EQUIPMENT SUBMITTAL FOR:

CAPITOL CONTRACTORS, INC.

ALEXANDRIA PUBLIC SAFETY BUILDING

YORK WATER COOLED SCREW CHILLERS

SUBMITTAL DATA

FOR

ALEXANDRIA PUBLIC SAFETY CENTER

ALEXANDRIA, VIRGINIA

EQUIPMENT:

TWO (2) YORK WATER COOLED SCREW CHILLERS – MODEL YRTCTDT0-46C
Per Camp Dresser & McKee Specification #15620

YORK/JCI REFERENCE:

CAPITOL P.O. #: 3330139
YORK ORDER # 09115417-02 & -03
YORK CONTRACT #: 09115417

SUBMITTED TO:

CAPITOL CONTRACTORS, INC.
225 TYLER VON WAY
FREDERICKSBURG, VA 22405

ATTENTION:
David Hatch

SUBMITTED BY:

JOHNSON CONTROLS INCORPORATED
4232 PARK PLACE COURT
GLEN ALLEN, VIRGINIA 23060

RICHARD MULLIS
SALES ENGINEER

DECEMBER 22, 2008

TABLE OF CONTENTS

SUBMITTAL DATA

ALEXANDRIA PUBLIC SAFETY CENTER

ALEXANDRIA, VA

TWO (2) YORK WATER COOLED SCREW CHILLERS

INSTALLATION/ENGINEERING NOTES

INSTALLATION/ENGINEERING NOTES

1) We have reviewed and comply with Camp Dresser & McKee's specification 15620.

2) Please verify the inlet and outlet connections for each chiller. If our submittal drawings indicate connection SIDES that are incorrect, please provide feedback in the returned submittal so we may make the changes prior to release for fabrication.

3) Pressure gauges (by others) should be provided on the inlet and outlet of the chilled water lines to allow verification of water flows and corresponding pressure drops.

4) Refrigerant relief piping (by others) to the outside of the building should be installed. The vent line should be sized in accordance with ANSI/ASHRAE-15 or local codes.

5) Service clearances for the chillers are as follows: 2'-0" at the rear and overhead; 3'-0" at front; 10' tube removal.

6) Factory installed isolation valves will be provided in the compressor discharge line and refrigerant liquid line. Isolation valves allow for storage of the refrigerant in the condenser instead of pumping the refrigerant out of the chiller into a separate storage tank. This eliminates the space and electrical required for a separate pump/tank.

7) Evaporator and condenser water standard connections (victaulic grooved pipe, no flanges) have been supplied for easy removal of the evaporator and condenser water piping (for cleaning).

8) Compact water boxes are provided on BOTH the evaporator and condenser per the design drawings and specifications.

9) We have provided spring isolators for vibration isolation.

10) The refrigerant (R-134A) for the chillers will be supplied and shipped in the chiller.

11) The YORK chillers have factory mounted and wired flow sensors in the condenser and evaporator loop. Separate flow switches are not supplied for the chillers.

12) The insulation for the evaporators has been provided and is 3/4" thick. We have NOT provided insulation for the evaporator water boxes. The required additional insulation for the chiller is 20 ft^2 for each chiller. Because of piping connection and rigging in the field, it is better to have the contractor field insulate the water boxes after piping connections have been made.

13) YORK chillers can accept remote start/stop, chilled water reset, and current limit signals via hard wire contacts to the chiller control panel. However, we have provided a BACNet MS/TP communication interface for each chiller giving the same capabilities.

14) A one (1) year parts and labor warranty on the entire unit will be provided, effective for eighteen (18) months from shipment. The warranty does NOT include maintenance, nuisance calls, and controls sequencing calls outside the normal start-up time allotted. If additional Factory service time is required, it will be quoted, paid for, and performed on a time and material basis.

15) A qualified York/JCI Service Technician will supply leak testing, evacuation and commissioning of the chillers during regular working hours. All service functions will be conducted by local York/JCI factory trained service technicians.

16) The current lead-time for YORK YR MaxE chillers is approximately twelve (12) weeks AFTER release for fabrication. Release for fabrication occurs after receipt of a purchase order AND approved submittals and does NOT include any factory shutdowns because of holidays. Please allow 3-5 business days for transit time after the chillers leave the factory.

CHILLER SPECIFICATION TEXT

GENERAL

Each unit shall produce a capacity of 230 tons, cooling 930 gpm of WATER in a Series/Counter flow configuration from 55°F to 45°F when supplied with 1240 gpm of condenser water at 85°F. Power input shall not exceed 121 KW for each chiller. The cooler shall be selected for 0.00010 ft² °F hr / Btu fouling factor and a maximum liquid pressure drop of 6.7 ft. The condenser shall be selected for 0.00025 ft² °F hr / Btu fouling factor and maximum liquid pressure drop of 5.3 ft. Water side shall be designed for 150 psig working pressure. Power shall be supplied to the compressor motor at 460 volts - 3 phase - 60 Hertz and controls at 115 volts – 1 phase - 60 Hertz. The chiller shall use R-134A refrigerant.

Each unit will be completely factory-packaged including evaporator, unit mounted starter, condenser, compressor, motor, Optiview control center and all interconnecting unit piping and wiring. The chiller will be painted prior to shipment and will be packaged to protect the unit during shipment.

Performance will be certified in accordance with ARI Standard 550/590. Only chillers that are listed in the ARI Certification Program for Centrifugal and Rotary Screw Water Chillers are acceptable.

The initial charge of refrigerant and oil will be supplied for each unit.

DRIVELINE

The compressor will be twin screw, rotary-screw type. The compressor housing will be of cast iron, precision machined to provide minimal clearance for the rotors. The rotors will be manufactured from forged steel and use asymmetric profiles operating at a maximum speed of 3570 RPM. The compressor will incorporate a complete anti-friction bearing design to reduce power and increase reliability; cylindrical roller bearings to handle radial loads; and 4-point angular contact ball bearings to handle axial loads. The compressor will have an internal oil reservoir to assure a constant supply of oil to the bearings at all times. A check valve will be incorporated in the compressor housing to prevent rotor backspin during shutdown.

Capacity control will be achieved by use of a slide valve to provide fully modulating control from 100% to 20% of full load. The slide valve will be actuated by system differential pressure, controlled by external solenoid valves through the OptiView control center. The unit will be capable of operating with off-design cooling tower water during part-load operation in accordance with ARI Standard 550/590.

The motor will be 2-pole, continuous duty, cage induction type, and will utilize suction gas cooling (semi-hermetic design). Motor full-load amperes at design conditions will not exceed motor nameplate (FLA). Motor will be designed for use with a Solid State Starter with non-fused disconnect switch.

LUBRICATION SYSTEM

An adequate supply of oil will be available to the compressor at all times. During operation, oil will be delivered by positive system pressure differential.

An immersion oil heater will be provided, (temperature actuated), to effectively remove refrigerant from the oil. An external, replaceable-cartridge, oil filter will be provided, along with manual isolation stop valves for ease of servicing. An oil eductor will be provided to automatically remove oil which may have migrated to the evaporator, and return it to the compressor. The oil separator will be of a vertical design with no moving parts, and will provide effective oil separation before the refrigerant enters the heat exchangers. The oil separator will be designed, tested, and stamped in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII - Division 1. Refrigerant injection will be provided to maintain satisfactory oil temperatures and allow operation of the chiller over the full range of conditions.

EVAPORATOR

Evaporator will be of the shell-and-tube, flooded type designed for 235 psig working pressure on the refrigerant side, and will be tested in accordance with ASME code. The shell will be fabricated from rolled carbon steel plate with fusion welded seams or carbon steel pipe; have carbon steel tube sheets, drilled and reamed to accommodate the tubes; and intermediate tube supports spaced no more than four feet apart. The refrigerant side will be designed, tested and stamped in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII – Division 1. Tubes shall be high-efficiency, internally and externally enhanced type having plain copper lands at all intermediate tube supports to provide maximum tube wall thickness at the support area. Each tube will be roller expanded into the tube sheets providing a leak-proof seal, and be individually replaceable. Water velocity through the tubes will not exceed 12 fps. A liquid level sight glass will be located on the side of the shell to aid in determining proper refrigerant charge. The evaporator will have a refrigerant relief device to meet the requirements of the ASHRAE 15 Safety Code for Mechanical Refrigeration.

Water boxes will be removable to permit tube cleaning and replacement. Stubout water connections having victaulic grooves will be provided. Vent and drain connections with plugs will be provided on each water box.

CONDENSER

Condenser will be of the shell-and-tube type, designed for 235 psig working pressure on the refrigerant side, and be tested in accordance with ASME code. The shell will be fabricated from rolled carbon steel plate with fusion welded seams or carbon steel pipe; have carbon steel tube sheets, drilled and reamed to accommodate the tubes; and intermediate tube supports spaced no more than four feet apart. A refrigerant subcooler will be provided for improved cycle efficiency. The refrigerant side will be designed, tested and stamped in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII - Division 1. Tubes shall be high-efficiency, internally and externally enhanced type having plain copper lands at all intermediate tube supports to provide maximum tube wall thickness at the support area. Each tube will be roller expanded into the tube sheets providing a leak-proof seal, and be individually replaceable. Water velocity through the tubes will not exceed 12 fps. The condenser will have refrigerant relief devices to meet the requirements of the ASHRAE 15 Safety Code for Mechanical Refrigeration.

Water boxes will be removable to permit tube cleaning and replacement. Stubout water connections having victaulic grooves will be provided. Vent and drain connections with plugs will be provided on each water box.

REFRIGERANT SYSTEM

A modulating variable orifice controlled by the OptiView Control Center to accommodate varying head conditions will meter refrigerant flow to the evaporator.

The condenser shell shall be capable of storing the entire system refrigerant charge during servicing. Isolation from the rest of the system will be by manually operated isolation valves located at the inlet and outlet of the condenser. Service valves will be provided to facilitate removal of refrigerant charge from the system.

The unit shall be equipped with a suction strainer to prevent any foreign debris introduced to the system during maintenance or service to be allowed into the motor housing. Motors cooled by refrigerant must be protected by means of filter or strainer to protect the motor and prolong motor life.

OPTIVIEW CONTROL CENTER

General: The chiller shall be controlled by a stand-alone microprocessor based control center. The chiller control panel shall provide control of chiller operation and monitoring of chiller sensors, actuators, relays and switches.

Control panel: The control panel shall include a 10.4 in. diagonal color liquid crystal display (LCD) surrounded by "soft" keys which are redefined based on the screen displayed at that time. This shall be mounted in the middle of a keypad interface and installed in a locked enclosure. The screen shall detail all operations and parameters, using a graphical representation of the chiller and its major components. Panel verbiage shall be available in other languages as an option with English always available. Data shall be displayed in either English or Metric units. Smart Freeze Point Protection shall run the chiller at 36.00 °F leaving chilled water temperature, and not have nuisance trips on low water temperature. The sophisticated program and sensor shall monitor the chiller water temperature to prevent freeze up. When needed Hot Gas Bypass is available as an option. The panel shall display countdown timer messages so the operator knows when functions are starting and stopping. Every programmable point shall have a pop-up screen with the allowable ranges, so that the chiller can not be programmed to operate outside of its design limits.

The control panel shall be provided with a thermal ice storage control mode to enhance system performance during ice building operation. In the thermal storage control mode, the chiller shall stay at 100% load until the setpoint shutdown temperature is reached. To add greater operating flexibility and eliminate unnecessary chiller cycling, two different Low Water (Liquid) Temperature Restart Thresholds shall be programmable, one for the ice mode and one for the standard cooling mode. The chiller shall have the capability to remain in the standard control mode for temperatures between 20.00 to 70.00 °F for applications involving a process cooling duty that requires leaving chilled liquid temperature setpoint control.

The chiller control panel shall also provide:

1. System operating information including:
    a. return and leaving chilled water temperature
    b. return and leaving condenser water temperature
    c. evaporator and condenser saturation temperature
    d. oil pressure at compressor and oil filter differential
    e. percent motor current
    f. evaporator and condenser saturation temperature
    g. compressor discharge temperature
    h. oil temperature
    i. percent slide valve position
    j. operating hours
    k. number of unit starts

2. Digital programming of setpoints through the universal keypad including:
    a. leaving chilled water temperature
    b. percent current limit
    c. pull-down demand limiting
    d. six-week schedule for starting and stopping the chiller, pumps and tower
    e. remote reset temperature range

3. Status messages indicating:
    a. system ready to start
    b. system running
    c. system coastdown
    d. system safety shutdown-manual restart
    e. system cycling shutdown-auto restart
    f. system prelube
    g. start inhibit

4. The text displayed within the system status and system details field shall be displayed as a color coded message to indicate severity: red for safety fault, orange for cycling faults, yellow for warnings, and green for normal messages.

5. Safety shutdowns enunciated through the display and the status bar, and consist of system status, system details, day, time, cause of shutdown, and type of restart required. Safety shutdowns with a fixed speed drive shall include:
    a. evaporator – low pressure
    b. evaporator – low pressure – smart freeze
    c. evaporator – transducer or leaving liquid probe
    d. evaporator – transducer or temperature sensor
    e. condenser – high pressure contacts open
    f. condenser – high pressure
    g. condenser – pressure transducer out of range
    h. auxiliary safety – contacts closed
    i. discharge – high temperature
    j. discharge – low temperature
    k. oil – high temperature
    l. oil – low differential pressure
    m. oil – low differential seal pressure
    n. oil or condenser transducer error
    o. oil – clogged filter
    p. oil – high pressure
    q. oil – separator – low level
    r. control panel – power failure
    s. watchdog – software reboot

5.1. Safety shutdowns with a Solid State Starter (LCSSS) shall include:
    a. shutdown – requesting fault data
    b. high instantaneous current
    c. high phase (X) heatsink temperature - running
    d. 105% motor current overload
    e. motor or starter – current imbalance
    f. phase (X) shorted SCR
    g. open SCR
    h. phase rotation

6. Cycling shutdowns enunciated through the display and the status bar, and consists of system status, system details, day, time, cause of shutdown, and type of restart required. Cycling shutdowns with a fixed speed drive shall include:
    a. multiunit cycling – contacts open
    b. system cycling - contacts open
    c. control panel - power failure
    d. leaving chilled liquid - low temperature
    e. leaving chilled liquid - flow switch open
    f. condenser – flow switch open
    g. motor controller – contacts open
    h. motor controller – loss of current
    i. power fault
    j. control panel - schedule

6.1 Cycling shutdowns with a Solid State Starter (LCSSS) shall include:
    a. initialization failed
    b. serial communications
    c. requesting fault data
    d. stop contacts open
    e. power fault
    f. low phase (X) temperature sensor
    g. run signal
    h. invalid current scale selection
    i. phase locked loop
    j. low supply line voltage
    k. high supply line voltage
    l. logic board processor
    m. logic board power supply
    n. phase loss

7. Security access to prevent unauthorized change of setpoints, to allow local or remote control of the chiller, and to allow manual operation of the prerotation vanes and oil pump. Access shall be through ID and password recognition, which is defined by three different levels of user competence: view, operator, and service.

8. Trending data with the ability to customize points of once every second to once every hour. The panel shall trend up to 6 different parameters from a list of over 140, without the need of an external monitoring system.

9. The operating program stored in non-volatile memory (EPROM) to eliminate reprogramming the chiller due to AC power failure or battery discharge. Programmed setpoints shall be retained in lithium battery-backed RTC memory for a minimum of 11 years with power removed from the system.

10. A fused connection through a transformer in the compressor motor starter to provide individual over-current protected power for all controls.

11. A numbered terminal strip for all required field interlock wiring.

12. An RS-232 port to output all system operating data, shutdown / cycling message, and a record of the last 10 cycling or safety shutdowns to a field-supplied printer. Data logs to a printer at a set programmable interval. This data can be preprogrammed to print from 1minute to 1day.

13. The capability to interface with a building automation system to provide:
    a. remote chiller start and stop
    b. remote leaving chiller liquid temperature adjust
    c. remote current limit setpoint adjust
    d. remote ready to start contacts
    e. safety shutdown contacts
    f. cycling shutdown contacts
    g. run contacts

STARTUP AND OPERATOR TRAINING
The services of a factory-trained, field service representative will be provided to supervise the initial startup and conduct concurrent operator instruction.

FACTORY INSULATION
Factory-applied, anti-sweat insulation will be attached to the cooler shell, flow chamber, tube sheets, suction connection, and (as necessary) to the auxiliary tubing. The insulation will be a flexible, closed-cell plastic type, 3/4 inch thick, applied with vapor-proof cement. The insulation will normally prevent sweating in environments with relative humidities up to 75% and dry bulb temperatures ranging from 50 to 90 °F.

SPRING ISOLATION MOUNTING
The unit will be provided with four level-adjusting, spring-type vibration isolators with non-skid pads. Pads will be field mounted on the steel brackets located on the tube sheets. Isolators will be designed for nominal one-inch deflection.

SHIPMENT FORM #1
The unit shall be completely assembled, with all main, auxiliary, and control piping installed, controls wired, leak tests completed, air run tests completed, and refrigerant and oil charge in place. Other miscellaneous materials shall be packed separately.

COMPRESSOR MOTOR STARTER
YORK will furnish a reduced-voltage, liquid-cooled Solid State Starter, factory-mounted on the centrifugal liquid chilling unit. The starter enclosure will be NEMA 1 and will be of modular construction with complete access to all parts without disturbing the refrigerant circuit. Power wiring from the starter to the compressor motor and control wiring from the starter to the chiller control panel will be completed at the factory. The starter will be tested and the design starting current and overload settings will be adjusted at the factory. The starter will provide, through the use of six silicon-controlled rectifiers (2 per phase) a smooth acceleration of the motor without current transitions or transients.

The following protective devices will be factory mounted and wired to the starter:

3-leg sensing electronic overloads with indicating lights and reset button – will shut unit down if current exceeds 105% of FLA to protect the motor windings.

Phase rotation protection circuit and indicating light – will deny start-up when detecting incorrect power wiring phase sequence to the starter which could cause reverse motor rotation and damage the equipment.
Single-phase failure protection circuit and indicating light – will insure against motor burnout by shutting the unit down if power loss occurs in any of the incoming lines during start-up.
High temperature safety protection system with indicating light and reset button – thermistors embedded on heat sinks will shut the unit down if the SCR temperature exceeds acceptable limits.
Hinged access door with lock and keys – will prevent tampering by unauthorized personnel.
High and low line voltage protection.

The following convenience items will be factory mounted and wired to the starter:

Auxiliary 1-1/2 KVA transformer – will eliminate the need for running separate 115V-1ph-50/60 Hz power source wiring to the OptiView Control Panel.
Digital Elapsed Time Meter – will easily keep track of operating hours to gauge regular maintenance and inspection requirements.
Power Fault Protection – momentary power interruption protection detects power interruptions within ¾ line cycle and will interrupt power to the compressor motor within 4 line cycles.
Electrical lugs – these tin-plated lugs will provide easy connection to incoming copper power lines.
3-phase digital ammeter and digital voltmeter readout via control panel – will easily crosscheck design current and voltage limitations against supply characteristics. Meter readings (selected in accordance with starter selection) amps: 0-750, 0-1500, 0-2800, 0-3500 volts: 0-300, 0-700.

KW Meter - The unit's input power consumption will be measured and displayed digitally via the unit's control panel. The KW meter accuracy is typically +/- 3% of reading. KW meter scale is 0 - 950 KW .

KWh Meter – The unit's cumulative input power consumption is measured and displayed digitally via the unit's control panel. The KWh meter is resetable and its accuracy is typically +/- 3% of reading. KWh meter scale is 0 – 999,999 kWh.

Ammeter – Simultaneous three-phase true RMS digital readout via the unit control panel. Three current transformers provide isolated sensing. The ammeter accuracy is typically +/- 3% of reading. Ammeter scale is 0 - 820 A RMS .

Voltmeter – Simultaneous three-phase true RMS digital readout via the unit control panel. The voltmeter accuracy is typically +/- 3% of reading. Voltmeter scale is 0 – 670 VAC.

Elapsed Time Meter – Digital readout of the unit's elapsed running time (0 – 876,600 hours, resetable) is displayed via the unit control panel.

UNIT MOUNTED DISCONNECT SWITCH

The disconnect switch is factory mounted and provides 18,000 amp short circuit withstand rating in accordance with UL Standard 508. The disconnect switch is mounted in the enclosure and the operating lever is accessible when the door is closed. The door cannot be opened with the lever in the on position and the switch can be padlocked in the off position for servicing.

