

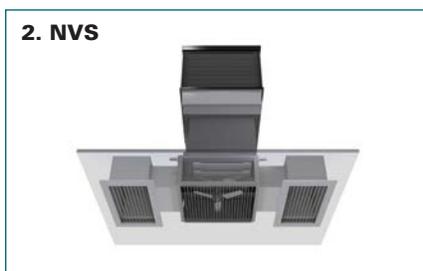
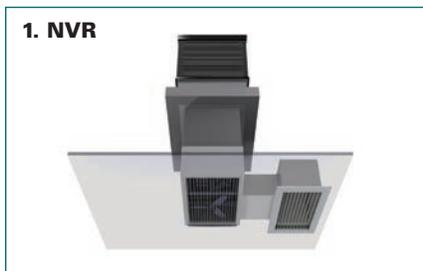
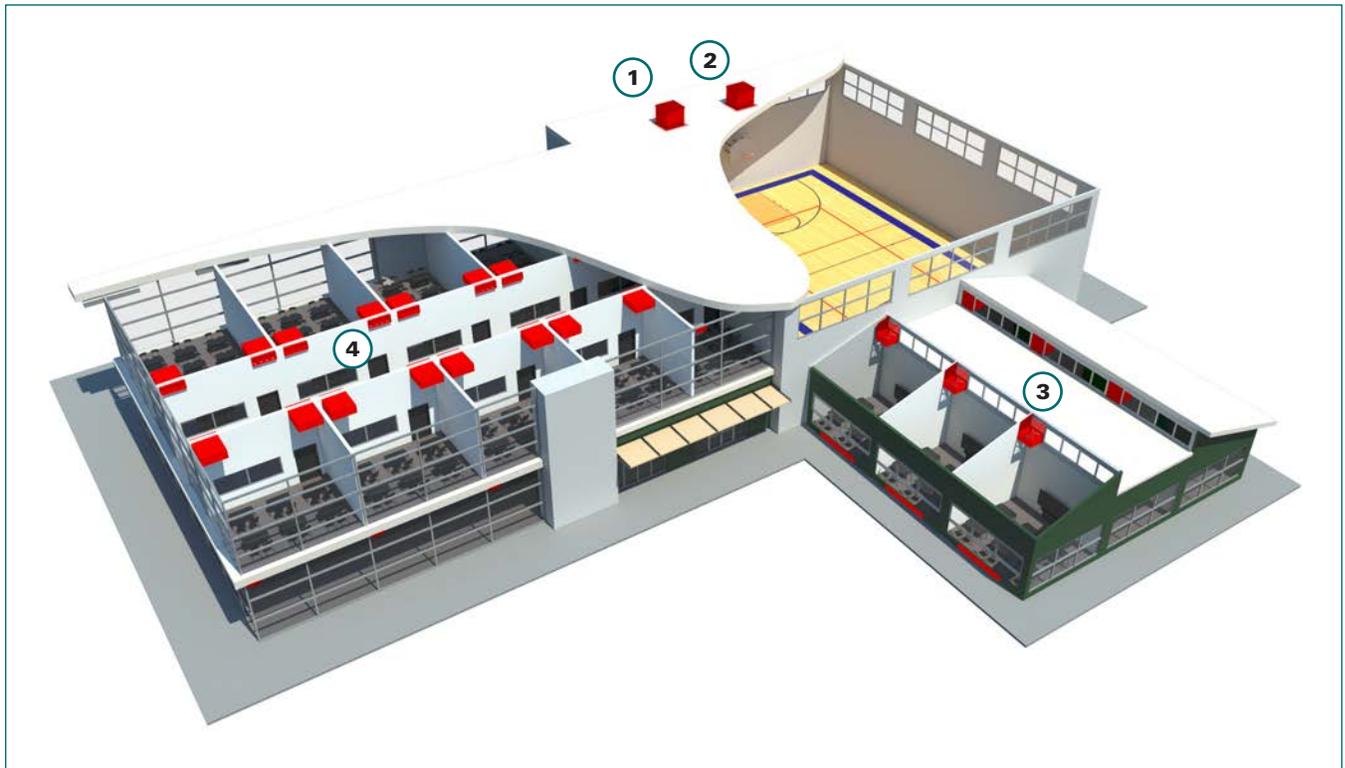
# Natural Ventilation Systems NVR / NVS / NVF / NVA

