HLR Technology Mechanical Design Guide

HLR 100Z

enVerid

Energy savings. Air quality.

Contents

Introduction

enVerid's HVAC Load Reduction® (HLR®) modules represent a vital addition to conventional HVAC systems to reduce outside air heating and cooling loads. HLR modules are equipped with enVerid's Sorbent Ventilation Technology® (SVT®) which removes previously hard-to-capture contaminants from the indoor air, thereby decreasing the required volume of outside air ventilation and providing more control over air quality.

The HLR 100Z is an all-inclusive solution with a cabinet containing a pre-filter, fan, and replaceable sorbent filters. The HLR 100Z is smaller, quieter, and easier to install directly within or above the ventilation zones in plenums due to its low height. The system is designed to be scalable to building size. Individual or multiple modules can be installed to account for varying building types and HVAC system sizes.

Figure 1.1: External view of the enVerid HLR 100Z Module.

Section 1: External Connections to HLR 100Z Module

This section provides an overview of HVAC, power, and communications components integral to the HLR Module that interface with external devices / systems. Note that components integral to the HLR module that do not interface externally, are not included in this guide – please refer to the *HLR 100Z Technical Guide* for an overview of all components.

Section 2: Dimensional Drawings

This section provides dimensional drawings of the HLR 100Z module.

Section 3: HLR Technology One-Line Schematic and Detailed Integration Overview

This section includes one-line schematics of conventional HVAC airside system designs compared to those with integrated HLR 100Z modules. This section also includes notes and drawings for mechanical design considerations, and how HLR modules should be specified on mechanical drawings.

Section 4: Installation Configurations

This section provides a guide for manufacturer approved installation configurations when mounting HLR module(s).

Section 5: HLR Module Ductwork Connections

This section includes methods to improve side stream flow through the HLR module(s).

Section 1 – External Connections to HLR 100Z Module

Each HLR module has mechanical and electrical components. The naming convention of these components is provided in this section and will be referenced in subsequent sections.

Components integral to the HLR module, that do not interface externally, are not discussed in this guide – please refer to the *HLR 100Z Technical Guide* for an overview of all components.

Figure 1.2: Internal view of the enVerid HLR 100Z Module.

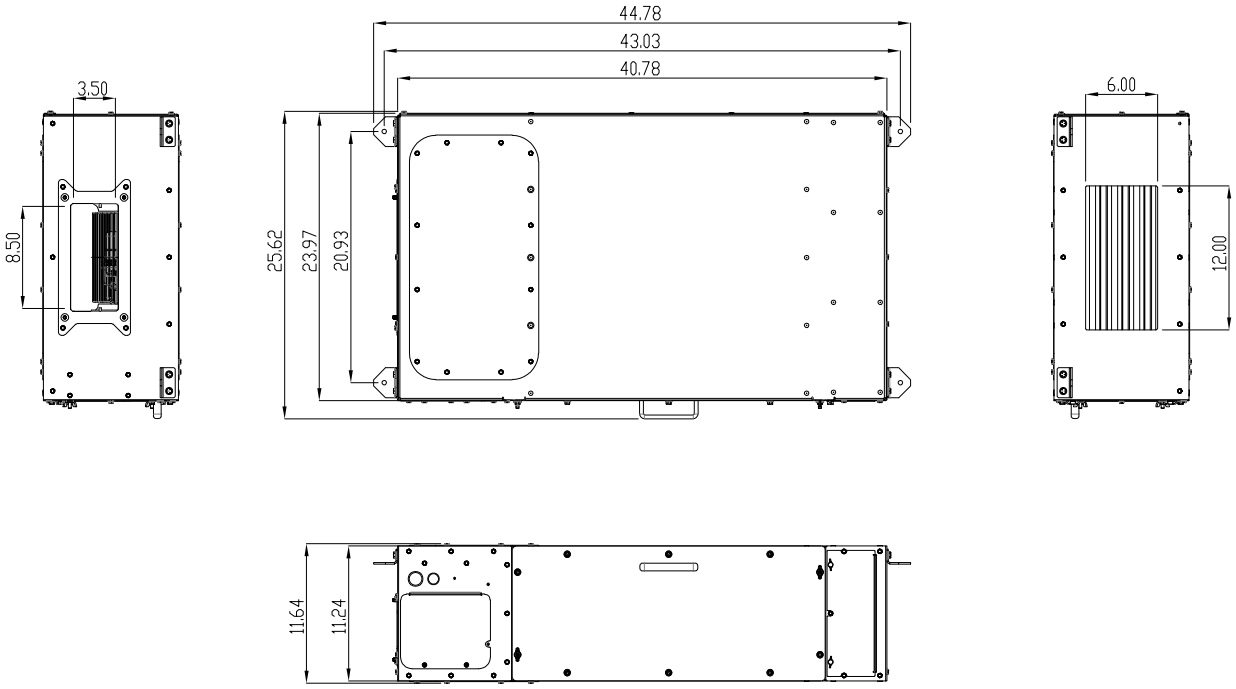
Component Legend		
Tag	Component Name	Component Information
A	Indoor Air Inlet	12.0" (30.5 cm) x 6.0" (15.2 cm)
B	Clean Air Outlet	9.0" (22.9 cm) x 4.0" (10.2 cm)
C	Electrical Enclosure – Power Connection Point	208V/60Hz, 277V/60Hz

During normal operation, the HLR Module is actively cleaning the indoor air in the following steps:

1. Return air enters the unit through the Indoor Air Inlet
2. Return air passes through the pleated pre-filter and sorbent filters
3. Air exits the unit as clean air through the Clean Air Outlet

The HLR 100Z fan nominally operates at 350 CFM (165 L/s) and 0.6" ESP (150 Pa).

Section 2 – Dimensional Drawings



Section 3 – HLR Technology One-Line Schematic and Detailed Integration Overview

This section provides high level diagrammatic examples of how HLR modules can be integrated into different baseline HVAC design cases.

For each baseline case, the minimum outside air (OA) flow is representative of a prescriptive-based requirement per ASHRAE 62.1 Ventilation Rate Procedure (VRP). For each proposed case, minimum OA and clean air (CA) flow rates are representative of a performance-based requirement per ASHRAE 62.1 Indoor Air Quality Procedure (IAQP).

Note: The proposed cases diagrammatically show one (1) HLR Module for simplicity. However, when integrating with larger systems, multiple modules can be installed within the same ventilation zone(s).

The baseline cases and proposed cases discussed in this section are outlined below:

Baseline Case	Applicable Proposed Cases:							
Baseline Case 1: Mixed Air System – Plenum Return	Proposed Case 1: Mixed Air System + HLR Module(s) in Return Plenum							
Baseline Case 2: Mixed Air System – Ducted Return	Proposed Case 2: Mixed Air System + HLR Module(s) in Ducted Return							
Baseline Case 3: 100% Outside Air System		Ducted Return	Plenum Return	Downsized Energy Recovery	Eliminated Energy Recovery	Single Zone	Multi Zone	Page Number
	Proposed Case 3A	X		X		X	X	14
	Proposed Case 3B	X		X		X	X	16
	Proposed Case 3C	X			X	X	X	18
	Proposed Case 3D		X	X		X		20
	Proposed Case 3E		X	X			X	22
	Proposed Case 3F		X	X		X		24
	Proposed Case 3G		X	X			X	26

Referenced acronyms in schematics:

OA = Outside Air

SA = Supply Air

RA = Return Air

RFA = Relief Air

IA = Indoor Air

EA = Exhaust Air

TX = Toilet Exhaust

GX = General Exhaust

CA = Clean Air (from HLR modules)

DCAS = Dedicated Clean Air System

DOAS = Dedicated Outside Air System

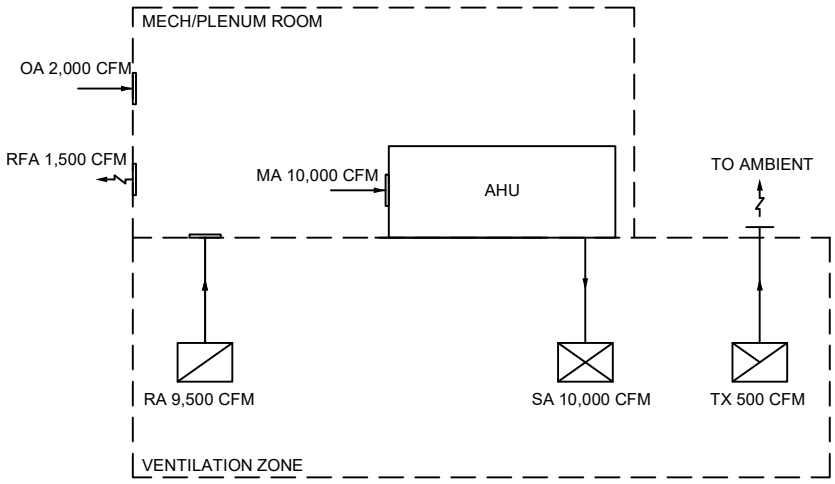
AHU = Air Handling Unit

RTU = Rooftop Unit

HLR = HVAC Load Reduction

Baseline Case 1: Mixed Air System - Plenum Return

BASELINE CASE 1	
CONDITIONS	1. AHU is supplying 20,000 CFM of mixed air (OA+RA). 2. System can be Constant Volume (CV) or Variable Air Volume (VAV). 3. Outside air to AHU is provided locally to return plenum.

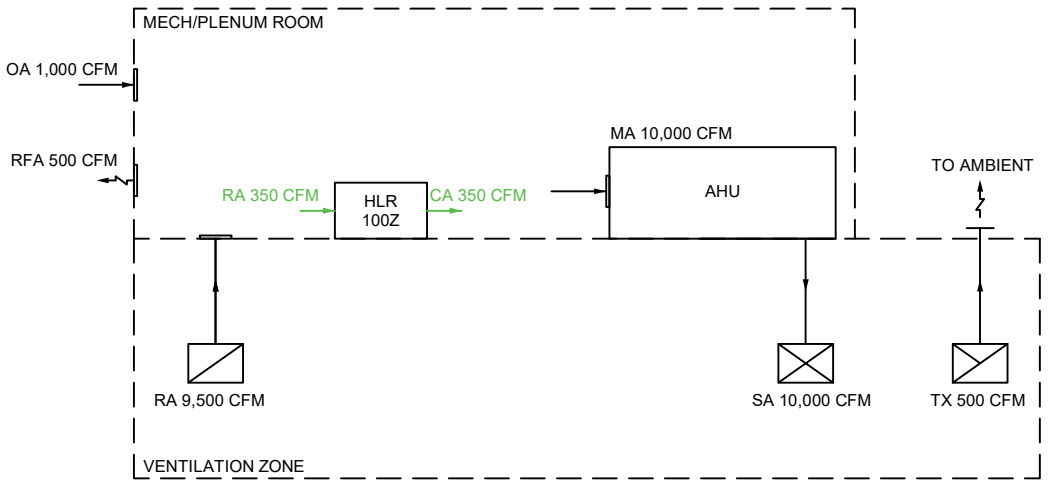


Proposed Case 1: Downsized Mixed Air System + HLR Module(s) in Return Plenum

PROPOSED CASE 1

CONDITIONS

1. Same as Baseline Case 1, and:
2. HLR Module(s) installed in Return Air plenum.



LOAD REDUCTION IMPACT

1. Downsized heating and cooling coils and respective central plant equipment (if applicable).
2. Downsized OA intake and DOAS or ERV (if applicable).
3. Downsized or eliminated Relief Section/General Exhaust Fan.