BILL OF MATERIAL SUMMARY

Base Bid (CH-1 & CH-2)

Two (2) York MaxE™ Model YR R-134a 230 ton Water Cooled Screw Chillers for 460 Volt power, factory assembled and shipped in one piece, and including the following features and accessories:

Base Unit:

- Model # YRTCTDT0-46CS
- Spring Isolation
- ASHRAE 90.1 Compliance Label

Evaporator:

- 1 Pass
- Compact Water Boxes with victaulic connections
- .025" enhanced copper tubes
- Factory mounted flow sensors
- ¾" thick insulation (excluding water boxes)

Condenser:

- 1 Pass
- Compact Water Boxes with victaulic connections
- .025" Enhanced Copper Tubes
- Factory mounted flow sensors
- Isolation Valves

Motor & Starter:

- Semi Hermetic Premium Efficiency motor
- Factory Mounted & Wired Solid Starter with Non-Fused Disconnect Switch

Controls:

- NEMA 1 Control Panel & Wiring
- Control Panel Designed for 40ºF-110ºF Ambient Temperatures
- BACNet MS/TP Interface

Start Up, Warranty, and Testing:

- One Year Parts and Labor Warranty for the entire chiller, including refrigerant
- Start Up Supervision
- Testing, Calibration, & Adjustment

PERFORMANCE DATA

YORK
A JOHNSON CONTROLS COMPANY

Issue Date:	12/08	**Program:**	LTC
Project:	Alexandria Public Safety Center	**Rev:**	v1_88.idd
Engineer:	Rick Mullis	**Date:**	12/22/08
Customer:	Capitol Contractors	**Page:**	2 of 4

SERIES COUNTERFLOW, IDENTICAL MACHINES

LOW SIDE MODEL	YRTCTDT0-46C	**RATED CAPACITY (TR)**	230
		% OF SYSTEM CAPACITY	50.0
HIGH SIDE MODEL	YRTCTDT0-46C	**RATED CAPACITY (TR)**	230
		% OF SYSTEM CAPACITY	50.0

SYSTEM:

RATED CAPACITY (TR)	460.0	**SPECIFIED CAPACITY (TR)**	460
INPUT POWER (KW)	270	**VOLTAGE / HZ**	460 / 60
FULL LOAD (kW/TR)	0.587	**NPLV**	0.000

STARTER TYPE (1) SOLID STATE STARTER - 3 LEAD

	Evaporator	Condenser
FLUID	WATER*	WATER*
% BY WEIGHT	0.0*	0.0*
TUBE MTI NO.	281*	260*
PASSES	1*	1*
FOUL FACTOR (hr.ft².℉/BTU)	0.00010*	0.00025*
FLUID ENT TEMP (℉)	56.86	85.00*
FLUID INTERIM TEMP (℉)	50.93	90.22
FLUID LVG TEMP (℉)	45.00*	95.43
FLUID FLOW (gpm)	930.0*	1240.0*
FLUID PRDROP (ft)	13.8	10.6

(*) Designates Specified Input

IPLV / NPLV CALCULATION:

$$\text{IPLV OR NPLV} = \frac{1}{\frac{0.01}{A} + \frac{0.42}{B} + \frac{0.45}{C} + \frac{0.12}{D}} \qquad \text{NPLV} = \frac{1}{0} = 0.000$$

A = kW / TR AT 100% CAPACITY
B = kW / TR AT 75% CAPACITY
C = kW / TR AT 50% CAPACITY
D = kW / TR AT 25% CAPACITY

% Load	CAPACITY (TR)	ECWT (℉)	kW / TR	WEIGHT	WEIGHTED TR / kW
100	460.0	85.000	0.587	0.01	0.0170
75	345.0	75.000	0.470	0.42	0.8944
50	230.0	65.000	0.000	0.45	0.0
25	115.0	65.000	0.374	0.12	0.3209

Low side machine:

Rating certified in accordance with ARI STD. 550/590.
Water-chilling packages using the vapor compression cycle certification program.

ARI PERFORMANCE CERTIFIED
ARI Standard 550/590 Water-Cooled Chiller
www.ahridirectory.org

High side machine: Ratings outside the scope of ARI STD 550/590.
Low side and high side machines Compliant with ASHRAE 90.1

NPLV is not applicable as the minimum allowed CEFT is greater than 65F/18.33C.
Materials and construction per mechanical specifications - Form 160.81-EG1.

YORK
A JOHNSON CONTROLS COMPANY

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PARTLOAD RATING WITH UNLOADING PER ARI 550/590

SERIES COUNTERFLOW, IDENTICAL MACHINES

LOW SIDE MODEL	YRTCTDT0-46C	**RATED CAPACITY (TR)**	230
		% OF SYSTEM CAPACITY	50.0
HIGH SIDE MODEL	YRTCTDT0-46C	**RATED CAPACITY (TR)**	230
		% OF SYSTEM CAPACITY	50.0

SYSTEM:

RATED CAPACITY (TR)	460.0	**SPECIFIED CAPACITY (TR)**	460
INPUT POWER (KW)	270	**VOLTAGE / HZ**	460 / 60
FULL LOAD (kW/TR)	0.587	**NPLV**	0.000

STARTER TYPE (1) SOLID STATE STARTER - 3 LEAD

	Evaporator	Condenser
FLUID	WATER*	WATER*
% BY WEIGHT	0.0*	0.0*
TUBE MTI NO.	281*	260*
PASSES	1*	1*
FOUL FACTOR	0.00010*	0.00025*
FLUID ENT TEMP (°F)	56.86	85.00*
FLUID INTERIM TEMP (°F)	50.93	90.22
FLUID LVG TEMP (°F)	45.00*	95.43
FLUID FLOW (gpm)	930.0*	1240.0*
FLUID PRDROP (ft)	13.8	10.6

(*) Designates Specified Input

PART LOAD PERFORMANCE:

Pct Load	CAP (TR)	Pct Power	Inp Pwr (KW)	EEFT (°F)	EIFT (°F)	ELFT (°F)	CEFT (°F)	CIFT (°F)	CLFT (°F)	Unit Perf (KW/TR)
100.0	460.0	100.0	270	56.86	50.93	45.00	85.00	90.22	95.43	0.587
90.0	414.0	81.5	220	55.67	50.33	45.00	81.00	85.63	90.25	0.531
80.0	368.0	66.3	179	54.49	49.74	45.00	77.00	81.07	85.13	0.486
70.0	322.0	54.1	146	53.30	49.15	45.00	73.00	76.53	80.06	0.453
60.0	276.0	44.8	121	52.11	48.56	45.00	69.00	72.01	75.02	0.438
50.0	230.0	34.4	93	50.93	0.00	45.00	66.03	0.00	71.00	0.404
40.0	184.0	25.9	70	49.74	0.00	45.00	65.05	0.00	69.00	0.380
30.0	138.0	20.4	55	48.56	0.00	45.00	65.00	0.00	67.98	0.399
20.0	92.0	16.7	45	47.37	0.00	45.00	65.00	0.00	67.03	0.489
11.6	53.4	16.3	44	46.38	0.00	45.00	65.00	0.00	66.27	0.824

Low side machine:

Rating certified in accordance with ARI STD. 550/590.
Water-chilling packages using the vapor compression cycle certification program.

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ARI Standard 550/590 Water-Cooled Chiller
www.ahridirectory.org

High side machine: Ratings outside the scope of ARI STD 550/590.
Low side and high side machines Compliant with ASHRAE 90.1

NPLV is not applicable as the minimum allowed CEFT is greater than 65F/18.33C.
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YORK
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FIELD ENGINEERING REPORT

Low side machine :

SYSTEM DATA					
MODEL	YRTCTDT0-46C	**REFRIGERANT**	134A	**HZ**	60
SPECIFIED ORIFICE	VALVE:2				

ENGINEERING DATA	EVAPORATOR	CONDENSER
SATURATED TEMP (°F)	40.95	94.29
FLUID VELOCITY (ft/s)	5.74	5.37
TUBE DATA		
TUBE NUMBER	281	260
TUBE TYPE	GEWA-B4	TURBO CSL
MATERIAL	COPPER	COPPER
FPI	0.0	0.0
THICKNESS	0.025	0.025

High side machine :

SYSTEM DATA					
MODEL	YRTCTDT0-46C	**REFRIGERANT**	134A	**HZ**	60
SPECIFIED ORIFICE	VALVE:2				

ENGINEERING DATA	EVAPORATOR	CONDENSER
SATURATED TEMP (°F)	47.03	99.40
FLUID VELOCITY (ft/s)	5.74	5.37
TUBE DATA:		
TUBE NUMBER	281	260
TUBE TYPE	GEWA-B4	TURBO CSL
MATERIAL	COPPER	COPPER
FPI	0.0	0.0
THICKNESS	0.025	0.025

HIGH SIDE MACHINES:

MODEL	YRTCTDT0-46C		(MOTOR SELECTED BY USER)	
REFRIGERANT	134A			
RATED CAPACITY (TR)	230		**SPECIFIED CAPACITY (TR)**	230
INPUT POWER (KW)	133		**MAX MOTOR LOAD (KW)**	264
VOLTAGE / HZ	460 / 60			
ORIFICE (VARY)	VALVE:2			
RLA	197		**LRA**	1488
MIN CIR. AMPS.	246		**MAX C.B.**	400
INRUSH (AMPS)	670			
SSS SIZE	07L_K-46			
FULL LOAD (kW/TR)	0.578			

STARTER TYPE (1) SOLID STATE STARTER - 3 LEAD

	Evaporator	**Condenser**
FLUID	WATER*	WATER*
% BY WEIGHT	0.0*	0.0*
TUBE MTI NO.	281*	260*
PASSES	1*	1*
FOUL FACTOR (hr.ft².°F/BTU)	0.00010*	0.00025*
FLUID ENT TEMP (°F)	56.86	90.22*
FLUID LVG TEMP (°F)	50.93*	95.43
FLUID FLOW (gpm)	930.0*	1240.0*
FLUID PRDROP (ft)	6.8	5.3

(*) Designates Specified Input

Ratings outside the scope of ARI STD 550/590.
Compliant with ASHRAE 90.1

NPLV is not applicable as the minimum allowed CEFT is greater than 65F/18.33C.
Materials and construction per mechanical specifications - Form 160.81-EG1.

YORK
A JOHNSON CONTROLS COMPANY

YR MAXE CHILLER
PERFORMANCE SPECIFICATION

Unit Tag	Qty	Model No.	Capacity (tons)	Power	Refrigerant
CH-1	1	YRTCTDT0-46C	230	460/3/60	R-134A

Unit Data	Evaporator	Condenser
EWT (°F):	56.86	90.22
LWT (°F):	50.93	95.43
Flow Rate (gpm):	930	1240
Pressure Drop (ft):	6.8	5.3
Fluid Type (%):	WATER	WATER
Circuit No. of Passes:	1	1
Fouling Factor (ft² °F hr / Btu):	0.00010	0.00025
Tube No. / Description:	281 - 0.025" Enhanced Copper	260 - 0.025" CSL Enhanced Copper
Design Working Pressure (psig):	150	150
Entering Water Nozzle @ Location:	A	P
Leaving Water Nozzle @ Location:	H	Q
Water Box Weight, ea (lbs) :	143	119
Cover Plate Weight , ea (lbs):	N/A	N/A
Return Head Weight (lbs):	N/A	N/A
Water Weight (lbs):	355	419

Performance Data		Electrical Data		Other	
KW:	133	RLA:	194	Operating Wt. (lbs):	14458
KW/Ton:	0.578	LRA:	1488	Per Isolator (lbs):	3615
IPLV (1):	N/A	Inrush Amps:	669	Refrigerant Wt. (lbs):	635
		Min Circuit Ampacity (Amps):	246	Oil Charge (gal):	10
		Non-Fused Disconnect (Amps):	400	Motor Wt. (lbs):	N/A
				Compressor Wt. (lbs):	4385
				Oil Separator Wt. (lbs):	1400
				Starter Wt. (lbs):	200
				Shipping Wt. (lbs):	13684
		Type Starter: Solid State Starter			

Notes:

(1) Chiller IPLV value calculated to ARI Standard 550/590 equation.

Project Name: Alexandria Public Safety Ctr	Sold To:	
Location:	Customer Purchase Order No.:	
Engineer:	York Contract No.: 09115417	
Contractor:	Date:	Revision Date:

MODEL	YRTCTDT0-46C		(MOTOR SELECTED BY USER)	
REFRIGERANT	134A			
RATED CAPACITY (TR)	230		**SPECIFIED CAPACITY (TR)**	230
INPUT POWER (KW)	133		**MAX MOTOR LOAD (KW)**	264
VOLTAGE / HZ	460 / 60			
ORIFICE (VARY)	VALVE:2			
RLA	197		**LRA**	1488
MIN CIR. AMPS.	246		**MAX C.B.**	400
INRUSH (AMPS)	670			
SSS SIZE	07L_K-46			
FULL LOAD (kW/TR)	0.578		**NPLV**	0.000

STARTER TYPE (1) SOLID STATE STARTER - 3 LEAD

	Evaporator	**Condenser**
FLUID	WATER*	WATER*
% BY WEIGHT	0.0*	0.0*
TUBE MTI NO.	281*	260*
PASSES	1*	1*
FOUL FACTOR	0.00010*	0.00025*
FLUID ENT TEMP (°F)	56.86	90.22*
FLUID LEV TEMP (°F)	50.93*	95.43
FLUID FLOW (gpm)	930.0*	1240.0*
FLUID PRDROP (ft)	6.8	5.3

(*) Designates Specified Input

YORK SCREW CHILLER SOUND PRESSURE LEVELS- Cooling (ARI 550)

SOUND PRESSURE LEVELS FOR UNIT WITH NO ACOUSTIC TREATMENT, STANDARD									
PCT LOAD	**OCTAVE BAND CENTER FREQUENCY, HZ**								**A-WEIGHTED DBA**
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
100.0	74.0	78.0	76.0	80.0	83.0	81.0	74.0	64.0	85.0
75.0	74.0	76.0	76.0	78.0	82.0	78.0	74.0	64.0	83.0
50.0	74.0	74.0	76.0	78.0	80.0	76.0	74.0	64.0	81.0
25.0	74.0	74.0	78.0	80.0	79.0	77.0	74.0	64.0	82.0

The octave and A-Weighted sound pressure levels are the levels expected to be obtained if measurements are performed in accordance with ARI Standard 575-94, Method of measuring machinery sound within equipment rooms. Sound pressure levels are at 1 meter from the chiller and 1.5 meters above the floor; db is referenced to 20 micro Pa. These levels are the average of various positions around the chiller.

These levels are expected to occur only in an acoustic free-field environment, such as a large machinery room with acoustic absorption on perimeter walls. Proper isolation is required at the chiller mounting feet, water piping and other chiller to building interfaces. **For more information on installation guidelines for screw chillers refer to YORK YR/YS Application Guidelines, Form 160.00-AD1.**

Sound levels listed are only for chiller operation at the screw compressor design volume ratio. Sound levels will increase based on chiller operation parameters that cause the volume ratio to differ from the design. Sound estimates are based on water temperatures of 44 deg. F leaving chilled water and 85 deg. F entering condenser water at full load and with ARI-550 condenser water relief at part loads. Contact marketing for sound estimates at other temperatures.

TOLERANCES: The sound level of identical unit selections can vary due to manufacturing tolerance and test repeatability. Variations of +/-3 DBA on the A-Weighted levels and +/-5 DB on the octave band levels are possible. Sound levels can be guaranteed at the upper end of the tolerance range, witness tests must be conducted in free-field environments such as the sound test facilities at the Grantley Plant, York, PA.

Sound data shown is based on the YR unit with standard factory acoustical treatment applied to the following components: Oil separator(26"), Discharge pipe and Muffler housing.

Ratings outside the scope of ARI STD 550/590.
Compliant with ASHRAE 90.1

Materials and construction per mechanical specifications - Form 160.81-EG1.

LOW SIDE MACHINES:

MODEL	YRTCTDT0-46C		(MOTOR SELECTED BY USER)	
REFRIGERANT	134A			
RATED CAPACITY (TR)	230		**SPECIFIED CAPACITY (TR)**	230
INPUT POWER (KW)	137		**MAX MOTOR LOAD (KW)**	264
VOLTAGE / HZ	460 / 60			
ORIFICE (VARY)	VALVE:2			
RLA	202		**LRA**	1488
MIN CIR. AMPS.	253		**MAX C.B.**	450
INRUSH (AMPS)	670			
SSS SIZE	07L_K-46			
FULL LOAD (kW/TR)	0.596			

STARTER TYPE (1) SOLID STATE STARTER - 3 LEAD

	Evaporator	**Condenser**
FLUID	WATER*	WATER*
% BY WEIGHT	0.0*	0.0*
TUBE MTI NO.	281*	260*
PASSES	1*	1*
FOUL FACTOR (hr.ft².°F/BTU)	0.00010*	0.00025*
FLUID ENT TEMP (°F)	50.93	85.00*
FLUID LVG TEMP (°F)	45.00*	90.22
FLUID FLOW (gpm)	930.0*	1240.0*
FLUID PRDROP (ft)	7.0	5.4

(*) Designates Specified Input

Rating certified in accordance with ARI STD. 550/590.
Water-chilling packages using the vapor compression cycle certification program.

Compliant with ASHRAE 90.1

NPLV is not applicable as the minimum allowed CEFT is greater than 65F/18.33C.
Materials and construction per mechanical specifications - Form 160.81-EG1.

YORK
A JOHNSON CONTROLS COMPANY

YR MAXE CHILLER
PERFORMANCE SPECIFICATION

Unit Tag	Qty	Model No.	Capacity (tons)	Power	Refrigerant
CH-2	1	YRTCTDT0-46C	230	460/3/60	R-134A

Unit Data	Evaporator	Condenser
EWT (°F):	50.93	85.00
LWT (°F):	45.00	90.22
Flow Rate (gpm):	930	1240
Pressure Drop (ft):	7.0	5.4
Fluid Type (%):	WATER	WATER
Circuit No. of Passes:	1	1
Fouling Factor (ft² °F hr / Btu):	0.00010	0.00025
Tube No. / Description:	281 - 0.025" Enhanced Copper	260 - 0.025" CSL Enhanced Copper
Design Working Pressure (psig):	150	150
Entering Water Nozzle @ Location:	A	P
Leaving Water Nozzle @ Location:	H	Q
Water Box Weight, ea (lbs) :	143	119
Cover Plate Weight , ea (lbs):	N/A	N/A
Return Head Weight (lbs):	N/A	N/A
Water Weight (lbs):	355	419

Performance Data		Electrical Data		Other	
KW:	137	RLA:	199	Operating Wt. (lbs):	14458
KW/Ton:	0.596	LRA:	1488	Per Isolator (lbs):	3615
NPLV (1):	0.470	Inrush Amps:	669	Refrigerant Wt. (lbs):	635
		Min Circuit Ampacity (Amps):	253	Oil Charge (gal):	10
		Non-Fused Disconnect (Amps):	400	Motor Wt. (lbs):	N/A
				Compressor Wt. (lbs):	4385
				Oil Separator Wt. (lbs):	1400
				Starter Wt. (lbs):	200
				Shipping Wt. (lbs):	13684
		Type Starter: Solid State Starter			

Notes:

(1) Chiller NPLV value calculated to ARI Standard 550/590 equation.

Project Name: Alexandria Public Safety Ctr	Sold To:	
Location:	Customer Purchase Order No.:	
Engineer:	York Contract No.: 09115417	
Contractor:	Date:	Revision Date:

MODEL	YRTCTDT0-46C		(MOTOR SELECTED BY USER)	
REFRIGERANT	134A			
RATED CAPACITY (TR)	230		**SPECIFIED CAPACITY (TR)**	230
INPUT POWER (KW)	137		**MAX MOTOR LOAD (KW)**	264
VOLTAGE / HZ	460 / 60			
ORIFICE (VARY)	VALVE:2			
RLA	202		**LRA**	1488
MIN CIR. AMPS.	253		**MAX C.B.**	450
INRUSH (AMPS)	670			
SSS SIZE	07L_K-46			
FULL LOAD (kW/TR)	0.596		**NPLV**	0.470

STARTER TYPE (1) SOLID STATE STARTER - 3 LEAD

	Evaporator	**Condenser**
FLUID	WATER*	WATER*
% BY WEIGHT	0.0*	0.0*
TUBE MTI NO.	281*	260*
PASSES	1*	1*
FOUL FACTOR	0.00010*	0.00025*
FLUID ENT TEMP (°F)	50.93	85.00*
FLUID LEV TEMP (°F)	45.00*	90.22
FLUID FLOW (gpm)	930.0*	1240.0*
FLUID PRDROP (ft)	7.0	5.4

(*) Designates Specified Input

YORK SCREW CHILLER SOUND PRESSURE LEVELS- Cooling (ARI 550)

SOUND PRESSURE LEVELS FOR UNIT WITH NO ACOUSTIC TREATMENT, STANDARD									
PCT LOAD	**OCTAVE BAND CENTER FREQUENCY, HZ**								**A-WEIGHTED DBA**
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
100.0	74.0	78.0	76.0	80.0	83.0	81.0	74.0	64.0	85.0
75.0	74.0	76.0	76.0	78.0	82.0	78.0	74.0	64.0	83.0
50.0	74.0	74.0	76.0	78.0	80.0	76.0	74.0	64.0	81.0
25.0	74.0	74.0	78.0	80.0	79.0	77.0	74.0	64.0	82.0

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TOLERANCES: The sound level of identical unit selections can vary due to manufacturing tolerance and test repeatability. Variations of +/-3 DBA on the A-Weighted levels and +/-5 DB on the octave band levels are possible. Sound levels can be guaranteed at the upper end of the tolerance range, witness tests must be conducted in free-field environments such as the sound test facilities at the Grantley Plant, York, PA.

Sound data shown is based on the YR unit with standard factory acoustical treatment applied to the following components: Oil separator(26"), Discharge pipe and Muffler housing.

Rating certified in accordance with ARI STD. 550/590.
Water-chilling packages using the vapor compression cycle certification program.
Compliant with ASHRAE 90.1

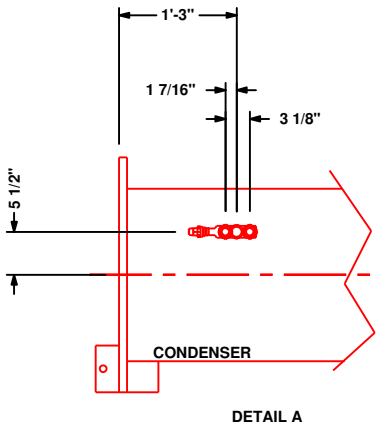
Materials and construction per mechanical specifications - Form 160.81-EG1.

