY

.1 Provide on indicated fans a method of displaying digitally, in real time, the fans current air flow.

.2 For interaction with a controller, the display shall output BACnet communication for each fan being monitored, and be capable of outputting one (1) 0-10VDC signal

.3 The display shall be capable of showing the airflow of ten (10) independent fans simultaneously, and communicating all connected fans through BACnet

.4 The controller shall incorporate two high accuracy low pressure transducers per connected fan.

.5 The output signal shall be ±0.5% full scale accuracy

.6 The display must be water tight allowing for use in outdoor locations. If the display is not water tight it shall be enclosed in a weatherproof housing.

Comply

2.13 VIBRATION ISOLATION

.1 An integral all weld steel vibration isolation base shall be provided for the fan and motor.

.2 Provide open spring mounts with iso stiff springs, sound deadening pads and leveling bolts.

.3 Horizontal stiffness shall be equal to vertical stiffness.

.4 Spring deflection shall be 2".

.5 Isolators shall have earthquake restraints. Upon request, the unit manufacturer shall submit a restraint detail certified by a professional engineer.

Comply

2.14 COILS

.1 Coils shall be fully enclosed within casing and mounted on angle frames manufactured to allow coils to be individually removed. Cooling coil racks shall be 12 Ga. 304 stainless steel. Heating coils shall be mounted on galvanized angle racks.

.2 Removable coil access panels shall be provided to remove coils through casing wall. Coil covers shall be double wall construction with all exposed edges of insulation covered with sheet metal including holes through the cover for coil header stub outs. Coils shall be individually removable towards (away from) the access side.

.3 All drain pans shall be double wall continuously welded 304 stainless steel. Intermediate drain pans shall be interconnected with stainless steel 1" down pipes. Condensate drain shall be a minimum 1-1/4" diameter stainless steel tube extending 1" out from unit for solder connection to trap. Drain pans shall be sloped within unit and fully drainable.

.4 Coils shall be certified in accordance with ARI Standard 410.

.5 Construction:

Tubes	Horizontal, copper.
Fins	Aluminum (copper where coils are sprayed) mechanically bonded to tubes.
Headers	Seamless copper with vent and drain connections.
Casing	16 gauge, galvanized steel channels with 16 gauge center and end supports.
Connections	Same end, counterflow, with vent, drain, supply and return stubs extended to outside of unit casing with grommets for airtight casing.

.6 All refrigerant coils shall be designed to conform to ANSI – B 9.1 Safety Code for Mechanical Refrigeration. All DX coils shall contain a holding charge of dry nitrogen when shipped from the factory.

.7 Steam coils shall be non-freeze type. Pitch steam coils in units for proper drainage of steam condensate.

2.15 PREFILTERS

.1 Prefilters shall be 2"-50mm Camfil-Farr 30/30, medium efficiency MERV 8A, pleated, disposable type. The filter shall be listed by Underwriters Laboratories as Class 2.

.2 Prefilters shall be installed in a prefabricated channel rack.

Filters are lift-out

.3 Prefilters shall be slide out.

2.16 FINAL FILTERS

.1 Final filters shall be high performance, Camfil-Farr deep pleated 12" long cartridge type. Each filter shall consist of glass fibre media, media support grid, contour stabilizer and enclosing frame.

.2 Final filter media shall be of high density microfine glass fibers laminated to a non-woven synthetic backing to form a lofted filter blanket. The filter media shall have an average efficiency of MERV 13Aon the ASHRAE Test Standard 52. The filter shall be listed by Underwriters Laboratories as Class 2.

.3 Holding frames shall be factory fabricated of 16-gauge galvanized steel and shall be equipped with gaskets and 2 heavy duty positive sealing fasteners. Each fastener shall be capable of withstanding 25 lb. pressure without deflection. They will be capable of being attached or removed without the use of tools.

Filters are lift-out

.4 Final filters shall be slide out.

Comply

2.17 DRAINS

.1 Provide 1 1/4" capped floor drain connections on the side of the unit for complete drainability of the base pan for the following sections:

.1 Fresh Air Plenums

.2 Fan Sections

.3 Sections upstream and downstream of coils

Comply

2.18 LIGHTS

.1 Marine lights with LED bulbs and protective cast metal cage and glass globes complete with duplex receptacles shall be installed on the wall (across from) (beside) the access doors. One (1) switch with an indicator light shall be installed on the exterior of the unit. Factory wire from switch to all lights in EMT conduit with liquid tight connections. At all split sections, provide a one foot long piece of flexible conduit, with the extra wire spooled, for reconnection on site by the installing contractor. Electrical power shall be 120V/1/60.

Comply

2.19 FILTER GAUGES

.1 Provide electronic filter gauges which have a digital display and a 4-20mA or 0-10VDC signal to indicate air pressure drop. Power the gauges from the lighting circuit.

.2 Provide sensing probes for each gauge.

.3 Provide 1 gauge flush mounted into the casing for each filter bank.

Comply

2.20 HOODS

.1 Fresh air and exhaust air hoods shall be provided complete with 1/2" x 1/2" bird screen and finished to match the unit. A rain gutter shall be provided on all edges of the hood. Outside air hoods shall be sized for maximum inlet velocity of 500 FPM.

Comply

2.21 ALUMINUM AIRFOIL DAMPERS

.1 Aluminum airfoil frames and blades shall be a minimum of 12-gauge extruded aluminum. Blades to be 6" wide single air foil design.

.2 Frames shall be extruded aluminum channel with grooved inserts for vinyl seals. Standard frames 2" x 4" x 5/8" on linkage side, 1" x 4" x 1" on the other sides.

.3 Pivot rods shall be 7/16" hexagon extruded aluminum interlocking into blade section. Bearings to be double sealed type with a Celcon inner bearing on a rod within a Polycarbonate outer bearing inserted into frame so that the outer bearing cannot rotate.

.4 Bearing shall be designed so that there are no metal-to-metal or metal-to-bearing riding surfaces. Interconnecting linkage shall have a separate Celcon bearing to eliminate friction in linkage.

.5 Blade linkage hardware is to be installed in frame out of airstream. All hardware to be on non-corrosive reinforced material or cadmium plated steel.

.6 Damper seals shall be designed for minimum air leakage by means of overlapping seals.

.7 Optional: Internal hollows shall be insulated with 7/8" thick polyurethane foam with R factor of 5.0 per inch. Blades shall be 100% thermally broken. Frame shall be insulated with polystyrene, R factor of 5.0 per inch. TAMCO 9000 or equal

.8 Damper blades shall be maximum 40" long per section.

.9 Dampers greater than 2 sections wide shall be provided with a blade jumper

.10 Acceptable dampers are: T.A. Morrison "TAMCO series 1000" and "RUSKIN CD-50".

Comply

2.22 DAMPER OPERATORS

.1 Provide factory installed electronic damper operators with all linkage and hardware internally mounted.

.2 Ensure operators are mounted in easily accessible sections of the air handling unit.

Comply

2.23 TEST PORTS

.1 Provide 0.5” diameter test ports for unit air stream testing in each plenum section between each component within the AHU. Test ports shall have a tube that extends between the inside and outside of the unit and a screwed cap on the exterior to allow access. The test ports shall have been flanged on the exterior to allow air seal and shall be flanged on the interior to cover the penetration of the casing

2.24 ELECTRICAL

.1 Factory wire and test all air handling units. Have units approved by CSA or ETLc.

Transformer not included to power lights.
Separate 120V/1ph power required for lights/GFI

.2 Supply one @ 575 V/60 Hz/3 Ph power connection for motors and other large electrical devices and one @ 120 V/208V/60 Hz/1 Ph power connection for lights, controls, heaters, etc. (Provide a minimum 2kVA transformer fed from the main power source to power the lighting circuit.)

.3 Provide a separate 120 V/ 1 phase feed for a 20 amp convenience outlet.

.4 Provide necessary circuit breakers and/or fuses for each type of electric device.

.5 A bonding wire shall be provided between the motor loads and the electrical panel. Use of the air handling unit casing for a bond will not be accepted.

.6 Label and number code all wiring and electrical devices in accordance with the unit electrical diagram. Mount the devices in a control panel inside the unit's service enclosure or on the outside. Ensure the control panel meets the CSA or Canadian Electrical Code (CEC) standard for the specific installation.

.7 Provide a system of motor control including all necessary terminal blocks, motor contactors, motor overload protection, grounding lugs, auxiliary contactors and terminals for the connection of external control devices or relays. Individually fuse all fan and branch circuits.

.8 Wire from the motors to the motor control in accordance with the local electrical code and contained by EMT conduit with liquid tight connections. Seal the casing penetrations in a manner that eliminates air leaks. At all split sections, provide a 1 foot long piece of flexible conduit, with the extra wire spooled, for reconnection on site by the installing contractor.

.9 External disconnects shall be provided in a NEMA 4 enclosure for superior water protection. Disconnects must be interlocked with the electrical panels for added personnel safety.

2.25 FINISH

Standard Haakon Grey colour provided

.1 Unit shall be finished painted with two components, etch bond primer and finish painted with alkyd enamel, color as selected by Owner. All uncoated steel shall be painted with grey enamel. All metal surfaces shall be prepainted with vinyl wash primer to ensure paint bonds to metal. Outdoor unit shall be finish coated with polyurethane paint. Paint for outdoor units shall be tested to ATSM B117 for 5000hr salt spray endurance.

Not applicable

2.26 PIPE WORK

.1 The manufacturer shall have a quality assurance program in place and have the quality assurance manual available for the customer upon request.

.2 Documented test procedures shall be available to the customer upon request

.3 All piping systems shall be hydrostatically pressure tested at 1.5 times design pressure and hold pressure for one hour in the factory before shipping. A chart recorder shall be used to record the pressure for the test period and will be submitted to the engineer for review prior to shipping the units

.4 Factory testing equipment shall be calibrated as outlined in the quality assurance manual, and be made available for customer inspection upon request

.5 All pipe shall be welded construction in accordance with ANSI/ASME B31.1 and B31.3, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1. The use of mechanical fasteners is not acceptable. Threaded connections shall only be permitted when connecting to equipment and valves with threaded connections

.6 Defects causing rejection shall be as described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code. Re-inspect and re-test repaired or re-worked welds.

.7 All valves and strainers shall be either full lug style or employ socket weld connections. The use of threaded valves on pipe over ¾" in diameter is not acceptable.

.8 Provide piping specialties, etc not described in this section of the specification, as outlined in other sections of specification.

2.27 CONTROLS

By BAS Contractor

.1 Refer to drawing control diagrams, sequences and points list. Control system components required for within air handling unit enclosures are to be in accordance with and compatible with product requirements specified in mechanical control work Section(s) and factory installed at air handling unit manufacturer's plant.

3 EXECUTION

By Contractor **3.01 INSTALLATION OF CUSTOM MADE AIR HANDLING UNITS**

.1 Provide custom made air handling units.

.2 Provide required rigging and hoisting/moving equipment required to move units to required locations. Perform rigging/hoisting/moving in accordance with unit manufacturer's directions and details.

.3 Hand curbs for roof mounted units to roofing trade on roof for installation and flashing into roof construction. Assemble in place on roof curb. Provide continuous gasketing around perimeter of each curb between curb and unit mounting frame.

.4 Remove fan base hold-down clamps and other shipping restraints and protective packaging.

.5 Install units on a flat surface level within 1/8 inch and of sufficient strength to support the units.

.6 Provide components furnished as per manufacturer's literature.

.7 Provide all water piping so water circuits are serviceable, without having to dismantle excessive lengths of pipe.

.8 Provide valves in water piping upstream and downstream of each coil for isolating the coils for maintenance and to balance and trim the system.

.9 Provide drain valves and vent cocks to each coil.

.10 Provide strainers ahead of all pumps and automatic modulating valves.

.11 Provide certified wiring schematics to the electrical division for the equipment and controls.

.12 Provide all necessary control wiring as recommended by the manufacturer.

.13 Provide condensate traps in accordance with manufacturers recommendations.

.14 Insulate all piping and equipment mounted inside the corridor.

.15 Carefully coordinate installation of each unit with other trades making connections to unit, in particular, control connections.

.16 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system manufacturer certification requirements. When installation is complete but prior to duct connections, arrange for the unit manufacturer's representative to conduct a site leakage test on each unit. Site leakage tests are to duplicate factory leakage tests and if results of site tests indicate leakage in excess of factory test results, re-seal the unit(s) and repeat the tests until satisfactory results are obtained. Submit leakage test documentation to the Consultant.

.17 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

.18 Include for a full 8 hour day on-site operation demonstration and training session. Training is to be a full review of all components including, but not limited to, a full operation and maintenance demonstration, with abnormal events.

END OF SECTION

HTS Toronto

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hts.com/ontario

Product Datasheets
AHU-1

TEMPEFF

Submittal Drawings

Project: Brampton Victoria Arena RG 4000
Tag: AHU-1
PO#: 719196
Date: April 28, 2025
Agent HTS Canada

Revision #	Revision Detail	Date Revised	Revised By
0	Initial preparation based on Quote#: 5597 - Rev. 8	2025-03-20	CR
1	GFCI & Lights on single circuit; connections & Disconnect on access side; 12" MERV 13 final filter; increased length	2025-04-28	CR

JOB STATUS

■ **HELD FOR APPROVAL**

Equipment will not be scheduled until approved drawings are returned to Tempeff

CURRENT LEAD TIME FROM RELEASE: 20-22 weeks*
*This is the current lead time only and is subject ot change without notice.

If immediate release is required, notify Tempeff in writing

☐ **RELEASE TO PRODUCTION**

Scheduled shipment from factory: _____

UNITS ARE SHIPPED SPLIT, WIRING RECONNECTION ON SITE REQUIRED – SEE PROPOSAL DRAWING FOR SPLIT LOCATIONS

675 Washington Ave. Winnipeg, MB R2K 1M4 Phone: (204) 783-1902

675 Washington Ave, WINNIPEG, MB CANADA R2K 1M4 PH: (204) 783-1902

QUOTE #: 5597 - 8 (Chris)

Project	Brampton Victoria Arena				Line In						GFCI & LED Lights		
Tag(s)	AHU-1				Voltage	575-3-60					Voltage	120-1-60	
Agent	HTS Canada				FLA	13.2	AMPS				FLA	20.20	AMPS
Job Number	0				AMPACITY	16	AMPS						
PO#	719196				MAX.NON-TIME DELAY FUSE	30	AMP						
					MAX.TIME DELAY FUSE	25	AMP						
					MAX.CIRCUIT BREAKER	20	AMP				MAX.CIRCUIT BREAKER	20	AMPS
Short Circuit Current Rating:	5KA				MIN.WIRE SIZE	#12	AWG				MIN.WIRE SIZE	#12	AWG

Model

RG 4000

Approximate Weight	3318 KG	7333 LBS	**Outdoor**
Heaviest Shipping Section	1410 KG	3117 LBS	
Approx. Curb Weight	273 KG	602 LB	

Fans

Supply air fan: ANPL 18 **X1**

Exhaust air fan: ANPA 16 **X1**

Technical data

Input data	Sup. air	Exh. air
Total volume (SCFM)	4238	4238
HX Air volume (SCFM)	4238	4238
Filter	Merv 10 (2")	Merv 10 (2")
Final Filter	Merv 13 (12" Cartridge)	-
External pressure drop (in. W.C)	2.30	1.50

Output data		
Filter air velocity (fpm)	469	469
Design pressure drop filter (in W.C)	1.60	0.50
HX air velocity (fpm)	437	437
Pressure drop heat exch. (in W.C)	0.64	0.64
Pressure drop HX filter (in W.C)	0.00	0.00
Heating Coil 1 Pressure Drop (in W.C)	0.00	0.00
Heating Coil 2 Pressure Drop (in W.C)	0.00	0.00
Cooling Coil Pressure Drop (in W.C)	0.00	0.00
Auxillary Pressure Drop (in W.C)	1.38	0.00
Backdraft dampers pressure drop (in W.C)	0.00	0.00
Louver/Hood pressure drop (in W.C)	0.00	0.00
Intake/discharge pressure drop (in W.C)	0.02	0.02
Static pressure (in W.C)	5.94	2.66

Fan speed (rpm)	2350	2158	Per fan
Max (rpm)	3025	3700	
Fan efficiency (%)	74.1	72.96	
Required BHP	5.56	2.83	
Motor efficiency (%)	91.7	89.5	
Motor power rating (hp)	7.50	5.00	
Motor RPM	1765	1755	
Motor Operating Frequency (Hz)	80	74	

Power and energy demand

Input data	Calculated			
	Winter		Summer	
	DB	WB	DB	WB
Design outdoor temp. (°F)	-5.80	-5.8	86.0	73.4
Desired supply air temp. winter (°F)				
Exhaust air temperature (°F)	72.0	54.0	75.0	63.0
Output data				
Efficiency (across unit) (%)	90.9%	70.0%	76.7%	0.0%
Supply air temp. after unit (°F)	64.94	48.5	77.6	71.0
Recovered energy across unit (BTUH)	323,766	64,635	-38,604	0

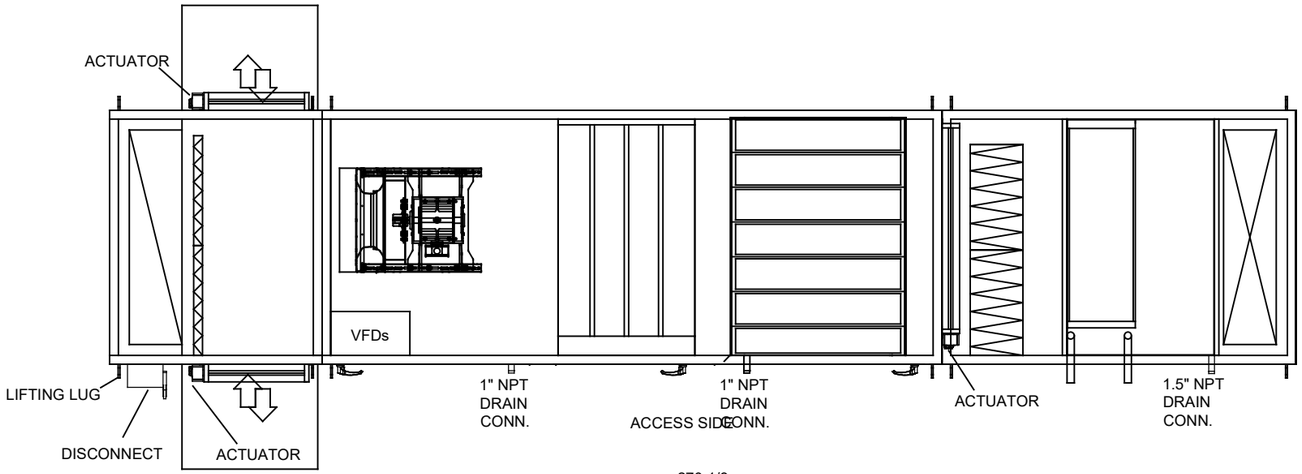
Standard Features

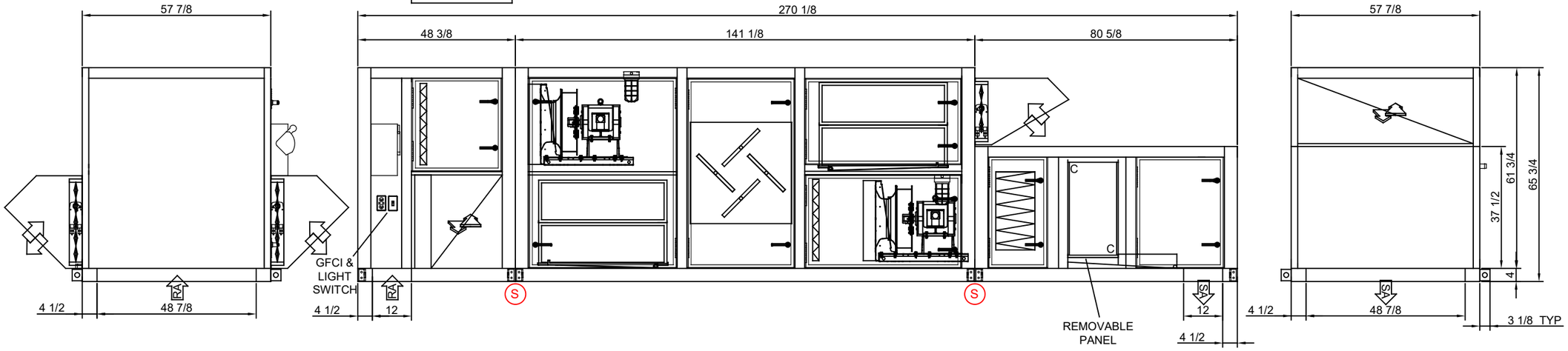
2" Foam injected panels
All sections come with hinged access doors and locking latches
Multi-Damper switchover section complete with actuators
SS Drain Pans under Heat Exchanger(s) w/ 1"NPTConnections
Galvanized Heat Exchanger Frames
Galvanized damper blades, damper rods and axles
18Ga Roof & Gutters
Hoods

Additional Features

Exterior Casing: 24 Ga G90 Galv
Interior Casing: 24 Ga G90 Galv
7.5 HP WEG TEFC Premium Eff. 4 Pole 213T Frame
5 HP WEG TEFC Premium Eff. 4 Pole 184T Frame
SA Drive: FC-102-P5K5-T6-131H9346
RA Drive: FC-102-P4K0-T6-131G1421
1in. Seismic Spring Isolation
SA Pre-Filter: Dafco Merv 10 (2") 400 HC
SA Final Filter: Dafco Merv 13 (12" Cartridge) Fiberglass Rigid Cell
RA Pre-Filter: Dafco Merv 10 (2") 400 HC
Chilled Water Coil
Connections on Access side
Insulated Shutoff Dampers with 2 position Belimo actuator
Single point power
Fused Disconnect
Low Limit
4" 10Ga Baseframe
18" Roof Curb
Multiple lights factory wired to single switch, 120V BY OTHERS
Each recepticle on individual circuit, 120V BY OTHERS
Piezo Ring & Pressure Transducer on all fans
Inlet Guard on all fans
Wheel guard on all fans
Dirty filter switch
Temperature sensor
Spare set of filters
BACNet controller
Field mounted low-pressure transmitter for SA & RA fan tracking
0-10VDC Heating control
0-10VDC Cooling control

Cells:
2- 12 x 200mm x 330mm
2- 2 x 166mm x 330mm





UNIT INCLUDES FLAT ROOF WITH SPLIT CAPS (NOT SHOWN)

Ⓢ SPLIT FOR SHIPMENT

NOTES:
1. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED RECOMMENDED CLEARANCE = SECTION SIZE.
2. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.

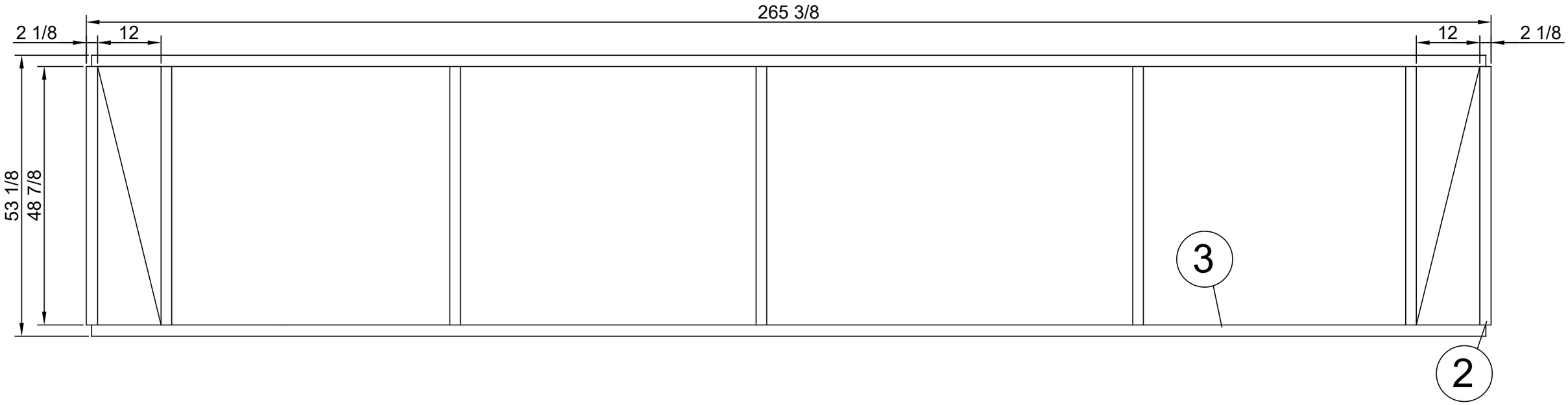
FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE

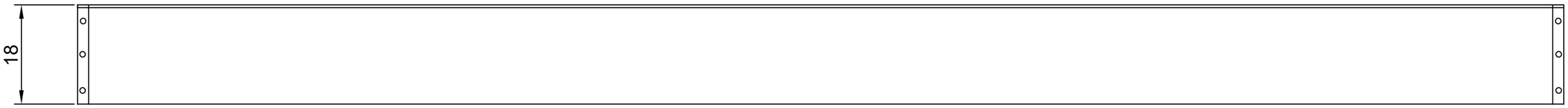
TEMPEFF
675 Washington Ave, Winnipeg, MB
Tel:(204) 783-1902

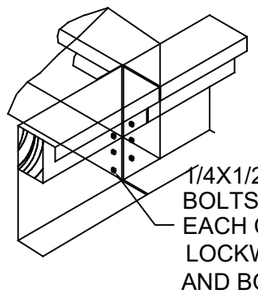
DRAWN BY	DATE	SCALE	MODEL	REV
CR	28-APR-25	NTS	RG 4000 Type 1	A

PROJECT NAME: Brampton Victoria Arena

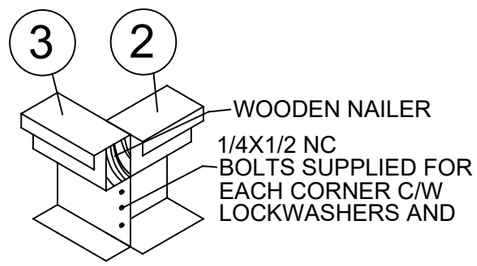
Unit Tag: AHU-1







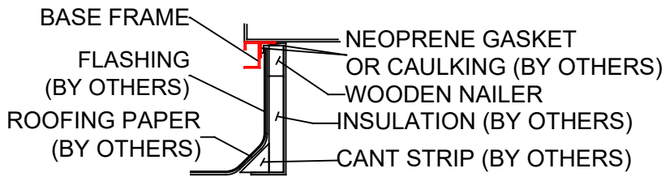
CENTER BRACING
BOLTING ASSEMBLY DETAIL #2



CORNER BOLTING DET. #1

2 CURB ENDS

3 CURB SIDES



ROOF CURB CROSS SECTION DETAIL AA

NOTES:
1. FIELD ASSEMBLED BY OTHERS.
2. SEE CUSTOMER DWG
3. ENSURE THAT THE 18" INCH CURB HEIGHT IS IN COMPLIANCE WITH LOCAL CODES.
4. RIGHT HAND CURB SHOWN/LEFT HAND OPPOSITE.

DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE.

TEMPEFF
675 Washington Ave, Winnipeg, MB
Tel:(204) 783-1902

DRAWN BY	DATE	SCALE	MODEL	REV
CR	28-APR-25	NTS	RG 4000 Curb	A

PROJECT NAME	
Brampton Victoria Arena	Unit Tag AHU-1

HOT WATER COIL REPORT

5055 Taylor Kidd Blvd
Millhaven, Ontario
Canada,
K0H 1G0
T: (613) 544-2200
F: (613) 544-7779
E-Mail: info@directcoil.com
Website: directcoil.com

Company:	HTS Canada	**Date:**	2025-02-04, 2:02:34 p.m.
Contact:	Chris Ritchot	**Reference:**	
Tel:		**PreparedBy:**	Jamie Loewen
Fax or Email:		**Project Name:**	Brampton Victoria arena

Coil Tag: AHU-1
Coil Model Number: 5W-10-28.5-08-44.0-13
Hand: Right

Physical Data

Number Of Coils	1	Tube Diameter	5/8 1.50 x 1.299
Fin Height (Per Coil)	28.500"	Tube Turbulators	Yes
Fin Length (Per Coil)	44.000"	Tube Material	Copper - 0.025 Plain
Number Of Rows Deep	10	Fin Material	Aluminum 0.010
Circuit Ratio	0.68	Fin Style	Corrugated
Fins Per Inch	8	Connection Type	MPT Steel
Supply Connection Size	3"	Coil Weight (Per Coil)[operating]	428 [539] lb
Return Connection Size	3"	Coil Internal Volume (Per Coil)	12.82 gal
Header Material	Copper (L)	Casing Style	Standard
		Casing Material	Galvanized Steel 16 gauge

Air Data

Total Air Flow (All Coils)	4,238 SCFM
Air Flow (Per Coil)	4,238 SCFM
Face Velocity	487 FPM
Altitude	0.00 FT
Entering Dry Bulb	60.00 °F
Leaving Dry Bulb	71.61 °F
Air Pressure Drop	0.65 inWG
Fouling Factor	0.0000 ft² °F h/Btu

Fluid Data

Fluid Type	Propylene Glycol
Fluid Ratio	42 %
Entering Fluid Temp	73.50 °F
Leaving Fluid Temp	69.68 °F
Fluid Flow Rate Per Coil (Total)	30.79 GPM (30.79)
Tube Velocity	2.73 FPS
Fluid Pressure Drop	13.66 ftWG
Fouling Factor	0.0000 ft² °F h/Btu

Capacity

Capacity Per Coil (Total)	53.78 MBH (53.78)

Notes:

Coil is outside the scope of AHRI Standard 410.

Version: 1.0.1 (web version)

CHILLED WATER COIL REPORT

5055 Taylor Kidd Blvd
Millhaven, Ontario
Canada,
K0H 1G0
T: (613) 544-2200
F: (613) 544-7779
E-Mail: info@directcoil.com
Website: directcoil.com

Company:	HTS Canada	**Date:**	2025-02-04, 2:02:34 p.m.
Contact:	Chris Ritchot	**Reference:**	
Tel:		**PreparedBy:**	Jamie Loewen
Fax or Email:		**Project Name:**	Brampton Victoria arena

Coil Tag: AHU-1
Coil Model Number: 5W-10-28.5-08-44.0-13
Hand: Right

Physical Data

Number Of Coils	1	Tube Diameter	5/8 1.50 x 1.299
Fin Height (Per Coil)	28.500"	Tube Turbulators	Yes
Fin Length (Per Coil)	44.000"	Tube Material	Copper - 0.025 Plain
Number Of Rows Deep	10	Fin Material	Aluminum 0.010
Circuit Ratio	0.68	Fin Style	Corrugated
Fins Per Inch	8	Connection Type	MPT Steel
Supply Connection Size	3"	Coil Weight (Per Coil)[operating]	428 [540] lb
Return Connection Size	3"	Coil Internal Volume (Per Coil)	12.82 gal
Header Material	Copper (L)	Casing Style	Standard
		Casing Material	Galvanized Steel 16 gauge

Air Data

Total Air Flow (All Coils)	4,238 SCFM
Air Flow (Per Coil)	4,238 SCFM
Face Velocity	487 FPM
Altitude	0.00 FT
Entering Dry Bulb	77.80 °F
Entering Wet Bulb	67.60 °F
Leaving Dry Bulb	55.00 °F
Leaving Wet Bulb	54.97 °F
Air Pressure Drop	1.38 inWG
Condensate Rate (Per Coil)	56.17 lb/h
Fouling Factor	0.0000 ft² °F h/Btu

Fluid Data

Fluid Type	Propylene Glycol
Fluid Ratio	42 %
Entering Fluid Temp	44.00 °F
Leaving Fluid Temp	56.00 °F
Fluid Flow Rate Per Coil (Total)	30.82 GPM (30.82)
Tube Velocity	2.74 FPS
Fluid Pressure Drop	13.93 ftWG
Fouling Factor	0.0000 ft² °F h/Btu

Capacity

Total Capacity Per Coil (Total)	167.87 MBH (167.87)
Sensible Capacity Per Coil (Total)	106.86 MBH (106.86)
Latent Capacity Per Coil (Total)	61.01 MBH (61.01)

Notes:

Coil is outside the scope of AHRI Standard 410.

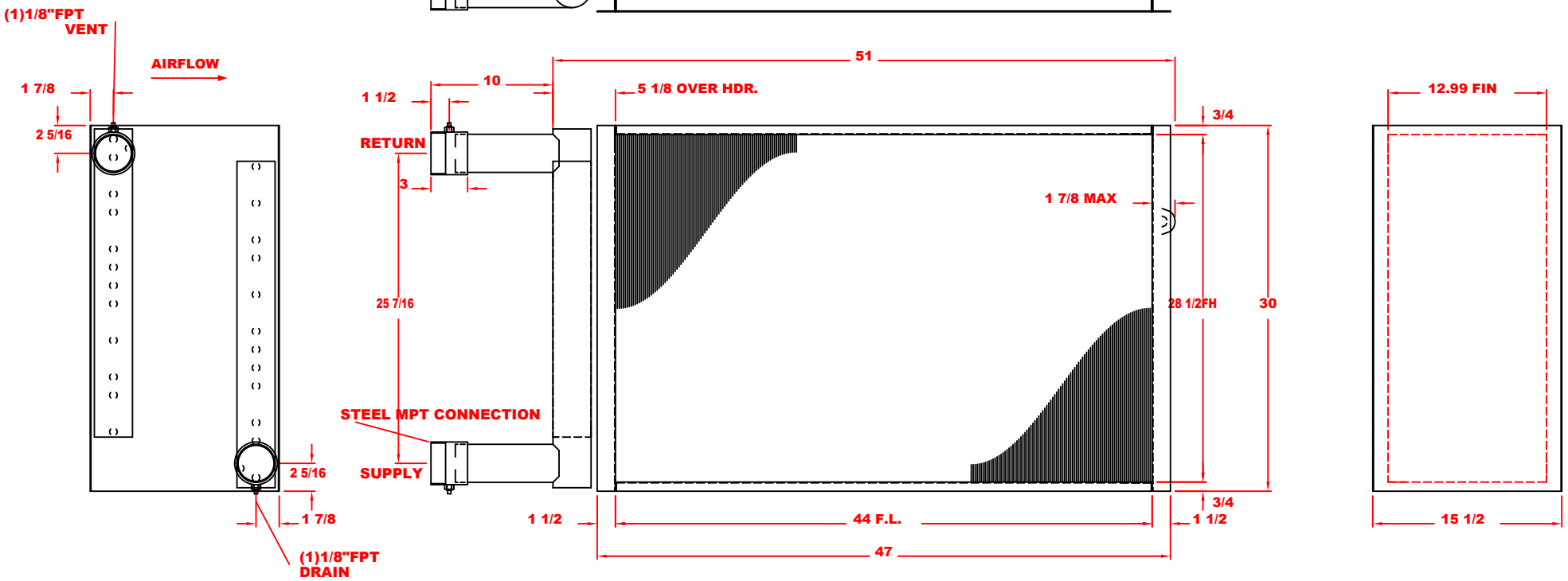
Version: 1.0.1 (web version)

COIL DETAILS

MODEL NUMBER: 5W-10-28.5-08-44.0-13 HANDING: RH
FINS: 0.01" AL CORR @ 8 PER INCH
TUBING: 5/8 OD X .025 CU ON 1.5x1.299 CTRS
CASING: GALV 16 GA.
HEADER: 1+2 - 3.125" O.D. TYPE 'L' COPPER
CONNS: 1/8"FPT VENT + 1/8"FPT DRAIN
CONNS: STEEL MPT CONNECTION 3"
ROWS DEEP: 10 TUBES HIGH: 19
CIRCUITS: 13
VERSION: CoilLeary_MOL v 1.0.486

COIL WITH TURBULATORS

GALVANIZED STEEL CASING



CSA FILE NO.: 242755 MODEL NO.: DC6
UL FILE NO.: SA 32693 COIL TYPE: HOT WATER

DIRECT COIL INC.
5055 TAYLOR KIDD BLVD., MILLHAVEN, ONT., K0H 1G0

PROJECT NAME-ITEM: Brampton Victoria arena-01R
ITEM TAG: AHU-1

DATE	ENGINEER	DESIGNER	APP'D BY
02/04/2025			???

CUSTOMER: HTS Canada
DWG. NO.: 01R

GENERAL DESCRIPTION OF FUNCTION

A Dual Core™ air handling unit comes with a regenerative cyclic dual core heat exchanger. It includes a supply and an exhaust fan (both optional) and two cores filled with specially corrugated 0.7 mm thick aluminium plates which act as heat accumulators. In between the cores is a patented damper section which changes over every 60 seconds to periodically direct warm air through one of the two cores while outside air gains heat from the other. Before each fan is a filter section (optional) to filter the air. Heat recovery is automatically activated when called upon.

The unit may also be used for cooling recovery. If the outside temperature is higher than the indoor the damper cycling starts, enabling cooling recovery. This function reduces the demand for mechanical cooling.

In the off position, the dampers all close against outdoor air thereby reducing infiltration losses through the unit.

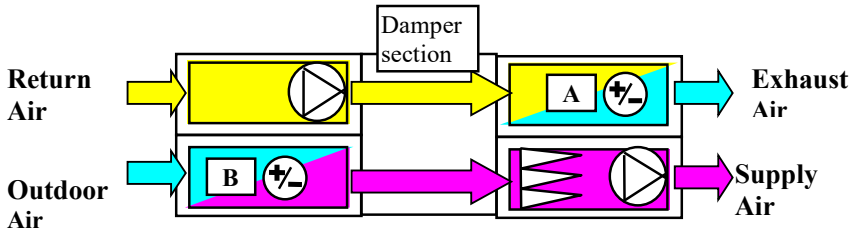
The extremely high temperature efficiency (90% +/- 5%) gives a supply air temperature just a few degrees below room temperature which in many cases allow systems to be designed without additional heating coils.

The inspection doors to fan and damper sections have lockable handles, which contributes to high security.

Principle of function

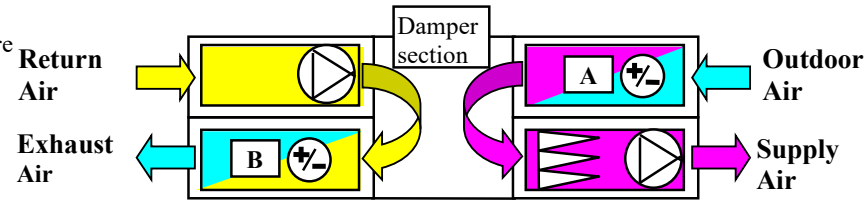
SEQUENCE 1
Exhaust air charges Core A with heat

Core B discharges heat to supply air



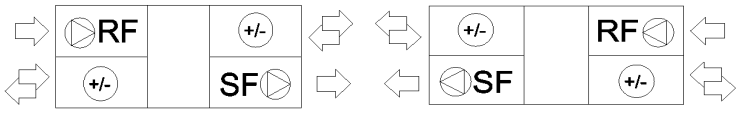
SEQUENCE 2
Exhaust air charges the Core B with heat

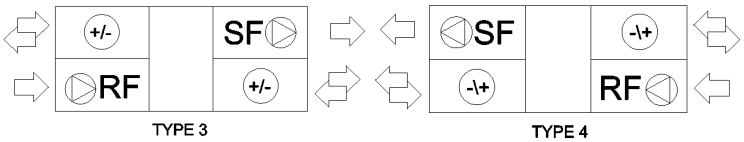
Core A discharges heat to supply air



Dampers change sequence every 60 sec.

Available configurations





Units are normally one of these configurations
Supply and exhaust air connection may also be on the backside

RG 1000-18000 Units

Sequence of Operation, BACnet

ORD

A. Testing Changeover Damper Actuators:

1. The damper motors can be tested by using the S1 switch in the damper control panel.
2. The normal position of the S1 switch is in position 0, the actuators follow the Remote or Local control signals.
3. If S1 is in position 1 the damper actuator M7 runs continuously, and in position 2 actuator M6 runs continuously. Unit will go into Damper Alarm mode if switch is left in either position for more than 5 actuator rotations.
    a. Clear Damper Alarm by resetting controller; see instructions in Additional Notes. **Follow the PLC reset procedure to prevent damage to the controller**.

B. Remote Control: Operation of the changeover damper with central control system (BMS) (for Cooling Recovery in summer, OAT sensor option must be purchased at time of order).

1. When the S2 switch is in position 2 (Remote) the changeover damper is controlled by the central control system (BMS) through physical contacts or BACnet commands.
2. When Enable contact is closed, warm-up sequence will start (see Additional Notes), shutoff dampers are not enabled and remain closed. After the warm-up sequence, the changeover damper section starts normal operation as listed below and the fans remain enabled. The shutoff dampers are enabled.
3. The changeover damper is now controlled by the internal thermistors. Supply Air (SAT) is set to 59 °F (15 °C), Return air (RAT) is set to 68 °F (20 °C), and Outside air (OAT) (if equipped) is set to 80 °F (27 °C).
    a. Press “OK” button to access controller main menu and navigate to the “ERV” page to adjust setpoints.
4. The sequence will now be:
    a. If return air < 68 °F (20 °C), heat recovery (cycling every 60 seconds).
    b. If return air > 68 °F (20 °C) and supply air > 59 °F (15 °C), free cooling (cycling every 3 hours).
    c. If return air > 68 °F (20 °C) and supply air < 59 °F (15 °C), heat recovery until supply air > 59 °F (15 °C) then it will revert to free cooling mode.
    d. If outdoor air > 80 °F (27 °C) then the unit will start cooling recovery (cycling every 60 seconds) until the outside air < 80 °F (27 °C) then it will revert to free cooling mode (if equipped with OAT sensor).

5. Recirc contact closed, changeover damper opens in both directions, shutoff dampers are disabled and close; 100% return air re-circulated back into supply air. Recirc contact opens, shutoff dampers are enabled, changeover damper remains open for 1 minute to allow shutoff dampers to open. After 1 minute delay, all dampers resume normal operation.
6. Enable Contact open, the Fan Interlocks are de-energized, disabling the fans while enabling the changeover damper to continue to cycle and the shutoff dampers to remain open for 1 minute, to prevent changeover damper damage; “Fan Ramp Down” displayed on controller’s screen.
7. Should the system fall below a low limit setpoint for 5 min, the unit shuts down, as described in B.6.
    a. Low limit alarm signal to BMS will be enabled (dry contact & BACnet signal).
    b. The low limit requires the unit turned off and then back on (remove Enable signal and then re-enable or turn S2 switch to Off and then back).

C. Local Control: Operation of the changeover damper without full central control system (BMS) (for Cooling Recovery in summer, OAT sensor option must be purchased at time of order).
    1. When the S2 switch is in position 1 (Local), warm-up sequence will start (see Additional Notes), shutoff dampers are not enabled and remain closed. After the warm-up sequence, the changeover damper section starts normal operation as listed below and the fans remain enabled. The shutoff dampers are enabled.
    2. The changeover damper is now controlled by 3 thermistors. Supply air (SAT) is set to 59 ^{o}F (15 ^{o}C), Return air (RAT) is set to 68 ^{o}F (20 ^{o}C) and Outdoor air (OAT) is set to 80^{o}F (27^{o}C).
        a. Press “OK” button to access controller main menu and navigate to the “ERV” page to adjust setpoints.
    3. The sequence will now be:
        a. If return air < 68 ^{o}F (20 ^{o}C), heat recovery (cycling every 60 seconds).
        b. If return air > 68 ^{o}F (20 ^{o}C) and supply air > 59 ^{o}F (15 ^{o}C), free cooling (cycling every 3 hours).
        c. If return air > 68 ^{o}F (20 ^{o}C) and supply air < 59 ^{o}F (15 ^{o}C), heat recovery until supply air > 59 ^{o}F (15 ^{o}C) then it will revert to free cooling mode.
        d. If outdoor air > 80 ^{o}F (27 ^{o}C) then the unit will start cooling recovery (cycling every 60 seconds) until the outside air < 80 ^{o}F (27 ^{o}C) then it will revert to free cooling mode (if equipped with OAT sensor).
    4. When the S2 switch is in position 0 (Off), the Fan Interlocks are de-energized, disabling the fans while enabling the changeover damper to continue to cycle and the shutoff dampers to remain open for 1 minute, to prevent changeover damper damage; “Fan Ramp Down” displayed on controller’s screen.
    5. Should the system fall below a low limit set point for 5 min, the unit shuts down, as described in C.4.
        a. Low limit alarm signal to BMS will be enabled (dry contact & BACnet signal).
        b. The low limit requires the unit turned off and then back on (turn S2 switch to Off and then back).

D. BACnet (if equipped) – * Optional* BACnet/IP (ethernet port) or BACnet/MSTP (RS-485 port) connectivity; unit may operate via BACnet or Standalone.

1. Press “OK” button to access controller main menu and navigate to the “BACnet” page to access the “RS-485” or the “Ethernet” pages to adjust communication settings. **Power to the controller must be cycled Off & On to permanently save the changes**, see instructions in Additional Notes.

E. Changeover Damper Alarm:

1. Should an error occur in the function of the changeover damper, the damper will be disabled.
2. Error code is displayed on controller’s screen and Red LED light is flashing.
3. The Fan Interlocks are de-energized, disabling the fans.
4. Damper alarm signal to BMS will be enabled (dry contact & BACnet signal).
5. After 1 minute delay, shut-off dampers close.
6. To reset damper alarm, controller’s power must be cycled off-on, see instructions in Additional Notes.

F. Duct Pressure Transmitters:

1. SA & RA duct pressure transmitters (provided by Tempeff; installed and wired by others) send a 0-10Vdc to the unit’s Controller and calculated inches W.C. value is sent to BMS via BACnet communication. The signal increases as duct pressure differential increases.
2. If the duct differential pressure (field-adjustable) surpasses the high setpoint or falls below the low setpoint for two minutes after the system has stabilized, the Controller will send an alarm signal to the BMS via BACnet communication. The unit will shut down when there is a high-pressure alarm.
    a. Press “OK” button to access controller main menu and navigate to the “Duct Pressure” page to adjust pressure alarm setpoints and timer.
    b. The pressure alarm requires the unit to be turned off and then back on (turn S2 switch to Off and then back).

G. Fans, Heating and Cooling:

1. The Controller starts and stops the fans.
2. The SA and RA fan speeds are controlled by 0-10Vdc signal to VFDs from the Controller to maintain required duct pressure setpoint of 1.0” W.C. (250PA) (field adjustable) as measured by the SA & RA pressure transmitters (see section F).
    a. At startup, both SA and RA fans ramp up to the high design speed setpoint (in Hz, field-adjustable) and operate at this speed for 3 minutes to allow the system to stabilize. After the 3-minute period, the SA & RA pressure transmitter outputs are used to regulate fan speeds.
        i. Press “OK” button to access controller main menu and navigate to the “Fan status” page to adjust the starting setpoints.
    b. VFD operation can be monitored via BACnet communication (see wiring diagrams).

3. Heating will be controlled from the unit's Controller and Discharge Air Temperature Sensor (DAT) (provided by Tempeff; installed and wired by others). Heating will only be operational when the outdoor air temperature is below the Heating Ambient Lockout setpoint of 65 °F (18 °C) and the return air temperature is below the changeover setpoint of 72 °F (22 °C) (field adjustable). Heating setpoint is set to 72 °F (22 °C) (field adjustable).
    a. On call for heating, the controller's output relay #7 closes and heating is enabled
    b. Heat modulation is controlled by 0-10Vdc signal from the controller's modulating output #5, to maintain discharge temperature setpoint.
    c. Press "OK" button to access controller main menu and navigate to the "Heat" page to adjust various setpoints. Setpoints can also be accessed via BACnet communication.
4. Cooling will be controlled from unit's Controller and Space Air Temperature Sensor (SPT) (provided by Tempeff; installed and wired by others). Cooling will only be operational when the outdoor air temperature is above the Cooling Ambient Lockout setpoint of 45 °F (7 °C) and the return air temperature is above the changeover setpoint of 72 °F (22 °C) (field adjustable). Cooling setpoint is set to 55 °F (12.8 °C) (field adjustable).
    a. On call for cooling, the PLC controller's output relay #6 closes and cooling is enabled.
    b. Cooling modulation is controlled by 0-10Vdc signal from Controller modulating output #6 to maintain discharged temperature setpoint.
    c. Press "OK" button to access controller main menu and navigate to the "Cool" page to adjust various setpoints. Setpoints can also be accessed via BACnet communication
5. Any type of supplemental heating or cooling of the supply air will be controlled by others (central control system).

H. Additional Notes:

1. If fire alarm contacts are used, remove the factory installed jumper from terminals 101 & 150 and connect the Normally Closed fire alarm contact. If the contact opens during operation, the unit will shut down and dampers close.
2. Cometer Differential Pressure Transmitters included, a 0-10Vdc reading is sent to unit's Controller and a calculated CFM value is sent to BMS via BACnet communication. The signal increases as the pressure differential increases. Initial set-up of the variable pressure transmitter will be done by Tempeff and a final set-up will have to be completed on site, as per Tempeff instructions, with clean filters and a completely assembled system.
3. SA Pre & Final Dirty filter and RA Dirty filter sensors included, when filter reach a set pressure differential the switch will send a signal to BMS through BACnet communication.
4. Additional temperature sensors provided. Return Air (RAT2) to measure temperature before the RA motor, Supply Air (SAT2) to measure temperature after the SA motor and Discharge Air (DAT, shipped loose) to measure duct temperature. All temperature readings can be monitored by BMS through BACnet communication.

5. Morning warm-up sequence: When unit is enabled, the changeover damper section opens in both directions, the Fan Interlocks are energized, enabling the fans to start. After the warm-up sequence, there is an additional 1-minute delay before the changeover dampers resume normal operation.
    a. Shutoff dampers: At the end of the warm-up sequence, there is a 1-minute delay to allow the shutoff dampers to open and prove open. During this transition period, changeover damper remains open in both directions and fans remain enabled. After the transition period, warm-up sequence is disabled, and changeover damper resumes normal operation. If the shutoff damper motor end switches have not proved open, the Fan Interlocks are de-energized until the end switches make.
    b. Morning warm-up duration is set to 0 minutes from the factory unless duration is specified at time of order (field adjustable, 0 to 60 minutes). Typical duration is 30 minutes.
    c. Press “OK” button to access controller main menu and navigate to the “ERV” page to adjust morning warm-up duration timer.
6. Clear Damper Alarm by resetting controller. **Follow the PLC reset procedure to prevent damage to the controller.**
    a. PLC reset procedure: Open 24Vdc fuse holder supplying power to 101 terminals, then open fuse holder F2, and finally open fuse holder FAF1 to controller power. Wait 5 seconds. Close fuse holder FAF1. While controller is re-booting, close 24Vdc fuse holder supplying power to 101 terminals and then close fuse holder F2. Once re-boot is complete, unit can resume normal operation.
7. Controller LED code:
    a. Top LED, solid Green – Controller is powered.
    b. Second LED, flashing Red – Damper alarm.
    c. Second LED, solid Red – Low Limit alarm (or other controller monitored alarms).
    d. Third LED, flashing Yellow – Energy Recovery mode.
    e. Third LED, solid Yellow – Recirc mode or Morning Warm-up.
    f. Fourth LED, flashing Green – Free Cooling Mode.

Note: In all cases ensure that changeover damper section is first on and last off to prevent damage to changeover damper section.

Danfoss Variable Frequency Drive, FC 101-102

Programming 0-10Vdc Signal

ORD

On initial start-up, or after resetting to factory parameters, follow the Set-Up Wizard to enter motor and supply information.

P3-02 – 0.0	Minimum Reference (Hz)
P3-03 – 90.0	Maximum Reference (Hz) – Supply Air VFD
P3-03 – 90.0	Maximum Reference (Hz) – Return Air VFD
P3-15 – 1	Ref 1 Source (Analog Terminal 53) (default)
P4-12 – 0.0	Speed Low Limit (Hz) (default)
P4-14 – 90.0	Speed High Limit (Hz)
P4-19 – 90.0	Max Output (HZ) (match to Speed High Limit)
P5-10 – 8	Terminal 18 DI (Start)
P5-11 – 0	Terminal 19 DI (no operation)
P5-12 – 0	Terminal 27 DI (no operation)
P5-13 – 0	Terminal 29 DI (no operation)
P6-14 – 0.0	Terminal 53 Low Reference @ 0Vdc (Hz) (default)
P6-15 – 90.0	Terminal 53 High Reference @ 10Vdc (Hz) – Supply Air VFD (match to Maximum Reference S/A VFD)
P6-15 – 90.0	Terminal 53 High Reference @ 10Vdc (Hz) – Return Air VFD (match to Maximum Reference R/A VFD)
P8-30 – 5	Communication Protocol (BACnet)
P8-31 – 1	Address – Supply Air VFD
P8-31 – 2	Address – Return Air VFD
P8-32 – 2	Baud Rate - 9600

Press “Auto/On” button to activate the drive

P14-22 – 2 Reset to factory parameters (after pressing OK, cut off main power and wait until LCD display turns off, re-apply main power).

Note: In case of a fire-alarm the unit shuts down and disables the VFD interlock relays (only in AUTO mode). To shut down the VFD in HAND and AUTO, replace factory-jumper on safety interlock terminals 12&27 with BMS fire alarm dry contact.

!! Maximum Reference (Hz) = (maximum fan RPM / maximum motor RPM) * 60Hz **!!**

Motor Operating Frequencies:

SA; 4238 cfm @ 5.94” W.C. = 80 Hz **RA; 4238 cfm @ 2.66” W.C. = 74 Hz**

BACnet Points List ORD Sample Only

Name	Type	Instance	Read/Write	Default	Unit	Description
Bcn_iEe_SAT_setpoint	AV	0	R/W	59	°F/C	SAT heat recovery setpoint in degF/C
Bcn_iEe_RAT_setpoint	AV	1	R/W	68	°F/C	RAT heat recovery setpoint in degF/C
Bcn_iEe_OAT_setpoint	AV	2	R/W	80	°F/C	OAT cooling recovery setpoint in F/C
Bcn_iSts_SAT1display	AV	3	R		°F/C	SAT temperature converted to degF/C
Bcn_iSts_RAT1display	AV	4	R		°F/C	RAT temperature converted to degF/C
Bcn_iSts_OATdisplay	AV	5	R		°F/C	OAT temperature converted to degF/C
Bcn_iSts_DATdisplay	AV	6	R		°F/C	DAT temperature converted to degF/C
Bcn_iSts_SAT2display	AV	7	R		°F/C	Post SA motor temperature converted to degF/C
Bcn_iSts_RAT2display	AV	8	R		°F/C	Pre RA motor temperature converted to degF/C
Bcn_iSts_SA_VFD_Spt	AV	9	R/W	77	Hz	SA VFD Starting Setpoint in HZ
Bcn_iSts_RA_VFD_Spt	AV	10	R/W	74	Hz	RA VFD Starting Setpoint in HZ
Bcn_iSts_SA_Duct_Pressure_Spt	AV	11	R/W	1.0	W.C.	SA Duct Pressure Setpoint in W.C.
Bcn_iSts_RA_Duct_Pressure_Spt	AV	12	R/W	1.0	W.C.	RA Duct Pressure Setpoint in W.C.
Bcn_iSts_SA_Duct_Pressure	AV	13	R		W.C.	SA Duct Pressure Output in W.C.
Bcn_iSts_RA_Duct_Pressure	AV	14	R		W.C.	RA Duct Pressure Output in W.C.
Bcn_uiSts_SA_FanCFM	AV	15	R		cfm	SA fan airflow in CFM
Bcn_uiSts_RA_FanCFM	AV	16	R		cfm	RA fan airflow in CFM
Bcn_xEe_Metric	BV	0	R/W	FALSE		TRUE: degC; FALSE: degF for setpoints & display temps
Bcn_xSts_MIB5	BV	1	R			TRUE: vertical damper open; FALSE: dmp closed
Bcn_xSts_MIB6	BV	2	R			TRUE: horizontal damper open; FALSE: dmp closed
Bcn_xSts_BACnetEnable	BV	3	R/W	FALSE		BACnet enable
Bcn_xSts_BACnetHeatRec	BV	4	R/W	FALSE		BACnet heat recovery
Bcn_xSts_BACnetRecirc	BV	5	R/W	FALSE		BACnet recirculation
Bcn_xSts_SA_Blower	BV	6	R			SA blower enable
Bcn_xSts_RA_Blower	BV	7	R			RA blower enable
Bcn_xSts_DamperAlarm	BV	8	R			Damper alarm
Bcn_xSts_MIB1alarm	BV	9	R			MIB1 limit switch alarm
Bcn_xSts_MIB2alarm	BV	10	R			MIB2 limit switch alarm
Bcn_xSts_MIB3alarm	BV	11	R			MIB3 limit switch alarm
Bcn_xSts_MIB4alarm	BV	12	R			MIB4 limit switch alarm
Bcn_xSts_MIB5alarm	BV	13	R			MIB5 limit switch alarm
Bcn_xSts_MIB6alarm	BV	14	R			MIB6 limit switch alarm
Bcn_xSts_MIB5_0alarm	BV	15	R			MIB5 limit switch alarm before startup
Bcn_xSts_MIB6_0alarm	BV	16	R			MIB6 limit switch alarm before startup
Bcn_xSts_M6alarm	BV	17	R			Actuator M6 alarm
Bcn_xSts_M7alarm	BV	18	R			Actuator M7 alarm
Bcn_xSts_LowLimit	BV	19	R			Low limit
Bcn_xSts_Shutoff_Enable	BV	21	R			Shutoff damper relay R5 enabled
Bcn_xSts_Shutoff_ProofOpen	BV	22	R			Shutoff damper proof of open
Bcn_xSts_SA_DirtyPreFilter	BV	24	R			SA Dirty Pre-filter Switch
Bcn_xSts_SA_DirtyFinalFilter	BV	25	R			SA Dirty Final Filter Switch
Bcn_xSts_RA_DirtyFilter	BV	26	R			RA Dirty Filter Switch
Bcn_xSts_SA_Duct_HighPress_Alarm	BV	28	R			SA Duct High Pressure Alarm
Bcn_xSts_SA_Duct_LowPress_Alarm	BV	29	R			SA Duct Low Pressure Alarm
Bcn_xSts_RA_Duct_HighPress_Alarm	BV	28	R			RA Duct High Pressure Alarm
Bcn_xSts_RA_Duct_LowPress_Alarm	BV	29	R			RA Duct Low Pressure Alarm

Notes:

1) Object name containing "Ee" indicates value stored in EEPROM non-volatile memory

2) Use BACnet points listed above to control the unit. Other points can be discovered but are disabled on this unit.

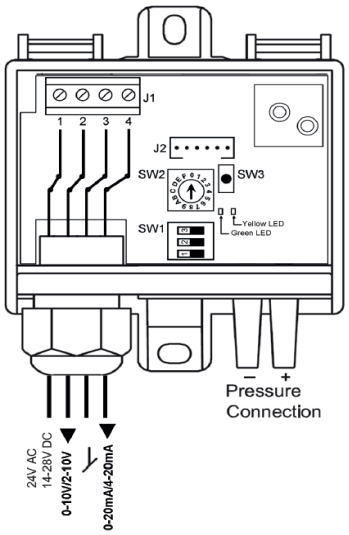
Electronic Cometer Setup Instructions - Step by Step

ORD XXXX

1 Mount the Controller.

2 Connect the Pressure Tubes.

- \- Low Connects To Piezo Ring
- \+ High Connects To Inlet Cabinet



3 Wire Terminal Lugs

- 1 24 AC or 14-28 V DC
- 2 0 - 10 V Output
- 3 Neutral
- 4 0 - 20 mA Output

4 Set SW1 DIP Switches

A DIP 1 for Output

On 2 to 10 V or 4 to 20 mA
Off 0 to 10 V or 0 to 20 mA

Output	DIP1	Terminal
0-10 V	Off	Terminal 2
2-10 V	On	
0-20 mA	Off	Terminal 4
4-20 mA	On	

B DIP2 for Damping Times

OFF 0.4 Second Samples
ON 10 Second Samples

4 Set SW1 DIP Switches (continued).

B DIP2 for Damping Times

Damping	DIP2
0,4 Sec	Off
10 Sec	On

C DIP 3 for Flow vs Pressure

OFF Displays Pressure in Pascal
ON Displays Volume in CFM

	DIP3
Pressure	*Off*
Volume	*On*

5 Disregard SW2 & SW3 Switches.

6 What is the Target Display?

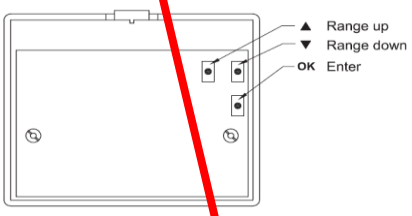
Flow CFM
TSP Pa

7 Enter settings.

A Program Controller for Pressure Display. Display will be Pascal Only.

Code	Pressure Range
50	0 to 50 Pascal (0 to 0.2" wc)
100	0 to 100 Pascal (0 to 0.4" wc)
150	0 to 150 Pascal (0 to 0.6" wc)
300	0 to 300 Pascal (0 to 1.2" wc)
500	0 to 500 Pascal (0 to 2.0" wc)
1000	0 to 1000 Pascal (0 to 4.0" wc)
1600	0 to 1600 Pascal (0 to 6.4" wc)
2500	0 to 2500 Pascal (0 to 10" wc)

1 Use the buttons on the inside of the front Cover to set Range. Toggle up until the desired range is displayed. Push okay.



Left Left Button is Up
Right Right Button is Down
Btm Bottom Button is Okay

Pressure should be displayed

Firstly, press OK button to enter the Range selection menu. Number on display will be flashing. Follow the steps below.

7 Enter settings (continued).

B Program Controller for volume Display. Display according to Factor.

