YORK INTERNATIONAL CORPORATION
MECHANICAL SPECIFICATIONS
SINGLE PACKAGE ROOFTOP UNITS 25, 30 and 40 NOMINAL TONS

MILLENNIUM®
Y12/13/14*
25 TON 10 EER
30 & 40 TON 9.5 EER

GENERAL

Units shall be manufactured by York International Unitary Products Group in an ISO 9001 certified facility. Introducing the YORK Millennium 25, 30, & 40 ton rooftop line - units designed to provide peak performance and value both today and for years to come. Millennium units are manufactured at an ISO 9001 registered facility, and each rooftop is completely computer-run tested prior to shipment. The Millennium is designed to be flexible enough to meet your needs today and in the future. The true value of York's Millennium is that it can be designed to fit any need, from cooling only, constant volume applications to variable air volume systems with variable frequency drive.

DESCRIPTION

Supply York Millennium packaged rooftop system in accordance with the capacities in the plans. Units shall be rated by the manufacturer at a minimum (30/40 Ton units: 9.5 EER / 25 Ton units: 10 EER) according to ARI 360. Units shall be shipped in a single package, fully charged with R-22 refrigerant. The manufacturing facility shall be registered under ISO 9001 Quality Standards for Manufacturing. Units shall carry both ETL and CGA safety approval ratings. Tags and decals to aid in the service or indicate caution areas shall be provided. Installation and maintenance manuals shall be supplied with each unit. Units shall be capable of providing mechanical cooling down to 40°F (0°F with low ambient kit). Unit shall be capable of starting and running at 120°F. Unit electric and gas connections shall be either through the curb or the side of the unit.

CONSTRUCTION

Base
The base rail shall be constructed of 12 gauge galvanized steel, extending the full perimeter of the unit. All components shall be supported from the base, and the base shall include integral lifting lugs. The unit base rail shall overhang the roof curb for water runoff and shall have a fabricated recess with a continuous flat surface to seat on the roof curb gasket, providing a positive, weather tight seal between the unit and the curb.

Casing The unit cabinet shall be double wall construction to provide both maximum resistance to bacterial growth in the air stream and superior structural integrity. All sheet metal shall be G90 mill galvanized sheet metal, formed and reinforced to provide a rigid assembly. Sheet metal shall be cleaned in an alkaline and zinc phosphate bath, and the exterior surfaces shall be coated with a 1.5 mil powder paint, capable of withstanding 1000 salt spray hours in accordance with ASTM B-117. The unit shall be insulated with 1-1/2," 1 pound fiberglass insulation between the two sheet metal skins. Insulation shall meet NFPA-90A regulations for smoke and flame spread ratings. The cabinet corner post and the intermediate side supports shall be 16 gauge steel. All access doors shall be 18 gauge on the exterior surfaces, and 20 gauge on the interior. Floor shall be 18 gauge, and 24 gauge. All serviceable sections shall have hinged access doors with latches on both sides of the unit. All access doors shall be constructed of 20 gauge steel on the outside, with 24 gauge on the inside. Each door shall seal against a rubber gasket to prevent air and water leakage. The roof shall be double wall, with 18 gauge on the external surface and 24 gauge on the interior. The roof shall be formed with a 45 degree drip lip overhanging the sidewalls to prevent precipitation drainage from streaming down the side of the unit. Roof sections shall be connected together via integral channels fastened with screws and sealed with rubber gasketing. Each fastened seam shall be further protected by a sheet metal channel covering the full length of the gasket surface, making a completely water tight seal.

SUPPLY AIR SYSTEM

SUPPLY AIR FAN
Fans shall be centrifugal type, statically and dynamically balanced in the factory. Fan wheels shall be designed for continuous operation at the maximum rate of fan speed and motor HP. The fan and motor assembly shall be mounted on a common base to allow consistent belt tension with no relative motion between the fan and motor shafts. The entire assembly shall be isolated from the unit base with 1" (or 2" optional) deflection springs. The fan discharge shall be connected to the cabinet through a reinforced neoprene flexible connection to eliminate vibration transmission from the fan to the unit casing. Fans shall be double-width, double-inlet with forward curved blades. Fan wheels shall be a minimum of Class II construction.