UNIT DRAWINGS

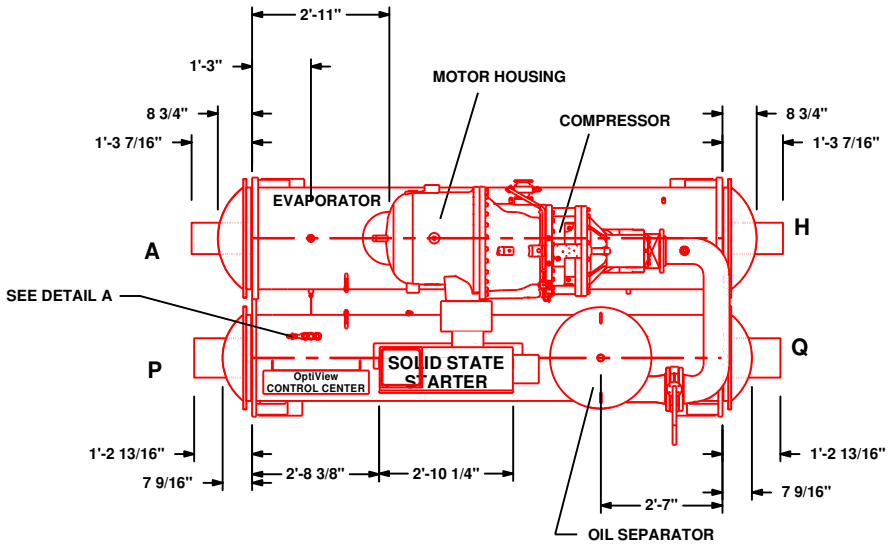
NOZZLE LEGEND

EVAPORATOR INLET "A" 1 PASS 8" DIA.(150 Psig DWP)
EVAPORATOR OUTLET "H" 1 PASS 8" DIA.(150 Psig DWP)
CONDENSER INLET "P" 1 PASS 10" DIA.(150 Psig DWP)
CONDENSER OUTLET "Q" 1 PASS 10" DIA.(150 Psig DWP)

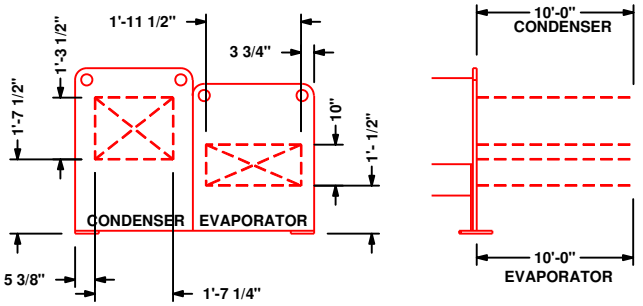
Victaulic Grooved Nozzles (per ANSI / AWWA C-606)

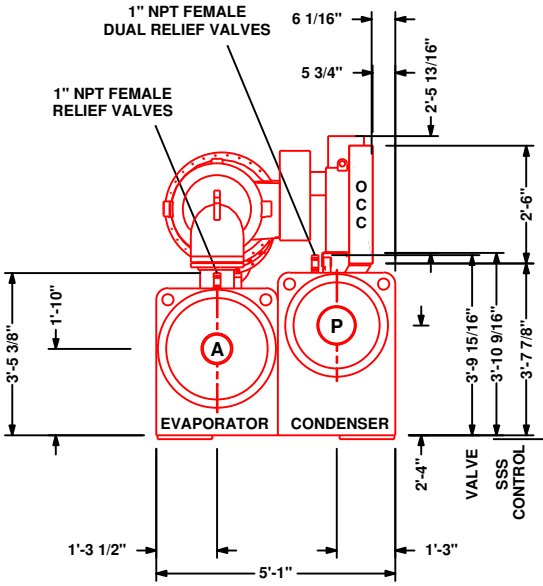


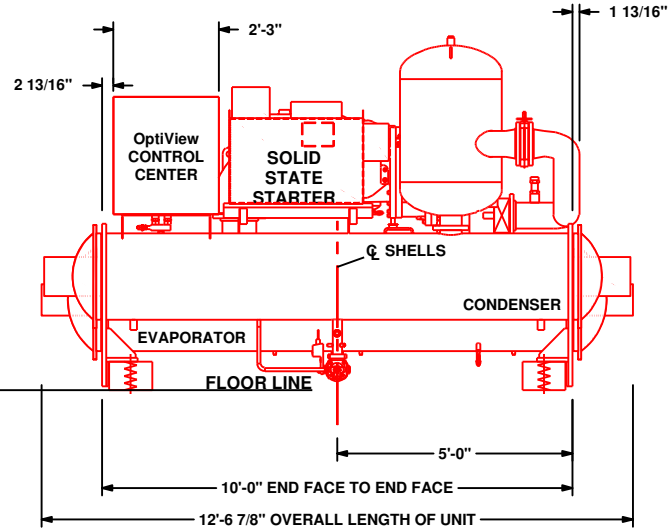
DETAIL A

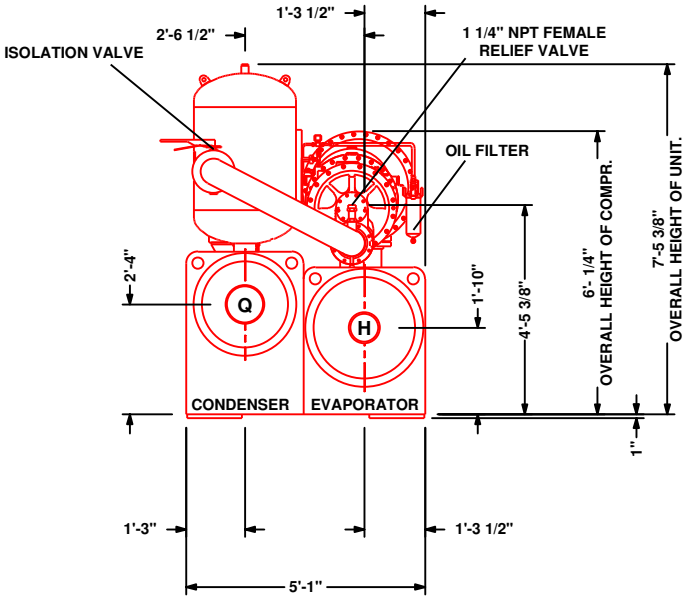


TUBE PULL AREA DETAIL









SHIPPING WT.: 13684 LBS, OPERATING WT. 14458 LBS, LOAD PER ISOLATOR 3614 LBS

PRODUCT DRAWING

MaxE Screw Liquid Chiller
MODEL YR TC TD T0 - 46 C
NOT FOR CONSTRUCTION

Project Name : Alexandria PSC
Location :
Engineer :
Contractor :
For : N/A

Sold To :
Cust Purch Order# :
York Contract# :

UNIT TAG: **CH-1**

Date : Dec 22, 2008
Rev. Date : 4:52 PM
Form: 160.81-EG2
Dwg. Lev. : 0905
Dwg. Scale : NTS

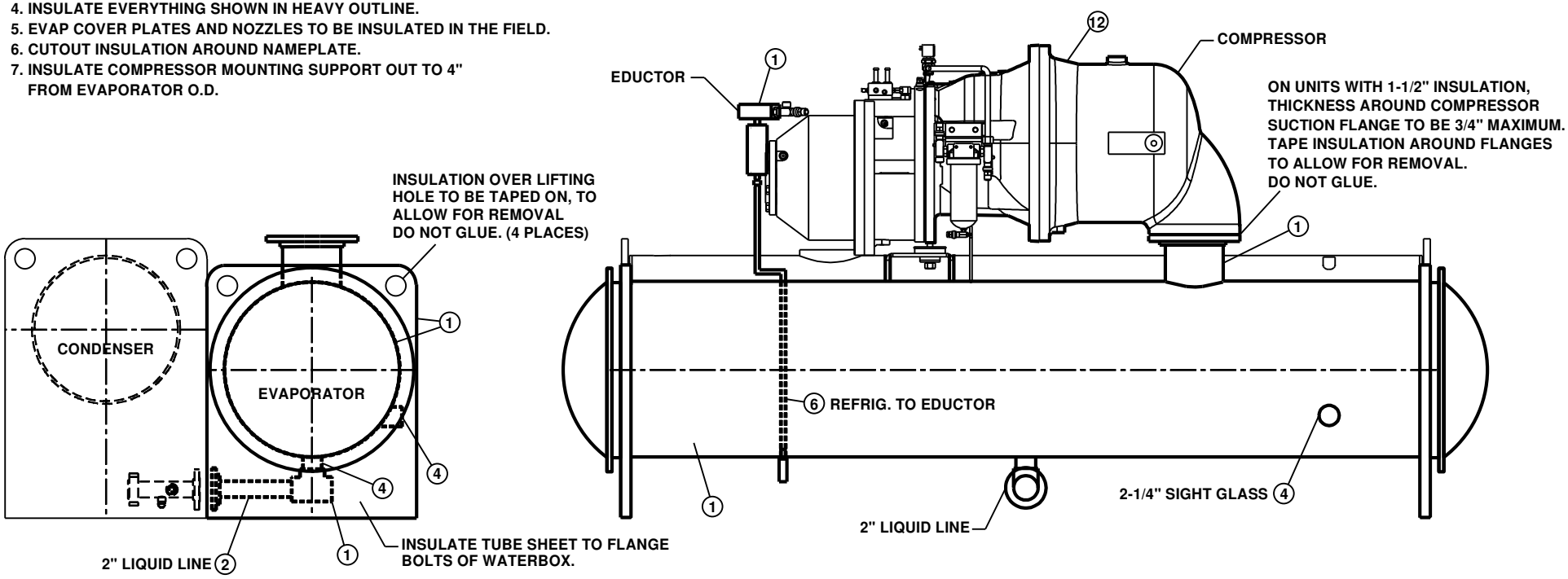
YORK®
A JOHNSON CONTROLS COMPANY

ITEM 1. INSULATION 3/4" THK. -- COOLER AND WATER BOXES 153 SQ. FT.
(WATER BOXES ONLY 20 SQ. FT.)
ITEM 2. INSULATION 2 3/8" ID X 3/4" WALL - 3 FT.
ITEM 4. INSULATION 2 7/8" ID X 3/4" WALL - 1 FT.
ITEM 6. INSULATION 3/8" IDX 3/4" WALL - 5 FT.
ITEM 12. COMPRESSOR THERMAL BLANKET

NOTE: FOR DOUBLE THICKNESS INSULATION USE 1 1/2" THK.
INSULATION INSTEAD OF 3/4" THK. INSULATION.

NOTES:

1. ALL SURFACE AREAS TO BE INSULATED SHALL BE CLEANED FREE OF OIL, DIRT & DUST PRIOR TO INSULATING.
2. ALL SEAMS AND JOINTS IN INSULATION TO BE CUT SQUARE, GLUED, TAPED AND SEALED WITH GLUE. THIS INCLUDES FORM TO METAL JOINTS WHICH ARE ACCESIBLE.
3. PRIMARILY 2" WIDE TAPE IS TO BE USED THROUGH-OUT WITH EXCEPTION TO 90° SEAMS AND JOINTS ON CONTOURED SURFACES WHERE 3/4" WIDE TAPE IS TO BE USED.
4. INSULATE EVERYTHING SHOWN IN HEAVY OUTLINE.
5. EVAP COVER PLATES AND NOZZLES TO BE INSULATED IN THE FIELD.
6. CUTOUT INSULATION AROUND NAMEPLATE.
7. INSULATE COMPRESSOR MOUNTING SUPPORT OUT TO 4" FROM EVAPORATOR O.D.



NOTE: WATER BOXES SHOWN EXCLUDING NOZZLES, FOR ACTUAL WATER BOX CONFIGURATION SEE UNIT DRAWING.

PRODUCT DRAWING

THERMAL INSULATION REQUIREMENTS
MODEL YR TC TD T0 - C S
NOT FOR CONSTRUCTION

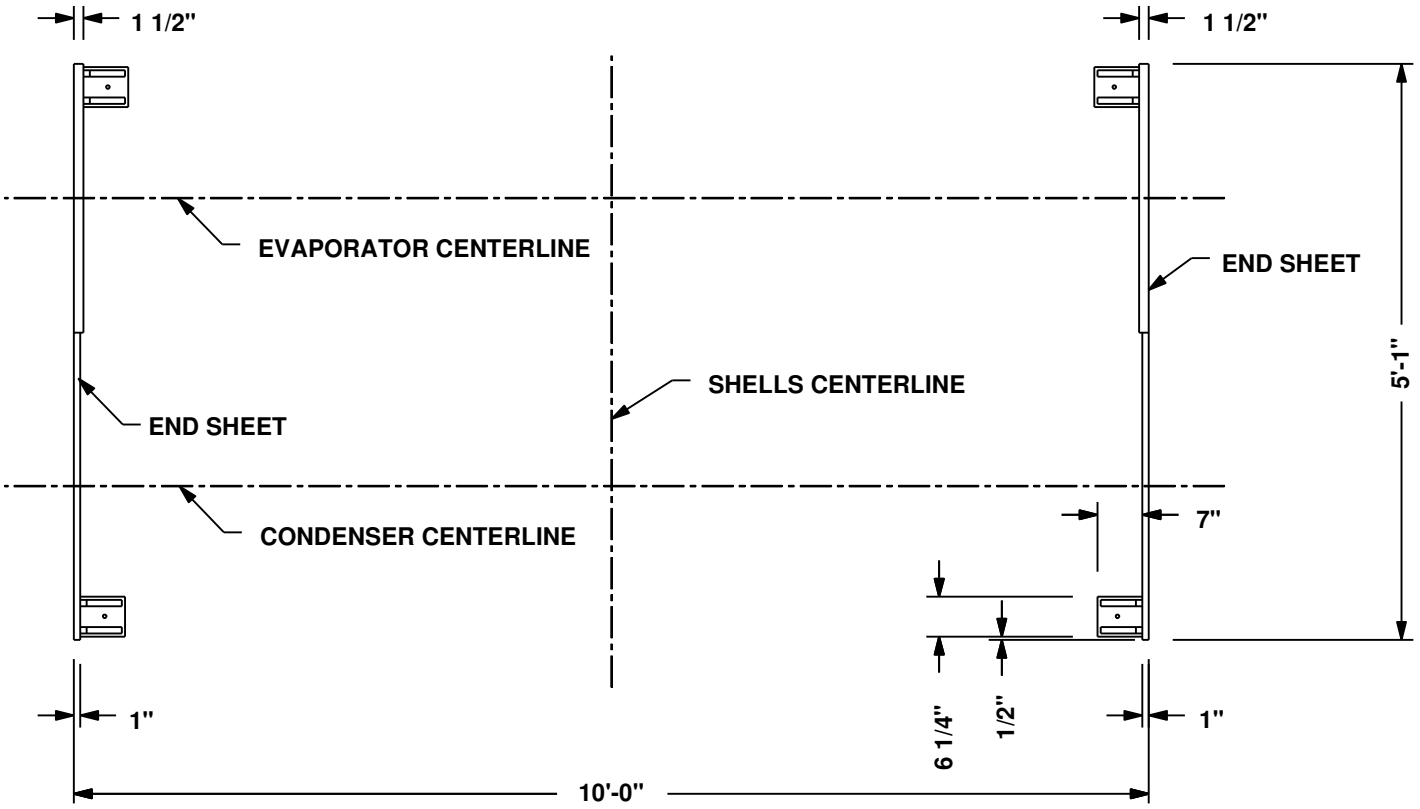
Project Name : Alexandria PSC
Location :
Engineer :
Contractor :
For : N/A

Sold To :
Cust Purch Order# :
York Contract# :

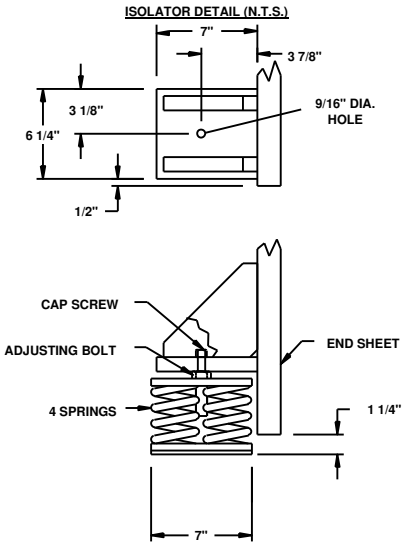
UNIT TAG: **CH-1**

Date : Dec 22, 2008
Rev. Date : 4:57 PM
Form: 160.81-EG2
Dwg. Lev. : 0905
Dwg. Scale : NTS

YORK®
A JOHNSON CONTROLS COMPANY



DIMENSIONS ARE TYPICAL ALL FOUR CORNERS



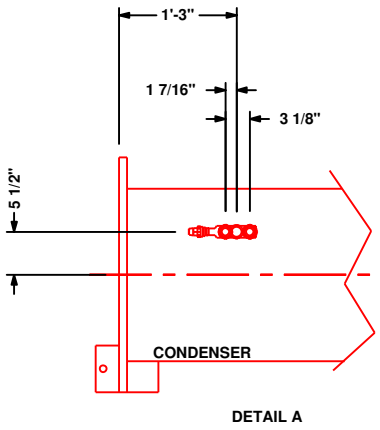
FLOOR LAYOUT (NOT TO SCALE)

PRODUCT DRAWING FLOOR LAYOUT W/SPRING ISOLATORS MODEL YR TC TD T0 - 46 C NOT FOR CONSTRUCTION	Project Name : Alexandria PSC Location : Engineer : Contractor : For : N/A	Sold To : Cust Purch Order# : York Contract# : UNIT TAG: **CH-1**	Date : Dec 22, 2008 Rev. Date : 4:56 PM Form: 160.81-EG2 Dwg. Lev. : 0905 Dwg. Scale : NTS	YORK® A JOHNSON CONTROLS COMPANY

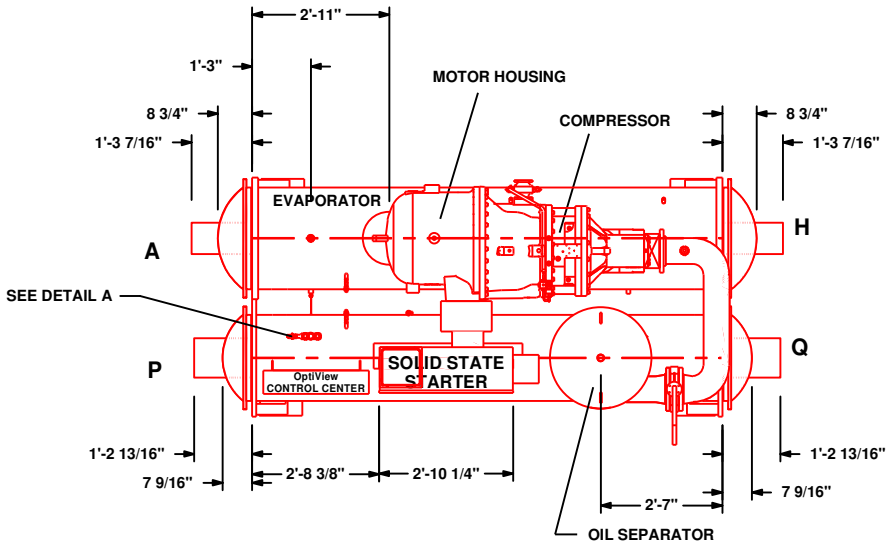
NOZZLE LEGEND

EVAPORATOR INLET "A" 1 PASS 8" DIA.(150 Psig DWP)
EVAPORATOR OUTLET "H" 1 PASS 8" DIA.(150 Psig DWP)
CONDENSER INLET "P" 1 PASS 10" DIA.(150 Psig DWP)
CONDENSER OUTLET "Q" 1 PASS 10" DIA.(150 Psig DWP)

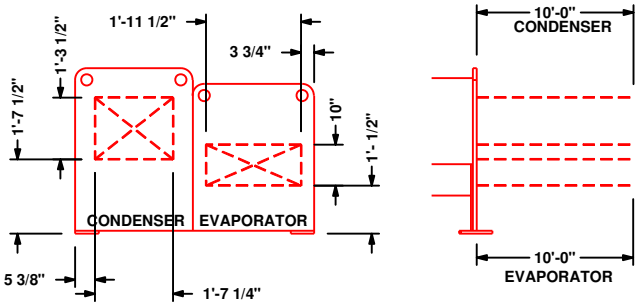
Victaulic Grooved Nozzles (per ANSI / AWWA C-606)

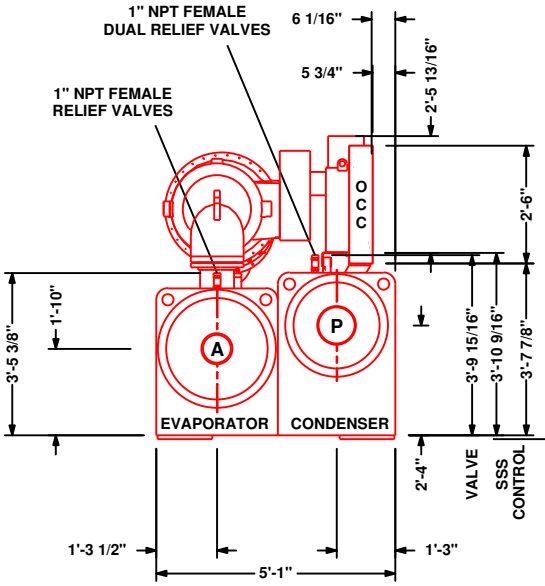


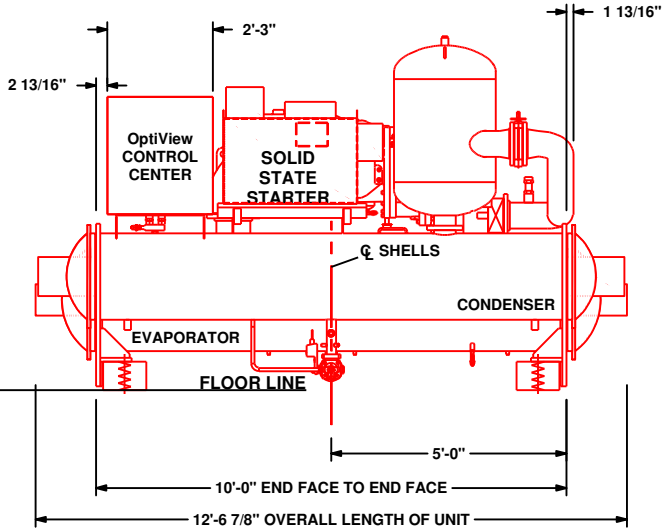
DETAIL A

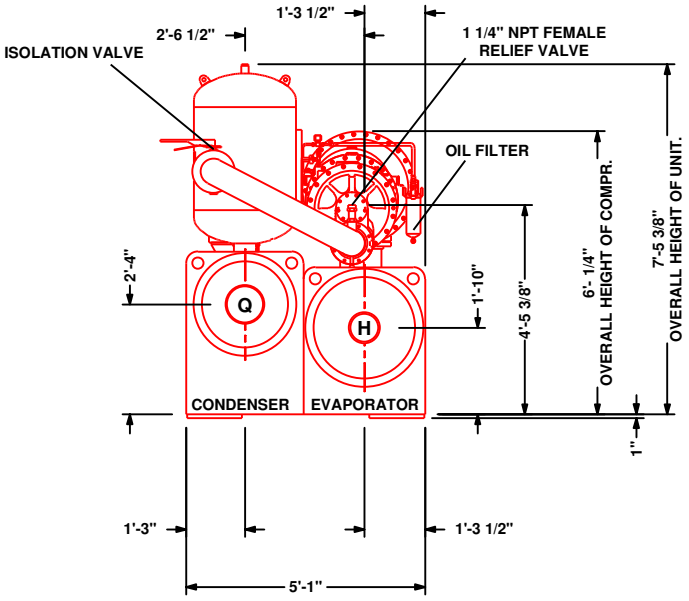


TUBE PULL AREA DETAIL









SHIPPING WT.: 13684 LBS, OPERATING WT. 14458 LBS, LOAD PER ISOLATOR 3614 LBS

PRODUCT DRAWING

MaxE Screw Liquid Chiller
MODEL YR TC TD T0 - 46 C
NOT FOR CONSTRUCTION

Project Name : Alexandria PSC
Location :
Engineer :
Contractor :
For : N/A

Sold To :
Cust Purch Order# :
York Contract# :