Code	Flow Range	Code	Flow Range
1	0 to 1	500	300 to 500
3	1 to3	1000	500 to 1000
5	3 to 5	3000	1000 to 3000
10	5 to 10	5000	3000 to 5000
30	10 to 30	9999	5000 to 9999
50	30 to 50	30.00	10000 to 30000
100	50 to100	50.00	30000 to 50000
300	100 to 300	99.99	50000 to 999900

1 Use the buttons on the inside of the front Cover to set Range. Toggle up for desired range. Push okay.

2 Determine Cometer Factor
Select Cometer Factor by Chart (CFM).
Apply conversion factor to change unit as needed.
IE: CF for ATZAF FF 20 T1 = 323.1
- or Calculate Factor *CF
*CF = CFM / √Piezo Pressure (low)

SA=135.1; RA=131.5

3 Use the buttons on the inside of the front Cover to set each digit of Factor. Toggle up for each digit until desired is displayed. Push okay. Repeat until all digits selected. Enter factor as a four digit number. Set the position of the decimal using up and down buttons. Press okay.

Flow should be displayed in CFM

LED INDICATION

The green LED is lit when the power supply has been connected correctly. The yellow LED flashes for approx. 3 secs during zeroing.

LED	ON	Flashing	Off
Green	OK		No power
Yellow		Zeroing in progress	OK

CE MARKING

OJ Electronics A/S hereby declares that the product is manufactured in accordance with Council Directive 2004 / 108 / EC on electro- magnet compatibility (and subsequent amend- ments) and Council Directive 2006 / 95 / EC on electrical equipment designed for use within certain voltage limits.

Comefri USA
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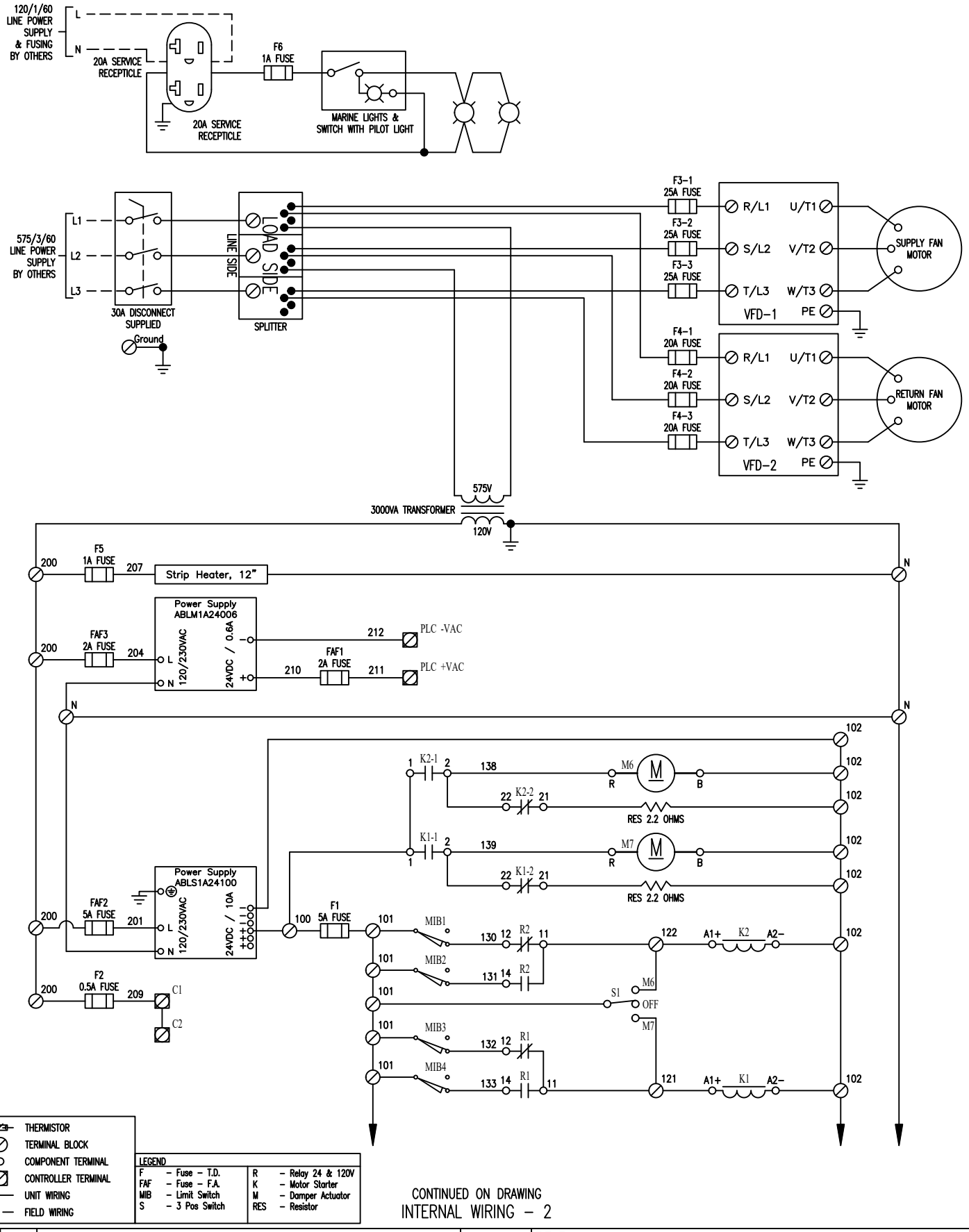
sales@comefriusa.com



CONTINUED ON DRAWING
INTERNAL WIRING - 2

Rev	By	Description	Date
A	N.N.	Update receptacle and marine lights.	04/28/25

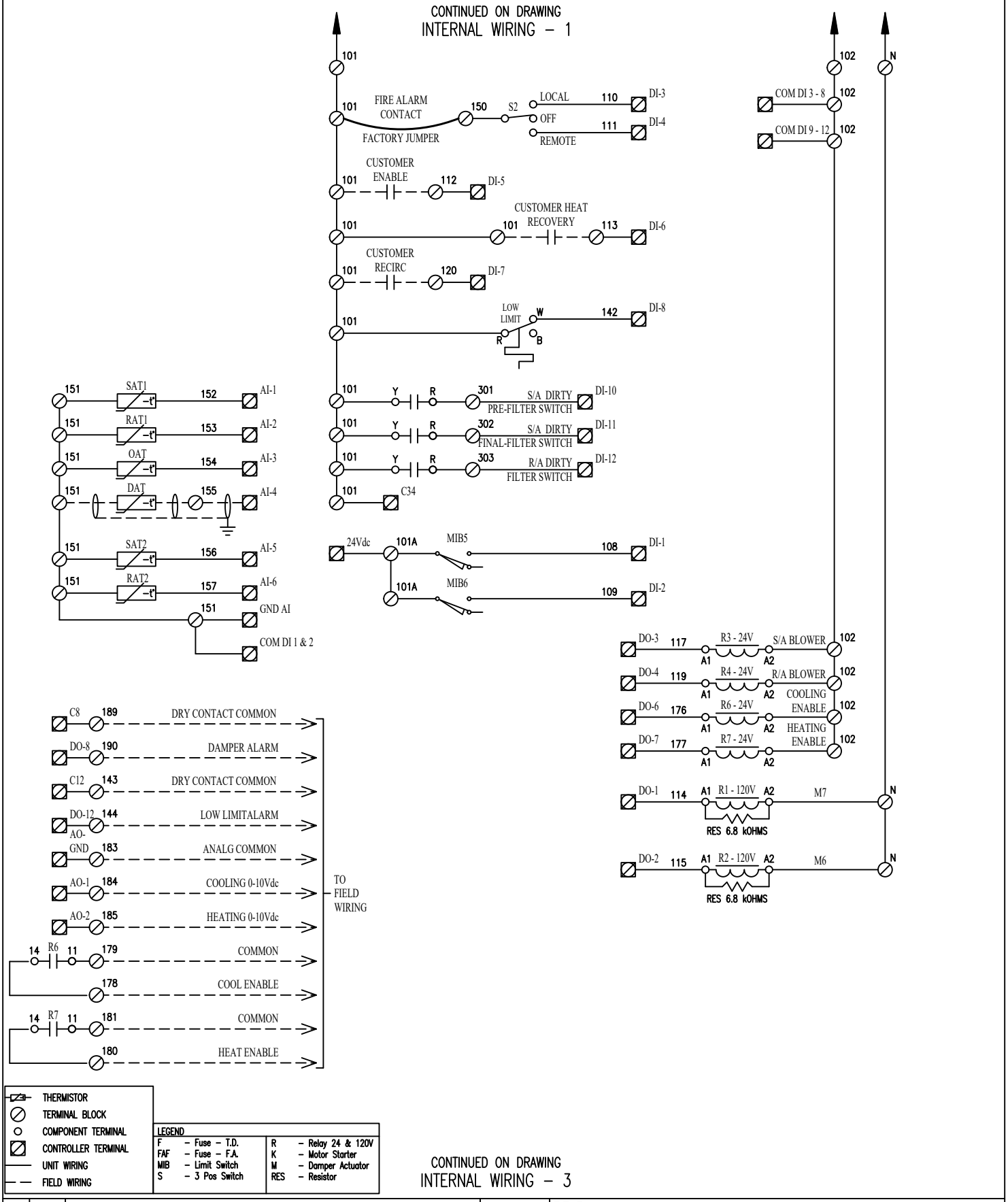
TEMPEFF

WIRING DIAGRAM

TITLE
RG Control Wiring (DOGA) - 575V
SPP, VFD (FC-102), Marine Light, GFCI Receptacles.

DRAWN BY	ISSUED BY	SCALE	DRW. NO.
N.N.		N/A	RG INT WIRING 1
CHK. BY	DATE	ORD NO.	REV
	Feb 12, 2025		A

DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.



Rev	By	Description	Date

TEMPEFF

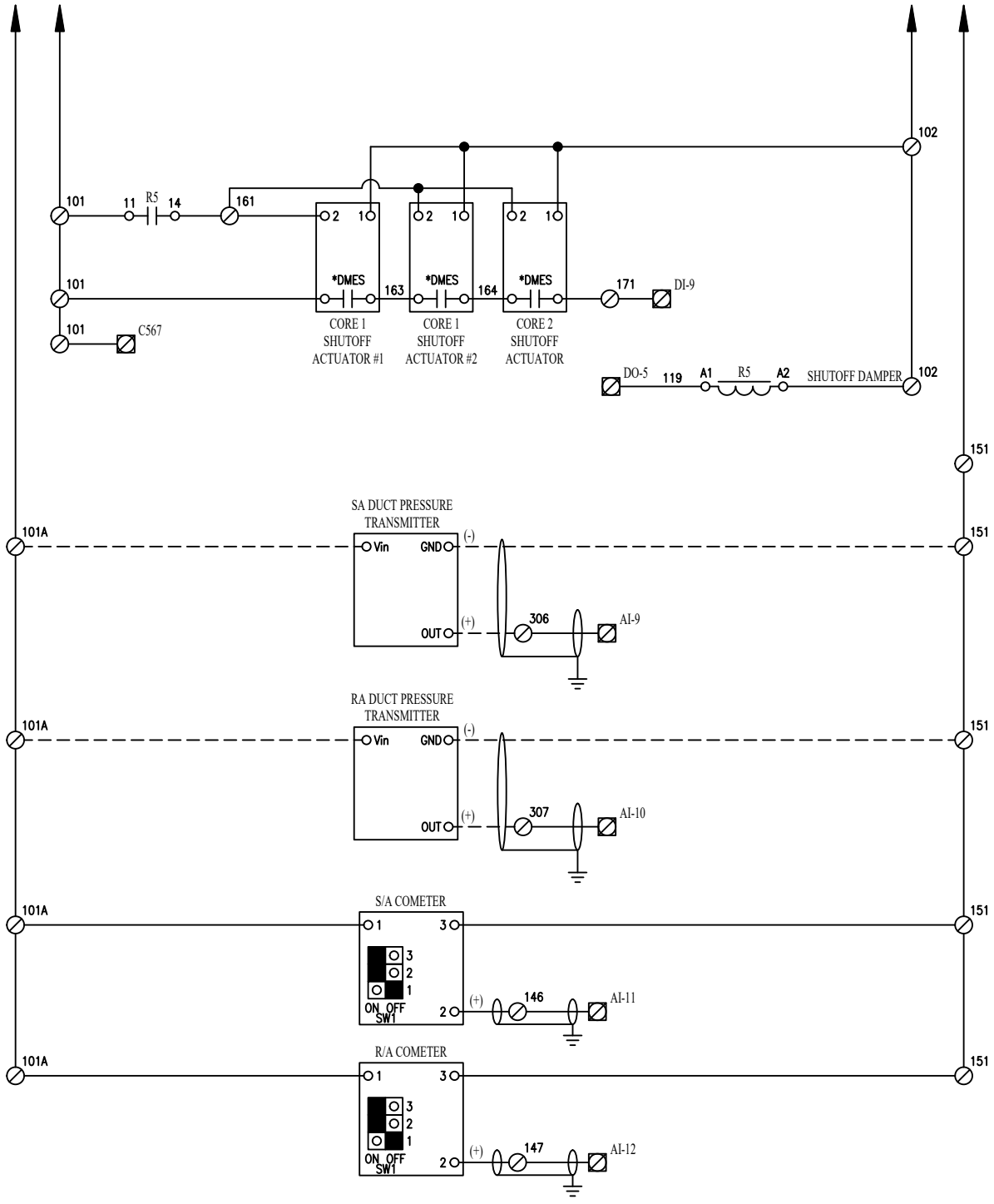
WIRING DIAGRAM

TITLE
RG Control Wiring – 575V
SPP, VFD (FC–102), Low Limit, OAT, DAT,
Dirty Filter Switches.

DRAWN BY	ISSUED BY	SCALE	DRW. NO.
N.N.		N/A	RG INT WIRING 2
CHK. BY	DATE	ORD NO.	REV
	Feb 12, 2025		–

DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.

CONTINUED ON DRAWING
INTERNAL WIRING – 2



THERMISTOR	
TERMINAL BLOCK	
COMPONENT TERMINAL	
CONTROLLER TERMINAL	
UNIT WIRING	
FIELD WIRING	

DAMPER MOTOR END SWITCHES (*DMES)

LF24–S US	S1 – S3	NFB24–S	S4 – S6
TFB24–S	S1 – S3	AFB24–S	S4 – S6
		EFB24–S	S4 – S6

LEGEND

F	– Fuse – T.D.	R	– Relay 24 & 120V
FAF	– Fuse – F.A.	K	– Motor Starter
MIB	– Limit Switch	M	– Damper Actuator
S	– 3 Pos Switch	RES	– Resistor

Rev	By	Description	Date

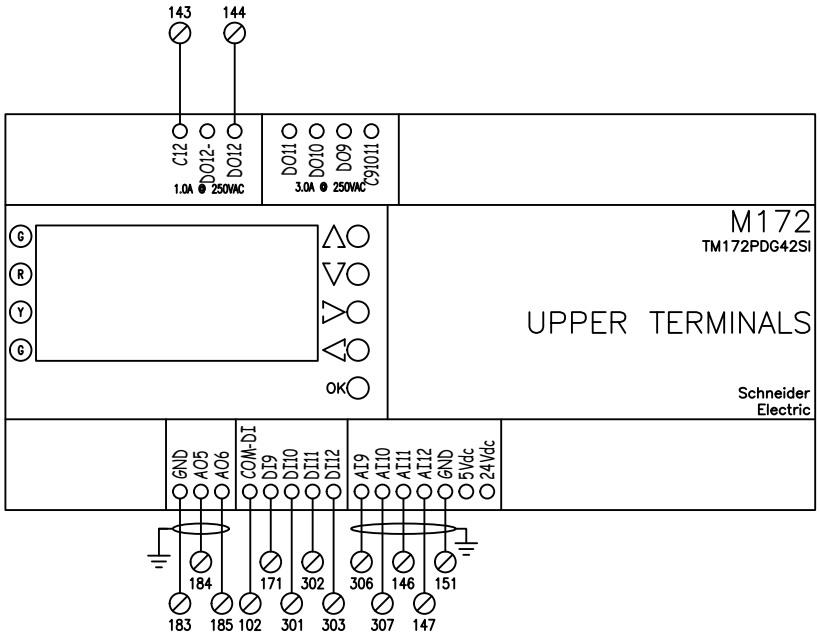
TEMPEFF

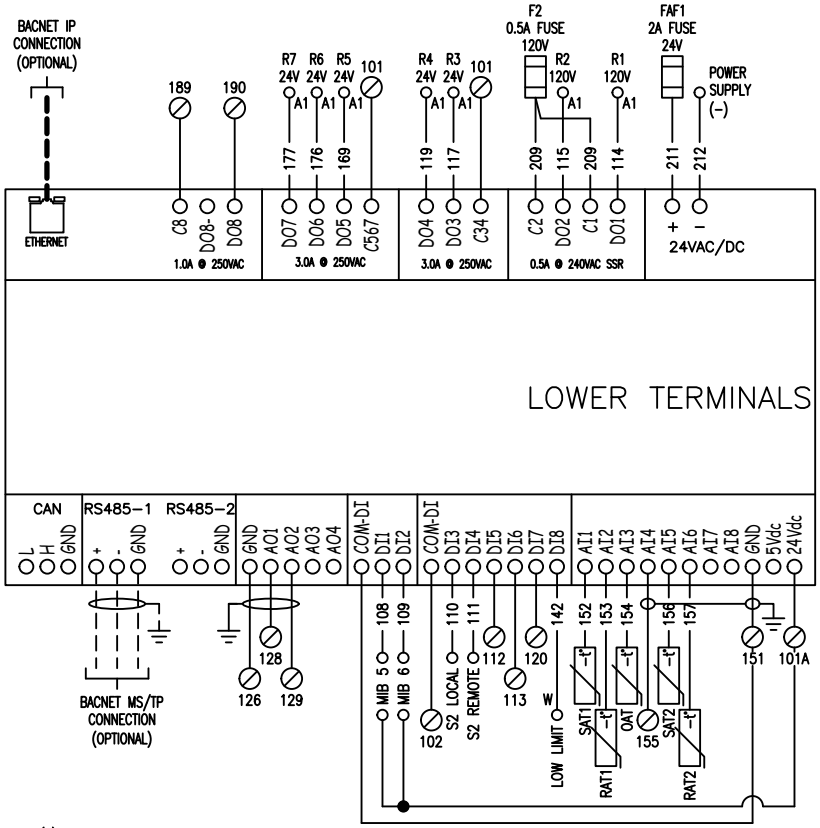
WIRING DIAGRAM

TITLE
RG Control Wiring – 575V
Shut–off dampers, Pressure Transmitters, Cometers.

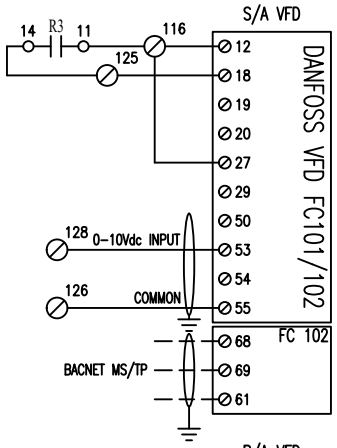
DRAWN BY	ISSUED BY	SCALE	DRW. NO.	
N.N.		N/A	RG INT WIRING 3	
CHK. BY	DATE		ORD NO.	REV
	Feb 12, 2025			–

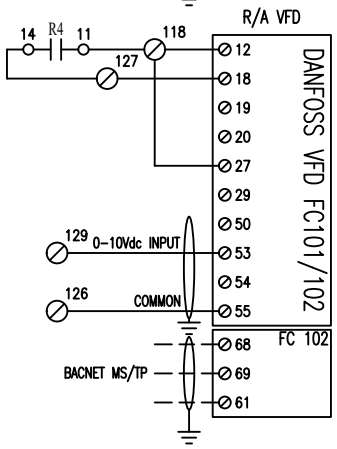
DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.





DANFOSS SPEED CONTROL IS DONE IN THE VFD USING PARAMETERS 3-02 (MIN SPEED) AND 3-03 (MAX SPEED). BACNET MORNITORING





NOTE(S):

A – IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 90°C AND AN 600Vac INSULATION RATING.

B – FIELD WIRING VOLTAGE DROP NOT TO EXCEED 10%.

C – ALL FIELD WIRING SHOWN SHALL BE COMPLETED BY INSTALLER.

D – ALL WIRING TO COMPLY WITH THE NEC (NFPA 70), CEC (CSA C22.2), OR LOCAL CODE WHICH EVER IS APPLICABLE.

E – IF FIRE ALARM CONTACTS ARE USED, REMOVE THE FACTORY INSTALLED JUMPER FROM TERMINALS 101 & 150. CONNECT THE N.C. FIRE ALARM CONTACTS. IF FIRE ALARM CONTACT OPENS, UNIT SHUTS DOWN. !! FOR OTHER OPERATION OPTIONS, CONTACT FACTORY !!

Rev	By	Description	Date

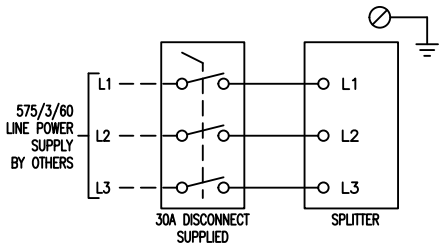
TEMPEFF

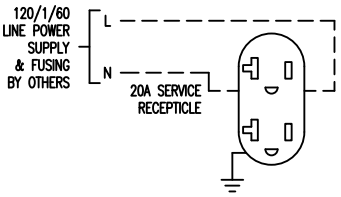
WIRING DIAGRAM

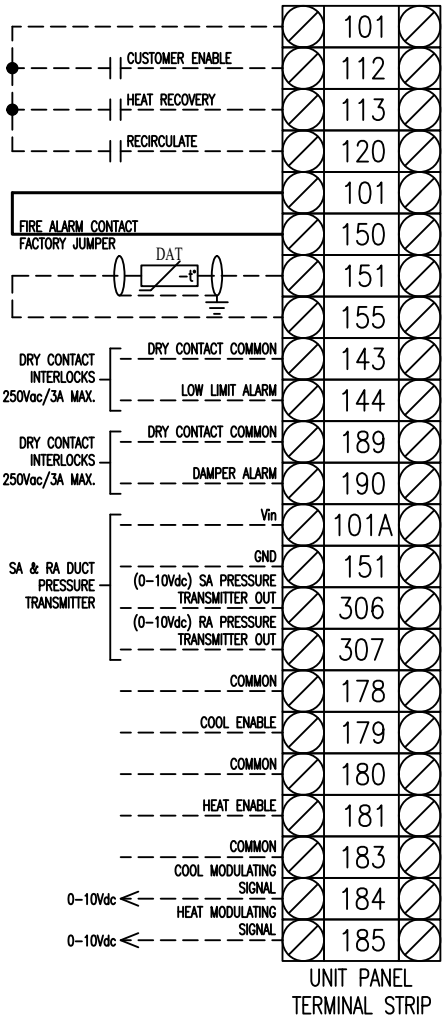
TITLE
RG Field Wiring – 575V
SPP, VFD (FC-102), Low Limit, OAT, DAT, Dirty Filter Switches, Cometers, Press. Trans.

DRAWN BY	ISSUED BY	SCALE	DRW. NO.
N.N.		N/A	RG FIELD WIRING 1
CHK. BY	DATE		ORD NO. / REV
	Feb 12, 2025		–

DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.







Rev	By	Description	Date

TEMPEFF

WIRING DIAGRAM

TITLE
RG Field Wiring – 575V
SPP, VFD (FC-102), Marine Light, GFCI Receptacles.
DAT, Low Limit, Duct Trans Press..

DRAWN BY	ISSUED BY	SCALE	DRW. NO.	
N.N.		N/A	RG FIELD WIRING 2	
CHK. BY	DATE		ORD NO.	REV
	Feb 12, 2025			–

DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.

Schneider RG Troubleshooting – Damper Alarm

Damper has a built-in alarm for testing the function of the internal components. If the damper goes into alarm the unit will shut down. Clear Damper Alarm by resetting Controller. **Follow the PLC reset procedure to prevent damage to the Controller**.

A. M6 Motor Alarm:
    a. Use S1 switch (Position 2) to test movement on motor; when enabled, the motor will turn.
    b. If motor moves on motor test, check NC contacts on MIB1 and MIB2 for continuity.
    c. If motor does not move:
        i. Check NC contacts on MIB1 and MIB2 for continuity.
        ii. Check motor starter (K2) for continuity.
        iii. Manually enable relay (R2) and check for continuity across relay contacts.
        iv. Check motor leads for voltage. Motor may defective; contact Tempeff.

B. M7 Motor Alarm:
    a. Use S1 switch (Position 1) to test movement on motor; when enabled, the motor will turn.
    b. If motor moves on motor test, check NC contacts on MIB3 and MIB4 for continuity.
    c. If motor does not move:
        i. Check NC contacts on MIB3 and MIB4 for continuity.
        ii. Check motor starter (K1) for continuity.
        iii. Manually enable relay (R1) and check for continuity across relay contacts.
        iv. Check motor leads for voltage. Motor may defective; contact Tempeff.

C. MIB1 Alarm – M6 Closed Position:
    a. Damper motor will not stop at MIB1; motor (M6) will just spin.
        i. Check that arm is making contact with the motor CAM (adjust position of limit switch if necessary).
        ii. Temporarily remove relay (R2), lift up limit switch arm with small screw driver, check continuity across both NC and NO contacts, if either side not working replace limit switch.

D. MIB2 Alarm – M6 Open Position:
    a. Damper motor will not stop at MIB2; motor (M6) will just spin.
        i. Check that arm is making contact with the motor CAM (adjust position of limit switch if necessary).
        ii. Temporarily remove relay (R2), lift up limit switch arm with small screw driver, check continuity across both NC and NO contacts, if either side not working replace limit switch.

E. MIB3 Alarm – M7 Closed Position:
    a. Damper motor will not stop at MIB3; motor (M7) will just spin.
        i. Check that arm is making contact with the motor CAM (adjust position of limit switch if necessary).
        ii. Temporarily remove relay (R1), lift up limit switch arm with small screw driver, check continuity across both NC and NO contacts, if either side not working replace limit switch.

F. MIB4 Alarm – M7 Open Position:
    a. Damper motor will not stop at MIB4; motor (M7) will just spin.
        i. Check that arm is making contact with the motor CAM (adjust position of limit switch if necessary).
        ii. Temporarily remove relay (R1), lift up limit switch arm with small screw driver, check continuity across both NC and NO contacts, if either side not working replace limit switch.

G. MIB5 Alarm – M6 Proof of Open:
    a. Blowers will enable for either 1 cycle or not at all, after a 10 second delay the unit will disable.
        i. Check that the arm is making contact with the end collar when the M6 motor cam is on MIB2.
            1. Adjust the collar if micro switch is on flat.
            2. Adjust the micro switch to make contact with collar.
    b. MIB5_0 Alarm:
        i. Alarm occurs when unit is Disabled.

H. MIB6 Alarm – M7 Proof of Open:
    a. Blowers will enable for either 1 cycle or not at all, after a 10 second delay the unit will disable.
        i. Check that the arm is making contact with the end collar when the M7 motor cam is on MIB4.
            1. Adjust the collar if micro switch is on flat.
            2. Adjust the micro switch to make contact with collar.
    b. MIB6_0 Alarm:
        i. Alarm occurs when unit is Disabled.

PLC Reset Procedure:

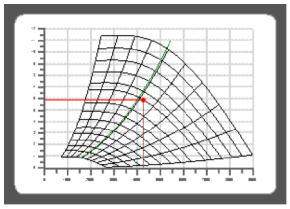
A. Open 24Vdc fuse holder supplying power to 101 terminals, then open fuse holder F2, and finally open fuse holder FAF1 to Controller power.
B. Wait 5 seconds.
C. Close fuse holder FAF1. While Controller is re-booting, close 24Vdc fuse holder supplying power to 101 terminals and then close fuse holder F2.
D. Once re-boot is complete, unit can resume normal operation.

Customer	
Project	**Description**
Your Ref.	**Our Ref.**

Input data

Volume	4238 CFM	**Temperature**	68.0 °F	**Density**	0.075 lb/cu.ft
Static Pressure	5.94 In.W.G.	**Altitude**	0 ft	**Free Inlet - Free Outlet**	

	Catalogue data		
Selected Fan **ANPL 18 -**	n Max 1/min	Pw Max BHP	J lb ft²
	3025		12.81



Fan Information

OV ft/min	p tot * In.W.G.	p sta In.W.G.	p dyn ** In.W.G.	tip speed ft/min	RPM 1/min	eta Tot * %	eta Sta %	P fan BHP	Min Mot. BHP	P mot BHP	Shaft diameter in
	6.18	5.94	0.24	10900	2350	74.10	71.19	5.56			0.00

(*)Theoric value calculated taking into account the dynamic pressure at the impeller outlet
(**)Theoric value, calculated at the impeller outlet

fm[Hz]	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Tot.**
Lw3 Total Sound Power Level in the inlet duct- Lwi Inlet Duct Sound Power Level includes the effect of duct end correction									
Level Lw3 dB/dB(A)	83 / 56	81 / 65	87 / 78	82 / 78	79 / 79	78 / 79	78 / 79	72 / 71	**91 / 86**
Lw5 Inlet Total Sound Power Level - Lwmi Inlet Sound Power Level (free inlet) do not includes the effect of duct end correction									
Level Lw5 dB/dB(A)	78 / 52	79 / 63	88 / 80	84 / 81	79 / 79	79 / 80	78 / 79	76 / 74	**91 / 87**
Lw6 Total Sound Power Level at the free outlet - Lwmo Outlet Sound Power Level (free outlet) do not includes the effect of duct end correction									
Level Lw6 dB/dB(A)	74 / 48	80 / 64	92 / 84	91 / 88	89 / 89	83 / 84	81 / 82	75 / 74	**96 / 93**

Certificates

Comefri USA Inc. certifies that the ANPL 18 - shown here is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and 311 and comply with the requirements of the AMCA Certified Ratings Program. Performance ratings include to effects of spring dampers and does not include the effects of appurtenances (accessories). Power rating (kW or BHP) does not include trasmission losses. Free inlet Lw5, LwA5 sound power levels shown are in decibels, referred to 10^{-12} watts calculated per AMCA International Standard 301. Air and free inlet Lw5, LwA5 sound performances shown are for installation type A: Free inlet - Free outlet. The AMCA Certified Ratings Seal applies to air performance and to free inlet Lw5, LwA5 sound power levels. The AMCA Certified Ratings Seal does not apply either to in-duct inlet Lw3, LwA3 sound or outlet Lw6, LwA6 sound.

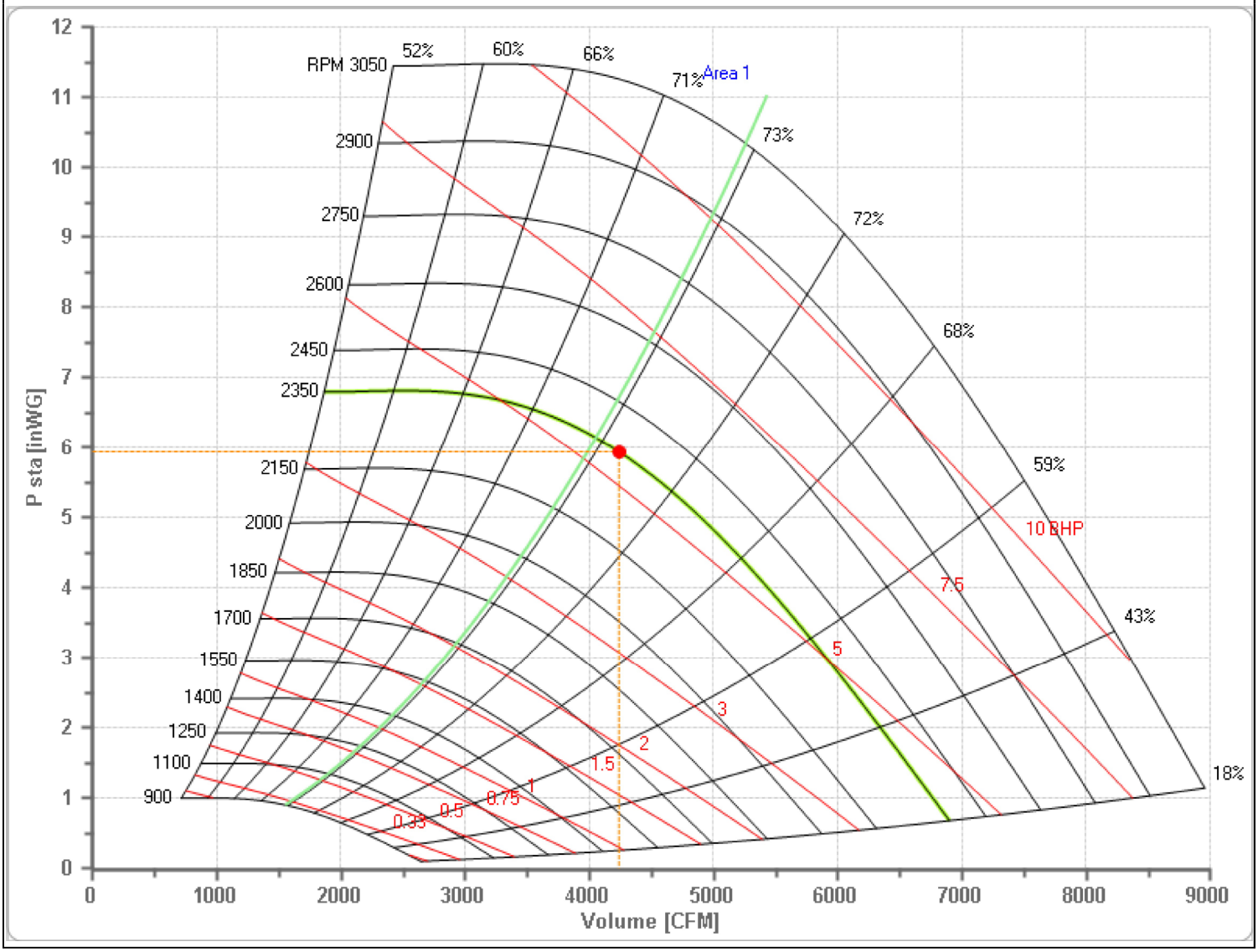
Chart

comefri fans of energy saving

SA Fan

2025-04-28
Aeolus4 1.0.23093.0 Apr 2023

Selected Fan	ANPL 18 -	Fan working conditions	Free Inlet - Free Outlet
n Max	3025 1/min	Volume	4238 CFM
Pw Max		Total Pressure	6.18 In.W.G.
J	12.81 lb ft²	Static Pressure	5.94 In.W.G.
		P fan	5.56 BHP
Required working point	•	eta Tot	74.10 %
Effective working point	•	eta Sta	71.19 %
		RPM	2350 1/min
		Temperature	68.0 °F
		Altitude	0 ft

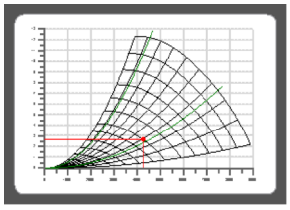


Customer	
Project	**Description**
Your Ref.	**Our Ref.**

Input data

Volume	4238 CFM	**Temperature**	68.0 °F	**Density**	0.075 lb/cu.ft
Static Pressure	2.66 In.W.G.	**Altitude**	0 ft	**Free Inlet - Free Outlet**	

	Catalogue data		
Selected Fan **ANPA16 -**	n Max 1/min	Pw Max BHP	J lb ft²
	3700		9.97



Fan Information

OV ft/min	p tot * In.W.G.	p sta In.W.G.	p dyn ** In.W.G.	tip speed ft/min	RPM 1/min	eta Tot * %	eta Sta %	P fan BHP	Min Mot. BHP	P mot BHP	Shaft diameter in
	3.10	2.66	0.44	8901	2158	72.96	62.67	2.83			0.00

(*)Theoric value calculated taking into account the dynamic pressure at the impeller outlet
(**)Theoric value, calculated at the impeller outlet

fm[Hz]	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Tot.**
Lw3 Total Sound Power Level in the inlet duct- Lwi Inlet Duct Sound Power Level includes the effect of duct end correction									
Level Lw3 dB/dB(A)	85 / 59	80 / 64	79 / 70	82 / 79	75 / 75	71 / 72	66 / 67	64 / 63	**88 / 82**
Lw5 Inlet Total Sound Power Level - Lwmi Inlet Sound Power Level (free inlet) do not includes the effect of duct end correction									
Level Lw5 dB/dB(A)	73 / 47	74 / 58	83 / 74	82 / 79	77 / 77	75 / 76	74 / 75	70 / 68	**87 / 84**
Lw6 Total Sound Power Level at the free outlet - Lwmo Outlet Sound Power Level (free outlet) do not includes the effect of duct end correction									
Level Lw6 dB/dB(A)	84 / 58	79 / 63	80 / 71	86 / 83	83 / 83	80 / 81	76 / 77	74 / 73	**90 / 88**

Certificates

Comefri USA Inc. certifies that the ANPA16 - shown here is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and 311 and comply with the requirements of the AMCA Certified Ratings Program. Performance ratings include to effects of spring dampers and does not include the effects of appurtenances (accessories). Power rating (kW or BHP) does not include trasmission losses. Free inlet Lw5, LwA5 sound power levels shown are in decibels, referred to 10^{-12} watts calculated per AMCA International Standard 301. Air and free inlet Lw5, LwA5 sound performances shown are for installation type A: Free inlet - Free outlet. The AMCA Certified Ratings Seal applies to air performance and to free inlet Lw5, LwA5 sound power levels. The AMCA Certified Ratings Seal does not apply either to in-duct inlet Lw3, LwA3 sound or outlet Lw6, LwA6 sound.

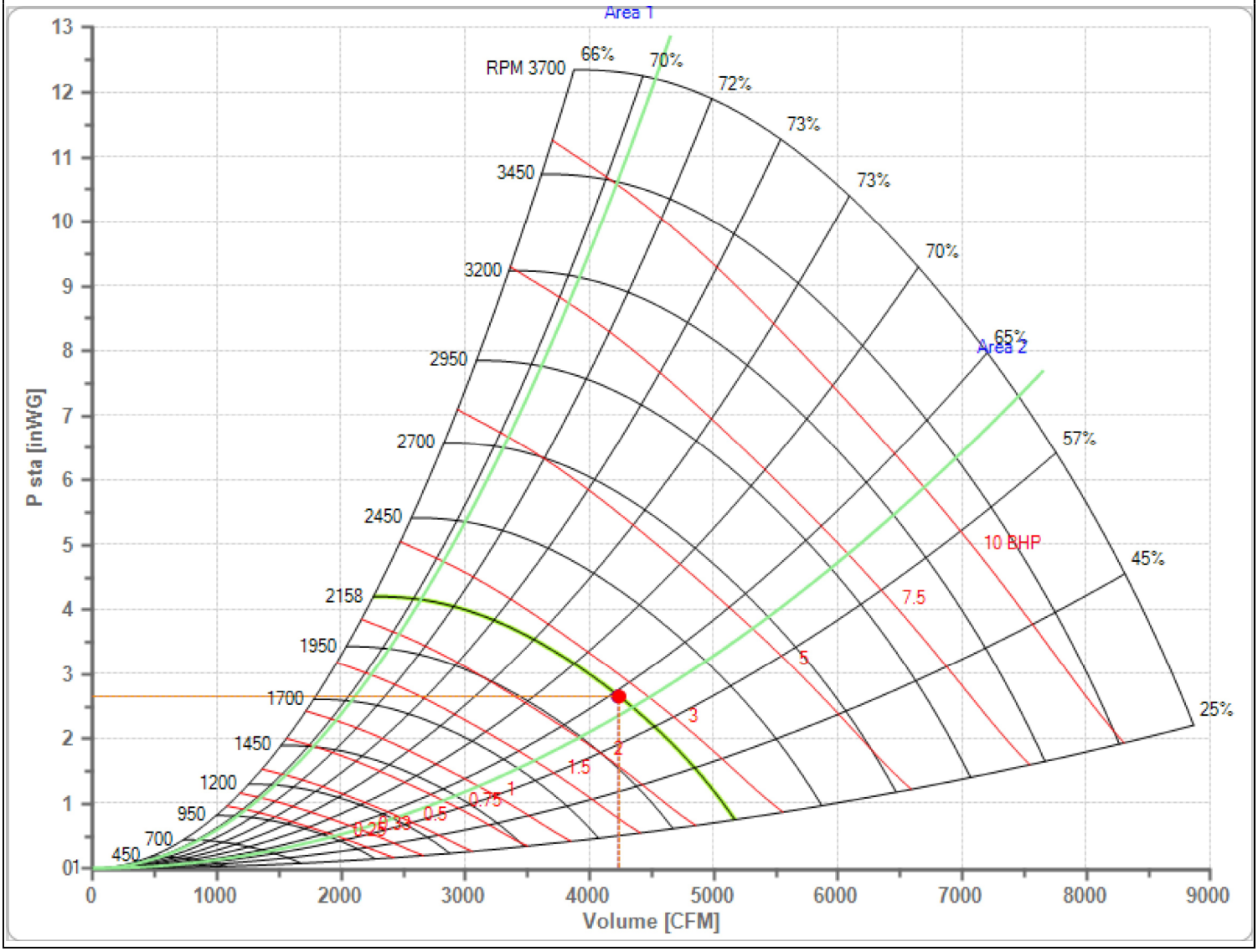
Chart

comefri fans of energy saving

EA Fan

2025-03-14
Aeolus4 1.0.23093.0 Apr 2023

Selected Fan	ANPA16 -	Fan working conditions	Free Inlet - Free Outlet
n Max	3700 1/min	Volume	4238 CFM
Pw Max		Total Pressure	3.10 In.W.G.
J	9.97 lb ft²	Static Pressure	2.66 In.W.G.
		P fan	2.83 BHP
Required working point	•	eta Tot	72.96 %
Effective working point	•	eta Sta	62.67 %
		RPM	2158 1/min
		Temperature	68.0 °F
		Altitude	0 ft

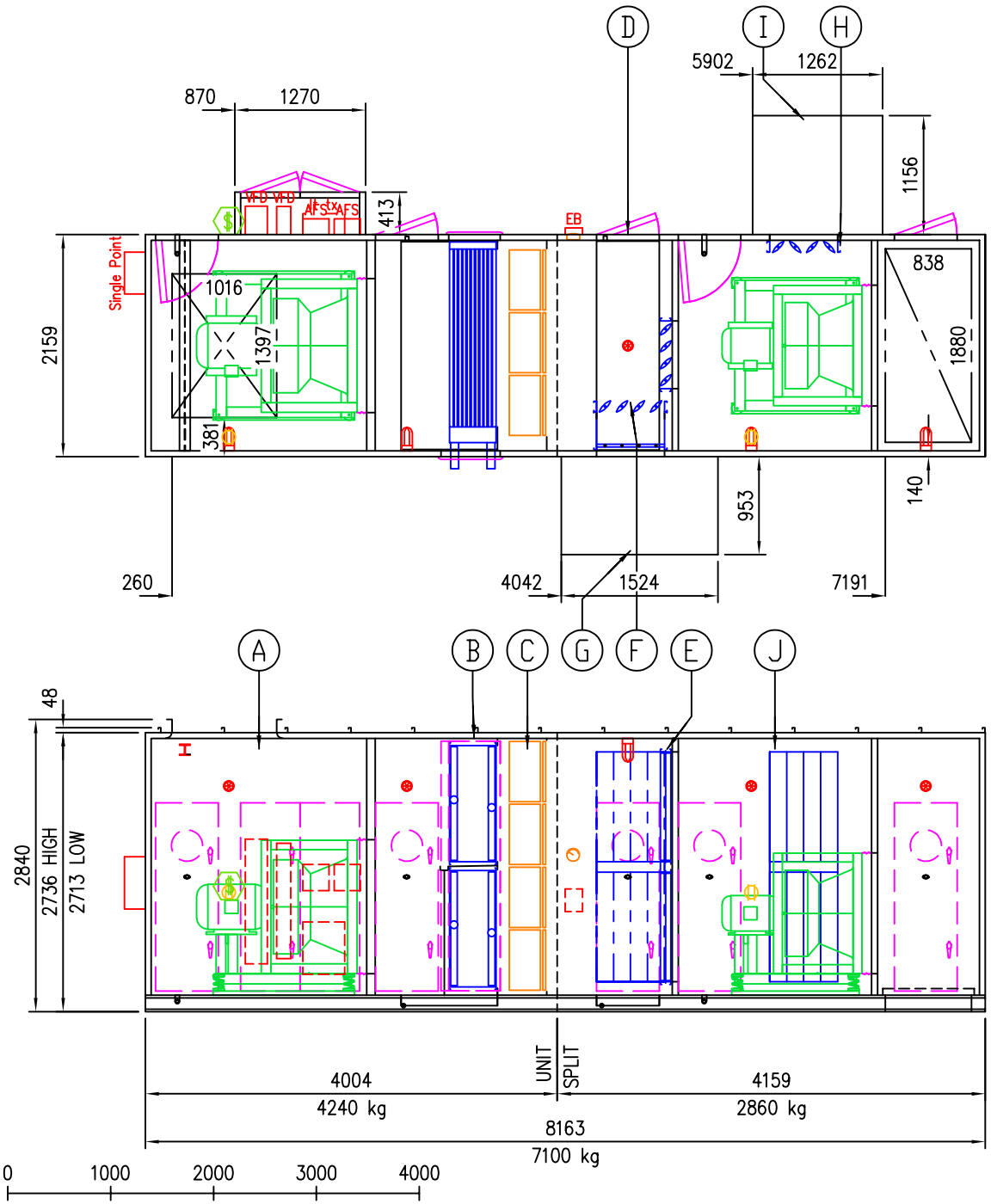


HTS Toronto

115 Norfinch Drive
Toronto, ON M3N 1W8
T 1.800.850.0567
F 416.661.0100

hts.com/ontario

Product Datasheets
AHU-2



UNIT MOUNTING

The unit is designed to be mounted on a roof curb.

Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

TOTAL CFM
SUPPLY AIR : 10000 l/s
RETURN AIR : 10000 l/s

(A) Service : SF
Fan: SF 36" EPFN SW, 90% Width, Arrangement-4
Class: 2 Max RPM: 1465
OP. PT1
A.F.(l/s): 10002
TSP (Pa): 1059
ESP (Pa): 374
RPM: 1150
FEI: 1.40
MOTOR : 18.65 kW, TEFC Prem-Eff, 575/3/60
RPM : 1150 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 51 mm
FEG85 η_{pt}: 80% η_t / η_{pt} : 91%

(B) COOLING COIL
TYPE : 10 ROW
SIZES : 2 @ 1143 X 1727
CONN : RIGHT PULL : LEFT
DRAIN : LEFT VEL : 2.56 m/s

(C) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 2.26 m/s
TYPE : 51mm (MERV 8) Farr 30/30
305mm (MERV 13) Farr Durafil 4V ES Merv 13
SIZES : 12 @ 610 X 610

(D) DRAIN PAN
CONN : LEFT

(E) RA DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 2286 X 711

(F) OA DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000/Ebtron
SIZE : 2286 X 711 [SL]

(G) OA HOOD
TYPICAL OF 3

(H) EA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 2286 X 711 [SL]

(I) EA HOOD
TYPICAL OF 3

(J) Service : RF
Fan: RF 33" EPFN SW, 92% Width, Arrangement-4
Class: 2 Max RPM: 1620
OP. PT1
A.F.(l/s): 10002
TSP (Pa): 274
ESP (Pa): 149
RPM: 1150
FEI: 1.00
MOTOR : 7.46 kW, TEFC Prem-Eff, 575/3/60
RPM : 1150 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 51 mm
FEG80 η_{pt}: 78% η_t / η_{pt} : 54%

SDG VER: Mar 4 2025

PROJECT

BRAMPTON VICTORIA PARK ARENA

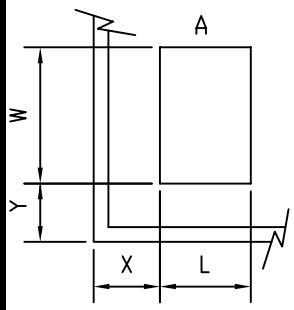
OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	7930	DRAWN BY	TN	DWG NO.	7930U02SD01	ACCESS SIDE	LEFT	DWG UNITS	mm
TAG	AHU-2	DATE	MAR 10/25	TYPE	OUTDOOR	16:22		SCALE	N.T.S.

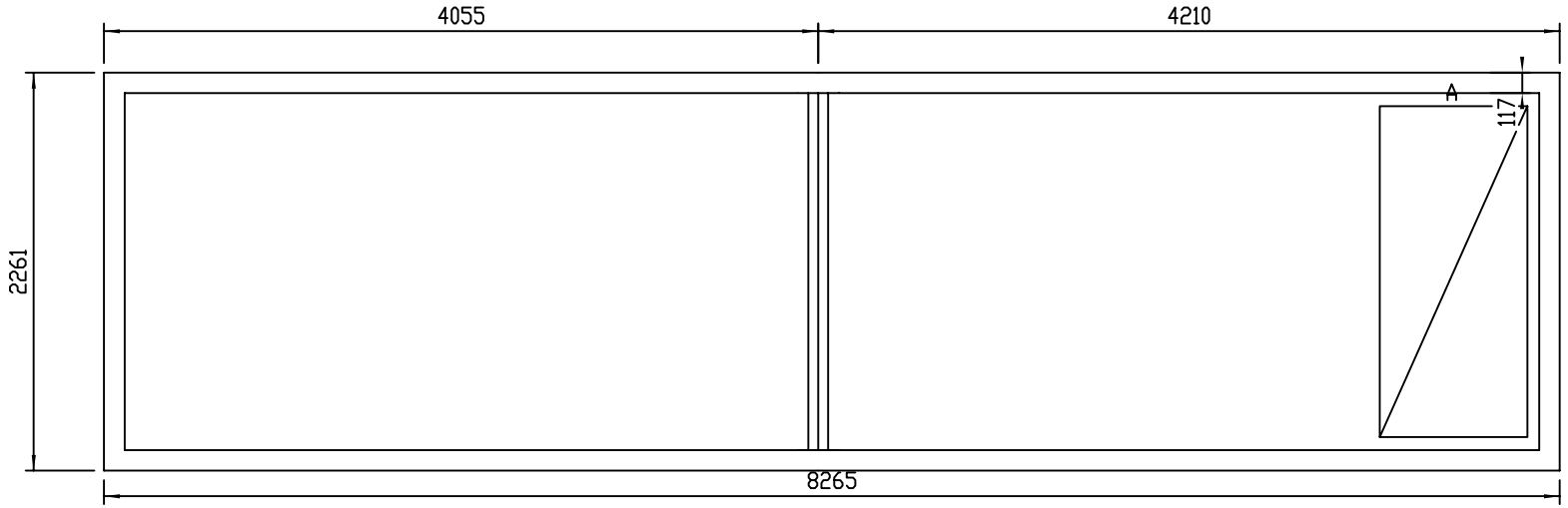
SALES OFFICE H.T.S.-TORONTO
SALES ENGINEER NEVIN WONG

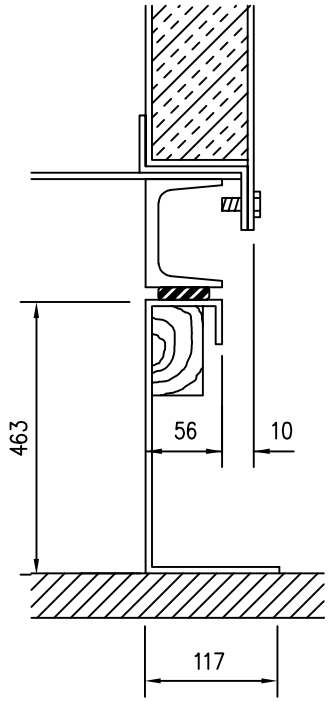
HAAKON INDUSTRIES.
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8

TAG	OPENING	X	Y	W	L	D	R
A	RA	7243	191	1880	838		



FOOT PRINT DIAGRAM - outline is base of roofcurb





SECTION VIEW

Roof Curb Weight: 416 kg

0 500 1000 1500 2000

UNITS ARE DESIGNED TO BE CONTINUOUSLY SUPPORTED ALONG THE ENTIRE FOOT PRINT INCLUDING (BUT NOT LIMITED TO) THE PERIMETER AS WELL AS UNDER THE SPLITS.

SDG VER: Mar 4 2025

PROJECT BRAMPTON VICTORIA PARK ARENA

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	7930	DRAWN BY	TN	DWG NO.	7930U02FP02	ACCESS SIDE	LEFT	DWG UNITS	mm
TAG	AHU-2	DATE	MAR 10/25	TYPE	OUTDOOR	16:22		SCALE	N.T.S.

SALES OFFICE	H.T.S.-TORONTO
SALES ENGINEER	NEVIN WONG

HAAKON INDUSTRIES.
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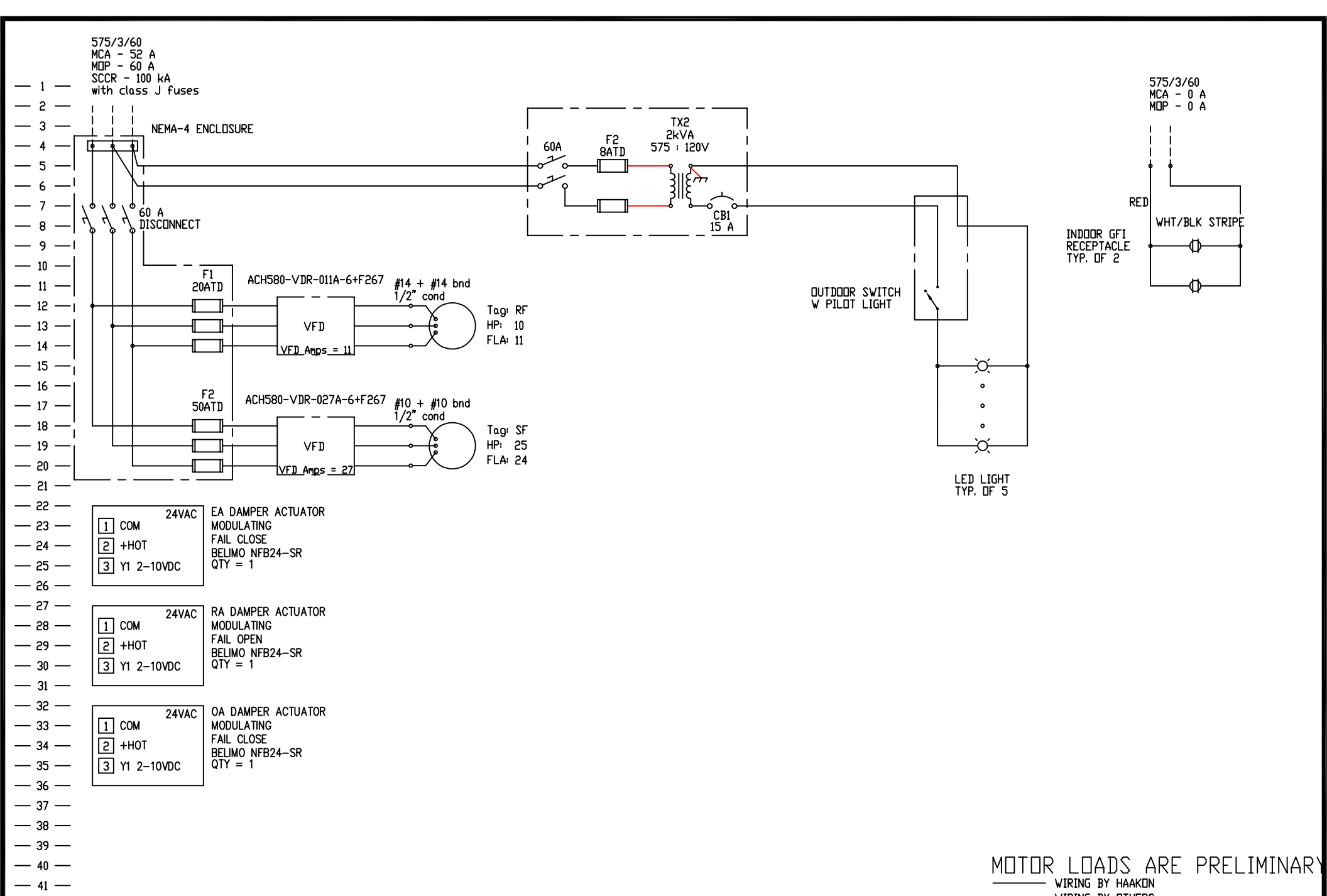

MOTOR LOADS ARE PRELIMINARY

——— WIRING BY HAAKON

- - - - - WIRING BY OTHERS

PROJECT BRAMPTON VICTORIA PARK ARENA

JOB NO.	7930	DRAWN BY	TN	DWG NO. 7930U02CS01	CERTIFICATION: CETL
TAG	AHU-2	DATE	MAR 10/25	UNIT: OUTDOOR, NEMA1 INSIDE	CONDUIT: EMT

REVISIONS

NO	DATE	BY
1		
2		
3		

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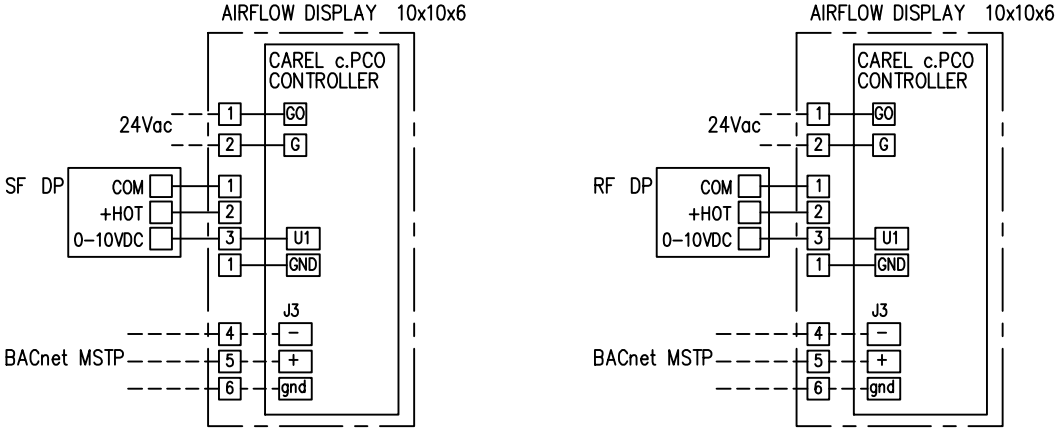
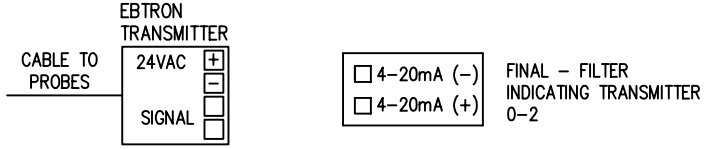




MOTOR LOADS ARE PRELIMINARY

——— WIRING BY HAAKON

- - - - - WIRING BY OTHERS

PROJECT	BRAMPTON VICTORIA PARK ARENA		
JOB NO. 7930	DRAWN BY TN	DWG NO. 7930U02CS02	CERTIFICATION: CETL
TAG AHU-2	DATE MAR 10/25	UNIT: OUTDOOR, NEMA1 INSIDE	CONDUIT: EMT

REVISIONS		
NO	DATE	BY
1		
2		
3		

HAAKON INDUSTRIES.
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8

Toronto : Tel: (416) 661-3400 Fax: (416) 661-0100
Hamilton : Tel: (905) 643-7719 Fax: (905) 643-3203
Kitchener : Tel: (519) 748-1860 Fax: (519) 748-9466
London : Tel: (519) 457-6700 Fax: (519) 457-8900
Oshawa : Tel: (905) 579-6700 Fax: (905) 579-5290
Ottawa : Tel: (613) 728-7400 Fax: (613) 728-8032
Sudbury: Tel: (705) 855-1589 Fax: (705) 855-7182

AIR HANDLING UNIT SCHEDULE

JOB: 22104386 - Brampton Victoria Park Arena **DATE: April 9, 2025**

	AIR HANDLING SUPPLY	AIR HANDLING RETURN		COOLING COIL	HEATING COIL	
TAG	AHU-2		TAG	COMBINATION COIL		
MODEL NUMBER	PENTPAK		AIRFLOW (CFM)	21200	21200	
MANUFACTURER	HAAKON		EAT DB/WB (^oF)	77.5/71.0	61.8	
ESP (IN.)	1.5	0.6	LAT DB/WB (^oF)	53.2/53.1	74.5	
TSP (IN.)	4.25	1.1	TOTAL CAP. (MBH)	1223.6	277.7	
AIRFLOW (CFM)	21200	21200	SENS CAP. (MBH)	561.6	277.7	
SPEED (RPM)	1150	1150	REFRIG.TYPE OR % WATER	42%PG	42%PG	
MOTOR SIZE QTY @ HP	1 @ 25	1 @ 10	EWT OR SUCTION TEMP (^oF)	44	74.5	
POWER INPUT QTY @ BHP			LWT (^oF)	55.8	71.8	
VOLTAGE	575V/3PH/60Hz		FLOW (USGPM)	228.2	228.2	
MOTOR TYPE	TEFC Prem Eff		WPD (FT)	21.7	21.7	
INDOOR / OUTDOOR	OUTDOOR		APD (IN.)	1.48	1.48	
PRESSURE	CLASS II	CLASS II	FACE AREA (FT^2)	42.5	42.5	
DT / BT	DT	BT	FACE VELOCITY (FPM)	498.8	498.8	
FAN TYPE	36" EPFN	33" EPFN	COIL QTY - FHxFL (IN.)	2 - 45 x 68	2 - 45 x 68	
AIRFLOW MODULATION	VFD	VFD	ROWS / FINS PER INCH	12/10	12/10	
PRE FILTER	2" MERV8	-	COIL TYPE	HYDRONIC	HYDRONIC	
FINAL FILTER	12" MERV13	-	COPPER FINS	NO	NO	
HUMIDIFIER SECTION	NO		TURBOSPIRALS	YES	YES	
SHIPPING WT (LBS)	15620		COIL WATER VOLUME (Gallon)	66	66	

REMARKS

Unit c/w 2-pipe change-over coil

Supply and Return fans c/w airflow stations

SOUND POWER LEVELS RE:10^{-12} WATTS

	1	2	3	4	5	6	7	8
SUPPLY								
RETURN								

VOLTAGE	120/1/60	208-230/1/60	208-230/3/60	460/3/60	575/3/60	
# OF ELECTRICAL FEEDS						
MCA						
Description						

Toronto : Tel: (416) 661-3400 Fax: (416) 661-0100
Hamilton : Tel: (905) 643-7719 Fax: (905) 643-3203
Kitchener : Tel: (519) 748-1860 Fax: (519) 748-9466
London : Tel: (519) 457-6700 Fax: (519) 457-8900
Oshawa : Tel: (905) 579-6700 Fax: (905) 579-5290
Ottawa : Tel: (613) 728-7400 Fax: (613) 728-8032
Sudbury: Tel: (705) 855-1589 Fax: (705) 855-7182

AIR HANDLING UNIT SCHEDULE (SI)

JOB: 22104386 - Brampton Victoria Park Arena **DATE: April 9, 2025**

	AIR HANDLING SUPPLY	AIR HANDLING RETURN		COOLING COIL	HEATING COIL	
TAG	AHU-2		TAG	COMBINATION COIL		
MODEL NUMBER	PENTPAK		AIRFLOW (L/S)	10004	10004	
MANUFACTURER	HAAKON		EAT DB/WB (^{o}C)	25.3/21.7	16.6	
ESP (PA)	374	149	LAT DB/WB (^{o}C)	11.8/11.7	23.6	
TSP (PA)	1059	274	TOTAL CAP. (KW)	358.6	81.4	
AIRFLOW (L/S)	10004	10004	SENS CAP. (KW)	164.6	81.4	
SPEED (RPS)	19.2	19.2	REFRIG.TYPE OR % WATER	42%PG	42%PG	
MOTOR SIZE QTY @ KW	1 @18.6	1 @7.5	EWT OR SUCTION TEMP (^{o}C)	6.7	23.6	
POWER INPUT QTY @ KW			LWT (^{o}C)	13.2	22.1	
VOLTAGE	575V/3PH/60Hz		FLOW (L/S)	14.4	14.4	
MOTOR TYPE	TEFC Prem Eff		WPD (KPA)	64.9	64.9	
INDOOR / OUTDOOR	OUTDOOR		APD (PA)	369	369	
PRESSURE	CLASS II	CLASS II	FACE AREA (M^2)	3.9	3.9	
DT / BT	DT	BT	FACE VELOCITY (M/S)	2.53	2.53	
FAN TYPE	36" EPFN	33" EPFN	COIL QTY - FHxFL (MM)	2-1,143x1,727	2-1,143x1,727	
AIRFLOW MODULATION	VFD	VFD	ROWS / FINS PER CM	12/4	12/4	
PRE FILTER	2" MERV8	-	COIL TYPE	HYDRONIC	HYDRONIC	
FINAL FILTER	12" MERV13	-	COPPER FINS	NO	NO	
HUMIDIFIER SECTION	NO		TURBOSPIRALS	YES	YES	
SHIPPING WT (KG)	7100		COIL WATER VOLUME (LITERS)	249.5	249.5	

REMARKS

Unit c/w 2-pipe change-over coil

Supply and Return fans c/w airflow stations

SOUND POWER LEVELS RE:10^{-12} WATTS

	1	2	3	4	5	6	7	8
SUPPLY								
RETURN								

VOLTAGE	120/1/60	208-230/1/60	208-230/3/60	460/3/60	575/3/60	
# OF ELECTRICAL FEEDS						
MCA						
Description						

Job Information	Technical Data Sheet		
Job Name	22104386 - Brampton VIctoria Park Arena		
Date	2/26/2025		
Submitted By	Graham Jones		
Software Version	10.60	**Coil DLL Version**	10.60
Unit Tag	AHU-2 (Cooling Performance)		

Coil Overview

Model Number	Application	Total Capacity Btu/hr	Air Flow CFM	Fin Height in	Fin Length in
5WM1012B	Chilled water coil	1223594	21200	45	68.00

Coil

Model Number:	5WM1012B
Application:	Chilled water coil
Type	Cooling - Standard
Crating:	Standard Crate
Number of Coils:	2

Physical (Per Coil)

Depth	Height	Length	Weight		
			Shipping	Operating	Dry
17.88 in	47.00 in	86.75 in	1111 lb	1113 lb	831 lb

Material			
Tube Diameter	**Fin**	**Tube**	**Case**
0.625 in	0.0075 in Aluminum	0.020 in Copper nominal	Stainless steel

Geometry					
Fin Design	**Fins per Inch**	**Number of Rows**	**Fin Height**	**Fin Length**	**Tube Spacing**
Corrugated	10	12	45 in	68.00 in	1.50 X 1.299

Connection				Flange Dimensions	
Type	**Size**	**Hand**	**Length**	**Header**	**Side**
Carbon Steel (threaded)	2.992 in	Right Hand	10.00 in	1.00 in	1.00 in

Performance (Per Coil Bank)

Airflow CFM	Airflow Direction	Altitude ft	Face Area ft²	Face Velocity ft/min
21200	Horizontal	0	42.5	498.8

Capacity		Air Temperature				Air Pressure Drop inH₂O
		Entering		Leaving		
Total Btu/hr	**Sensible** Btu/hr	**Dry Bulb** °F	**Wet Bulb** °F	**Dry Bulb** °F	**Wet Bulb** °F	
1223594	561639	77.5	71.0	53.2	53.1	1.48

Fluid							
Entering Temp °F	**Leaving Temp** °F	**Type**	**Glycol Concentration** %	**Flow Rate** gpm	**Velocity** ft/s	**Pressure Drop** ft H_2O	**Volume** gal
44.0	55.8	Propylene	42.0	228.2	2.7	21.7	66.00

Chilled Water Fouling Factor:	0.0000

Options

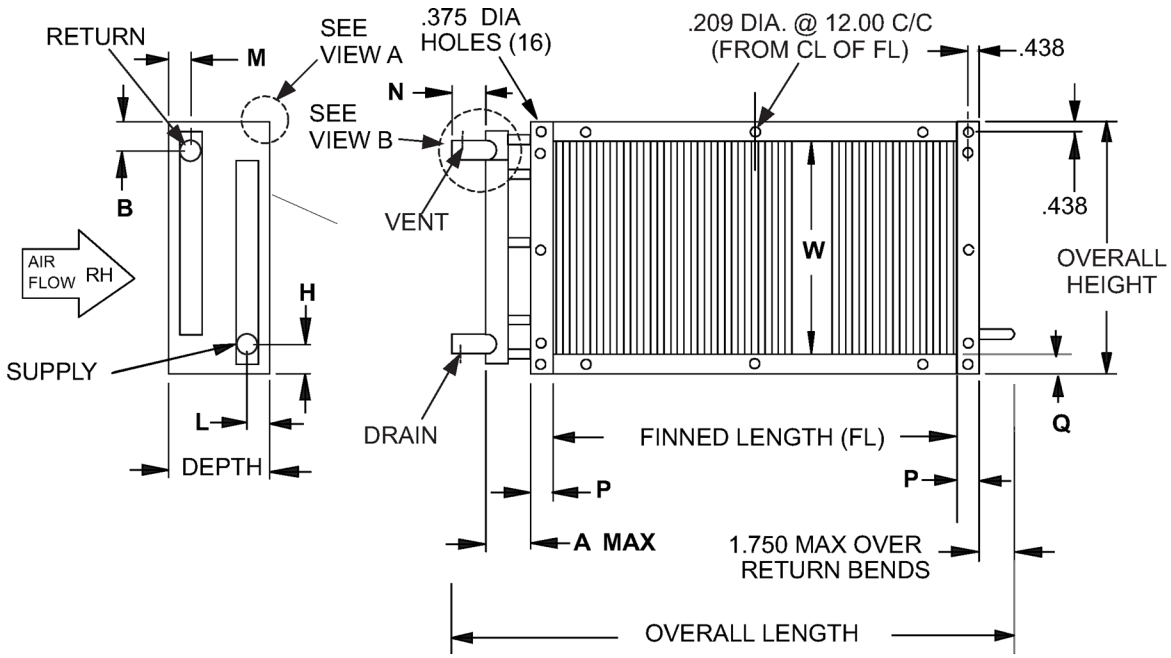
Coil Options	Brass Turbospirals
Protective Coatings	None

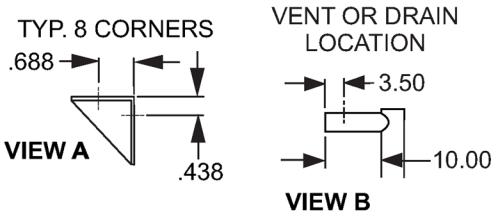
Replacement Coil

Type	Serial Number	Order Number
Vision/Skyline Airhandler		

AHRI Certification

Coil is NOT certified by AHRI.