## Product Overview

### Models

Rectangular Roof Stack Unit	<b>NVR</b>
Square Roof Stack Unit	<b>NVS</b>
Facade Mounted Natural Vent	<b>NVF</b>
Wall Mounted Transfer Unit	<b>NVA</b>

The Price natural ventilation system operates under a natural upwards displacement strategy in summer and a high level mixing mode in winter. The winter mode exploits the heat gains in the building to temper the incoming fresh air, dramatically reducing the heating energy required for the building while reducing the risk of drafts.



## Product Information

### Models

Square Roof Stack Unit **NVS**

The Price natural ventilator, model NVS, is a ceiling mounted unit which is designed to relieve air to the outdoors in cooling mode and exchange air with the outdoors in heating mode. The NVS features an integral low energy mixing fans which serves to draw air through the roof opening when a "boost" is required in cooling mode, as well as disrupt cool air motion in heating mode, thereby reducing the risk of drafts. A wide variety of grille finishes and constructions are available to assist in blending in with the aesthetic of the occupied space.

Available with a penthouse louver, the NVS offers a packaged solution to simplify the selection and design of natural ventilation systems.

### Features

- Low power mixing fans for winter mixing mode and summer exhaust boost
- Insulated low leakage damper with spring return modulating actuator
- Thermostat with CO<sub>2</sub> sensor
- Exterior temperature sensor
- Internal controller to respond to environmental conditions
- Control signals for automated actuation of high/low level openings

### Options

- Penthouse louver with bird mesh
- Integral noise attenuation
- Configuration
  - Exposed
  - Concealed (bulkhead)
  - Concealed (T-bar ceiling)
- Finish
  - Mill
  - B12 (White)
- Configuration
  - Exposed Configuration
  - Concealed with Ducted Connections
- Grilles
  - LBM / LBP Series
  - 520 / 620 Series