UNIT TAG: **CH-2**

Date : Dec 22, 2008
Rev. Date : 5:01 PM
Form: 160.81-EG2
Dwg. Lev. : 0905
Dwg. Scale : NTS

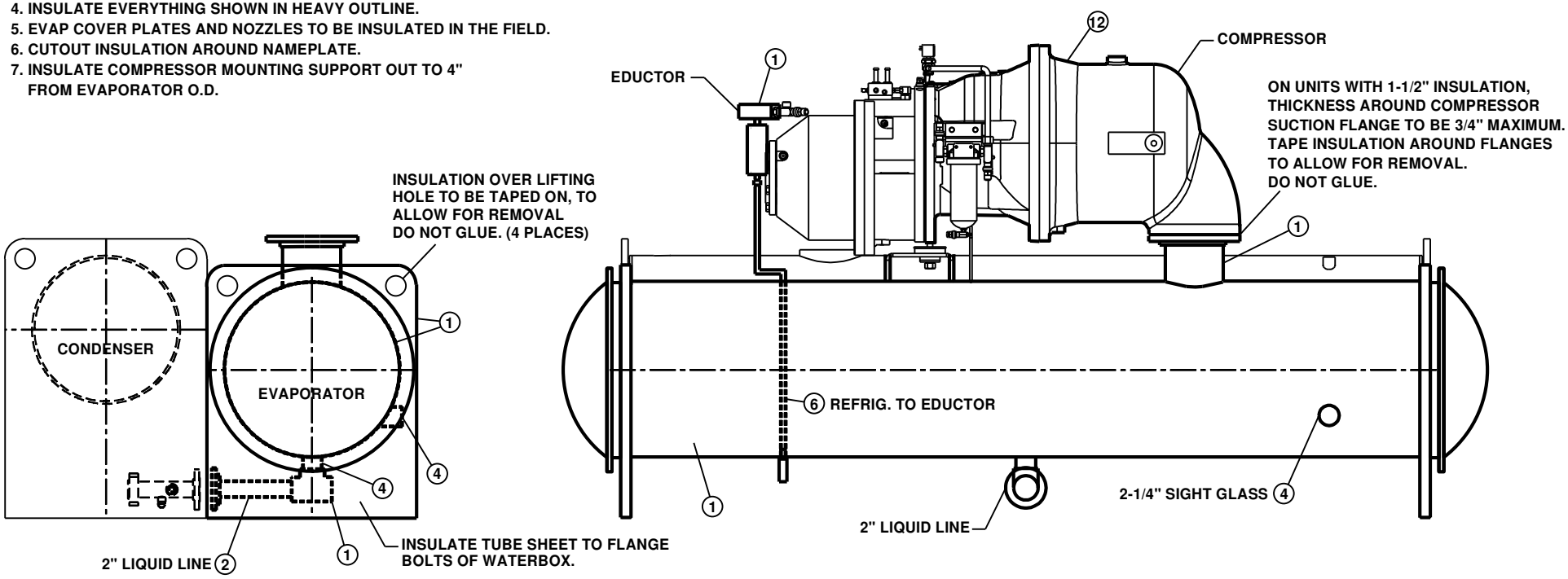
YORK®
A JOHNSON CONTROLS COMPANY

ITEM 1. INSULATION 3/4" THK. -- COOLER AND WATER BOXES 153 SQ. FT.
(WATER BOXES ONLY 20 SQ. FT.)
ITEM 2. INSULATION 2 3/8" ID X 3/4" WALL - 3 FT.
ITEM 4. INSULATION 2 7/8" ID X 3/4" WALL - 1 FT.
ITEM 6. INSULATION 3/8" IDX 3/4" WALL - 5 FT.
ITEM 12. COMPRESSOR THERMAL BLANKET

NOTE: FOR DOUBLE THICKNESS INSULATION USE 1 1/2" THK.
INSULATION INSTEAD OF 3/4" THK. INSULATION.

NOTES:

1. ALL SURFACE AREAS TO BE INSULATED SHALL BE CLEANED FREE OF OIL, DIRT & DUST PRIOR TO INSULATING.
2. ALL SEAMS AND JOINTS IN INSULATION TO BE CUT SQUARE, GLUED, TAPED AND SEALED WITH GLUE. THIS INCLUDES FORM TO METAL JOINTS WHICH ARE ACCESIBLE.
3. PRIMARILY 2" WIDE TAPE IS TO BE USED THROUGH-OUT WITH EXCEPTION TO 90° SEAMS AND JOINTS ON CONTOURED SURFACES WHERE 3/4" WIDE TAPE IS TO BE USED.
4. INSULATE EVERYTHING SHOWN IN HEAVY OUTLINE.
5. EVAP COVER PLATES AND NOZZLES TO BE INSULATED IN THE FIELD.
6. CUTOUT INSULATION AROUND NAMEPLATE.
7. INSULATE COMPRESSOR MOUNTING SUPPORT OUT TO 4" FROM EVAPORATOR O.D.



NOTE: WATER BOXES SHOWN EXCLUDING NOZZLES, FOR ACTUAL WATER BOX CONFIGURATION SEE UNIT DRAWING.

PRODUCT DRAWING

THERMAL INSULATION REQUIREMENTS
MODEL YR TC TD T0 - C S
NOT FOR CONSTRUCTION

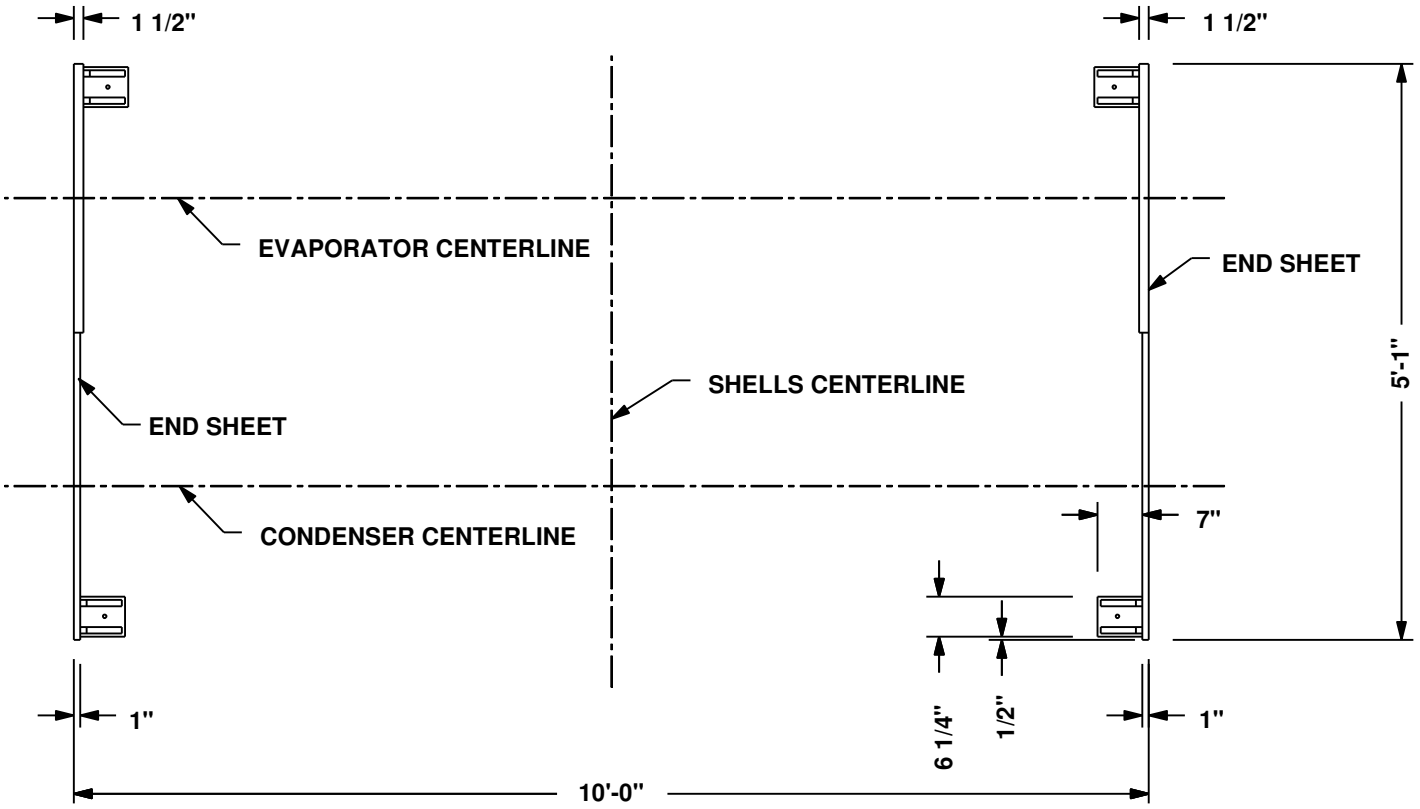
Project Name : Alexandria PSC
Location :
Engineer :
Contractor :
For : N/A

Sold To :
Cust Purch Order# :
York Contract# :

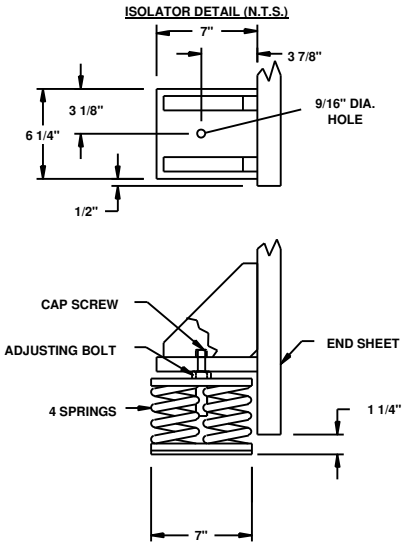
UNIT TAG: **CH-2**

Date : Dec 22, 2008
Rev. Date : 5:03 PM
Form: 160.81-EG2
Dwg. Lev. : 0905
Dwg. Scale : NTS

YORK®
A JOHNSON CONTROLS COMPANY



DIMENSIONS ARE TYPICAL ALL FOUR CORNERS

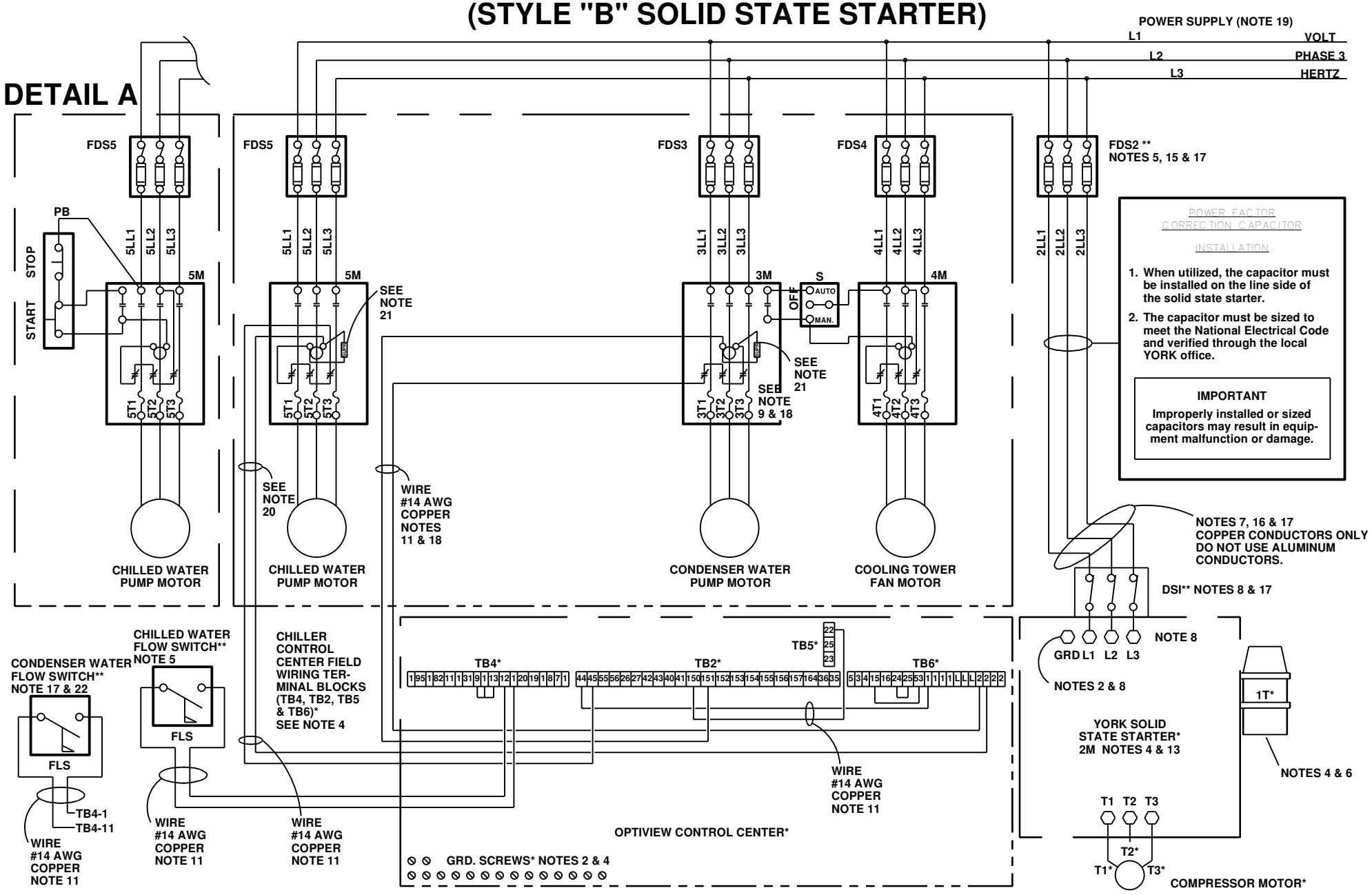


FLOOR LAYOUT (NOT TO SCALE)

PRODUCT DRAWING FLOOR LAYOUT W/SPRING ISOLATORS MODEL YR TC TD T0 - 46 C NOT FOR CONSTRUCTION	Project Name : Alexandria PSC Location : Engineer : Contractor : For : N/A	Sold To : Cust Purch Order# : York Contract# : UNIT TAG: **CH-2**	Date : Dec 22, 2008 Rev. Date : 5:02 PM Form: 160.81-EG2 Dwg. Lev. : 0905 Dwg. Scale : NTS	YORK® A JOHNSON CONTROLS COMPANY

ELECTRICAL DATA

WIRING DIAGRAM FIELD CONNECTIONS
(STYLE "B" SOLID STATE STARTER)



PRODUCT DRAWING

OPTIVIEW CONTROL Center
WITH SOLID STATE STARTER
NOT FOR CONSTRUCTION

Project Name : Alexandria PSC
Location :
Engineer :
Contractor :
For : N/A

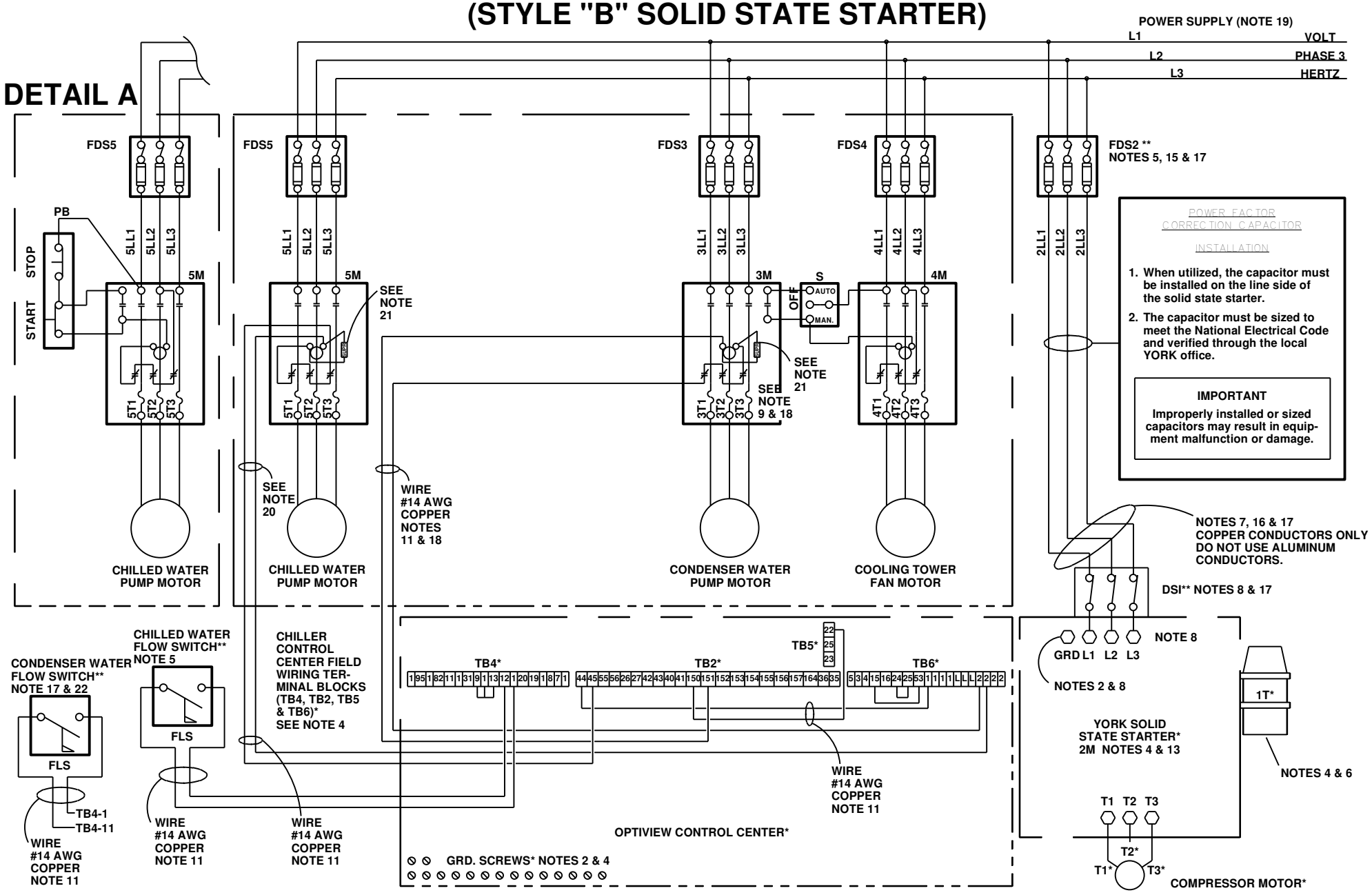
Sold To :
Cust Purch Order# :
York Contract# :

UNIT TAG: **CH-1**

Date : Dec 22, 2008
Rev. Date : 4:56 PM
Form No.: 160.81-PW4
Dwg. Lev. : 1004
Dwg. Scale : NTS

YORK®
A JOHNSON CONTROLS COMPANY

WIRING DIAGRAM FIELD CONNECTIONS
(STYLE "B" SOLID STATE STARTER)



PRODUCT DRAWING

OPTIVIEW CONTROL Center
WITH SOLID STATE STARTER
NOT FOR CONSTRUCTION

Project Name : Alexandria PSC
Location :
Engineer :
Contractor :
For : N/A

Sold To :
Cust Purch Order# :
York Contract# :

UNIT TAG: **CH-2**

Date : Dec 22, 2008
Rev. Date : 5:02 PM
Form No.: 160.81-PW4
Dwg. Lev. : 1004
Dwg. Scale : NTS

YORK®
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YORK®
PRODUCT DRAWING

SUPERSEDES: 160.81-PW4(1004) Form 160.81-PW4 (307)

WIRING DIAGRAM – FIELD CONNECTIONS
MAXE™ YR (STYLE C) ROTARY SCREW CHILLER
OPTIVIEW CONTROL CENTER
WITH YORK STYLE B SOLID STATE STARTER

CONTRACTOR:	**CAPITOL CONTRACTORS**	PURCHASER:	**Capitol Contractors**
ORDER NO.:		JOB NAME:	**Alexandria Public Safety Center**
YORK CONTRACT NO.:	**09115417**	LOCATION:	**Alexandria, Virginia**
YORK ORDER NO.:	**09115417-02 & -03**	ENGINEER:	**Camp Dresser & McKee**

☐ REFERENCE DATE:_____ ■ APPROVAL DATE: 12/22/08 ☐ CONSTRUCTION DATE: _____

JOB DATA:

CHILLER MODEL NO.:	**YRTCTDT0-46C**
NUMBER OF UNITS:	**2**
STYLE B SOLID STATE STARTER MODEL NO.:	**SSS-7**
MOTOR/STARTER POWER:	**460 VOLTS, 3-PHASE, 60 HZ**
OPTIONAL FACTORY INSTALLED DISCONNECT SWITCH:	**400 AMPS**

NOTES:

1. All field wiring shall be in accordance with the current edition of the National Electrical code (N.E.C.) as well as all other applicable codes and specifications.