GENERAL NOTES:

1. VERTICAL OR HORIZONTAL AIR FLOW MUST BE SPECIFIED.
2. ALL COILS DRAINABLE.
3. CONNECT COILS FOR COUNTER-FLOW I.E. ENTERING LIQUID CONNECTION ON LEAVING AIR SIDE OF COIL.
4. CONNECTIONS ARE PIPE, NPT (EXT).
5. ALL DIMENSIONS ARE IN INCHES.
6. CONNECTION LOCATION ± .125.
7. CONNECTION VENT & DRAIN 1/4 NPT.

Dimensions																
Coil Model	Coil Airflow	Rows	Fin Height (in)	Fin Length (in)	Overall Height (in)	Overall Length (in)	Conn Size (in)	A (in)	B (in)	H (in)	L (in)	M (in)	N (in)	P (in)	Q (in)	Depth (in)
5WM1012B	Horizontal	12	45	68.00	47.00	86.75	2.992	5.000	2.630	2.630	2.44	2.44	10.00	1.00	1.00	17.880

Product Drawing	Unit Tag: AHU-2 (Heating			Sales Office: HTS Engineering Ltd.			DAIKIN
Product:	Project Name: 22104386 - Brampton			Sales Engineer:			13600 Industrial Park Blvd. Minneapolis, MN 55441
Model: 5WM	Feb. 26, 2025	Ver/Rev:	Sheet: 1 of 1	Scale: NTS	Tolerance: +/- 0.25”	Dwg Units: (in)	www.DaikinApplied.com Software Version: 10.60

Job Information	*Technical Data Sheet*		
Job Name	22104386 - Brampton VIctoria Park Arena		
Date	2/26/2025		
Submitted By	Graham Jones		
Software Version	10.60	**Coil DLL Version**	10.60
Unit Tag	AHU-2 (Heating Performance)		

Coil Overview

Model Number	Application	Total Capacity Btu/hr	Air Flow CFM	Fin Height in	Fin Length in
5WM1012B	Hot Water coil	277748	21200	45	68.00

Coil

Model Number:	5WM1012B
Application:	Hot Water coil
Type	Standard
Crating:	Standard Crate
Number of Coils:	2

Physical (Per Coil)

Depth	Height	Length	Weight		
			Shipping	Operating	Dry
17.88 in	47.00 in	86.75 in	1111 lb	1113 lb	831 lb

Material			
Tube Diameter	**Fin**	**Tube**	**Case**
0.625 in	0.0075 in Aluminum	0.020 in Copper nominal	Stainless steel

Geometry					
Fin Design	**Fins per Inch**	**Number of Rows**	**Fin Height**	**Fin Length**	**Tube Spacing**
Corrugated	10	12	45 in	68.00 in	1.50 X 1.299

Connection				Flange Dimensions	
Type	**Size**	**Hand**	**Length**	**Header**	**Side**
Carbon Steel (threaded)	2.992 in	Right Hand	10.00 in	1.00 in	1.00 in

Performance (Per Coil Bank)

Air Flow CFM	Altitude ft	Face Area ft^2	Face Velocity ft/min
21200	0	42.5	498.8

Total Capacity Btu/hr	Temperature				Air Pressure Drop inH_2O
	Entering		Leaving		
	Air Dry Bulb °F	Water °F	Air Dry Bulb °F	Water °F	
277748	61.8	74.5	73.8	71.8	1.14

Fluid					
Volume gal	**Flow rate gpm**	**Velocity ft/s**	**Type**	**Glycol Concentration %**	**Pressure Drop ft H_2O**
66.00	228.2	2.7	Propylene	42.0	22.4

Hot Water Fouling Factor:	0.0000

Options

Coil Options	Brass Turbospirals
Protective Coatings	None

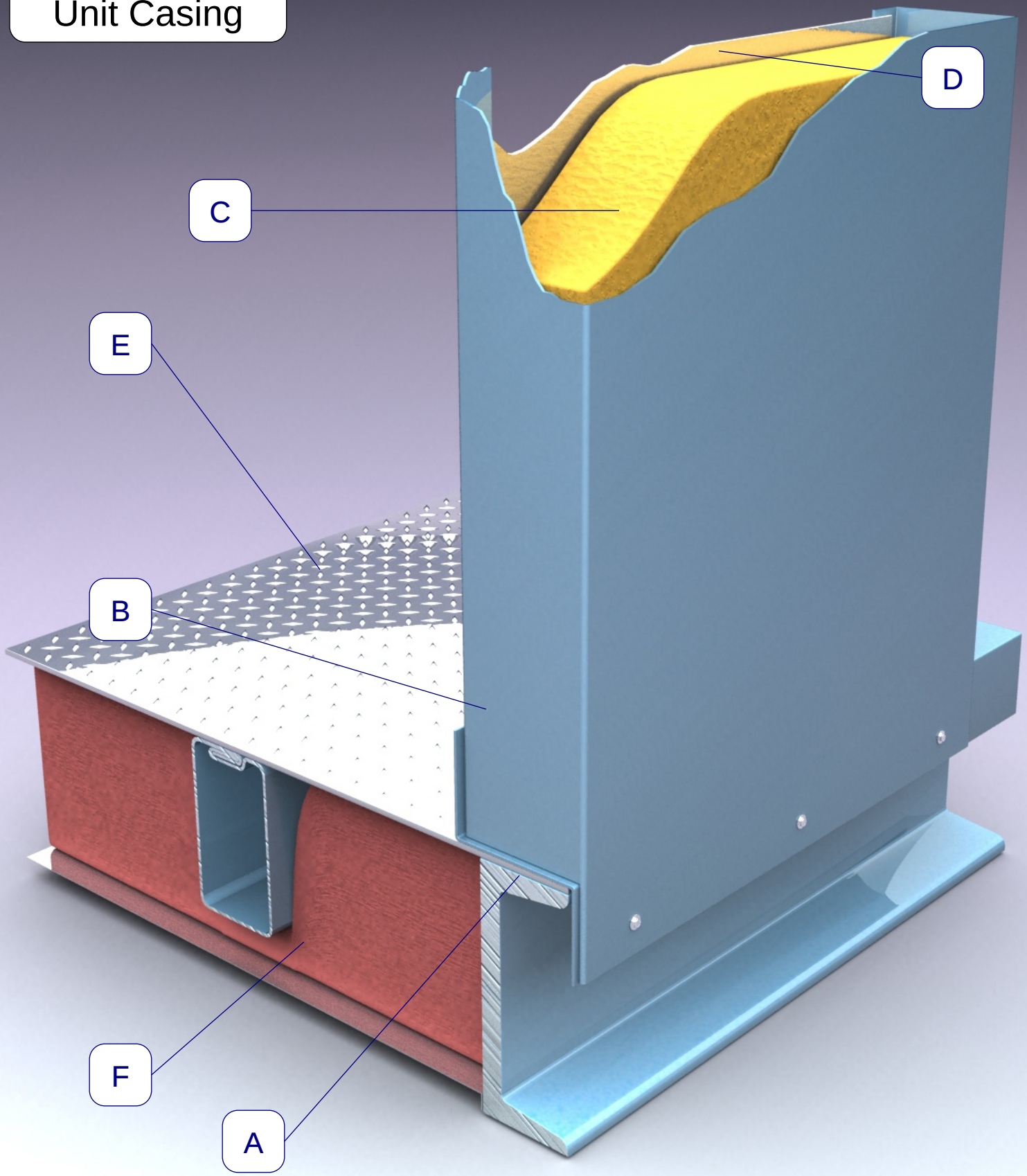
Replacement Coil

Type	Serial Number	Order Number
Vision/Skyline Airhandler		

AHRI Certification

Coil is NOT certified by AHRI.

Unit Casing

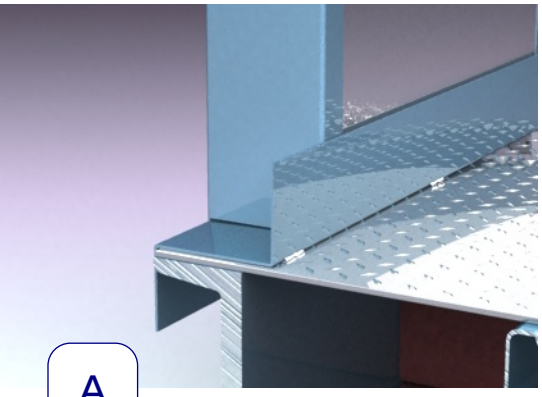


TAG: AHU-2

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT01		
DATE	2025-03-10	UNITS	METRIC	REVISION			

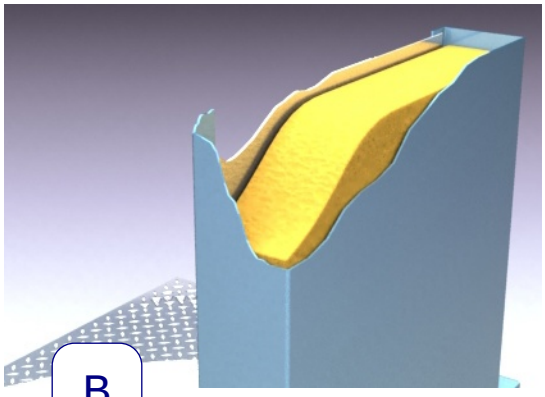
HAAKON INDUSTRIES



A

Z-bar

This 38 mm collar is installed around the perimeter of the unit floor to ensure that the unit is internally watertight.The collar is alternately screwed down and tack welded to the unit base on 305 mm centres.



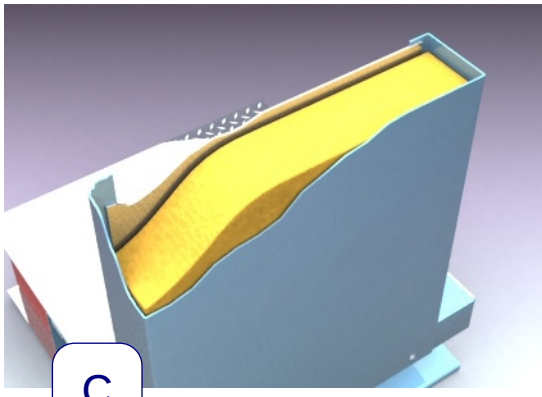
B

Casing

Wall and roof panels are constructed out of 1.6 mm satin coat galvanized steel. Wall panels are 51 mm thick. Wall seams are turned inward to provide a clean flush exterior finish. All panel seams are caulked and sealed during assembly to produce an airtight unit. The permanently joined flanged panel surfaces are sealed with an individual strip of " x " tape sealer.

Succesfully tested to 5000 hours for salt spray, the casing is painted with a 2 part Acrylic enamel paint:
--> THICKNESS : 0.04 mm
--> COLOUR : STD. HAAKON GRAY

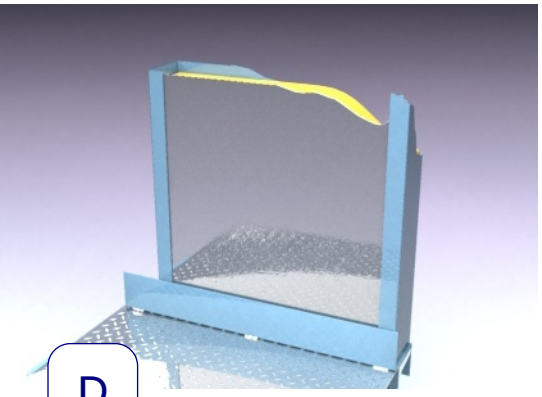
over a 2 part metallic zinc rich primer.



C

Insulation

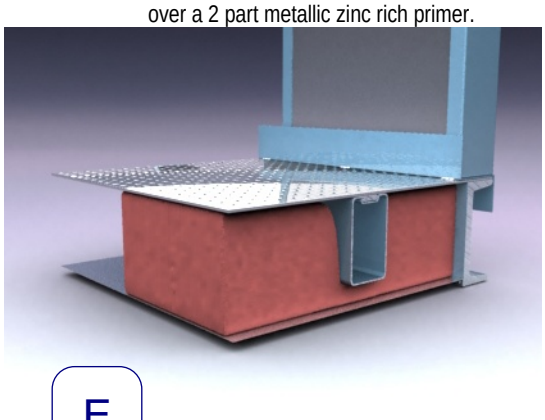
Walls are insulated with 51 mm thick, 64 kg/cu. m density rigid fibre insulation .The insulation has a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50.



D

Casing Liner

A 0.9 mm galvanized steel metal liner is provided to protect the insulation.



E

Floor

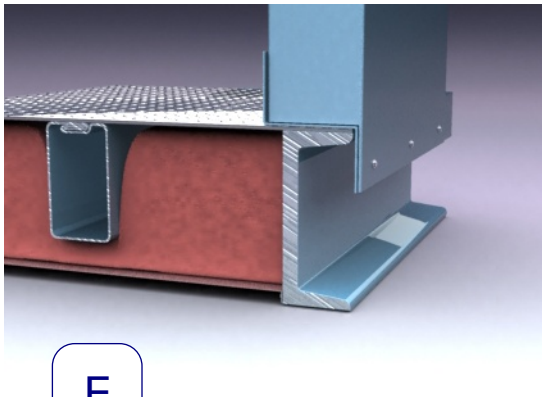
A 3.2 mm aluminum checkerplate floor is installed on the base. Floor seams are continuously welded.

The base is insulated with 76 mm thick, batt insulation.

The floor is standard mill finish.

The base is painted with acrycote paint:
--> THICKNESS : 0.04 mm
--> COLOUR : GRAY

over Interzinc 52 zinc primer.



F

Base Construction

The base is constructed from a C150 x 12 perimeter channel iron frame with intermediate structural box sections.

A 0.9 mm galvanized steel metal liner is provided to protect the insulation. The base liner is broken and tack welded to the underside of the base.

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT02
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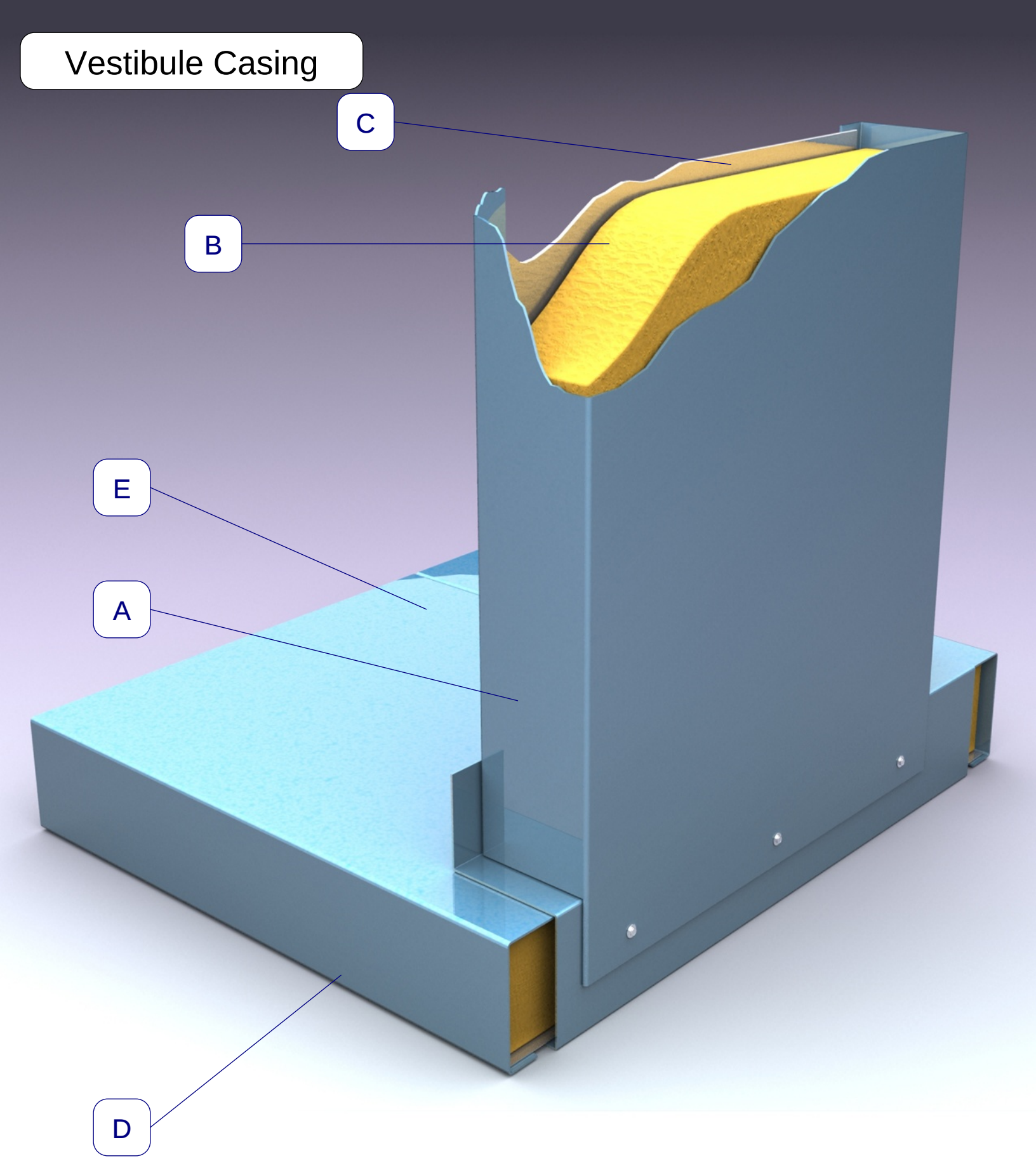
HAAKON INDUSTRIES

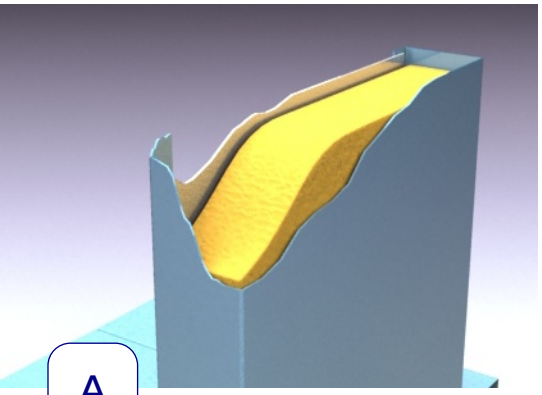
Vestibule Casing



TAG: AHU-2

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT03	HAAKON INDUSTRIES
DATE	2025-03-10	UNITS	METRIC	REVISION		



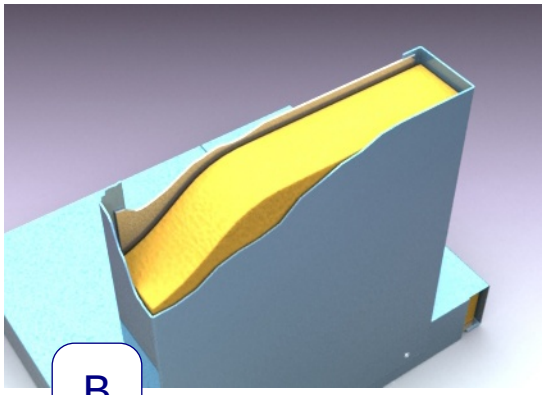
A

Casing

Wall and roof panels are constructed out of 1.6 mm satin coat galvanized steel. Wall panels are 51 mm thick. Wall seams are turned inward to provide a clean flush exterior finish. All panel seams are caulked and sealed during assembly to produce an airtight unit. The permanently joined flanged panel surfaces are sealed with an individual strip of " x " tape sealer.

Succesfully tested to 5000 hours for salt spray, the casing is painted with a 2 part Acrylic enamel paint:
--> THICKNESS : 0.04 mm
--> COLOUR : STD. HAAKON GRAY

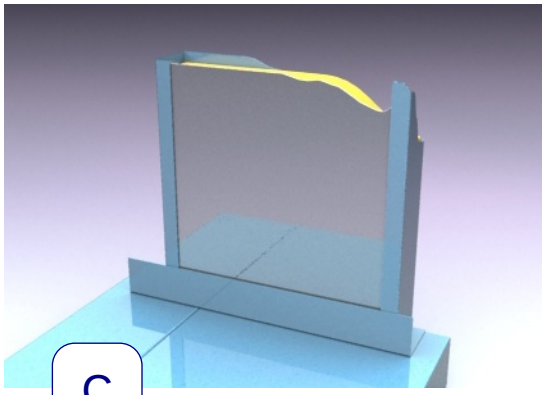
over a 2 part metallic zinc rich primer.



B

Insulation

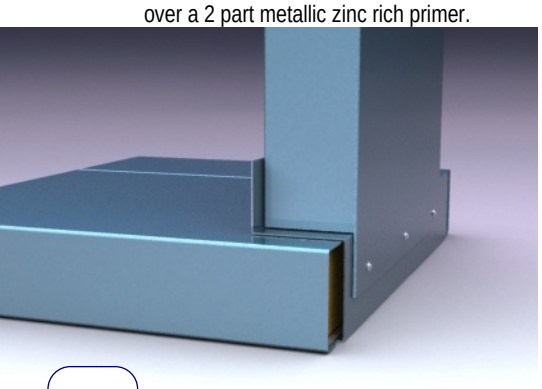
Walls are insulated with 51 mm thick, 64 kg/cu. m density rigid fibre insulation .The insulation has a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50.



C

Casing Liner

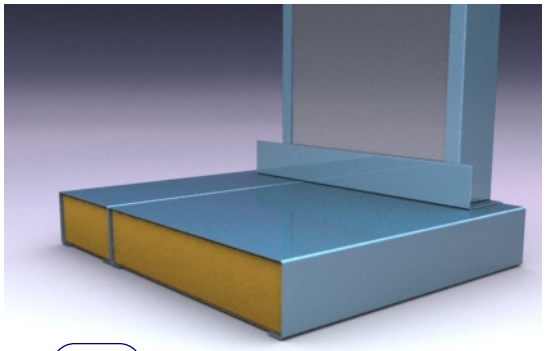
A 0.9 mm galvanized steel metal liner is provided to protect the insulation.



D

Base Liner

A 1.6 mm galvanized steel metal liner is provided to protect the insulation. The base liner is broken and tack welded to the underside of the base.



E

Base Insulation

The base is insulated with 51 mm thick, rigid fibre insulation .

The floor is standard mill finish.

The base is painted with acrycote paint:
--> THICKNESS : 0.04 mm
--> COLOUR : GRAY

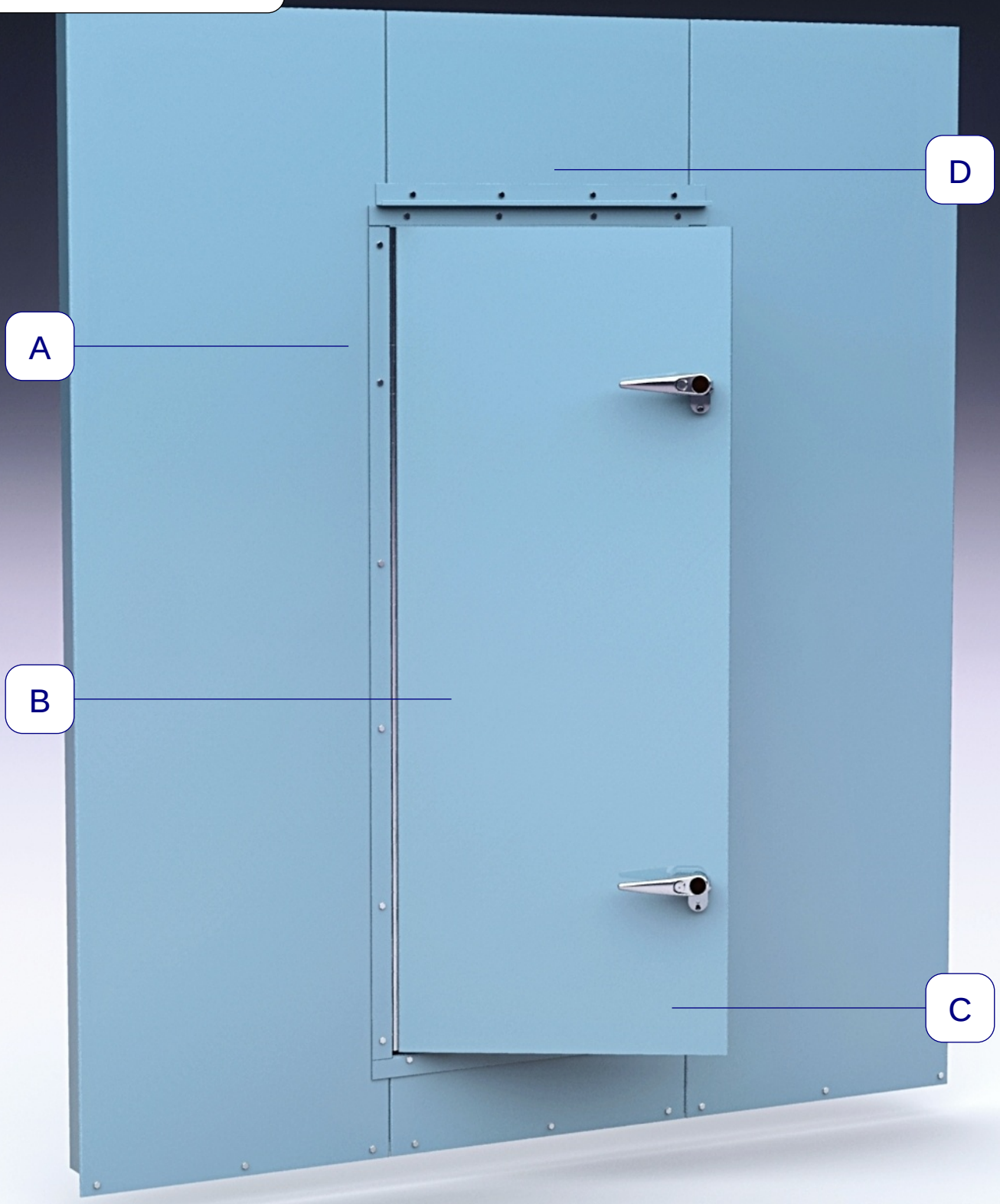
over Interzinc 52 zinc primer.

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT04
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

Standard Door



TAG: AHU-2

PROJECT:		BRAMPTON VICTORIA PARK ARENA					
DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT05		
DATE	2025-03-10	UNITS	METRIC	REVISION			

HAAKON INDUSTRIES

A

Frame, Hinge & Seal

Door Frame
Door frames are made from 1.6 mm satin coat galvanized steel and continuously welded for rigidity.

Door Hinge
Continuous piano hinges are made of ~stainless steel.

Door Seal
Close cell EPDM bulb type seal is used around the door to prevent air leakage.

B

Material & Insulation

Door Material
Doors are manufactured from 1.6 mm satin coat galvanized steel. Doors are 51 mm thick.

Insulation
Doors are insulated with 51 mm, 64 kg/cu. m density rigid fibre insulation . A 0.9 mm galvanized steel liner is provided to protect the insulation.

C

Handles

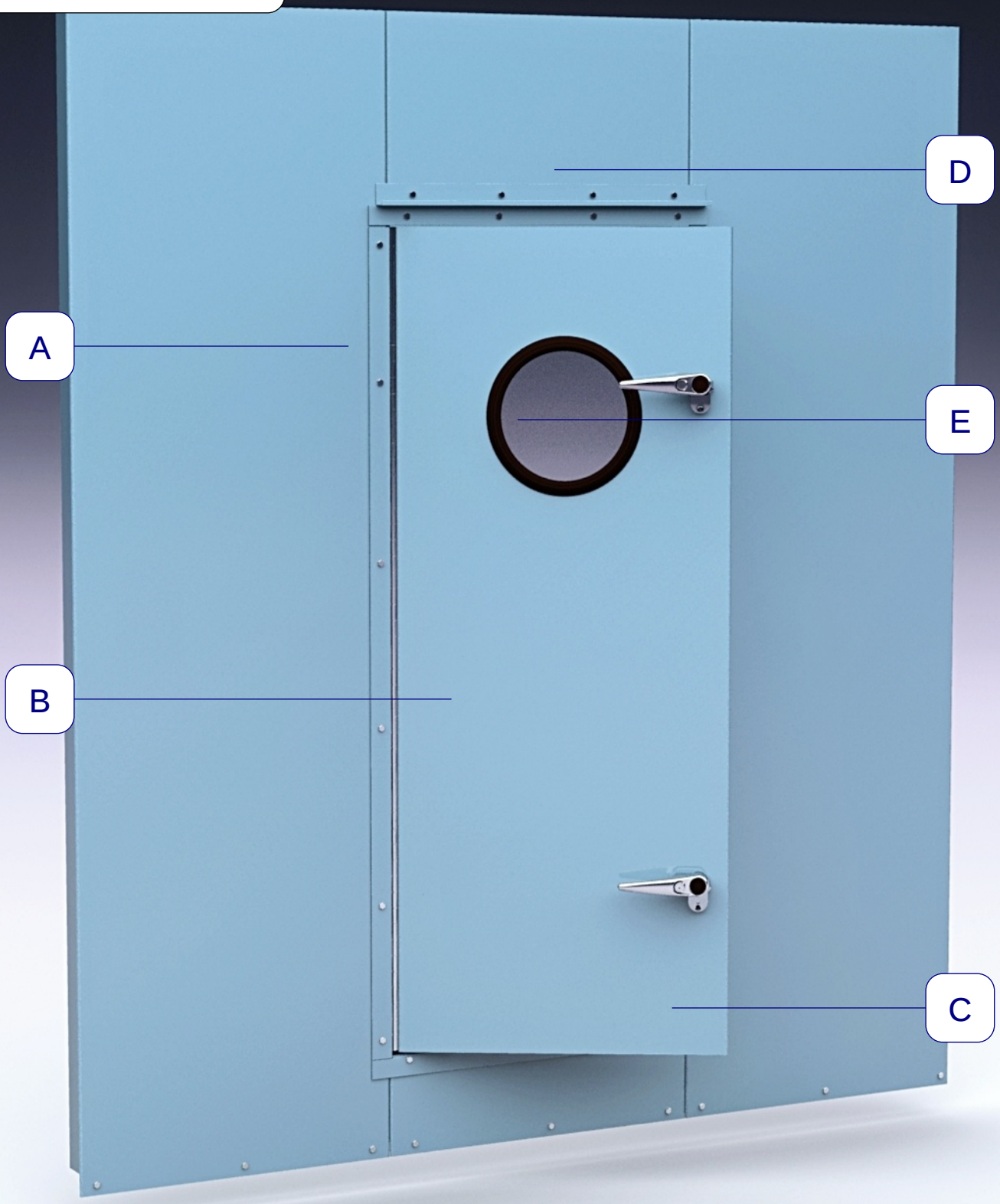
Heavy duty cast handles of a non-corrosive alloy of zinc and aluminum are installed on both sides of the door for easy access. (Doors 1219 mm and under in height have only one handle.)

D

Rain Lip

A rain lip is provided on outdoor units.

Standard Door



TAG: AHU-2

PROJECT:		BRAMPTON VICTORIA PARK ARENA					
DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT07		
DATE	2025-03-10	UNITS	METRIC	REVISION			

HAAKON INDUSTRIES

A

Frame, Hinge & Seal

Door Frame
Door frames are made from 1.6 mm satin coat galvanized steel and continuously welded for rigidity.

Door Hinge
Continuous piano hinges are made of ~stainless steel.

Door Seal
Close cell EPDM bulb type seal is used around the door to prevent air leakage.

B

Material & Insulation

Door Material
Doors are manufactured from 1.6 mm satin coat galvanized steel. Doors are 51 mm thick.

Insulation
Doors are insulated with 51 mm, 64 kg/cu. m density rigid fibre insulation . A 0.9 mm galvanized steel liner is provided to protect the insulation.

C

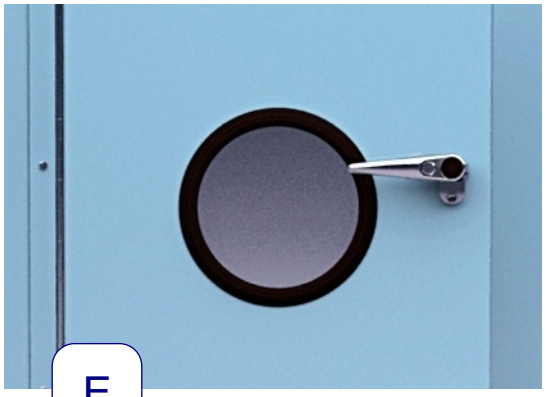
Handles

Heavy duty cast handles of a non-corrosive alloy of zinc and aluminum are installed on both sides of the door for easy access. (Doors 1219 mm and under in height have only one handle.)

D

Rain Lip

A rain lip is provided on outdoor units.



E

Viewing Port

A 305 mm round double glazed tempered glass hermetically sealed window is provided.

F

Test Port

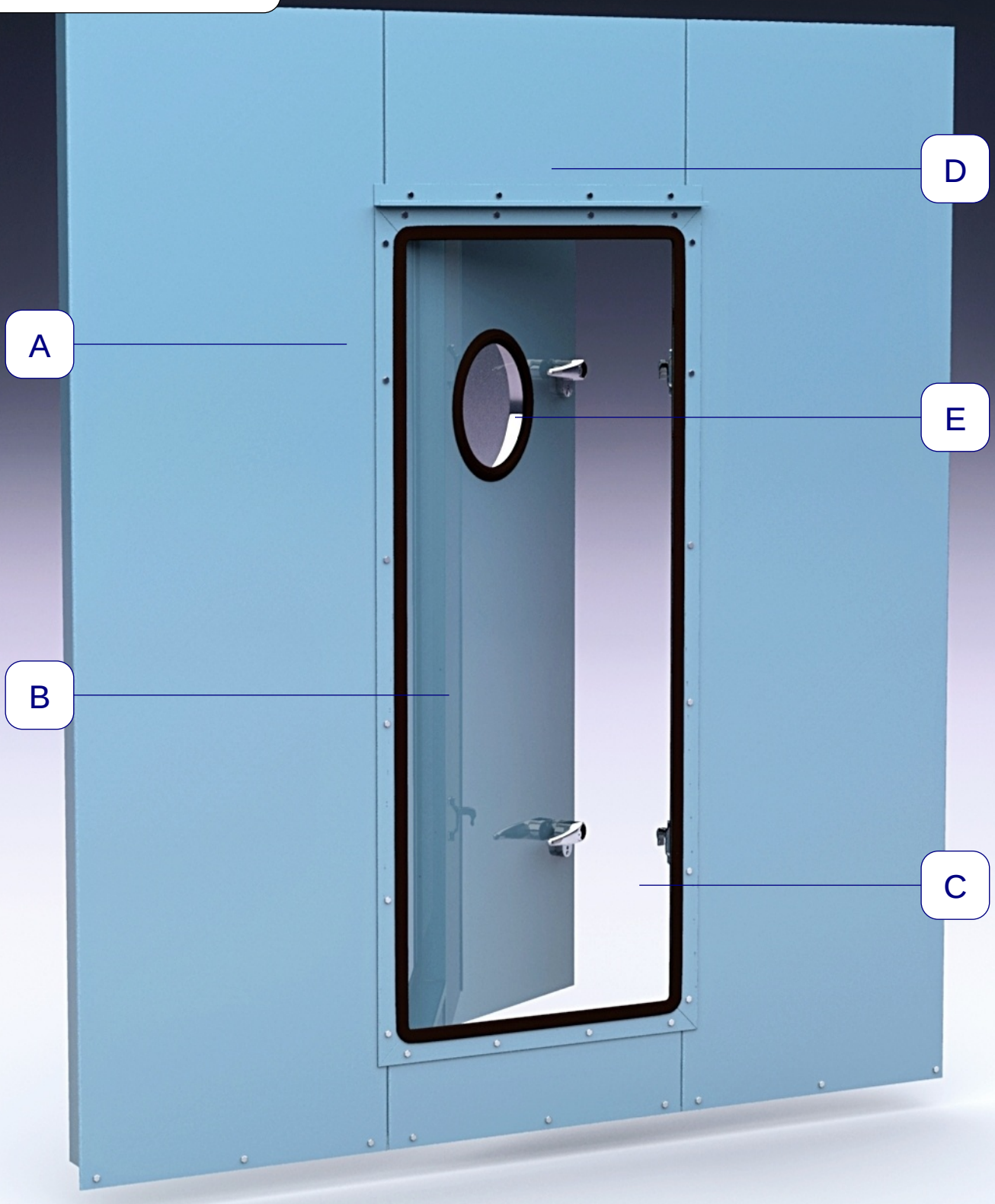
A Durodyne IP test port is located in each door.

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT08
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

Pressure Door



TAG: AHU-2

PROJECT:		BRAMPTON VICTORIA PARK ARENA					
DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT09		
DATE	2025-03-10	UNITS	METRIC	REVISION			

HAAKON INDUSTRIES

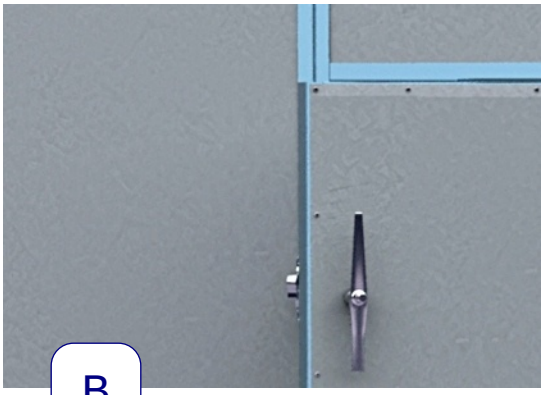
A

Frame, Hinge & Seal

Door Frame
Door frames are made from 2.7 mm satin coat galvanized steel and continuously welded for rigidity.

Door Hinge
Continuous piano hinges are made of ~stainless steel.

Door Seal
Close cell EPDM bulb type seal is used around the door to prevent air leakage.



B

Material & Insulation

Door Material
Doors are manufactured from 1.6 mm satin coat galvanized steel. Doors are 51 mm thick.

Insulation
Doors are insulated with 51 mm, 64 kg/cu. m density rigid fibre insulation . A 0.9 mm galvanized steel liner is provided to protect the insulation.

C

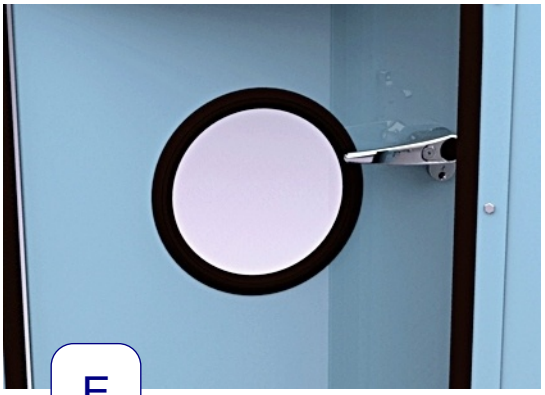
Handles

Heavy duty cast handles of a non-corrosive alloy of zinc and aluminum are installed on both sides of the door for easy access. (Doors 1219 mm and under in height have only one handle.)

D

Rain Lip

A rain lip is provided on outdoor units.



E

Viewing Port

A 305 mm round double glazed tempered glass hermetically sealed window is provided.

F

Test Port

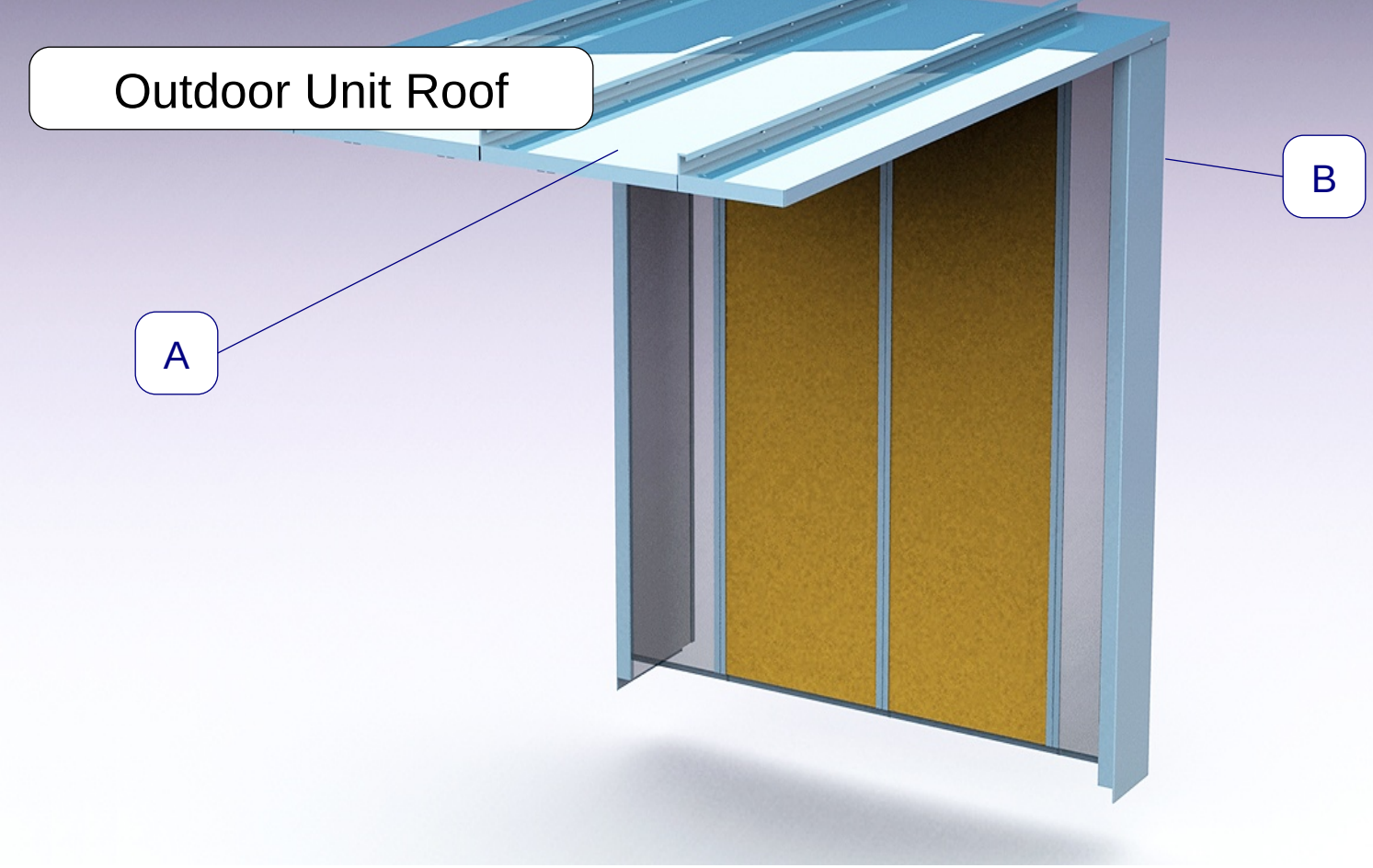
A Durodyne IP test port is located in each door.

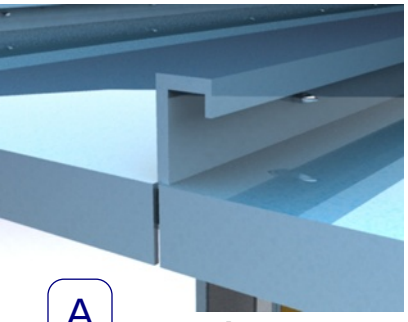
PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT10
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

Outdoor Unit Roof





A

Panel

Outdoor unit roofs is constructed with same material and insulation as casing panels. Outdoor roof panels are broken outward to provide a lapped watertight seal.

B

Trim

Outdoor unit roof panels are provided with overlapping flanges to prevent water entrainment into casing panels. Roof panels are caulked and tek screwed into unit casing to produce an airtight unit.

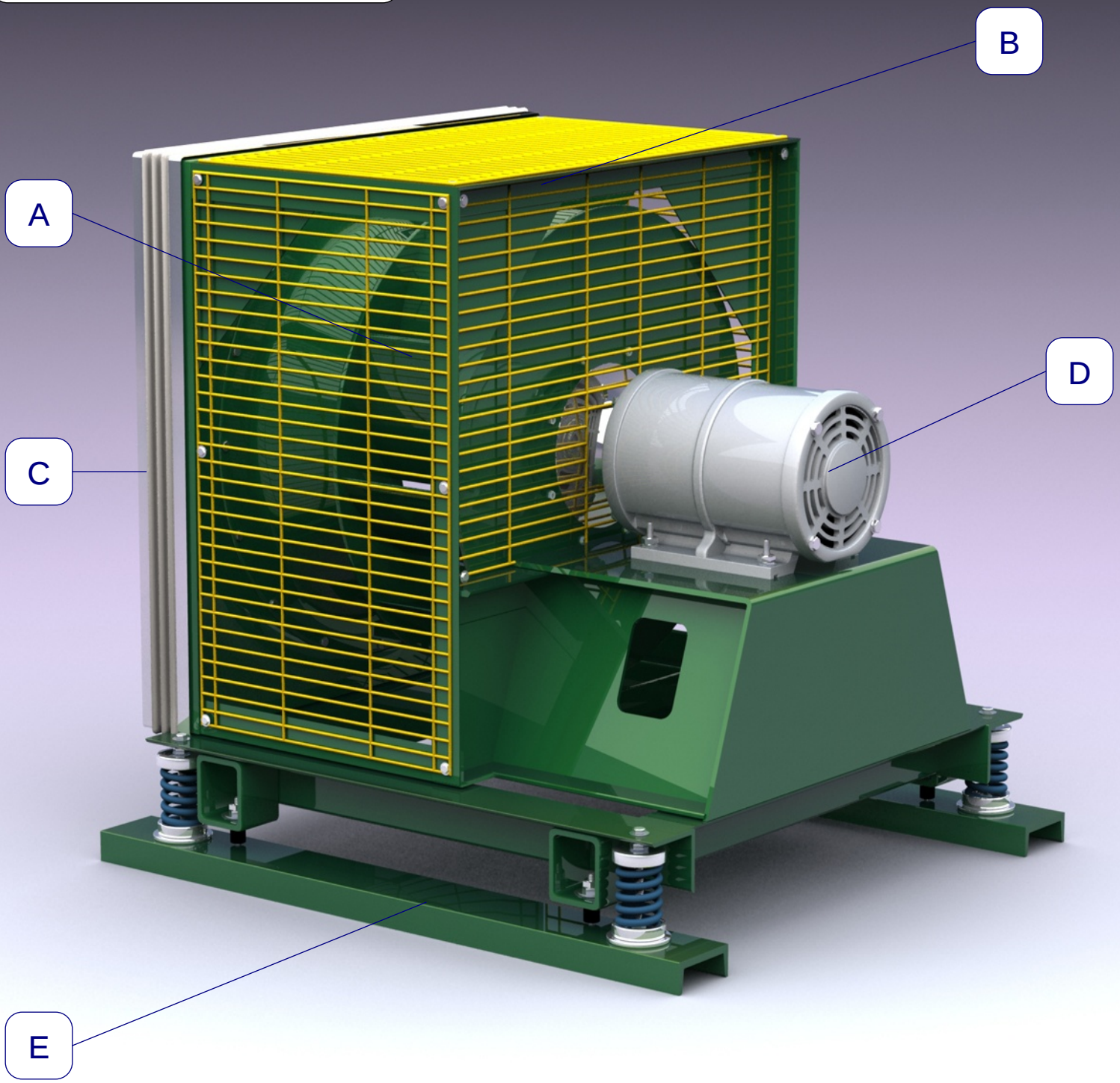
TAG: AHU-2

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT11		
DATE	2025-03-10	UNITS	METRIC	REVISION			

HAAKON INDUSTRIES

Fan Construction

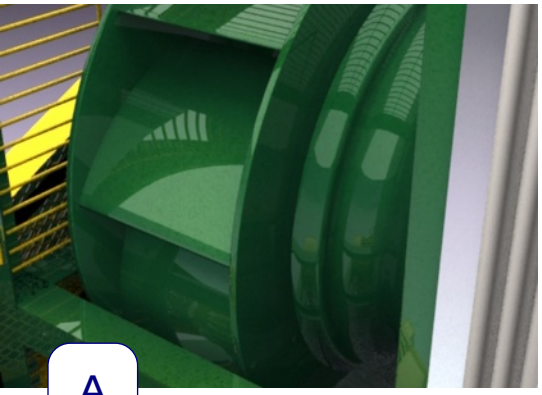


TAG: AHU-2 RF, AHU-2 SF

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT12
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

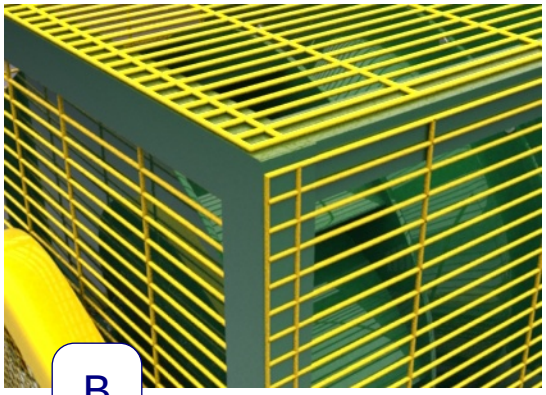


A

Wheel

Wheels are precision spun, flat inlet cone to allow higher efficiencies over the performance range of the fan. Hollow airfoil-shaped blades are made from Aluminum , continuously welded around all edges, and statically and dynamically balanced on precision electronic balancers to category BV3.

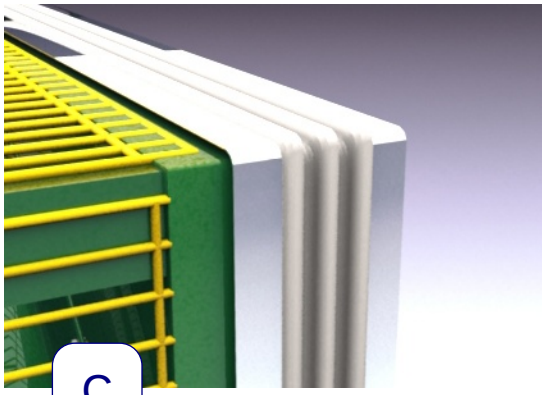
Inlet cone is steel and the entire fan is thoroughly degreased and deburred before application of a rust-preventative primer. Completed assembly is coated with Polyester Powder. Aluminum parts are not painted.



B

Screening

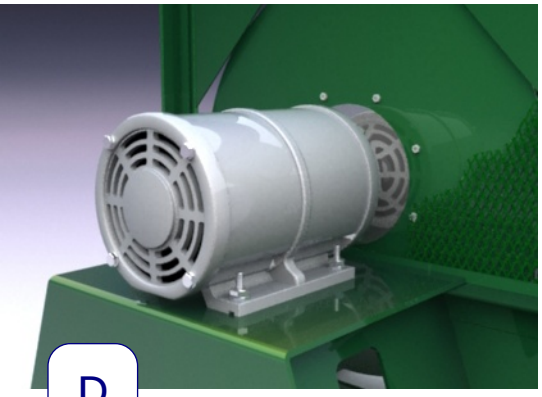
Protective enclosures are made of powder coated mild steel.



C

Flex

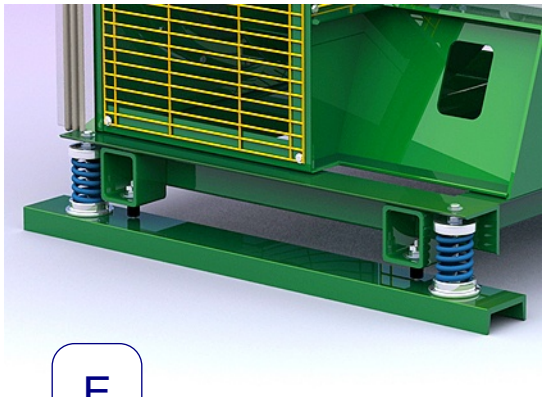
Fan discharges have heavy glass fabric, double-coated with neoprene, connection. Flex connection is resistant to abrasion and damage from flexing and is air-tight, water-tight, and fire retardant. Flex connection is provided with GLV trim.



D

Motor

Motors are mounted on a pedestal. The motors are premium efficiency, Totally Enclosed Fan Cooled industrial grade T frame, suitable for VFD operation. Shaft Grounding is supplied on all motors. Motors will have an insulation class of F. Motor Service Factor: 1.15



E

Isobase

Fans and motors are mounted on heavy duty angle isolation bases. The base is supported on four open spring isolators.

Fans tested in accordance with AMCA 211 and AMCA 311 test codes for air moving devices and licensed to bear the AMCA certified ratings seal for both sound and air.