OPTIONAL On variable air volume units without variable frequency drives, fans shall be provided with heavy gauge, corrosion resistant blades, with zinc-plated steel inter-locking operating mechanism. Both inlet vanes must operate from a single shaft and be synchronized for precise control.

OPTIONAL Units equipped with variable frequency drive on supply fan must be controlled by a duct static transducer providing a 2-10 VDC signal to the drive. Supply fan variable frequency drives shall have factory option of being equipped with a manual drive bypass.

BEARINGS AND DRIVES

Bearings shall be self-aligning pillow-block re-greasable ball bearings with an average life expectancy of 200,000 hours. Grease fittings shall be accessible through access doors. Fan motors shall be NEMA designed, Standard efficiency (option, Hi-efficiency) ball bearing type with electrical characteristics and horsepower as specified. Motors shall be 1750 RPM, open drip proof type. The motor shall be located within the unit on an adjustable, heavy steel base. All fan motor drives shall be selected for a minimum service factor of 1.2 and have fixed pitched sheaves.

AIR FILTERING SYSTEM

All filter holding frames shall be of heavy duty construction designed for industrial applications. All filters shall be either side accessible or front loading with access doors provided on both sides of the filter section. All filter media shall be Class II listed under UL Standard 900. Filter efficiencies shall be rated in accordance with ASHRAE Standard 52-76 2” Throwaway Filters with fiberglass media multiple shall be standard

OPTIONAL Two inch pleated, throwaway filters with 30% efficiency. Rigid filters shall be high performance, expanded area, disposable type filters. Rigid filter sections shall be preceded by a 2 throwaway prefilter assembly. Filter efficiency shall be 95% (Option: 65%) based on ASHRAE Standard 52-76.

AIR INLET SYSTEM

General
Outside Air inlet openings shall be covered by a factory installed rain hood permanently attached to the cabinet to prevent windblown precipitation from entering the unit. The rain hoods on the front and back of the unit shall be rotated into the cabinet and secured for shipment so that upon installation they need only be rotated upwards and screwed into place. The outside air hood shall contain a removable and cleanable filter with an efficiency rating of 50% based on ASHRAE 52- 76. All damper assemblies shall be of low leak design. Damper blades shall be fabricated from a minimum of 16 gauge galvanized steel. Blade ends and edges shall be covered with vinyl seals. Damper shafts shall be fabricated from solid steel and mounted in the frame with bronze bearings. On all units not equipped with an economizer, an option shall be available for a manually adjustable outside air damper shall be capable of admitting 0-25% outside air.

Economizer (Optional)
An economizer shall have outdoor air and return air dampers that are interlocked and positioned by fully modulating, solid state damper actuators. The actuators shall be spring loaded so that the outside air damper will close when power to the unit is interrupted. The operation of the economizer shall be fully

integrated into the cooling control system. The economizer shall be available for control via a dry bulb sensor (Optional: single or dual enthalpy sensors).

RELIEF SYSTEM (Optional)
All units with relief must have an economizer.

Barometric Relief (Optional) Building air exhaust shall be accomplished through barometric relief dampers installed in the return air plenum. The dampers will open relative to the building pressure. The opening pressure shall be adjustable.

Exhaust Air Fans (Optional) General - forward curved centrifugal fan(s) shall be installed in the return air plenum for positive power exhaust. Fans shall be on a common shaft, driven by a single motor. The fans, motors and drives shall be of the same quality and design as specified for the Supply Air Fan, except the fans shall be Class I. Fans shall be capable of exhausting up to 100% of the nominal CFM of the unit. Non-modulating Exhaust - Units with non-modulating power exhaust shall have a barometric relief damper to prevent outside air from entering in the off cycle. The fans shall cycle on and off with building pressure. Modulating Operation - The fans shall be capable of modulating the amount of air from 0% to 100% of nominal CFM. Modulation shall be through discharge dampers or variable frequency motor speed modulation. Dampers or VFD shall be controlled by static pressure in the conditioned space or return air duct.