2. Solid State Starter shall be grounded in accordance with the 1999 N.E.C. (paragraph 250-118); and as applies to present-day N.E.C. standards, for equipment grounding. Where a separate grounding conductor is used, it must be a copper conductor only and sized per the 1999 N.E.C. (Table 250-122); and as applies to present-day N.E.C. standards. Per 1999 N.E.C. (Paragraph 250-(f)11); and as applies to present-day N.E.C. standards, where multiple parallel conduits are used, each must contain a grounding conductor. See Note 8 for grounding lug wire range.

3. Wiring, electrical conduit, junction boxes, fused disconnect switches (FDS), or circuit breakers, starters (M), push-button stations (PB), manual-off-automatic switch (S), flow switch (FLS), and control relays furnished by others unless otherwise specified.

4. Items marked with an * are furnished by YORK.

5. Items marked with an ** are available from YORK at additional cost.

6. OptiView™ Control Center power supply 115V - 50/ 60 Hz, 1.5 KVA capacity for control center only, is supplied by a control power transformer (1T) mounted on the side of the Solid State Starter as shown. It is factory wired.

7. Starter power conduit connection (cut holes to suit) locations, motor full load amperes (FLA), locked rotor amperes and inrush amperes per Product Drawing 160.81-PA1. Flexible conduit must be used for final connections to starter. Multiple conduits shall contain an equal number of wires from each phase in each conduit to prevent overheating per 1999 N.E.C. (Paragraph 300-20(a)); and as applies to present-day N.E.C. standards. Use copper conductors only; DO NOT USE aluminum conductors. See Note 8 and 24 for factory furnished starter terminal lug wire ranges and conduit connection provisions.

   The following terminal lugs are factory furnished for field wiring connections when a factory-installed disconnect switch or circuit breaker with ground fault protection is supplied.

Starter Model No. and Avail. Disconnect Switch / Circuit Breaker Amp Rating (See Note 17a)	Line Side Lugs		Grounding Lug	
	Qty. Per Terminal	Wire Range	Lug Rating	Wire Range Qty. AL9CU
SSS 7L.400A	2	3/0-250kcmil	AL7CU	#14-1/0, 1 bbl

8. Condenser water pump motor starter (3M) holding coil to be furnished for 115V - 50/60 Hz. The power requirements for the water pump starter (3M) must be a max. of 1 Amp holding and 10 Amps inrush. If power requirements exceed this value, furnish coil for line voltage, and control relay with 115V coil.

9. Units shipped knocked down require field connection of harnesses to control panel and power wiring between compressor motor and starter. These harnesses and power wiring are furnished by YORK for field assembly and consist of proper lengths of flexible conduit with necessary connectors, and contain the wires (shown in Note 13) properly terminated and marked.

10. Wire #14 AWG copper for one way distance of less than 175 feet. Wire #12 AWG copper for one way distance of more than 175 feet, but less than 300 feet.

11. Wiring diagram for YORK OptiView™ Control Center, Form 160.81-PW2. Field wiring modifications per Form 160.81-PW5. Wring diagram for YORK Solid State Starter Form 160.81-PW6.

12. The following interconnecting wires are factory sup plied when a YORK Solid State Starter is used. (See Forms 160.81-PW2 and 160.81-PW4).

    a. Starter to control center - L, 2, 16, 24, and 53; 3 and 2 conductor shielded cables.

13. Full load amperes for 1.5 KVA control power transformer (furnished by YORK and factory wired) to be used with Notes 15, 16 and 17 are:

3-Phase Voltage	Hz	Control Power (1T) Transformer (Amps)
460	60	3.4

14. If an optional circuit breaker is not provided, the branch circuit overcurrent protection device(s) for the YORK Solid State Starter must be a time delay type with a maximum rating which is sized in accordance with the N.E.C., and shall not exceed the smaller of the two ratings listed following, (a) or (b):
    a. The next standard fuse/breaker rating equal to or below:

       2.25(Compressor-Motor FLA) + Control Transformer Amps

    b. A rating limited by the starter size as follows:

Starter Model No.	Max. Fuse/Breaker Size (Amps)
SSS 7L	500

    Where 2.25 factor is per 1999 N.E.C. [Paragraphs 440-22(a) and (b)]; and as applies to present-day N.E.C. standards. FLA is per Note 7; control power transformer Amps per Note 14.

15. The YORK Solid State Starter power wiring ampacity shall be calculated as follows.

    Model YR minimum circuit ampacity:
    Ampacity = 1.25(Compressor-Motor FLA) + Control Transformer Amps

    Where 125% factor per 1999 N.E.C. (Para. 440-33); and as applies to present-day N.E.C. standards, FLA is per Note 7; control power transformer Amps per Note 14.

16. If the fused disconnect switch (FDS2) is not located in sight (1999 N.E.C. Paragraph 440-14; and as applies to present-day N.E.C. standards) of the YORK Style "B" Solid State Starter, a non-fused disconnect switch (not shown) shall be located in sight of the Solid State Starter between FDS2 and the Solid State Starter. The ampere rating shall be determined as follows for the disconnect switch of FDS2: The larger of

    a. Amp Rating = 1.15 (Compressor-Motor FLA + Control Power Transformer Amps)
       Or

    b. The size required to mount the fuses determined in Note 15 (if a fused disconnect is employed).

    Where 115% factor is per 1999 N.E.C. (Paragraph 440- 12b (2));and as applies to present-day N.E.C. standards, FLA is per Note 7 and control power transformer Amps per Note 14. An optional factory mounted and wired disconnect switch or circuit breaker is available within the Mod "B" SSS (See Note 8).

17. Control circuit wiring for 3M condenser water pump motor starter is shown for cooling only application. Refer to 160.81-PW5.

18. The main power transformer should be adequately sized such that the transformer voltage drop does not exceed 10% during unit start-up. Also, the supply voltage, at starter input terminals, during start-up must be maintained above the minimum value specified in the table. Note that while the YORK chiller will perform acceptably during startup with this amount of voltage drop, the performance of other equipment connected to the supply transformer could be adversely affected.

3 Phase Voltage	Hz	Minimum Voltage at Starter Input Terminals During Start-Up
460	60	391

19. Automatic control of the chilled water pump by the Control Center is shown. Chilled water pump motor starter (5M) holding coil to be furnished for 115V - 50/60 Hz. The power requirements for the water pump starter (5M) must be a maximum of 2 Amps inductive at 115VAC. If power requirements exceed this value, furnish coil for line voltage, and control relay with 115V coil.

Two chilled water pump operating modes are available via the CHW Pump programming dip switch (SW1, position 8) on the micro board. With the switch in the "OFF" position, the chilled water pump operates for 30 seconds prior to compressor start, during compressor operation, coastdown, and LWT cycling shutdowns. With the switch in the "ON" position, the chilled water pump operates as above plus it operates during MULTI-UNIT and REMOTE/ LOCAL cycling shutdowns.

For manual chilled water pump control, connect a manual start/stop switch as shown in Detail A.

20. Each 115VAC field-connected inductive load, i.e. relay coil, motor starter coil, etc. shall have a transient suppressor wired (by others) in parallel with its coil, physically located at the coil. Spare transient suppressors are factory supplied in a bag attached to the keypad cable clamp in the OptiView™ Control Center.

21. The condenser Flow Switch is optional. If not present, a jumper must be installed between TB11 and TB4-1.

22. The short circuit withstand capacity, as described in UL Standard 508, in symmetrical RMS Current is listed in the following table for each of the field wiring option kits.

MODEL	OPTION KIT	KA RATING (SYMMETRICAL A, RMS)	
		480V MAX.	600V MAX.
SSS 7L	400 A DISCONNECT SW.	18	18

23. Conduit Connection Provisions

Starter Model No.	No. of Conduits Max. Trade Conduit Size
7L	(2) 3"

RELIEF VALVE SIZING

YORK A JOHNSON CONTROLS COMPANY	YR Refrigerant Relief Valve Vent Sizing	
APPLICATION DATA	Supersedes: 160.81-AD1 (303)	Form 160.81-AD1 (1105)

The ASHRAE-15 Safety Code for Mechanical Refrigeration provides guidelines for sizing refrigerant relief valves and vent piping. Without attempting to provide a complete and thorough interpretation, this document provides the necessary data to properly determine piping requirements.

Relief Valve Sizing

YORK YR units are supplied with pressure relieving devices which are properly sized, selected, and installed on each unit. Owners, facility managers, or consulting engineers need relief valve rated discharge capacities [C_r] to adequately size relief vent piping from the chiller. ASHRAE 15-2001, Section 9.4 provides guidelines for selecting the type of pressure-relief protection (relief valves, rupture discs, or fusible plugs) and Section 9.7 provides the criteria for properly sizing the relief valve and vent piping from the chiller.

Section 9.7.5 defines the **minimum required discharge capacity [C]** of the relief device as:

$$C = f\,DL \quad \text{[lbs. of air per minute (kg/s)]} \qquad \text{Eq. 1}$$

where:
f = factor dependent upon type of refrigerant {= 1.6 for R-134a},
D = outside diameter of vessel in feet (m), and
L = length of vessel in feet (m).

Notes:
1) When combustible materials are used within 20 ft. (6.1 m) of a pressure vessel, multiply the value of *f* (or C as provided in tabular form) by 2.5.
2) The formula is based on fire conditions. Other heat sources shall be calculated separately.

When one pressure-relief device or fusible plug is used to protect more than one pressure vessel, the required capacity shall be the sum of the capacities required for each pressure vessel**.** The relief valve located on the YR condenser is sized to protect both the condenser and the oil separator. There is no means of isolation between these two components.

The rated discharge capacities [C_r] for relief valves on York YR equipment are provided in Table I.

Section 9.7.6 specifies that the rated discharge capacity of each relief device shall be determined in accordance with the ASME Boiler and Pressure Vessel Code (paragraph UG-131, Section VIII, Division I) and that pipe and fittings between the pressure-relief valve and the parts of the system it protects shall have at least the area of the pressure-relief valve inlet area. Section 9.7.2.3. requires vessels or systems with a refrigerant capacity greater than 10 cubic feet be provided with a single rupture member or a dual relief valve assembly. A single relief valve is adequate for all vessels less than 10 cubic feet and for low side vessels equipped with isolation valves (e.g. YR evaporator). Additionally, *every pressure vessel* containing liquid refrigerant, which is capable of being isolated by stop valves, requires over-pressure relief protection.

Table I - Refrigerant Relief Configurations
York YR (mod. level C) Chillers

Compressor Code	Heat Exchanger Code	Relief Valve Setting	Evaporator (1)		Condenser (2)		Discharge Line (4)	
			Cr	Outlet Size	Cr	Outlet Size	Cr	Outlet Size
		PSIG	lb air/min	NPT	lb air/min	NPT	lb air/min	NPT
T0, ~~T1~~	T, ~~V~~	235	55.9	1”	55.9	1”	91.8	1-1/4”
~~T1~~	~~W~~		~~91.8~~	~~1 1/4”~~	~~91.8~~	~~1 1/4”~~	~~91.8~~	~~1 1/4”~~
~~T2, T3~~	~~W, X~~		~~91.8~~	~~1-1/4”~~	~~91.8~~	~~1-1/4”~~	~~2 @ 91.8~~	~~1-1/4”~~

Notes: (1) If the chiller is supplied with refrigerant isolation valves, the evaporator will be shipped with one single relief valve. If the chiller is supplied without refrigerant isolation valves (standard), the evaporator will be shipped with one dual valve assembly (see note 3 below) with one valve active at all times.

(2) All condensers are supplied with dual relief valves (see note 3 below), whether or not the chiller is equipped with isolation valves.

(3) A dual relief valve assembly consists of one three-way shut off valve and two single relief valves. The valve configuration will not allow both valves to be shut off at the same time, and valves are sized such that each relief valve has sufficient discharge capacity when used alone (line sizing should be based on the capacity of one valve for each dual relief assembly). This permits safe removal of either relief valve for repair or replacement, while maintaining vessel protection.-

(4) If the chiller is supplied with refrigerant isolation valves, the compressor discharge line will be shipped with relief valves as shown above. If the chiller is supplied *without* isolation valves (standard), relief valves are *not* required, and are not supplied on the discharge line.

Vent Line Sizing

Piping. ASHRAE 15-2001, Section 9.7.8 outlines acceptable relief piping locations and sizing. Summarized, the relief piping should vent R-134a refrigerant at least 15 feet above ground level and at least 20 feet from any window, ventilation opening, or building exit. The discharge piping should prevent a discharged refrigerant from being sprayed directly on personnel and prevent foreign material or debris from entering the piping. Additionally, discharge piping for a fusible plug or rupture disc shall have provisions to prevent plugging the pipe in the event of a discharge by the plug or disc.

As indicated in YORK Installation Instructions, each vent line must contain a dirt trap in the vertical section to allow collection and removal for any stack condensation or debris. The piping MUST be arranged to avoid strain on the relief valves – *YORK recommends the use of a flexible connector.* The vent line should be sized in accordance with ANSI/ASHRAE 15, and local code, *but should never be smaller than relief valve outlet sizes provided in Table I.*

Common Header. Section 9.7.8.4 allows for multiple relief devices (of the same or multiple units) to be connected into a common line or header. The sizing of the common discharge header and vent piping for relief devices expected to operate simultaneously shall be based on the sum of their outlet areas with due allowance for the pressure drop in all downstream sections and back-pressure resulting from the discharge of multiple relief devices.

For YORK MaxE YR mod C units, all externally vented relief devices are rated at the same pressure and must be considered in common header calculations. The relief devices on the ASME stamped heat exchangers are sized for fire conditions.

Maximum Length. Section 9.7.8.5 and Appendix H define the maximum length of discharge piping downstream of the pressure-relief device as:

$$L = \frac{0.2146 d^5 (P_0^2 - P_2^2)}{f C_r^2} - \frac{d * \ln(P_0 / P_2)}{6 f} \qquad \textit{[inches]} \qquad \text{Eq. (2)a}$$

$$\left[L = \frac{7.4381 \times 10^{-15} d^5 (P_0^2 - P_2^2)}{f C_r^2} - \frac{d * \ln(P_0 / P_2)}{500\ f} \right] \qquad \textit{millimeters} \qquad \text{Eq. (2)b}$$

Where:

L = equivalent length of discharge piping, ft (m);
C_r = rated capacity as stamped on the device in lb/min (kg/s);
f = Moody friction factor in fully turbulent flow (see table III);
d = inside diameter of pipe or tube, in (mm);
ln = natural logarithm;
P_2 = absolute pressure at outlet of discharge piping, psi (kPa);
P_0 = allowed back pressure (absolute) at the outlet of pressure release device, psi (kPa)
(0.15 x relief valve set pressure + atmospheric pressure)
For YR mod A equipment, P_0 = 50.0 for 235 psig set pressure

The ASHRAE 15 User's Manual provides that, when the length of vent pipe exceeds approximately 220 diameters (L/d > 220), the first term in equation (2)a or (2)b may be used to solve for the diameter, d.

$$d = 1.36 * \left(\frac{f L C_r^2}{P_0^2 - P_2^2} \right)^{0.2} \qquad \text{[inches]} \qquad \text{Eq. (3)a}$$

$$\left[d = 2521 * \left(\frac{f L C_r^2}{P_0^2 - P_2^2} \right)^{0.2} \right] \qquad \text{[millimeters]} \qquad \text{Eq. (3)b}$$

An average friction factor f = 0.02 may be used when the pipe size is not known.

Table II lists the maximum lengths of vent piping for various YK relief valve capacities and pipe sizes vented to atmosphere.

Note: This document is to be used only as a guideline for estimating and is subject to changes made in standard ASHRAE 15 or overriding local code.

Table II -- Maximum Length [feet] of Discharge Piping.						
Rated Rupture Disc Capacity, Cr (lb air / min)	Relief Valve Pressure Setting, PSIG					
	235					
	Nominal pipe size, in (calculations based on sch. 40 pipe)					
	1-1/4”	1-1/2”	2”	2-1/2”	3”	4”
56	24	67	288	759		
92		15	93	264	872	
112		5	55	169	576	
148			22	85	315	
168			12	60	236	
184			7	45	191	887
204			1	32	148	712
224				21	117	582
276				5	65	366
296					52	312

Table III - Steel Pipe Dimensions (Sch. 40)						
	Nominal Pipe Size (in)					
	1-1/4	1-1/2	2	2-1/2	3	4
I. D. (in)	1.380	1.610	2.067	2.469	3.068	4.026
Friction Factor	0.0209	0.0202	0.0190	0.0182	0.0173	0.0163

Example 1: *Maximum length -- Single vent line per relief valve*.

(1) YRTBTBT0-00A0 *without* refrigerant isolation valves is to be installed in the equipment room. The relief valves will be vented to atmosphere, using standard schedule 40 pipe, at a distance 100 feet from the valves.

Solution:

From Table I:

	Evaporator	Condenser	Discharge Line
Valve Config. Type	Dual	Dual	N/A
Cr [#air/min]	55.9	55.9	
Valve outlet size	1”	1”	
Valve set press.	235	235	

Using Table II, scan down the first column to find the Rated Discharge Capacity [C_r] of 56. Next, follow that row across to intersect a column with a length that meets or exceeds the 100 feet requirement. The first two intersections (for 1-1/4” and 1-1/2” diameter pipe) contain values of 24 and 67, which do *not* meet the minimum requirement. At the next intersection, we find that 2” diameter pipe is good for a maximum of 288 feet, which satisfies the job requirements.

Alternatively, since *L/d* > 220, equation (3) may be used, assuming *f* = 0.02. The required pipe diameter is given by:

$$d = 1.36 * \left(\frac{fLC^2}{P_0^2 - P_2^2} \right)^{0.2} = 1.36 * \left(\frac{(0.02)(40)(91.8)^2}{50.0^2 - 14.7^2} \right)^{0.2} = 1.689"$$

From Table III, we see that 2" diameter pipe is the smallest size having an inside diameter of 1.663" or more.

Example 2: *Maximum length – Common header vent line*.

(1) YRWCWCT1-00A0 *with* refrigerant isolation valves is to be installed in the equipment room. The relief valves will be vented to atmosphere, using standard schedule 40 pipe, at a distance 50 feet from the valves.

From Table I:

	Evaporator	Condenser	Discharge Line
Valve Config. Type	Single	Dual	Single
Cr [#air/min]	91.8	91.8	91.8
Valve outlet size	1-1/4"	1-1/4"	1-1/4"
Valve set press.	235	235	235

*The minimum line size of a common vent line application for the chiller unit is based on the sum of the relief device discharge **areas** and the sum of the rated discharge **capacities**.*

First , sum the discharge *areas* of the relief valves using ID values from Table III:

$$\Sigma \pi r^2 = \Sigma\, 0.25\pi d^2 = 0.25\pi\, (\Sigma\, d^2)$$

$$\Sigma\, d^2 = (\,1.380^{\,2} + 1.380^{\,2} + 1.380^{\,2}\,) = 5.713$$

$$d_{(min)} = (5.713)^{1/2} = 2.390"$$

From Table III, we see that 2-1/2" pipe (2.469" I.D.) is the minimum size which meets or exceeds the sum of the relief valve discharge *areas*.

Next, sum the rated discharge *capacities* [C_r] to determine required flow capacity.

$$C_{r\,(sum)} = 3\,(91.8) = 275.4 \text{ lb. air / min}$$

Using Table II, scan down the first column to find the Rated Discharge Capacity [Cr] of 276. Then, follow that row across to intersect a column with a length that meets or exceeds the 50 feet requirement. The first intersection (for 2-1/2" diameter pipe) has a value of 5 feet, which does *not* meet the 50 feet minimum requirement. At the next intersection, we find that 3" diameter pipe is good for a maximum of 65 feet, which satisfies the job requirements.

Alternatively, since *L/d* > 220, equation (3) may be used, assuming *f* = 0.02:

$$d = 1.36 * \left(\frac{fLC^2}{P_0^2 - P_2^2} \right)^{0.2} = 1.36 * \left(\frac{(0.02)(70)(255.4)^2}{50.0^2 - 14.7^2} \right)^{0.2} = 2.844"$$

From Table III, we see that 3" diameter pipe is the smallest size having an inside diameter of 2.740" or more. Therefore, this application requires a 3" common vent pipe for the chiller relief valves.

Other Methods:

Equation (2) can be used to calculate the maximum length of vent piping for *any* relief valve rating and pipe or tubing diameter. Table 3 in ASHRAE 15-2001 also lists flow capacities for various set pressures and line lengths.