TAG: AHU-2 RF, AHU-2 SF

PROJECT: BRAMPTON VICTORIA PARK ARENA

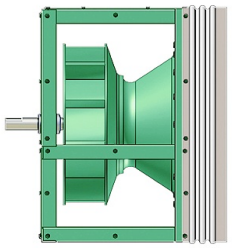
DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT13
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

Fan Performance

AHU-2
RF

FAN	
MODEL	33TCEPFN
FAN CLASS	2
WHEEL DIAMETER	33 in
WIDTH	SWSI
WHEEL WIDTH %	92
FAN BLADE QUANTITY	9
QUANTITY OF FANS	1



OPERATING POINT	OP. PT1			
AIRFLOW	10001	l/s		
TOTAL STATIC PRESSUE	273	Pa		
EXTERNAL STATIC PRESSURE	149	Pa		
ELEVATION	0	m		
TEMPERATURE USED FOR DENSITY	21	°C		
AIR DENSITY	1.201	g/l		
AIR MASS FLOW RATE	0	kg/s		
FAN SPEED	1150	rev/min		
MAXIMUM SPEED FOR FAN CLASS	1620	rev/min		
TIP SPEED	9935	m/s		
MOTOR SPEED AT OPERATING POINT	1150	rev/min		
VFD HZ AT DESIGN SPEED	60	hz		
FAN POWER CONSUMPTION AT OP POINT	6.4	kW		
MOTOR POWER CAPABILITY AT OP POINT	7.5	kW		
FAN TORQUE AT OPERATING POINT	53	N-m		
MOTOR TORQUE CAPABILITY AT OP POINT	62	N-m		
FAN STATIC EFFICIENCY	42.8	%		
FAN TOTAL EFFICIENCY	42.8	%		
FAN PEAK TOTAL EFFICIENCY	78.7	%		
FAN EFFICIENCY GRADE RATING	80.0	%		
TOTAL EFF/PEAK TOTAL EFF	54.4	%		
BLADE PASSAGE FREQUENCY	172	hz		
TEMPERATURE RISE ACROSS FAN	1.0	°C		
FAN EFFICIENCY INDEX	1.00			

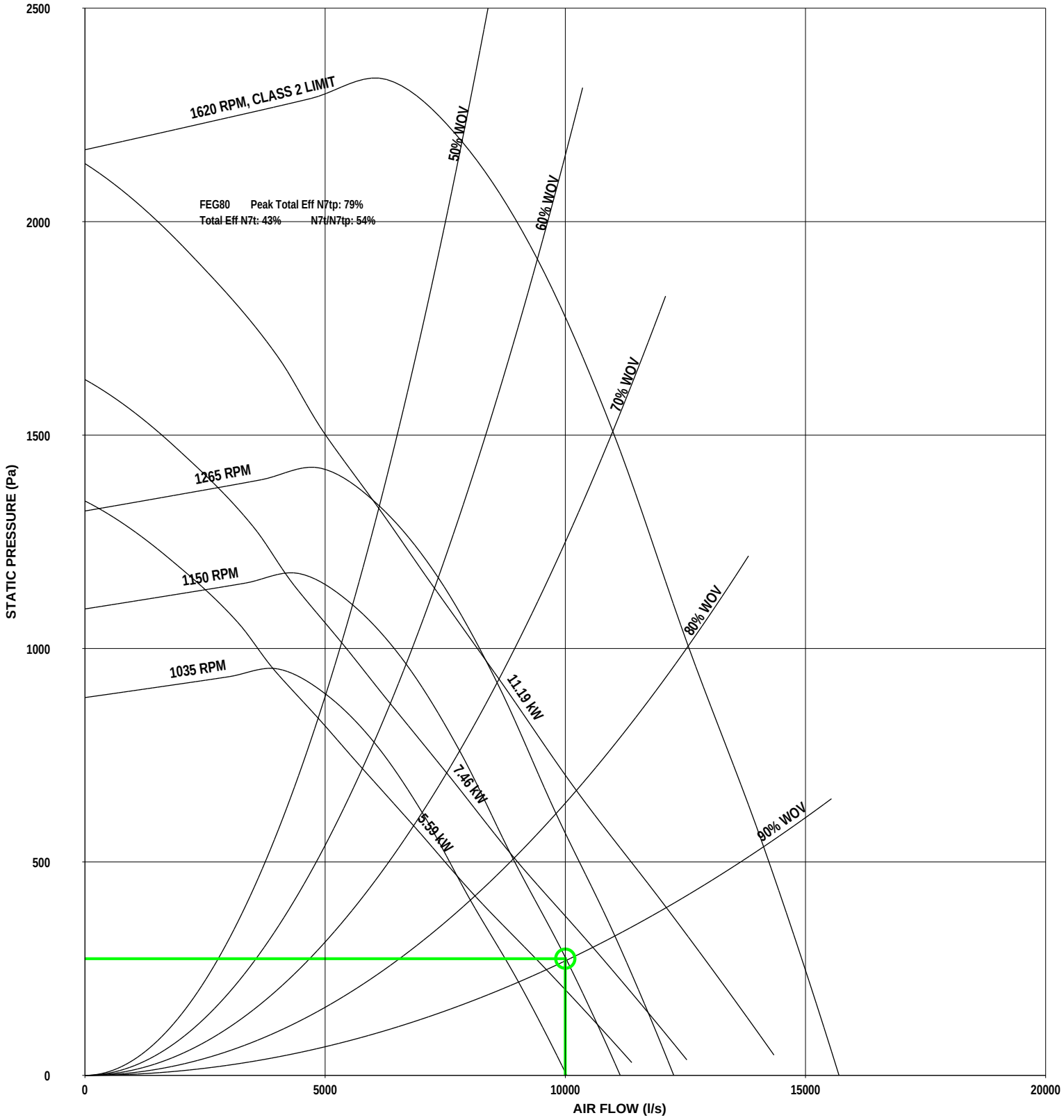
MOTOR DATA		
MOTOR RATED HP	7.457	kW
MOTOR FULL LOAD CURRENT	11	A
MOTOR EFFICIENCY	91	%
MOTOR SHAFT GROUNDING	YES	
MOTOR FRAME SIZE	256T	
ENCLOSURE TYPE	TEFC	
SYNCHRONOUS MOTOR SPEED AT 60HZ	1150	rev/min
VOLTAGE/PHASE/HZ	575/3/60	

OPERATING POINT	SOUND POWER LEVELS (dB re 10^{-12} Watts)								
	OCTAVE BAND	1	2	3	4	5	6	7	8
OP. PT1	INLET	84	95	100	90	83	82	77	67
	OUTLET	85	94	99	94	91	89	82	71
	INLET								
	OUTLET								
	INLET								
	OUTLET								
	INLET								
	OUTLET								

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT16	HAAKON INDUSTRIES
DATE	2025-03-10	UNITS	METRIC	REVISION		

AHU-2
RF



PROJECT: BRAMPTON VICTORIA PARK ARENA

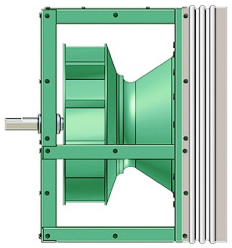
DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT16	
DATE	2025-03-10	UNITS	METRIC	REVISION		

HAAKON INDUSTRIES

Fan Performance

AHU-2
SF

FAN	
MODEL	36TCEPFN
FAN CLASS	2
WHEEL DIAMETER	36 in
WIDTH	SWSI
WHEEL WIDTH %	90
FAN BLADE QUANTITY	9
QUANTITY OF FANS	1



OPERATING POINT	OP. PT1			
AIRFLOW	10001	l/s		
TOTAL STATIC PRESSUE	1058	Pa		
EXTERNAL STATIC PRESSURE	373	Pa		
ELEVATION	0	m		
TEMPERATURE USED FOR DENSITY	21	°C		
AIR DENSITY	1.201	g/l		
AIR MASS FLOW RATE	0	kg/s		
FAN SPEED	1150	rev/min		
MAXIMUM SPEED FOR FAN CLASS	1465	rev/min		
TIP SPEED	10838	m/s		
MOTOR SPEED AT OPERATING POINT	1150	rev/min		
VFD HZ AT DESIGN SPEED	60	hz		
FAN POWER CONSUMPTION AT OP POINT	14.3	kW		
MOTOR POWER CAPABILITY AT OP POINT	18.6	kW		
FAN TORQUE AT OPERATING POINT	119	N-m		
MOTOR TORQUE CAPABILITY AT OP POINT	155	N-m		
FAN STATIC EFFICIENCY	73.9	%		
FAN TOTAL EFFICIENCY	73.9	%		
FAN PEAK TOTAL EFFICIENCY	80.4	%		
FAN EFFICIENCY GRADE RATING	85.0	%		
TOTAL EFF/PEAK TOTAL EFF	91.9	%		
BLADE PASSAGE FREQUENCY	172	hz		
TEMPERATURE RISE ACROSS FAN	2.3	°C		
FAN EFFICIENCY INDEX	1.40			

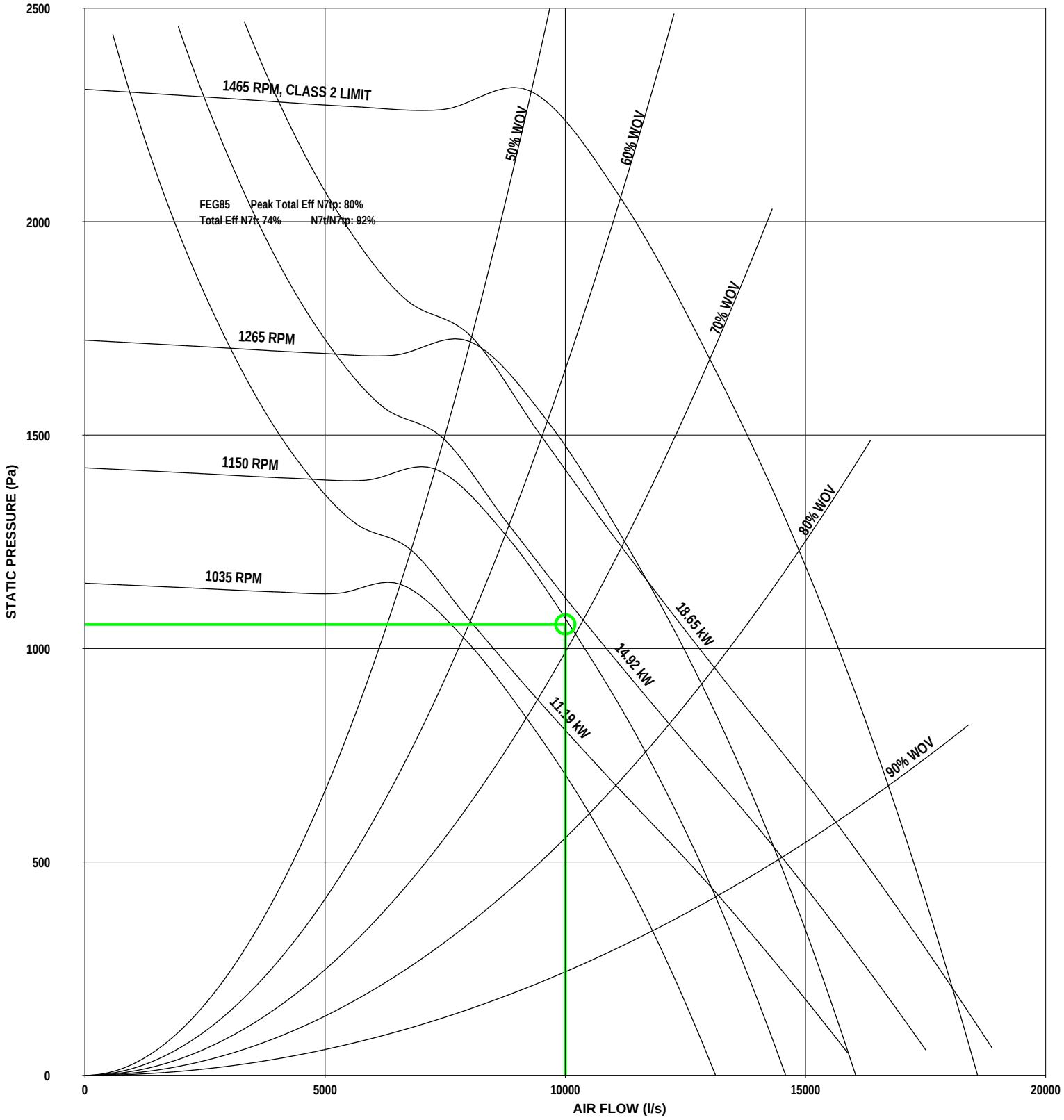
MOTOR DATA		
MOTOR RATED HP	18.642	kW
MOTOR FULL LOAD CURRENT	24	A
MOTOR EFFICIENCY	93	%
MOTOR SHAFT GROUNDING	YES	
MOTOR FRAME SIZE	324T	
ENCLOSURE TYPE	TEFC	
SYNCHRONOUS MOTOR SPEED AT 60HZ	1150	rev/min
VOLTAGE/PHASE/HZ	575/3/60	

OPERATING POINT	SOUND POWER LEVELS (dB re 10^{-12} Watts)								
	OCTAVE BAND	1	2	3	4	5	6	7	8
OP. PT1	INLET	91	98	92	82	83	79	71	67
	OUTLET	89	96	94	89	88	84	77	71
	INLET								
	OUTLET								
	INLET								
	OUTLET								
	INLET								
	OUTLET								

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT20	HAAKON INDUSTRIES
DATE	2025-03-10	UNITS	METRIC	REVISION		

AHU-2
SF



PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT20		
DATE	2025-03-10	UNITS	METRIC	REVISION			

HAAKON INDUSTRIES

FreeFlo Sensing Ring

The FreeFlo display converts the pressure drop through the fan inlet cone, as measured by the FreeFlo ring, into cfm. The CFM is displayed on the front LCD screen. The display is equipped with BACnet MSTP communication protocol. The display is programmed to output an airflow reading between 10% and 120% of the design airflow. The pressure transducers are 0.5% of full scale of the pressure range.

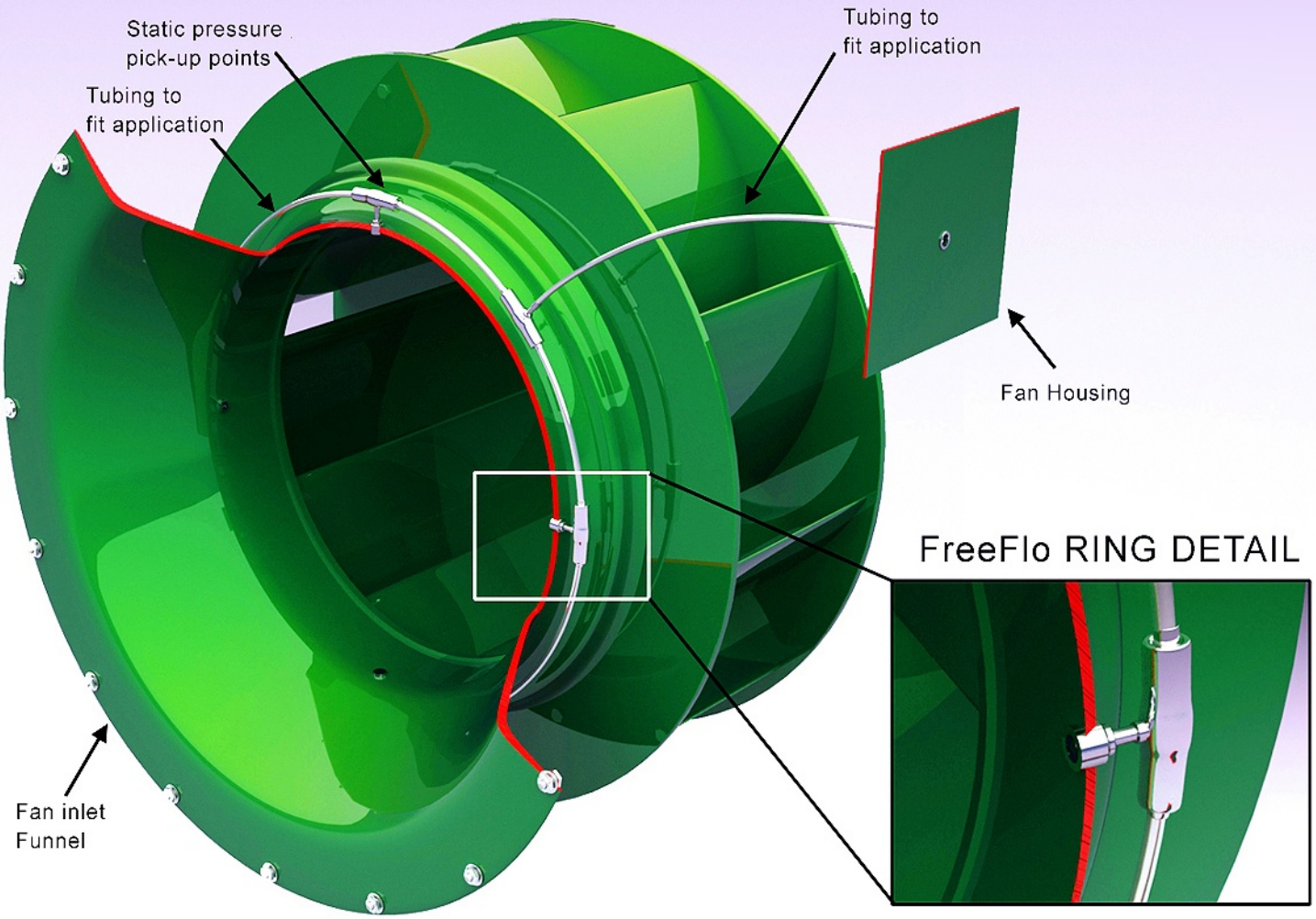
Display is installed in an enclosure, surface mounted on the unit casing.

Each display can simultaneously transmit the unobstructed CFM for individual fans plus total airflow for multiple fans.

Specifications

Supply Voltage : 24VAC
Power required : 40VA
Output Signal : BACnet MSTP

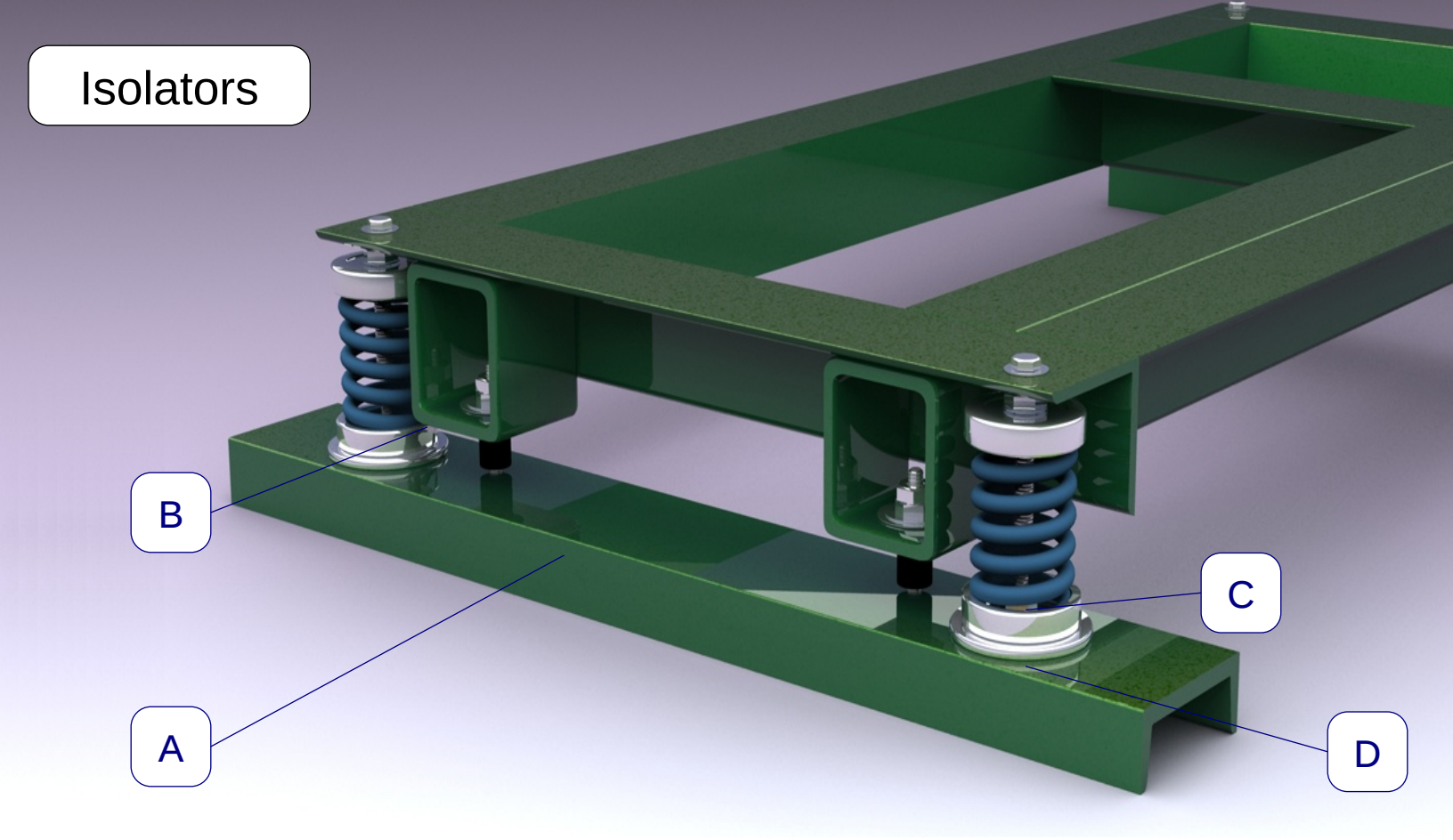
FreeFlo Sensing Ring

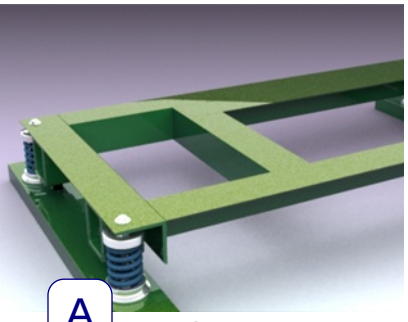


TAG: AHU-2 SF, AHU-2 RF

PROJECT:	BRAMPTON VICTORIA PARK ARENA					
DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT24	HAAKON INDUSTRIES
DATE	2025-03-10	UNITS	METRIC	REVISION		

Isolators

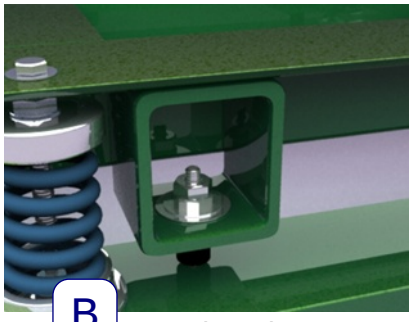




A

Fanbase

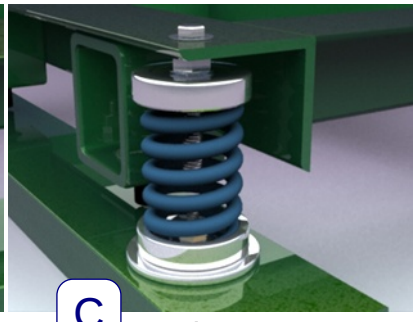
Motors are mounted on industrial grade T frame slide bases. Fans and motor bases are mounted on heavy duty isolation bases. Bases are fabricated out of structural angle.



B

Earthquake Restraint

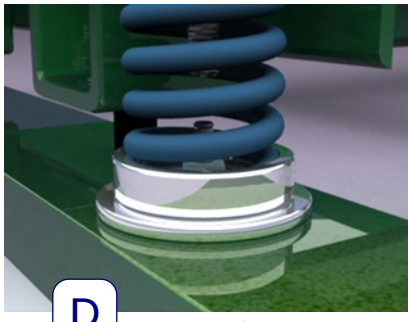
Isolation base comes complete with earthquake restraints designed to inhibit the fanbase from coming off of the isolators. EQ restraints are provided with rubber sleeves to eliminate metal to metal contact, and are designed in accordance with IBC 2006/ASCE 7-05. (EQ. restraints are designed to double as shipping restraints.) Restraints are mounted on structural channel to avoid any penetration into the unit base.



C

Isolators

Fanbase is supported on four open spring isolators. Horizontal stiffness is equal to vertical stiffness. Static deflection is 51 mm.
Isolators are mounted on a structural channel to avoid any penetration into the unit base.



D

Iso Pad

A non-skid neoprene acoustical isolation pad is supplied.

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT25		
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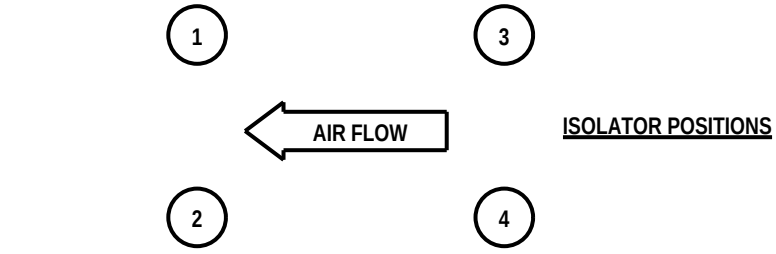
HAAKON INDUSTRIES



ISOLATOR TABLE

TAG	ISOLATORS												OPERATING HEI (mm)
	1			2			3			4			
	RATED CAP. (KG)	RATED DEF. (mm)	COLOUR	RATED CAP. (KG)	RATED DEF. (mm)	COLOUR	RATED CAP. (KG)	RATED DEF. (mm)	COLOUR	RATED CAP. (KG)	RATED DEF. (mm)	COLOUR	
AHU-2 SF	338	51	RED	338	51	RED	227	51	GREEN	227	51	GREEN	165
AHU-2 RF	227	51	GREEN	227	51	GREEN	141	51	PINK	141	51	PINK	165

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT26
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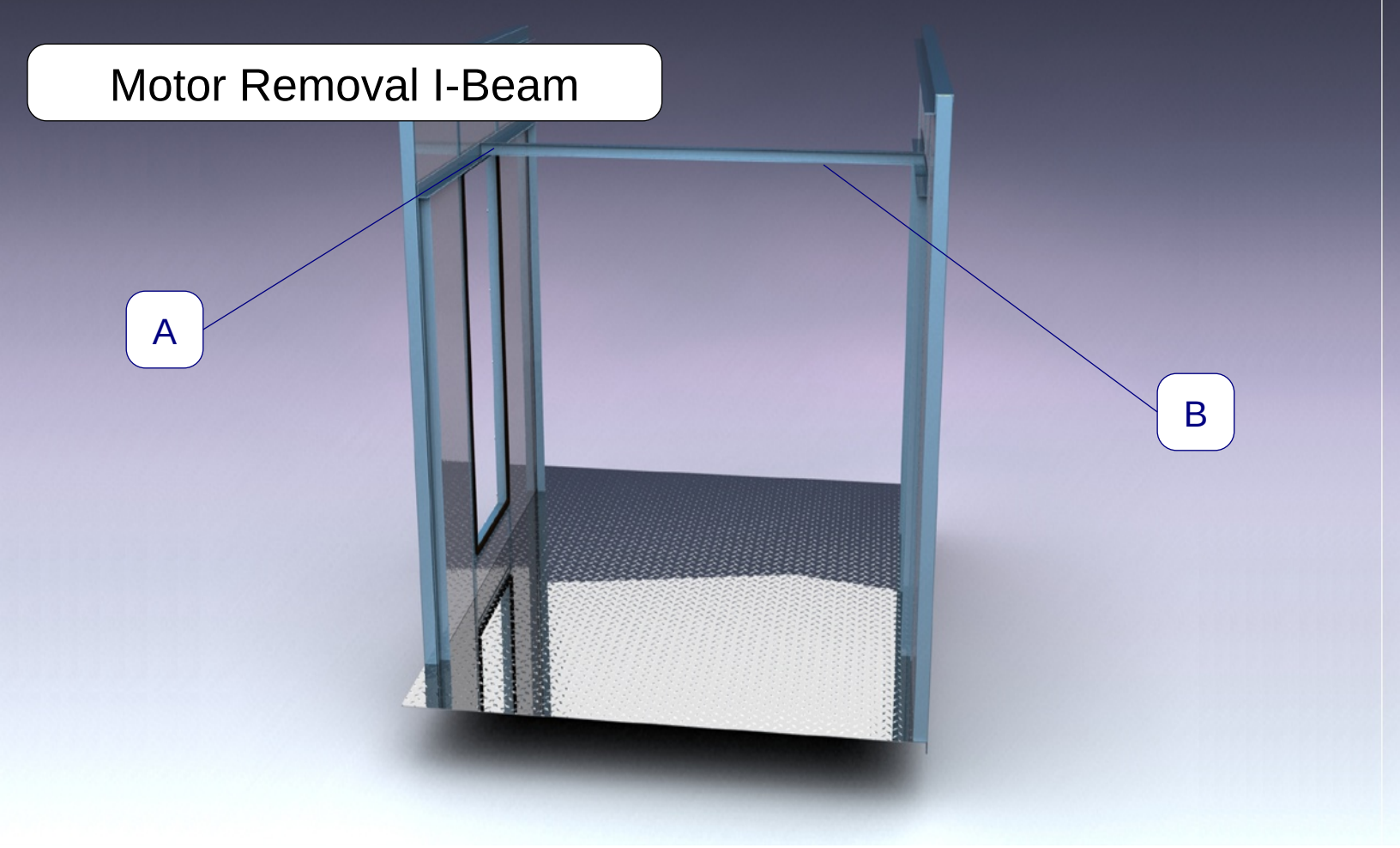
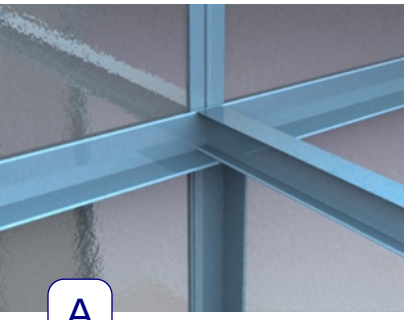
HAAKON INDUSTRIES

Motor Removal I-Beam

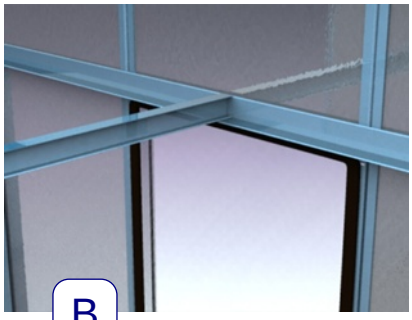




A

I-Beam Frame

Structural steel frame is provided to support motor removal I-beam.



B

Motor Removal I-Beam

Structural steel I-beam traverses along air tunnel width and is provided for easy motor removal.

TAG: AHU-2 SF

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT27
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HAAKON INDUSTRIES

SOUND POWER LEVELS

Sound calculations are based on ASHRAE equations for attenuation of sound from lined plenums. To match actual test data, adjustments are made in the lower bands to account for sound reflection by the plenums.

Haakon casing sound absorption coefficients and transmission loss values used in the calculations have been obtained by an independent sound testing laboratory. The fan sound data is based on AMCA 300 testing.

UNIT	OPEN	SOUND POWER LEVELS (db)									
		BAND	1	2	3	4	5	6	7	8	
		FREQ	63	125	250	500	1000	2000	4000	8000	
AHU-2	SA		90	94	91	85	84	81	74	67	
AHU-2	OA		89	93	93	87	86	83	76	67	
AHU-2	EA		87	94	98	91	89	87	80	69	
AHU-2	RA		88	95	100	95	92	90	83	72	

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT28
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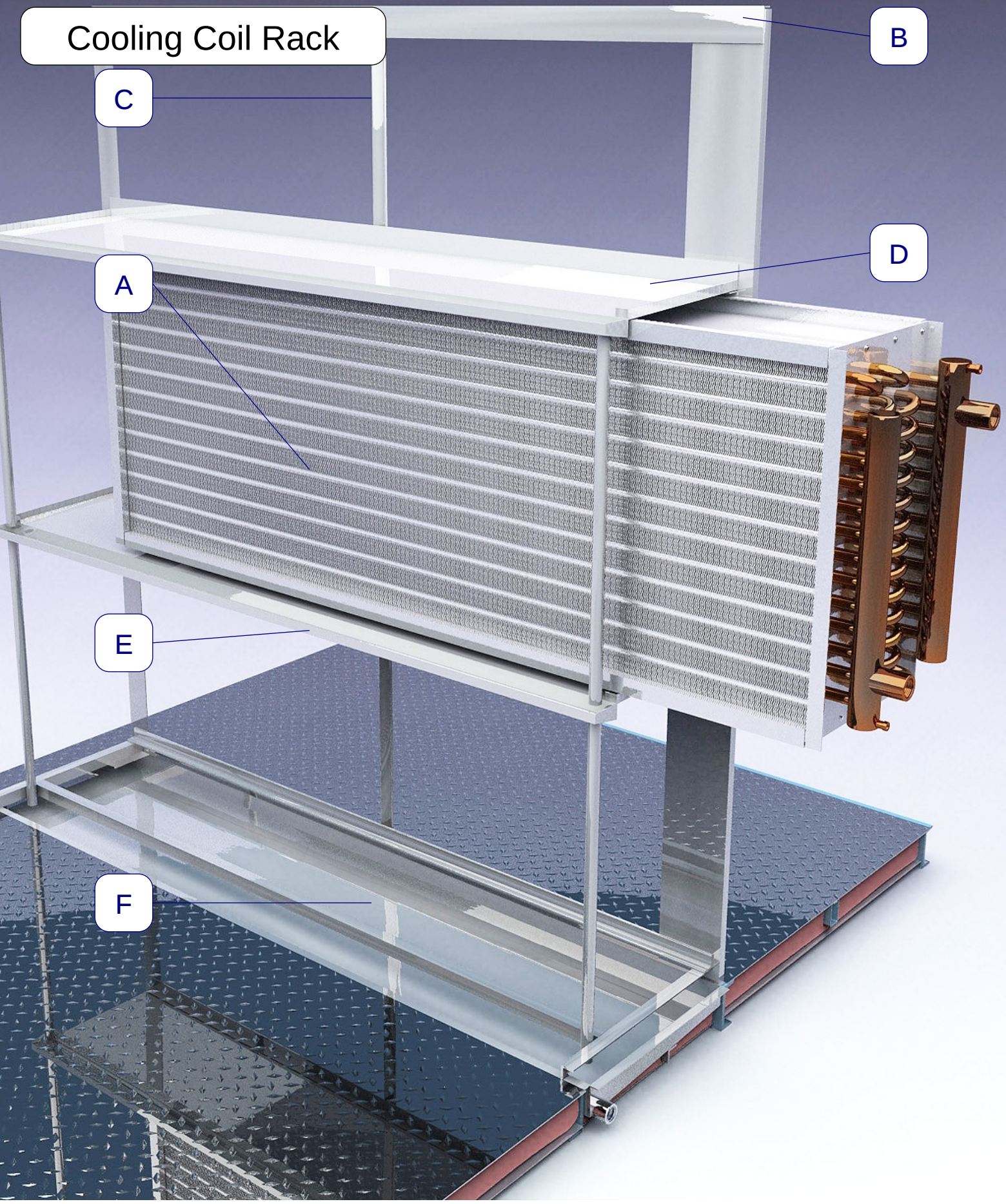
HAAKON INDUSTRIES

Cooling Coil Rack

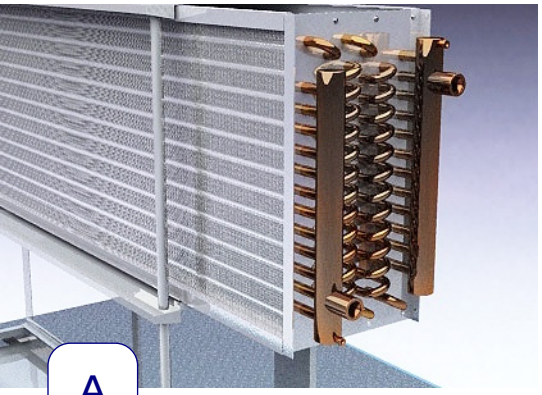


TAG: AHU-2 COOLING

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT29
DATE	2025-03-10	UNITS	METRIC	REVISION	

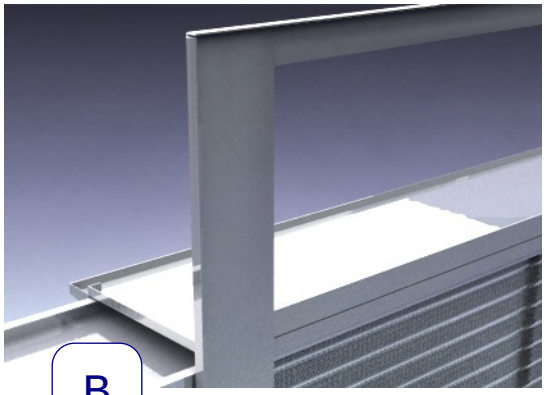
HAAKON INDUSTRIES



A

Coils

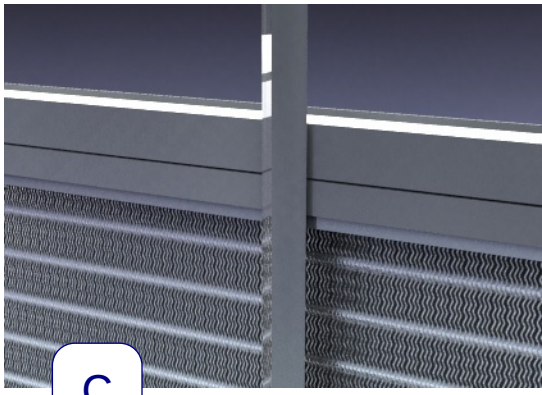
Cooling coil racks are designed to allow each coil to be individually removed. Coils are fully enclosed within the unit casing.



B

Blank-off

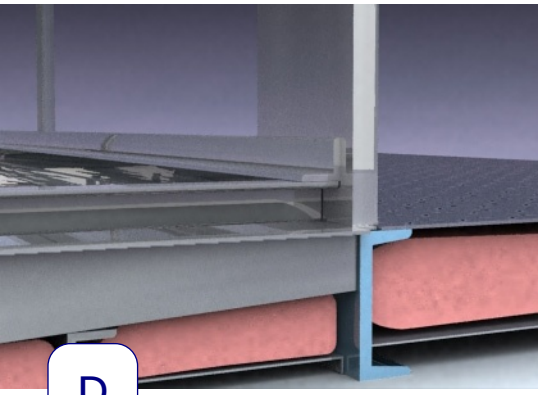
Coil rack blank-off and frame support is fabricated out of 1.6 mm 304 Stainless Steel.



C

V-Brace

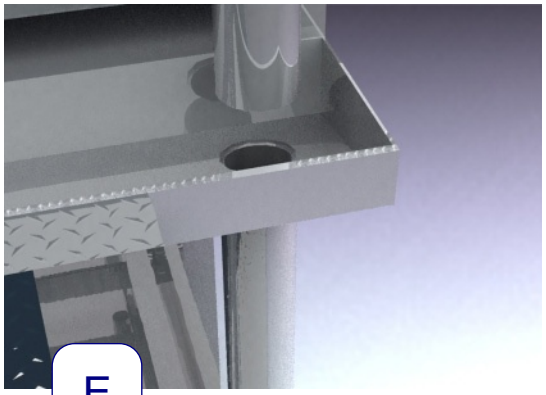
A 'V-Brace' fabricated out of 1.6 mm 304 Stainless Steel is tack welded to the coil rack frame for extra rigidity.



D

Coil Rack Frame

Coil rack frame is constructed of 2.8 mm 304 Stainless Steel.

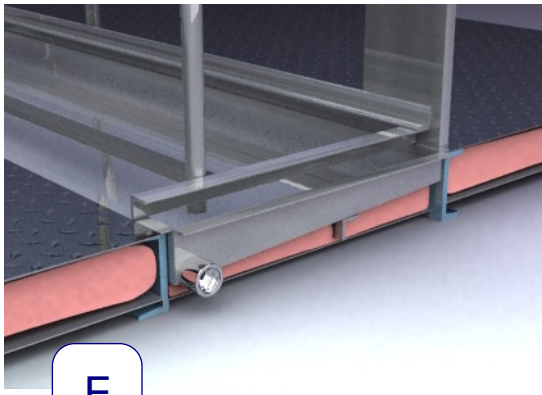


E

Extra Drain Pans

Intermediate drain pans are provided for multi-coil racks. Intermediate drain pans are fabricated from the same material as the main drain pan.

Intermediate drain pans are interconnected with 25 mm 304 Stainless Steel drain lines.

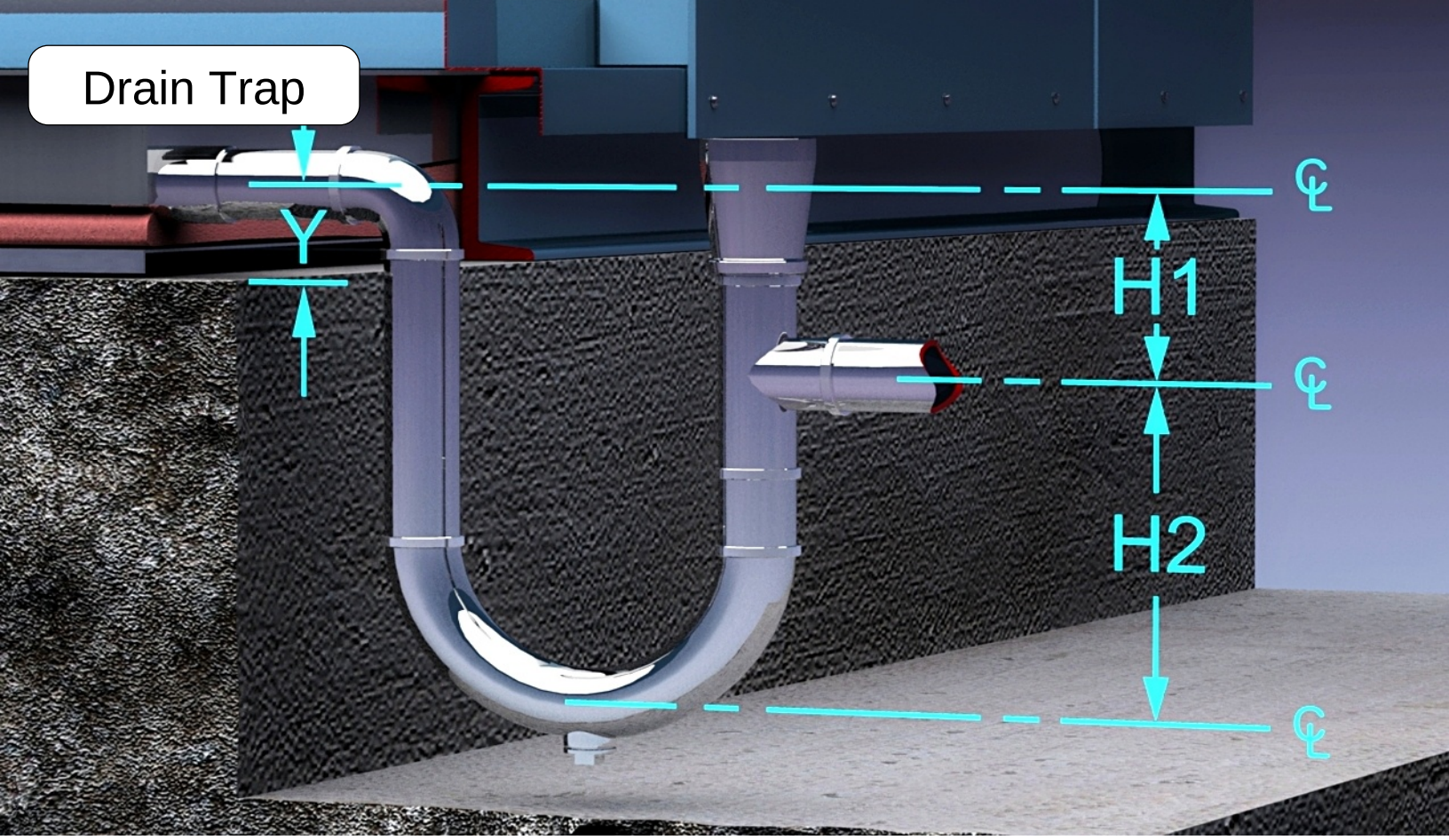


F

Drain Pan

Drain pans are fabricated out of 1.6 mm 304 Stainless Steel, and continuously welded to ensure that they are watertight. A FPT 304 Stainless Steel drain fitting is also provided on the drain pan end. Drain pan height and extension downstream of the cooling coil's air exiting face are tabulated below. Drain pan is sloped both in the direction of airflow and towards the drain connection.

Tag	Pan Hei	Pan Ext	Drain Size
AHU-2 COOLING	**102**	**457**	**32**



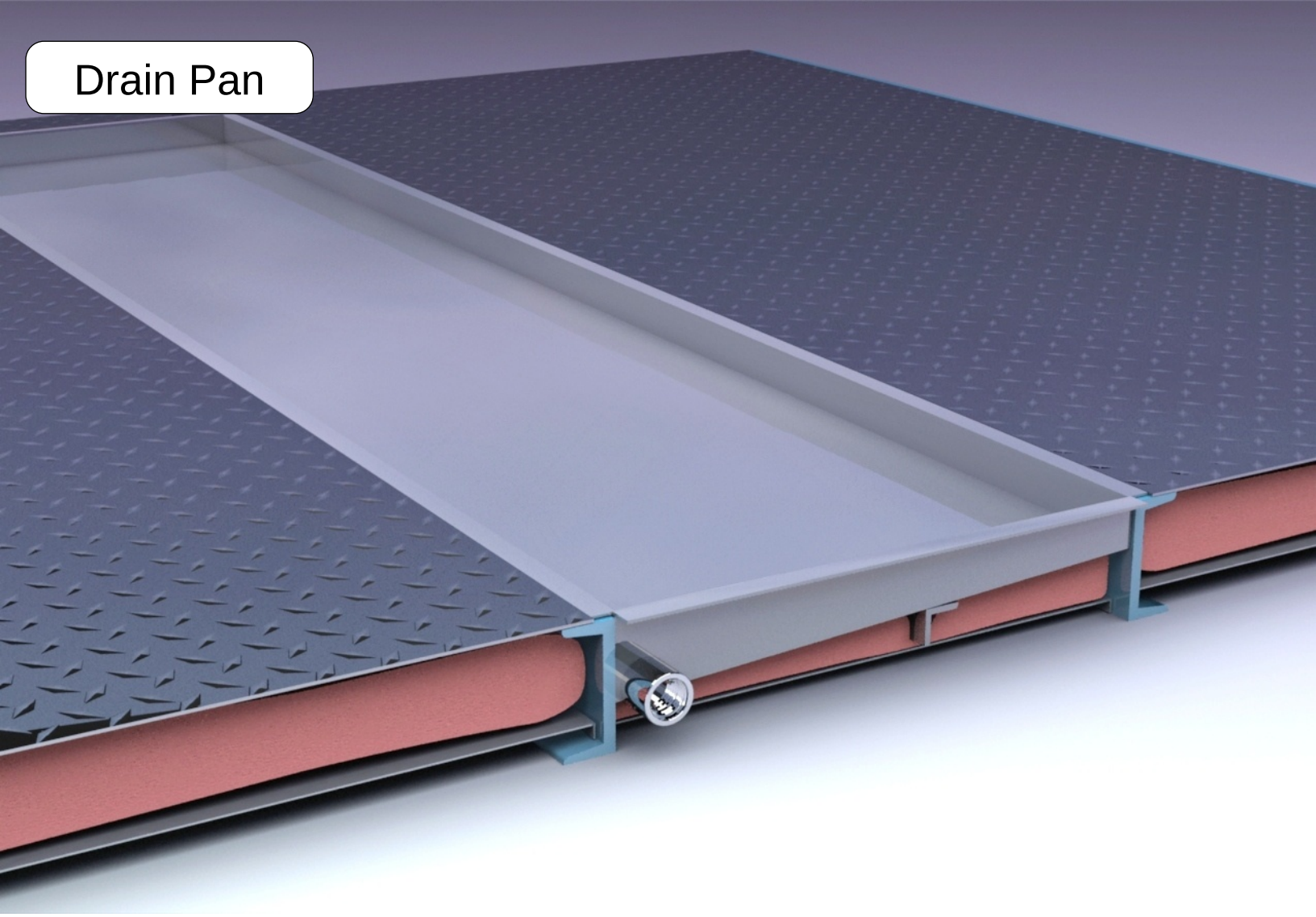
Draw Thru Drain Trap

DRAIN TRAPS ARE BY OTHERS : Trap all drains as shown on the drawing. Values H1 and H2 are referenced in the table below for each coil.

Tag	Plenum Press. (Pa)	Y (mm)	H1 (mm)	H2 (mm)	Drain Size (mm)
AHU-2 COOLING	1059	75	133	79	32
AHU-2 DRAIN PAN	1059	75	133	79	32

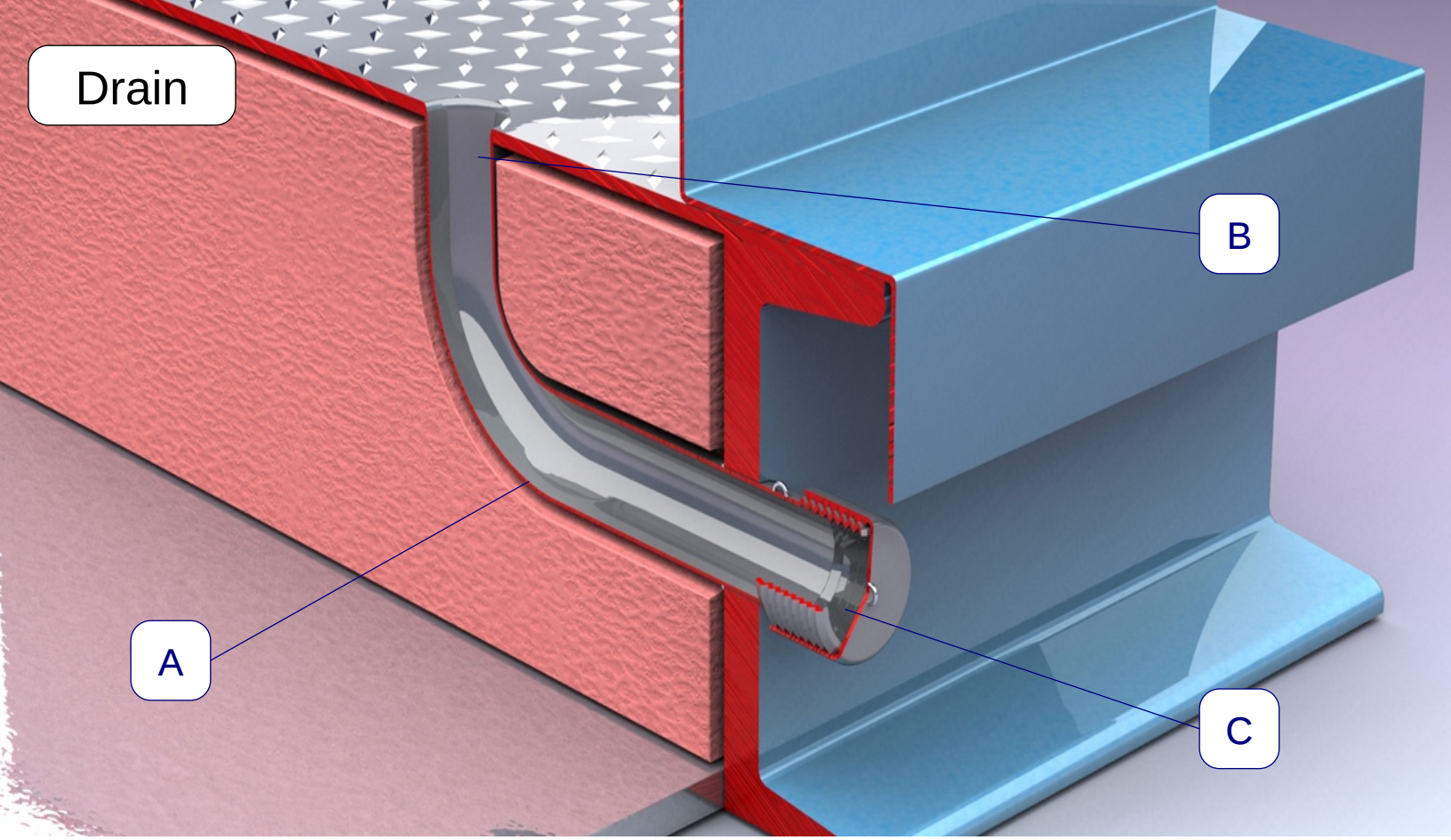
TAG: AHU-2 COOLING

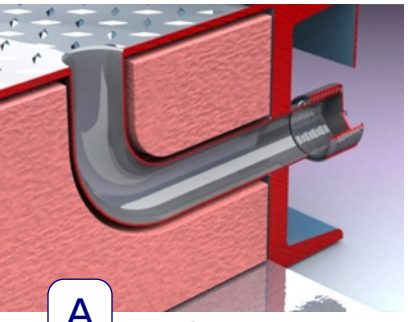
Drain Pan



Drain pans are fabricated out of 16 ga. 304 Stainless, and continuously welded to ensure that they are watertight. A FPT 304 Stainless drain fitting is also provided on the drain pan end. Drain pan is sloped both in the direction of airflow and towards the drain connection.

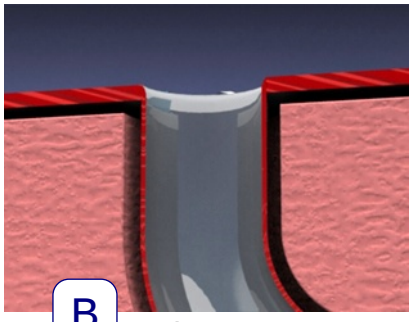
Tag	Pan Hei	Pan Ext	Drain Size
AHU-2 DRAIN PAN	**102**	**610**	**32**





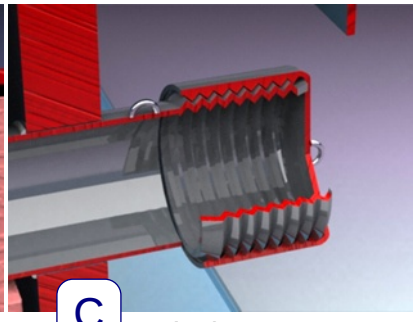
Drain

32 mm Standard Drain drains are provided at the locations shown on the drawings and are insulated with base insulation.



Inlet

A 32 mm drain pipe is continuously welded to unit floor.



Discharge

A 32 mm diameter drain connection terminates out the side of the unit.

TAG: AHU-2

PROJECT: BRAMPTON VICTORIA PARK ARENA

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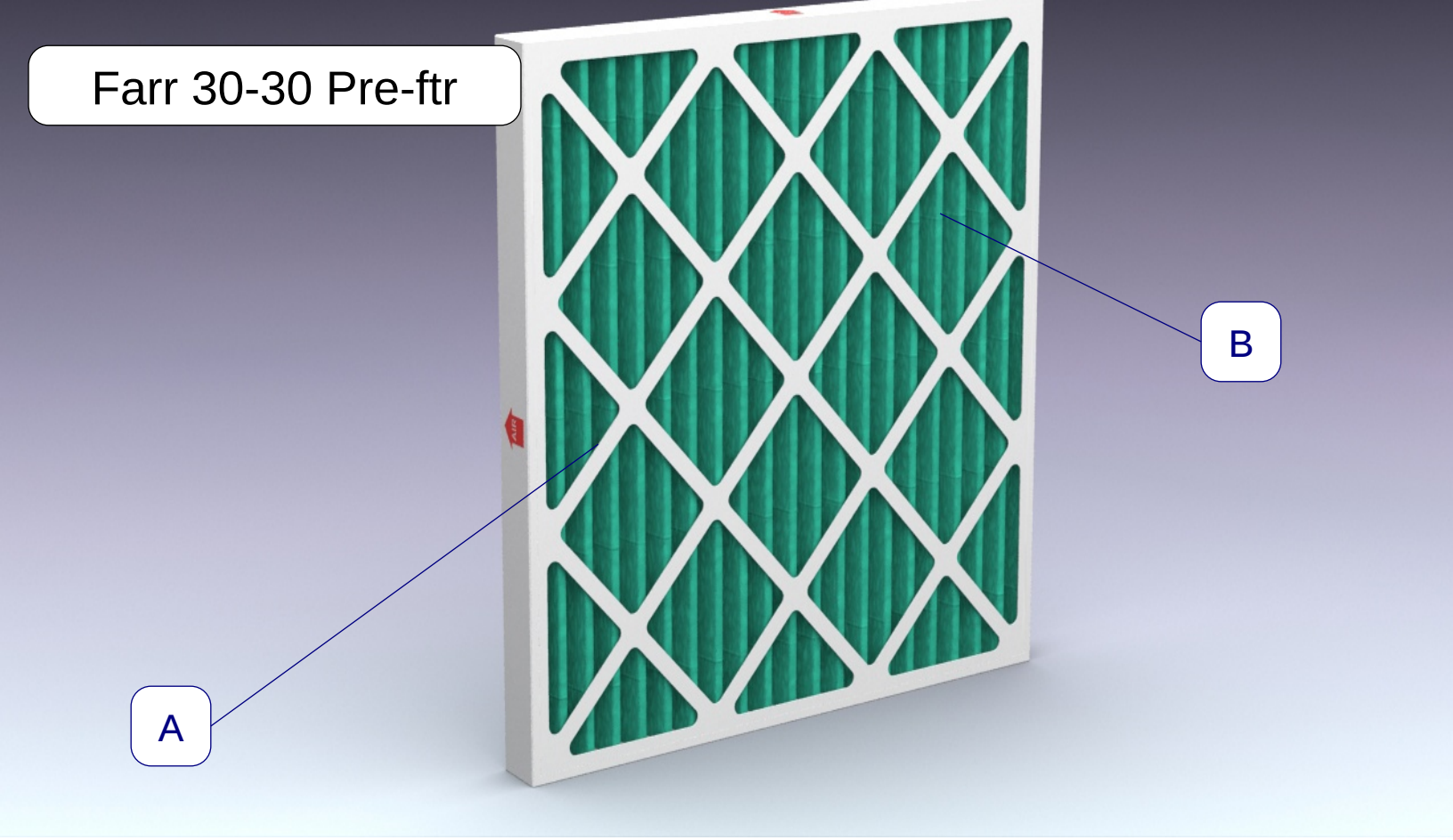
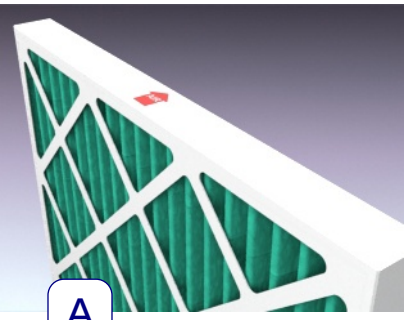
HAAKON INDUSTRIES

Farr 30-30 Pre-ftr





A

Filters

The filters are Cam-Farr 30/30 disposable extended area pleated design filters. High efficiency ratings, extended service life and ease of handling have made them the accepted choice where both performance and economy are required. U.L. Class 2.

B

Filter Media

The media used in the Cam-Farr 30/30 filter is a lofted, high performance, non-woven, reinforced cotton and synthetic fabric. The media is formed into a radial pleat (maintained by a corrosion resistant welded wire grid) to ensure full use of the media area.

Filter Thickness : 51 mm
Rated Initial PD : 70 Pa @ 2.6 m/s
Max. Recommend final PD : 224 Pa @ 2.6 m/s
MERV Rating : 8
Efficiency: 25-30%

SIZE	WEIGHT (LB)
24x24	2

TAG: AHU-2 OA

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT34
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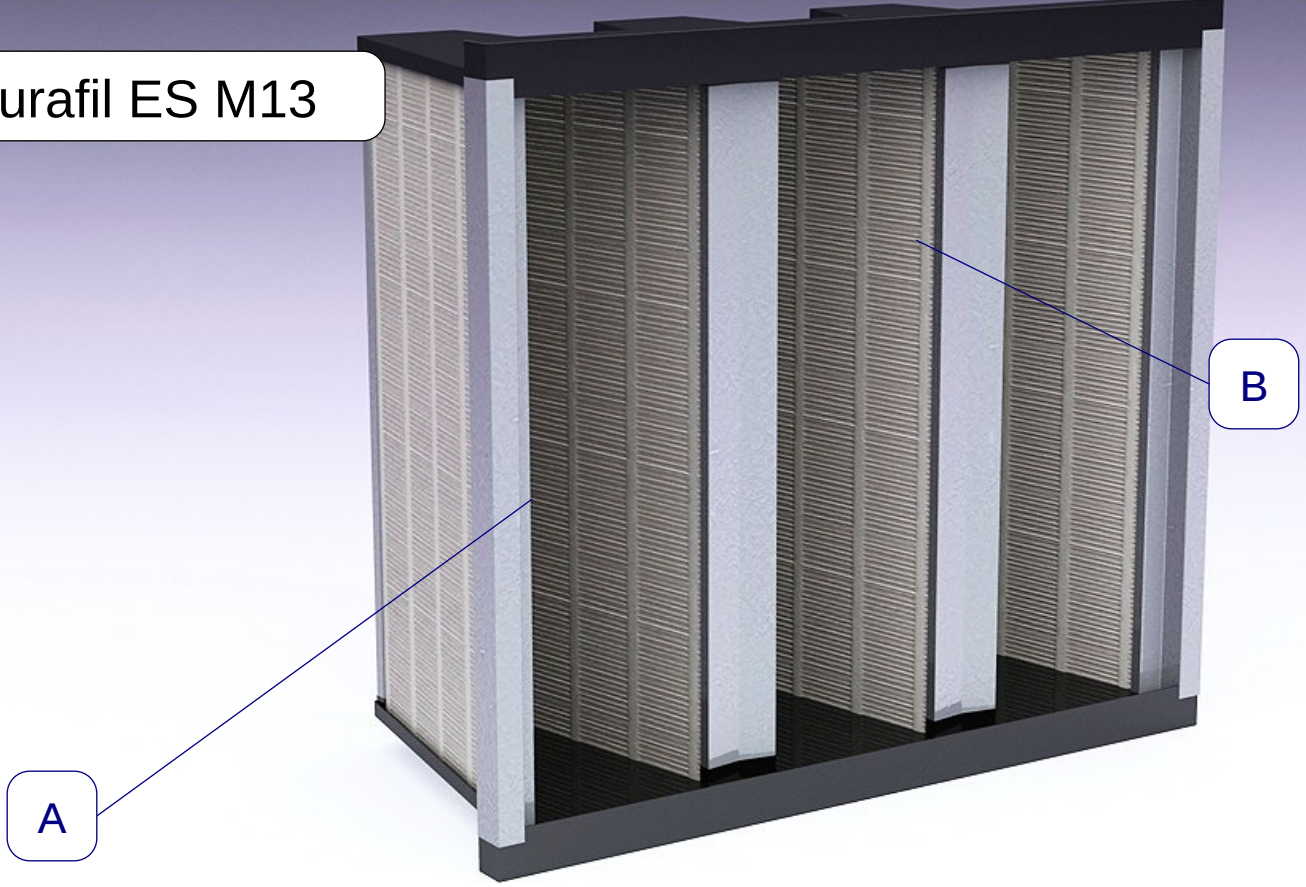
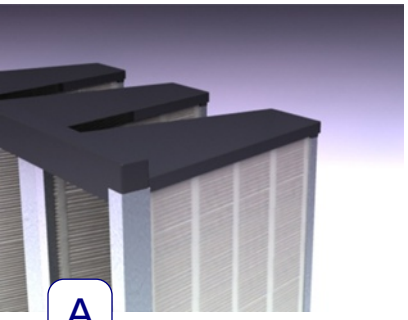
HAAKON INDUSTRIES

Durafil ES M13



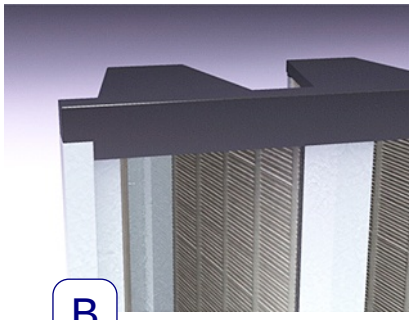


A

Filters

Air filters shall be V-bank mini-pleated fiberglass disposable type with pleat separators, polyurethane pack-to-frame sealant, polystyrene enclosing frame and have an ECI value of five stars. Filter shall be listed by Underwriters Laboratories as UL Class 2.