HEATING SYSTEM

Gas-fired Heating Section (Optional)
One or more gas-fired heating modules shall be installed to provide the heating requirements per the schedule shown on the plans. The heat exchanger shall be of tubular design. Tubes shall be 2 1/4 OD and constructed of minimum 20 gauge, G160 aluminized steel (1.6 mil aluminum silicone alloy) for corrosion resistance (Optional: 409 Stainless Steel). Flue baffles shall be made of 430 stainless steel. Each gas-fired heat module shall have an induced draft combustion fan with energy efficient intermittent pilot spark ignition and redundant main gas valves with pressure regulator. Units with standing spark ignition shall not be acceptable. An induced draft fan shall be provided to maintain a positive flow of air through each tube, to expel the flue gas and to maintain a negative pressure within the heat exchanger relative to the conditioned space. Induced draft fans shall be direct-drive. One (1) high limit controller per heating module, with automatic reset to prevent the heat exchanger from operating at an excessive temperature will be installed. A centrifugal switch on the induced draft fan motor shaft must be provided to prevent ignition until sufficient air flow is established through the heat exchanger. Secondary airflow safety shall be provided by rollout switch protection. The rollout switch shall discontinue furnace operation if the flue becomes restricted. Units shall ship with an external flue to be shipped in the unit and mounted on the job site. The flue shall discharge products of combustion above the unit, preventing recycling of corrosive combustion gases back through the heat exchanger. Gas heating sections shall be both ETL and CGA approved to both US and Canadian safety standards.

Electric Heating Section
An electric slip-in heater shall be installed within the rooftop unit to provide the heating requirements per the schedule shown on the plans. The electric heater shall be wired in such a manner as to provide two equal steps of capacity (80 and 108 kW) or a single step of capacity (40 kW). The furnace shall be an industrial grade design using an open coil(s) made of the highest grade resistance wire containing 80% nickel and 20% chromium. The resistance coil(s) shall be adequately supported in the air stream using ceramic bushings in the supporting framework. Terminals of the coil(s) shall be stainless steel with high temperature ceramic bushings. The primary high temperature protection shall be an automatic reset type thermal cut out. Secondary protection shall be an automatic reset type thermal cut out. Secondary protection shall be a replaceable thermal link. The operation of the electric heater shall be an integral part of the roof top control system. Power connection to the strip heater shall be through the single power point connection for the entire unit. Electric heat shall be ETL certified to both US and Canadian safety standards.

Hot Water Heating Coil
The manufacturer shall furnish and factory install a hot water coil in the rooftop units, as described in the following specifications. Water coil capacities and pressure drops shall be certified in accordance with ARI Standard 410. The hot water coil shall have eight fins per inch, 2 tubes per circuit, and and 2" inlet and outlet connection. Primary surface shall be 1/2" OD copper tube, staggered in direction of airflow. Tubes shall be mandrel expanded to form fin bond and provide burnished, work-hardened interior surface. Return bends shall be die formed and silver-brazed to tubes. Headers shall be of heavy seamless copper tubing, silver-

brazed to tubes. Connections shall be of red brass, with male pipe threads, silver brazed to headers. Connections also have 1/4" FPT drain plug on each connection. Extended surface shall consist of die-formed, continuous, aluminum fins with formed channels, and surface treatment to minimize moisture carry-over. Fins shall have fully drawn collars to accurately space fins, and to form a protective sheath for the primary surface. A structural galvanized steel casing shall protect the coil. Tube sheets on each end shall have drawn collars to support tubes. An intermediate coil support shall be provided. The coil shall be circuited to provide free draining and venting, through one vent and drain. Completed coil, including headers, connections and return bends shall be tested with 325 pounds compressed air under water. Coils shall be designed for operation at 250 psig design working pressure.

Steam Heating Coil
The manufacturer shall furnish and factory install a steam heating coil in the rooftop units, as described in the following specifications. Steam coil capacities and pressure drops shall be certified in accordance with ARI standard 410. The steam coil shall be constructed in the non-freeze style. The steam coil shall have six fins per inch, and 2" inlet, and 1 1/2" outlet connection. Tubes shall be 1" OD seamless copper tubing with a minimum wall thickness of 0.035" and expanded into the fin collars for maximum fin-tube bond. Inner distributing tubes shall be 5/8" OD seamless copper tubing with a minimum wall thickness of 1/4". The copper to copper joints shall be joined with high temperature, silver solder. Corrugated fins with integral spacing collars shall cover the entire tube surface. Headers shall be constructed of seamless copper. The header tube holes shall be extruded providing better tube to header contact for a stronger braze connection. All header connections shall be of red brass or steel, with male pipe threads and silver braze to headers. Casing shall be 16 gauge galvanized steel. Chafing shall be prevented by extruding and flaring the holes in the tube sheet and intermediate tube sheet. The core shall be pitched in the direction of the condensate connection for proper drainage. The completed coil (including headers and connections) shall be tested underwater with 325 lbs. compressed air to ensure a leak free coil.