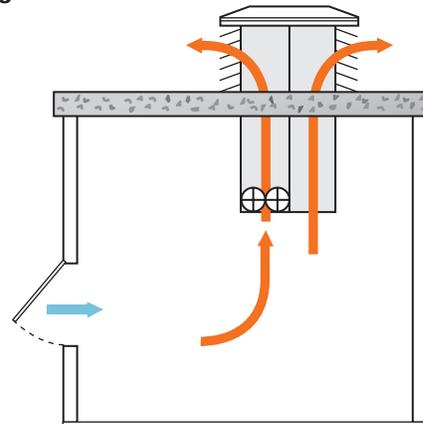
### System Options

- Supplemental heat control
- Indicator light for window operation

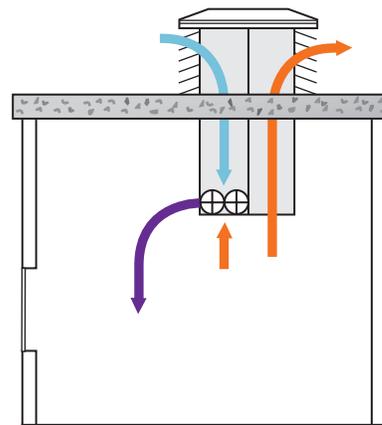
### Model NVS



### Air Flow Strategies



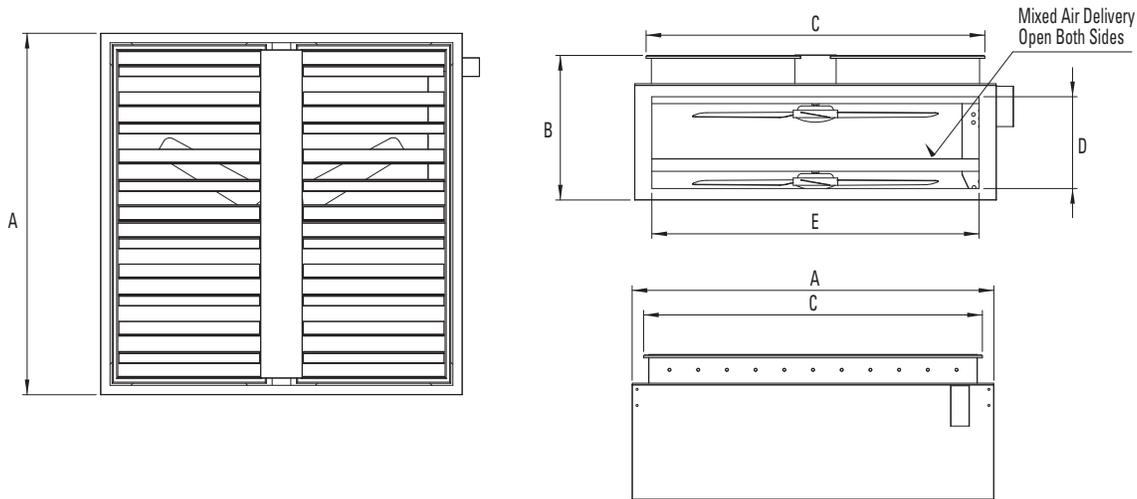
Summer Strategy - Upwards Displacement Ventilation



Winter Strategy - Winter Mixing Ventilation

## Dimensional Data

### NVS - Square Roof Stack Unit



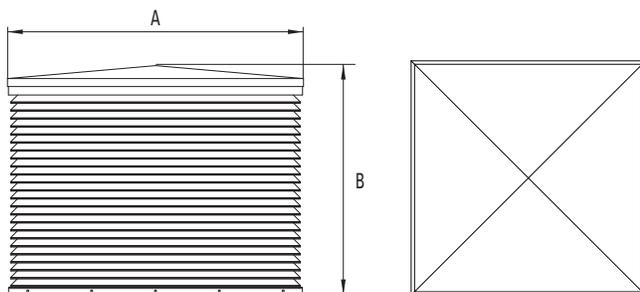
**Dimensional Data - Imperial (inches)**