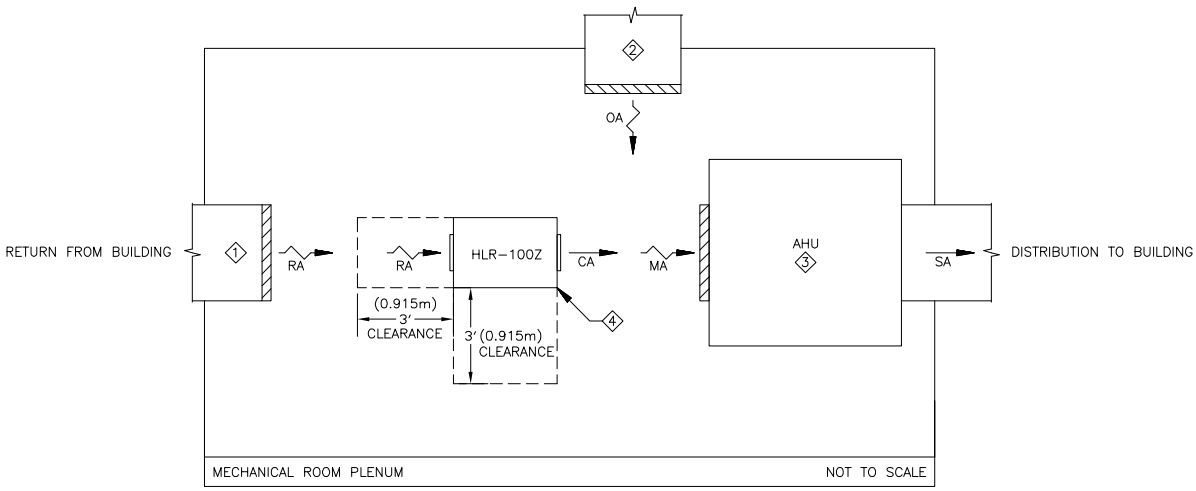
INTEGRATION DRAWING REFERENCE

Integration Drawing - Proposed Case 1A - Mixed Air System + HLR Module(s) in Return Plenum
Integration Drawing - Proposed Case 1B - Mixed Air System + HLR Module(s) in Ceiling Plenum

INTEGRATION DRAWING - PROPOSED CASE 1A - MIXED AIR SYSTEM + HLR MODULE(S) IN RETURN PLENUM

CONDITIONS

1. HLR Module(s) are integrated with an air handling unit (AHU) located in a plenum room.
2. Outside Air and Return Air are ducted to plenum room.
3. The AHU supplies Mixed Air.



LEGEND	
SA	SUPPLY AIR
RA	RETURN AIR
MA	MIXED AIR
OA	OUTDOOR AIR
CA	CLEAN AIR

HLR–100Z DIAGRAM KEYNOTES

1 RETURN AIR

1. HLR MODULE DRAWS AIR FROM THE RETURN AIR INLET. LOCATE HLR MODULE NEAR ROOM RETURN AIR INLET AND AWAY FROM OA SOURCE. IF HLR IS NOT LOCATED NEAR THE RETURN INLET (>10'–0"), A DUCT OR 'SNORKEL' SHALL BE REQUIRED.

2 OUTSIDE AIR

1. CONTROLLED BY BUILDING MANAGEMENT SYSTEM TO MAINTAIN INDOOR AIR QUALITY PROCEDURE (IAQP) MINIMUM OUTSIDE AIRFLOW RATE.

3 AIR HANDLING UNIT

1. AIR HANDLING UNIT INTAKE DRAWS MIXED AIR (RETURN AIR, CLEANED AIR FROM HLR–100Z, AND OUTDOOR AIR).

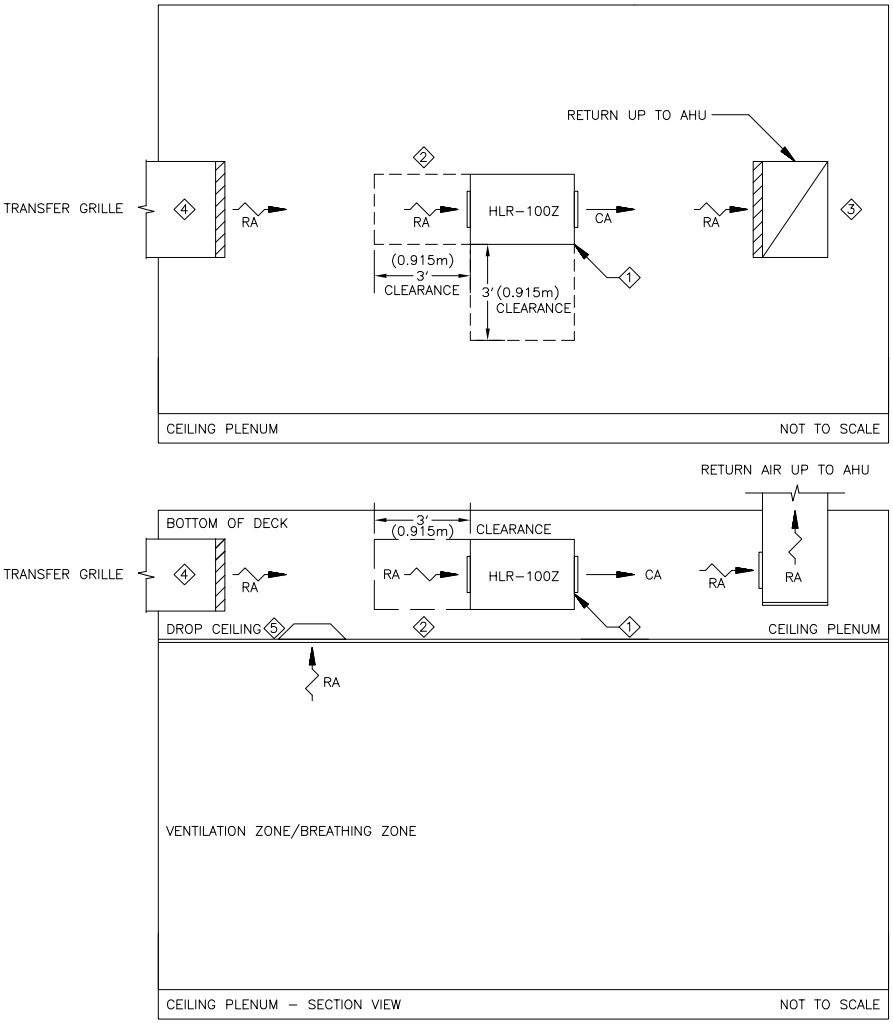
4 HLR–100Z UNIT

1. REFER TO PAGE 3 AND PAGE 4 FOR UNIT DIMENSIONS AND COMPONENTS. MAINTAIN 3'–0" (0.915m) CLEARANCE FROM RETURN AIR INTAKE. MAINTAIN 3'–0" (0.915m) CLEARANCE FROM FILTER ACCESS PANEL FOR MAINTENANCE AND FILTER REMOVAL.

INTEGRATION DRAWING - PROPOSED CASE 1B - MIXED AIR SYSTEM + HLR MODULE(S) IN CEILING PLENUM

CONDITIONS

1. HLR Module(s) are serving an air handling unit (AHU) located in a mechanical room or roof top unit (RTU) on the roof.
2. HLR Module(s) are located in ceiling return plenum. Clean air discharged to Return Air Riser.
3. The AHU supplies Mixed Air.



LEGEND	
SA	SUPPLY AIR
RA	RETURN AIR
MA	MIXED AIR
OA	OUTDOOR AIR
CA	CLEAN AIR

HLR–100Z DIAGRAM KEYNOTES

1 HLR–100Z UNIT
1. REFER TO PAGE 3 AND PAGE 4 FOR UNIT DIMENSIONS AND COMPONENTS. MAINTAIN 3'–0" (0.915m) CLEARANCE FROM RETURN AIR INTAKE. MAINTAIN 3'–0" (0.915m) CLEARANCE FROM FILTER ACCESS PANEL FOR MAINTENANCE AND FILTER REMOVAL.

2 RETURN AIR
1. HLR MODULE DRAWS AIR FROM THE RETURN AIR INLET. HLR MODULE DRAWS RETURN FROM THE PLENUM VIA TRANSFER GRILLE(S) FROM ZONE(S) SERVED BY ASSOCIATED AHU.

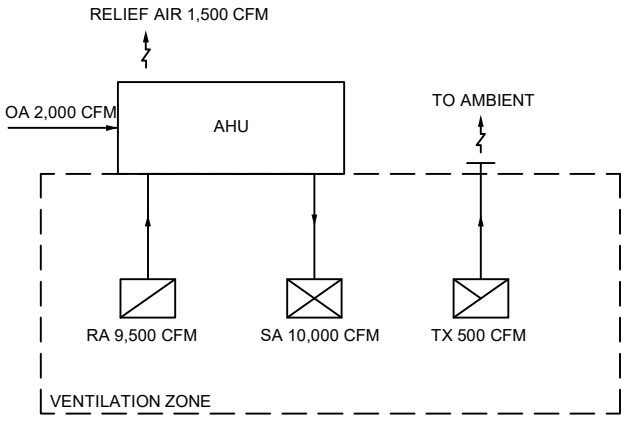
3 RETURN AIR RISER TO AIR HANDLING UNIT
1. RETURN AIR RISER TO ASSOCIATED AIR HANDLING UNIT. POSITION CLEAN AIR OUTLET OF HLR–100Z UNIT TO DISCHARGE TOWARDS RETURN AIR RISER INTAKE.

4 TRANSFER GRILLES
1. TRANSFER GRILLES PROVIDE RETURN AIR TO CEILING PLENUM. RETURN AIR FROM THE PLENUM TO OPEN RETURN OF HLR–100Z.

5 DROP CEILING
1. IF DESIGN DOES NOT HAVE DROP CEILING/CEILING PLENUM, MODULE CAN BE INSTALLED EXPOSED DIRECTLY WITHIN THE VENTILATION ZONE. DISTRIBUTION DUCTWORK AND DIFFUSER TYPE MAY CHANGE ACCORDINGLY.

Baseline Case 2: Mixed Air System - Ducted Return

BASELINE CASE 2	
CONDITIONS	1. AHU or RTU is supplying 20,000 CFM of Mixed Air (OA + RA). 2. Can be Constant Volume (CV) or Variable Air Volume (VAV). 3. Outside air to AHU/RTU is provided locally or is decoupled. 4. Return Air provided to AHU/RTU through ducted Return Air system.

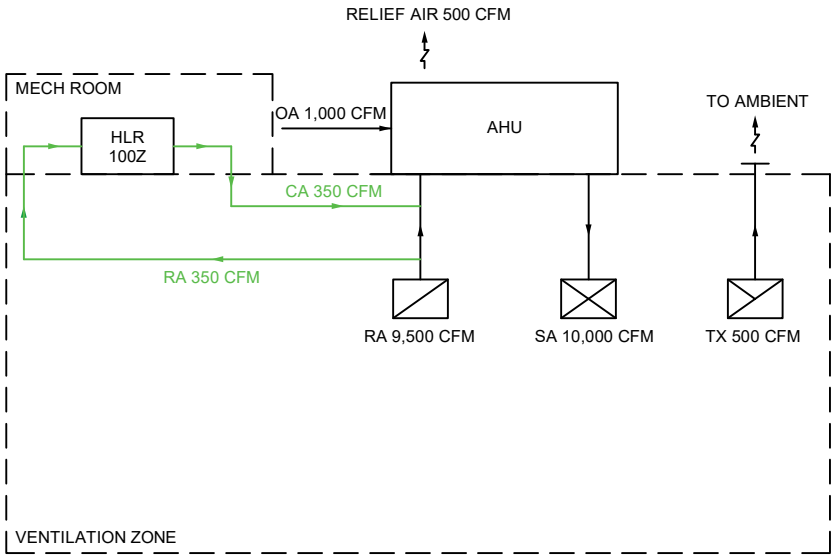


Proposed Case 2: Mixed Air System + HLR Module(s) in Ducted Return

PROPOSED CASE 2

CONDITIONS

1. Same as Baseline Case 2, and:
2. HLR Module(s) installed in side stream of ducted return air system.



LOAD REDUCTION IMPACT

1. Downsized heating and cooling coils and respective central plant equipment (if applicable).
2. Downsized OA intake and DOAS or ERV (if applicable).
3. Downsized or eliminated Relief Section/General Exhaust Fan.