REFRIGERATION SYSTEM

Units shall have two (25 ton), three (30 ton) or four (40 ton) independent refrigerant circuits for maximum load-matching capability. Each refrigerant circuit shall be controlled with a balance-port thermal expansion valve for maximum control at low load conditions.

Evaporator Coils
Evaporator coils shall be direct expansion type with intertwined circuiting to assure complete coil face activity during part load operation. Coil tubes shall be 3/8 OD copper, internally enhanced tubes. Fins shall be enhanced aluminum mechanically expanded to bond with the copper tubes. Coil casing shall be fabricated from heavy gauge galvanized steel. All coils shall be pressure tested at a minimum of 450 PSIG. A stainless steel drain pan shall be provided under the entire length and width of the evaporator coil, including all return bends. The main drain pan shall be sloped a total of 1/4 per foot towards the drainage point. Main drain pan shall be easily cleanable in the field. The condensate drain opening shall be flush with the bottom of the drain pan to allow complete drainage. Coils in excess of 48 high shall have an intermediate drain pan, also fabricated of stainless steel extending the entire finned length of the coil to provide better water drainage. Drainage from the intermediate drain pan shall be to the primary drain pan. OPTIONAL: Evaporator coils shall be protected by the Technicoat 10-1 four coat process. Coils shall be dipped in a phenolic coating, which provides substantial resistance to corrosion of aluminum and copper.

Compressors
Units shall have two (25 ton), three (30 ton) or four (40 ton) industrial duty hermetic scroll compressors, independently piped and charged. Compressors shall have an enlarged liquid carrying capacity to withstand rugged operating conditions. Compressor frame shall be cast iron, with cast iron fixed and orbiting scrolls. Each compressor shall feature a solid state protection module, designed to protect the compressor from over temperature and overcurrent conditions. Each compressor shall include the following safety and convenience devices: replaceable suction screen, discharge line check valve, and oil sight glass. Compressors shall be vibration isolated from the unit, and installed in an easily accessible area of the unit.

Condenser Coils
Condenser coils shall have 3/8 seamless copper tubes, arranged in staggered rows, mechanically expanded into aluminum fins. Coils shall be protected from hail damage with a V configuration, with individual flat coils rotated 30 from the vertical plane for each condensing circuit. Condensing coils shall have an integral subcooler for more efficient, stable operation. OPTIONAL: Condenser coils shall be protected by the

Technicoat 10-1 four coat process. Coils shall be dipped in a phenolic coating, which provides substantial resistance to corrosion of aluminum and copper.

Condenser Fans and Motors
Condenser fans shall be direct drive, propeller type, discharging vertically. Condenser fan motors shall be 3 phase, totally enclosed air over (TEAO) type, with built in thermal overload protection.

Refrigerant Piping
All interconnecting piping between refrigeration components shall be copper tubing with brazed joints. Each refrigerant circuit shall be equipped with liquid line filter drier, and moisture indicating sight glass. Each circuit shall also have both high and low pressure switches installed on either side of the compressor and include shrader depressors for replacement of the pressure switches without removing charge. All small diameter distributor tubing to the evaporator coil shall be protected by polyurethane sleeves over the length of the tubing to prevent the tubes from copper-to-copper contact during shipment or operation.

Hot Gas Bypass (Optional on CV; standard on VAV)
Unit shall have hot gas bypass factory installed on the lead compressor.

CONTROLS

GENERAL DESCRIPTION

Equipment with Simplicity as standard shall be factory run-tested through the control, after the test is complete; there will be no wires to re-connect. All control wiring points shall be tested and verified through communication.

The control shall be UL or CSA recognized. The control shall be manufactured in a manufacturing facility that is certified to ISO 9001.

COMPRESSOR CONTROL

The control shall have a five-minute Anti-Short Cycle Delay to prevent excessive compressor cycling. The control shall have a three-minute minimum run time to insure that oil gets returned to the compressor each time it starts. The minimum runtime shall be programmable up to 10 minutes.