Filter Thickness : 305 mm
Rated Initial PD : 67 Pa @ 2.6 m/s
Max. Recommend final PD : 373 Pa @ 2.6 m/s
MERV Rating : 13



B

Filter Media

Filter media shall be of microfine glass fibers formed into uniform pleats. Pleats media packs shall be assembled into a V-bank configuration with sufficient total media area to meet airflow requirements. The filter outlet shall be radial in shape with a maximum of 60% open area to maintain low-pressure drop and uniform airflow. The enclosing frame shall include top and bottom molded tracks as an integral part of the frame to ensure a proper seal.

SIZE	WEIGHT (LB)
24x24	9.6

TAG: AHU-2 OA

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT35	HAAKON INDUSTRIES
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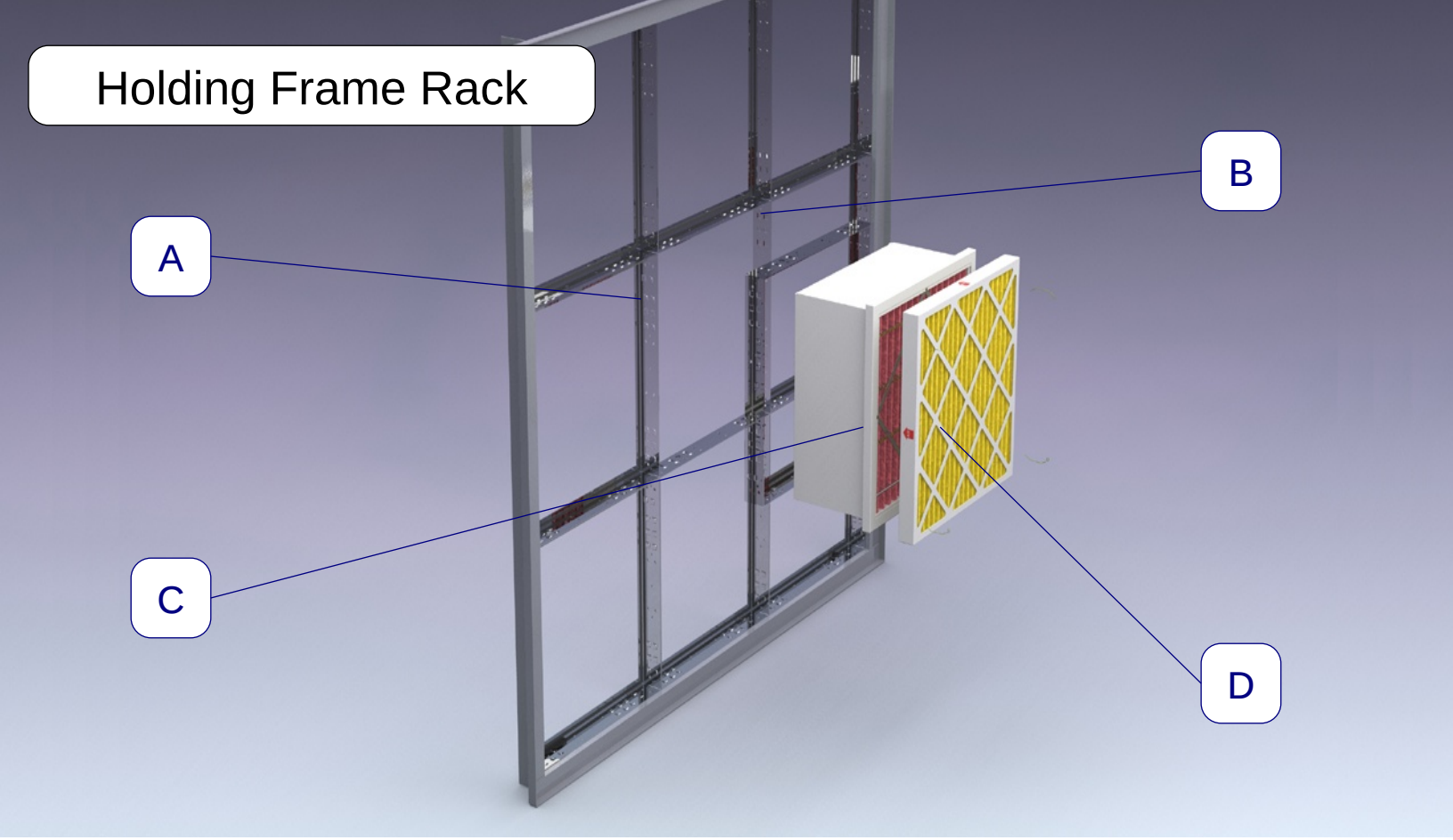
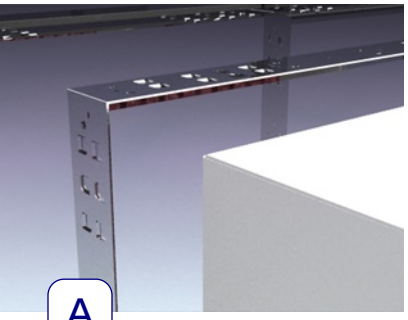
Holding Frame Rack

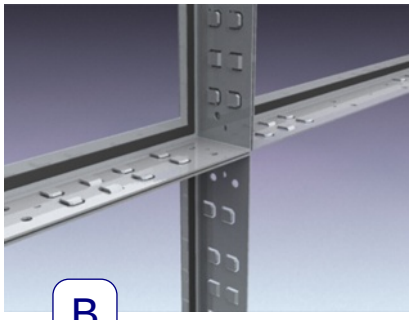




A

Rack

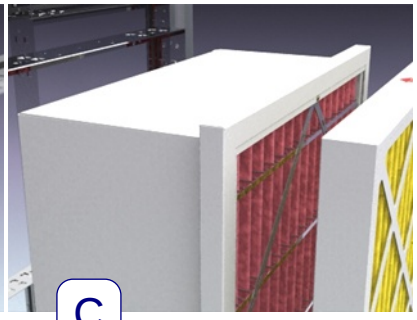
1.6 mm galvanized steel holding frame.



B

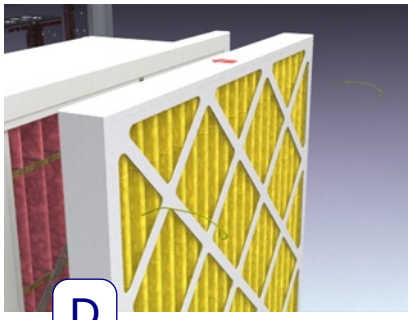
Foam Tape

Open cell foam tape keeps air from bypassing filters.



C

Durafil ES M13



D

Farr 30-30 Pre-ftr

TAG	COMPONENT	CLIP TYPE
AHU-2	OA	C-70 FASTENER
		C-86 FASTENER

TAG: AHU-2 OA

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT36
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

Digital Filter Gauge

Dwyer DM-005

The Series DM DigiMag Differential Pressure Transmitter senses the pressure of air and compatible gases and sends a standard 4-20 mA output signal. Digital push-button zero and span simplify calibration over typical turn-potentiometers. A single push-button allows field selection of 4 to 6 engineering units, depending on the range.

FILTER GAUGE TABLE

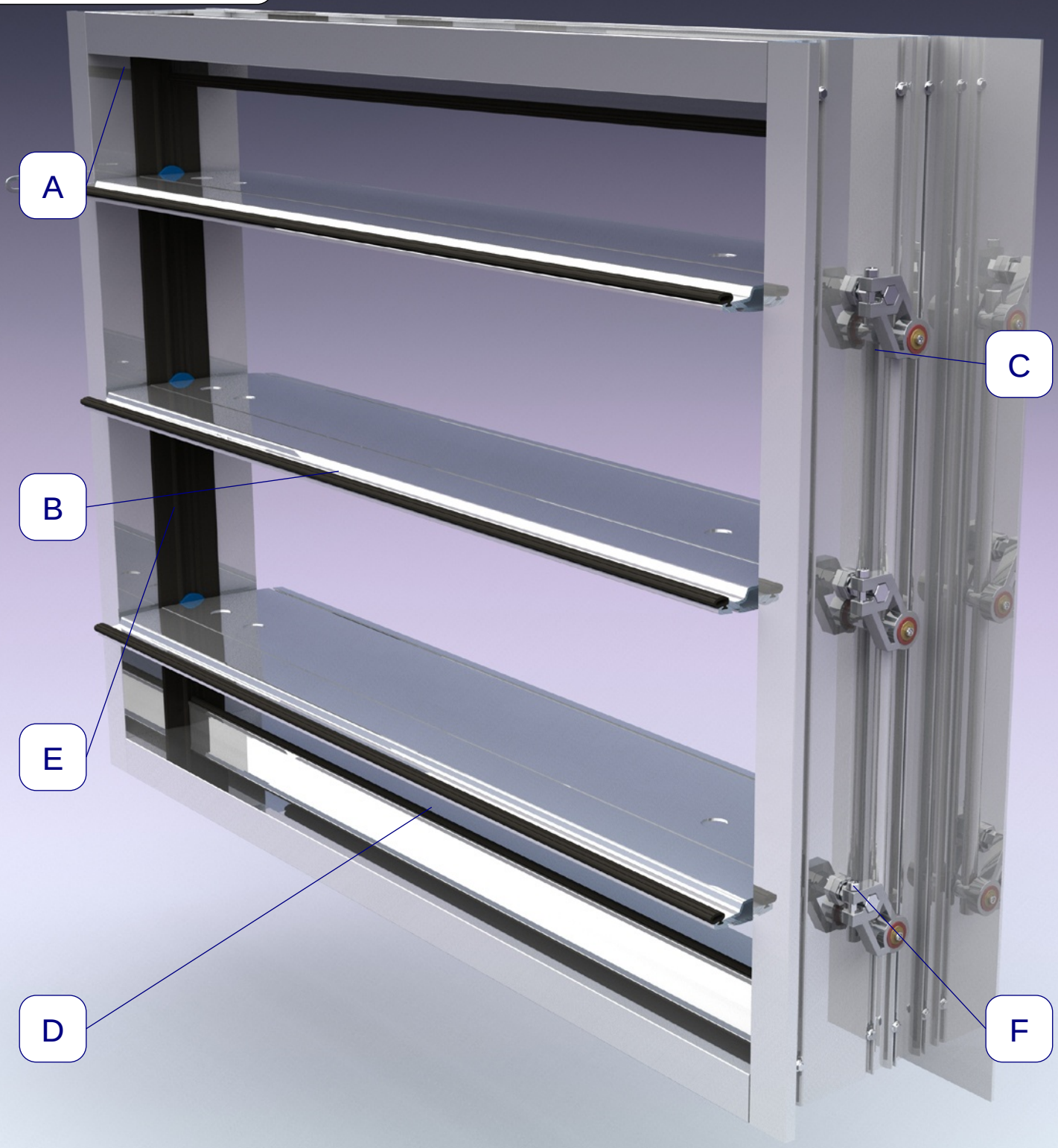
TAG	RANGE
AHU-2 OA ALL	0-2in and 0-500Pa DIGITAL GAUGE 4-20mA OUTPUT

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT37
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

TAMCO 1000

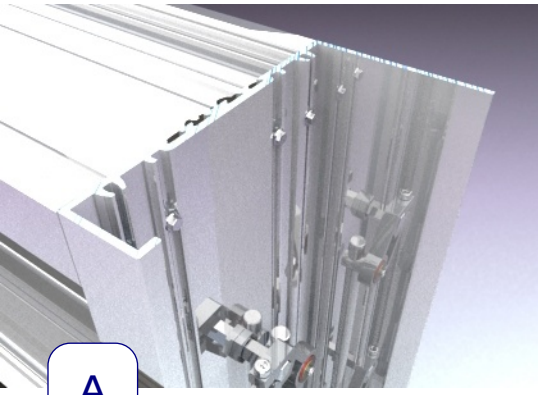


TAG: AHU-2 EA

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT38		
DATE	2025-03-10	UNITS	METRIC	REVISION			

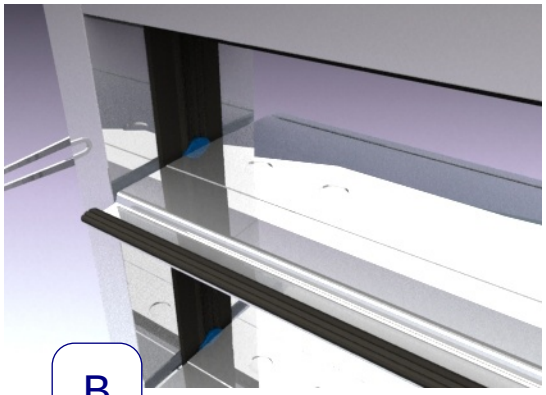
HAAKON INDUSTRIES



A

Frame

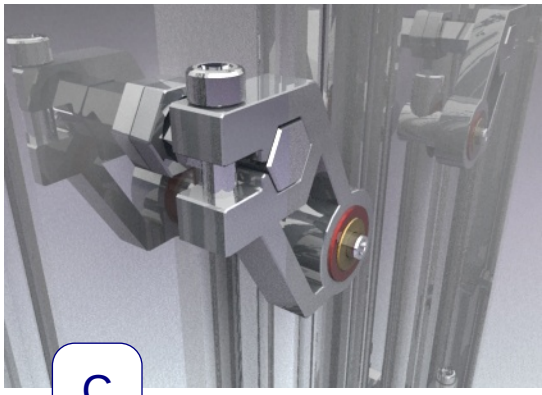
Frame is constructed of minimum 2.1 mm extruded aluminum. Dampers are designed such that leakage does not exceed 15 l/s/m^2 at 25 mm W.C. static pressure differential.



B

Blades

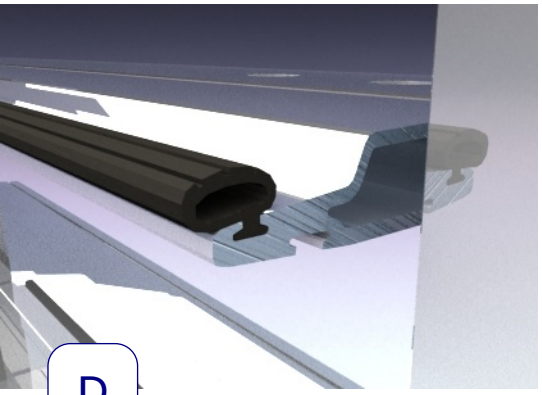
Minimum 2.1 mm extruded aluminum airfoil.



C

Linkage

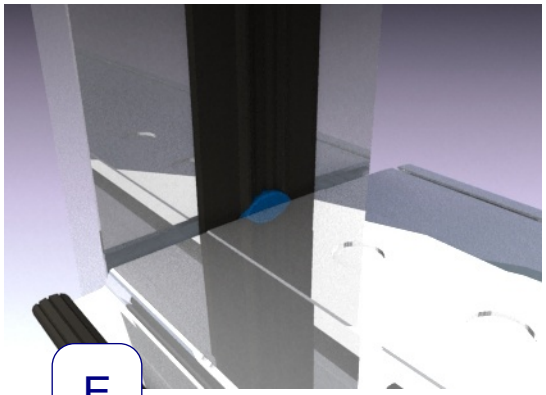
The blade linkage hardware is installed in the frame out of the air-stream.



D

Blade Seal

Continuous EPMD blade seal.



E

Jamb Seal

Frame seals shall be extruded silicone. Gaskets to be secured in an integral slot within the aluminum extrusion.

F

Axles

Aluminum 11.1 mm hexagon pivot rods.

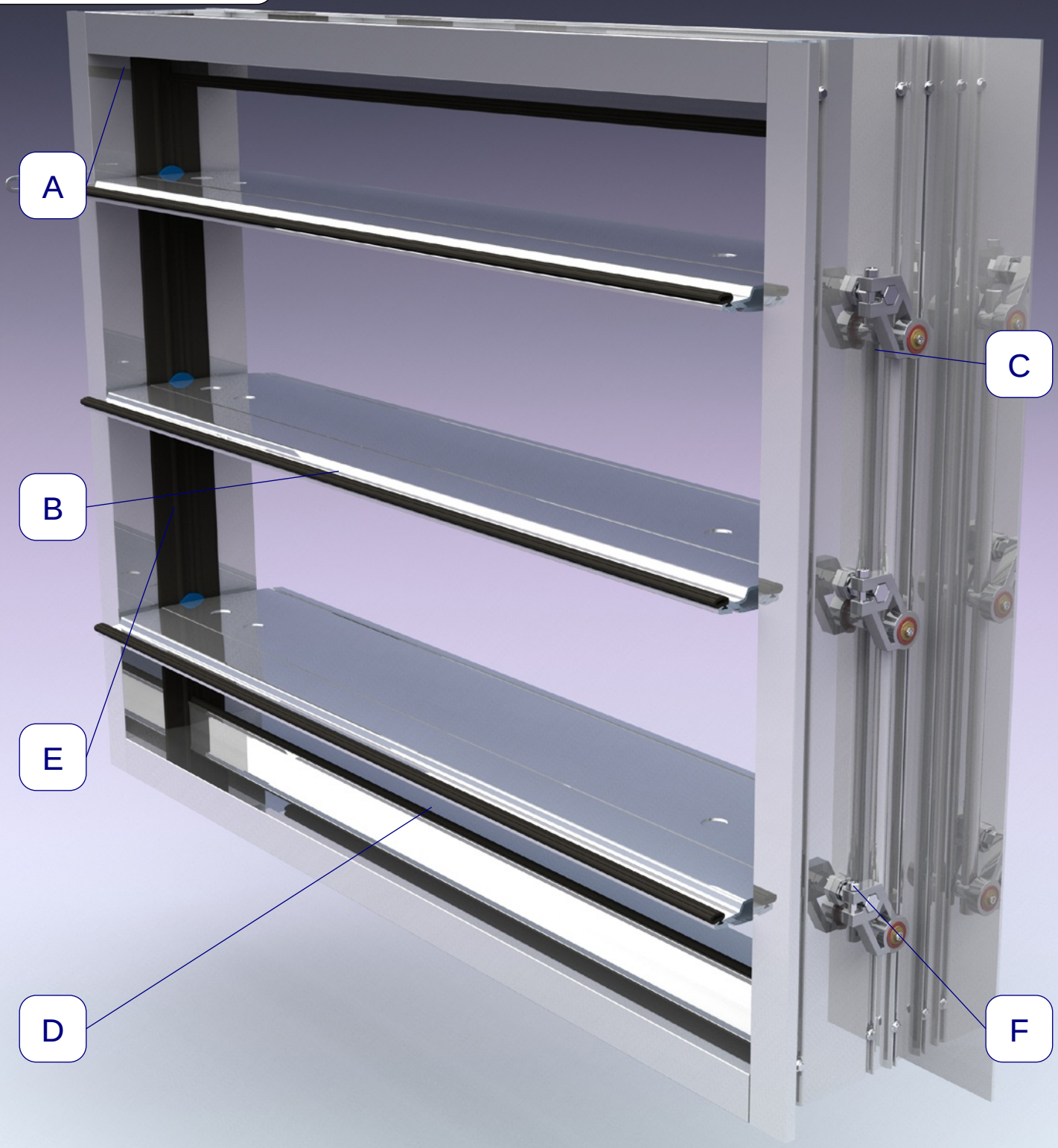
TAMCO "Double-Sealed" bearings, with a Celcon inner bearing fixed on hexagon rod rotates within a Polycarbonate outer bearing inserted in frame.

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT39
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

TAMCO 1000

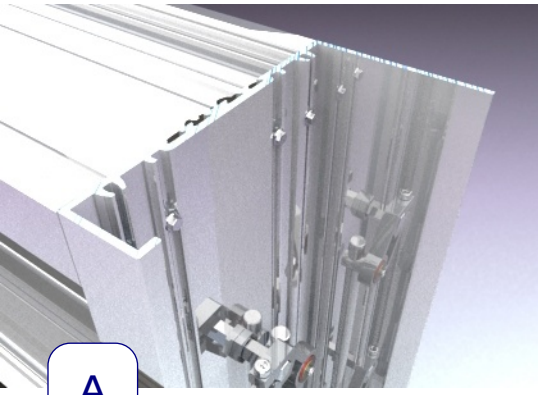


TAG: AHU-2 RA

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT40
DATE	2025-03-10	UNITS	METRIC	REVISION	

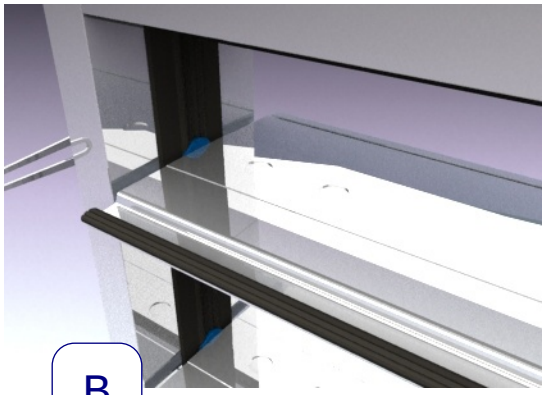
HAAKON INDUSTRIES



A

Frame

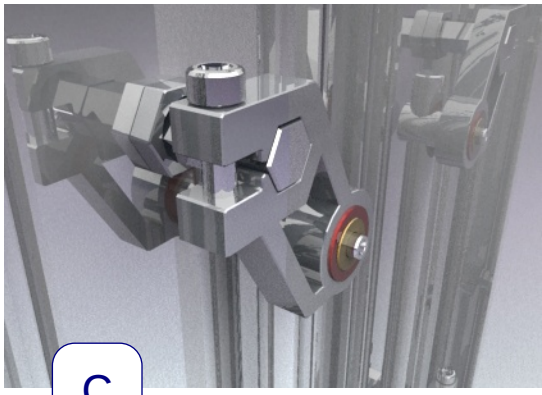
Frame is constructed of minimum 2.1 mm extruded aluminum. Dampers are designed such that leakage does not exceed 15 l/s/m^2 at 25 mm W.C. static pressure differential.



B

Blades

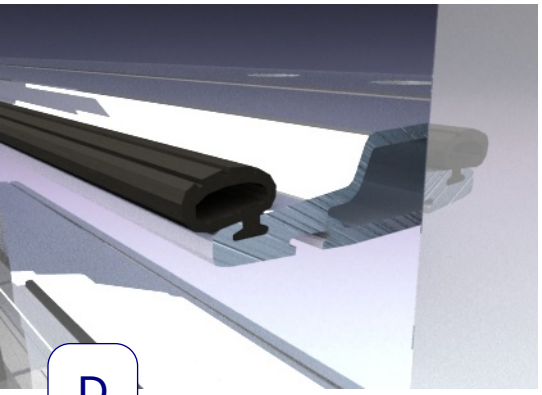
Minimum 2.1 mm extruded aluminum airfoil.



C

Linkage

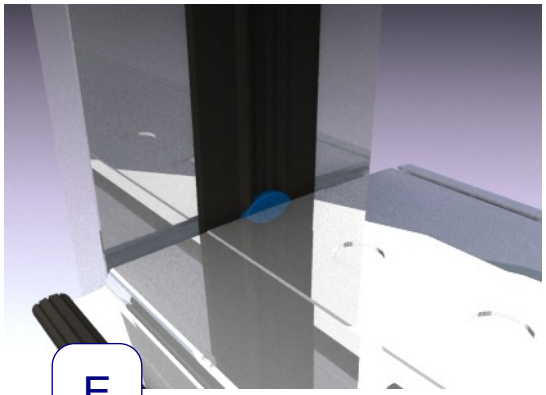
The blade linkage hardware is installed in the frame out of the air-stream.



D

Blade Seal

Continuous EPMD blade seal.



E

Jamb Seal

Frame seals shall be extruded silicone. Gaskets to be secured in an integral slot within the aluminum extrusion.

F

Axles

Aluminum 11.1 mm hexagon pivot rods.

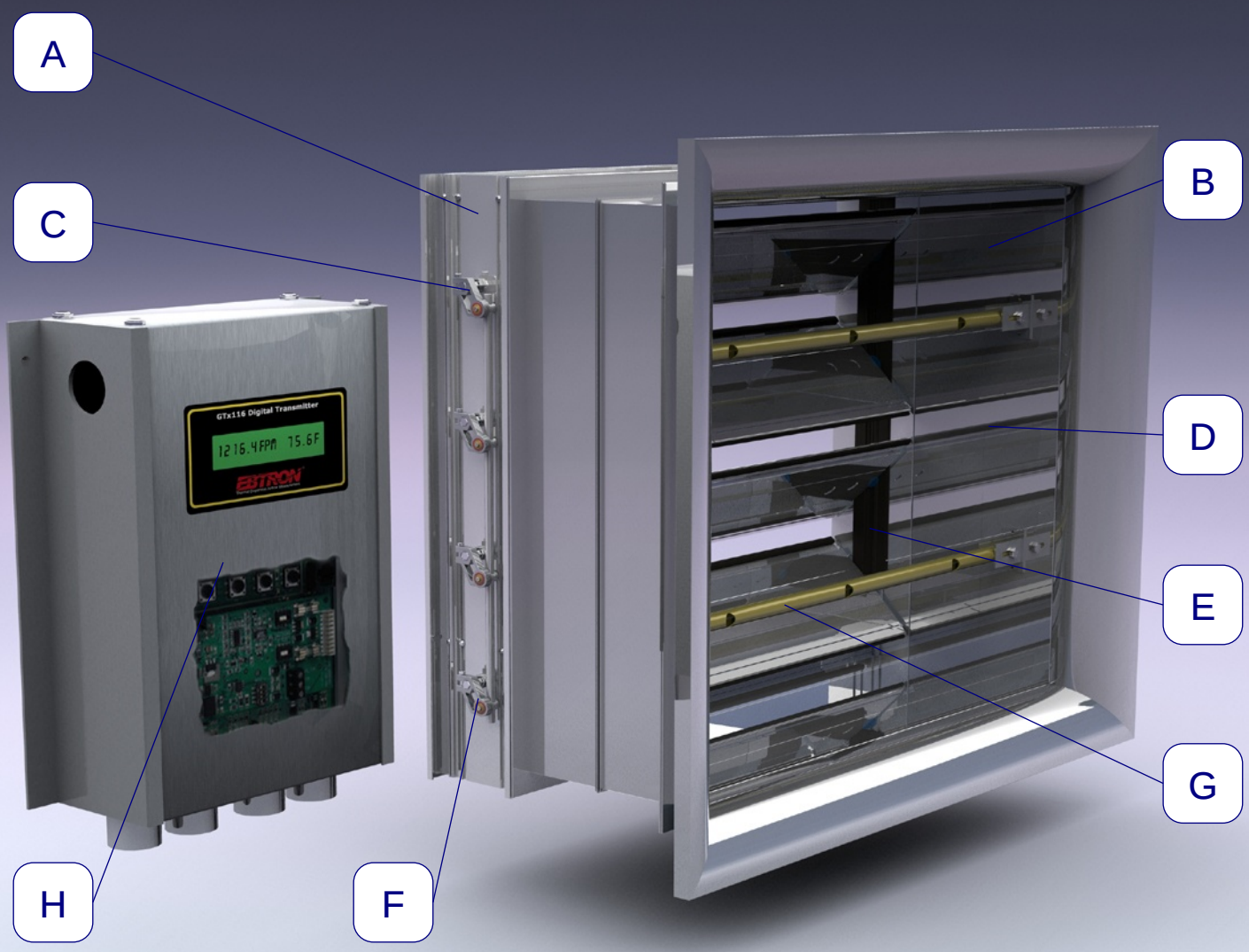
TAMCO "Double-Sealed" bearings, with a Celcon inner bearing fixed on hexagon rod rotates within a Polycarbonate outer bearing inserted in frame.

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT41
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

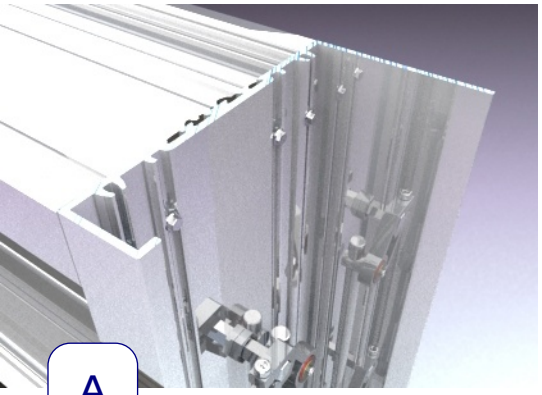
TAMCO EBTRON AIR-IQ



TAG: AHU-2 OA

PROJECT:		BRAMPTON VICTORIA PARK ARENA					
DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT42		
DATE	2025-03-10	UNITS	METRIC	REVISION			

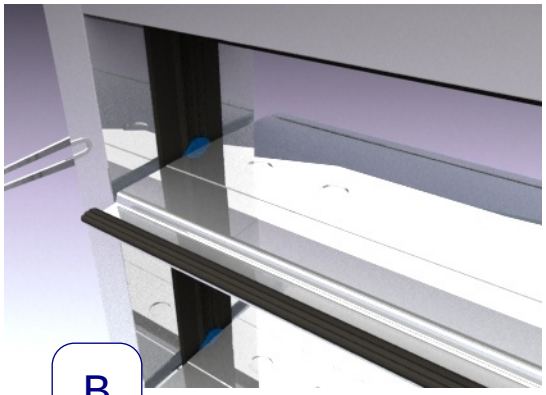
HAAKON INDUSTRIES



A

Frame

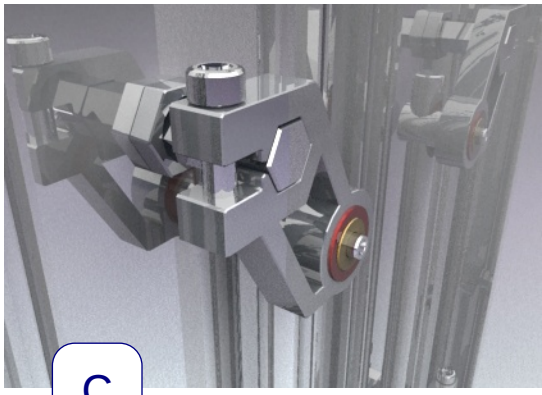
Frame is constructed of minimum 2.1 mm extruded aluminum. Dampers are designed such that leakage does not exceed 15 l/s/m^2 at 25 mm W.C. static pressure differential.



B

Blades

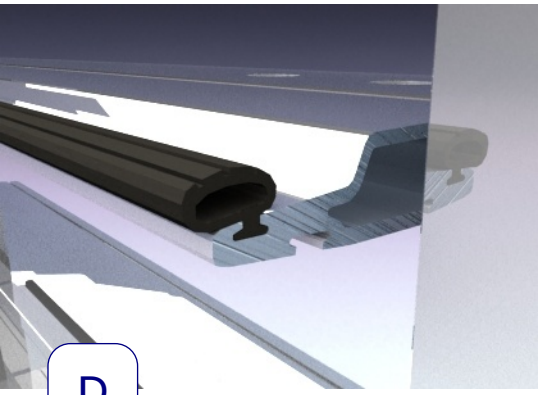
Minimum 2.1 mm extruded aluminum airfoil.



C

Linkage

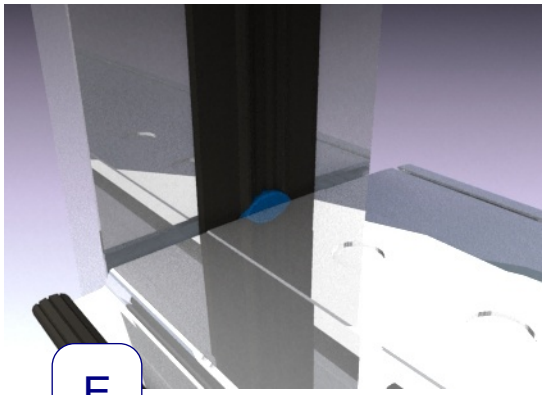
The blade linkage hardware is installed in the frame out of the air-stream.



D

Blade Seal

Continuous EPMD blade seal.



E

Jamb Seal

Frame seals shall be extruded silicone. Gaskets to be secured in an integral slot within the aluminum extrusion.

F

Axles

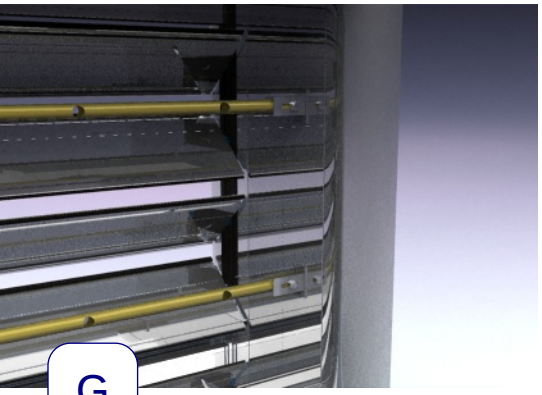
Aluminum 11.1 mm hexagon pivot rods.

TAMCO "Double-Sealed" bearings, with a Celcon inner bearing fixed on hexagon rod rotates within a Polycarbonate outer bearing inserted in frame.

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT43
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES



G

Probes

Thermal dispersion airflow/temperature measuring probes shall be gold anodized, extruded aluminum (6063T5) tube with aluminum mounting brackets. Each sensor probe shall consist of 1 to 8 independent sensor nodes consisting of 2 hermetically sealed bead-in-glass thermistors which are potted in an engineering thermoplastic.

Sensor probes are provided with durable FEP jacketed, plenum rated cables, which can be exposed to UV and ultra-cold temperatures. The assembly shall be capable of measuring airflow rates over the full range of 0 to 5,000 FPM between -20 deg F and 160 deg F.

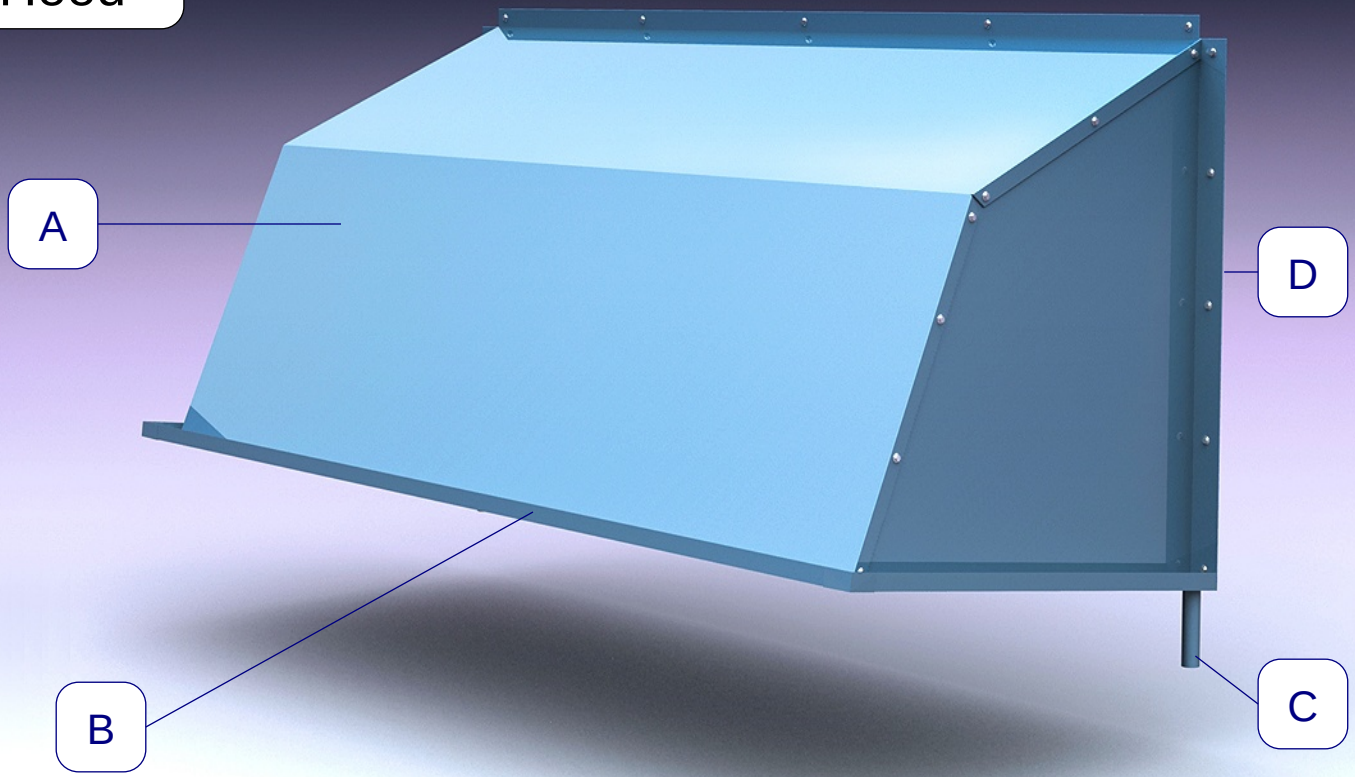
H

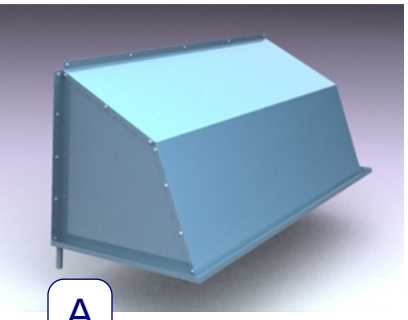
Transmitter

The transmitter shall powered by 24VAC and shall determine the airflow rateand temperature of each sensing node prior to averaging.Standard transmitter is provided with RS-485 (BACnet or Modbus) and analogoutputs (Dual 0-5 VDC, 0-10 VCD, or 4-20 mA).

All protocols or outputsignals can be field selected and configured.Analog output signal be capable of transmitting the average airflow rate,average temperature, individual airflow rates and temperature of each sensornodes, and system status.The airflow measurement device shall be UL 973 and BTL listed.

Hood

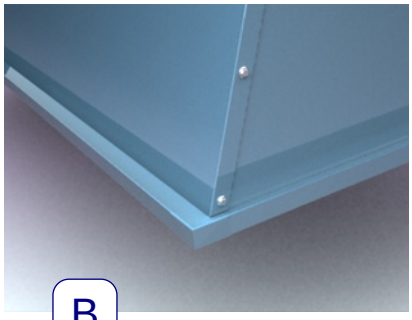




A

Construction

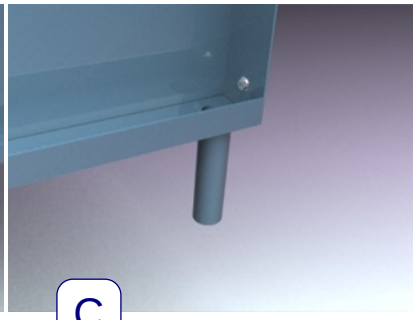
Hood shall be constructed from same material and gauge as casing. Finish to match unit casing.



B

Perimeter Gutter

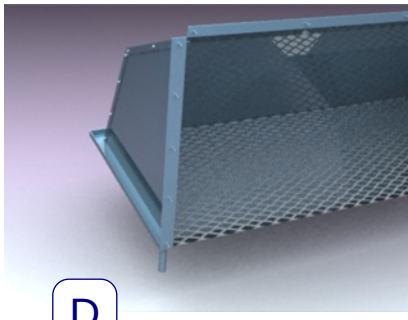
Full perimeter rain gutter shall be provided to carry water run-off from the hood surface. Gutter shall be 25 mm deep by 25 mm high.



C

Downspouts

25 mm diameter downspout shall be provided for drainage of the rain gutter.



D

Screening

12.7 mm x 12.7 mm galvanized bird screen shall be provided at the inlet of the hood.

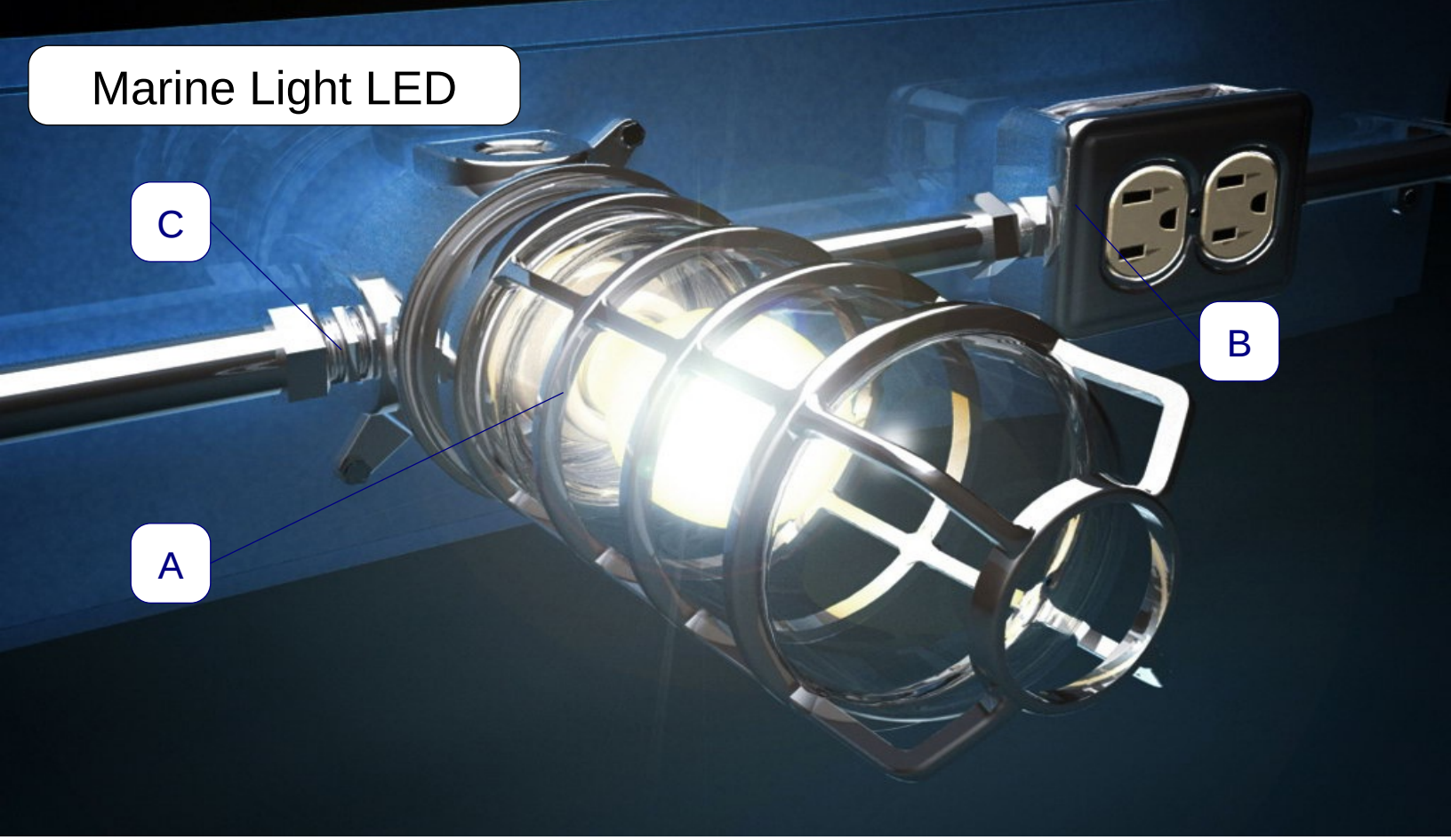
TAG: AHU-2 OA, AHU-2 EA

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT45
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

Marine Light LED



A

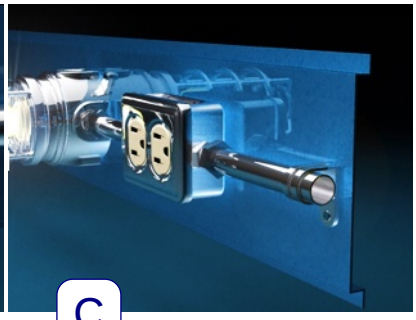
LED Marine Light

LED marine lights with protective metal cage and glass seals are supplied in the locations shown on the drawings. All lights are wired to a single junction box with a switch and indicator light.

B

Duplex Receptacle

Duplex receptacles are provided only in the fan sections.



C

Conduit

All wiring is done in EMT conduit with raintight fittings.

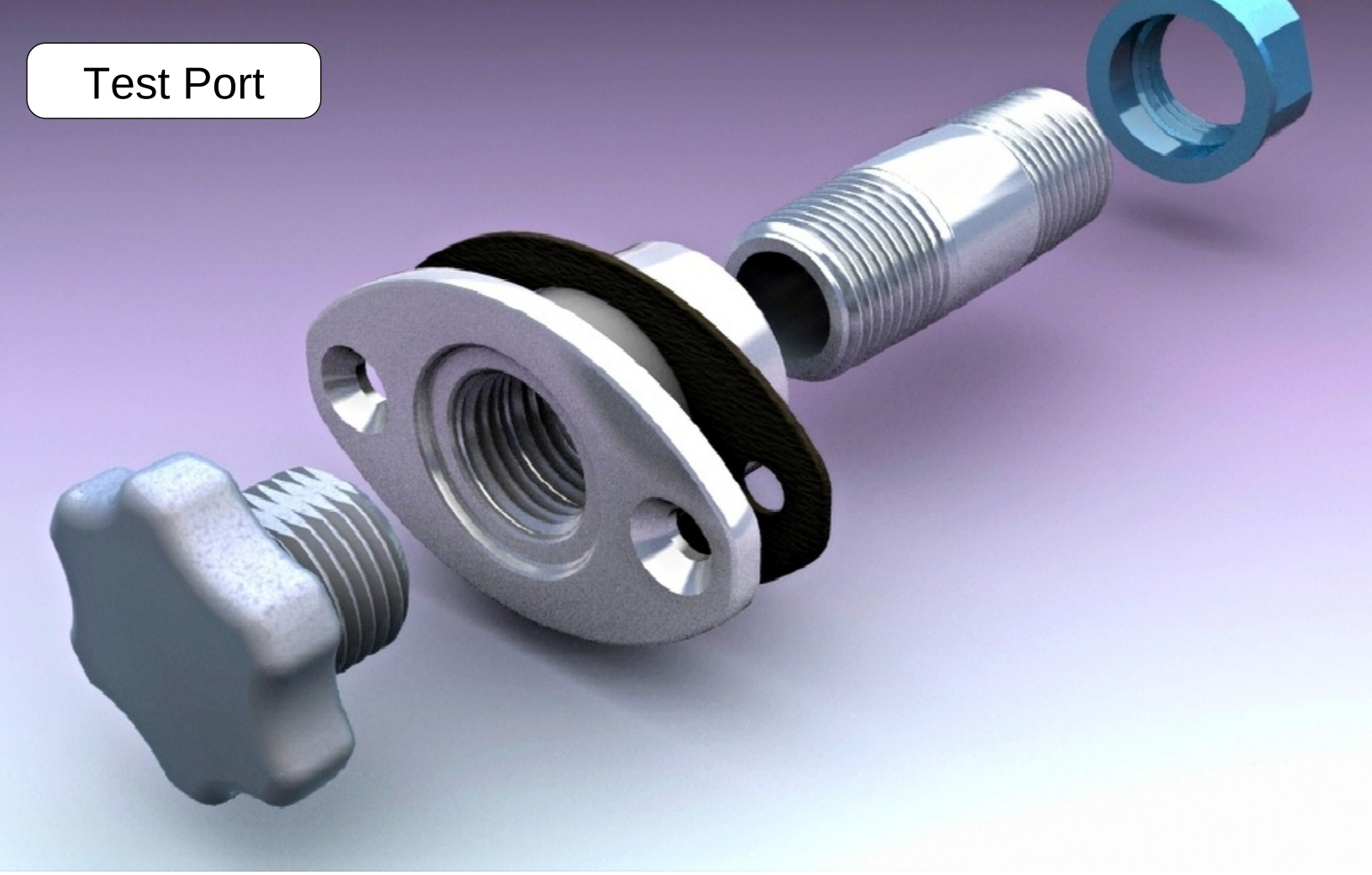
TAG: AHU-2

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT46
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

Test Port



Testports

Test Ports are supplied for unit air stream testing. The inside diameter of the test port is 14 mm.

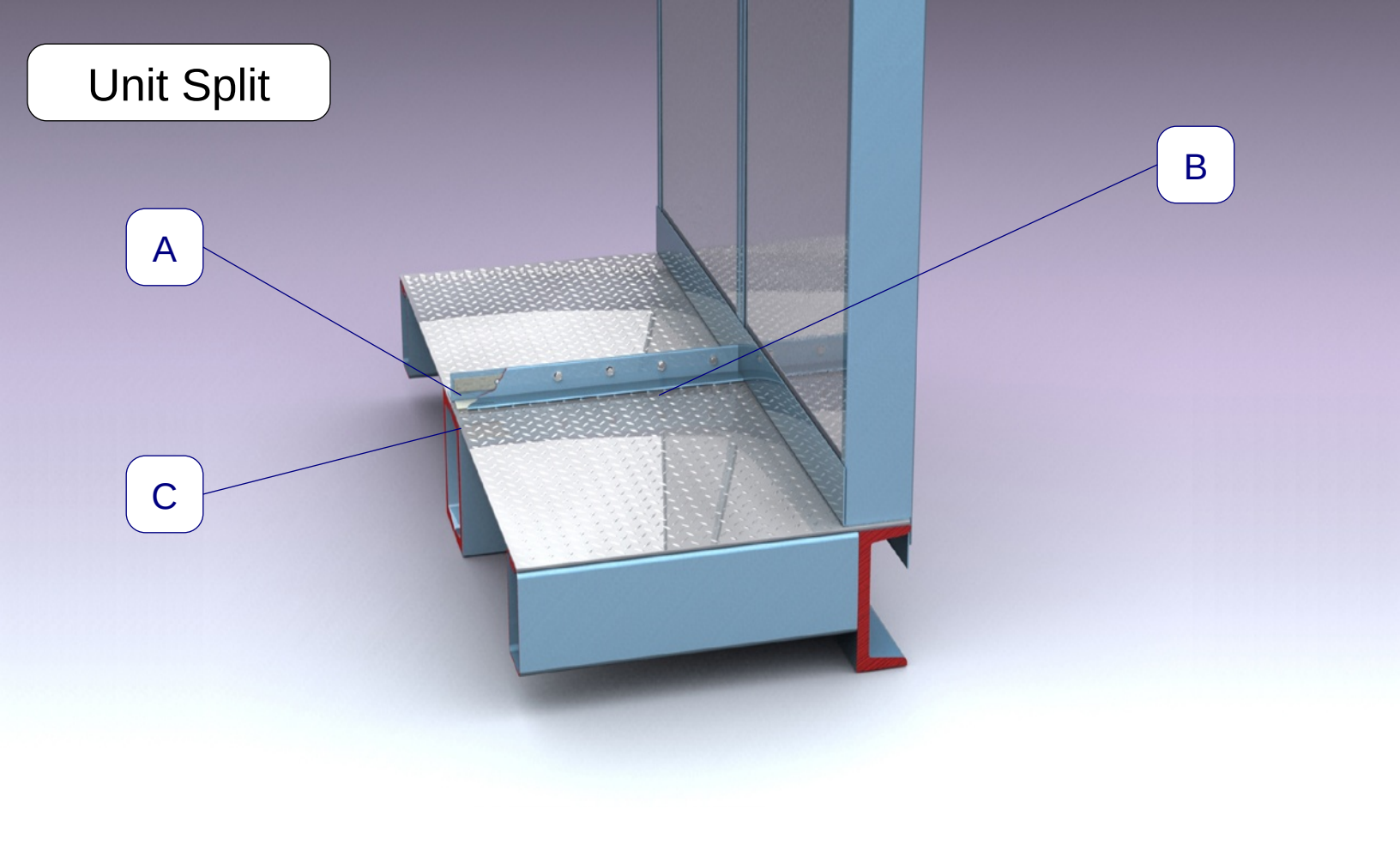
TAG: AHU-2, AHU-2 SA, AHU-2 VFD - SUPPLY, AHU-2 AFMS, AHU-2 SF 36" EPFN SW, 90% Width, Arrangement-4, AHU-2 COOLING, AHU-2 OA, 33" EPFN SW, 92% Width, Arrangement-4, AHU-2 RA

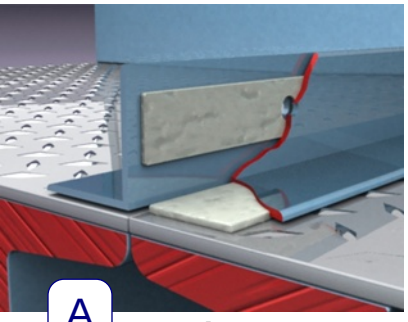
PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT47
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

Unit Split

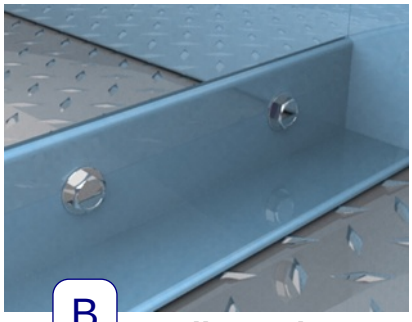




A

Seal

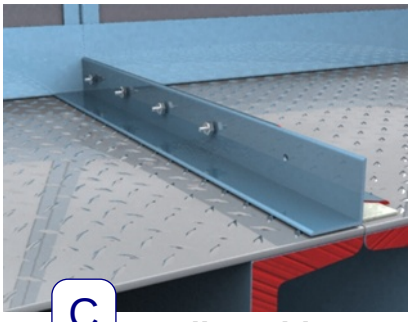
Caulking is provided under split angles to prevent air-bypass between split angle and unit floor.



B

Split Angle

38 mm structural angle is provided to join split sections. Structural angles are provided with holes pre-drilled at the factory. 6.3 mm nuts and bolts are provided for field assembly.



C

Split Weld

Split angle is continuously welded to unit floor.

Joining Strip

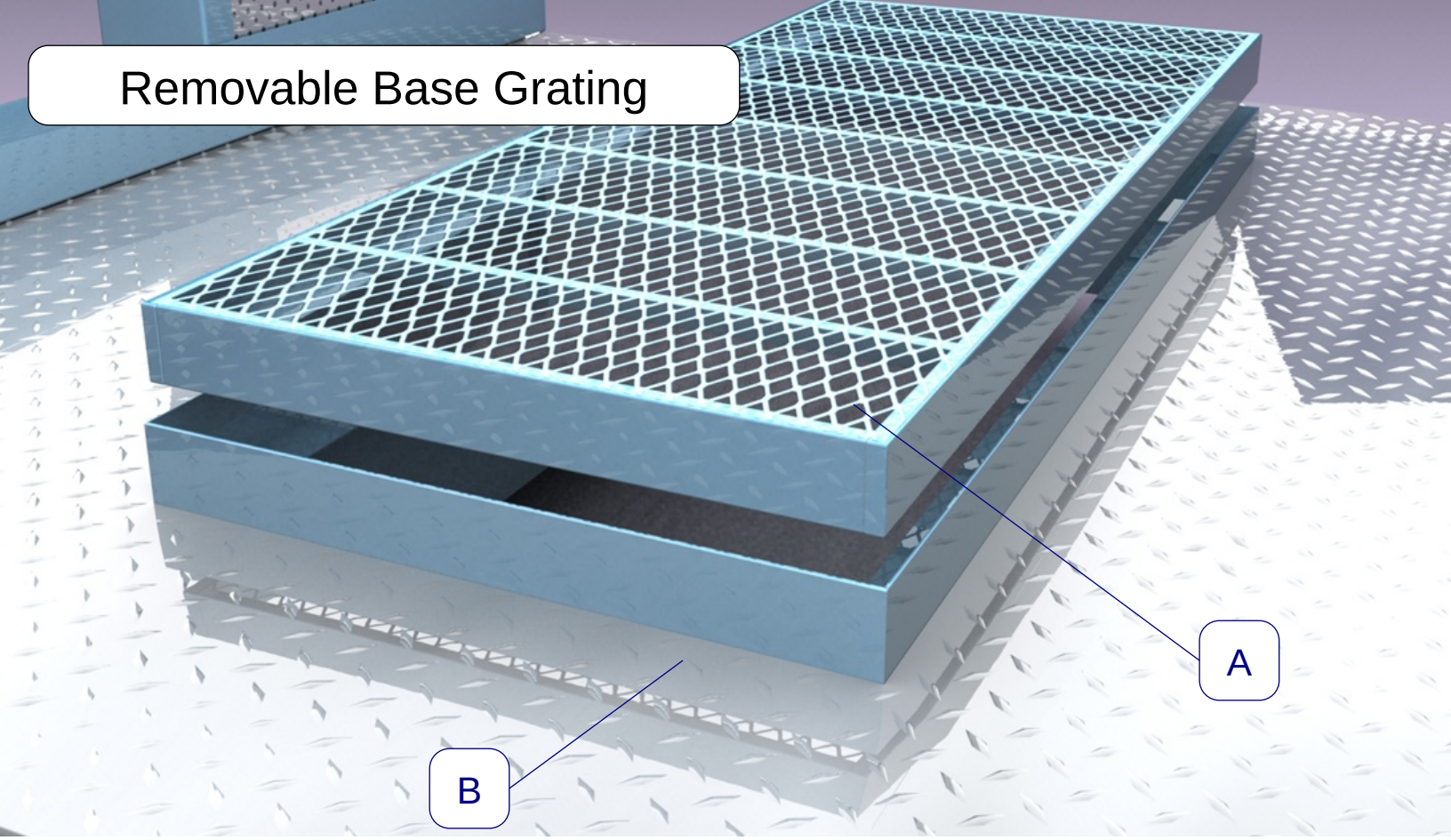
A 1.6 mm joining strip is provided. Joining strip to be tek screwed into unit casing after assembly of split sections.

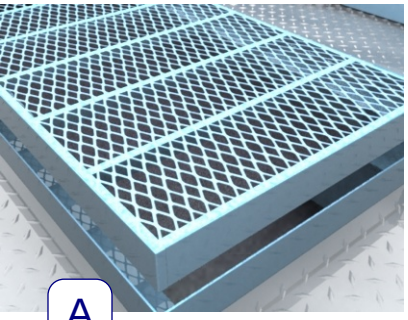
TAG: AHU-2

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT48	HAAKON INDUSTRIES
DATE	2025-03-10	UNITS	METRIC	REVISION		

Removable Base Grating

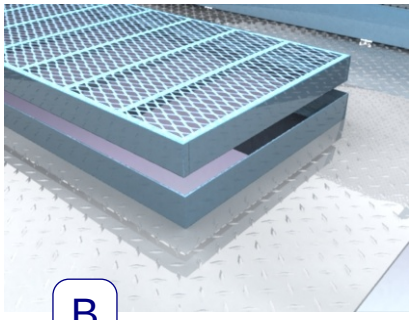




A

Grating

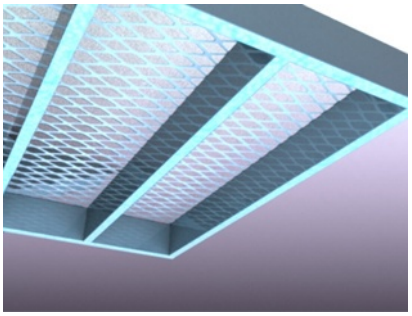
Removable grating made from expanded metal and flatbar is provided.



B

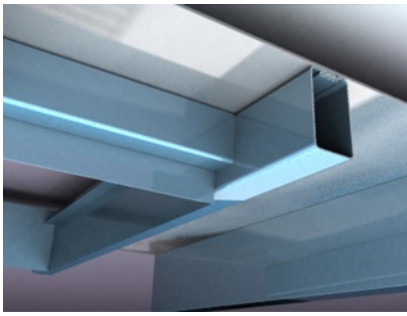
Collar

A 38 mm high collar is installed around the base opening.



Support

Tube steel is installed in the unit base, around base opening for strength.