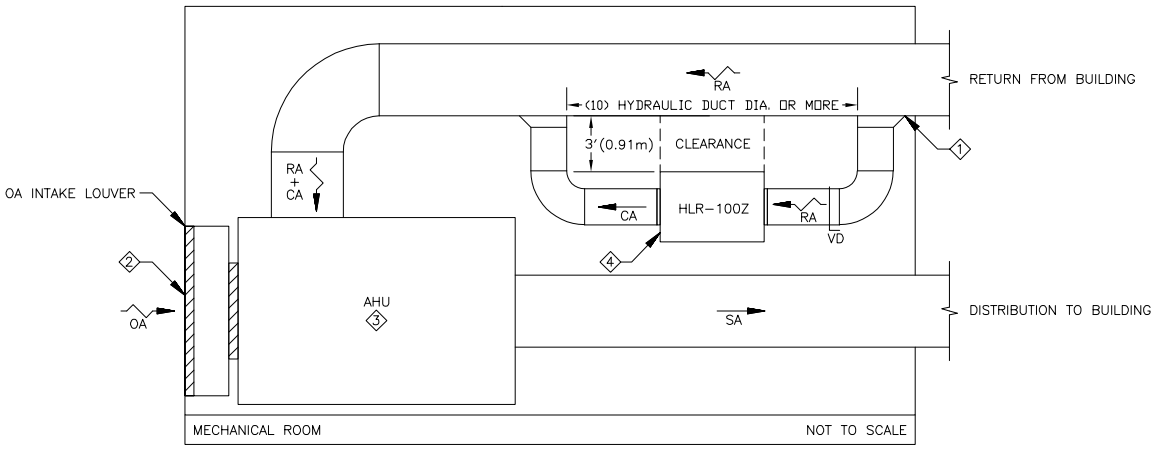
INTEGRATION DRAWING REFERENCE

Integration Drawing - Proposed Case 2 - Mixed Air System + HLR Module(s) in Ducted Return

INTEGRATION DRAWING - PROPOSED CASE 2 - MIXED AIR SYSTEM + HLR MODULE(S) IN DUCTED RETURN

CONDITIONS

1. HLR Module(s) are integrated with an air handling unit (AHU) located in a mechanical room.
2. Outside Air and Return Air are directly ducted to air handling unit (AHU).
3. The AHU supplies Mixed Air.



LEGEND	
SA	SUPPLY AIR
RA	RETURN AIR
MA	MIXED AIR
OA	OUTDOOR AIR
CA	CLEAN AIR
VD	VOLUME DAMPER

HLR–100Z DIAGRAM KEYNOTES

1 RETURN AIR

1. DUCTED CONNECTION FROM AHU RETURN AIR DUCT TO HLR MODULE RETURN AIR INLET.

2 OUTSIDE AIR

1. CONTROLLED BY BUILDING MANAGEMENT SYSTEM TO MAINTAIN INDOOR AIR QUALITY PROCEDURE (IAQP) MINIMUM OUTSIDE AIRFLOW RATE.

3 AIR HANDLING UNIT

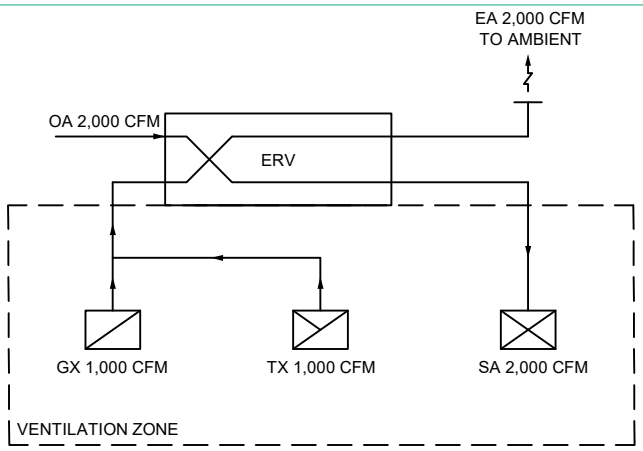
1. AIR HANDLING UNIT INTAKE DRAWS MIXED AIR (RETURN AIR, CLEANED AIR FROM HLR–100Z, AND OUTDOOR AIR).

4 HLR–100Z UNIT

1. A STRAIGHT DUCT RUN OF (3) HYDRAULIC DIAMETERS IS RECOMMENDED ON THE INLET AND OUTLET OF THE UNIT.
2. REFER TO PAGE 3 AND PAGE 4 FOR UNIT DIMENSIONS AND COMPONENTS. MAINTAIN 3'–0" (0.915m) CLEARANCE FROM RETURN AIR INTAKE. MAINTAIN 3'–0" (0.915m) CLEARANCE FROM FILTER ACCESS PANEL FOR MAINTENANCE AND FILTER REMOVAL.

Baseline Case 3: 100% Outside Air System with Energy Recovery - Ducted Return

BASELINE CASE 3	
CONDITIONS	1. Dedicated Outside Air System supplying 3,000 CFM of 100% Outside Air 2. Outside Air is supplied directly to the ventilation zone, or indirectly with supplemental cooling and/or heating provided by: a. Fan Coil Units, Variable Refrigerant Flow Units, Heat Pumps, Chilled Beams, Mixed Air AHU/RTU, etc. 3. Energy may be recovered from both Toilet Exhaust (TX) and General Exhaust (GX) airstreams

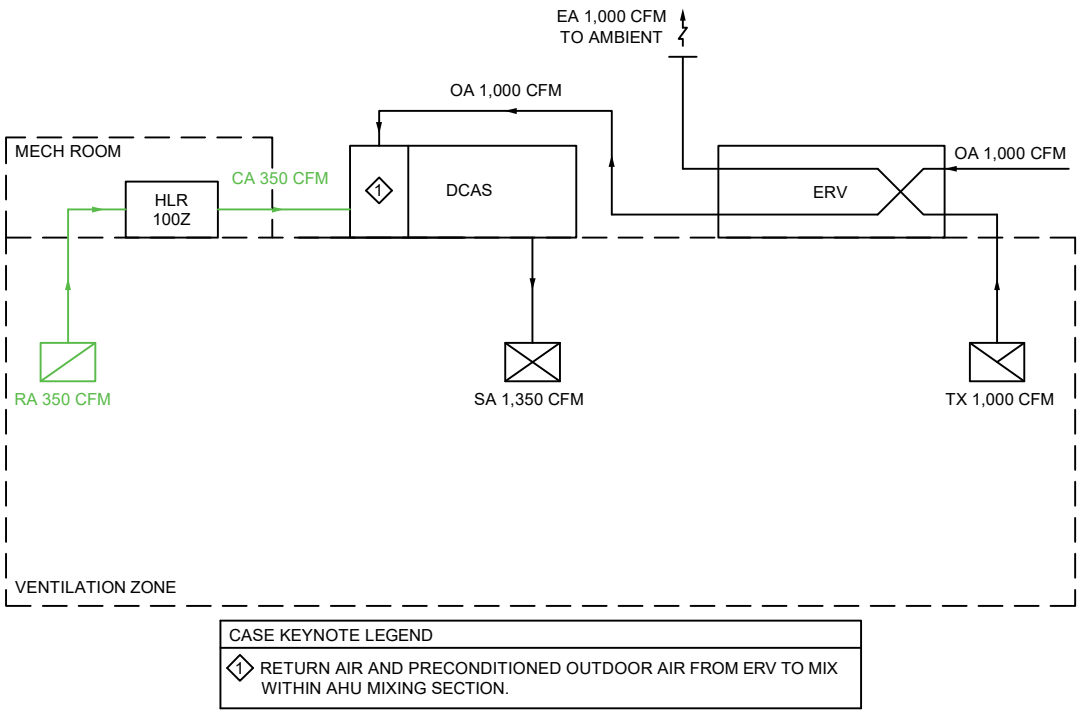


Proposed Case 3A: Dedicated Clean Air System - Decoupled Energy Recovery - Ducted Return

PROPOSED CASE 3A

CONDITIONS

1. Mixed Air System providing conditioned Outside Air, Clean Air, and Return Air. Decoupled ERV pre-conditioning minimum OA
    a. Minimum OA and minimum CA flow rates are calculated per ASHRAE 62.1 - Indoor Air Quality Procedure.
2. HLR Module(s) installed in Return Air ductwork of AHU.
3. Energy is recovered from Toilet Exhaust (TX).



LOAD REDUCTION IMPACT

1. Downsized heating and cooling coils and respective central plant equipment (if applicable).
2. Downsized Outside Air intake and Energy Recovery Ventilator.
3. Downsized Supply Fan and respective ductwork.
4. Downsized General Exhaust Fan and respective ductwork.

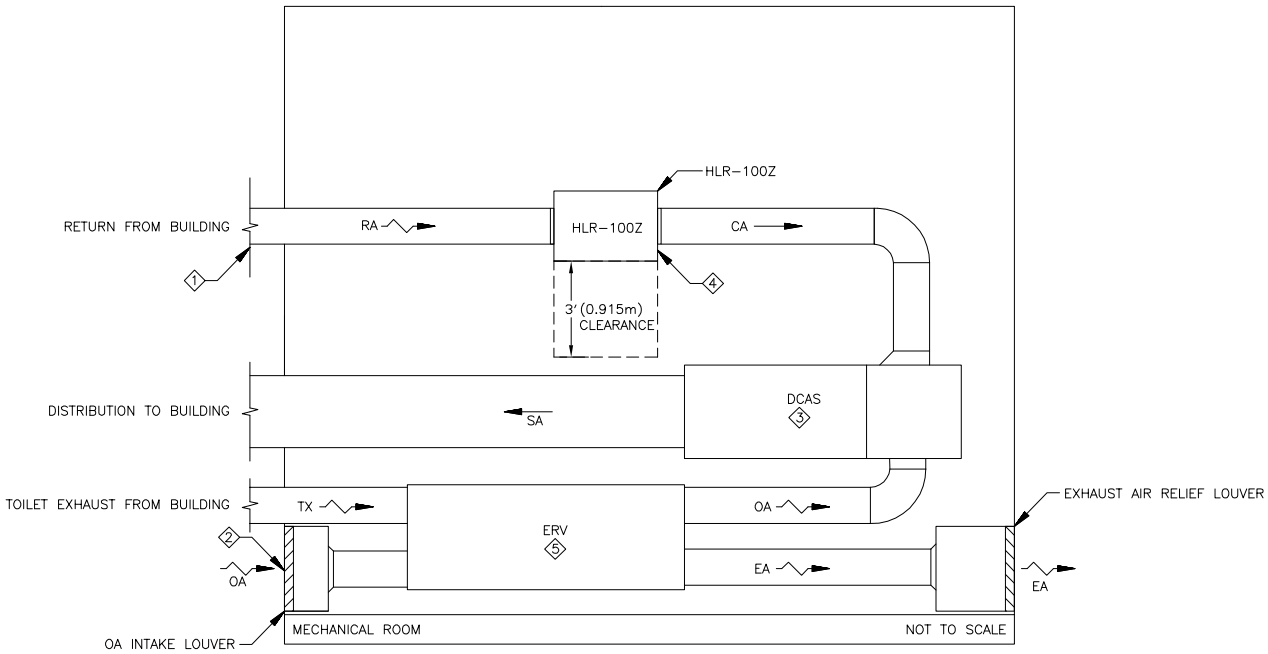
INTEGRATION DRAWING REFERENCE

Integration Drawing - Proposed Case 3A - Dedicated Clean Air System - Decoupled Energy Recovery - Ducted Return

INTEGRATION DRAWING - PROPOSED CASE 3A - DEDICATED CLEAN AIR SYSTEM - DECOUPLED ENERGY RECOVERY - DUCTED RETURN

CONDITIONS

1. HLR Module(s) are integrated with an air handling unit (AHU) located in a mechanical room.
2. Outside Air is pre-conditioned by a decoupled Energy Recovery Ventilator.
3. Outside Air and Return Air/Clean Air are directly ducted to mixing section of AHU.
4. The AHU supplies Mixed Air.



HLR–100Z DIAGRAM KEYNOTES

1 RETURN AIR

1. HLR MODULE DRAWS AIR FROM THE DCAS RETURN AIR DUCT MAIN.

2 OUTSIDE AIR

1. CONTROLLED BY BUILDING MANAGEMENT SYSTEM TO PROVIDE MINIMUM OUTSIDE AIR FLOW RATE DETERMINED BY THE INDOOR AIR QUALITY PROCEDURE (IAQP).

3 DEDICATED CLEAN AIR SYSTEM (DCAS)

1. AIR HANDLING UNIT INTAKE DRAWS IN MIXED AIR (RETURN AIR, CLEANED AIR FROM HLR–100Z, AND OUTSIDE AIR). MIXING SECTION SHOWN HAS TWO OPENINGS; RETURN/CLEAN AIR, AND PRECONDITIONED OUTSIDE AIR. RETURN/CLEAN AIR AND PRECONDITIONED AIR CAN ALSO BE MIXED UPSTREAM OF THE AIR HANDLING UNIT FOR A SINGLE CONNECTION POINT TO THE DCAS.

4 HLR–100Z UNIT

1. REFER TO PAGE 3 AND 4 FOR UNIT DIMENSIONS AND COMPONENTS. MAINTAIN 3'–0" (0.915m) CLEARANCE FROM FILTER ACCESS PANEL FOR MAINTENANCE AND FILTER REMOVAL/REPLACEMENT.
2. HLR–100Z INTERNAL FAN CAN PROVIDE 0.60" W.C. (150 Pa) OF EXTERNAL STATIC PRESSURE.