The control shall monitor the High Pressure switch, the Low Pressure switch, and the Compressor Overloads separately for each refrigeration circuit. The control shall have a 30 second Low Pressure Switch bypass when it starts any compressor.

A hard compressor lockout shall occur if the control detects the same switch trip three times in a two-hour window, which starts when the first trip occurs. On the first and second trips, the control will turn the compressor off and wait five-minutes after the switch re-closes, before restarting the compressor.

The control shall be capable of operating both compressors and the economizer when there is a call for both stages of cooling.

The control shall have a means of locking out mechanical compression below a programmable low ambient trip point. This must be done without adding extra components to the unit.

The control shall have a means of locking out the mechanical compression when the economizer is operating in free cooling mode without additional components

The control shall have a means of starting the compressor before the indoor Fan comes on when operating with a Thermostat in the AUTO FAN mode.

FAN CONTROL

The control shall have fully adjustable Fan ON and Fan OFF delays for both Heating and Cooling settable at the control or via communication.

The control's default Fan OFF delay for Cooling shall be 30 seconds to take advantage of the remaining capacity in the coil after the compressor has been turned off.

The control shall lock on the Fan if the high temperature limit trips three times in one hour of operation.

The control will have a software programmable Fan Mode Switch for Auto operation or Continuous operation.

When the Fan is in the Continuous mode, it will run continuously during the occupied schedule and in the Auto mode when in an unoccupied schedule.

The control shall be capable of operating the fan without a G or fan signal from the thermostat.

EQUIPMENT CONTROL FEATURES

The control shall be capable of communicating on the Standard Open protocol, MODBUS RTU.

The register data for the MODBUS must be publicly available and open.

Monitoring Software shall be provided at no Cost. The monitoring software shall have a flashing icon when any unit wired to the computer has an alarm. Clicking the flashing icon shall display the fault code and the details of the fault.

The networking setup shall be completed by connecting a three-wire daisy chain cable to each unit, then powering all the units up and pushing a button on each control. There shall not be any dipswitches to configure the network address.

The control shall use a communication driver that is capable of having 64 nodes on the bus before a repeater is needed.

The control shall use non-volatile memory to store the last five alarms. There shall be a single button to push to recall these last five alarms. The alarms shall be stored first in last out. The first flash code shall be the last alarm that occurred. There shall be a button press sequence to clear the alarms in non-volatile memory.

The control shall have a button to reset compressor lockouts without powering the unit down.

The control shall have a button to clear compressor Anti-Short Cycle Delays. When this button is pressed it will only clear the Anti-Short Cycle Delays for one cycle only and not permanently.

The control will be compatible with any BAS (Building Automation System). Any BAS shall be able to control the equipment when wired to the control's Thermostat Terminal Strip.

The control shall have loading of at least 25 milliamps on all thermostat inputs for controllers and thermostats that use output TRIACs.

The control shall have a Smoke Detector Shutdown input on the board. The control shall be powered through this input, so when the Smoke Detector trips, the control will shut down the unit immediately.

The control will have low voltage protection for the contactors and will not energize a contactor if the voltage is below 19.2 VAC, to insure contactor pull-in. If the control has a compressor contactor energized when the voltage drops, it shall not de-energize the contactor until the voltage drops below 16 VAC, which is the drop out voltage for most contactors.

The control shall have a means of low ambient control without adding any additional components. The control shall have a means of cycling the compressor on for 10 minutes and off for 5 minutes to defrost the indoor coil when the out side ambient is below a low ambient switch point without adding additional components.

The control shall have a means of storing compressor run time. This data shall be available through communication. The control shall have the ability to clear this data when a compressor is replaced.

The control shall have the ability to store a name of at least 26 characters in length. The control will leave the factory with the serial number of the equipment it is in, stored in nonvolatile memory in the Name location.

The control shall have the ability to store the model number of the equipment of at least 26 characters in length. The control will leave the factory with the model number of the equipment it is in, stored in nonvolatile memory.

The control shall have the ability to store the serial number of the equipment of at least 26 characters in length. The control will leave the factory with the serial number of the equipment it is in, stored in nonvolatile memory.

The control shall not power the contactors through the thermostat wiring. Dropping voltage over the thermostat wiring causes chattering contactors when the contactors are powered in this manner.

The control will operate and monitor up to 3 stages of heat independently.