Connection

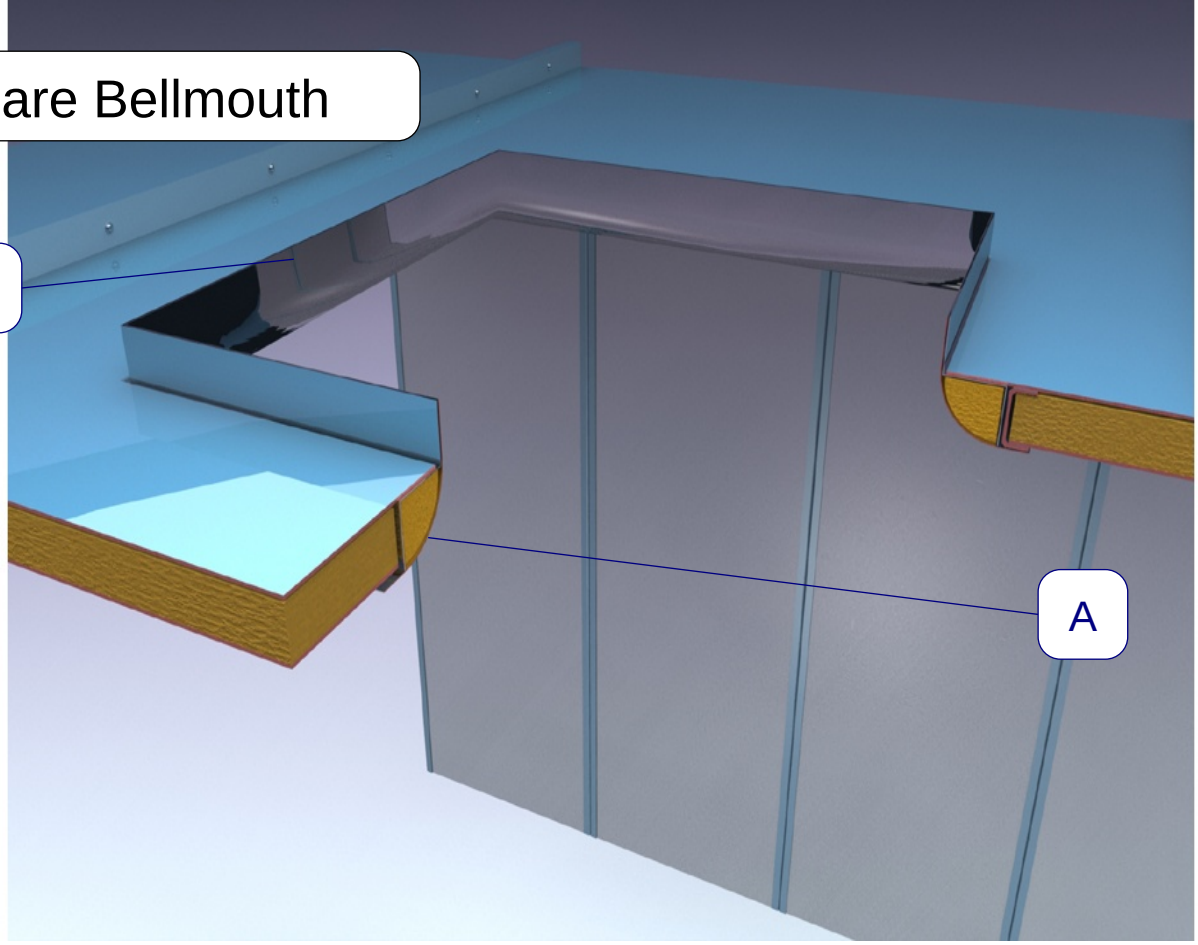
Collar extends below the base liner for field connection.

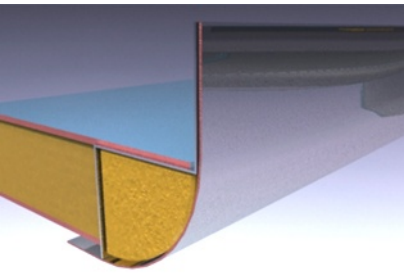
TAG: AHU-2 RA

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT49	HAAKON INDUSTRIES
DATE	2025-03-10	UNITS	METRIC	REVISION		

Square Bellmouth



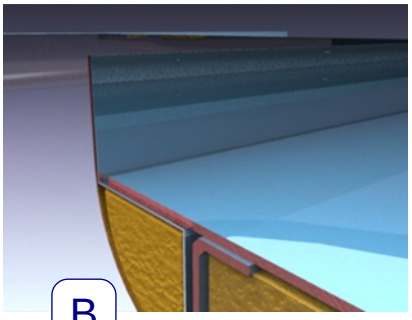


A

Bellmouth

A bellmouth fabricated out of 16 ga. steel is provided as indicated on shop drawings (Rectangular bellmouth shown). The finish of the bellmouth is painted to match the finish of the casing on the outside.

The radius of the curvature of the bellmouth is equivalent to the wall thickness unless otherwise noted on the shop drawings.



B

Ductwork

Bellmouth is provided with collar. Provisions and attachment of ductwork is the responsibility of the installing contractor.

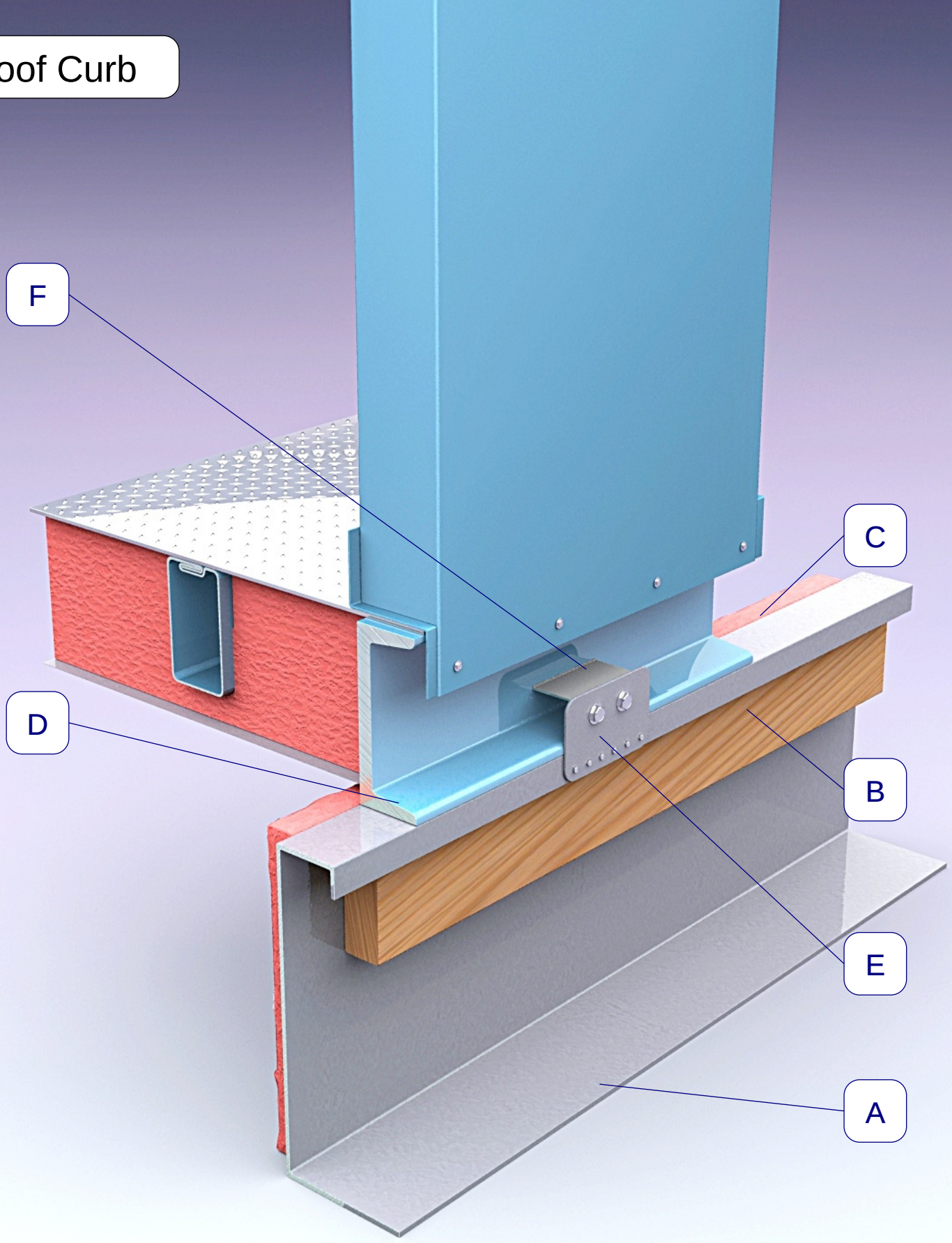
TAG: AHU-2 SA

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT50
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

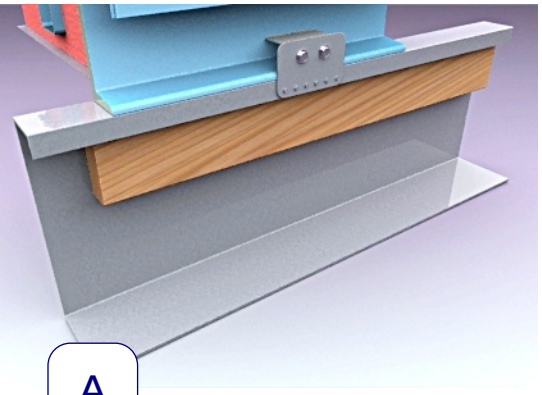
Roof Curb



TAG: AHU-2

PROJECT:	BRAMPTON VICTORIA PARK ARENA						
DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT51		
DATE	2025-03-10	UNITS	METRIC	REVISION			

HAAKON INDUSTRIES



A

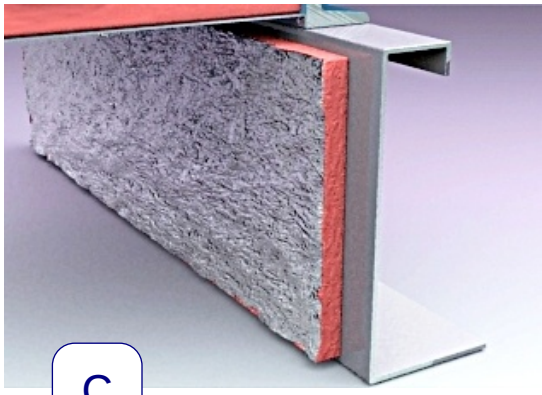
Roof Curb

The roof curb is fabricated from 2.7 mm galvanized steel. Roof curb to be installed level and continuously supported around the perimeter and at all splits.

B

Nailing Strip

A 51 mm x 102 mm cedar nailing strip is provided.



C

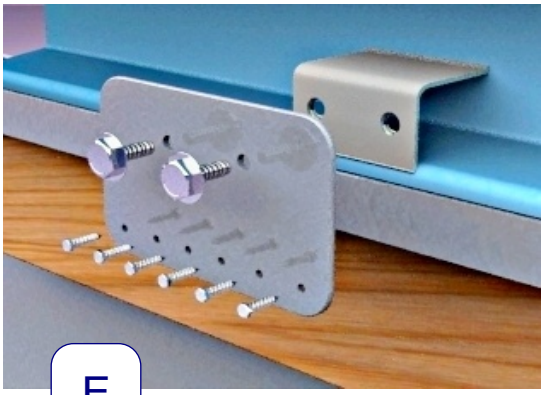
Insulation

The roof curb is pre-insulated with 25 mm foil faced insulation.

D

Unit Base Channel

The support channel section of the air handling unit. The channel is sealed to the roof curb with a continuous bead of caulking. The caulking is supplied with the unit to be field installed.



E

Restraint Plate

Restraint plate is factricated from 6.3 mm galvanized steel. Plate to ship loose and field installed by others. Restraint plate will be provided with appropriate number of 15.9 mm dia. x 25 mm grade 5 bolts and 6.3 mm tek screws.

F

Restraint Angle Anchor

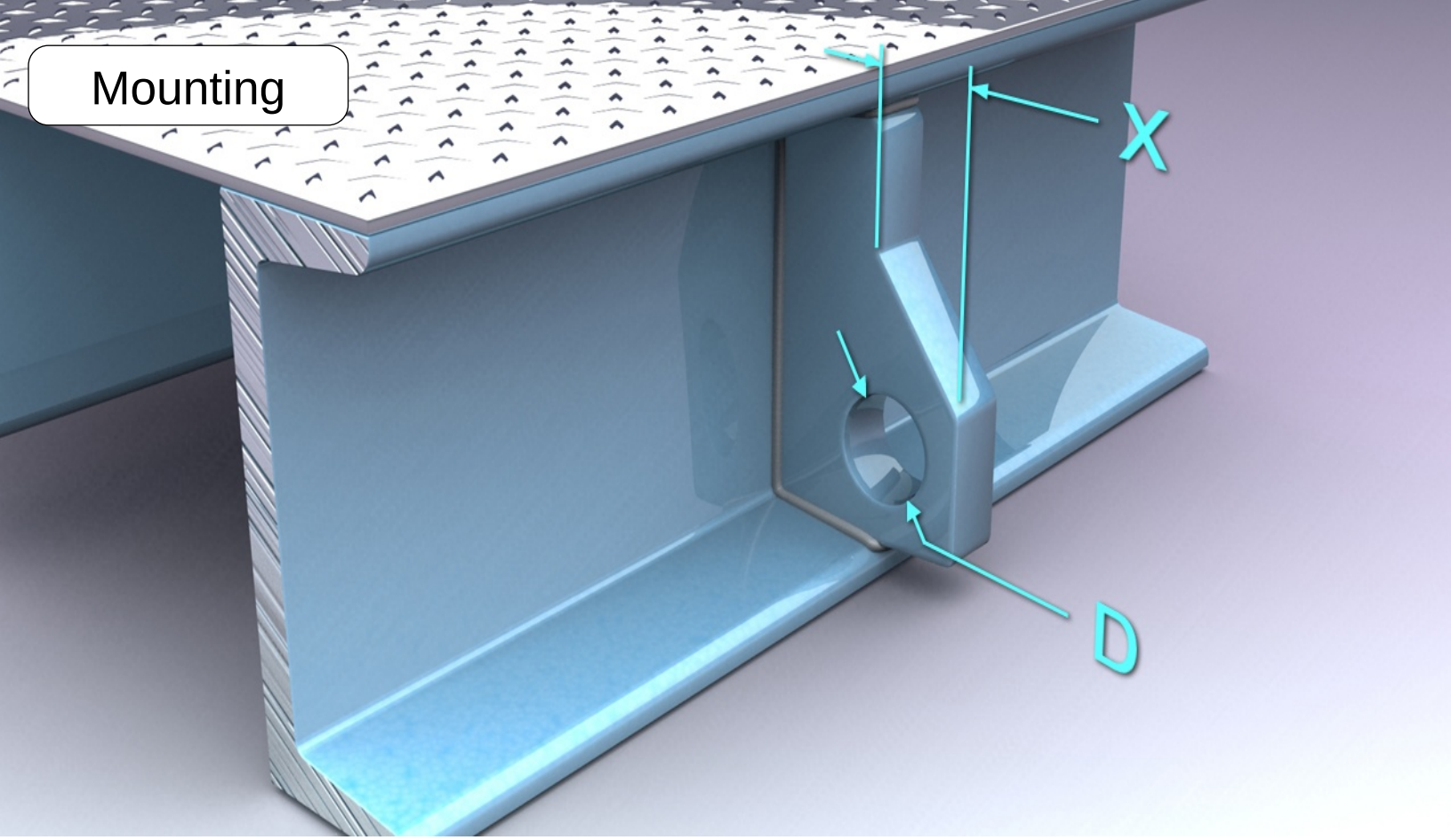
Restraint angle anchor is fabricated from 3.5 mm satin coat steel or hot rolled steel.

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT52
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES

Mounting



The unit is designed to be mounted on a roof curb.

Lifting lugs are provided on the base rail to facilitate lifting. A minimum of 4 lugs are provided per section. The quantity and location of the lugs are dependant on the size and weight distribution of the section.

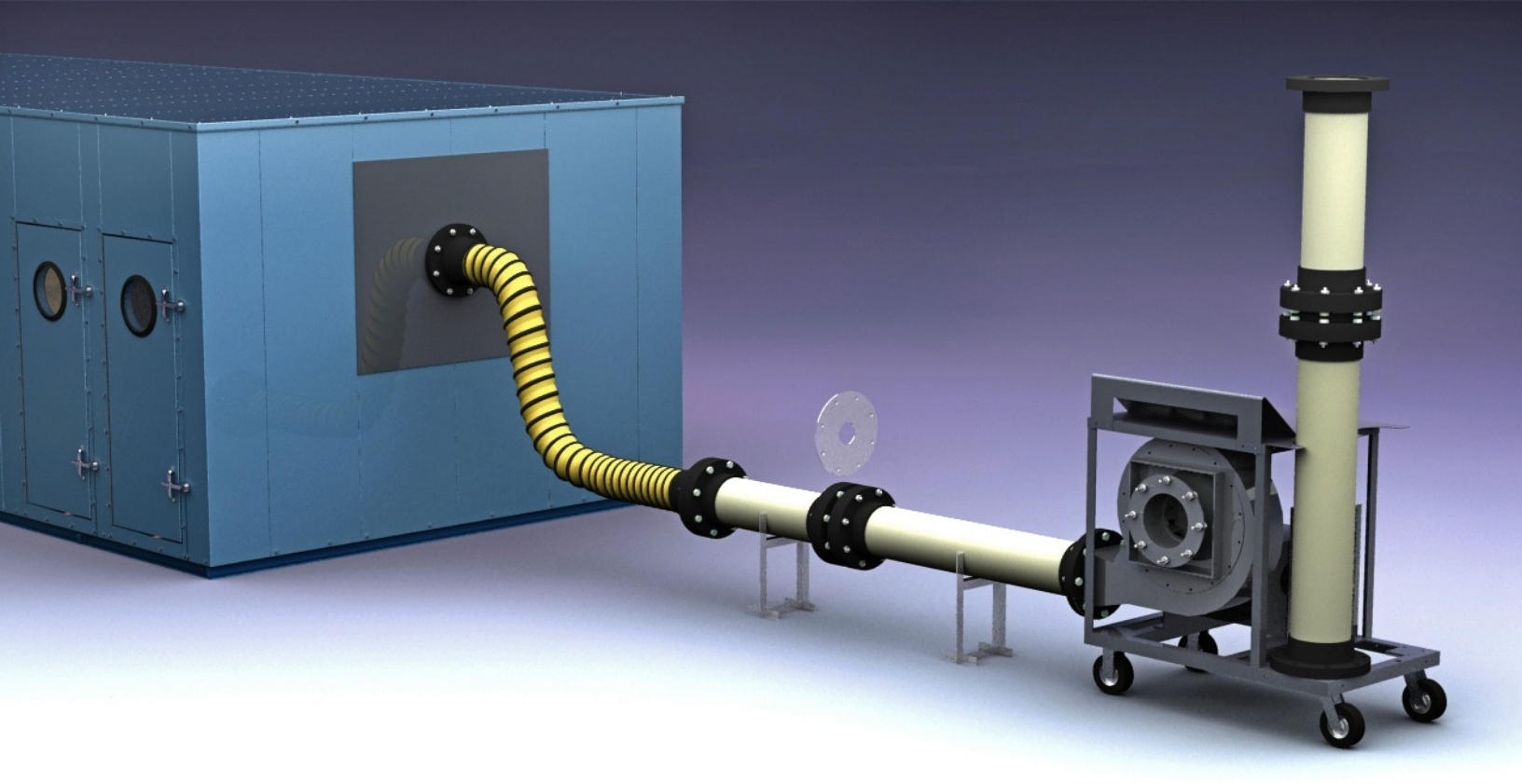
CHANNEL SIZE	"X"	"D"
4"	1.29"	1.125"
6"	1.23"	1.25f"
8"	1.46"	1.25f"
10"	1.14"	1.25f"
12"	2.09"	1.25f"

TAG: AHU-2

PROJECT: BRAMPTON VICTORIA PARK ARENA

DRAWN BY	TN	JOB NO.	7930	DWG NO	7930DT53
DATE	2025-03-10	UNITS	METRIC	REVISION	

HAAKON INDUSTRIES



FACTORY CASING AIR % LEAKAGE TEST

Haakon will factory pressure test air handling unit to ensure the leakage rate of the casing does not exceed leakage as noted below (Leakage test shall be performed with all VFD and humidifier panels installed, all electrical gear installed, and all coil penetrations made).

Test will be conducted in accordance with SMACNA duct construction manual. All external openings will be blocked off with temporary plates. The unit will be pressurized to the test pressure using an external blower.A calibrated orifice will be used to measure leakage airflow into or out of the unit.

Due to limitations on leak test equipment, minimum accurate detectable air leakage is 40 cfm. If allowable leakage is less than 40 cfm, leakage data recorded in this certificate is a best estimate of actual leakage. The result of the test will be certified by Haakon.

UNIT	LEAKAGE RATE	POSITIVE PRESS.	NEGATIVE PRESS.	COMMENT
AHU-2	< 1.0%		1588 Pa	

BELIMO

Technical data sheet NFB24-SR

Basic Fail-Safe modulating actuator for controlling dampers in typical commercial HVAC applications.

- **Torque motor 90 in-lb [10 Nm]**
- **Nominal voltage AC/DC 24 V**
- **Control Modulating**
- **Position feedback 2...10 V**

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...28.8 V / DC 21.6...28.8 V
	Power consumption in operation	3.5 W
	Power consumption in rest position	2.5 W
	Transformer sizing	6 VA
	Electrical Connection	18 GA appliance cable, 1 m, with 1/2" NPT conduit connector
	Overload Protection	electronic throughout 0...95° rotation
	Electrical Protection	actuators are double insulated
Functional data	Torque motor	90 in-lb [10 Nm]
	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Direction of motion motor	selectable with switch 0/1
	Direction of motion fail-safe	reversible with cw/ccw mounting
	Manual override	5 mm hex crank (3/16" Allen), supplied
	Angle of rotation	95°
	Angle of rotation note	adjustable with mechanical end stop, 35...95°
	Running Time (Motor)	95 s / 90°
	Running time fail-safe	<20 s @ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]
	Noise level, motor	40 dB(A)
	Noise level, fail-safe	62 dB(A)
	Position indication	Mechanical
Safety data	Power source UL	Class 2 Supply
	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2
	Enclosure	UL Enclosure Type 2
	Agency Listing	cULus listed to UL60730-1A:02; UL 60730-2-14:02 and CAN/CSA-E60730-1:02
	Quality Standard	ISO 9001
	UL 2043 Compliant	Suitable for use in air plenums per Section 300.22(C) of the NEC and Section 602 of the IMC
	Ambient humidity	Max. 95% RH, non-condensing
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]

Safety data	Servicing	maintenance-free
Weight	Weight	5.3 lb [2.4 kg]
Materials	Housing material	Galvanized steel and plastic housing

Footnotes †Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3

Product features

Application For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The actuator operates in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication. Not to be used for a master-slave application.

Operation The NF..24-SR series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The NF..24-SR series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The NF..24-SR uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The NF..24-SR actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Typical specification Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Accessories

Electrical accessories

Description	Type
DC Voltage Input Rescaling Module	IRM-100
Auxiliary switch, mercury-free	P475
Auxiliary switch, mercury-free	P475-1
Signal simulator, Power supply AC 120 V	PS-100
Convert Pulse Width Modulated Signal to a 2...10 V Signal for Belimo Proportional Actuators	PTA-250
Positioner for wall mounting	SGA24
Positioner for front-panel mounting	SGF24
Cable conduit connector 1/2"	TF-CC US
Resistor, 500 Ω, 1/4" wire resistor with 6" pigtail wires	ZG-R01
Resistor kit, 50% voltage divider	ZG-R02
Transformer, AC 120 V to AC 24 V, 40 VA	ZG-X40

Mechanical accessories

Description	Type
Anti-rotation bracket, for AF / NF	AF-P
Shaft extension 240 mm ø20 mm for damper shaft ø8...22.7 mm	AV8-25
End stop indicator	IND-AFB
Shaft clamp reversible, for central mounting, for damper shafts ø12.7 / 19.0 / 25.4 mm	K7-2
Ball joint suitable for damper crank arm KH8 / KH10	KG10A
Ball joint suitable for damper crank arm KH8	KG8
Damper crank arm Slot width 8.2 mm, clamping range ø14...25 mm	KH10
Damper crank arm Slot width 8.2 mm, for ø1.05"	KH12
Damper crank arm Slot width 8.2 mm, clamping range ø10...18 mm	KH8
Actuator arm, for 3/4" shafts, clamping range ø10...22 mm, Slot width 8.2 mm	KH-AFB
Push rod for KG10A ball joint 36" L, 3/8" diameter	SH10
Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).	SH8
Wrench 0.32 in and 0.39 in [8 mm and 10 mm]	TOOL-06
Retrofit clip	Z-AF
Mounting bracket for AF..	ZG-100
Mounting bracket	ZG-101
Mounting bracket	ZG-109
Linkage kit	ZG-110
Mounting bracket for AF / NF	ZG-118
Jackshaft mounting bracket.	ZG-120
Mounting kit for linkage operation for flat and side installation	ZG-AFB
Mounting kit for foot mount installation	ZG-AFB118
Damper clip for damper blade, 3.5" width.	ZG-DC1
Damper clip for damper blade, 6" width.	ZG-DC2
1" diameter jackshaft adaptor (11" L).	ZG-JSA-1
1-5/16" diameter jackshaft adaptor (12" L).	ZG-JSA-2
1.05" diameter jackshaft adaptor (12" L).	ZG-JSA-3
Weather shield 13x8x6" [330x203x152 mm] (LxWxH)	ZS-100
Baseplate, for ZS-100	ZS-101
Weather shield 406x213x102 mm [16x8-3/8x4"] (LxWxH)	ZS-150
Explosion proof housing 16x10x6.435" [406x254x164 mm] (LxWxH), UL and CSA, Class I, Zone 1&2, Groups B, C, D, (NEMA 7), Class III, Hazardous (classified) Locations	ZS-260
Weather shield 17-1/4x8-3/4x5-1/2" [438x222x140 mm] (LxWxH), NEMA 4X, with mounting brackets	ZS-300
Weather shield 17-1/4x8-3/4x5-1/2" [438x222x140 mm] (LxWxH), NEMA 4X, with mounting brackets	ZS-300-5
Shaft extension 1/2"	ZS-300-C1
Shaft extension 3/4"	ZS-300-C2
Shaft extension 1"	ZS-300-C3
Baseplate extension	Z-SF
Linkage kit	ZG-JSL
Jackshaft Retrofit Linkage with Belimo Rotary Actuators	

Electrical installation

Warning! Live electrical components!
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Meets cULus requirements without the need of an electrical ground connection.

A Actuators with appliance cables are numbered.

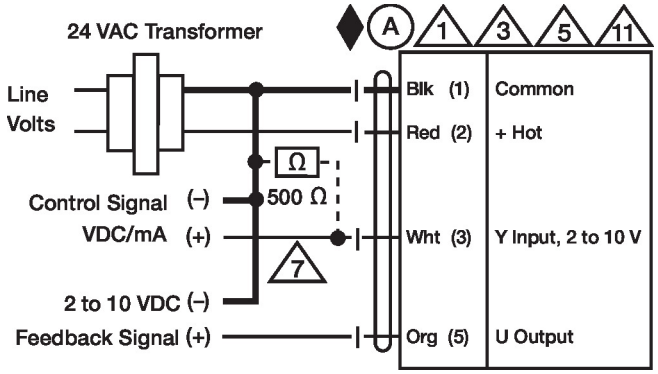
1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by DC 24 V.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

11 Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.



2...10 V / 4...20 mA Control

Dimensions

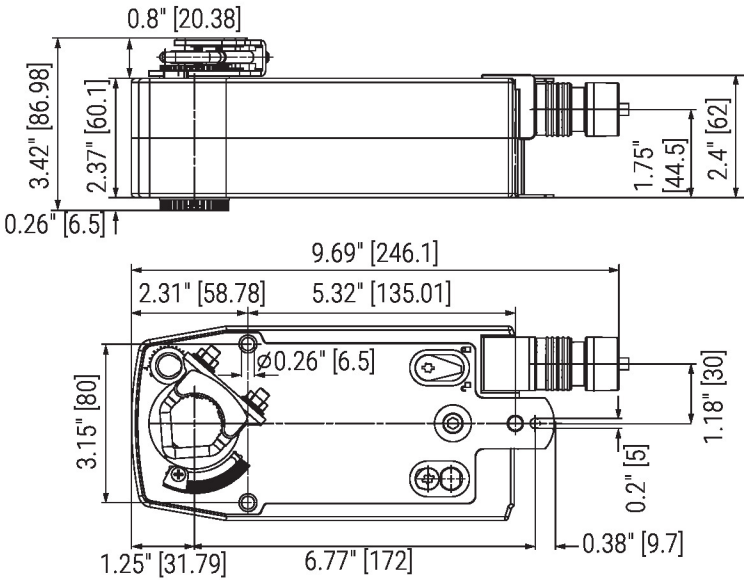


ABB
ACH580 SERIES
ADJUSTABLE SPEED AC DRIVES
SUBMITTAL

JOB #: 7930

JOB NAME: BRAMPTON VICTORIA PARK ARENA

QTY	UNIT TAG	HP	OUTPUT AMPS	MODEL
1	AHU-2-RF	10	11	ACH580-VDR-011A-6+F267
1	AHU-2-SF	25	27	ACH580-VDR-027A-6+F267

All of the above include the following:

- Voltage: 575/3/60
- Short circuit current rating: 100kA
- Input Disconnect Switch
- Drive Input Fuses
- E-Clipse Bypass
- Service Switch
- 5% Input Line Impedance with Input Line Reactors
- EMI / RFI Filter
- Standard control panel/keypad
- Standard communication protocols: BACnet MS/TP, Modbus RTU, Johnson N2
- Nema 1 Enclosure

PRODUCT OVERVIEW

ACH580 E-Clipse Bypass

The ACH580 drive sets new standards in both simplicity and reliability, and ensures smooth, energy-efficient operation of your HVAC systems in normal and mission-critical situations.

The ACH580 with ABB E-Clipse bypass is an ACH580 HVAC Drive in an integrated UL (NEMA) Type 1, 12 or 3R enclosure with a bypass motor starter. The ACH580 with ABB E-Clipse bypass provides an input disconnect switch or circuit breaker with door mounted and interlocked operator (padlockable in the OFF position), a bypass starter, electronic motor overload protection, a door mounted control panel with graphical display for local control, provisions for external control connections, and serial communications capability. Configurations with the +F267 option include a drive service switch.

UL (NEMA) Type 1 and 12 E-Clipse units are available from 1 to 100 HP at 208/230V, 1 to 350 HP at 460V, and 2 to 150 HP at 575V. UL (NEMA) Type 1 and 12 units are wall mounted from 1 to 200 HP.

For outdoor applications, UL (NEMA) Type 3R E-Clipse unit are available from 1 to 100 HP at 208/230V, 1 to 350 HP at 460V and 2 to 150 HP at 575V. Construction is sheet steel with a tough powder coat paint finish for corrosion resistance. A thermostatically controlled space heater and forced ventilated air cooling system are standard.

The ACH580 with ABB E-Clipse bypass includes two contactors. One contactor is the bypass contactor, used to connect the motor directly to the incoming power line in the event that the ACH580 is out of service. The other contactor is the ACH580 output contactor that disconnects the ACH580 from the motor when the motor is operating in the Bypass mode. The drive output contactor and the bypass contactor are electrically interlocked to prevent “back feeding”.

The ACH580 with ABB E-Clipse bypass is a microprocessor-controlled “intelligent” system which features programmable Class 10, 20, or 30 overload curves, programmable underload (broken belt) and overload trip or indication. Also included as standard features are single-phase protection in bypass mode, programmable manual or automatic transfer to bypass, fireman’s override, smoke control, damper control, no contactor chatter on brown-out power conditions and serial communications. Should a drive problem occur, fast acting fuses exclusive to the ACH580 drive path disconnect the drive from the line prior to clearing upstream branch circuit protection, maintaining bypass capability.

Technical specifications

Product compliance (complete list on following page)	
ACH580-VxR/BxR	UL508A
Supply connection	
Input voltage (U_1)	
ACH580-xx-xxxA-2	208/240V
ACH580-xx-xxxA-4	480V
ACH580-xx-xxxA-6	600V
Input voltage tolerance	+10% / -15%
Phase	3-phase
Frequency	48 to 63 Hz
Line Limitations	Max ±3% of nominal phase to phase input voltage
Power Factor (cos φ) at nominal load	
ACH580-VxR	0.98
ACH580-BxR	0.98
Efficiency at rated power	
ACH580-VxR	98.0%
ACH580-BxR	98.0%
Power Loss	Approximately 2% of rated power
Motor connection	
Supported motor control	Scalar and vector
Supported motor types	Asynchronous motor
Voltage	3-phase, from 0 to supply voltage
Frequency	0 to 500 Hz
Short Term Overload Capacity Variable Torque	110% for 1 min/10min
Peak Overload Capacity Variable Torque	1.35 for 2 second (2 sec / 10 min)
Switching Frequency	2, 4, 8 or 12 kHz Automatic fold back in case of overload
Acceleration/Deceleration Time	0 to 1800 s
Short Circuit Current Rating (SCCR)	

	240V	480V	600V
-VCR	100kA	100kA	10 kA
-VDR*	100kA	100kA	100 kA
-BCR	100kA	100kA	10 kA
-BDR*	100kA	100kA	100 kA

* External fuses are required for 100 kA rating as specified in the “Technical Data” section of User Manual 3AXD50000289554.

Technical specifications

Inputs and outputs (drive)	
2 analog inputs	Selection of Current/Voltage input mode is user programmable.
Voltage reference	0 (2) to 10 V, R_{in} > 200 kΩ
Current reference	0 (4) to 20 mA, R_{in} = 100 Ω
Potentiometer reference value	10 V ±1% max. 20 mA
2 analog outputs	AO1 is user programmable for current or voltage. AO2 current
Voltage reference	0 to 10 V, R_{load}: > 100 kΩ
Current reference	0 to 20 mA, R_{load}: < 500 Ω
Applicable potentiometer	1 kΩ to 10 kΩ
Internal auxiliary voltage	24 V DC ±10%, max. 250 mA
Accuracy	+/- 1% full scale range at 25°C (77°F)
Output updating time	2 ms
6 digital inputs	12 to 24 V DC, 10 to 24 V AC, Connectivity of PTC sensors supported by a single digital input. PNP or NPN connection (5 DIs with NPN connection). Programmable
Input Updating Time	2 ms
3 relay outputs	Maximum switching voltage 250 V AC/30 V DC. Maximum continuous current 2 A rms. Programmable, Form C
Contact material	Silver Tin Oxide ($AgSnO_2$)
PTC, PT100 and PT1000	Any of the analog inputs, or digital input 6, are configurable for PTC with up to 6 sensors.
Adjustable filters on analog inputs and outputs	
All control inputs isolated from ground and power	
Operation	
Air temperature	0 to -15 °C (32 to 5 °F). -15 to +50 °C (5 to 122 °F): No frost allowed. Output derated above +40 °C (104 °F)
Installation site altitude	0 to 1000 m (3281 ft) above sea level Output derated above 1000 m (3281 ft)
Relative humidity	5 to 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric pressure	70 to 106 kPa (10.2 to 15.4 PSI) 0.7 to 1.05 atmospheres
Siesmic	Risk category IV Certified (IBC 2018)

Feature overview

Communication
Protocols as standard (EIA-485): BACnet MS/TP, Modbus RTU, Johnson Controls N2
Available as plug-in options: BACnet/IP, Modbus TCP, PROFIBUS-DP, DeviceNet, EtherNet/IP

Application functions
Start interlock
Delayed start
Run permissive (damper monitoring)
Override operation mode
Real-time clock (scheduling)
PID controllers for motor and process
Motor flying start
Motor preheating
Energy optimizer and calculators
Timer
2 or 3 wire start/stop
Ramp to stop
2 independent adjustable accel/decel ramp

Protection functions
Overvoltage controller
Undervoltage controller
Motor earth-leakage monitoring
Motor short-circuit protection
Motor overtemperature protection
Output and input switch supervision
Motor overload protection (UL508C)
Phase-loss detection (both motor and supply)
Under load supervision (belt loss detection)
Overload supervision
Stall protection
Loss of reference
Panel loss
Ground fault
External events
Overcurrent
Current limit regulator
Transient/Surge protection (MOV and choke)

Panel functions
First start assistant
Primary settings for HVAC applications
Hand-Off-Auto operation mode
HVAC quick set-up
Includes Day, Date and Time
Operator Panel Parameter Backup (read/write)
Full Graphic and Multilingual Display for Operator Control, Parameter Set-Up and Operating Data Display:
- Output Frequency (Hz)
- Speed (RPM)
- Motor Current
- Calculated % Motor Torque
- Calculated Motor Power (kW)
- DC Bus Voltage
- Output Voltage
- Heatsink Temperature
- Elapsed Time Meter (resettable)
- kWh (resettable)
- Input / Output Terminal Monitor
- PID Actual Value (Feedback) & Error Fault Text
- Warning Text
- Three (3) Scalable Process Variable Displays
- User-Definable Engineering Units

Motor control features
Scalar (V/Hz) and vector modes of motor control
V/Hz shapes
- Linear
- Squared

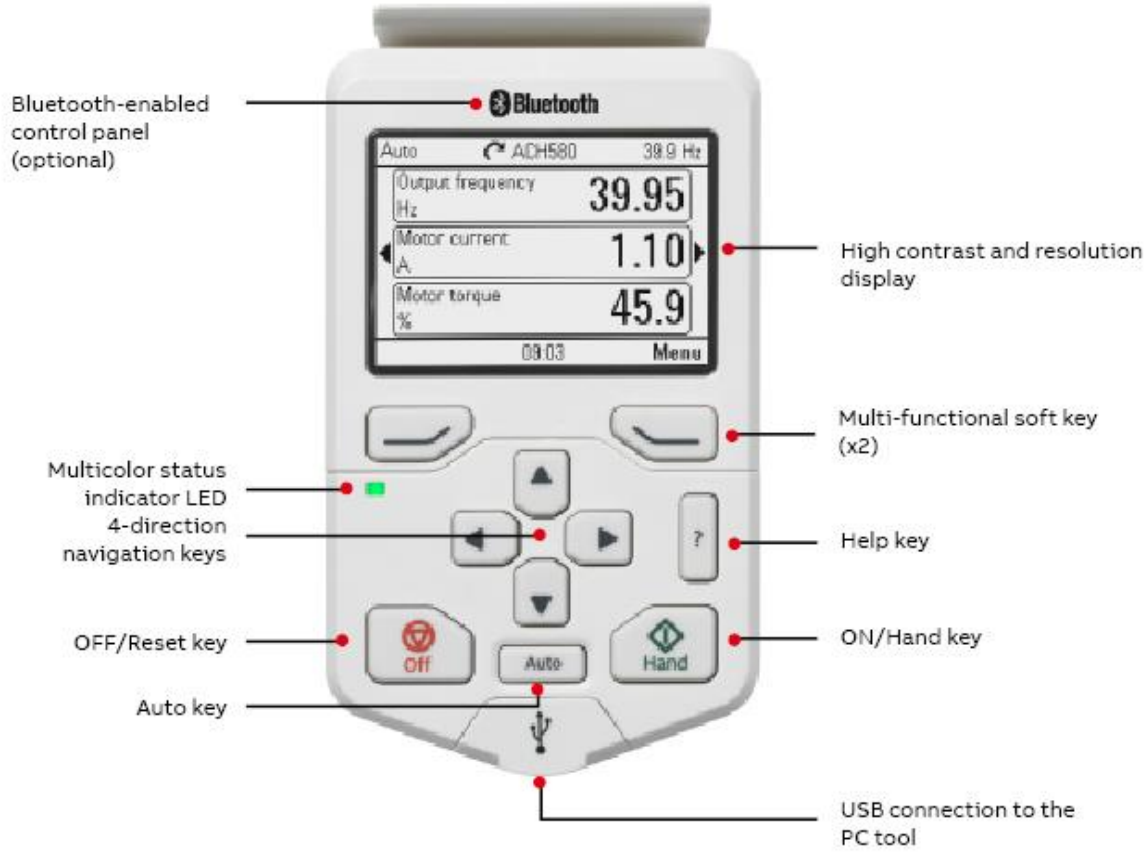
Energy optimization
IR compensation
Slip compensation
Three (3) Critical Frequency Lockout Bands

PID control
One (1) Process PID
Four (4) Integral Independent Programmable PID
Setpoint Controllers (Process and External)
External Selection between Two (2) Sets of Process PID Controller Parameters
PID Sleep/Wake-Up

Control panel features

The ACH580 Assistant Control Panel features:

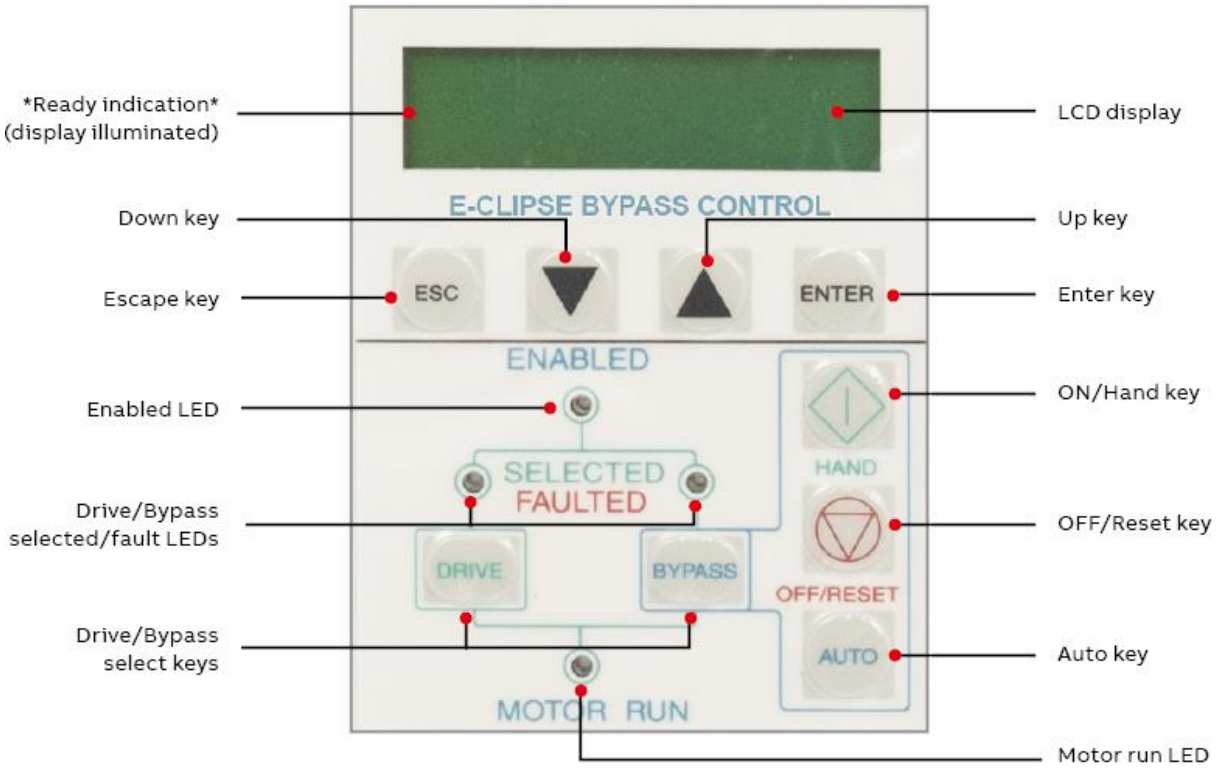
- Intuitive to operate
- Primary Setting menu to ease drive commissioning
- Real-time clock
- Diagnostic and maintenance functions
- Full-graphic display, including chart, graph, and meter options
- 21 editable home views
- USB interface for PC and tool connection as standard
- Parameters are alpha-numeric
- North American version supports 14 languages as standard
- Dedicated “Help” key
- 4 user sets
- Parameter are stored in control panel memory for later transfer to other drives or for backup of a particular system
- Back-up and restore parameters and/or motor data
- Automatic back-up 2 hours after parameter change
- Modified parameter display
- Creates unique short menu
- Shows parameters that differ from the default
- Bluetooth connectivity for use with mobile device (requires +J429 option)



E-Clipse control panel features

The ACH580 E-Clipse Control Panel features:

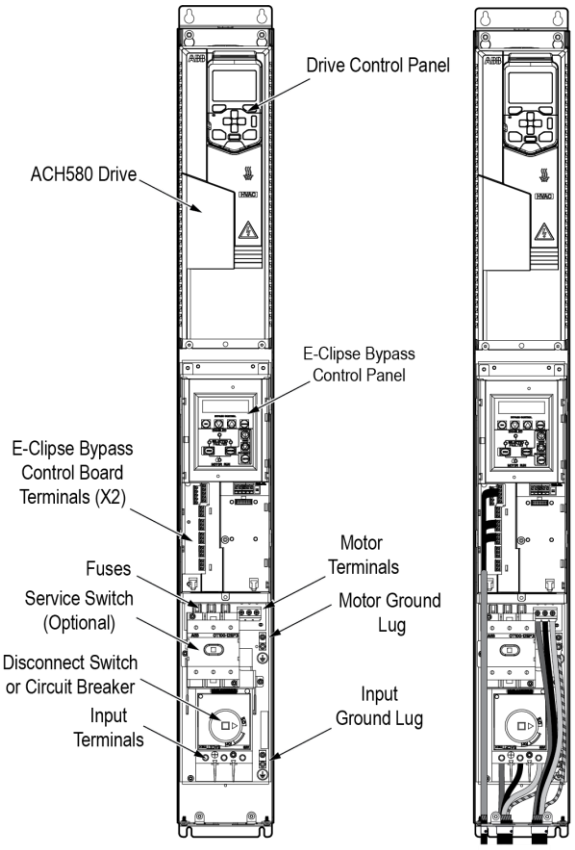
- Dedicated programming and operating controls (keys) are logically grouped on the keypad by their function.
  - H-O-A, Drive/Bypass Selection keys (Control)
  - UP/DOWN arrows, ESC, ENTER keys (Programming)
- LCD display provide:
  - Operating Control Status
  - Bypass Status
  - Fault/Warning annunciation
  - Parameter Lists and Values
  - Power On indication
- Individual LEDs arranged to provide a logical control path visual:
  - System Enabled
  - Separate multi colored Drive and Bypass “SELECTED/FAULTED LEDs in separate paths
  - Motor Run Indicator
  - LEDs that illuminate, change color, and flash to provide visible indication of system status
- Provides System control from one location



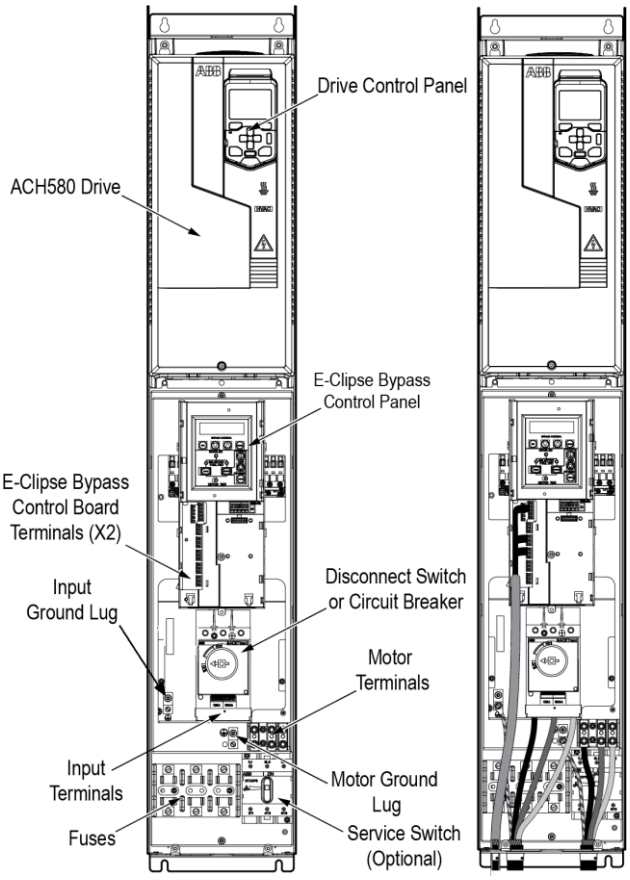
Cable connections

The following illustrations show the ACH580 with ABB E-Clipse bypass cable connection points for the various enclosure styles. The illustrations indicate the location of input and output power connections as well as equipment and motor grounding connection points.

ACH580 drives are configured for wiring access from the bottom only on Vertical ABB E-Clipse bypass units and from the top only on Standard ABB E-Clipse bypass units. At least three separate metallic conduits are required, one for input power, one for output power to the motor and one for control signals.

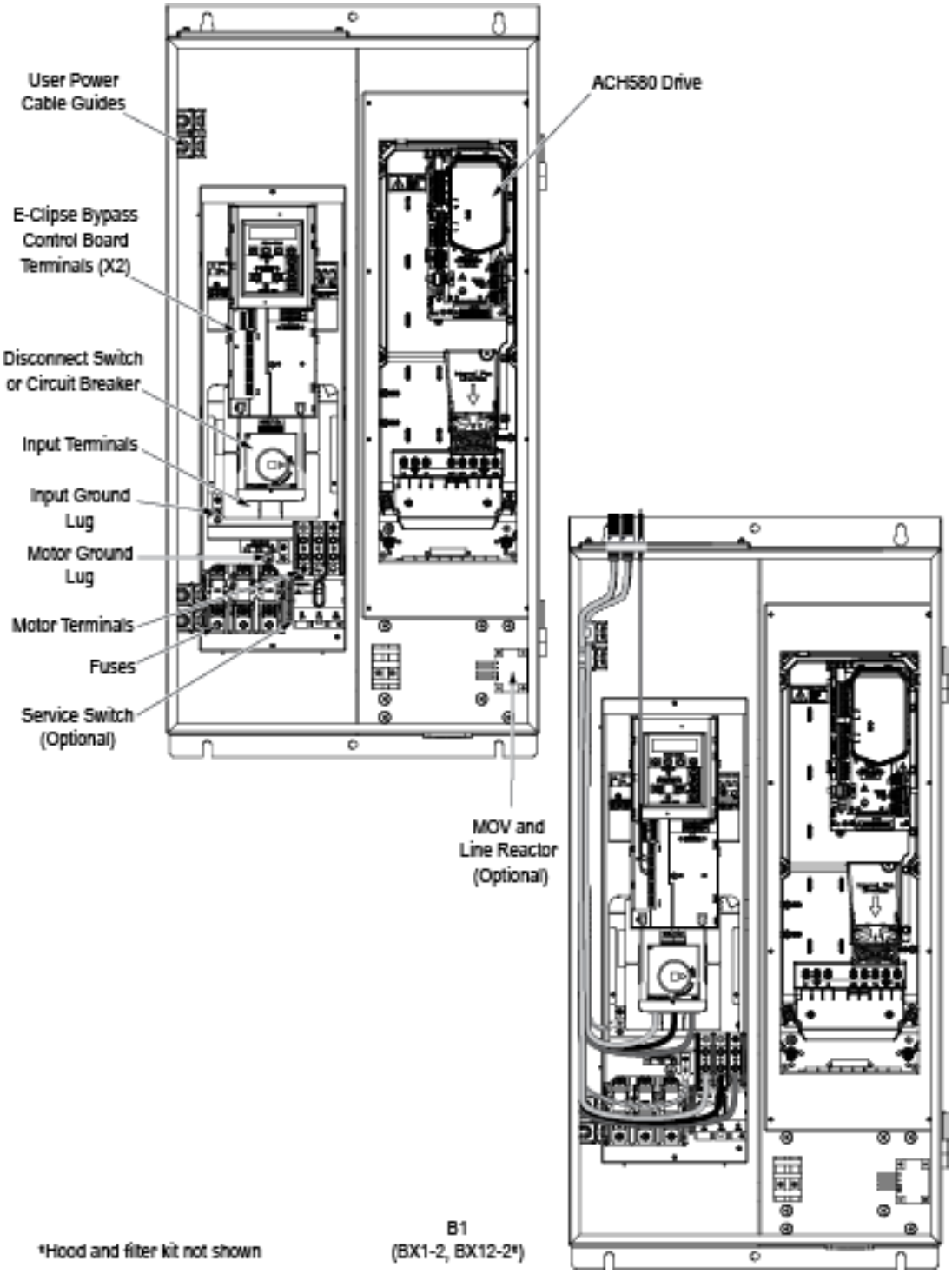


Vx1-1, Vx1-2



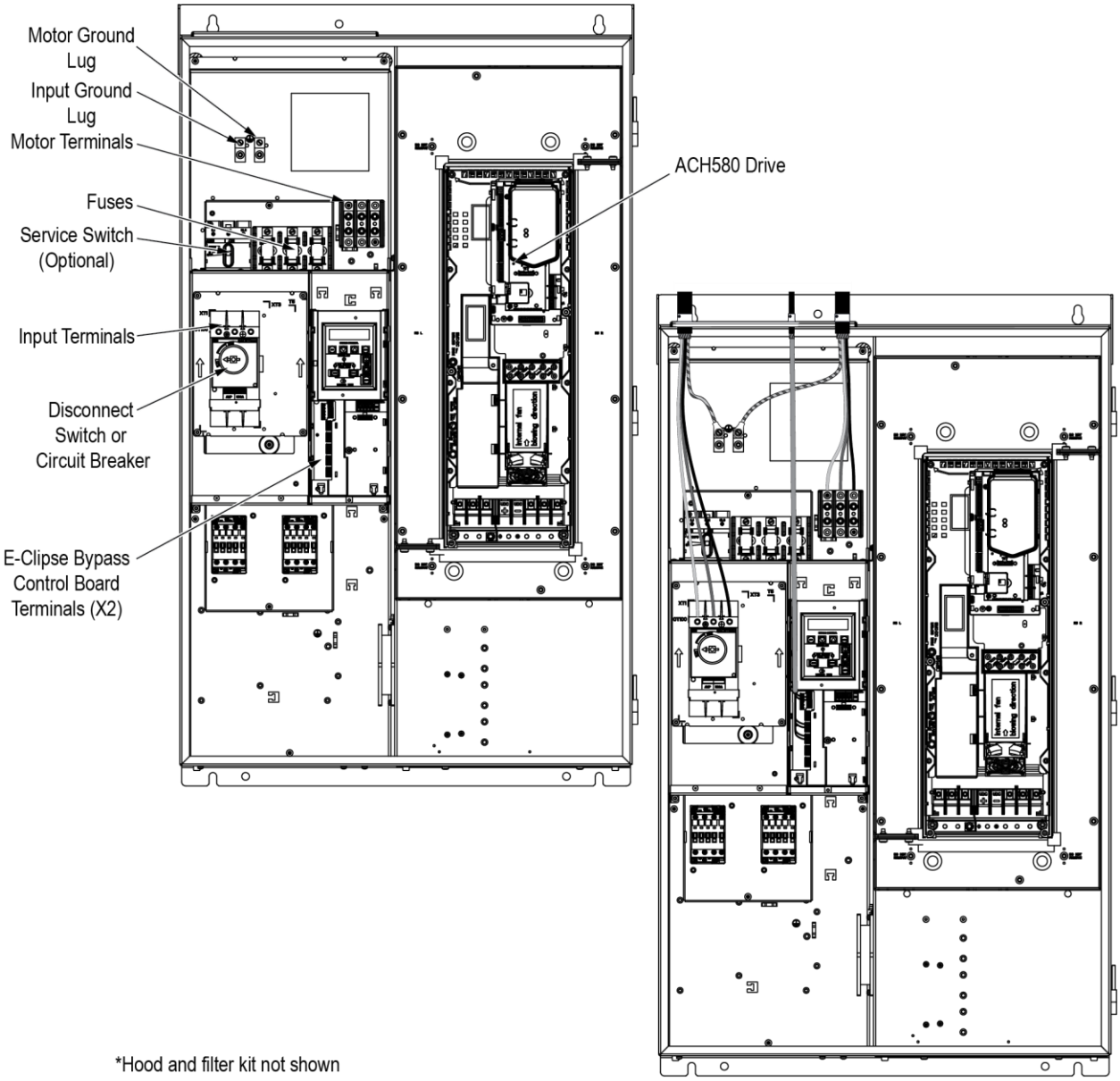
Vx1-3, Vx1-4

Cable connections



Bx1-1, Bx12-1, Bx3R-1

Control connections

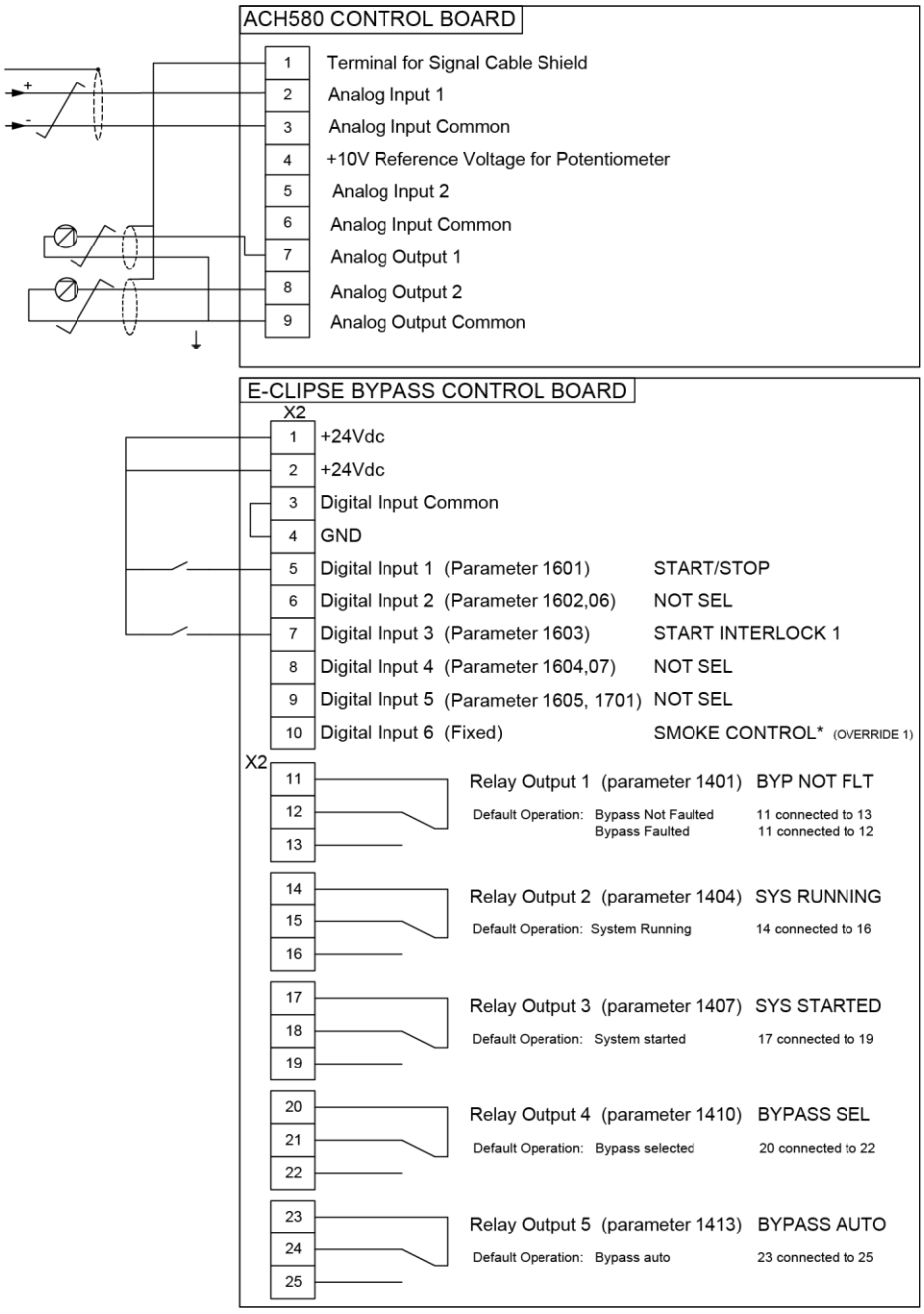


*Hood and filter kit not shown

Bx1-3*, Bx12-3*

Control connections

The control wiring includes connections to an analog speed command signal and a start/stop relay contact for controlling the motor in the AUTO mode. There may also be connections to external run permissive interlock contacts and a connection from the Motor Run contact to an external status indication circuit. For a detailed description of the control circuit functions and alternate Control Connection diagrams, refer to the ACH580 E-Clipse bypass and packaged drive manual.



Branch circuit protection

Input power is connected to the ACH580 with E-Clipse Bypass through a door interlocked disconnect switch or circuit breaker. Neither of these inputs are fused. The branch circuit that provides power to the ACH580 with E-Clipse Bypass with disconnect switch must include the specified external fuses to provide short circuit and ground fault protection for the motor in the bypass mode.

When connected to a 240V or 480V power source, the ACH580 with E-Clipse Bypass with the circuit breaker option is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes. When connected to a 600V power source ABB E-Clipse units provided with a circuit breaker, VCR and BCR configurations, are suitable for use on a circuit capable of delivering not more than 10,000 RMS symmetrical amperes.

Fuses

Note: The UL listed drive fuses in the table are provided in the purchased product.

- Replacement fuses are required to be of the same class, current rating, and voltage rating. Fuses from other manufacturers can be used if they are 600V rated and meet the specifications given in the table.
- Fuses with higher current rating than specified must not be used.

208/230 Volt fuses for vertical enclosures

Type Code[1]	Nominal Output Ratings		Base Drive Frame Size	Internal Drive Fuse Rating		External Fuse for Disconnect Option	
	Drive Current	Package Power		Class	Max Current Rating	Class	Max Current Rating
	A	HP					
208/230 Volts							
ACH580-VxR-04A6-2	4.6	1	R1	Class CC	15A	Class J	15A
ACH580-VxR-06A6-2	6.6	1.5	R1	Class CC	15A	Class J	15A
ACH580-VxR-07A5-2	7.5	2	R1	Class CC	15A	Class J	20A
ACH580-VxR-10A6-2	10.6	3	R1	Class CC	15A	Class J	25A
ACH580-VxR-017A-2	16.7	5	R1	Class CC	30A	Class J	40A
ACH580-VxR-024A-2	24.2	7.5	R2	Class CC	30A	Class J	45A
ACH580-VxR-031A-2	30.8	10	R2	Class T	40A	Class J	60A
ACH580-VxR-046A-2	46.2	15	R3	Class T	80A	Class J	100A
ACH580-VxR-059A-2	59.4	20	R3	Class T	80A	Class J	100A
ACH580-VxR-075A-2	74.8	25	R4	Class T	100A	Class J	100A

1) “VxR” represents both VCR and VDR.