5 ENERGY RECOVERY VENTILATOR

1. DECOUPLED ENERGY RECOVERY VENTILATION PRE–CONDITIONS OUTSIDE AIR WITH AN ENERGY RECOVERY DEVICE. ENERGY RECOVERY DEVICE COULD BE ENERGY RECOVERY WHEEL, FIXED ENERGY RECOVERY PLATE, AIR TO AIR HEAT EXCHANGER CORE, ETC.
2. PRE–CONDITIONED OUTSIDE AIR IS DUCTED TO THE MIXING SECTION OF THE AIR HANDLING UNIT.

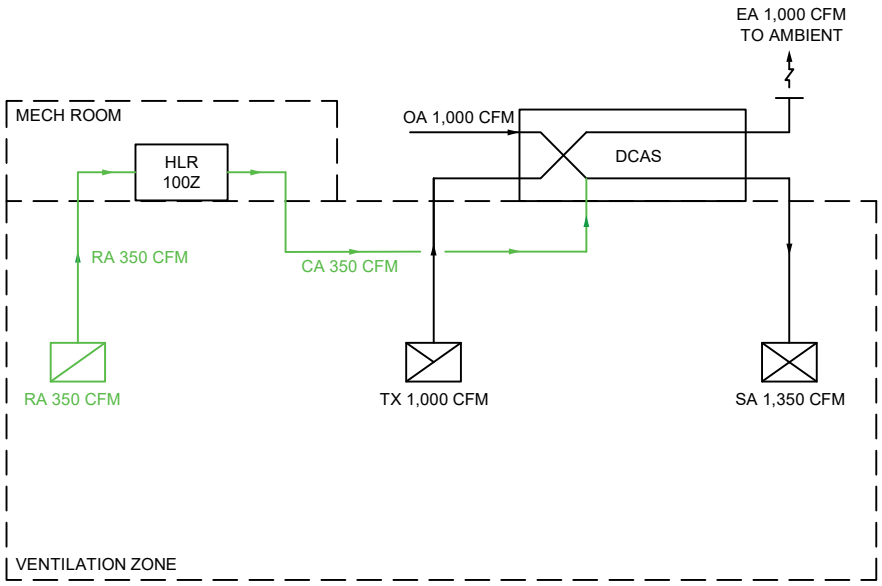
LEGEND	
SA	SUPPLY AIR
RA	RETURN AIR
MA	MIXED AIR
OA	OUTDOOR AIR
CA	CLEAN AIR
IA	INDOOR AIR
EA	EXHAUST AIR
VD	VOLUME DAMPER

Proposed Case 3B: Dedicated Clean Air System - Internal Energy Recovery - Ducted Return

PROPOSED CASE 3B

CONDITIONS

1. Mixed Air System providing conditioned Outside Air, Clean Air, and Return Air with a downsized Energy Recovery section.
    a. Minimum OA and minimum CA flow rates are calculated per ASHRAE 62.1 - Indoor Air Quality Procedure.
2. HLR Module(s) installed in Return Air ductwork of AHU.
3. Energy is recovered from Toilet Exhaust (TX).



LOAD REDUCTION IMPACT

1. Downsized heating and cooling coils and respective central plant equipment (if applicable).
2. Downsized Outside Air intake and Energy Recovery section.
3. Downsized Supply Fan and respective ductwork.
4. Downsized General Exhaust Fan and respective ductwork.

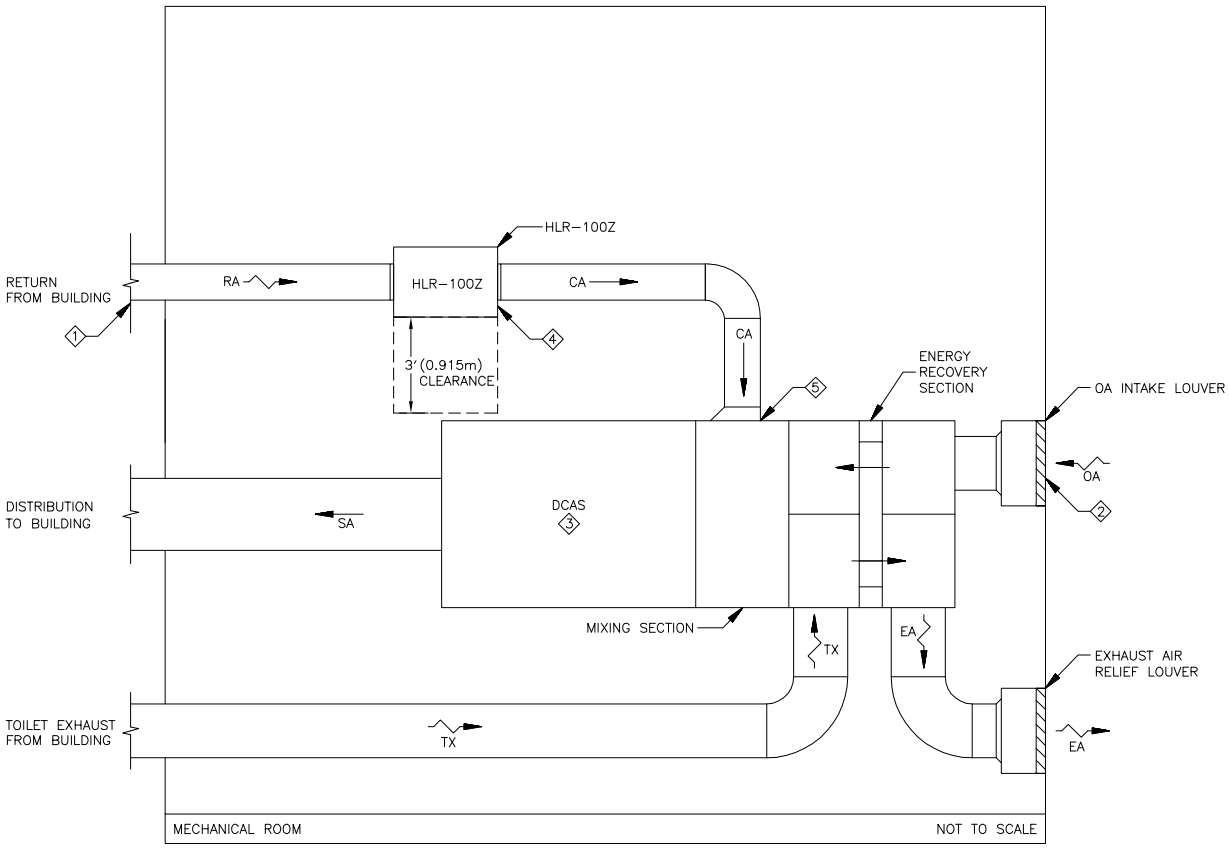
INTEGRATION DRAWING REFERENCE

Integration Drawing - Proposed Case 3B - Dedicated Clean Air System - Internal Energy Recovery - Ducted Return

INTEGRATION DRAWING - PROPOSED CASE 3B - DEDICATED CLEAN AIR SYSTEM - INTERNAL ENERGY RECOVERY - DUCTED RETURN

CONDITIONS

1. HLR Module(s) are integrated with a Dedicated Clean Air System (DCAS) located in a mechanical room.
2. Scheduled Return Air flow is equal to the Clean Air flow of the HLR Module(s).
3. Outside Air and Return Air/Clean Air are directly ducted to the mixing section of the DCAS.
4. The DCAS supplies Mixed Air.



HLR–100Z DIAGRAM KEYNOTES

1. RETURN AIR
   1. HLR MODULE DRAWS RETURN AIR FROM THE DEDICATED CLEAN AIR SYSTEM RETURN AIR DUCT MAIN.
2. OUTSIDE AIR
   1. CONTROLLED BY BUILDING MANAGEMENT SYSTEM TO PROVIDE MINIMUM OUTSIDE AIRFLOW RATE DETERMINED BY THE INDOOR AIR QUALITY PROCEDURE (IAQP).
3. DEDICATED CLEAN AIR SYSTEM (DCAS)
   1. DEDICATED CLEAN AIR SYSTEM INTAKE DRAWS IN MIXED AIR (RETURN AIR, CLEANED AIR FROM HLR–100Z, AND OUTDOOR AIR).
4. HLR–100Z UNIT
   1. REFER TO PAGE 3 AND 4 FOR UNIT DIMENSIONS AND COMPONENTS. MAINTAIN 3'–0" (0.915m) CLEARANCE FROM FILTER ACCESS PANEL FOR MAINTENANCE AND FILTER REMOVAL.
   2. HLR–100Z INTERNAL FAN CAN PROVIDE 0.60" W.C. (150 Pa) OF EXTERNAL STATIC PRESSURE.
5. RETURN AIR/CLEAN AIR CONNECTION
   1. RETURN AIR/CLEAN AIR CONNECTION TO THE DEDICATED CLEAN AIR SYSTEM MUST BE DOWNSTREAM OF THE ENERGY RECOVERY DEVICE AND UPSTREAM OF HEATING AND COOLING COILS FOR MIXING WITH PRE–CONDITIONED OUTSIDE AIR.

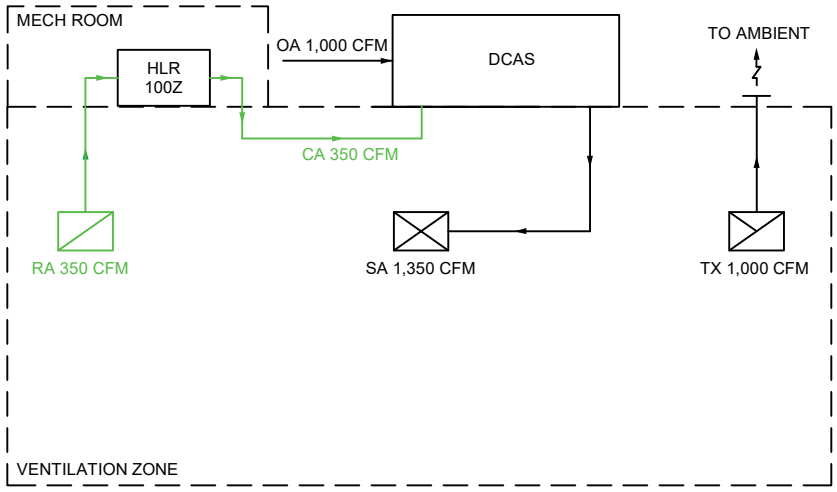
LEGEND	
SA	SUPPLY AIR
RA	RETURN AIR
MA	MIXED AIR
OA	OUTDOOR AIR
CA	CLEAN AIR
IA	INDOOR AIR
EA	EXHAUST AIR
VD	VOLUME DAMPER

Proposed Case 3C: Dedicated Clean Air System - No Energy Recovery

PROPOSED CASE 3C

CONDITIONS

1. Same as Proposed Case 3B, but no energy is recovered from Toilet Exhaust (TX).



LOAD REDUCTION IMPACT

1. Downsized heating and cooling coils and respective central plant equipment (if applicable).
2. Downsized Supply Fan and respective ductwork.
3. Downsized or eliminated Relief Section/General Exhaust Fan.
4. Eliminated energy recovery, in compliance with ASHRAE 90.1 and/or International Energy Conservation Code (IECC):
    a. Prescriptive Compliance Path: Energy recovery is no longer required if Outside Air is less than a certain percentage of total Supply Air. See Table 6.5.6.1 of ASHRAE 90.1 - 2013 or Table C403.2.7 of IECC.
    b. Performance-based Compliance Path: Energy recovery is no longer required if the annual energy use of the proposed case energy model (i.e. building with HLR modules and ventilation rate calculated per IAQP) is less than the annual energy use of the ASHRAE 90.1 baseline case energy model (i.e. building with ventilation calculated per VRP and 50% energy recovery effectiveness.) See Appendix B -ASHRAE 90.1 - 2013 Compliance Pathways Flow Chart for more information.