INSTALLATION/RIGGING INFORMATION

MODEL YR	YORK®	MAXE ™

INSTALLATION CHECK LIST AND REQUEST FOR AUTHORIZED START-UP ENGINEER

*TO: _____
_____
_____

JOB NAME: _____
LOCATION: _____
CUSTOMER ORDER NO. _____

YORK TEL. NO. _____ YORK ORDER NO. _____ YORK CONTRACT NO. _____

CHILLER

MODEL NO. _____ **SERIAL NO.** _____

The work (as checked below) is in process and will be completed by _____ / _____ / _____
Month Day Year

The following work must be completed in accordance with installation instructions:

A. YORK CHILLER
1. Unit assembled (if shipped dismantled) and refrigerant piping installed under YORK supervision ☐
2. Vibration isolator mounts so the unit is level, and isolators equally deflected ☐

B. WATER PIPING
1. Condenser water piping installed between condenser, pumps and cooling tower ☐
2. Chilled water piping installed between cooler, pumps, and cooling coils ☐
3. Make-up and fill lines installed to cooling tower and chilled water system ☐
4. All water piping checked for strain – Piping should not spring when connections are broken at unit ☐
5. Water piping leak tested and flushed, and water strainers cleaned after flushing. Piping systems filled with water and trapped air vented ☐
6. Chilled and condenser water flow available to meet unit design requirements ☐

C. REFRIGERANT RELIEF PIPING (when required)
1. Refrigerant relief piping (with flexible connection) installed from unit to atmosphere (per ASHRAE-15) ☐

D. ELECTRICAL WIRING
1. ELECTRO-MECHANICAL STARTER ☐
   a. Main and control power supply available ☐
   b. Compressor motor starter furnished in accordance with, YORK Standard R-1079 – Form 160.47-PA5.1 ☐
   c. Wiring completed from main power supply to starter – **but not cut to length or connected to starter** ☐
   d. Wiring completed from starter to compressor motor – **but not cut to length or connected to motor** ☐
   e. 115 volt service completed to Control Center – **but not connected** ☐
2. SOLID STATE STARTER ☐
   a. Main and control power supply available ☐
   b. Wiring completed from main power supply to solid state starter – **but not cut to length or connected to starter** ☐
3. CONTROL CENTER ☐
   a. Jumper wire NOT installed between terminal 24 and 25 located on the control center terminal strip ☐
   b. External control wiring completed from the control center to chilled water flow switches or interlocks in accordance with the YORK Wiring Diagram ☐
   c. Power available and wiring completed to the following starters and motors, and rotation of each checked ☐
      1. Chilled water pump(s) ☐
      2. Condenser water pump(s) ☐
      3. Cooling tower fan ☐
   d. Meg ohm meter available for checking motor windings ☐

E. TESTING, EVACUATION AND CHARGING (Under YORK Supervision if Unit Shipped Less Refrigerant or Dismantled)
1. R-134a available for testing ☐
2. Dry Nitrogen available for testing ☐
3. A high vacuum pump available for evacuation and dehydration of system ☐
4. R-134a (Supplied by YORK available for charging) ☐
5. Unit (ready to be) (has been) pressure tested, evacuated, dehydrated and charged ☐

F. CONDITIONS
1. YORK oil for compressor on job ☐
2. Cooling load available for testing and operating unit ☐
3. Personnel available for final wiring connections ☐
4. Personnel available for start-up and testing ☐
5. Owners operating personnel for instruction ☐
   Names: _____
   _____
   _____

With reference to the terms of the above contract, we are requesting the presence of your Authorized Representative at the job site on Month _____ / Day _____ / Year _____ to start the system and instruct operating personnel HAVE HIM CONTACT _____ Names

We understand that the services of the YORK Authorized Representative will be furnished in accordance with the contract for a period of not more than _____ consecutive normal working hours, and we agree that a charge of _____ per diem plus travel expenses will be paid to YORK if services are required for longer than _____ consecutive normal hours or if repeated calls are required.

Signed: _____
Title: _____

YORK® INTERNATIONAL

Return to Service Manager

INSTRUCTIONS FOR USE OF FORM

YORK REGIONAL OR DISTRICT SERVICE OFFICE

1. Fill in the blanks at the top of the form.
   * To: (Service Managers Name and YORK office address)
   YORK TELEPHONE NO.
   JOB NAME
   LOCATION
   CUSTOMER ORDER NO.
   YORK ORDER NO.
   YORK CONTRACT NO.
   SYSTEM MODEL NO.

2. Completely rule out or "XXXX" out items on check list that do NOT apply to this specific job. (Review Para. A-1, A-2, D-lb, D-2, D-3, E, E-1, E-2, E-3, E-4, & E-5).

3. Fill in terms of contract at bottom of pages as to hours of supervision to be furnished and per diem charges for additional time. (There is some room for additional terms, if applicable – travel expenses, for instance).

4. Retain in files and copy the contractor.

   NOTE: After completion of start-up, write in the date of start-up at the bottom, insert Unit Serial Number and send to YORK A.S. Service Manager, York, PA.

CUSTOMER

This installation Check List provides you with a quick, convenient way to check whether all of the necessary installation work has been completed in accordance with YORK Installation Instructions, and when completed, acts as a request for the start-up supervision to be furnished by YORK.

Complete the form as follows:

1. In the box at the top of the page, enter Unit Serial No. (from Unit Data Plate) and date work will be completed.

2. Check off each item as completed.

3. Item F-5 – Enter names of owner/operator's personnel who have been assigned to be present at time of start-up for instruction in proper operation of the YORK Millennium chiller.

4. Bottom of form – Enter date YORK Supervisor should be at job site and name(s) of your supervisor(s) he should contact.

5. Sign the request form and return to the local York Service Manager. Please give as much advance warning as possible so that we can give you the service you want, when you want it. Thank you.

P.O. Box 1592, York, Pennsylvania USA 17405-1592
Tele. 800-861-1001
www.york.com

Form 160.81-CL1 (801)

YORK®	MAXE™ ROTARY SCREW LIQUID CHILLERS	
INSTALLATION, OPERATION & MAINTENANCE	Supersedes: 160.81-NOM1 (703)	Form 160.81-NOM1 (904)

MODELS
YR TB TB T0 THROUGH YR VD VD T1
YR TB TB T0 THROUGH YR XD XD T3
FIELD RE-ASSEMBLY FOR FORM 2, 3, 7 & 8 SHIPMENT
(STYLE A & B)

00562VIP

R-134a

Metric Conversions

MANUFACTURER CERTIFIED TO ARI AS COMPLYING WITH ARI STANDARD 550

LLOYD'S REGISTER QUALITY COMPANY ISO9001

Manufactured in ISO-Certified Facility

IMPORTANT!
READ BEFORE PROCEEDING!
GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During installation, operation, maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to: refrigerants, oils, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized operating/service personnel. It is expected that this individual possesses independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood this document and any referenced materials. This individual shall also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to areas of potential hazard:

NOTE is used to highlight additional information which may be helpful to you.

CAUTION identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution. Usually an instruction will be given, together with a brief explanation.

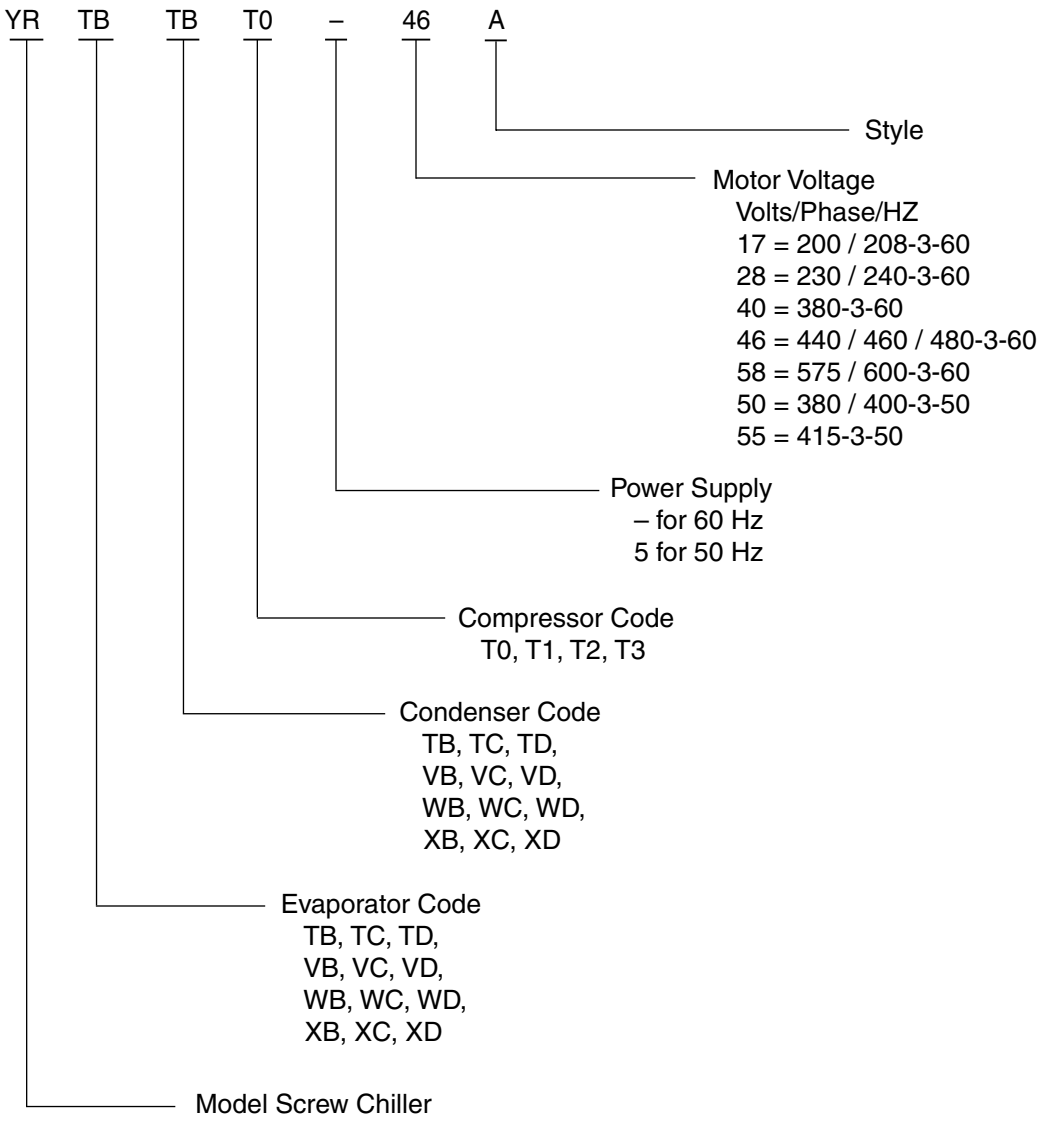
CHANGEABILITY OF THIS DOCUMENT

In complying with YORK's policy for continuous product improvement, the information contained in this document is subject to change without notice. While YORK makes no commitment to update or provide current information automatically to the manual owner, that information, if applicable, can be obtained by contacting the nearest YORK Engineered Systems Service office.

It is the responsibility of operating/service personnel as to the applicability of these documents to the equipment in question. If there is any question in the mind of operating/service personnel as to the applicability of these documents, then, prior to working on the equipment, they should verify with the owner whether the equipment has been modified and if current literature is available.

NOMENCLATURE

The model number denotes the following characteristics of the unit:



SECTION 1 – INSTALLATION

GENERAL

This instruction describes the installation of a Model YR Rotary Screw Liquid Chiller. The standard unit is shipped as a single factory assembled, piped, wired and nitrogen or refrigerant charged package. This unit requires a minimum of field labor to make chilled water connections, condenser water connections, refrigerant atmospheric relief connections, and electrical power connections.

YR units can also be shipped dismantled when required by rigging conditions, but generally it is more economical to enlarge access openings to accommodate the factory assembled unit.

The services of a YORK representative will be furnished to check the installation and perform the initial start-up of all units in accordance with the contract.

CONSTRUCTION DRAWINGS

Construction drawings are furnished for each job as noted in Table 1. These drawings must be carefully followed and used in conjunction with this installation instruction, to ensure proper installation of the unit.

In event of any differences between drawings and this instruction, the drawings shall supercede this instruction.

TABLE 1 – CONSTRUCTION DRAWINGS (PRODUCT DRAWINGS) ISSUED BY THE YORK DISTRICT OFFICE

DESCRIPTION	371-02772 CONTROL CENTER NO.
	PRODUCT DRAWING FORM NO.
Dimensions and Physical Data	160.81-PA1
Wiring Diagram MicroComputer Control Center Solid State Starter	160.81-PW2
Wiring Diagram MicroComputer Control Center Electro-Mechanical Starter	160.81-PW1
Field Wiring, Solid State Starter	160.81-PW4
Field Wiring, Electro-Mechanical Starter	160.81-PW3
Field Control Modifications	160.81-PW5
Remote Motor Starter Specifications with OptiView Control Center	160.81-PW7

The YORK Warranty will be voided if the following restrictions are not adhered to:

1. No valves or connections should be opened under any circumstances because such action will result in loss of the factory refrigerant or nitrogen charge.

2. Do not dismantle or open the unit for any reason except under the supervision of a YORK representative.

3. When units are shipped dismantled, notify the nearest YORK office in ample time for a YORK representative to supervise rigging the unit to its operating position and the assembly of components.

4. Do not make final power supply connections to the compressor motor or control center.

5. Do not charge the system with oil.

6. Do not attempt to start the system.

7. When chiller is charged, do not run hot water (100°F, 38°C max.) or steam through the evaporator.

INSPECTION – DAMAGE – SHORTAGE

The unit shipment should be checked on arrival to see that all major pieces, boxes and crates are received. Each unit should be checked on the trailer when received, before unloading, for any visible signs of damage. Any damage or signs of possible damage must be reported to the transportation company immediately for their inspection.

YORK WILL NOT BE RESPONSIBLE FOR ANY DAMAGE IN SHIPMENT OR AT JOB SITE OR LOSS OF PARTS.

When received at the job site all containers should be opened and contents checked against the packing list. Any material shortage should be reported to YORK immediately. (Refer to Shipping Damage Claims, Form 50.15-NM.)

DATA PLATE

A unit data plate is mounted on the control center assembly of each unit, giving unit model number; design working pressure; water passes; refrigerant charge; serial numbers; and motor power characteristics and connection diagrams. Refer to “Nomenclature” on page 3 to verify data plate markings.

LOCATION

The chiller should be located in an indoor location where temperature ranges from 40°F to 110°F (4°C to 43°C).

The units are furnished with neoprene vibration isolator mounts for basement or ground level installations. Units may be located on upper floor levels provided the floor is capable of supporting the total unit operating weight. Refer to Figure 2 and Table 3.

Equipment room should be ventilated to allow adequate heat removal. Check ANSI, state, local or other codes.

FOUNDATION

A level floor, mounting pad or foundation must be provided by others, capable of supporting the operating weight of the unit.

CLEARANCE FOR SERVICE REQUIREMENTS

Clearances should be adhered to as follows:

Rear, Ends and Above Unit	–	2 Feet / 610 mm
Front of Unit	–	3 Feet / 914 mm
Tube Removal	–	See Table 2

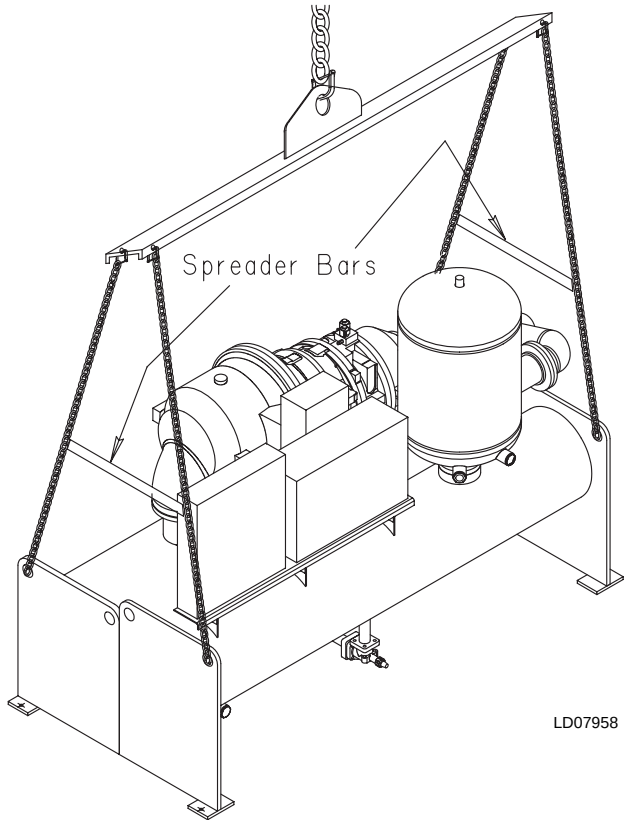


FIG. 1 – UNIT RIGGING

TABLE 2 – SERVICE CLEARANCE REQUIREMENTS

SHELL CODES	TUBE REMOVAL SPACE		ADD – MARINE WATER BOXES	
	Ft. - In.	mm	Ft. - In.	mm
TB, TC, TD	10'-1"	3073	2'-2"	660
VB, VC, VD	14'-1"	4293	2'-2"	660
WB, WC, WD	12'-1"	3683	2'-2"	660
XB, XC, XD	16'-1"	4902	2'-2"	660

RIGGING

The complete standard unit is shipped without skids. (When optional skids are used, it may be necessary to remove the skids so riggers skates can be used under the unit end sheets to reduce the overall height.)

Each unit has four lifting holes (two on each end) in the end sheets which should be used to lift the unit. Care should be taken at all times during rigging and handling to avoid damage to the unit and its external connections. Lift only using holes shown in Figure 1.

WARNING

Do not lift the unit with slings around motor/compressor assembly or by means of eyebolts in the tapped holes of the compressor motor assembly. Do not turn a unit on its side for rigging. Do not rig with driveline in a vertical orientation.

CAUTION

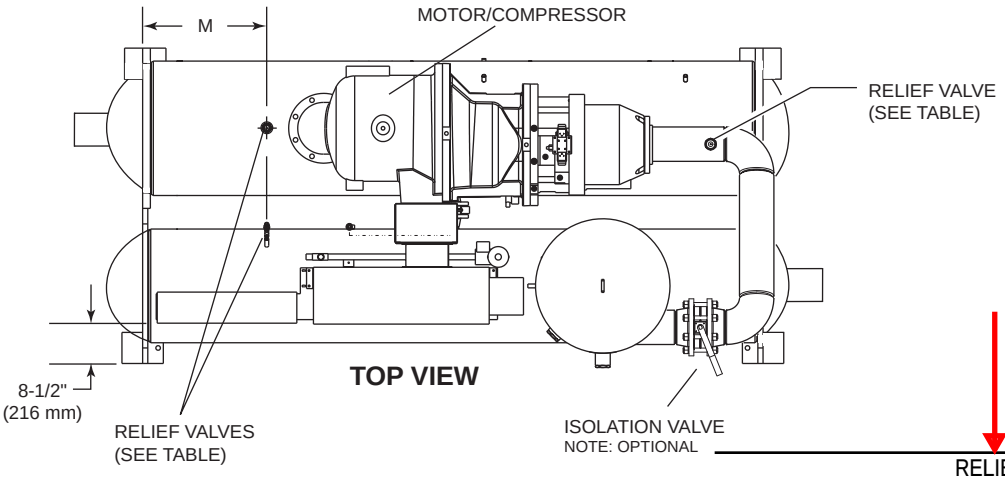
If necessary to rig a unit by one end to permit lifting or dropping through a vertical passageway, such as an elevator shaft, contact YORK Factory for special rigging instructions.

The shipping and operating weights are given in Table 3. Overall dimensions are shown in Fig. 2. More detailed dimensions can be found in Form 160.81-PA1.

If optional shipping skids are used, remove them before lowering the unit to its mounting position. Rig the unit to its final location on the floor or mounting pad by lifting the unit (or shell assembly) with an overhead lift and lower the unit to its mounting position.

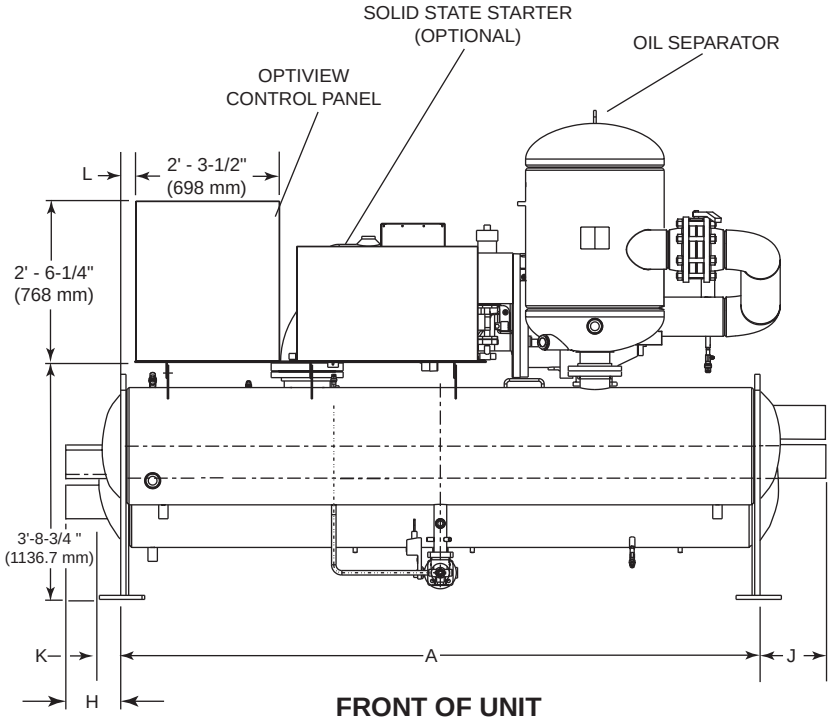
NOTE

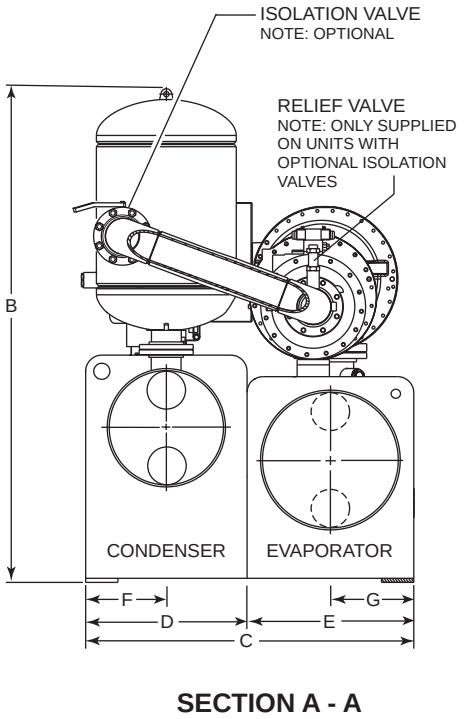
Units shipped dismantled should be assembled under the supervision of a YORK representative.