460 Volt fuses for vertical enclosures

Type Code[1]	Nominal Output Ratings		Base Drive Frame Size	Internal Drive Fuse Rating		External Fuse for Disconnect Option	
	Drive Current	Package Power		Class	Max Current Rating	Class	Max Current Rating
	A	HP					
460 Volts							
ACH580-VxR-02A1-4	2.1	1	R1	Class CC	15A	Class J	15A
ACH580-VxR-03A0-4	3.0	1.5	R1	Class CC	15A	Class J	15A
ACH580-VxR-03A5-4	3.5	2	R1	Class CC	15A	Class J	15A
ACH580-VxR-04A8-4	4.8	3	R1	Class CC	15A	Class J	15A
ACH580-VxR-07A6-4	7.6	5	R1	Class CC	15A	Class J	20A
ACH580-VxR-012A-4	12	7.5	R1	Class CC	15A	Class J	25A
ACH580-VxR-014A-4	14	10	R2	Class CC	30A	Class J	35A
ACH580-VxR-023A-4	23	15	R2	Class CC	30A	Class J	45A
ACH580-VxR-027A-4	27	20	R3	Class T	40A	Class J	60A
ACH580-VxR-034A-4	34	25	R3	Class T	60A	Class J	60A
ACH580-VxR-044A-4	44	30	R3	Class T	60A	Class J	60A
ACH580-VxR-052A-4	52	40	R4	Class T	80A	Class J	100A
ACH580-VxR-065A-4	65	50	R4	Class T	90A	Class J	100A
ACH580-VxR-077A-4	77	60	R4	Class T	100A	Class J	100A

1) "VxR" represents both VCR and VDR.

575 Volt fuses for vertical enclosures

Type Code[1]	Nominal Output Ratings		Base Drive Frame Size	Internal Drive Fuse Rating		External Fuse for Disconnect Option	
	Drive Current	Package Power		Class	Max Current Rating	Class	Max Current Rating
	A	HP					
575 Volts[2]							
ACH580-VxR-02A7-6	2.7	2	R2	Class CC	30A	Class J	15A
ACH580-VxR-03A9-6	3.9	3	R2	Class CC	30A	Class J	15A
ACH580-VxR-06A1-6	6.1	5	R2	Class CC	30A	Class J	15A
ACH580-VxR-09A0-6	9	7.5	R2	Class CC	30A	Class J	20A
ACH580-VxR-011A-6	11	10	R2	Class CC	30A	Class J	25A
ACH580-VxR-017A-6	17	15	R2	Class CC	30A	Class J	40A
ACH580-VxR-022A-6	22	20	R3	Class T	40A	Class J	50A
ACH580-VxR-027A-6	27	25	R3	Class T	40A	Class J	60A

1) "VxR" represents both VCR and VDR.
2) VCR is rated 600Y/347V. For use on a solidly grounded Wye source only.

UL (NEC)

Type ACH580	Heat dissipation					Air flow		Noise	Frame size
	Main circuit at rated I_1 at I_{Ld}	Control circuit minimum	Control circuit maximum	Main and control boards maximum					
	W	W	W	W	BTU/h	m^3/h	CFM	dB(A)	
3-phase U_1 = 200...240 V, P_n at U_N = 208/230 V, 60 Hz									
04A6-2	20	3.5	25	45	155	43	25	59	R1
06A6-2	30	3.5	25	55	187	43	25	59	R1
07A5-2	41	3.5	25	66	224	43	25	59	R1
10A6-2	59	3.5	25	84	288	43	25	59	R1
017A-2	108	3.5	25	133	454	43	25	59	R1
024A-2	149	3.5	25	174	593	101	59	64	R2
031A-2	203	3.5	25	228	777	101	59	64	R2
046A-2	297	3.5	25	322	1100	179	105	76	R3
059A-2	405	3.5	25	430	1469	179	105	76	R3
075A-2	500	3.5	25	525	1791	288	170	69	R4
088A-2	594	3.5	25	619	2114	139	82	63	R5
114A-2	810	3.5	25	835	2852	139	82	63	R5
143A-2	999	4.1	36	1035	3535	435	256	67	R6
169A-2	1215	4.1	36	1251	4272	450	265	67	R7
211A-2	1485	4.1	36	1521	5194	450	265	67	R7
273A-2	2025	4.1	36	2061	7039	550	324	65	R8
3-phase U_1 = 440...480 V, P_n at U_N = 460 V, 60 Hz									
02A1-4	20	3.5	25	45	155	43	25	59	R1
03A0-4	30	3.5	25	55	187	43	25	59	R1
03A5-4	41	3.5	25	66	224	43	25	59	R1
04A8-4	59	3.5	25	84	288	43	25	59	R1
07A6-4	108	3.5	25	133	454	43	25	59	R1
012A-4	149	3.5	25	174	593	43	25	59	R1
014A-4	203	3.5	25	228	777	101	59	64	R2
023A-4	297	3.5	25	322	1100	101	59	64	R2
027A-4	405	3.5	25	430	1469	179	105	76	R3
034A-4	500	3.5	25	525	1791	179	105	76	R3
044A-4	594	3.5	25	619	2114	179	105	76	R3
052A-4	810	3.5	25	835	2852	134	79	69	R4
065A-4	999	3.5	25	1024	3497	134	79	69	R4
077A-4	1215	3.5	25	1240	4235	288	170	63	R4
096A-4	1485	3.5	25	1510	5157	139	82	63	R5
124A-4	1440	4.1	36	1476	5041	435	256	67	R6
156A-4	1940	4.1	36	1976	6748	450	265	67	R7
180A-4	2310	4.1	36	2346	8012	450	265	67	R7
240A-4	3300	4.1	36	3336	11393	550	324	65	R8
302A-4	3900	4.1	36	3936	13442	550	324	68	R9
361A-4	4800	4.1	36	4836	16516	1150	677	68	R9
414A-4	6000	4.1	36	6036	20614	1150	677	68	R9

Type ACH580	Heat dissipation					Air flow		Noise	Frame size
	Main circuit at rated I_1 at I_{Ld}	Control circuit minimum	Control circuit maximum	Main and control boards maximum					
	W	W	W	W	BTU/h	m^3/h	CFM	dB(A)	
3-phase U_1 = 500...600 V, P_n at U_N = 575 V, 60 Hz									
02A7-6	41	3.5	25	66	224	101	59	64	R2
03A9-6	59	3.5	25	84	288	101	59	64	R2
06A1-6	108	3.5	25	133	454	101	59	64	R2
09A0-6	149	3.5	25	174	593	101	59	64	R2
11A0-6	203	3.5	25	228	777	101	59	64	R2
017A-6	297	3.5	25	322	1100	101	59	64	R2
022A-6	405	3.5	25	430	1469	179	105	75	R3
027A-6	500	3.5	25	525	1791	179	105	75	R3
032A-6	594	3.5	25	619	2114	179	105	75	R3
041A-6	810	3.5	25	835	2852	139	82	63	R5
052A-6	999	3.5	25	1024	3497	139	82	63	R5
062A-6	1215	3.5	25	1240	4235	139	82	63	R5
077A-6	1485	3.5	25	1510	5157	139	82	63	R6
099A-6	2025	4.1	36	2061	7039	450	265	67	R7
125A-6	2430	4.1	36	2466	8422	450	265	67	R7
144A-6	2970	3.5	36	3006	10266	550	324	65	R8
192A-6	4050	4.1	36	4086	13954	1150	677	68	R9
242A-6	4860	4.1	36	4896	16721	1150	677	68	R9
271A-6	4860	4.1	36	4896	16721	1150	677	68	R9

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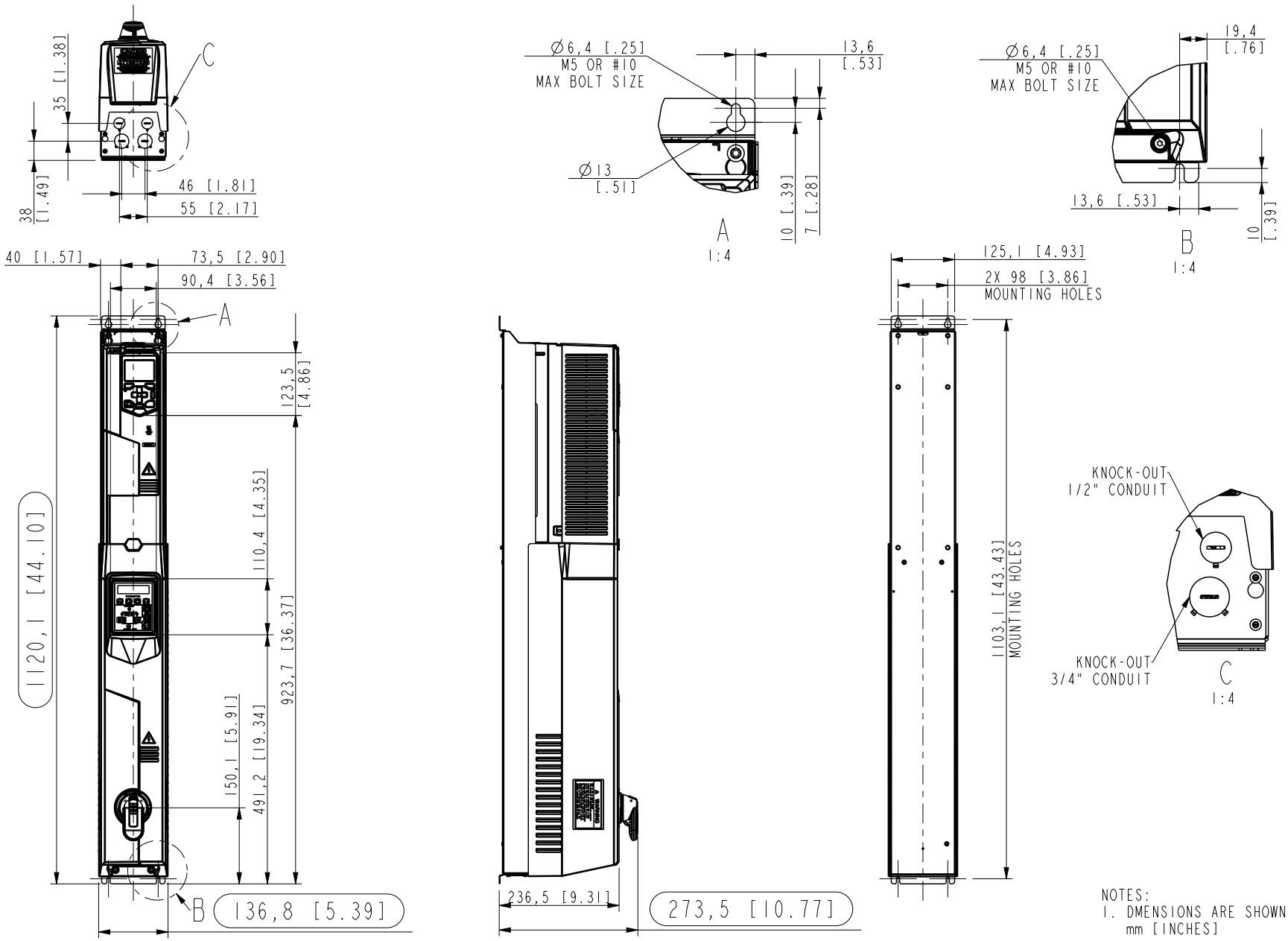
ACH580-VDR-011A-6+F267

First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.



NOTES:
1. DMENSIONS ARE SHOWN IN:
mm [INCHES]

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C	Modified Title Block	14-May-19	B.Baldwin

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ACH580-VXR_V2_MAIN_ASSY (ASSEM)	-.19+	5000011662	13

Based on		Prepared	B.Baldwin	02-Mar-18	Title DIMENSION DRAWING E-CLIPSE V2, TYPE I ACH580
Customer		Check.	D.Crawley	14-May-19	
		Appr.	A. D. Wade	14-May-19	
Cust. Doc. No.					
DMS Number	3AXD10000491395				

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Resp.dept.	Rev.ind. C (AP)		Lang. EN
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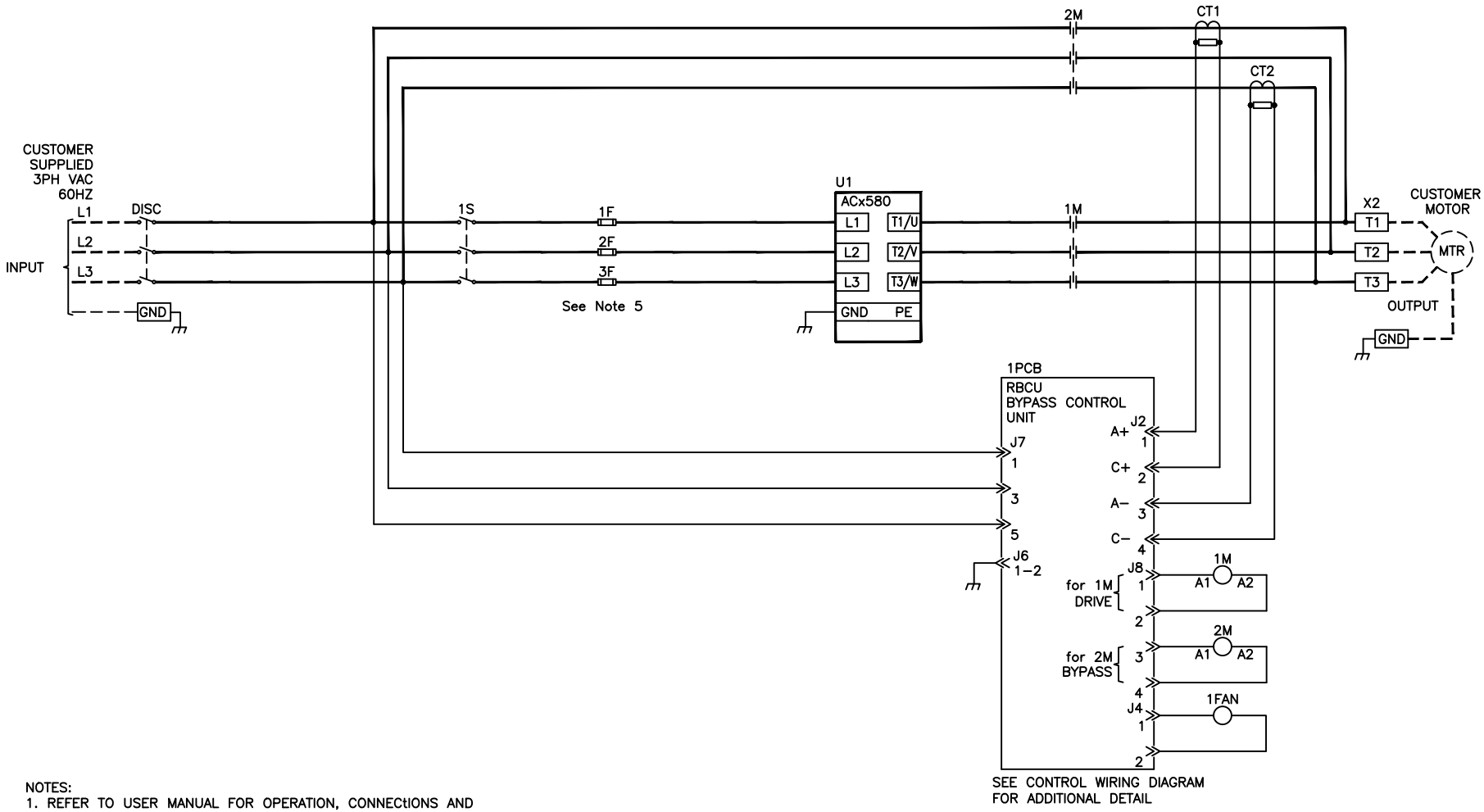
			Total 1

ACH580-VDR-011A-6+F267



NOTES:
1. REFER TO USER MANUAL FOR OPERATION, CONNECtIONS AND TIGHTENING TORQUE VALUES
2. CUSTOMER REQUIRED TO PROVIDE BRANCH CIRCUIT PROTECTION AND DISCONNECT MEANS PER NEC AND LOCAL CODE
3. DASH LINES INDICATE CUSTOMER INSTALLED DEVICES AND WIRING
4. USE COPPER CONDUCTORS ONLY. 90°C (194°F) RATED OR HIGHER; TERMINATIONS RATED FOR 75°C (167°F)
5. FUSE RATING LABEL IS NEAR DEVICE
6. REFER TO RATING LABEL FOR REQUIRED EXTERNAL BRANCH CIRCUIT FUSE TYPE AND SIZE

F-3BUA0980502-M, rev. 0 8-21-03

Rev	Description	Date	Appd
Based On			

Description: POWER WIRING DIAGRAM .

Project Name: ACH580-VDR (R1-R2) F267

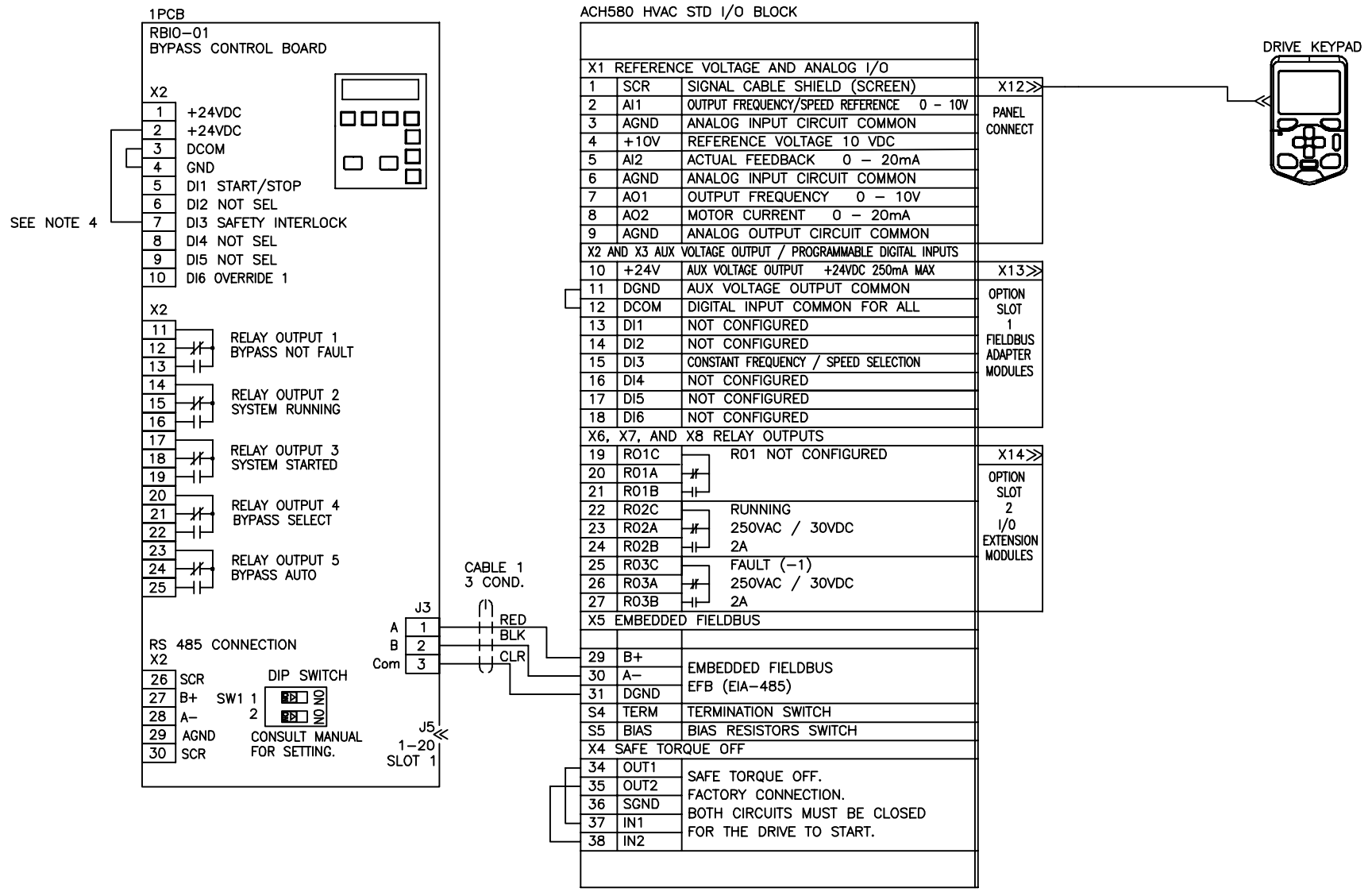
Approved: J. Brenner
Checked: J. Brenner
Prepared: S. Novak

ABB Inc.

Resp. dept.: AJ
Date: 7/25/2018

Reference number: 2
Document number: 3AXD50000313471

Sheet: A
Cont.: B



NOTES:

1. PROGRAMMING: PARAMETER 95.21, HW OPTIONS WORD 2, BIT 5 = 1 (BYPASS PRESENT)
2. REFER TO USER MANUAL FOR OPERATION, CONNECTIONS AND TIGHTENING TORQUE VALUES
3. DASH LINES INDICATE CUSTOMER INSTALLED DEVICES AND WIRING
4. REPLACE JUMPER WITH NORMALLY CLOSED SAFETY INTERLOCK CONTACT AS NEEDED
5. CONSULT USER'S MANUAL FOR I/O RATINGS
6. BYPASS CONFIGURATION DOES NOT SUPPORT SAFE TORQUE OFF FUNCTIONALITY

ACH580-VDR-011A-6+F267

F-3BUA0980502-M, rev. 0 8-21-03

Rev	Description	Date	Appd
Based On			

Description: CONTROL WIRING DIAGRAM .

Project Name: ACH580-VxR (R1-5) ACH580-BxR (R5-8) .

Approved J. Brenner
Checked J. Brenner
Prepared S. Novak

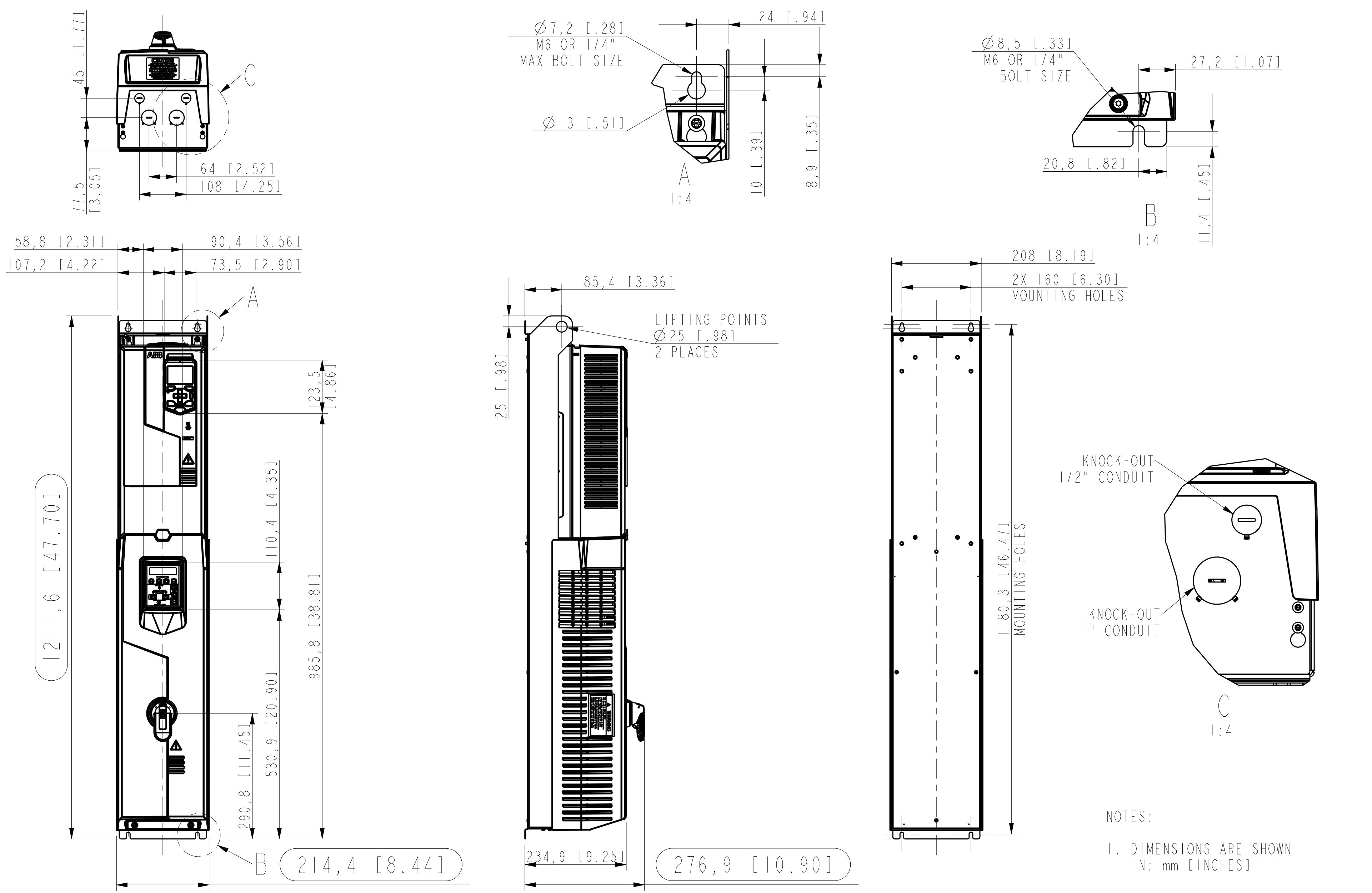
ABB Inc.
Resp. dept. AJ
Date 7/25/2018

Reference number
Document number 3AXD50000312146

Sheet B
Cont. -

ACH580-VDR-027A-6+F267

First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.



NOTES:

1. DIMENSIONS ARE SHOWN IN: mm [INCHES]

Rev	Description	Date	Name	Doc.
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C	Modified Title Block	14-May-19	B.Baldwin	5000001166213

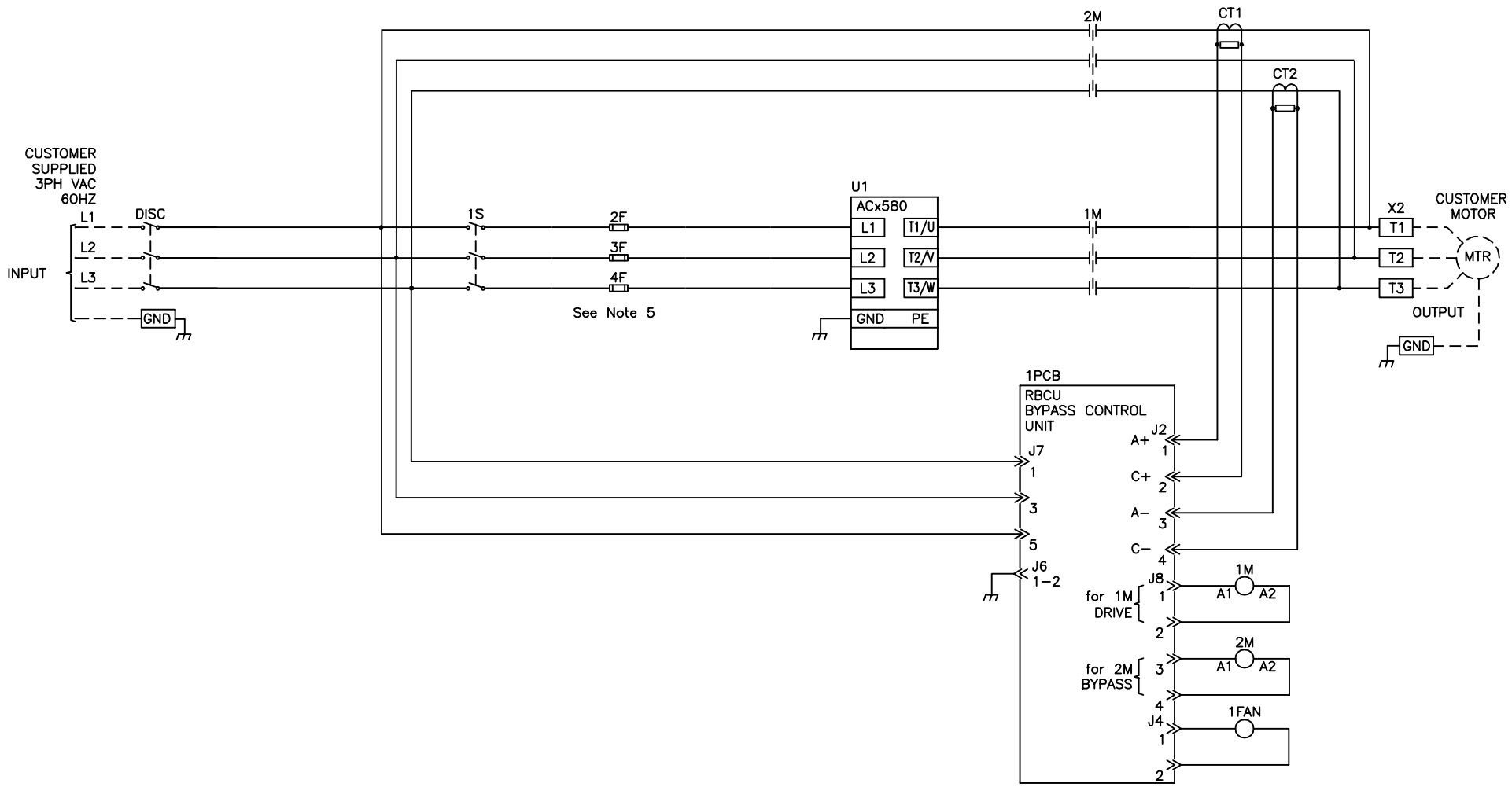
3AXD50000153787
ACH580-VXR_V3_MAIN_ASSY (ASSEM) -.26+
C.1+

Based on		Prepared B.Baldwin	02-Mar-18
Customer		Check. D.Crawley	14-May-19
		Appr. A. D. Wade	14-May-19
Cust. Doc. No.			
DMS Number	3AXD10000633045		

Title DIMENSION DRAWING
E-CLIPSE V3, TYPE 1
ACH580

ABB

Doc. des. DIMENSION DRAWING	Scale 3:50	Form A4	
Resp.dept.	Rev.ind -.3+ (DR)		Lang. EN
Doc. No. 3AXD50000153787			Sheet 1
			Total 1



NOTES:
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2. CUSTOMER REQUIRED TO PROVIDE BRANCH CIRCUIT PROTECTION AND DISCONNECT MEANS PER NEC AND LOCAL CODE
3. DASH LINES INDICATE CUSTOMER INSTALLED DEVICES AND WIRING
4. USE COPPER CONDUCTORS ONLY. 90°C (194°F) RATED OR HIGHER; TERMINATIONS RATED FOR 75°C (167°F)
5. FUSE RATING LABEL IS NEAR DEVICE
6. REFER TO RATING LABEL FOR REQUIRED EXTERNAL BRANCH CIRCUIT FUSE TYPE AND SIZE

ACH580-VDR-027A-6+F267

F-3BUA0980502-M, rev. 0 8-21-03

Rev	Description	Date	Appd
Based On			

Description: POWER WIRING DIAGRAM

Project Name: ACH580-VDR (R3-R5) F267

Approved: J. Brenner
Checked: J. Brenner
Prepared: S. Novak

ABB Inc.
Resp. dept. AJ
Date 7/25/2018

Reference number: 2
Document number: 3AXD50000332168

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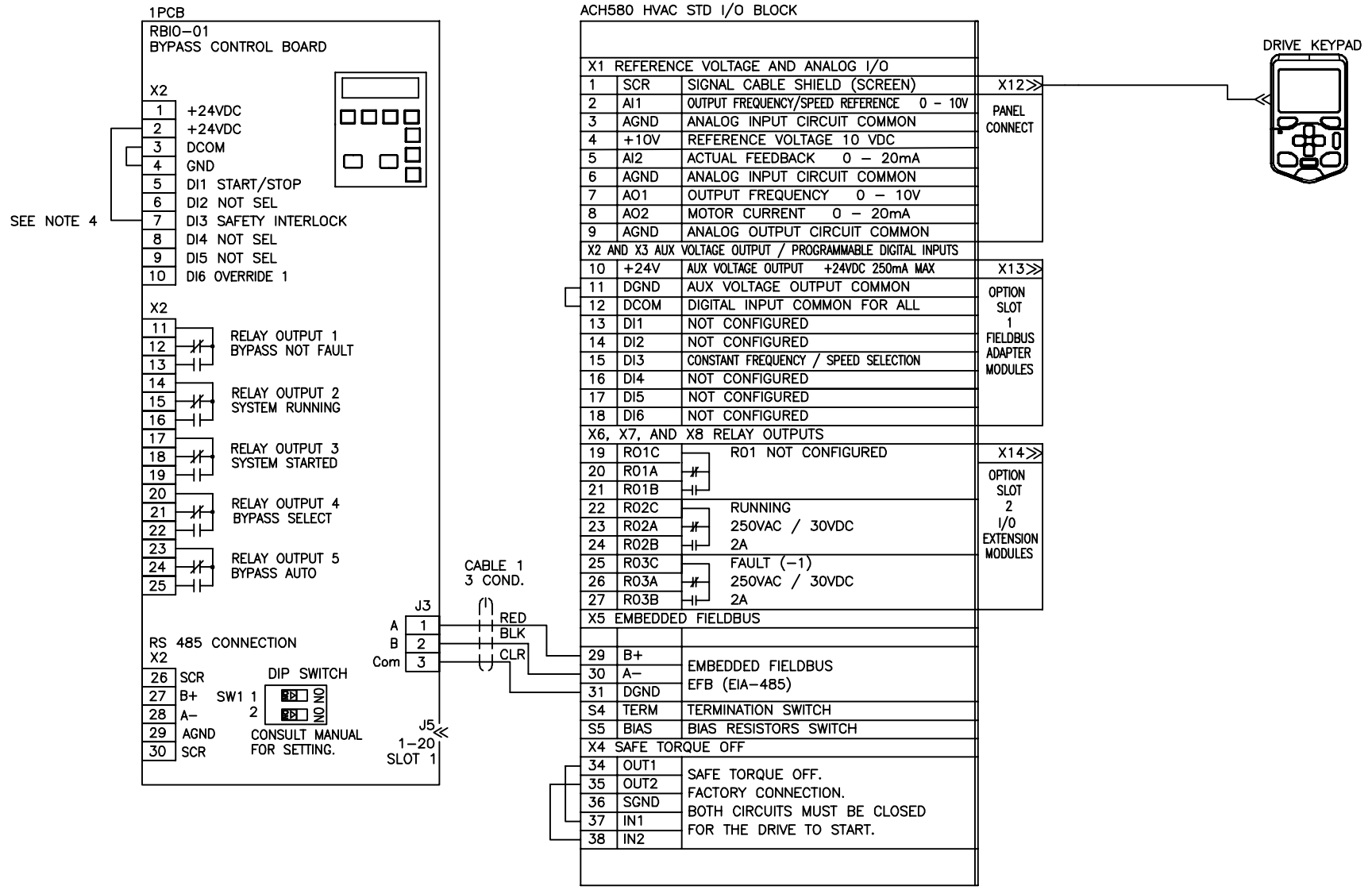

NOTES:

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6. BYPASS CONFIGURATION DOES NOT SUPPORT SAFE TORQUE OFF FUNCTIONALITY

ACH580-VDR-027A-6+F267

F-3BUA0980502-M, rev. 0 8-21-03

Rev	Description	Date	Appd
Based On			

Description: CONTROL WIRING DIAGRAM .

Project Name: ACH580-VxR (R1-5) ACH580-BxR (R5-8) .

Approved J. Brenner
Checked J. Brenner
Prepared S. Novak

ABB Inc.
Resp. dept. AJ
Date 7/25/2018

Reference number
Document number 3AXD50000312146

Sheet B
Cont. -

HTS Toronto

115 Norfinch Drive
Toronto, ON M3N 1W8
T 1.800.850.0567
F 416.661.0100

hts.com/ontario

Product Datasheets
AHU-3

TEMPEFF

Submittal Drawings

Project: Brampton Victoria Arena RG 5500
Tag: AHU-3
PO#: 719196
Date: April 28, 2025
Agent HTS Canada

Revision #	Revision Detail	Date Revised	Revised By
0	Initial preparation based on Quote#: 5597 - Rev. 9	2025-03-20	CR
1	GFCI & Lights on single circuit; Type 2; Connections & Disconnect on access side; 12" MERV 13 final filter; increased length	2025-04-28	CR

JOB STATUS

■ **HELD FOR APPROVAL**

Equipment will not be scheduled until approved drawings are returned to Tempeff

CURRENT LEAD TIME FROM RELEASE: 20-22 weeks*
*This is the current lead time only and is subject ot change without notice.

If immediate release is required, notify Tempeff in writing

☐ **RELEASE TO PRODUCTION**

Scheduled shipment from factory: _____

UNITS ARE SHIPPED SPLIT, WIRING RECONNECTION ON SITE REQUIRED – SEE PROPOSAL DRAWING FOR SPLIT LOCATIONS

675 Washington Ave. Winnipeg, MB R2K 1M4 Phone: (204) 783-1902

675 Washington Ave, WINNIPEG, MB CANADA R2K 1M4 PH: (204) 783-1902

QUOTE #: 5597 - 9 (Chris)

Project	Brampton Victoria Arena				Line In						GFCI & LED Lights		
Tag(s)	AHU-3				Voltage	575-3-60					Voltage	120-1-60	
Agent	HTS Canada				FLA	13.2	AMPS				FLA	20.20	AMPS
Job Number	0				AMPACITY	15	AMPS						
PO#	719196				MAX.NON-TIME DELAY FUSE	30	AMP						
					MAX.TIME DELAY FUSE	25	AMP						
					MAX.CIRCUIT BREAKER	20	AMP				MAX.CIRCUIT BREAKER	20	AMPS
Short Circuit Current Rating:	5KA				MIN.WIRE SIZE	#14	AWG				MIN.WIRE SIZE	#12	AWG

Model

RG 5500

Approximate Weight	5042 KG	11143 LBS	**Outdoor**
Heaviest Shipping Section	1191 KG	2631 LBS	
Approx. Curb Weight	314 KG	690 LB	

Fans

Supply air fan: ANPA 18 **X1**

Exhaust air fan: ANPA 18 **X1**

Technical data

Input data	Sup. air	Exh. air
Total volume (SCFM)	5403	5403
HX Air volume (SCFM)	5403	5403
Filter	Merv 10 (2")	Merv 10 (2")
Final Filter	Merv 13 (12" Cartridge)	-
External pressure drop (in. W.C)	2.00	1.20

Output data		
Filter air velocity (fpm)	374	374
Design pressure drop filter (in W.C)	1.60	0.50
HX air velocity (fpm)	344	344
Pressure drop heat exch. (in W.C)	0.44	0.44
Pressure drop HX filter (in W.C)	0.00	0.00
Heating Coil 1 Pressure Drop (in W.C)	0.00	0.00
Heating Coil 2 Pressure Drop (in W.C)	0.00	0.00
Cooling Coil Pressure Drop (in W.C)	0.00	0.00
Auxillary Pressure Drop (in W.C)	1.49	0.00
Backdraft dampers pressure drop (in W.C)	0.00	0.00
Louver/Hood pressure drop (in W.C)	0.00	0.00
Intake/discharge pressure drop (in W.C)	0.02	0.02
Static pressure (in W.C)	5.55	2.16

Fan speed (rpm)	2315	1802	Per fan
Max (rpm)	3300	3300	
Fan efficiency (%)	77.16	70.79	
Required BHP	6.63	3.15	
Motor efficiency (%)	91	89.5	
Motor power rating (hp)	7.50	5.00	
Motor RPM	1770	1760	
Motor Operating Frequency (Hz)	78	61	

Power and energy demand

Input data	Calculated			
	Winter		Summer	
	DB	WB	DB	WB
Design outdoor temp. (°F)	-5.80	-5.8	86.0	73.4
Desired supply air temp. winter (°F)				
Exhaust air temperature (°F)	72.0	54.0	75.0	63.0
Output data				
Efficiency (across unit) (%)	93.1%	70.0%	79.3%	0.0%
Supply air temp. after unit (°F)	66.62	49.3	77.3	70.9
Recovered energy across unit (BTUH)	422,603	82,403	-50,889	0

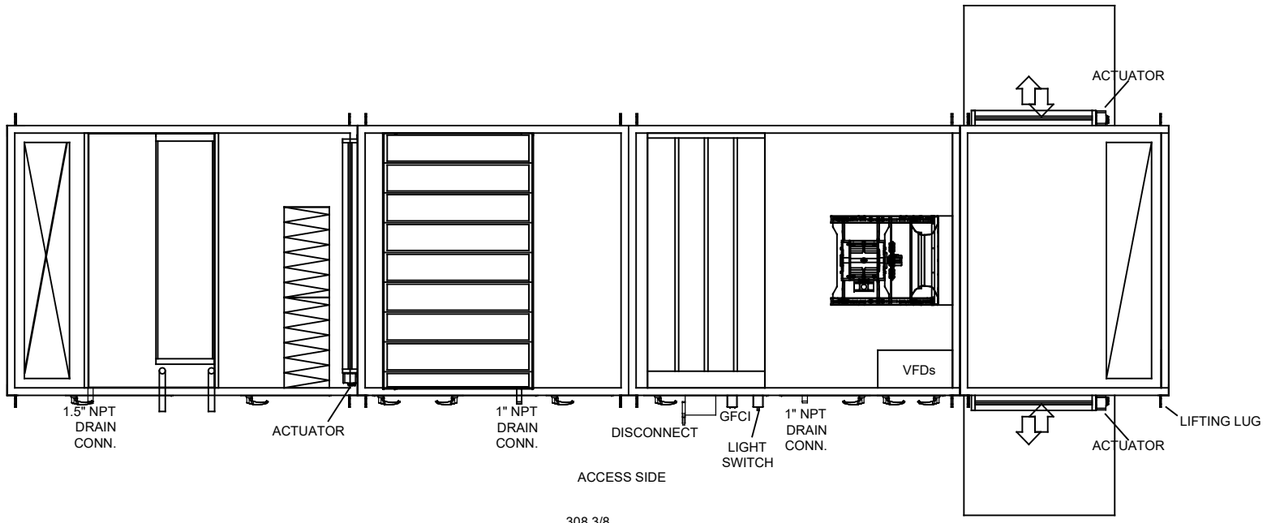
Standard Features

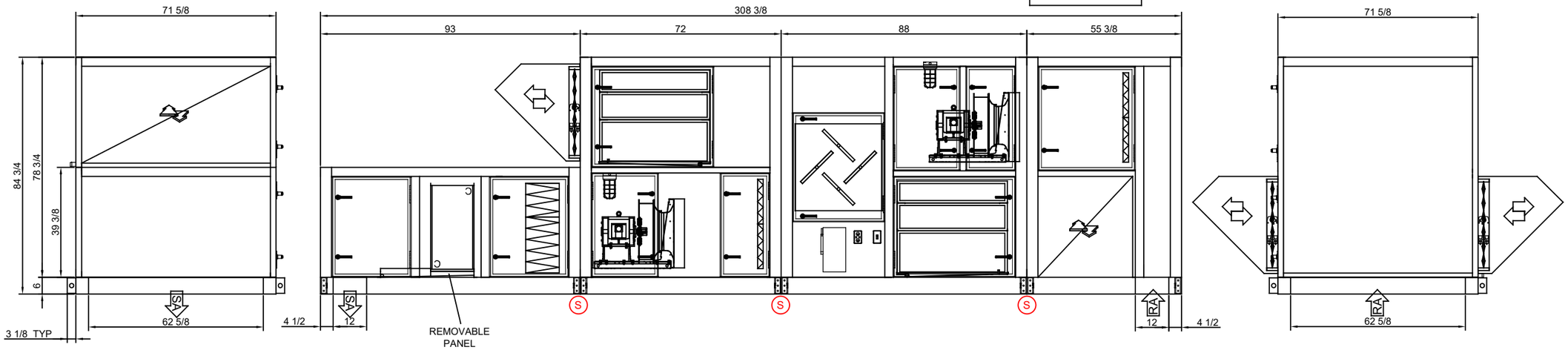
2" Foam injected panels
All sections come with hinged access doors and locking latches
Multi-Damper switchover section complete with actuators
SS Drain Pans under Heat Exchanger(s) w/ 1"NPTConnections
Galvanized Heat Exchanger Frames
Galvanized damper blades, damper rods and axles
18Ga Roof & Gutters
Hoods

Additional Features

Exterior Casing: 24 Ga G90 Galv
Interior Casing: 24 Ga G90 Galv
7.5 HP WEG ODP Premium Eff. 4 Pole 213T Frame
5 HP WEG ODP Premium Eff. 4 Pole 184T Frame
SA Drive: FC-102-P5K5-T6-131H9346
RA Drive: FC-102-P4K0-T6-131G1421
1in. Seismic Spring Isolation
SA Pre-Filter: Dafco Merv 10 (2") 400 HC
SA Final Filter: Dafco Merv 13 (12" Cartridge) Fiberglass Rigid Cell
RA Pre-Filter: Dafco Merv 10 (2") 400 HC
Chilled Water Coil
Connections on Access side
Insulated Shutoff Dampers with 2 position Belimo actuator
Single point power
Non-fused Disconnect
Low Limit
6" 10Ga Baseframe
18" Roof Curb
Multiple lights factory wired to single switch, 120V BY OTHERS
Each recepticle on individual circuit, 120V BY OTHERS
Piezo Ring & Pressure Transducer on all fans
Inlet Guard on all fans
Wheel guard on all fans
Dirty filter switch
Temperature sensor
Spare set of filters
BACNet controller
Field mounted low-pressure transmitter for SA & RA fan tracking
0-10VDC Heating control
0-10VDC Cooling control

Cells:
2- 8 x 200mm x 200mm
2- 8 x 200mm x 250mm
2- 8 x 200mm x 400mm
2- 1 x 115mm x 200mm
2- 1 x 115mm x 250mm
2- 1 x 115mm x 400mm





UNIT INCLUDES FLAT ROOF WITH SPLIT CAPS (NOT SHOWN)

Ⓢ SPLIT FOR SHIPMENT

NOTES:
1. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED RECOMMENDED CLEARANCE = SECTION SIZE.
2. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.

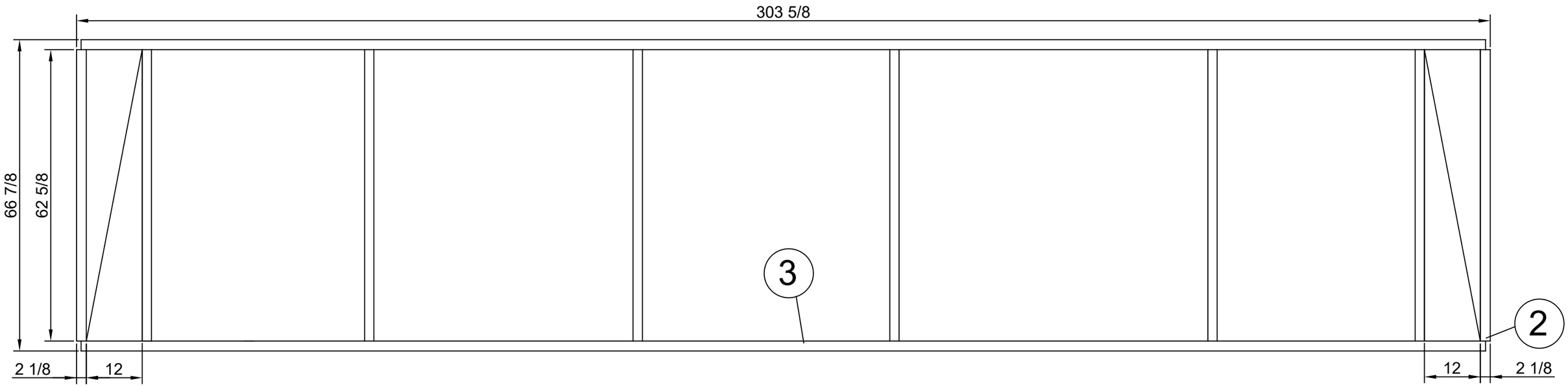
FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE

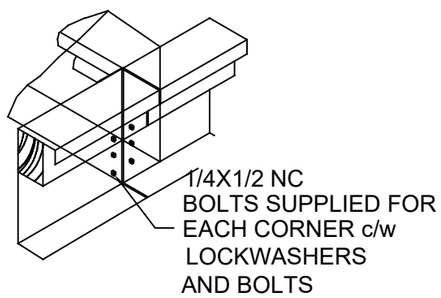
TEMPEFF
675 Washington Ave, Winnipeg, MB
Tel:(204) 783-1902

DRAWN BY	DATE	SCALE	MODEL	REV
CR	28-APR-25	NTS	RG 5500 Type 2	A

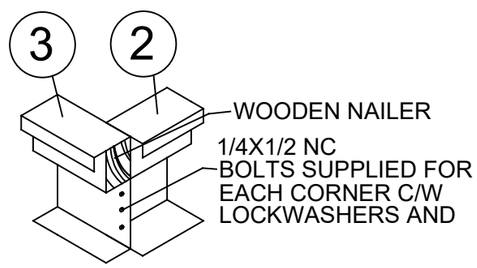
PROJECT NAME: Brampton Victoria Arena

Unit Tag: AHU-3





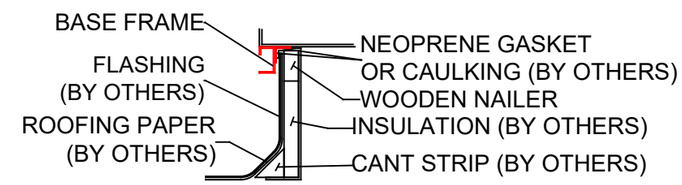
CENTER BRACING
BOLTING ASSEMBLY DETAIL #2



CORNER BOLTING DET. #1

2 CURB ENDS

3 CURB SIDES



ROOF CURB CROSS SECTION DETAIL AA

NOTES:
1. FIELD ASSEMBLED BY OTHERS.
2. SEE CUSTOMER DWG
3. ENSURE THAT THE 18" INCH CURB HEIGHT IS IN COMPLIANCE WITH LOCAL CODES.
4. RIGHT HAND CURB SHOWN/LEFT HAND OPPOSITE.

DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE.

TEMPEFF
675 Washington Ave, Winnipeg, MB
Tel:(204) 783-1902

DRAWN BY	DATE	SCALE	MODEL	REV
CR	28-APR-25	NTS	RG 5500 Curb	A

PROJECT NAME
Brampton Victoria Arena

Unit Tag
AHU-3

HOT WATER COIL REPORT

5055 Taylor Kidd Blvd
Millhaven, Ontario
Canada,
K0H 1G0
T: (613) 544-2200
F: (613) 544-7779
E-Mail: info@directcoil.com
Website: directcoil.com

Company:	HTS Canada	**Date:**	2025-03-17, 1:55:27 p.m.
Contact:	Chris Ritchot	**Reference:**	
Tel:		**PreparedBy:**	Jamie Loewen
Fax or Email:		**Project Name:**	Brampton Victoria arena

Coil Tag: AHU-3
Coil Model Number: 5W-10-30.0-10-56.0-20
Hand: Left

Physical Data

Number Of Coils	1	Tube Diameter	5/8 1.50 x 1.299
Fin Height (Per Coil)	30.000"	Tube Turbulators	Yes
Fin Length (Per Coil)	56.000"	Tube Material	Copper - 0.025 Plain
Number Of Rows Deep	10	Fin Material	Aluminum 0.008
Circuit Ratio	1.0	Fin Style	Corrugated
Fins Per Inch	10	Connection Type	MPT Steel
Supply Connection Size	2"	Coil Weight (Per Coil)[operating]	516 [648] lb
Return Connection Size	2"	Coil Internal Volume (Per Coil)	15.29 gal
Header Material	Copper (L)	Casing Style	Standard
		Casing Material	Galvanized Steel 16 gauge

Air Data

Total Air Flow (All Coils)	5,403 SCFM
Air Flow (Per Coil)	5,403 SCFM
Face Velocity	463 FPM
Altitude	0.00 FT
Entering Dry Bulb	60.00 °F
Leaving Dry Bulb	72.23 °F
Air Pressure Drop	0.70 inWG
Fouling Factor	0.0000 ft² °F h/Btu

Fluid Data

Fluid Type	Propylene Glycol
Fluid Ratio	42 %
Entering Fluid Temp	74.50 °F
Leaving Fluid Temp	70.16 °F
Fluid Flow Rate Per Coil (Total)	36.40 GPM (36.40)
Tube Velocity	2.10 FPS
Fluid Pressure Drop	10.25 ftWG
Fouling Factor	0.0000 ft² °F h/Btu

Capacity

Capacity Per Coil (Total)	72.21 MBH (72.21)

Notes:

Coil is outside the scope of AHRI Standard 410.

Version: 1.0.1 (web version)

CHILLED WATER COIL REPORT

5055 Taylor Kidd Blvd
Millhaven, Ontario
Canada,
K0H 1G0
T: (613) 544-2200
F: (613) 544-7779
E-Mail: info@directcoil.com
Website: directcoil.com

Company:	HTS Canada	**Date:**	2025-03-17, 1:55:27 p.m.
Contact:	Chris Ritchot	**Reference:**	
Tel:		**PreparedBy:**	Jamie Loewen
Fax or Email:		**Project Name:**	Brampton Victoria arena

Coil Tag: AHU-3
Coil Model Number: 5W-10-30.0-10-56.0-20

Physical Data

Number Of Coils	1	Tube Diameter	5/8 1.50 x 1.299
Fin Height (Per Coil)	30.000"	Tube Turbulators	Yes
Fin Length (Per Coil)	56.000"	Tube Material	Copper - 0.025 Plain
Number Of Rows Deep	10	Fin Material	Aluminum 0.008
Circuit Ratio	1.0	Fin Style	Corrugated
Fins Per Inch	10	Connection Type	MPT Steel
Supply Connection Size	2"	Coil Weight (Per Coil)[operating]	513 [646] lb
Return Connection Size	2"	Coil Internal Volume (Per Coil)	15.29 gal
Header Material	Copper (L)	Casing Style	Standard
		Casing Material	Galvanized Steel 16 gauge

Air Data

Total Air Flow (All Coils)	5,403 SCFM
Air Flow (Per Coil)	5,403 SCFM
Face Velocity	463 FPM
Altitude	0.00 FT
Entering Dry Bulb	77.50 °F
Entering Wet Bulb	66.80 °F
Leaving Dry Bulb	55.00 °F
Leaving Wet Bulb	54.99 °F
Air Pressure Drop	1.49 inWG
Condensate Rate (Per Coil)	58.89 lb/h
Fouling Factor	0.0000 ft² °F h/Btu

Fluid Data

Fluid Type	Propylene Glycol
Fluid Ratio	42 %
Entering Fluid Temp	44.00 °F
Leaving Fluid Temp	56.00 °F
Fluid Flow Rate Per Coil (Total)	36.40 GPM (36.40)
Tube Velocity	2.10 FPS
Fluid Pressure Drop	11.74 ftWG
Fouling Factor	0.0000 ft² °F h/Btu

Capacity

Total Capacity Per Coil (Total)	198.29 MBH (198.29)
Sensible Capacity Per Coil (Total)	134.32 MBH (134.32)
Latent Capacity Per Coil (Total)	63.97 MBH (63.97)

Notes:

Coil is outside the scope of AHRI Standard 410.

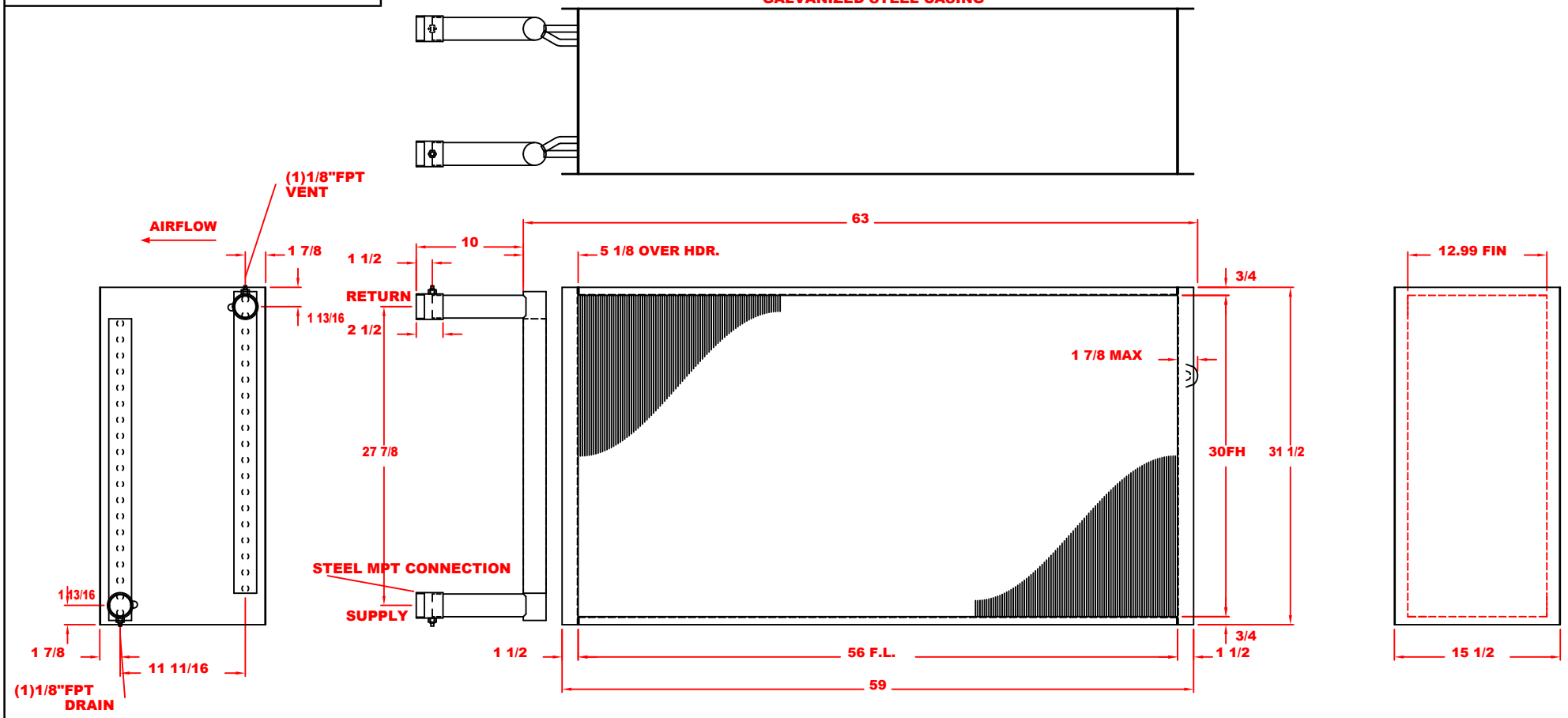
Version: 1.0.1 (web version)

COIL DETAILS

MODEL NUMBER: 5W-10-30.0-10-56.0-20 HANDING: LH
FINS: 0.008" AL CORR @ 10 PER INCH
TUBING: 5/8 OD X .025 CU ON 1.5x1.299 CTRS
CASING: GALV 16 GA.
HEADER: 1+2 - 2.125" O.D. TYPE 'L' COPPER
CONNS: 1/8"FPT VENT + 1/8"FPT DRAIN
CONNS: STEEL MPT CONNECTION 2"
ROWS DEEP: 10 TUBES HIGH: 20
CIRCUITS: 20
VERSION: CoilLeary_MOL v 1.0.486

COIL WITH TURBULATORS

GALVANIZED STEEL CASING



CSA FILE NO.: 242755 MODEL NO.: DC6
UL FILE NO.: SA 32693 COIL TYPE: HOT WATER

DIRECT COIL INC.
5055 TAYLOR KIDD BLVD., MILLHAVEN, ONT., K0H 1G0

PROJECT NAME-ITEM: Brampton Victoria arena-01R
ITEM TAG: AHU-3

DATE	ENGINEER	DESIGNER	APP'D BY
03/17/2025			???

CUSTOMER: HTS Canada
DWG. NO.: 01R

RG 1000-18000 Units

Sequence of Operation, BACnet

ORD

A. Testing Changeover Damper Actuators:

1. The damper motors can be tested by using the S1 switch in the damper control panel.
2. The normal position of the S1 switch is in position 0, the actuators follow the Remote or Local control signals.
3. If S1 is in position 1 the damper actuator M7 runs continuously, and in position 2 actuator M6 runs continuously. Unit will go into Damper Alarm mode if switch is left in either position for more than 5 actuator rotations.
    a. Clear Damper Alarm by resetting controller; see instructions in Additional Notes. **Follow the PLC reset procedure to prevent damage to the controller**.

B. Remote Control: Operation of the changeover damper with central control system (BMS) (for Cooling Recovery in summer, OAT sensor option must be purchased at time of order).

1. When the S2 switch is in position 2 (Remote) the changeover damper is controlled by the central control system (BMS) through physical contacts or BACnet commands.
2. When Enable contact is closed, warm-up sequence will start (see Additional Notes), shutoff dampers are not enabled and remain closed. After the warm-up sequence, the changeover damper section starts normal operation as listed below and the fans remain enabled. The shutoff dampers are enabled.
3. The changeover damper is now controlled by the internal thermistors. Supply Air (SAT) is set to 59 °F (15 °C), Return air (RAT) is set to 68 °F (20 °C), and Outside air (OAT) (if equipped) is set to 80 °F (27 °C).
    a. Press “OK” button to access controller main menu and navigate to the “ERV” page to adjust setpoints.
4. The sequence will now be:
    a. If return air < 68 °F (20 °C), heat recovery (cycling every 60 seconds).
    b. If return air > 68 °F (20 °C) and supply air > 59 °F (15 °C), free cooling (cycling every 3 hours).
    c. If return air > 68 °F (20 °C) and supply air < 59 °F (15 °C), heat recovery until supply air > 59 °F (15 °C) then it will revert to free cooling mode.
    d. If outdoor air > 80 °F (27 °C) then the unit will start cooling recovery (cycling every 60 seconds) until the outside air < 80 °F (27 °C) then it will revert to free cooling mode (if equipped with OAT sensor).