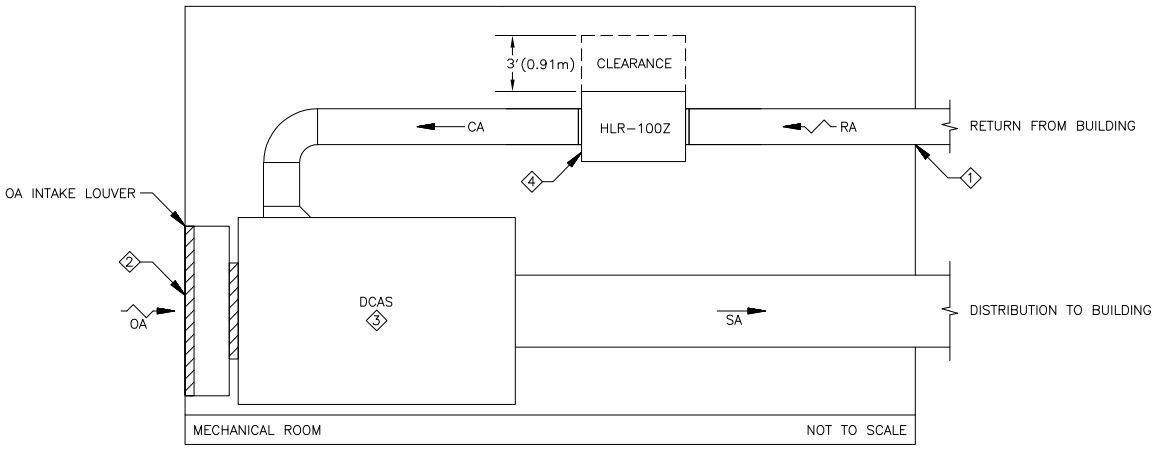
INTEGRATION DRAWING REFERENCE

Integration Drawing - Proposed Case 3C - Dedicated Clean Air System - No Energy Recovery

INTEGRATION DRAWING - PROPOSED CASE 3C - DEDICATED CLEAN AIR SYSTEM - NO ENERGY RECOVERY

CONDITIONS

1. HLR Module(s) are integrated with a Dedicated Clean Air System (DCAS) located in a mechanical room.
2. Scheduled Return Air flow is equal to the Clean Air flow of the HLR Module(s).
3. Outside Air and Return Air/Clean Air are directly ducted to the mixing section of the DCAS.
4. The DCAS supplies Mixed Air.



LEGEND	
SA	SUPPLY AIR
RA	RETURN AIR
MA	MIXED AIR
OA	OUTDOOR AIR
CA	CLEAN AIR
VD	VOLUME DAMPER

HLR–100Z DIAGRAM KEYNOTES

1 RETURN AIR

1. DUCTED CONNECTION FROM AHU RETURN AIR DUCT TO HLR MODULE RETURN AIR INLET.

2 OUTSIDE AIR

1. CONTROLLED BY BUILDING MANAGEMENT SYSTEM TO MAINTAIN INDOOR AIR QUALITY PROCEDURE (IAQP) MINIMUM OUTSIDE AIRFLOW RATE.

3 DEDICATED CLEAN AIR SYSTEM

1. DEDICATED CLEAN AIR SYSTEM INTAKE DRAWS MIXED AIR (RETURN AIR/CLEANED AIR FROM HLR–100Z, AND OUTDOOR AIR).

4 HLR–100Z UNIT

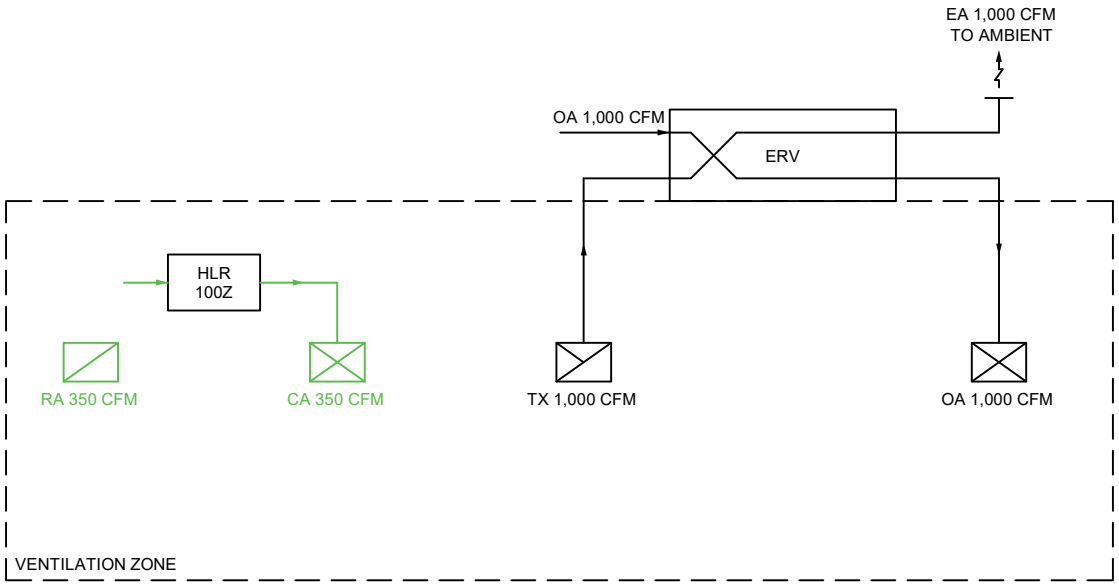
1. A STRAIGHT DUCT RUN OF (3) HYDRAULIC DIAMETERS IS RECOMMENDED ON THE INLET AND OUTLET OF THE UNIT.
2. REFER TO PAGE 3 AND PAGE 4 FOR UNIT DIMENSIONS AND COMPONENTS. MAINTAIN 3'–0" (0.915m) CLEARANCE FROM RETURN AIR INTAKE. MAINTAIN 3'–0" (0.915m) CLEARANCE FROM FILTER ACCESS PANEL FOR MAINTENANCE AND FILTER REMOVAL.

Proposed Case 3D: 100% Outside Air System - Energy Recovery - Decoupled HLR Module(s) - Single Zone

PROPOSED CASE 3D

CONDITIONS

1. Downsized Dedicated Outside Air System providing conditioned Outside Air with a downsized Energy Recovery section.
    a. Minimum OA and minimum CA flow rates are calculated per ASHRAE 62.1 - Indoor Air Quality Procedure.
2. HLR Module(s) installed decoupled, within the ventilation zone.
3. Energy is recovered from Toilet Exhaust (TX).



LOAD REDUCTION IMPACT

1. Downsized heating and cooling coils and respective central plant equipment (if applicable).
2. Downsized Outside Air intake and Energy Recovery section.
3. Downsized Supply Fan and respective ductwork.
4. Downsized General Exhaust Fan and respective ductwork.

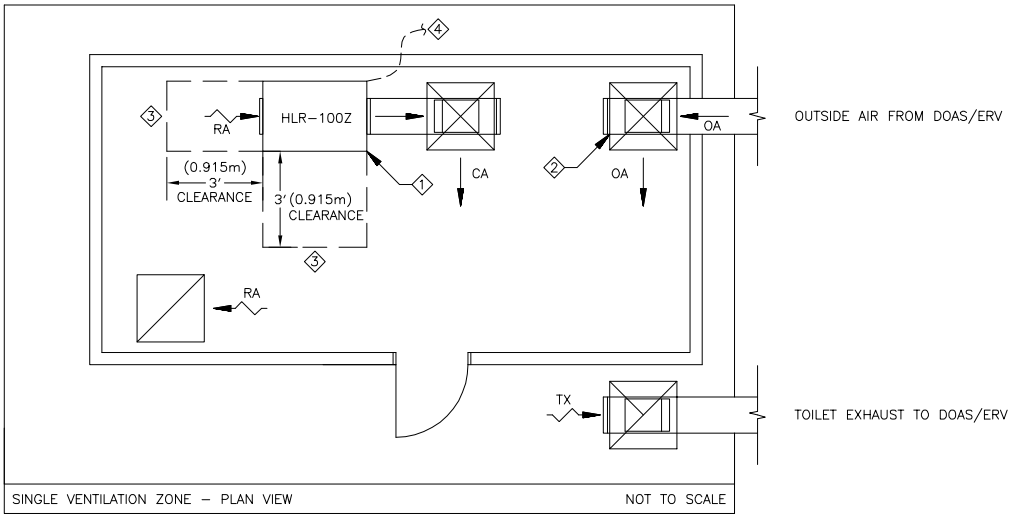
INTEGRATION DRAWING REFERENCE

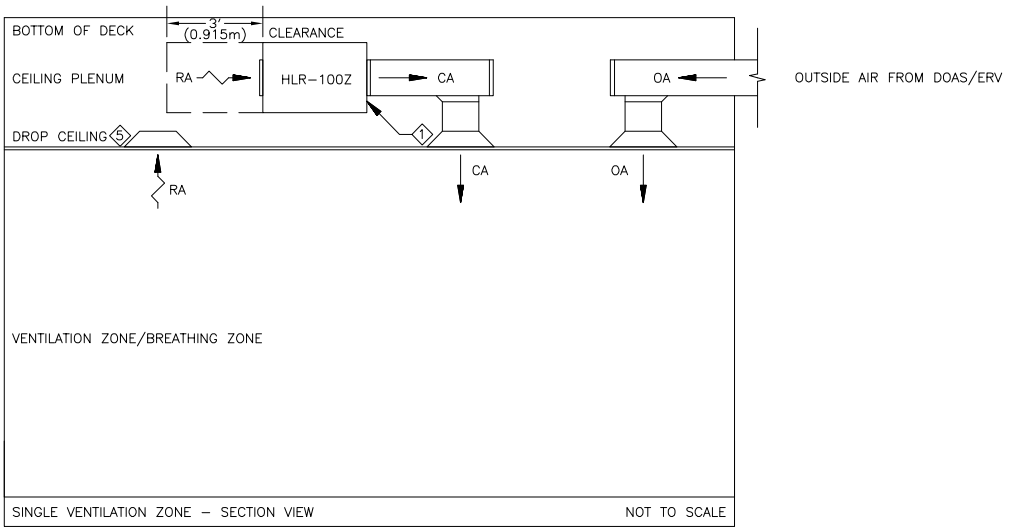
Integration Drawing - Proposed Case 3D - 100% Outside Air System - Energy Recovery - Decoupled HLR Module(s) - Single Zone

INTEGRATION DRAWING - PROPOSED CASE 3D - 100% OUTSIDE AIR SYSTEM - ENERGY RECOVERY - DECOUPLED HLR MODULE(S) - SINGLE ZONE

CONDITIONS

1. HLR Module(s) are decoupled, recirculating clean air directly to the ventilation zone.
2. Outside Air is conditioned by a decoupled Dedicated Outside Air System/ Energy Recovery Ventilator.
3. Outside Air and Clean Air are directly ducted to ventilation zone.





LEGEND	
EA	EXHAUST AIR
RA	RETURN AIR
OA	OUTSIDE AIR
CA	CLEAN AIR

HLR–100Z DIAGRAM KEYNOTES

1 HLR–100Z

1. HLR MODULE DRAWS AIR FROM THE RETURN AIR INLET AND CLEANS GASEOUS CONTAMINANTS. REFER TO PAGE 3 AND PAGE 4 FOR UNIT DIMENSIONS AND COMPONENTS.

2 OUTSIDE AIR

1. OUTSIDE FOR VENTILATION PROVIDED TO SPACE VIA DISTRIBUTION FROM ASSOCIATED ERV/DOAS UNIT.

3 CLEARANCE

1. PROVIDE 3'–0" (0.915m) CLEARANCE FOR FILTER MAINTENANCE – REMOVAL AND REPLACEMENT, AND FOR PRE–FILTER, FAN, AND POWER/CONTROL ACCESS.

4 CONTROL/INTERLOCK

1. IF REQUIRED BY CONTROLS SCHEME OR PROJECT REQUIREMENTS, PROVIDE CONTROLS WIRING OR INTERLOCK TO ASSOCIATED ERV/DOAS UNIT SUCH THAT DECOUPLED MODULE POWERS ON WHILE ASSOCIATED UNIT SERVING ZONE IS OPERATING.