The control shall monitor the Gas Heat operation in the heating mode. It shall monitor the gas valve when there is a call for heating. The control shall alarm when there is a call for heat and no gas valve voltage after 5 minutes.

There will only be one control board for this series of units, for both CV and VAV operation.

COMFORT CONTROL FEATURES

The control will be installed and tested at the factory where the equipment is assembled.
The control will use a Wall Senor that has a means of overriding the unoccupied mode for a programmable amount of time.
The Unoccupied Override time will be programmed in minutes up to 4 hours.
The control will use a Wall Sensor that has a warmer/cooler dial so the occupants can offset the programmed setpoint by a programmed amount between 1 and 5 degrees.
The control will have a Supply Air Sensor as standard.
The control will have a Return Air Sensor as standard.
The control will have an Outside Air Sensor as standard.
The control will use the Return Air Sensor in place of the Space Sensor if the Space Sensor fails for any reason,
The control will have a 365 day Real Time Clock.
The Real Time Clock will be able to do automatic Daylight Savings Time adjustment.
The control will have an Occupancy Schedule that allows two different Occupied schedules per day for each of the seven days of the week individually.
The control will have 20 Holiday Schedules, each capable of 99 days.
The control's Holiday Schedules will have a start time associated with each schedule.
The control will control the Economizer directly.
The control will be capable of operating the Economizer using Dry Bulb, Outside Enthalpy, or Differential Enthalpy.
When the control is using Enthalpy to control the Economizer, it will also have an Outside Air Temperature enable Setpoint.
The control will use two setpoints for Supply Air Temperature for the Economizer operation. One will be for a small space cooling demand and one for a large space cooling demand.
The control will have the ability to do Demand Ventilation using one CO_2 sensor.
The control will have a programmable maximum Outside Air Damper Position for IAQ operation.
The control will have the ability to temper the ventilation air during times when heating or cooling is not required.
The control will have the ability to offset the operating setpoint based on high Humidity in the Space.
The control will have programmable limits when offsetting the Operating Setpoint to control Humidity.
The control must be able to lockout Cooling below a programmable Outside Air Temperature Setpoint.
The control will be able to lockout Heating above a programmable Outside Air Temperature Setpoint.
The control will have a Space Temperature Alarm.
The control will have a Supply Air Temperature Alarm for Heating and Cooling. The Alarm temperature will be programmable

The Control will be able to do a Pre-Occupancy Purge at a Programmable Time.
The control will have a hardware Smoke-Purge input.
The control will have the ability to read a dirty filter switch
The control will have the capability of reading a Fan proving switch.
The control will have an intelligent recovery function that will bring the space to the Occupied Setpoint just before or at the beginning of the first Occupied schedule each day. The control will learn and apply the minimum run time required to heat or cool the space to setpoint for the first Occupied period of a day.
The control will have Software controllable Mode Switches (Heat, Cool, and Fan).
The control will meter and track Unoccupied Override Time for billing purposes.

AVAILABLE ACCESSORIES

The following accessories shall be available:

Full perimeter and partial perimeter roof curbs
14" high roof curb with wood nailer. Roof curb covers the entire perimeter of the unit (full curb) or that portion of the unit, which has airflow (partial curb).

Burglar Bars
This accessory mounts in the supply and return opening of either the full or partial perimeter curb to prevent entry into the building through the ductwork.

Field Installed Barometric Relief
This accessory is a set of barometric relief dampers and hood used for the millennium barometric relief option that is fully assembled for mounting to return ductwork. This accessory is intended for use on horizontal return applications

Programmable thermostat, with or without remote sensor (required for constant volume units)
Provides 2 Heat/4 Cool control and 7 day programming.

Remote Wall Mounted Temperature Sensors- Attractive wall mounted temperature sensors are available to precisely control multiple or individual zone temperature. Sensors are available without adjustment, with override and override with programmable setpoint adjustment.

Dirty Filter Switch- A Dirty Filter pressure switch kit is available for field installation. Switches will monitor pressure drop across the units air filters and provide an alarm when filters become dirty.

Natural gas and propane conversion kits
Contains the necessary orifices and gas valve parts to convert from natural gas to propane and from propane to natural gas.

High altitude conversion kits
These kits are required for natural gas or propane applications between 2,000 and 6,000 feet.