	NVS 1200	NVS 1500
A	50 1/4	62
B	24 3/4	24 3/4
C	46 1/4	58
D	15 3/4	15 3/4
E	44 1/4	56

**Dimensional Data - Metric (mm)**

	NVS 1200	NVS 1500
A	1275	1575
B	630	630
C	1175	1475
D	400	400
E	1125	1425

### Penthouse Louver



**Dimensional Data - Imperial (inches)**

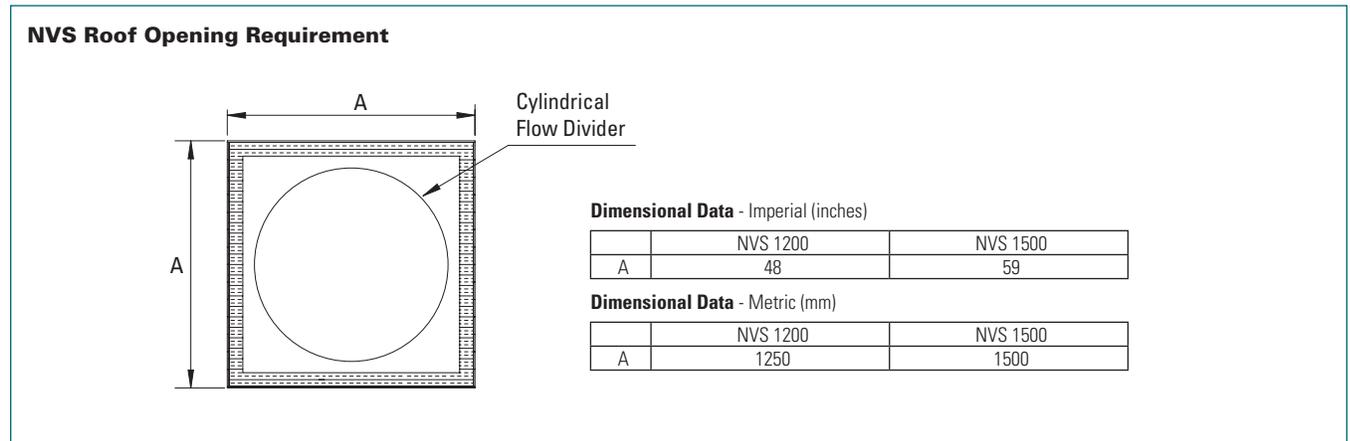
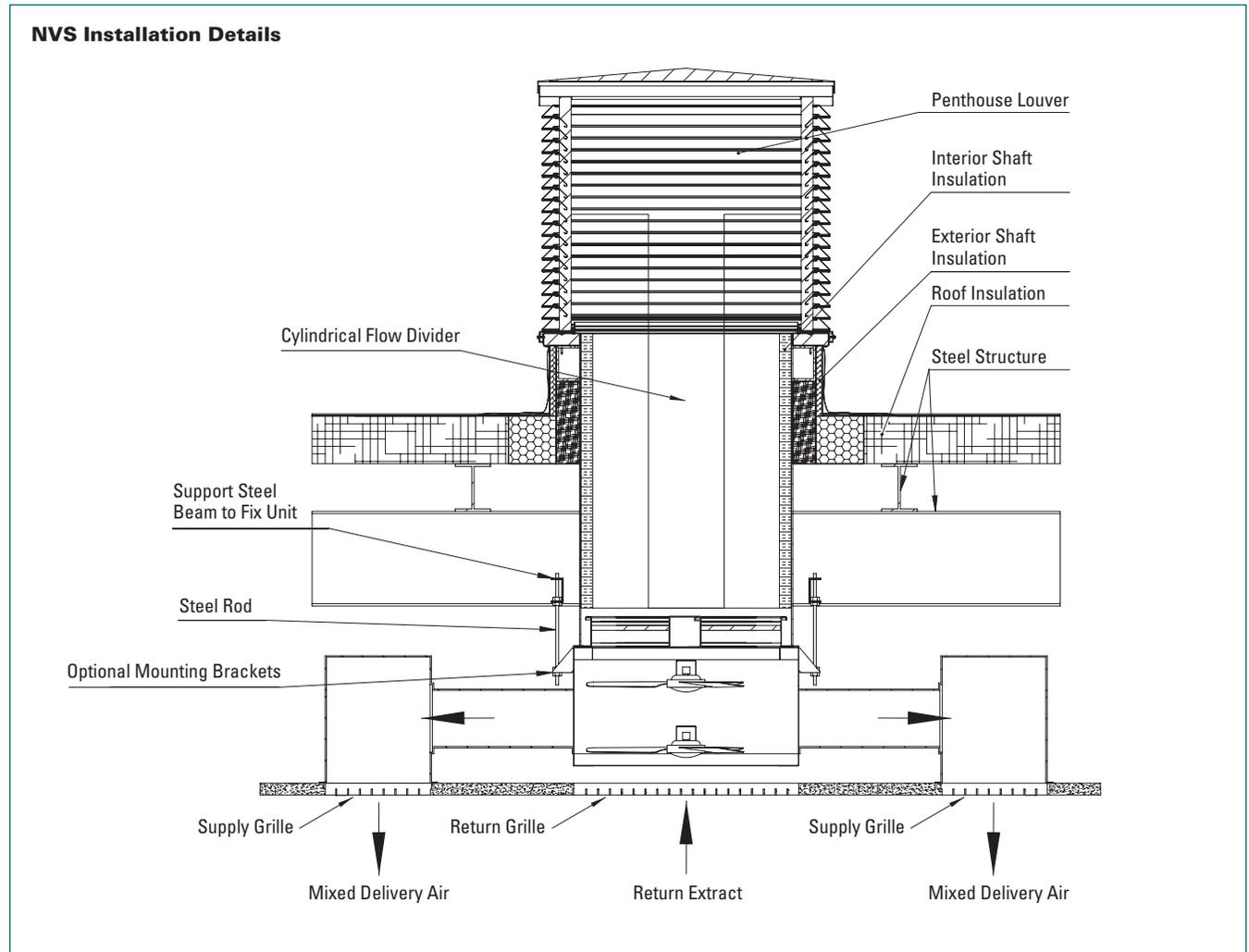
	NVS 1200	NVS 1500
A	59	70 3/4
B	56 1/2	56 1/2