5 DROP CEILING

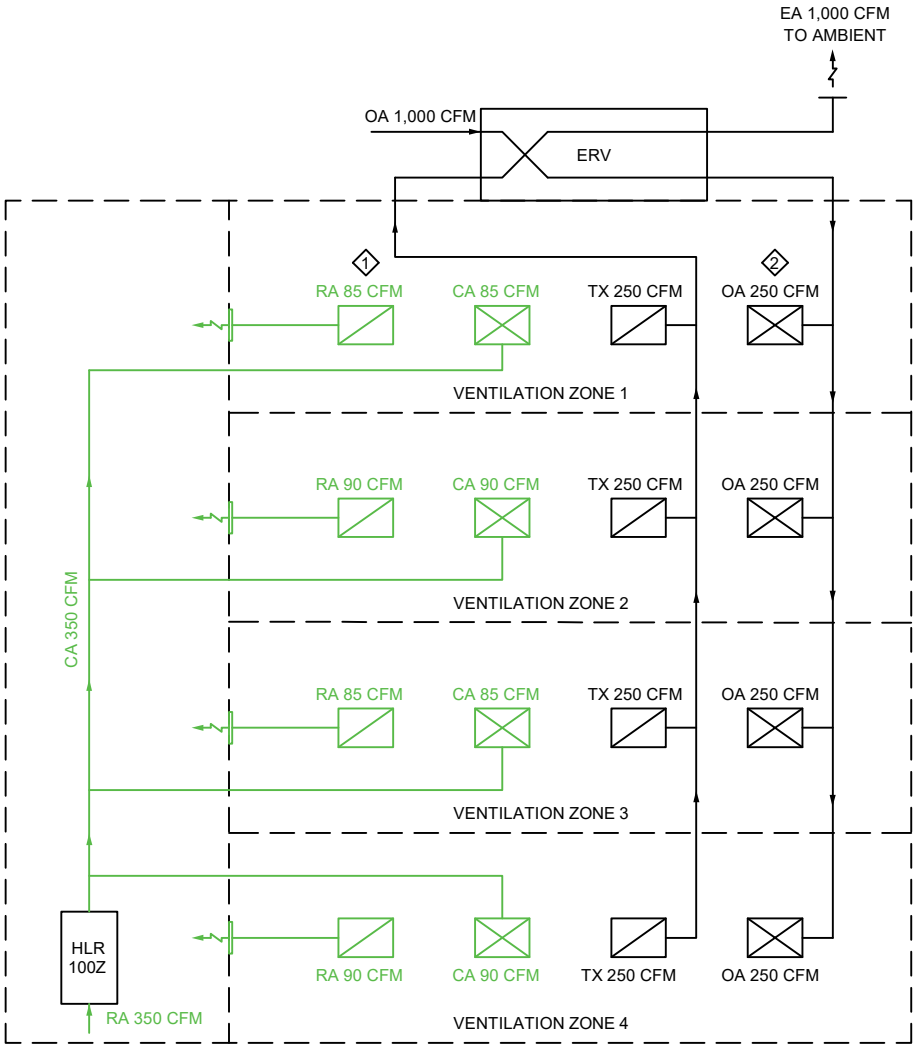
1. IF DESIGN DOES NOT HAVE DROP CEILING/CEILING PLENUM, MODULE CAN BE INSTALLED EXPOSED DIRECTLY WITHIN THE VENTILATION ZONE. DISTRIBUTION DUCTWORK AND DIFFUSER TYPE MAY CHANGE ACCORDINGLY.

Proposed Case 3E: 100% Outside Air System - Energy Recovery - Decoupled HLR Module(s) - Multi Zone

PROPOSED CASE 3E

CONDITIONS

1. Downsized Dedicated Outside Air System providing conditioned Outside Air with a downsized Energy Recovery section.
    a. Minimum OA and minimum CA flow rates are calculated per ASHRAE 62.1 - Indoor Air Quality Procedure.
2. HLR Module(s) installed decoupled, providing Clean Air directly to the ventilation zones.
3. Energy is recovered from Toilet Exhaust (TX).



CASE KEYNOTE LEGEND

1. CLEAN AIR PROVIDED TO EACH VENTILATION ZONE MAY VARY DEPENDING ON SPACE TYPE, AREA, OCCUPANCY. REFER TO RESULTS OF IAQP CALCULATIONS. HERE SHOWN EQUIVALENT IN EACH ZONE FOR DEMONSTRATION.
2. OUTSIDE AIR PROVIDED TO EACH VENTILATION ZONE MAY VARY DEPENDING ON SPACE TYPE, AREA, OCCUPANCY, AND SENSIBLE/LATENT HEATING & COOLING REQUIREMENTS. HERE SHOWN EQUIVALENT IN EACH ZONE FOR DEMONSTRATION.

LOAD REDUCTION IMPACT

1. Downsized heating and cooling coils and respective central plant equipment (if applicable).
2. Downsized Outside Air intake and Energy Recovery section.
3. Downsized Supply Fan and respective ductwork.
4. Downsized General Exhaust Fan and respective ductwork.

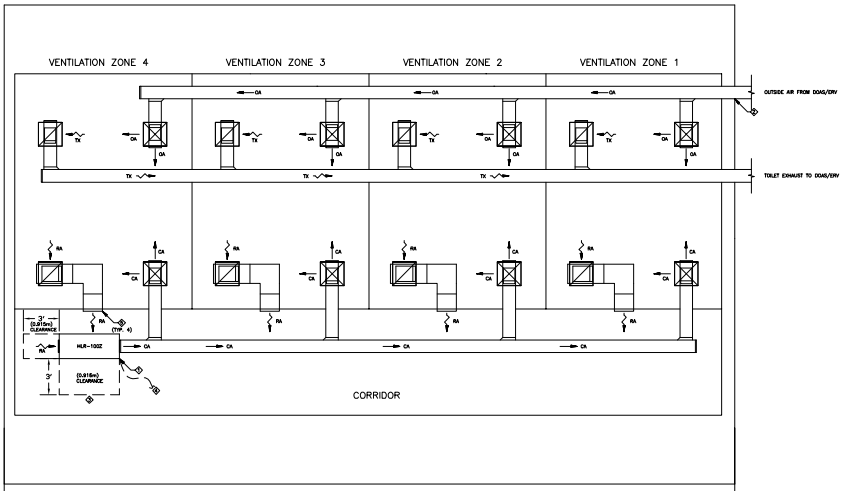
INTEGRATION DRAWING REFERENCE

Integration Drawing - Proposed Case 3E - 100% Outside Air System - Energy Recovery Decoupled HLR Module(s) - Multi Zone

INTEGRATION DRAWING - PROPOSED CASE 3E - 100% OUTSIDE AIR SYSTEM - ENERGY RECOVERY - DECOUPLED HLR MODULE(S) - MULTI ZONE

CONDITIONS

1. HLR Module(s) are decoupled, recirculating clean air directly to the ventilation zones.
2. Outside Air is conditioned by a decoupled Dedicated Outside Air System/ Energy Recovery Ventilator.
3. Outside Air and Clean Air are directly ducted to ventilation zones.



MULTI–ZONE VENTILATION ZONE – PLAN VIEW NOT TO SCALE

LEGEND	
EA	EXHAUST AIR
RA	RETURN AIR
OA	OUTSIDE AIR
CA	CLEAN AIR

HLR–100Z DIAGRAM KEYNOTES

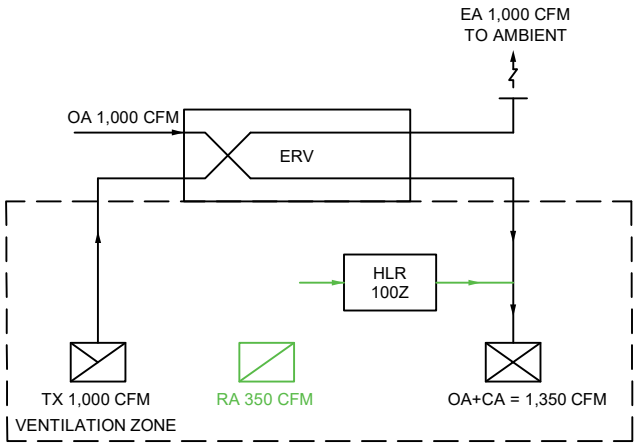
1. HLR–100Z
   1. HLR MODULE DRAWS AIR FROM THE RETURN AIR INLET AND CLEANS GASEOUS CONTAMINANTS. REFER TO PAGE 3 AND PAGE 4 FOR UNIT DIMENSIONS AND COMPONENTS.
2. OUTSIDE AIR
   1. OUTSIDE AIR FOR VENTILATION PROVIDED TO SPACE VIA DISTRIBUTION FROM ASSOCIATED ERV/DOAS UNIT.
3. CLEARANCE
   1. PROVIDE 3'–0" (0.915m) CLEARANCE FOR FILTER MAINTENANCE – REMOVAL AND REPLACEMENT, AND FOR PRE–FILTER, FAN, AND POWER/CONTROL ACCESS. PROVIDE 3'–0" CLEAR FROM RETURN AIR INLET WITHIN PLENUM SPACE, OR INSTALLED ZONE.
4. CONTROL/INTERLOCK
   1. IF REQUIRED BY CONTROLS SCHEME OR PROJECT REQUIREMENTS, PROVIDE CONTROLS WIRING OR INTERLOCK TO ASSOCIATED ERV/DOAS UNIT SUCH THAT DECOUPLED MODULE POWERS ON WHILE ASSOCIATED UNIT SERVING ZONES ARE OPERATING.
5. TRANSFER GRILLES
   1. TRANSFER GRILLES PROVIDE RETURN AIR TO CEILING PLENUM OF CORRIDOR. RETURN AIR FROM THE PLENUM TO OPEN RETURN OF HLR–100Z.

Proposed Case 3F: 100% Outside Air System - Energy Recovery - Decoupled HLR Module(s) - Single Zone

PROPOSED CASE 3F

CONDITIONS

1. Downsized Dedicated Outside Air System providing conditioned Outside Air with a downsized Energy Recovery section.
    a. Minimum OA and minimum CA flow rates are calculated per ASHRAE 62.1 - Indoor Air Quality Procedure.
2. HLR Module(s) installed decoupled, within the ventilation zone, and shares distribution ductwork to provide OA and CA directly to ventilation zone.
3. Energy is recovered from Toilet Exhaust (TX).



LOAD REDUCTION IMPACT

1. Downsized heating and cooling coils and respective central plant equipment (if applicable).
2. Downsized Outside Air intake and Energy Recovery section.
3. Downsized Supply Fan and respective ductwork.
4. Downsized General Exhaust Fan and respective ductwork.

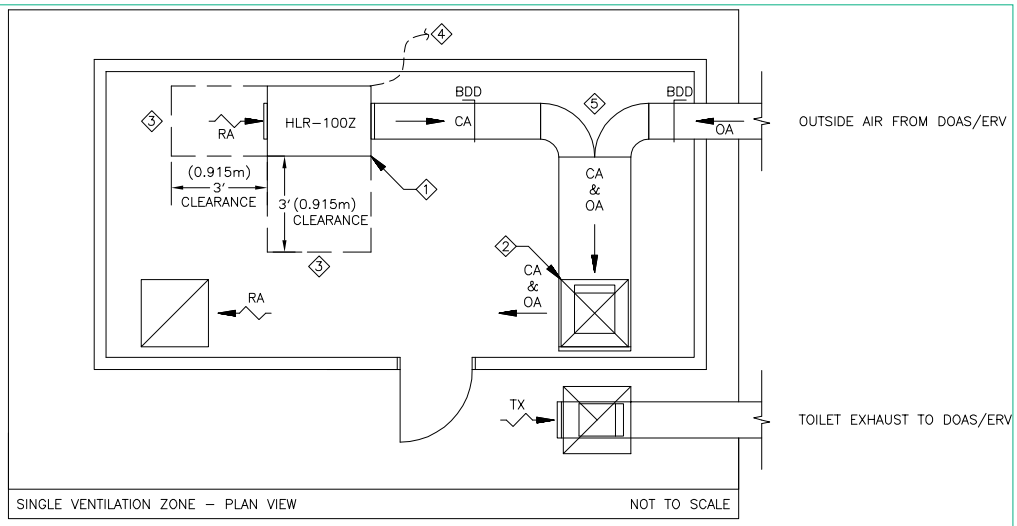
INTEGRATION DRAWING REFERENCE

Integration Drawing - Proposed Case 3F - 100% Outside Air System - Energy Recovery Decoupled HLR Module(s) - Single Zone

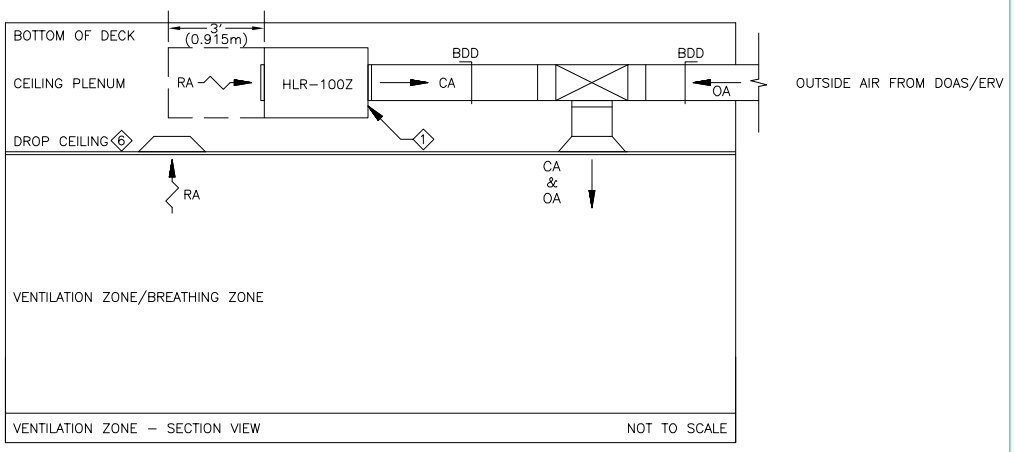
INTEGRATION DRAWING - PROPOSED CASE 3F - 100% OUTSIDE AIR SYSTEM - ENERGY RECOVERY - DECOUPLED HLR MODULE(S) - SINGLE ZONE

CONDITIONS

1. HLR Module(s) are decoupled, recirculating clean air directly to the ventilation zone.
2. Outside Air is conditioned by a decoupled Dedicated Outside Air System/ Energy Recovery Ventilator.
3. Outside Air and Clean Air are provided to ventilation zone via shared supply ductwork.