RELIEF VALVES*		
LOCATION	WITH ISOLATION VALVES	WITHOUT ISOLATION VALVES
EVAPORATOR	1" SINGLE	1" DUAL
CONDENSER	1" DUAL	1" SINGLE
DISCHARGE LINE	1-1/4" SINGLE	NONE

*All are NPT female





LD09970

FIG. 2 – COMPRESSORS – EVAPORATOR, CONDENSER AND WATER BOXES DIMENSIONS

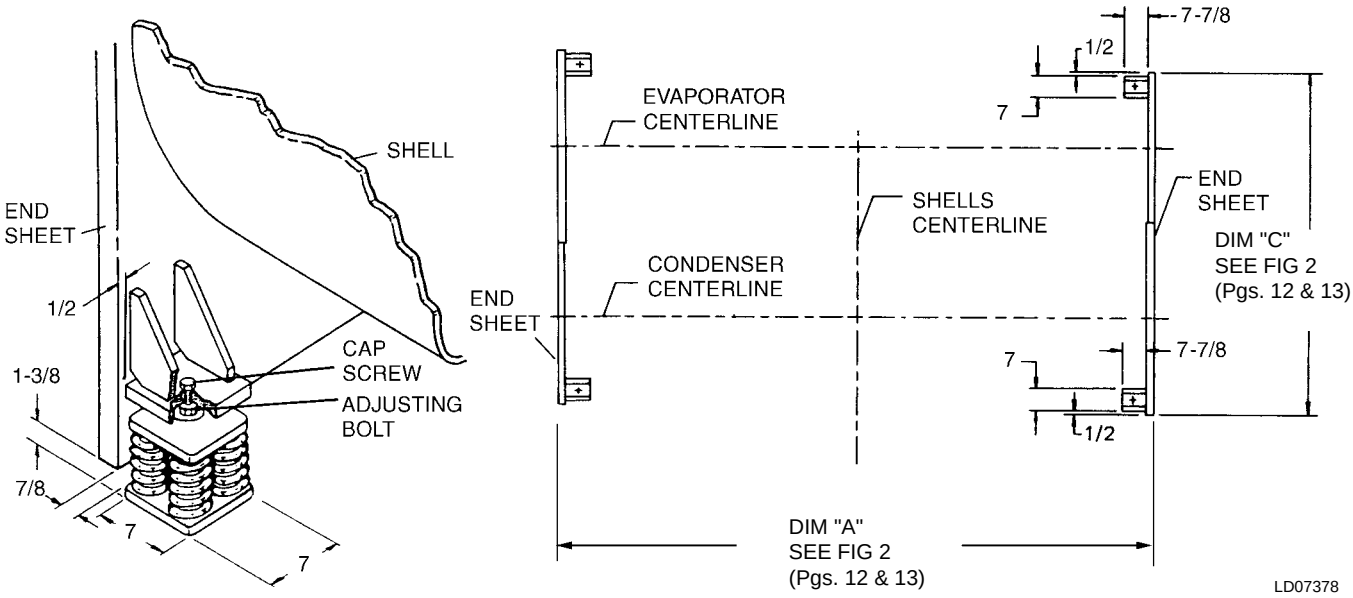
INSTALLING OPTIONAL SPRING ISOLATORS (REFER TO FIG. 4)

When ordered, 4 spring type isolator assemblies will be furnished with the unit. The 4 assemblies are identical and can be placed at any of the 4 corners of the unit.

While the unit is still suspended by the rigging, the isolators should be bolted to the unit by inserting the cap screw(s) through the hole(s) in the mounting bracket into the tapped hole in the top of the isolator leveling bolt(s). Then the unit can be lowered onto the floor.

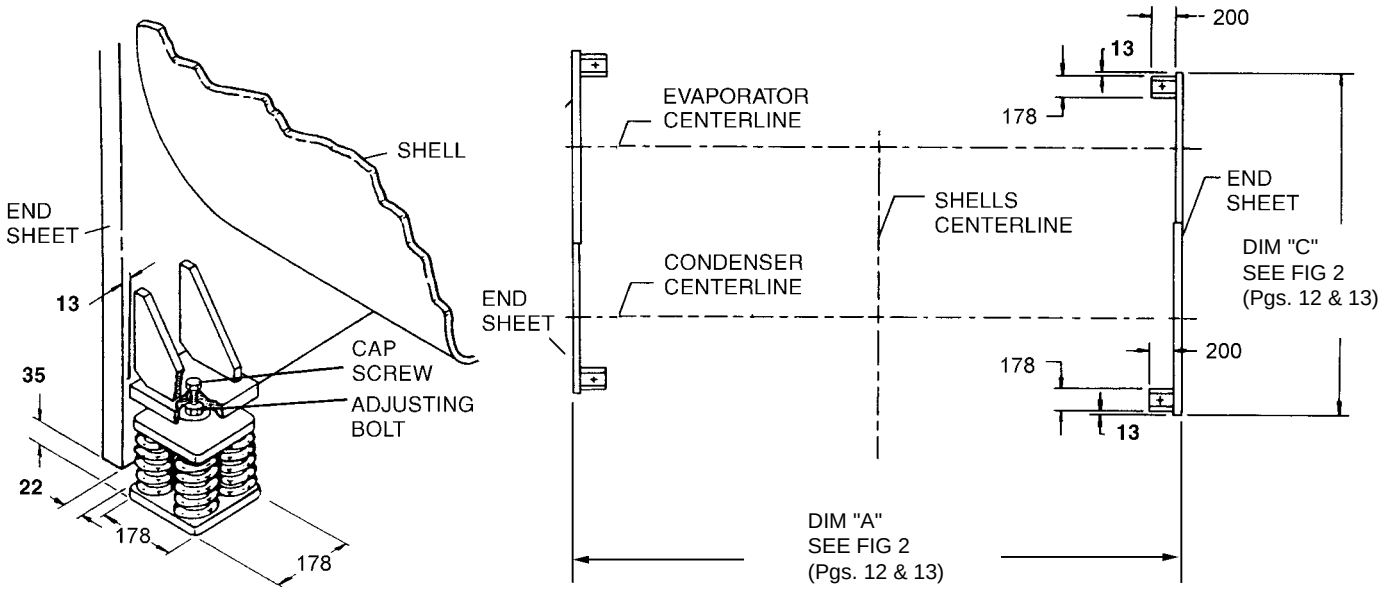
The leveling bolts should now be rotated one (1) turn at a time, in sequence, until the unit end sheets are clear of the floor by the dimension shown in Fig. 4 and the unit is level. Check that the unit is level, both longitudinally and transversely (see Leveling the Unit). If the leveling bolts are not long enough to level unit due to an uneven or sloping floor or foundation, steel shims (grouted, if necessary) must be added beneath the isolator assemblies as necessary.

After the unit is leveled, wedge and shim under each corner to solidly support the unit in this position while piping connections are being made, pipe hangers adjusted and connections checked for alignment. Then the unit is filled with water and checked for leaks. The leveling bolts should now be finally adjusted until the wedges and shims can be removed. The unit should now be in correct level position, clear of the floor or foundation and without any effect from the weight of the piping.



ALL DIMENSIONS ARE IN INCHES

FIG. 4 – SPRING ISOLATORS (OPTIONAL)



ALL DIMENSIONS ARE IN MILLIMETERS

LD07379

FIG. 4 – SPRING ISOLATORS (OPTIONAL) (CONT'D)

VACUUM DEHYDRATION

To obtain a sufficiently dry system, the following instructions have been assembled to provide an effective method for evacuating and dehydrating a system in the field. Although there are several methods of dehydrating a system, we are recommending the following, as it produces one of the best results, and affords a means of obtaining accurate readings as to the extent of dehydration.

The equipment required to follow this method of dehydration consists of a wet bulb indicator or vacuum gauge, a chart showing the relation between dew point temperature and pressure in inches of mercury (vacuum), (see last page) and a vacuum pump capable of pumping a suitable vacuum on the system.

OPERATION

Dehydration of a refrigeration system can be obtained by this method because the water present in the system reacts much as a refrigerant would. By pulling down the pressure in the system to a point where its saturation temperature is considerably below that of room temperature, heat will flow from the room through the walls of the system and vaporize the water, allowing a large percentage of it to be removed by the vacuum pump. The length of time necessary for the dehydration of a system is dependent on the size or volume of the system, the capacity and efficiency of the vacuum pump, the room temperature and the quantity of water present in the system. By the use of the vacuum indicator as suggested, the test tube will be evacuated to the same pressure as the system, and the distilled water will be maintained at the same saturation temperature as any free water in the system, and this temperature can be observed on the thermometer.

If the system has been pressure tested and found to be tight prior to evacuation, then the saturation temperature recordings should follow a curve similar to the typical saturation curve shown as Fig. 11.

The temperature of the water in the test tube will drop as the pressure decreases, until the boiling point is reached, at which point the temperature will level off and remain at this level until all of the water in the shell is vaporized. When this final vaporization has taken place the pressure and temperature will continue to drop until eventually a temperature of 35°F (2°C) or a pressure of 5mm Hg. is reached.

When this point is reached, practically all of the air has been evacuated from the system, but there is still a small amount of moisture left. In order to provide a medium for carrying this residual moisture to the vacuum pump, nitrogen should be introduced into the system to bring it to atmospheric pressure and the indicator temperature will return to approximately ambient temperature. Close off the system again, and start the second evacuation.

The relatively small amount of moisture left will be carried out through the vacuum pump and the temperature or pressure shown by the indicator should drop uniformly until it reaches a temperature of 35°F (2°C) or a pressure of 5mm Hg.

When the vacuum indicator registers this temperature or pressure it is a positive sign that the system is evacuated and dehydrated to the recommended limit. If this level can not be reached, it is evident that there is a leak somewhere in the system. Any leaks must be corrected before the indicator can be pulled down to 35°F (2°C) or 5mm Hg. in the primary evacuation. During the primary pulldown keep a careful watch on the wet bulb indicator temperature, and do not let it fall below 35°F (2°C) . If the temperature is allowed to fall to 32°F (0°C) the water in the test tube will freeze, and the result will be a faulty temperature reading.

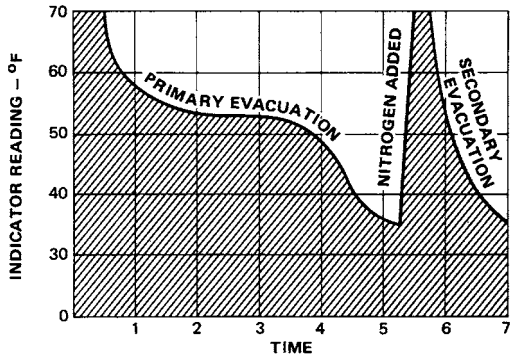


FIG. 11 – SATURATION CURVE LD00474

SYSTEMS PRESSURES

*GAUGE	ABSOLUTE			BOILING TEMPERATURES OF WATER °F
INCHES OF MERCURY (HG) BELOW ONE STANDARD ATMOSPHERE	PSIA	MILLIMETERS OF MERCURY (HG)	MICRONS	
0	14.696	760	760,000	212
10.24*	9.629	500	500,000	192
22.05*	3.865	200	200,000	151
25.98*	1.935	100	100,000	124
27.95*	.968	50	50,000	101
28.94*	.481	25	25,000	78
29.53*	.192	10	10,000	52
29.67*	.122	6.3	6,300	40
29.72*	.099	5	5,000	35
29.842*	.039	2	2,000	15
29.882*	.019	1.0	1,000	+1
29.901*	.010	.5	500	-11
29.917*	.002	.1	100	-38
29.919*	.001	.05	50	-50
29.9206*	.0002	.01	10	-70
29.921*	0	0	0	

WATER FREEZES

* One standard atmosphere = 14.696 PSIA
= 760 mm Hg. absolute pressure at 32°F
= 29.921 inches Hg. absolute at 32°F

NOTES: PSIG = Lbs. per sq. in. gauge pressure
= Pressure above atmospheric
PSIA = Lbs. per sq. in. absolute pressure
= Sum of gauge plus atmospheric pressure

PIPING CONNECTIONS

After the unit is leveled (and wedged in place for optional spring isolators) the piping connections may be fabricated; chilled water, condenser water and refrigerant relief. The piping should be arranged with offsets for flexibility, and adequately supported and braced independently of the unit to avoid strain on the unit and vibration transmission. Hangers must allow for alignment of pipe. Isolators (by others) in the piping and hangers are highly desirable, and may be required by specifications. This is done to effectively utilize the vibration isolation characteristics of the isolator mounts on the unit.

CHECK FOR PIPING ALIGNMENT

When piping is complete, check for alignment. Try opening a connection in each line, as close to the unit as possible, by removing the flange bolts or coupling. If any of the bolts are bound in their holes, or if the connection springs are out of alignment, the misalignment must be corrected by properly supporting the piping or by applying heat to anneal the pipe.

It may be necessary to weld chilled water or condenser water piping directly to the water pipe nozzles. Since chilled and condenser water temperature sensor wells are often in close proximity to these connection points, sensors in the wells may often see temperatures of several hundred degrees. We have reason to believe that some potential exists for damaging these sensors from the transferred heat. Any damage will most likely show up as error in the sensor.

It is advisable to remove the sensors from the wells during the welding process as a precautionary measure. If the sensor is removed, assure that it bottoms out when it is placed back in the well.

If the piping is annealed to relieve stress, the inside of the pipe must be cleaned of scale before it is finally bolted in place.

EVAPORATOR AND CONDENSER WATER PIPING

YR chillers have evaporator and condenser liquid heads with nozzles that are grooved for the use of victaulic couplings. The nozzles are also suitable for welding Class 150 PSIG (1034 kPa) flanges.

The nozzles and water pass arrangements are furnished in accordance with the job requirements (see Product Drawing, Form 160.81-PA1). Standard units are designed for 150 PSIG (1034 kPa) DWP on the water side. If job requirements are for greater than 150 PSIG (1034 kPa) DWP, check the unit data plate to determine if the unit has provisions for the required DWP before applying pressure to evaporator or condenser.

Foreign objects which could lodge in, or block flow through, the evaporator and condenser tubes must be kept out of the water circuit. All water piping must be cleaned or flushed before being connected to the unit, pumps, or other equipment.

Permanent strainers (by others) are required in both the evaporator and condenser water circuits to protect the unit as well as the pumps, tower spray nozzles, chilled water coils and controls, etc. (The strainer, should be installed in the entering chilled water line, directly upstream of the unit.)

Water piping circuits should be arranged so that the pumps discharge through the unit. The circuits should be controlled as necessary to maintain essentially constant chilled and condenser water flows through the unit at all load conditions.

If pumps discharge through the unit, the strainer may be located upstream from the pumps to protect both pump and unit. (Piping between the strainer, pump and unit must be very carefully cleaned before start-up.) If pumps are remotely installed from the unit, strainers should be located directly upstream.

Chilled Water Circuit

The minimum velocity through the tubes is 3 FPS (feet per second) (0.914 MPS - meters per second), so chilled water piping designs for variable flow should be selected with higher velocities at design conditions. The rate of change should be slow, to make sure that the chiller controls can track the load.

The following is a guideline for an allowable variable flow rate of change. This may require modification based on specific design application.

The maximum allowable rate of change is 15 minutes to go from 10% to 50% of design flow, based on a minimum chilled water system turnover rate of 15 minutes. System turnover rate (STR) is a measure of the chilled water system volume as compared to the design chilled water flow rate, and is defined as:

$$\text{System Turnover Rate (STR)} = \frac{\text{Volume of chilled water system (gallons)}}{\text{Design chilled water flow rate (gpm)}}$$

As noted previously, if the STR is above 15 minutes, chilled water flow rate of change is 15 minutes. If STR goes below 15 minutes, chilled water flow rate of change must be modified as follows:

$$\text{Rate of Change from 100\% to 50\% Flow (minutes)} = 15 + 15 - \text{STR}$$

Chilled water supply must leave the evaporator through the connection marked “Liquid Outlet”. Chilled water return must enter the evaporator through the connection marked “Liquid Inlet”.

Condenser water supply must enter the condenser through the connection marked “Liquid Inlet”. Condenser water return must leave the condenser through the connection marked “Liquid Outlet”.

TABLE 5 – WATER FLOW RATE LIMITS – GPM (L/S)

SHELL CODE	PASS	EVAPORATOR				CONDENSER			
		MINIMUM		MAXIMUM		MINIMUM		MAXIMUM	
TB, VB	1	383	(24.2)	1525	(96.2)	613	(38.7)	2204	(139.1)
	2	192	(12.1)	762	(48.1)	307	(19.4)	1102	(69.5)
	3	128	(8.1)	508	(32.1)	205	(12.9)	734	(46.3)
TC, VC	1	468	(29.5)	1866	(118.0)	683	(43.1)	2455	(154.9)
	2	234	(14.8)	932	(58.8)	342	(21.6)	1227	(77.4)
	3	157	(9.9)	621	(39.2)	228	(14.4)	818	(51.6)
TD, VD	1	570	(36.0)	2277	(143.7)	771	(48.7)	2774	(175.0)
	2	286	(18.0)	1138	(71.8)	386	(24.4)	1386	(87.5)
	3	—	—	—	—	—	—	—	—
WB, XB	1	693	(43.7)	2771	(174.9)	866	(54.6)	3462	(218.5)
	2	346	(21.8)	1385	(87.4)	433	(27.3)	1731	(109.2)
	3	231	(14.6)	924	(58.3)	289	(18.2)	1154	(72.8)
WC, XC	1	822	(51.9)	3287	(207.4)	1082	(68.3)	4328	(273.1)
	2	411	(25.9)	1644	(103.7)	541	(34.1)	2164	(136.5)
	3	274	(17.3)	1096	(69.2)	361	(22.8)	1443	(91.1)
WD, XD	1	986	(62.2)	3945	(248.9)	1350	(85.2)	5400	(340.1)
	2	493	(31.1)	1972	(124.4)	675	(42.6)	2700	(170.0)
	3	—	—	—	—	—	—	—	—

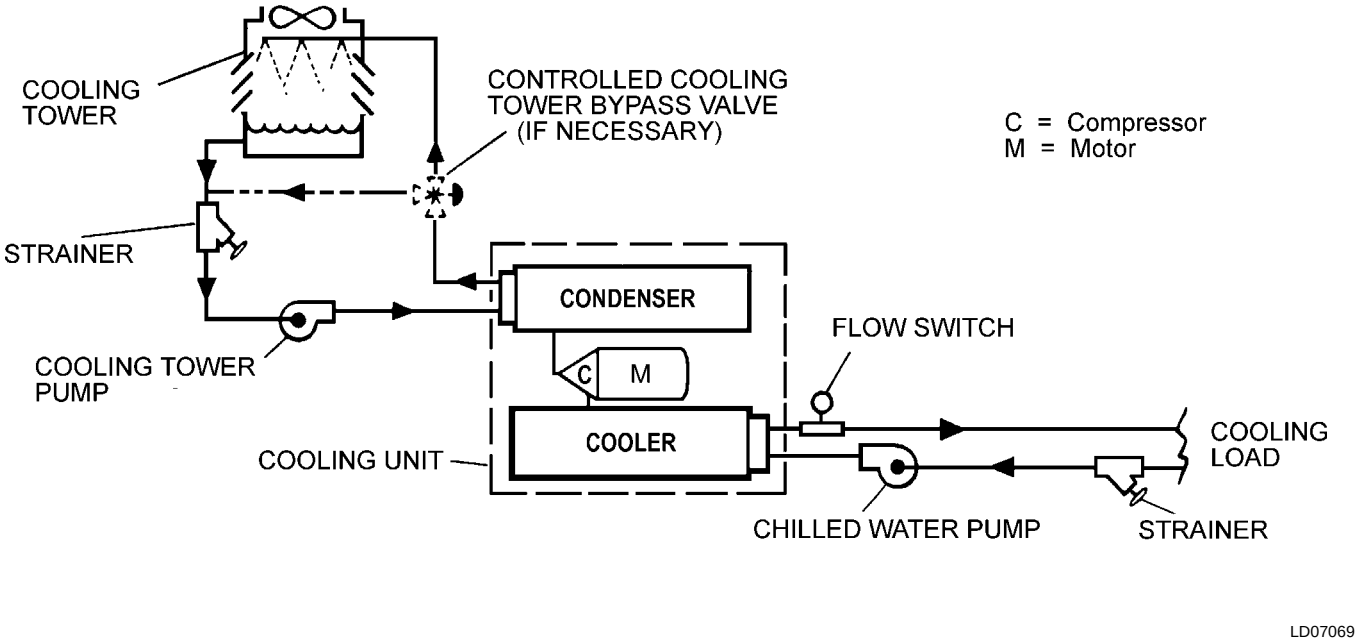


FIG. 12 – SCHEMATIC OF A TYPICAL PIPING ARRANGEMENT

Condenser Water Circuit

For proper operation of the unit, condenser refrigerant pressure must be maintained above evaporator pressure. If operating conditions will fulfill this requirement, no attempt should be made to control condenser water temperature by means of automatic valves, cycling of the cooling tower fan or other means. YR chillers are designed to function satisfactorily and efficiently, when condenser water is allowed to seek its own temperature level at reduced loads and off-peak seasons of the year. YR Chillers can be operated with entering condensing water temperature that is less than design conditions. The following formula is used to calculate the minimum entering condensing water temperature.

R-134a Refrigerant

ECW minimum =

LCWT+16+[(%of load/100)x(10-full load condenser water ΔT)]

Where:
ECW minimum =
Minimum Entering Condensing Water Temperature ºF

LCWT =
Leaving Chilled Water Temperature ºF

This is a guideline for estimating ECW minimum. Actual ECW minimum will vary.

Operating the chiller below it's minimum ECW could result in "Low Oil Differential" shut downs. There are different methods used to maintain minimum ECW, however the most effective is to install a three-port by-pass valve in the leaving condenser water line. Refer to Fig 12a.

Operating below the minimum entering condensing water will not provide energy savings and will result in oil management problems. However, if entering condenser water temperature can go below the required minimum, condenser water temperature must be maintained equal to or slightly higher than the required minimum. Refer to Figure 12.