**Dimensional Data - Metric (mm)**

	NVS 1200	NVS 1500
A	1500	1800
B	1433	1433

Note: Dimensions are typical and can be modified based on project requirements

## Installation Details



## Performance Data - Cooling Mode

Configuration	Air Volume cfm [L/s]			Effective Area ft <sup>2</sup> [m <sup>2</sup> ]
	5 [3]	10 [6]	15 [8]	
Temperature Differential °F [°C]				A*
Base Unit S1200	858 [405]	1208 [570]	1396 [659]	7.2 [0.67]
Base Unit S1200 (fan assist-no wind)	1070 [505]	1208 [570]	1396 [659]	7.2 [0.67]
Base Unit S1200 (weak wind)	1144 [540]	1434 [677]	1596 [753]	7.2 [0.67]
Base Unit S1200 (mild wind)	2471 [1166]	2615 [1234]	2706 [1277]	7.2 [0.67]
Base Unit S1500 (fan assist-no wind)	1227 [579]	1735 [819]	2002 [945]	11.6 [1.08]
Base Unit S1500 (weak wind)	1653 [780]	2060 [972]	2288 [1080]	11.6 [1.08]
Base Unit S1500 (mild wind)	3545 [1673]	3750 [1770]	3882 [1832]	11.6 [1.08]

### Performance Notes:

- Distance between mid-height of NVS roof termination and low level openings (Window / NVT) is 12 ft (3.7 m).
- Size (A\*) of low level openings is equivalent to A\* of the NVS.
- Weak wind is assumed 5 mph (8km/hr), mild wind 15mph (24 km/hr). 20% of the potential wind energy is assumed to assist airflow.

## Performance Data - Winter Mode

Configuration	Air Volume cfm [L/s]		
	1:0	1:1	1:2
Mixing Ratio (Ventilation : Room Air Recirculation)			
Base unit S1200	N/A	212 [100]	N/A
Base unit S1500	487 [230]	466 [220]	318 [150]

## Performance Data - Typical Attenuator

Insertion Loss (dB) Measured at Octave Band Center Frequencies							
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
1	2	3	4	9	13	9	8

### Performance Notes:

- Obtained in accordance with ASTM E477-06a.
- Silencer selection can be modified for custom applications.

## Performance Data - Sound Power Levels

### Sound Power Levels NVS S1200

Frequency (Hz)	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Overall
Winter Mode - Slow	32	35	29	26	20	16	18	23	29
Winter Mode - Fast	39	44	38	36	32	23	19	23	37
Summer Fan Assist	33	39	35	36	32	23	19	23	36

### Sound Power Levels NVS S1500

Frequency (Hz)	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Overall
Winter Mode - Slow	41	42	39	38	34	24	-	-	38.7
Winter Mode - Fast	46	47	44	42	40	30	-	-	43.5
Summer Fan Assist	41	41	40	40	38	28	-	-	41.1

### Performance Notes:

- This is radiated sound power.
- Denotes results at ambient levels during testing.