SINGLE VENTILATION ZONE – PLAN VIEW NOT TO SCALE



VENTILATION ZONE – SECTION VIEW NOT TO SCALE

LEGEND	
EA	EXHAUST AIR
RA	RETURN AIR
OA	OUTSIDE AIR
CA	CLEAN AIR
BDD	BACKDRAFT DAMPER

HLR–100Z DIAGRAM KEYNOTES

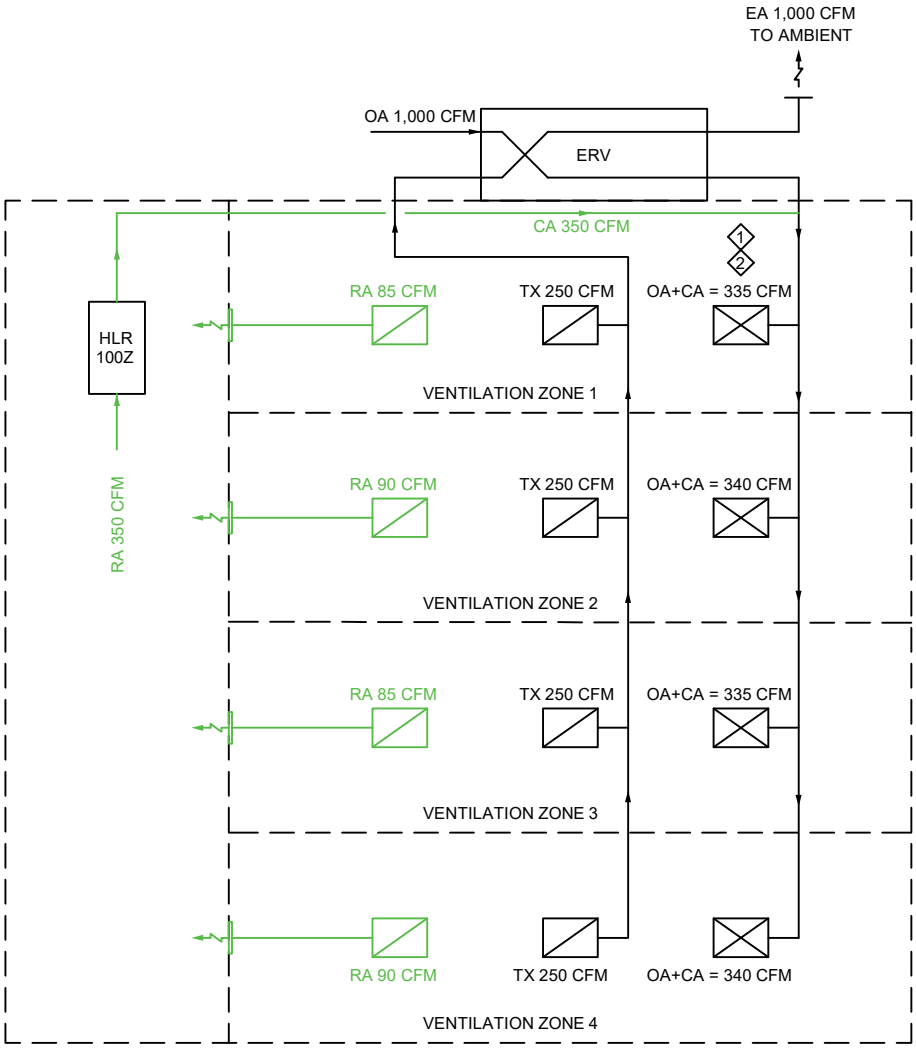
1. HLR–100Z
   1. HLR MODULE DRAWS AIR FROM THE RETURN AIR INLET AND CLEANS GASEOUS CONTAMINANTS. REFER TO PAGE 3 AND PAGE 4 FOR UNIT DIMENSIONS AND COMPONENTS.
2. OUTSIDE AIR
   1. OUTSIDE AIR FOR VENTILATION PROVIDED TO SPACE VIA DISTRIBUTION FROM ASSOCIATED ERV/DOAS UNIT.
3. CLEARANCE
   1. PROVIDE 3'–0" (0.915m) CLEARANCE FOR FILTER MAINTENANCE – REMOVAL AND REPLACEMENT, AND FOR PRE–FILTER, FAN, AND POWER/CONTROL ACCESS. PROVIDE 3'–0" CLEAR FROM RETURN AIR INLET WITHIN PLENUM SPACE, OR INSTALLED ZONE.
4. CONTROL/INTERLOCK
   1. IF REQUIRED BY CONTROLS SCHEME OR PROJECT REQUIREMENTS, PROVIDE CONTROLS WIRING OR INTERLOCK TO ASSOCIATED ERV/DOAS UNIT SUCH THAT DECOUPLED MODULE POWERS ON WHILE ASSOCIATED UNIT SERVING ZONE IS OPERATING.
5. CLEAN AIR & OUTSIDE AIR SHARED DISTRIBUTION
   1. PROVIDE BACKDRAFT DAMPERS ON BOTH CLEAN AIR DUCTWORK AND OUTSIDE AIR DUCTWORK SUCH THAT BACK PRESSURE DOES NOT CAUSE AIRFLOW IN OPPOSITE DIRECTION OF DISTRIBUTION DUCTWORK. ENSURE BDD IS RATED FOR THE STATIC PRESSURES OF THE OPERATING SYSTEMS. CLEAN AIR AND OUTSIDE AIR TO MIX WITHIN DUCTWORK FOR SHARED DISTRIBUTION TO VENTILATION ZONE.
6. DROP CEILING
   1. IF DESIGN DOES NOT HAVE DROP CEILING/CEILING PLENUM, MODULE CAN BE INSTALLED EXPOSED DIRECTLY WITHIN THE VENTILATION ZONE. DISTRIBUTION DUCTWORK AND DIFFUSER TYPE MAY CHANGE ACCORDINGLY.

Proposed Case 3G: 100% Outside Air System - Energy Recovery - Decoupled HLR Module(s) - Multi Zone

PROPOSED CASE 3G

CONDITIONS

1. Downsized Dedicated Outside Air System providing conditioned Outside Air with a downsized Energy Recovery section.
    a. Minimum OA and minimum CA flow rates are calculated per ASHRAE 62.1 - IAQP.
2. HLR Module(s) installed decoupled, within the ventilation zones, and shares distribution ductwork to provide OA and CA directly to ventilation zones.
3. Energy is recovered from Toilet Exhaust (TX).



CASE KEYNOTE LEGEND

1. CLEAN AIR PROVIDED TO EACH VENTILATION ZONE MAY VARY DEPENDING ON SPACE TYPE, AREA, OCCUPANCY. REFER TO RESULTS OF IAQP CALCULATIONS. HERE SHOWN EQUIVALENT IN EACH ZONE FOR DEMONSTRATION.
2. OUTSIDE AIR PROVIDED TO EACH VENTILATION ZONE MAY VARY DEPENDING ON SPACE TYPE, AREA, OCCUPANCY, AND SENSIBLE/LATENT HEATING & COOLING REQUIREMENTS. HERE SHOWN EQUIVALENT IN EACH ZONE FOR DEMONSTRATION.

LOAD REDUCTION IMPACT

1. Downsized heating and cooling coils and respective central plant equipment (if applicable).
2. Downsized Outside Air intake and Energy Recovery section.
3. Downsized Supply Fan and respective ductwork.
4. Downsized General Exhaust Fan and respective ductwork.

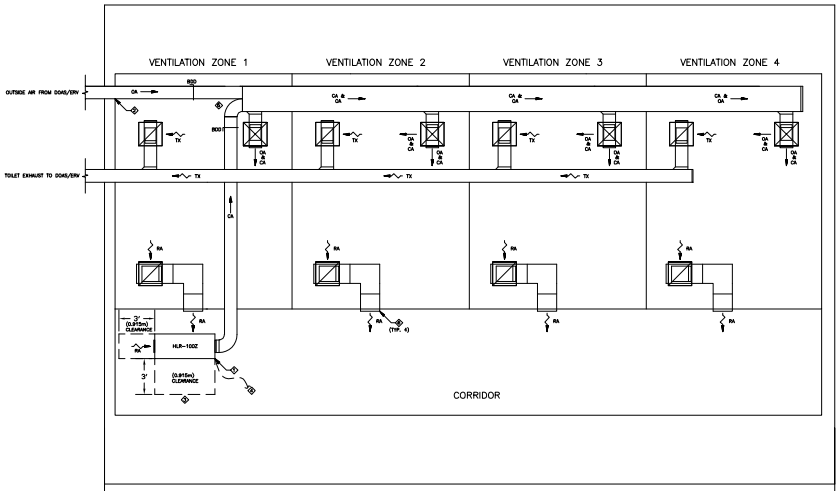
INTEGRATION DRAWING REFERENCE

Integration Drawing - Proposed Case 3G - 100% Outside Air System - Energy Recovery Decoupled HLR Module(s) - Multi Zone

INTEGRATION DRAWING - PROPOSED CASE 3G - 100% OUTSIDE AIR SYSTEM - ENERGY RECOVERY - DECOUPLED HLR MODULE(S) - MULTI ZONE

CONDITIONS

1. HLR Module(s) are decoupled, recirculating clean air directly to the ventilation zone.
2. Outside Air is conditioned by a decoupled Dedicated Outside Air System/ Energy Recovery Ventilator.
3. Outside Air and Clean Air are provided to ventilation zones via shared supply ductwork.



MULTI–ZONE VENTILATION ZONE – PLAN VIEW NOT TO SCALE

LEGEND	
EA	EXHAUST AIR
RA	RETURN AIR
OA	OUTSIDE AIR
CA	CLEAN AIR
BDD	BACKDRAFT DAMPER

HLR–100Z DIAGRAM KEYNOTES

1. HLR–100Z
   1. HLR MODULE DRAWS AIR FROM THE RETURN AIR INLET AND CLEANS GASEOUS CONTAMINANTS. REFER TO PAGE 3 AND PAGE 4 FOR UNIT DIMENSIONS AND COMPONENTS.
2. OUTSIDE AIR
   1. OUTSIDE AIR FOR VENTILATION PROVIDED TO SPACE VIA DISTRIBUTION FROM ASSOCIATED ERV/DOAS UNIT.
3. CLEARANCE
   1. PROVIDE 3'–0" (0.915m) CLEARANCE FOR FILTER MAINTENANCE – REMOVAL AND REPLACEMENT, AND FOR PRE–FILTER, FAN, AND POWER/CONTROL ACCESS.
4. CONTROL/INTERLOCK
   1. IF REQUIRED BY CONTROLS SCHEME OR PROJECT REQUIREMENTS, PROVIDE CONTROLS WIRING OR INTERLOCK TO ASSOCIATED ERV/DOAS UNIT SUCH THAT DECOUPLED MODULE POWERS ON WHILE ASSOCIATED UNIT SERVING ZONE IS OPERATING.
5. CLEAN AIR & OUTSIDE AIR SHARED DISTRIBUTION
   1. PROVIDE BACKDRAFT DAMPERS ON BOTH CLEAN AIR DUCTWORK AND OUTSIDE AIR DUCTWORK SUCH THAT BACK PRESSURE DOES NOT CAUSE AIRFLOW IN OPPOSITE DIRECTION OF DISTRIBUTION DUCTWORK. ENSURE BDD IS RATED FOR THE STATIC PRESSURES OF THE OPERATING SYSTEMS. CLEAN AIR AND OUTSIDE AIR AIR TO MIX WITHIN DUCTWORK FOR SHARED DISTRIBUTION TO VENTILATION ZONE.
6. TRANSFER GRILLES
   1. TRANSFER GRILLES PROVIDE RETURN TO CEILING PLENUM OF CORRIDOR. RETURN AIR FROM THE PLENUM TO OPEN RETURN OF HLR–100Z.