5. Recirc contact closed, changeover damper opens in both directions, shutoff dampers are disabled and close; 100% return air re-circulated back into supply air. Recirc contact opens, shutoff dampers are enabled, changeover damper remains open for 1 minute to allow shutoff dampers to open. After 1 minute delay, all dampers resume normal operation.
6. Enable Contact open, the Fan Interlocks are de-energized, disabling the fans while enabling the changeover damper to continue to cycle and the shutoff dampers to remain open for 1 minute, to prevent changeover damper damage; “Fan Ramp Down” displayed on controller’s screen.
7. Should the system fall below a low limit setpoint for 5 min, the unit shuts down, as described in B.6.
    a. Low limit alarm signal to BMS will be enabled (dry contact & BACnet signal).
    b. The low limit requires the unit turned off and then back on (remove Enable signal and then re-enable or turn S2 switch to Off and then back).

C. Local Control: Operation of the changeover damper without full central control system (BMS) (for Cooling Recovery in summer, OAT sensor option must be purchased at time of order).
    1. When the S2 switch is in position 1 (Local), warm-up sequence will start (see Additional Notes), shutoff dampers are not enabled and remain closed. After the warm-up sequence, the changeover damper section starts normal operation as listed below and the fans remain enabled. The shutoff dampers are enabled.
    2. The changeover damper is now controlled by 3 thermistors. Supply air (SAT) is set to 59 ^{o}F (15 ^{o}C), Return air (RAT) is set to 68 ^{o}F (20 ^{o}C) and Outdoor air (OAT) is set to 80^{o}F (27^{o}C).
        a. Press “OK” button to access controller main menu and navigate to the “ERV” page to adjust setpoints.
    3. The sequence will now be:
        a. If return air < 68 ^{o}F (20 ^{o}C), heat recovery (cycling every 60 seconds).
        b. If return air > 68 ^{o}F (20 ^{o}C) and supply air > 59 ^{o}F (15 ^{o}C), free cooling (cycling every 3 hours).
        c. If return air > 68 ^{o}F (20 ^{o}C) and supply air < 59 ^{o}F (15 ^{o}C), heat recovery until supply air > 59 ^{o}F (15 ^{o}C) then it will revert to free cooling mode.
        d. If outdoor air > 80 ^{o}F (27 ^{o}C) then the unit will start cooling recovery (cycling every 60 seconds) until the outside air < 80 ^{o}F (27 ^{o}C) then it will revert to free cooling mode (if equipped with OAT sensor).
    4. When the S2 switch is in position 0 (Off), the Fan Interlocks are de-energized, disabling the fans while enabling the changeover damper to continue to cycle and the shutoff dampers to remain open for 1 minute, to prevent changeover damper damage; “Fan Ramp Down” displayed on controller’s screen.
    5. Should the system fall below a low limit set point for 5 min, the unit shuts down, as described in C.4.
        a. Low limit alarm signal to BMS will be enabled (dry contact & BACnet signal).
        b. The low limit requires the unit turned off and then back on (turn S2 switch to Off and then back).

D. BACnet (if equipped) – * Optional* BACnet/IP (ethernet port) or BACnet/MSTP (RS-485 port) connectivity; unit may operate via BACnet or Standalone.

1. Press “OK” button to access controller main menu and navigate to the “BACnet” page to access the “RS-485” or the “Ethernet” pages to adjust communication settings. **Power to the controller must be cycled Off & On to permanently save the changes**, see instructions in Additional Notes.

E. Changeover Damper Alarm:

1. Should an error occur in the function of the changeover damper, the damper will be disabled.
2. Error code is displayed on controller’s screen and Red LED light is flashing.
3. The Fan Interlocks are de-energized, disabling the fans.
4. Damper alarm signal to BMS will be enabled (dry contact & BACnet signal).
5. After 1 minute delay, shut-off dampers close.
6. To reset damper alarm, controller’s power must be cycled off-on, see instructions in Additional Notes.

F. Duct Pressure Transmitters:

1. SA & RA duct pressure transmitters (provided by Tempeff; installed and wired by others) send a 0-10Vdc to the unit’s Controller and calculated inches W.C. value is sent to BMS via BACnet communication. The signal increases as duct pressure differential increases.
2. If the duct differential pressure (field-adjustable) surpasses the high setpoint or falls below the low setpoint for two minutes after the system has stabilized, the Controller will send an alarm signal to the BMS via BACnet communication. The unit will shut down when there is a high-pressure alarm.
    a. Press “OK” button to access controller main menu and navigate to the “Duct Pressure” page to adjust pressure alarm setpoints and timer.
    b. The pressure alarm requires the unit to be turned off and then back on (turn S2 switch to Off and then back).

G. Fans, Heating and Cooling:

1. The Controller starts and stops the fans.
2. The SA and RA fan speeds are controlled by 0-10Vdc signal to VFDs from the Controller to maintain required duct pressure setpoint of 1.0” W.C. (250PA) (field adjustable) as measured by the SA & RA pressure transmitters (see section F).
    a. At startup, both SA and RA fans ramp up to the high design speed setpoint (in Hz, field-adjustable) and operate at this speed for 3 minutes to allow the system to stabilize. After the 3-minute period, the SA & RA pressure transmitter outputs are used to regulate fan speeds.
        i. Press “OK” button to access controller main menu and navigate to the “Fan status” page to adjust the starting setpoints.
    b. VFD operation can be monitored via BACnet communication (see wiring diagrams).

3. Heating will be controlled from the unit's Controller and Discharge Air Temperature Sensor (DAT) (provided by Tempeff; installed and wired by others). Heating will only be operational when the outdoor air temperature is below the Heating Ambient Lockout setpoint of 65 °F (18 °C) and the return air temperature is below the changeover setpoint of 72 °F (22 °C) (field adjustable). Heating setpoint is set to 72 °F (22 °C) (field adjustable).
    a. On call for heating, the controller's output relay #7 closes and heating is enabled
    b. Heat modulation is controlled by 0-10Vdc signal from the controller's modulating output #5, to maintain discharge temperature setpoint.
    c. Press "OK" button to access controller main menu and navigate to the "Heat" page to adjust various setpoints. Setpoints can also be accessed via BACnet communication.
4. Cooling will be controlled from unit's Controller and Space Air Temperature Sensor (SPT) (provided by Tempeff; installed and wired by others). Cooling will only be operational when the outdoor air temperature is above the Cooling Ambient Lockout setpoint of 45 °F (7 °C) and the return air temperature is above the changeover setpoint of 72 °F (22 °C) (field adjustable). Cooling setpoint is set to 55 °F (12.8 °C) (field adjustable).
    a. On call for cooling, the PLC controller's output relay #6 closes and cooling is enabled.
    b. Cooling modulation is controlled by 0-10Vdc signal from Controller modulating output #6 to maintain discharged temperature setpoint.
    c. Press "OK" button to access controller main menu and navigate to the "Cool" page to adjust various setpoints. Setpoints can also be accessed via BACnet communication
5. Any type of supplemental heating or cooling of the supply air will be controlled by others (central control system).

H. Additional Notes:

1. If fire alarm contacts are used, remove the factory installed jumper from terminals 101 & 150 and connect the Normally Closed fire alarm contact. If the contact opens during operation, the unit will shut down and dampers close.
2. Cometer Differential Pressure Transmitters included, a 0-10Vdc reading is sent to unit's Controller and a calculated CFM value is sent to BMS via BACnet communication. The signal increases as the pressure differential increases. Initial set-up of the variable pressure transmitter will be done by Tempeff and a final set-up will have to be completed on site, as per Tempeff instructions, with clean filters and a completely assembled system.
3. SA Pre & Final Dirty filter and RA Dirty filter sensors included, when filter reach a set pressure differential the switch will send a signal to BMS through BACnet communication.
4. Additional temperature sensors provided. Return Air (RAT2) to measure temperature before the RA motor, Supply Air (SAT2) to measure temperature after the SA motor and Discharge Air (DAT, shipped loose) to measure duct temperature. All temperature readings can be monitored by BMS through BACnet communication.

5. Morning warm-up sequence: When unit is enabled, the changeover damper section opens in both directions, the Fan Interlocks are energized, enabling the fans to start. After the warm-up sequence, there is an additional 1-minute delay before the changeover dampers resume normal operation.
    a. Shutoff dampers: At the end of the warm-up sequence, there is a 1-minute delay to allow the shutoff dampers to open and prove open. During this transition period, changeover damper remains open in both directions and fans remain enabled. After the transition period, warm-up sequence is disabled, and changeover damper resumes normal operation. If the shutoff damper motor end switches have not proved open, the Fan Interlocks are de-energized until the end switches make.
    b. Morning warm-up duration is set to 0 minutes from the factory unless duration is specified at time of order (field adjustable, 0 to 60 minutes). Typical duration is 30 minutes.
    c. Press “OK” button to access controller main menu and navigate to the “ERV” page to adjust morning warm-up duration timer.
6. Clear Damper Alarm by resetting controller. **Follow the PLC reset procedure to prevent damage to the controller.**
    a. PLC reset procedure: Open 24Vdc fuse holder supplying power to 101 terminals, then open fuse holder F2, and finally open fuse holder FAF1 to controller power. Wait 5 seconds. Close fuse holder FAF1. While controller is re-booting, close 24Vdc fuse holder supplying power to 101 terminals and then close fuse holder F2. Once re-boot is complete, unit can resume normal operation.
7. Controller LED code:
    a. Top LED, solid Green – Controller is powered.
    b. Second LED, flashing Red – Damper alarm.
    c. Second LED, solid Red – Low Limit alarm (or other controller monitored alarms).
    d. Third LED, flashing Yellow – Energy Recovery mode.
    e. Third LED, solid Yellow – Recirc mode or Morning Warm-up.
    f. Fourth LED, flashing Green – Free Cooling Mode.

Note: In all cases ensure that changeover damper section is first on and last off to prevent damage to changeover damper section.

Danfoss Variable Frequency Drive, FC 101-102

Programming 0-10Vdc Signal

ORD

On initial start-up, or after resetting to factory parameters, follow the Set-Up Wizard to enter motor and supply information.

P3-02 – 0.0	Minimum Reference (Hz)
P3-03 – 90.0	Maximum Reference (Hz) – Supply Air VFD
P3-03 – 90.0	Maximum Reference (Hz) – Return Air VFD
P3-15 – 1	Ref 1 Source (Analog Terminal 53) (default)
P4-12 – 0.0	Speed Low Limit (Hz) (default)
P4-14 – 90.0	Speed High Limit (Hz)
P4-19 – 90.0	Max Output (HZ) (match to Speed High Limit)
P5-10 – 8	Terminal 18 DI (Start)
P5-11 – 0	Terminal 19 DI (no operation)
P5-12 – 0	Terminal 27 DI (no operation)
P5-13 – 0	Terminal 29 DI (no operation)
P6-14 – 0.0	Terminal 53 Low Reference @ 0Vdc (Hz) (default)
P6-15 – 90.0	Terminal 53 High Reference @ 10Vdc (Hz) – Supply Air VFD (match to Maximum Reference S/A VFD)
P6-15 – 90.0	Terminal 53 High Reference @ 10Vdc (Hz) – Return Air VFD (match to Maximum Reference R/A VFD)
P8-30 – 5	Communication Protocol (BACnet)
P8-31 – 1	Address – Supply Air VFD
P8-31 – 2	Address – Return Air VFD
P8-32 – 2	Baud Rate - 9600

Press “Auto/On” button to activate the drive

P14-22 – 2 Reset to factory parameters (after pressing OK, cut off main power and wait until LCD display turns off, re-apply main power).

Note: In case of a fire-alarm the unit shuts down and disables the VFD interlock relays (only in AUTO mode). To shut down the VFD in HAND and AUTO, replace factory-jumper on safety interlock terminals 12&27 with BMS fire alarm dry contact.

!! Maximum Reference (Hz) = (maximum fan RPM / maximum motor RPM) * 60Hz **!!**

Motor Operating Frequencies:

SA; 5403 cfm @ 5.01” W.C. = 76 Hz **RA; 5403 cfm @ 2.16” W.C. = 61 Hz**

BACnet Points List ORD Sample Only

Name	Type	Instance	Read/Write	Default	Unit	Description
Bcn_iEe_SAT_setpoint	AV	0	R/W	59	°F/C	SAT heat recovery setpoint in degF/C
Bcn_iEe_RAT_setpoint	AV	1	R/W	68	°F/C	RAT heat recovery setpoint in degF/C
Bcn_iEe_OAT_setpoint	AV	2	R/W	80	°F/C	OAT cooling recovery setpoint in F/C
Bcn_iSts_SAT1display	AV	3	R		°F/C	SAT temperature converted to degF/C
Bcn_iSts_RAT1display	AV	4	R		°F/C	RAT temperature converted to degF/C
Bcn_iSts_OATdisplay	AV	5	R		°F/C	OAT temperature converted to degF/C
Bcn_iSts_DATdisplay	AV	6	R		°F/C	DAT temperature converted to degF/C
Bcn_iSts_SAT2display	AV	7	R		°F/C	Post SA motor temperature converted to degF/C
Bcn_iSts_RAT2display	AV	8	R		°F/C	Pre RA motor temperature converted to degF/C
Bcn_iSts_SA_VFD_Spt	AV	9	R/W	76	Hz	SA VFD Starting Setpoint in HZ
Bcn_iSts_RA_VFD_Spt	AV	10	R/W	61	Hz	RA VFD Starting Setpoint in HZ
Bcn_iSts_SA_Duct_Pressure_Spt	AV	11	R/W	1	W.C.	SA Duct Pressure Setpoint in W.C.
Bcn_iSts_RA_Duct_Pressure_Spt	AV	12	R/W	1	W.C.	RA Duct Pressure Setpoint in W.C.
Bcn_iSts_SA_Duct_Pressure	AV	13	R		W.C.	SA Duct Pressure Output in W.C.
Bcn_iSts_RA_Duct_Pressure	AV	14	R		W.C.	RA Duct Pressure Output in W.C.
Bcn_uiSts_SA_FanCFM	AV	15	R		cfm	SA fan airflow in CFM
Bcn_uiSts_RA_FanCFM	AV	16	R		cfm	RA fan airflow in CFM
Bcn_xEe_Metric	BV	0	R/W	FALSE		TRUE: degC; FALSE: degF for setpoints & display temps
Bcn_xSts_MIB5	BV	1	R			TRUE: vertical damper open; FALSE: dmp closed
Bcn_xSts_MIB6	BV	2	R			TRUE: horizontal damper open; FALSE: dmp closed
Bcn_xSts_BACnetEnable	BV	3	R/W	FALSE		BACnet enable
Bcn_xSts_BACnetHeatRec	BV	4	R/W	FALSE		BACnet heat recovery
Bcn_xSts_BACnetRecirc	BV	5	R/W	FALSE		BACnet recirculation
Bcn_xSts_SA_Blower	BV	6	R			SA blower enable
Bcn_xSts_RA_Blower	BV	7	R			RA blower enable
Bcn_xSts_DamperAlarm	BV	8	R			Damper alarm
Bcn_xSts_MIB1alarm	BV	9	R			MIB1 limit switch alarm
Bcn_xSts_MIB2alarm	BV	10	R			MIB2 limit switch alarm
Bcn_xSts_MIB3alarm	BV	11	R			MIB3 limit switch alarm
Bcn_xSts_MIB4alarm	BV	12	R			MIB4 limit switch alarm
Bcn_xSts_MIB5alarm	BV	13	R			MIB5 limit switch alarm
Bcn_xSts_MIB6alarm	BV	14	R			MIB6 limit switch alarm
Bcn_xSts_MIB5_0alarm	BV	15	R			MIB5 limit switch alarm before startup
Bcn_xSts_MIB6_0alarm	BV	16	R			MIB6 limit switch alarm before startup
Bcn_xSts_M6alarm	BV	17	R			Actuator M6 alarm
Bcn_xSts_M7alarm	BV	18	R			Actuator M7 alarm
Bcn_xSts_LowLimit	BV	19	R			Low limit
Bcn_xSts_Shutoff_Enable	BV	21	R			Shutoff damper relay R5 enabled
Bcn_xSts_Shutoff_ProofOpen	BV	22	R			Shutoff damper proof of open
Bcn_xSts_SA_DirtyPreFilter	BV	24	R			SA Dirty Pre-filter Switch
Bcn_xSts_SA_DirtyFinalFilter	BV	25	R			SA Dirty Final Filter Switch
Bcn_xSts_RA_DirtyFilter	BV	26	R			RA Dirty Filter Switch
Bcn_xSts_SA_Duct_HighPress_Alarm	BV	28	R			SA Duct High Pressure Alarm
Bcn_xSts_SA_Duct_LowPress_Alarm	BV	29	R			SA Duct Low Pressure Alarm
Bcn_xSts_RA_Duct_HighPress_Alarm	BV	28	R			RA Duct High Pressure Alarm
Bcn_xSts_RA_Duct_LowPress_Alarm	BV	29	R			RA Duct Low Pressure Alarm

Notes:

1) Object name containing "Ee" indicates value stored in EEPROM non-volatile memory

2) Use BACnet points listed above to control the unit. Other points can be discovered but are disabled on this unit.

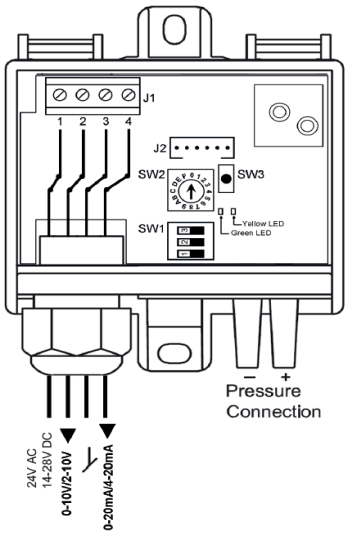
Electronic Cometer Setup Instructions - Step by Step

ORD XXXX

1 Mount the Controller.

2 Connect the Pressure Tubes.

- \- Low Connects To Piezo Ring
- \+ High Connects To Inlet Cabinet



3 Wire Terminal Lugs

1 24 AC or 14-28 V DC
2 0 - 10 V Output
3 Neutral
4 0 - 20 mA Output

4 Set SW1 DIP Switches

A DIP 1 for Output

On 2 to 10 V or 4 to 20 mA
Off 0 to 10 V or 0 to 20 mA

Output	DIP1	Terminal
0-10 V	Off	Terminal 2
2-10 V	On	
0-20 mA	Off	Terminal 4
4-20 mA	On	

B DIP2 for Damping Times

OFF 0.4 Second Samples
ON 10 Second Samples

4 Set SW1 DIP Switches (continued).

B DIP2 for Damping Times

Damping	DIP2
0,4 Sec	Off
10 Sec	On

C DIP 3 for Flow vs Pressure

OFF Displays Pressure in Pascal
ON Displays Volume in CFM

	DIP3
Pressure	*Off*
Volume	*On*

5 Disregard SW2 & SW3 Switches.

6 What is the Target Display?

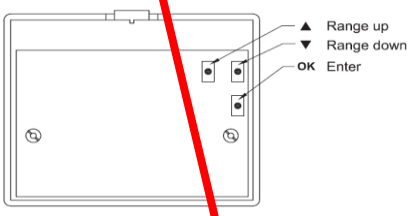
Flow CFM
TSP Pa

7 Enter settings.

A Program Controller for Pressure Display. Display will be Pascal Only.

Code	Pressure Range
50	0 to 50 Pascal (0 to 0.2" wc)
100	0 to 100 Pascal (0 to 0.4" wc)
150	0 to 150 Pascal (0 to 0.6" wc)
300	0 to 300 Pascal (0 to 1.2" wc)
500	0 to 500 Pascal (0 to 2.0" wc)
1000	0 to 1000 Pascal (0 to 4.0" wc)
1600	0 to 1600 Pascal (0 to 6.4" wc)
2500	0 to 2500 Pascal (0 to 10" wc)

1 Use the buttons on the inside of the front Cover to set Range. Toggle up until the desired range is displayed. Push okay.



Left Left Button is Up
Right Right Button is Down
Btm Bottom Button is Okay

Pressure should be displayed

Firstly, press OK button to enter the Range selection menu. Number on display will be flashing. Follow the steps below.

7 Enter settings (continued).

B Program Controller for volume Display. Display according to Factor.

Code	Flow Range	Code	Flow Range
1	0 to 1	500	300 to 500
3	1 to3	1000	500 to 1000
5	3 to 5	3000	1000 to 3000
10	5 to 10	5000	3000 to 5000
30	10 to 30	9999	5000 to 9999
50	30 to 50	30.00	10000 to 30000
100	50 to100	50.00	30000 to 50000
300	100 to 300	99.99	50000 to 999900

1 Use the buttons on the inside of the front Cover to set Range. Toggle up for desired range. Push okay.

2 Determine Cometer Factor
Select Cometer Factor by Chart (CFM).
Apply conversion factor to change unit as needed.
IE: CF for ATZAF FF 20 T1 = 323.1
\- or Calculate Factor *CF
*CF = CFM / √Piezo Pressure (low)

SA=145.9; RA=145.9

3 Use the buttons on the inside of the front Cover to set each digit of Factor. Toggle up for each digit until desired is displayed. Push okay. Repeat until all digits selected. Enter factor as a four digit number. Set the position of the decimal using up and down buttons. Press okay.

Flow should be displayed in CFM

LED INDICATION

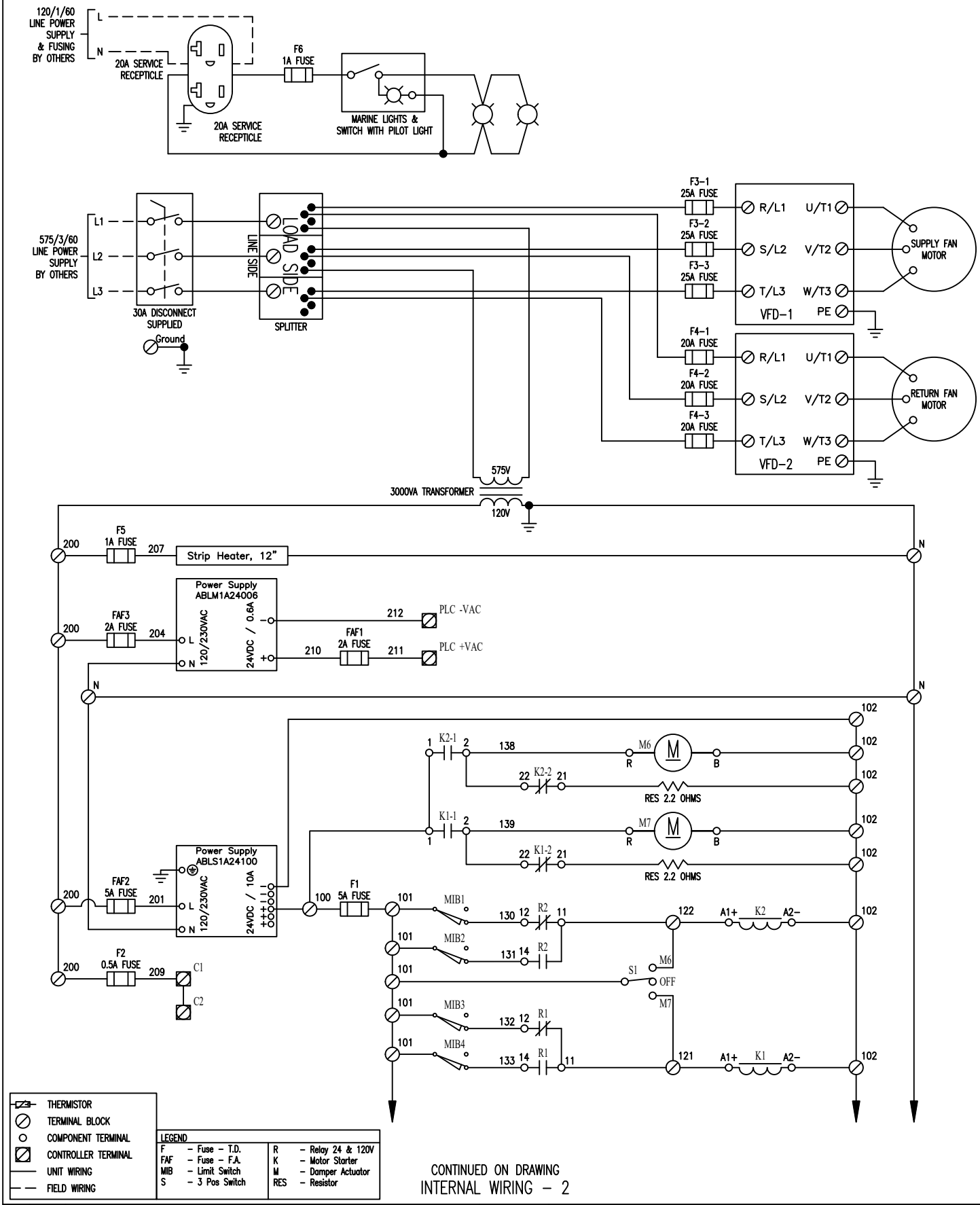
The green LED is lit when the power supply has been connected correctly. The yellow LED flashes for approx. 3 secs during zeroing.

LED	ON	Flashing	Off
Green	OK		No power
Yellow		Zeroing in progress	OK

CE MARKING

OJ Electronics A/S hereby declares that the product is manufactured in accordance with Council Directive 2004 / 108 / EC on electro- magnet compatibility (and subsequent amend- ments) and Council Directive 2006 / 95 / EC on electrical equipment designed for use within certain voltage limits.

Comefri USA
330 Bill Bryan Blvd, Hopkinsville, KY 42240
Tel: 270-881-1444 Fax: 270-889-0309
sales@comefriusa.com



CONTINUED ON DRAWING
INTERNAL WIRING - 2

Rev	By	Description	Date
A	N.N.	Update receptacle and marine lights.	04/28/25

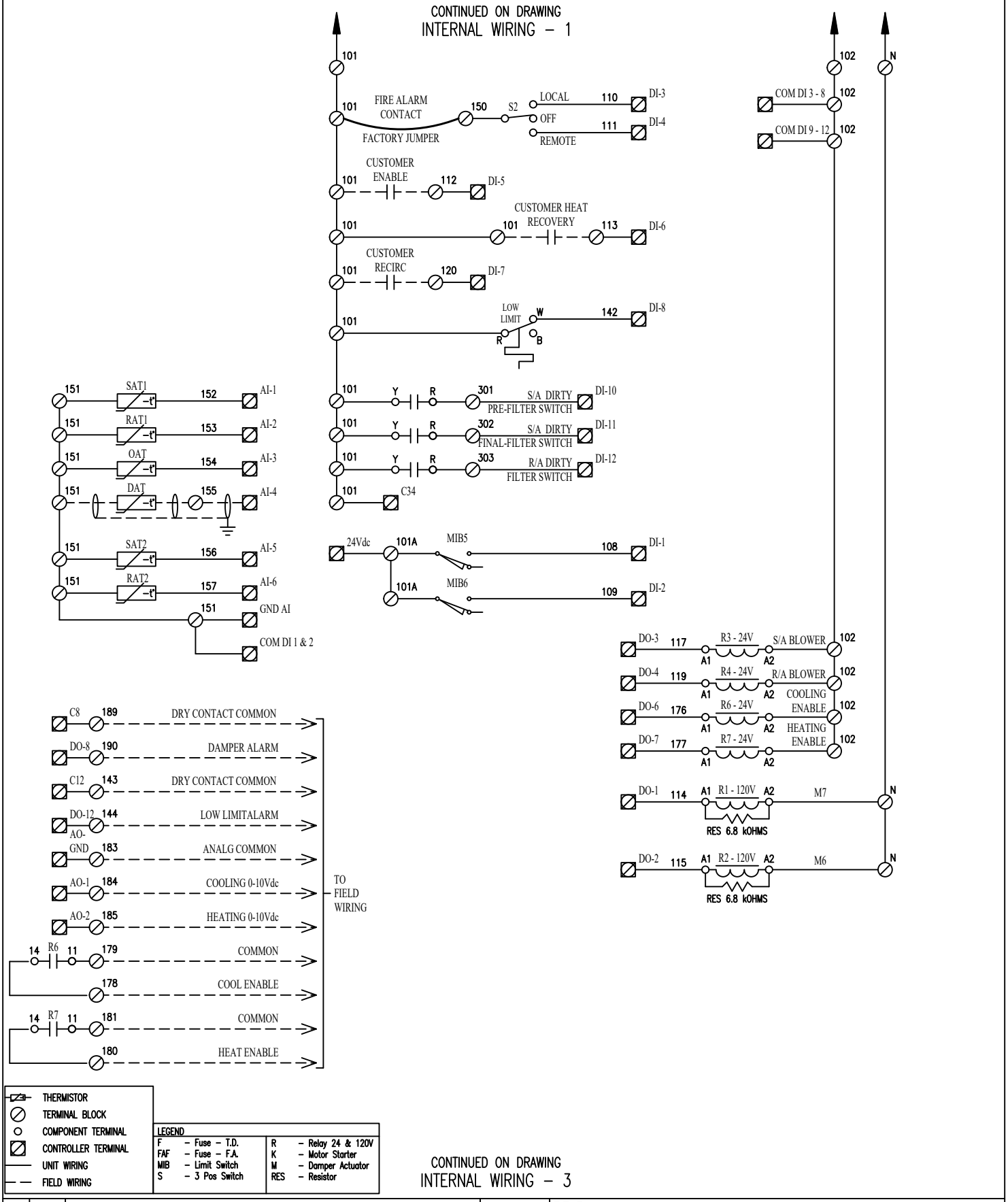
TEMPEFF

WIRING DIAGRAM

TITLE
RG Control Wiring (DOGA) - 575V
SPP, VFD (FC-102), Marine Light, GFCI Receptacles.

DRAWN BY	ISSUED BY	SCALE	DRW. NO.
N.N.		N/A	RG INT WIRING 1
CHK. BY	DATE		ORD NO. / REV
	Feb 12, 2025		A

DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.



Rev	By	Description	Date

TEMPEFF

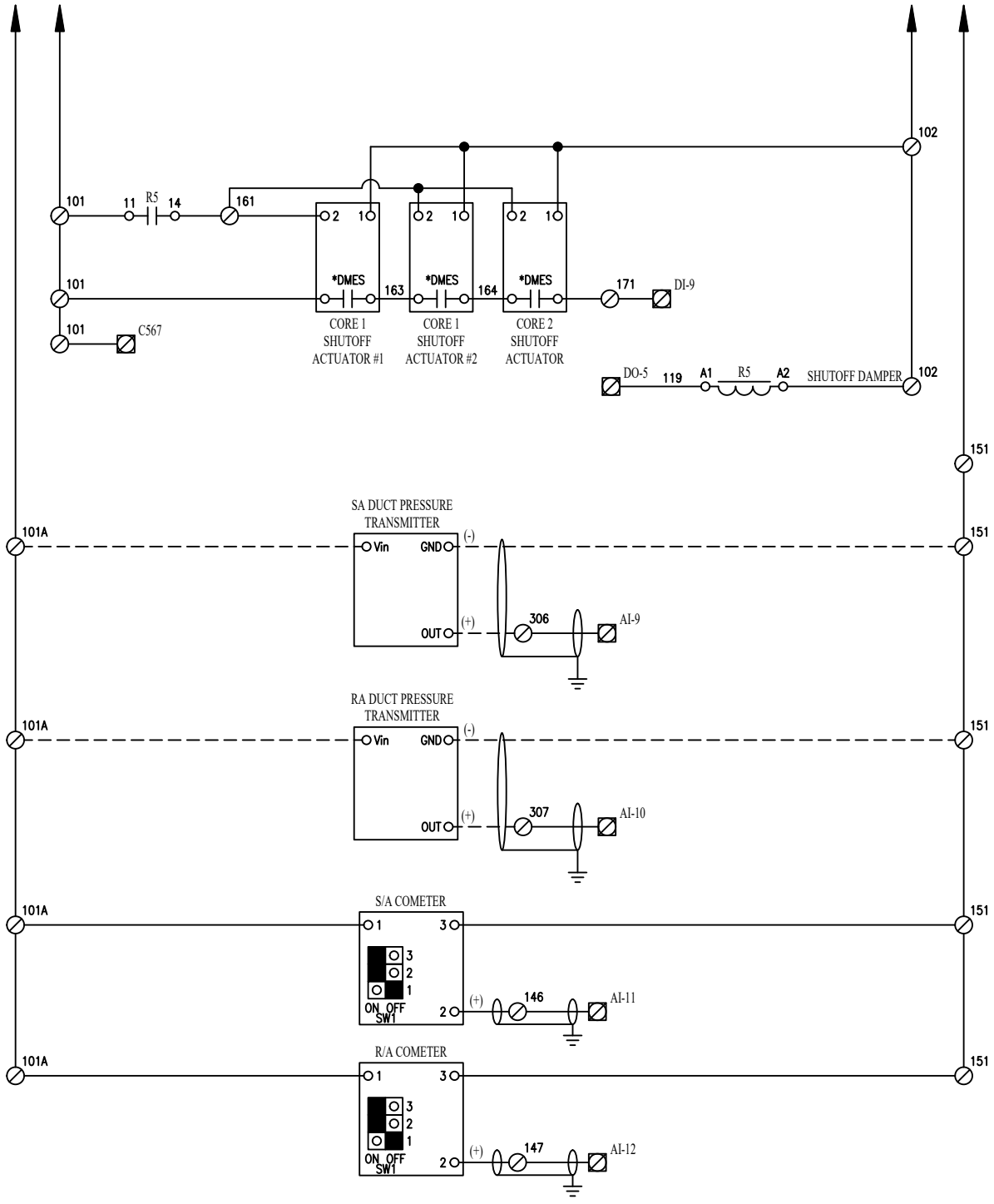
WIRING DIAGRAM

TITLE
RG Control Wiring – 575V
SPP, VFD (FC–102), Low Limit, OAT, DAT,
Dirty Filter Switches.

DRAWN BY	ISSUED BY	SCALE	DRW. NO.
N.N.		N/A	RG INT WIRING 2
CHK. BY	DATE	ORD NO.	REV
	Feb 12, 2025		–

DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.

CONTINUED ON DRAWING
INTERNAL WIRING – 2



THERMISTOR	
TERMINAL BLOCK	
COMPONENT TERMINAL	
CONTROLLER TERMINAL	
UNIT WIRING	
FIELD WIRING	

DAMPER MOTOR END SWITCHES (*DMES)

LF24–S US	S1 – S3	NFB24–S	S4 – S6
TFB24–S	S1 – S3	AFB24–S	S4 – S6
		EFB24–S	S4 – S6

LEGEND

F	– Fuse – T.D.	R	– Relay 24 & 120V
FAF	– Fuse – F.A.	K	– Motor Starter
MIB	– Limit Switch	M	– Damper Actuator
S	– 3 Pos Switch	RES	– Resistor

Rev	By	Description	Date

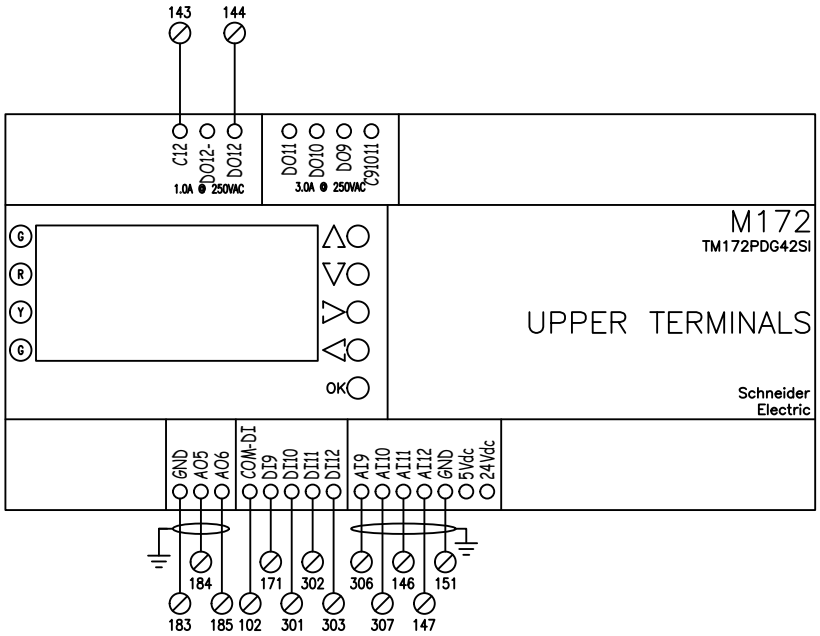
TEMPEFF

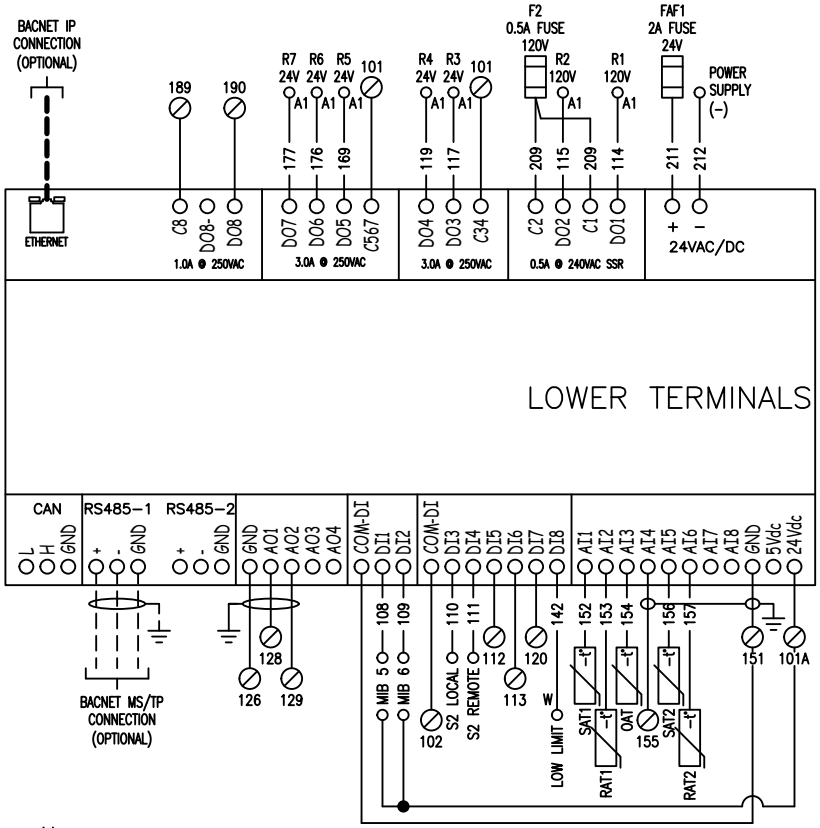
WIRING DIAGRAM

TITLE
RG Control Wiring – 575V
Shut–off dampers, Pressure Transmitters, Cometers.

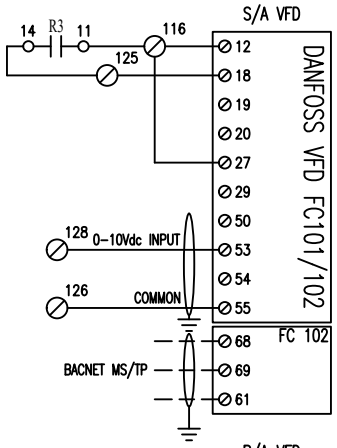
DRAWN BY	ISSUED BY	SCALE	DRW. NO.	
N.N.		N/A	RG INT WIRING 3	
CHK. BY	DATE		ORD NO.	REV
	Feb 12, 2025			–

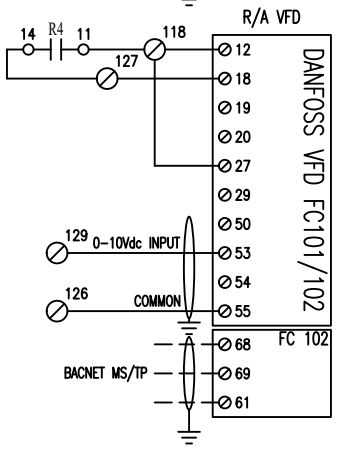
DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.





DANFOSS SPEED CONTROL IS DONE IN THE VFD USING PARAMETERS 3-02 (MIN SPEED) AND 3-03 (MAX SPEED). BACNET MORNITORING





NOTE(S):

A – IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 90°C AND AN 600Vac INSULATION RATING.

B – FIELD WIRING VOLTAGE DROP NOT TO EXCEED 10%.

C – ALL FIELD WIRING SHOWN SHALL BE COMPLETED BY INSTALLER.

D – ALL WIRING TO COMPLY WITH THE NEC (NFPA 70), CEC (CSA C22.2), OR LOCAL CODE WHICH EVER IS APPLICABLE.

E – IF FIRE ALARM CONTACTS ARE USED, REMOVE THE FACTORY INSTALLED JUMPER FROM TERMINALS 101 & 150. CONNECT THE N.C. FIRE ALARM CONTACTS. IF FIRE ALARM CONTACT OPENS, UNIT SHUTS DOWN. !! FOR OTHER OPERATION OPTIONS, CONTACT FACTORY !!

Rev	By	Description	Date

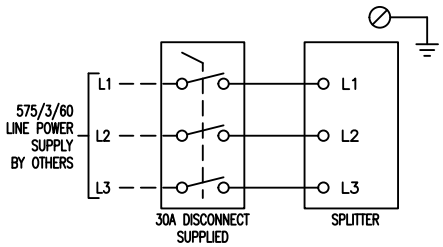
TEMPEFF

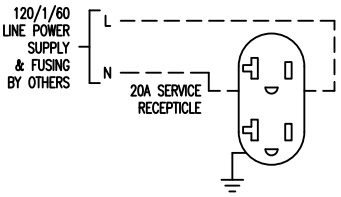
WIRING DIAGRAM

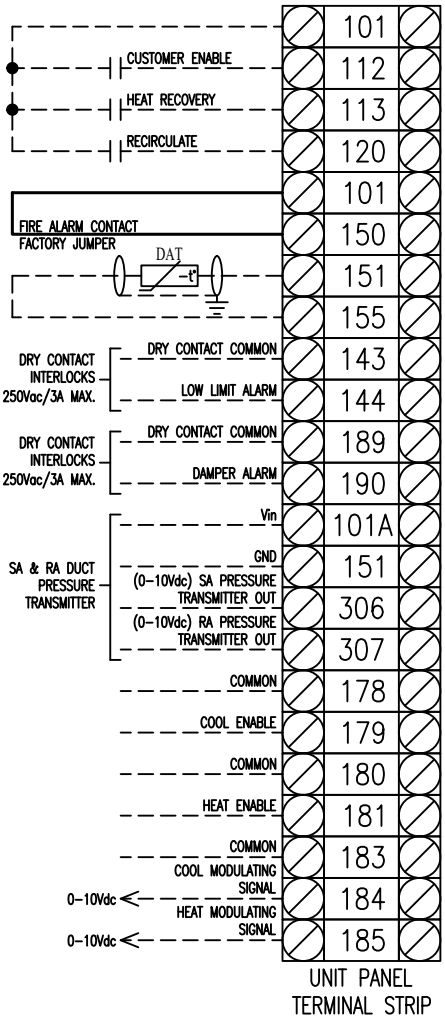
TITLE
RG Field Wiring – 575V
SPP, VFD (FC-102), Low Limit, OAT, DAT, Dirty Filter Switches, Cometers, Press. Trans.

DRAWN BY	ISSUED BY	SCALE	DRW. NO.
N.N.		N/A	RG FIELD WIRING 1
CHK. BY	DATE		ORD NO. / REV
	Feb 12, 2025		–

DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.







Rev	By	Description	Date

TEMPEFF

WIRING DIAGRAM

TITLE
RG Field Wiring – 575V
SPP, VFD (FC-102), Marine Light, GFCI Receptacles.
DAT, Low Limit, Duct Trans Press..

DRAWN BY	ISSUED BY	SCALE	DRW. NO.	
N.N.		N/A	RG FIELD WIRING 2	
CHK. BY	DATE		ORD NO.	REV
	Feb 12, 2025			–

DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.

Schneider RG Troubleshooting – Damper Alarm

Damper has a built-in alarm for testing the function of the internal components. If the damper goes into alarm the unit will shut down. Clear Damper Alarm by resetting Controller. **Follow the PLC reset procedure to prevent damage to the Controller**.

A. M6 Motor Alarm:
    a. Use S1 switch (Position 2) to test movement on motor; when enabled, the motor will turn.
    b. If motor moves on motor test, check NC contacts on MIB1 and MIB2 for continuity.
    c. If motor does not move:
        i. Check NC contacts on MIB1 and MIB2 for continuity.
        ii. Check motor starter (K2) for continuity.
        iii. Manually enable relay (R2) and check for continuity across relay contacts.
        iv. Check motor leads for voltage. Motor may defective; contact Tempeff.

B. M7 Motor Alarm:
    a. Use S1 switch (Position 1) to test movement on motor; when enabled, the motor will turn.
    b. If motor moves on motor test, check NC contacts on MIB3 and MIB4 for continuity.
    c. If motor does not move:
        i. Check NC contacts on MIB3 and MIB4 for continuity.
        ii. Check motor starter (K1) for continuity.
        iii. Manually enable relay (R1) and check for continuity across relay contacts.
        iv. Check motor leads for voltage. Motor may defective; contact Tempeff.

C. MIB1 Alarm – M6 Closed Position:
    a. Damper motor will not stop at MIB1; motor (M6) will just spin.
        i. Check that arm is making contact with the motor CAM (adjust position of limit switch if necessary).
        ii. Temporarily remove relay (R2), lift up limit switch arm with small screw driver, check continuity across both NC and NO contacts, if either side not working replace limit switch.

D. MIB2 Alarm – M6 Open Position:
    a. Damper motor will not stop at MIB2; motor (M6) will just spin.
        i. Check that arm is making contact with the motor CAM (adjust position of limit switch if necessary).
        ii. Temporarily remove relay (R2), lift up limit switch arm with small screw driver, check continuity across both NC and NO contacts, if either side not working replace limit switch.

E. MIB3 Alarm – M7 Closed Position:
    a. Damper motor will not stop at MIB3; motor (M7) will just spin.
        i. Check that arm is making contact with the motor CAM (adjust position of limit switch if necessary).
        ii. Temporarily remove relay (R1), lift up limit switch arm with small screw driver, check continuity across both NC and NO contacts, if either side not working replace limit switch.

F. MIB4 Alarm – M7 Open Position:
    a. Damper motor will not stop at MIB4; motor (M7) will just spin.
        i. Check that arm is making contact with the motor CAM (adjust position of limit switch if necessary).
        ii. Temporarily remove relay (R1), lift up limit switch arm with small screw driver, check continuity across both NC and NO contacts, if either side not working replace limit switch.

G. MIB5 Alarm – M6 Proof of Open:
    a. Blowers will enable for either 1 cycle or not at all, after a 10 second delay the unit will disable.
        i. Check that the arm is making contact with the end collar when the M6 motor cam is on MIB2.
            1. Adjust the collar if micro switch is on flat.
            2. Adjust the micro switch to make contact with collar.
    b. MIB5_0 Alarm:
        i. Alarm occurs when unit is Disabled.

H. MIB6 Alarm – M7 Proof of Open:
    a. Blowers will enable for either 1 cycle or not at all, after a 10 second delay the unit will disable.
        i. Check that the arm is making contact with the end collar when the M7 motor cam is on MIB4.
            1. Adjust the collar if micro switch is on flat.
            2. Adjust the micro switch to make contact with collar.
    b. MIB6_0 Alarm:
        i. Alarm occurs when unit is Disabled.

PLC Reset Procedure:

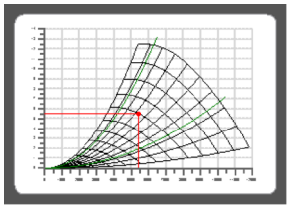
A. Open 24Vdc fuse holder supplying power to 101 terminals, then open fuse holder F2, and finally open fuse holder FAF1 to Controller power.
B. Wait 5 seconds.
C. Close fuse holder FAF1. While Controller is re-booting, close 24Vdc fuse holder supplying power to 101 terminals and then close fuse holder F2.
D. Once re-boot is complete, unit can resume normal operation.

Customer	
Project	**Description**
Your Ref.	**Our Ref.**

Input data

Volume	5403 CFM	**Temperature**	68.0 °F	**Density**	0.075 lb/cu.ft
Static Pressure	5.55 In.W.G.	**Altitude**	0 ft	**Free Inlet - Free Outlet**	

	Catalogue data		
Selected Fan **ANPA18 -**	n Max 1/min	Pw Max BHP	J lb ft²
	3300		15.42



Fan Information

OV ft/min	p tot * In.W.G.	p sta In.W.G.	p dyn ** In.W.G.	tip speed ft/min	RPM 1/min	eta Tot * %	eta Sta %	P fan BHP	Min Mot. BHP	P mot BHP	Shaft diameter in
	6.02	5.55	0.47	10741	2315	77.16	71.16	6.63			0.00

(*)Theoric value calculated taking into account the dynamic pressure at the impeller outlet
(**)Theoric value, calculated at the impeller outlet

fm[Hz]	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Tot.**
Lw3 Total Sound Power Level in the inlet duct- Lwi Inlet Duct Sound Power Level includes the effect of duct end correction									
Level Lw3 dB/dB(A)	83 / 57	78 / 62	80 / 72	82 / 79	79 / 79	76 / 78	73 / 74	69 / 68	**89 / 84**
Lw5 Inlet Total Sound Power Level - Lwmi Inlet Sound Power Level (free inlet) do not includes the effect of duct end correction									
Level Lw5 dB/dB(A)	78 / 52	80 / 64	88 / 80	91 / 88	82 / 82	80 / 82	78 / 79	72 / 71	**94 / 90**
Lw6 Total Sound Power Level at the free outlet - Lwmo Outlet Sound Power Level (free outlet) do not includes the effect of duct end correction									
Level Lw6 dB/dB(A)	88 / 62	83 / 67	86 / 77	91 / 88	89 / 89	84 / 85	80 / 81	75 / 74	**96 / 93**

Certificates

Comefri USA Inc. certifies that the ANPA18 - shown here is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and 311 and comply with the requirements of the AMCA Certified Ratings Program. Performance ratings include to effects of spring dampers and does not include the effects of appurtenances (accessories). Power rating (kW or BHP) does not include trasmission losses. Free inlet Lw5, LwA5 sound power levels shown are in decibels, referred to 10^{-12} watts calculated per AMCA International Standard 301. Air and free inlet Lw5, LwA5 sound performances shown are for installation type A: Free inlet - Free outlet. The AMCA Certified Ratings Seal applies to air performance and to free inlet Lw5, LwA5 sound power levels. The AMCA Certified Ratings Seal does not apply either to in-duct inlet Lw3, LwA3 sound or outlet Lw6, LwA6 sound.

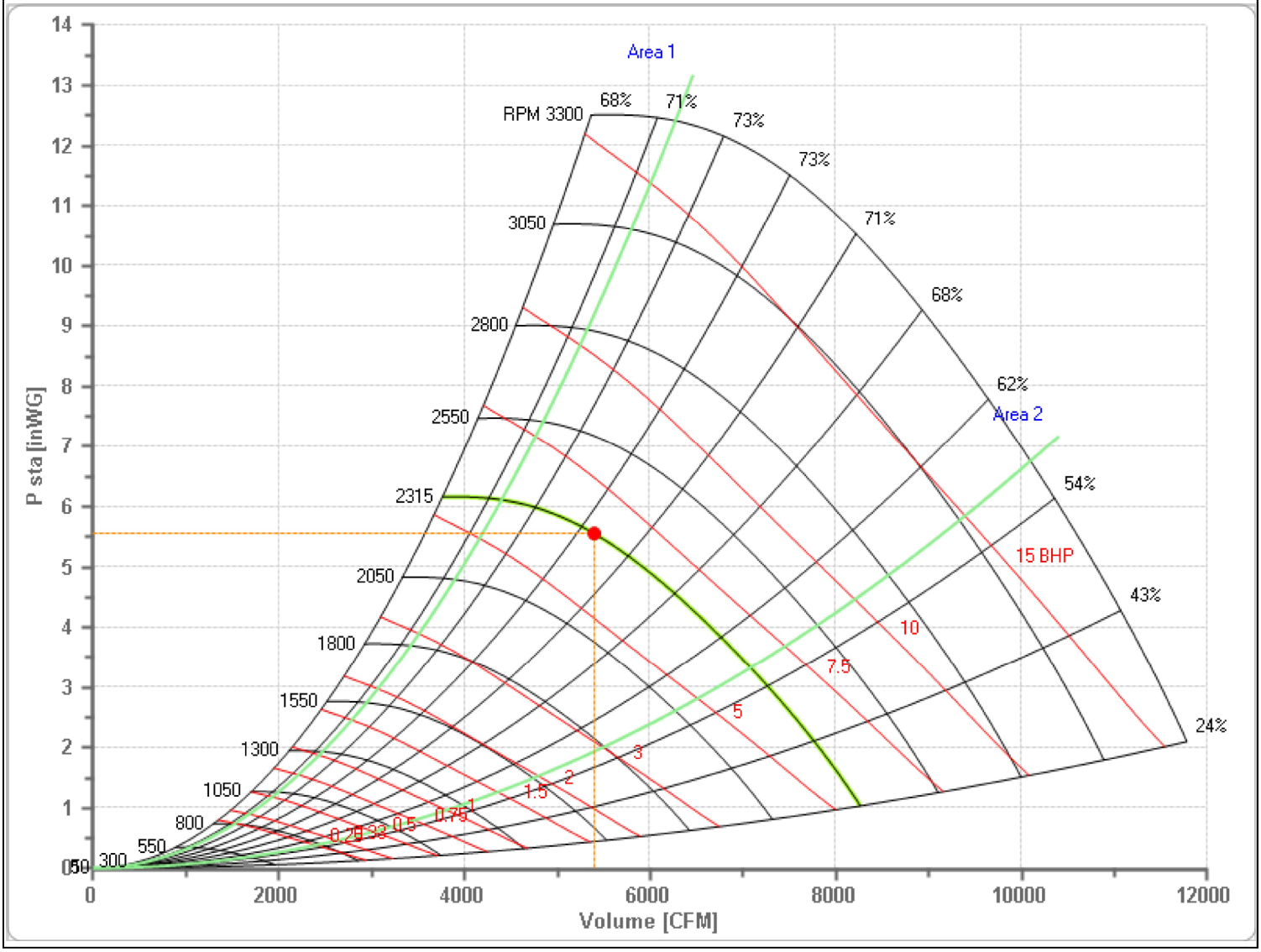
Chart

comefri fans of energy saving

SA Fan

2025-04-28
Aeolus4 1.0.23093.0 Apr 2023

Selected Fan	ANPA18 -	Fan working conditions	Free Inlet - Free Outlet
n Max	3300 1/min	Volume	5403 CFM
Pw Max		Total Pressure	6.02 In.W.G.
J	15.42 lb ft²	Static Pressure	5.55 In.W.G.
		P fan	6.63 BHP
Required working point	•	eta Tot	77.16 %
Effective working point	•	eta Sta	71.16 %
		RPM	2315 1/min
		Temperature	68.0 °F
		Altitude	0 ft

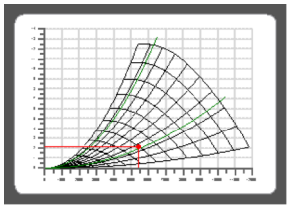


Customer	
Project	**Description**
Your Ref.	**Our Ref.**

Input data

Volume	5403 CFM	**Temperature**	68.0 °F	**Density**	0.075 lb/cu.ft
Static Pressure	2.16 In.W.G.	**Altitude**	0 ft	**Free Inlet - Free Outlet**	

	Catalogue data		
Selected Fan **ANPA18 -**	n Max 1/min	Pw Max BHP	J lb ft²
	3300		15.42



Fan Information

OV ft/min	p tot * In.W.G.	p sta In.W.G.	p dyn ** In.W.G.	tip speed ft/min	RPM 1/min	eta Tot * %	eta Sta %	P fan BHP	Min Mot. BHP	P mot BHP	Shaft diameter in
	2.63	2.16	0.47	8362	1802	70.79	58.19	3.15			0.00

(*)Theoric value calculated taking into account the dynamic pressure at the impeller outlet
(**)Theoric value, calculated at the impeller outlet

fm[Hz]	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Tot.**
Lw3 Total Sound Power Level in the inlet duct- Lwi Inlet Duct Sound Power Level includes the effect of duct end correction									
Level Lw3 dB/dB(A)	77 / 51	75 / 59	79 / 70	76 / 73	76 / 76	72 / 73	69 / 70	63 / 62	**84 / 80**
Lw5 Inlet Total Sound Power Level - Lwmi Inlet Sound Power Level (free inlet) do not includes the effect of duct end correction									
Level Lw5 dB/dB(A)	78 / 51	78 / 62	89 / 81	85 / 81	79 / 79	77 / 78	71 / 72	65 / 64	**92 / 86**
Lw6 Total Sound Power Level at the free outlet - Lwmo Outlet Sound Power Level (free outlet) do not includes the effect of duct end correction									
Level Lw6 dB/dB(A)	85 / 59	81 / 65	89 / 81	87 / 84	86 / 86	81 / 82	76 / 77	72 / 71	**94 / 90**

Certificates

Comefri USA Inc. certifies that the ANPA18 - shown here is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and 311 and comply with the requirements of the AMCA Certified Ratings Program. Performance ratings include to effects of spring dampers and does not include the effects of appurtenances (accessories). Power rating (kW or BHP) does not include trasmission losses. Free inlet Lw5, LwA5 sound power levels shown are in decibels, referred to 10^{-12} watts calculated per AMCA International Standard 301. Air and free inlet Lw5, LwA5 sound performances shown are for installation type A: Free inlet - Free outlet. The AMCA Certified Ratings Seal applies to air performance and to free inlet Lw5, LwA5 sound power levels. The AMCA Certified Ratings Seal does not apply either to in-duct inlet Lw3, LwA3 sound or outlet Lw6, LwA6 sound.

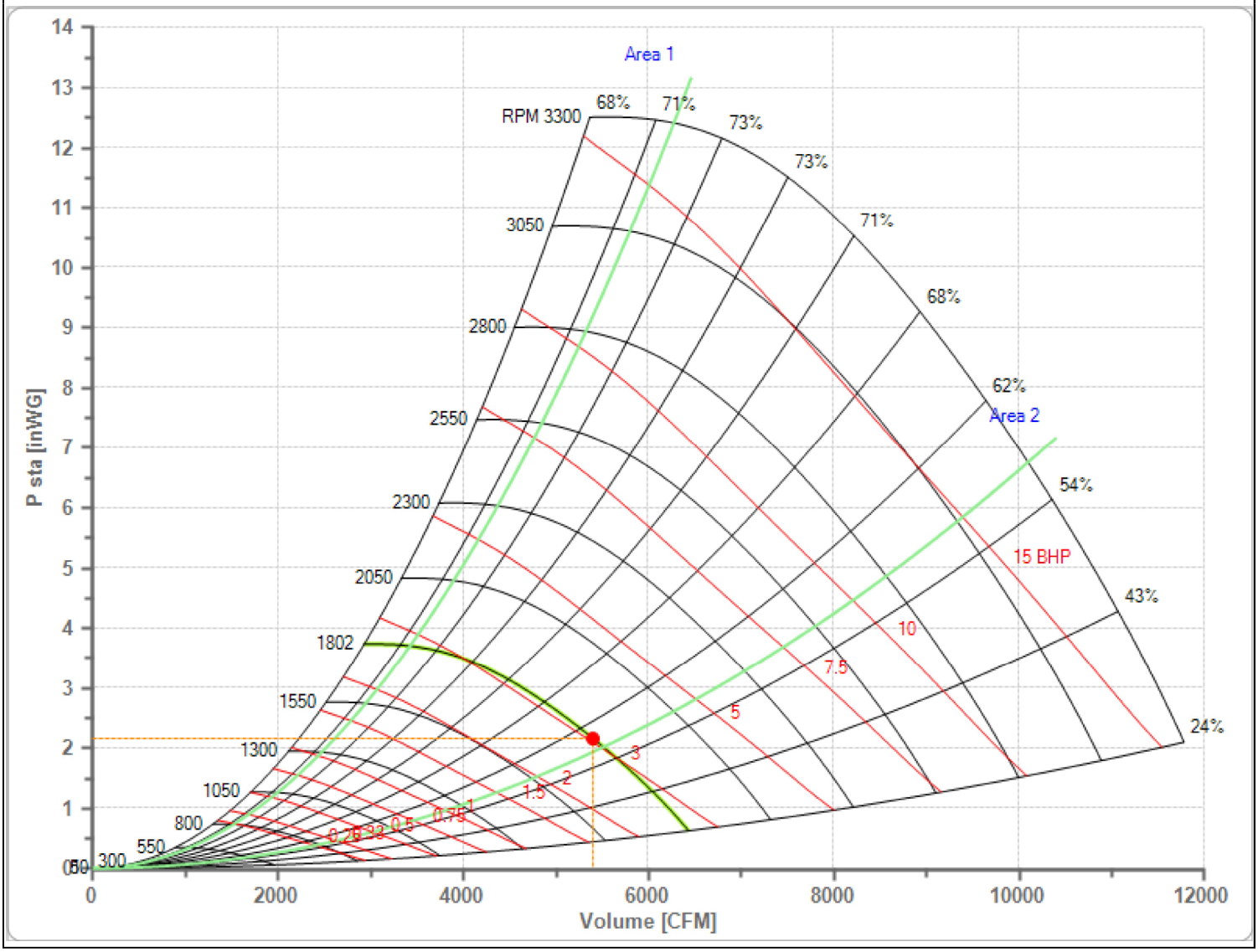
Chart

comefri fans of energy saving

EA Fan

2024-06-26
Aeolus4 1.0.23093.0 Apr 2023

Selected Fan	ANPA18 -	Fan working conditions	Free Inlet - Free Outlet
n Max	3300 1/min	Volume	5403 CFM
Pw Max		Total Pressure	2.63 In.W.G.
J	15.42 lb ft²	Static Pressure	2.16 In.W.G.
		P fan	3.15 BHP
Required working point	•	eta Tot	70.79 %
Effective working point	•	eta Sta	58.19 %
		RPM	1802 1/min
		Temperature	68.0 °F
		Altitude	0 ft



Installation, Operation & Maintenance Manuals
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