## NVR / NVS Roof Mounted Natural Ventilation Stack

### SECTION 23 06 30 – PRODUCT

#### PART 1 - GENERAL

##### 1.1 Summary

- A. This section includes the following:
  - 1. NVR/NVS Roof Mounted Natural Ventilation Stack

##### 1.2 Related Documents

- A. 23 01 00 – Operation and Maintenance of HVAC Systems
- B. 23 05 00 – Common Work Results for HVAC
- C. 23 09 00 – Instrumentation of Control for HVAC
- D. 23 20 00 – HVAC Piping and Pumps
- E. 23 30 00 – HVAC Air Distribution

##### 1.3 Submittals

- A. Product Data:
  - 1. For each type of product indicated, include rated capacities, furnished specialties and accessories.
  - 2. The system shall include a ventilation unit incorporating insulated dampers, an internal mixing system and an integral controller. The unit shall be connected to grilles in the room and to a shaft leading to an external weatherproof penthouse louver unit above.
  - 3. Each unit shall be automatically controlled via a combined temperature / CO2 sensor in each room and an external temperature sensor to determine the operation of the unit.
  - 4. A key switch with ON/OFF/TEST control of the system shall be included.
  - 5. Each room ventilated with an NVR/NVS series unit with manually operable windows shall Wall mounted panel with indicator lights for when windows should be opened or closed in each room.
  - 6. The exterior opening of NVR/NVS shall incorporate a penthouse louver that incorporates weatherproof louver with the required aerodynamic effective area to ventilate the rooms. The penthouse louver shall incorporate a protective bird screen, roof section designed to attenuate rain noise, and polyester powder paint finish to the required standard RAL color.
- B. Shop Drawings: For each type of product indicated, include the following:
  - 1. Detail equipment assemblies & indicated dimensions.
  - 2. Required clearances.
  - 3. Method of field assembly.
  - 4. Revit models
- C. Coordination Drawings: Include floor plans, and other details, drawn to scale, one which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Ceiling-mounted items including;
    - a. Fixtures
    - b. Lightning fixtures
    - c. Speakers
    - d. Sprinklers

- e. Access panels
- f. Diffusers
- g. Grilles
- h. Air inlets
- i. Perimeter molding for exposed or partially exposed cabinets.

- D. Operation and Maintenance Data: To include in emergency, operation and maintenance manuals, maintenance schedules and repair part lists for all parts.

##### 1.4 Quality Assurance

- A. Product Options: Include drawings indicating size, profiles and dimensional requirements of the natural ventilation stacks that are based on the specific system indicated.
- B. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100 by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

##### 1.5 Coordination

- A. Coordinate layout and installation of diffusers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- B. Specific configuration of the supply and return ductwork at each unit has been indicated on the drawings. If the configuration of the units furnished on the project differs from that indicated on the drawings (whether or not the units furnished are the specific units or an acceptable substitute), it shall be the contractor's responsibility to modify ductwork, etc., as required to accommodate the actual configuration of units furnished on the project.

### PART 2 – PRODUCTS

#### 2.1 General

- A. Manufacturer shall be responsible for examining applications of each type of unit to assure that each will operate properly in the intended application.
- B. Unit sizes are shown as selected in accordance with the principles set forth in the ASHRAE Guide and Manufacturer's literature.
- C. All items of a given type shall be the products of the same manufacturer.

#### 2.2 Manufactureres

- A. In Part 2 articles where titles below introduce lists, the following requirements apply to selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified. Manufacturers shall demonstrate that they have successfully supplied and installed natural ventilation products, the computer and water bath modeling thereof for a minimum of 10 years. Manufacturers must be pre-qualified to bid based on the completion of a minimum of xx jobs in similar climates. Manufacturers shall provide a list of completed jobs and references.