Section 4 – Installation Configurations

Introduction

This section provides an overview of the different configurations the HLR module can be installed in. The HLR 100Z, can be mounted on the floor, hung from a ceiling, or mounted on another structural element. Please refer to the "Installation Section" in the installation manual for detailed installation instructions and clearance requirements. *Note: The filter door should not face downwards in any installation. The HLR Module should not be placed in egress spaces and should be easily accessible for service and maintenance.*

Floor-Mounted

Floor-mounted units should be installed horizontally as shown in the schematic below, with the installation of included threaded feet. Vibration isolation and concrete housekeeping pads for floor mounted units are left to the discretion and designed requirements as specified by the engineer on record.

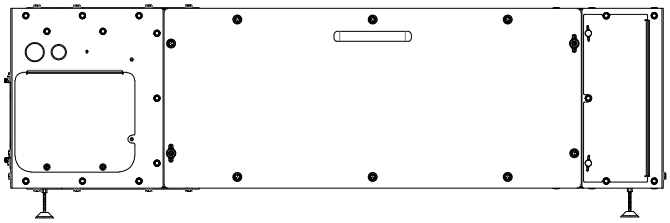


Figure 4.1: Floor-mounted HLR 100Z with factory-included threaded feet.

Other Mounting Configurations

The modules can be suspended either horizontally or vertically mounted to struts. For vertical floor-mounted (Figure 4.2), the module is supported by factory-included threaded feet. For vertical suspended (Figure 4.3), the module must be supported from both sides, using all eight (8) mounting bolts. For horizontal suspended (Figure 4.4), the module can be supported from the top, bottom, or both. (4) Brackets are included for hanging the unit, which can be attached at the 8 threaded hole locations.

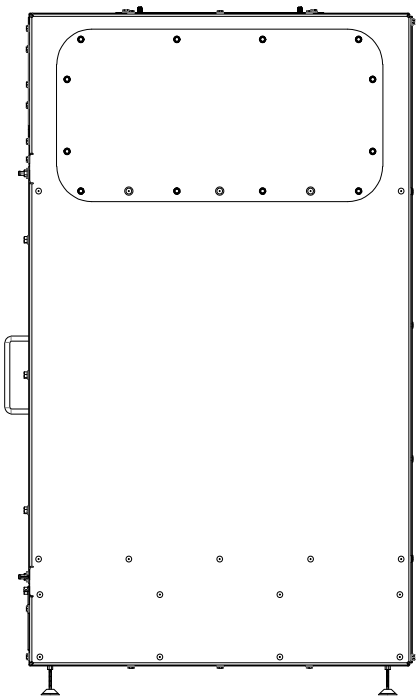


Figure 4.2: Vertically floor-mounted configuration.

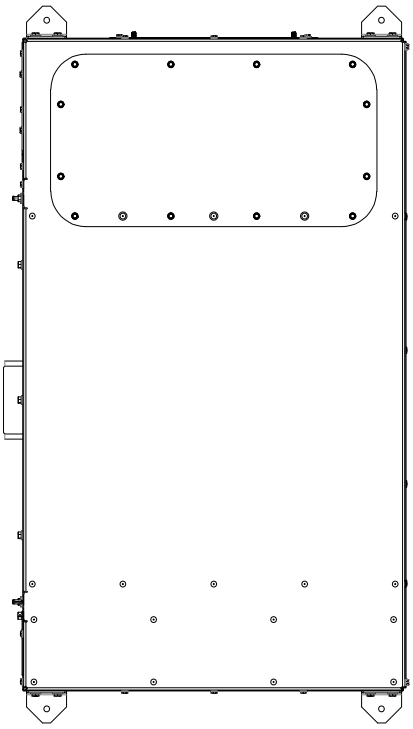


Figure 4.3: Vertically hung configuration.

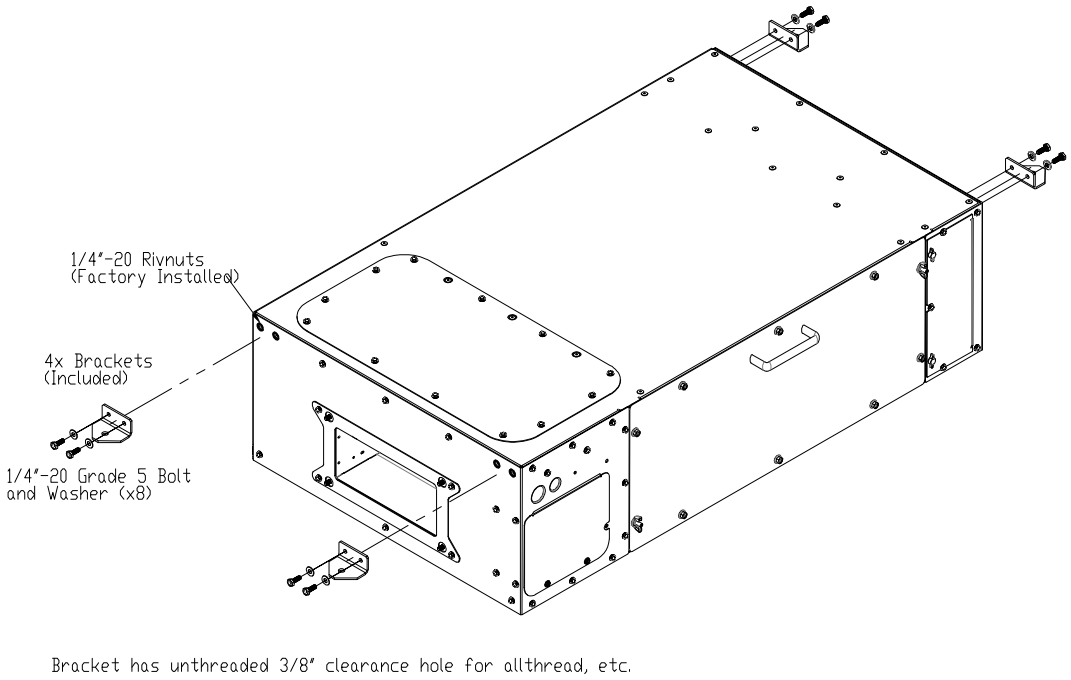


Figure 4.4: Horizontally hung configuration.

Section 5 – HLR Module Ductwork Connections

Introduction

Inducing flow through HLR Module

Inducing a side stream airflow in a heavily negative pressure return duct main presents unique duct design challenges. enVerid has identified two solutions commonly used by designers and which have been deployed in the field.

These methods are not required, and HLR Modules ducted conventionally with return are systems will function as intended, below measures are suggestions for improved operation.

Subduct Solution

Installing a subduct into the return duct air stream can help direct flow into the HLR return air intake. The branch connection to the HLR protrudes through the main return duct wall and into the airstream to direct the flow into the branch. Please see Figure 5.1 below describing the solution.

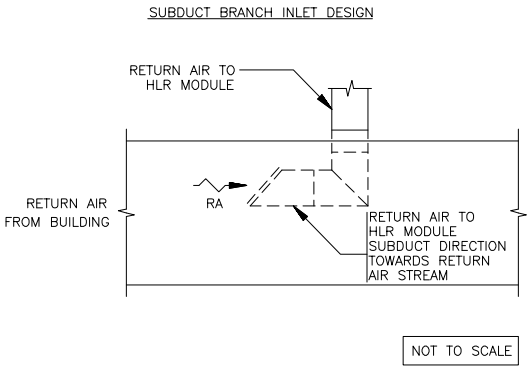


Figure 5.1: Subduct Branch Inlet

Venturi Effect—duct upsizing Solution

An increase in the cross-sectional area of the main return duct in the localized section where the HLR return air inlet branch connection occurs will cause the velocity of the air flow in that section to decrease, resulting in an increase in static pressure in that duct section—the venturi effect. As the duct returns to its original design size; the static pressure decreases as the velocity increases. This will cause a pressure differential across the HLR unit inlet and outlet connections, which will assist the induction of flow through the unit. An increase in in cross-sectional area of >= 30% recommended. Please see Figure 5.2 below showing the venturi effect.

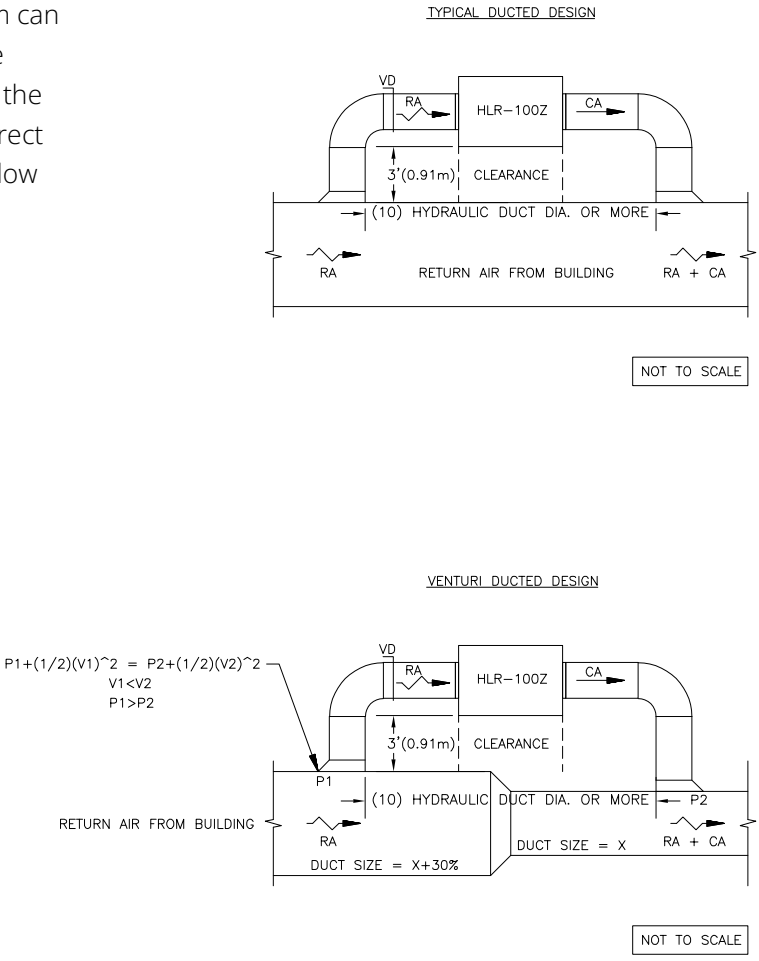


Figure 5.2: Venturi Flow Induction

About enVerid

enVerid Systems, the leading provider of sustainable indoor air quality (IAQ) solutions, helps buildings achieve indoor air quality goals, save money, and reduce energy consumption and carbon emissions. Its flagship HVAC Load Reduction® (HLR®) modules are award-winning air cleaners that deliver up to 40% HVAC energy savings and superior indoor air quality in new and existing buildings. For new HVAC systems, HLR modules also enable immediate capital cost savings. At the core of all HLR modules is enVerid Sorbent Ventilation Technology® (SVT®), uniquely designed to capture gaseous contaminants that degrade indoor environmental quality. enVerid's products are deployed in commercial, academic, and government buildings globally. Its air cleaning products are ASHRAE Standard 62.1, LEED® and WELL compliant and eligible for utility rebates. For more information, please visit enverid.com

Technical Support

For additional support required during installation or operation, please contact *enVerid Technical Support*:

enverid.com

+1.617.795.4000

info@enverid.com