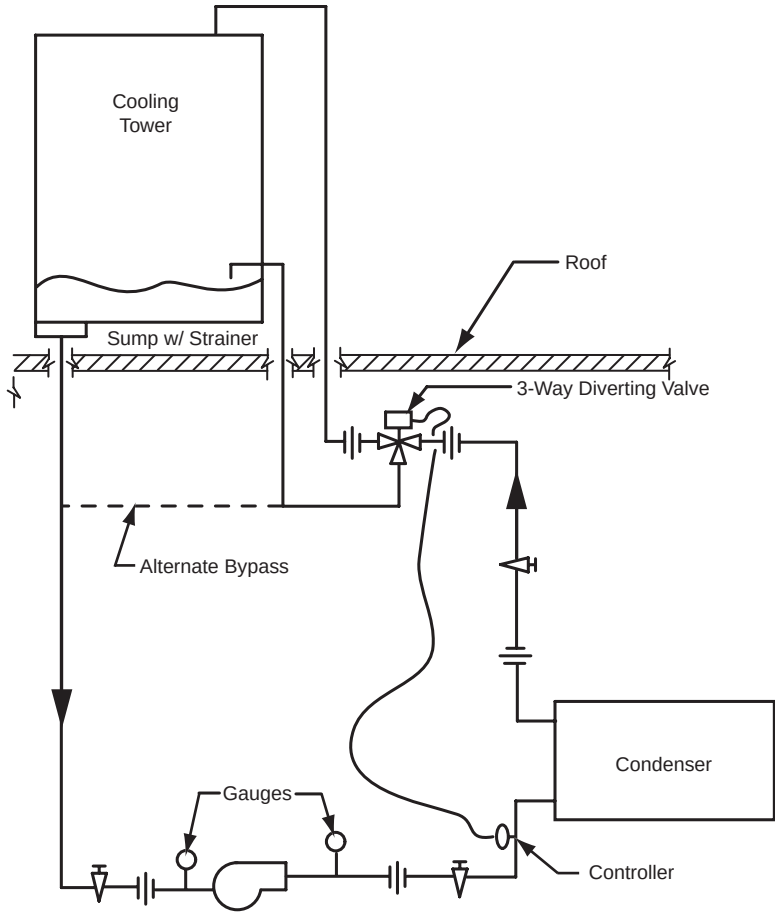


FIG. 12A – COOLING TOWER PIPING WITH 3 PORT BY-PASS VALVE

Special entering condensing water temperature controls may be required when long condensing water circuits are used and the chiller is being started with minimum load available.

Stop Valves

Stop valves may be provided (by others) in the evaporator and condenser water piping, adjacent to the unit to ease maintenance. Pressure taps should be provided (by others) in the piping as close to the unit as possible, to aid in obtaining operating checks.

Flow Switches (Field Installed)

A flow switch or pressure differential control in the chilled water line(s), adjacent to the unit, is an accessory which can be provided by YORK for connection to the control center. If a flow switch is used, it must be directly in series with the unit and sensing only water flow through the unit. The differential switch must sense pressure drop across the unit.

Drain and Vent Valves

Drain and vent valves (by others) should be installed in the connections provided in the evaporator and condenser liquid heads. These connections may be piped to drain if desired.

Checking Piping Circuits and Venting Air

After the water piping is completed, but before any water box insulation is applied, tighten and torque the nuts on the liquid head flanges (to maintain between 30 and 60 ft. lbs. / 41 and 81 mm). Gasket shrinkage and handling during transit may cause nuts to loosen. If water pressure is applied before this is done, the gaskets may be damaged and have to be replaced. Fill the chilled and condenser water circuits, operate the pumps manually and carefully check the evaporator and condenser water heads and piping for leaks. Repair leaks as necessary.

Before initial operation of the unit both water circuits should be thoroughly vented of all air at the high points.

REFRIGERANT RELIEF PIPING

Each unit is equipped with relief device(s) on the evaporator, condenser and oil separator for the purpose of quickly relieving excess pressure of the refrigerant charge to the atmosphere in case of an emergency. The relief valve is furnished in accordance with American Society of Heating, Refrigeration and Air Conditioning Engineers Standard 15 (ASHRAE 15) and set to relieve at 235 PSIG (1621 kPa).

Refrigerant relief vent piping (by others), from the relief valves to the outside of the building, is required by code and must be installed on all units. Refer to Figure 13 and Table 6. For additional information on relief valve discharge line sizing, refer to ASHRAE-15 addendum 15C and 15D-2000 section 9.7.8.5.

CAUTION

Piping should be properly supported to prevent any strain on relief valve mounting.

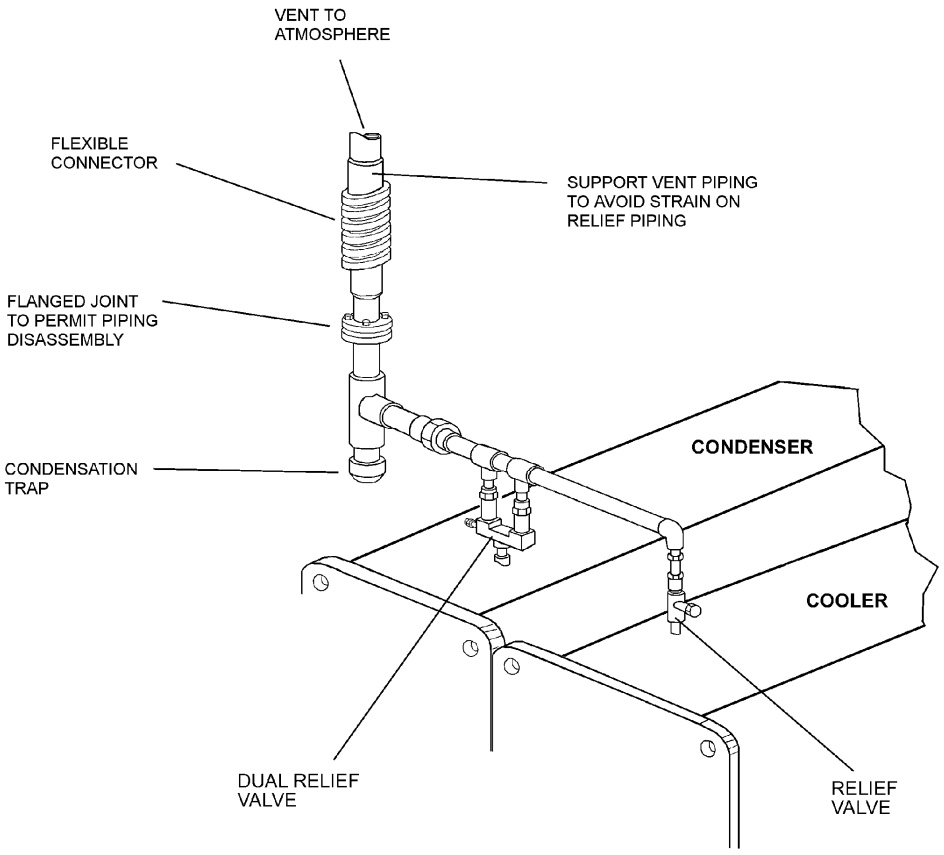


FIG. 13 – TYPICAL REFRIGERANT VENT PIPING FROM RELIEF VALVES

LD04896

TABLE 6 – REFRIGERANT RELIEF CHARACTERISTICS

	Evaporator				
SHELL CODE	C	SINGLE RELIEF VALVE		DUAL RELIEF VALVE[1]	
		Cr	OUTLET	Cr	OUTLET
	LBS. AIR PER MIN.		NPT	LBS. AIR PER MIN.	NPT
T	34.7	55.9	1-11-1/2 (FEM)	55.9	1-11-1/2 (FEM)
V	48.5	55.9	1-11-1/2 (FEM)	55.9	1-11-1/2 (FEM)
W	48.0	91.8	1-1/4 - 11-1/2 (FEM)	91.8	1-1/4 - 11-1/2 (FEM)
X	64.0	91.8	1-1/4 - 11-1/2 (FEM)	91.8	1-1/4 - 11-1/2 (FEM)

Where:

Cr = Rated capacity of YORK supplied relief valve at 235 PSIG.

Relief valve set pressure - 235 PSIG (1,621 kPa).

	CONDENSER		
SHELL CODE	C	DUAL RELIEF VALVE[1]	
		Cr	OUTLET
	LBS. AIR PER MIN.		NPT
T	42.1	55.9	1-11-1/2 (FEM)
V	53.8	55.9	1-11-1/2 (FEM)
W	59.4	91.8	1-1/4 - 11-1/2 (FEM)
X	73.3	91.8	1-1/4 - 11-1/2 (FEM)

NOTES:

1. Dual relief valve consists of one three-way shut-off valve and two single relief valves. The valve configuration will not allow both valves to be shut off at the same time, and valves are sized such that each relief valve has sufficient discharge capacity when used alone. This permits safe removal of either relief valve for repair or replacement, while maintaining vessel protection.
2. ASHRAE 15-1994 Section 9.8 and Appendix F describes relief requirements for positive displacement compressors. Summarized, the unit must be equipped with a relief device suitable for relieving the entire compressor capacity.

UNIT PIPING

Compressor lubricant piping and system refrigerant piping are factory installed on all units shipped assembled. On units shipped dismantled, the following piping should be completed under the supervision of the YORK representative; the lubricant piping; system oil return using material furnished.

CONTROL WIRING

After installation of the control center on units shipped disassembled, the control wiring must be completed between unit components and control center or solid state starter when used, using the wiring harness furnished.

Field wiring connections for commonly encountered control modifications (by others), if required, are shown on Wiring Diagram, Form 160.81-PW5.

No deviations in unit wiring from that shown on drawings furnished shall be made without prior approval of the YORK Representative.

POWER WIRING

Unit With Electro-Mechanical Starter

A 115 volt – single-phase – 60 or 50 Hertz power supply of 15 amperes must be furnished to the control center, from the control transformer (1-1/2 kVa required) included with the compressor-motor starter. DO NOT make final power connections to control center until approved by YORK Representative. Refer to Form 160.81-PW3, *Power Wiring*. YORK recommends that all connections to the unit be flexible. Consult with and conform to all local regulatory requirements.

Remote Electro-Mechanical Starters for the YR Unit must be furnished in accordance with YORK Standard .

Each YR unit is furnished for a specific electrical power supply as stamped on the unit data plate, which also details the motor connection diagrams.

To ensure proper motor rotation, the starter power input and starter to motor connections must be checked with a phase sequence indicator in the presence of the YORK Representative.

IMPORTANT: DO NOT cut wires to final length or make final connections to motor terminals or starter power input terminals until approved by the YORK Representative.

Figure 14 shows the power wiring hook-up for YR Motor Connections. (Refer to Wiring Labels in Motor Terminal Box for hook-up to suit motor voltage and amperage.)

Unit With Solid State Starter (Optional)

A YR unit equipped with a Solid State Starter, does not require wiring to the compressor-motor. The motor power wiring is factory connected to the Solid State Starter. All wiring to the control panel is completed by the factory. A control transformer is furnished with the Solid State Starter. Refer to Form 160.81-PW1.

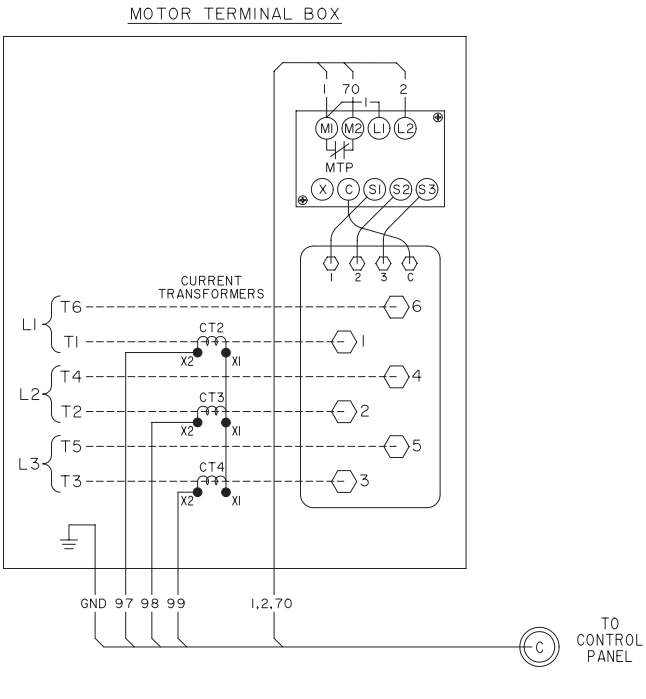


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FIG. 14 – YR MOTOR CONNECTIONS (ELECTRO-MECHANICAL STARTER)

INSULATION

Insulation of the type specified for the job, or minimum thickness to prevent sweating of 30°F (-1° C) surfaces (water chill application), should be furnished (by others) and applied to the evaporator shell, end sheets, liquid feed line to flow chamber, compressor suction connection, and evaporator liquid heads and connections. The liquid head flange insulation must be removable to allow head removal for tube maintenance. Details of areas to be insulated are given in Product Drawing, Form 160.81-PA1.

Units can be furnished, factory anti-sweat insulated, on order at additional cost. This includes all low temperature surfaces except the two evaporator liquid heads.

IMPORTANT: DO NOT field insulate until the unit has been leak tested under the supervision of the YORK Representative.

INSTALLATION CHECK – REQUEST FOR START-UP SERVICE

After the unit is installed, piped and wired as described in this Instruction, but before any attempt is made to start the unit, the YORK District Office should be advised so that the start-up service, included in the contract price, can be scheduled. Notification to the YORK Office should be by means of Installation Check List and Request, Form 160.81-CL1, in triplicate.

The services of a YORK Representative will be furnished to check the installation and supervise the initial start-up and operation on all YR units installed within the Continental United States.

START-UP

1. If the chilled water pump is manually operated, start the pump – the OptiView Control Center will not allow the chiller to start unless chilled liquid flow is established through the unit. (A field installed chilled water flow switch is required.) If the chilled liquid pump is wired to the OptiView Control Center the pump will automatically start; therefore, this step is not necessary.
2. To start the chiller, place the START/STOP control in the START position. This switch will automatically spring return to the RUN position. When the START switch is energized, the control center is placed in an operating mode and the "START SEQUENCE INITIATED" will be displayed. Any malfunction will be noted by messages on the 40 character alphanumeric display.

CHECKING OPERATION

During operation, the following conditions should be checked:

1. On starting, the slide valve should remain unloaded until the compressor motor is up to speed on the run winding; then the slide valve solenoid valve causes the slide valve to load and unload the compressor as required to maintain the leaving chilled water temperature equal to the leaving water temperature setpoint.
2. Check Oil Pressure Display. The oil and oil filter transducers are compared during compressor operation. A gradual decrease in bearing pressure of 5 to 10 PSI (34 to 69 kPa) (with constant suction and discharge pressures) may be an indication of a dirty filter. The filter should be replaced when pressure loss is 30% of the original pressure. The actual bearing oil pressure will vary with compressor suction and discharge pressures. When a new system is first operated under normal full load conditions, the bearing oil pressure should be recorded as a reference point with which to compare subsequent readings.

OPERATING LOG SHEET

A permanent daily record of system operating conditions (temperatures and pressures) recorded at regular intervals throughout each 24 hour operating period should be kept.

An optional status printer is available for this purpose, a log sheet can be used by YORK personnel for recording test data on chiller systems. It is available from the factory in pads of 50 sheets each under Form No. 160.81-CL1, and may be obtained through the nearest YORK office. Automatic data logging is possible by connecting the optional printer and programming the DATA LOGGER function (Refer to Form 160.81-O1, Section 3).

PRE-START CHECKLIST

All checkpoints in the following list **must** be completed before placing the Rotary Screw Liquid Chiller in operation. Only when the checklist is **completed** will the unit be ready for initial start-up.

	CHECKPOINTS
❑	Pressure test before introducing pressure to unit, and check for leaks.
❑	Confirm motor disconnect is open.
❑	Confirm oil level is between the two sight glasses on the oil separator.
❑	Confirm all field wiring connections have been made.
❑	Confirm Control Center display is operating.
❑	Confirm pressures and temperatures are consistent with anticipated ranges. Confirm heater is operating.
❑	Open discharge service valve.
❑	Confirm the COM, LP, HP ports on the capacity control block valve are back seated.
❑	Confirm all oil return system service valves are open.
❑	Confirm liquid injection service valves are open.
❑	Close motor main disconnect.

An accurate record of readings serves as a valuable reference for operating the system. Readings taken when a system is newly installed will establish normal conditions with which to compare later readings.

For example, dirty condenser tubes may be indicated by higher than normal temperature differences between leaving condenser water and refrigerant leaving the condenser.

CHILLER COMMISSIONING

This checklist is provided as a guide to the service technician to ensure the YR Chiller is properly commissioned. Refer to Form 160.81-CL1.

YR CHILLER START-UP

Start

✓ Start the chiller and operate the chiller at design conditions or at the maximum load conditions available.

OptiView Control Center

✓ Recheck the setpoints and programmable functions of the OptiView Control Center. Change as necessary to match the operating conditions.

Print

✓ Use the OptiView Control Center print feature to print a copy of all operating data.

✓ Print a copy of the Sales Order Screen.

Important: Save the hard copies of the operating data and the Sales Order screen. Maintain a file in the local YORK Service Office.

Leak Check (Visual)

✓ Thoroughly check all fittings and connections for oil and refrigerant leaks.

CUSTOMER (OPERATING PERSONNEL) INSTRUCTION

Operation

✓ Instruct the customer or operating personnel on the location of all controls and the operation of the OptiView Control Center.

Maintenance

✓ Review the maintenance schedule with the customer.

✓ Review the preventative maintenance schedule with the operating personnel and make certain that it is thoroughly understood, including the required oil filter element change after the first 200 hours of operation.

✓ Start-up is an excellent time to log baseline data from vibration analysis, oil analysis and eddy current testing.

LIMITED WARRANTY
YORK AMERICAS
ENGINEERED SYSTEMS

SERVICE POLICY | Supersedes: 50.05-NM2 (203) | Form 50.05-NM2 (903)

WARRANTY ON NEW EQUIPMENT

York International Corporation ("YORK") warrants all equipment and associated factory supplied materials, or start-up services performed by YORK in connection therewith, against defects in workmanship and material for a period of eighteen (18) months from date of shipment. Subject to the exclusions listed below, YORK, at its option, will repair or replace, FOB point of shipment, such YORK products or components as it finds defective.

Exclusions: Unless specifically agreed to in the contract documents, this warranty does not include the following costs and expenses:

1. Labor to remove or reinstall any equipment, materials, or components.
2. Shipping, handling, or transportation charges.
3. Cost of refrigerants.

No warranty repairs or replacements will be made until payment for all equipment, materials, or components has been received by YORK.

WARRANTY ON RECONDITIONED OR REPLACEMENT MATERIALS

Except for reciprocating compressors, which YORK warrants for a period of one year from date of shipment, YORK warrants reconditioned or replacement materials, or start-up services performed by YORK in connection therewith, against defects in workmanship or material for a period of ninety (90) days from date of shipment. Subject to the exclusions listed below, YORK, at its option, will repair or replace, FOB point of shipment, such materials or parts as YORK finds defective. However, where reconditioned or replacement materials or parts are placed on equipment still under the original new equipment warranty, then such reconditioned or replacement parts are warranted only until the expiration of such original new equipment warranty.

Exclusions: Unless specifically agreed to in the contract documents, this warranty does not include the following costs and expenses:

1. Labor to remove or reinstall any equipment, materials, or components.
2. Shipping, handling, or transportation charges.
3. Cost of refrigerant.

No warranty repairs or replacements will be made until payment for all equipment, materials, or components has been received by YORK.

ALL WARRANTIES AND GUARANTEES ARE VOID IF:

1. Equipment is used with refrigerants, oil, or antifreeze agents other than those authorized by YORK.
2. Equipment is used with any material or any equipment such as evaporators, tubing, other low side equipment, or refrigerant controls not approved by YORK.
3. Equipment has been damaged by freezing because it is not properly protected during cold weather, or damaged by fire or any other conditions not ordinarily encountered.
4. Equipment is not installed, operated, maintained and serviced in accordance with instructions issued by YORK.
5. Equipment is damaged due to dirt, air, moisture, or other foreign matter entering the refrigerant system.
6. Equipment is not properly stored, protected or inspected by the customer during the period from date of shipment to date of initial start.
7. Equipment is damaged due to acts of God, abuse, neglect, sabotage, or acts of terrorism.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES AND LIABILITIES, EXPRESS OR IMPLIED IN LAW OR IN FACT, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE WARRANTIES CONTAINED HEREIN SET FORTH BUYER'S SOLE AND EXCLUSIVE REMEDY IN THE EVENT OF A DEFECT IN WORKMANSHIP OR MATERIALS. IN NO EVENT SHALL YORK'S LIABILITY FOR DIRECT OR COMPENSATORY DAMAGES EXCEED THE PAYMENTS RECEIVED BY YORK FROM BUYER FOR THE MATERIALS OR EQUIPMENT INVOLVED. NOR SHALL YORK BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES. THESE LIMITATIONS ON LIABILITY AND DAMAGES SHALL APPLY UNDER ALL THEORIES OF LIABILITY OR CAUSES OF ACTION, INCLUDING, BUT NOT LIMITED TO, CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE) OR STRICT LIABILITY. THE ABOVE LIMITATIONS SHALL INURE TO THE BENEFIT OF YORK'S SUPPLIERS AND SUBCONTRACTORS.

P.O. Box 1592, York, Pennsylvania USA 17405-1592

Form 50.05-NM2 (903)
Supersedes: 50.05-NM2 (203)

CODES: SN, SM, SRC, SP, ST, SJ

YORK
A JOHNSON CONTROLS COMPANY

YR MAXE CHILLER MAINTENANCE REQUIREMENTS

Maintenance Requirements for YORK YR MaxE Chillers

Procedure	Daily	Weekly	Monthly	Quarterly	Yearly	Every 50,000 Hours
Record chiller operating conditions	X					
Check oil and refrigerant levels		X				
Check operation of oil heater			X			
Leak check and repair leaks (see note 1)				X		
Check three-phase voltage and current balance				X		
Calibrate safety controls (see note 1)					X	
Check slide valve operation and calibrate slide valve potentiometer					X	
Check motor terminal connections					X	
Mechanically brush condenser tubes					X	
Megohm motor windings					X	
Perform oil analysis on compressor lube oil (see note 1)					X	
Remove condenser water box(es) / inspect tube sheets					X	
Replace filter/dryers					X	
Replace oil filters					X or as needed	
Verify evaporator and condenser water flow rates vs. design conditions					X	
Compressor internal inspection (see note 1)						X

Note 1: This procedure must be performed at the specified time interval by an Industry Certified Technician who has been trained and qualified to work on this type of YORK equipment. A record of this procedure being successfully carried out must be maintained on file by the equipment owner should proof of adequate maintenance be required at a later date for warranty validation purposes.