## NVR / NVS Roof Mounted Natural Ventilation Stack

### 2.3 NVR/NVS Roof Mounted Natural Ventilation Stack

- A. Approved Manufacturers:
  - 1. Price
  - 2. Breathing Buildings
- B. Description: Furnish and install Price model series NVR/NVS with the sizes and capacities indicated on the plans and natural ventilation stack schedule.
- C. Performance: Air shall be delivered to the space at low noise levels and low velocities that meets the fresh air ventilation requirements in accordance with ASHRAE 62.1. When external temperatures exceed a design set point, the unit will operate as an exhaust opening for buoyancy-driven natural ventilation system with provision for automatic fan assistance to when required. When the external temperature is below a design set point the unit will operate in mixing mode where incoming cool fresh air is mixed with warm interior air to minimize the risk of drafts while maintaining the design fresh air ventilation rates. The unit will be capable of automatic secure night cooling of the interior space to assist with high thermal loads.
- D. Construction: The NVR/NVS Roof mounted Natural Ventilation system shall be constructed with G90 Galvanized steel.
- E. Coating System: The finish shall be a standard galvanized finish or powder coat polyester. Epoxies and their derivatives are unacceptable.
- F. Grilles: Grilles on the openings of the NVR/NVS unit shall be supplied by Price to ensure air distribution and protection from internal rotating fans.
- G. Mixing Mode / Exhaust Boost Fans: The mixing mode and exhaust boost fans shall be quiet, low power fans capable of bidirectional rotation.
- H. Damper: The insulated low leakage damper shall include a fully modulating rotary actuator.
- I. Integral Controller: The internal controller shall operate the fans, control the damper actuator, and provide control signals for automated high / low level openings.
- J. Exterior Temperature Sensor: The outside temperature sensor shall be located on the exterior façade in a permanently shaded position. One exterior temperature sensor shall supply a signal for no more than five NVR/NVS series units.
- K. Room Temperature / CO2 Sensor: One combined room temperature and CO2 sensor shall be installed in each room containing an NVR/NVS series unit. The sensor shall be installed at eye-level and away from windows or doors in frequent use.
- L. Key Switch: An ON/OFF/TEST switch shall be included to control the mode of the R-Series unit. The TEST setting will initiate a test routine for easy inspection of the fans and damper for maintenance.
- M. Room Indicator panel: For installations with manually opening façade windows, a blue 24VDC LED shall illuminate to indicate the occupants should close the windows and a red 24VDC LED shall indicate that the occupants should open the windows.

- N. MODBUS Interface: A MODBUS interface shall connect the NVR/NVS Series unit to the BMS system. The following information shall be available to read from the unit:
  - a. External Temperature
  - b. Internal Temperature
  - c. Internal CO<sub>2</sub>
  - d. Damper Position
  - e. Top Fan Speed
  - f. Bottom Fan Speed
  - g. Room Indicator Status
- O. Mounting/Fastening: The NVR/NVS unit shall be supported by drop rods with a Unistrut cradle system or optional factory mounted support brackets.
- P. Penthouse Louvers: Penthouse louvers shall incorporate weatherproof louvers with the required effective area to ventilate the rooms. The units shall incorporate a bird guard, insulated roof section to attenuate rain noise, and a polyester powder paint finish to the required standard RAL color.
- Q. Roof Stack Section: A divided insulated shaft between each NVR/NVS Series unit and the roof termination is required and shall be provided as specified by the PRICE NVR/NVS Series installation manual.

### PART 3 – EXECUTION

#### 3.3 Installation – General

- A. Install displacement diffusers level and plumb. Maintain sufficient clearance for normal services, maintenance, or in accordance with construction drawings.
- B. Complete installation and startup checks according to manufacturer's instructions and perform the following.
  - 1. Verify that inlet duct connections are as recommended by manufacture to achieve proper performance.
  - 2. Verify that any identification tags are visible.
  - 3. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation.