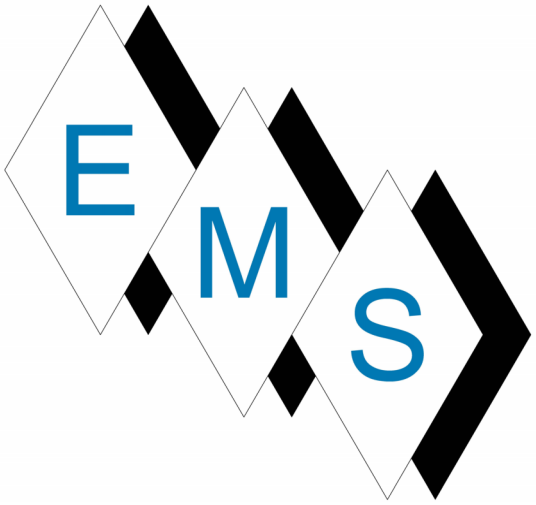
POST HOUSE APARTMENTS

O&M DOCUMENTS
Job 1317



Eastern Mechanical Services, Inc.
3 Starr Street
Danbury, CT 06810
www.emsinc.us

EATON | Electrical

Baltimore Aircoil Company

Estimated Startup Date

_____

Variable Frequency Drive Pre-startup Checklist

(All of the following information must be filled out or checked YES or NO)

Job site name:	Post House Appt
System/Circuit:	Water based heat pumps
Drive nameplate:	GO# U073723-002 Catalog Number: BAC02511N1C4K9P6 Serial #: 12781504 Horsepower: 25 Amps: 74.8 Line voltage: 208 Does the line voltage reflect that on the drive nameplate? ☒ Yes ☐ No
Motor nameplate:	Inverter Duty ☒ Yes ☐ No Estimated Motor Lead length: 275 HP: 25 Voltage: 200 FLA: 67 RPM: 1775 SF: 1.15
Drive installation:	Environmental conditions have been checked against operational capabilities. (i.e. NEMA enclosure matches the location requirements) ☒ Yes ☐ No Line side power is connected and available. (Do not energize) ☒ Yes ☐ No
Motor installation:	Has the drive to motor sizing been verified? ☒ Yes ☐ No Motor wired to drive. ☒ Yes ☐ No
Control system:	Control system (i.e. temperature or pressure sensor, controller or Building Management System) installed and ready to operate ☒ Yes ☐ No Control wiring is run in separate conduit than the power wiring. ☒ Yes ☐ No Control wiring to/from the drive installed. ☒ Yes ☐ No Control wiring terminated. ☒ Yes ☐ No
Input signals	☐ Temperature Sensor provided by BAC ☐ Pressure Sensor provided by BAC ☐ Controller provided by BAC ☒ Temperature Sensor provided by others ☐ Pressure Sensor provided by others ☒ Building Management System
Process control:	☐ 4-20 milli-amp ☒ 0-10 vdc

Drives Watertown Plant 901 S. 12th Street Watertown, WI 53094 Phone: 920-262-6142 Fax: 920-262-6099 Email: Sherryl.Hisel@eaton.com

EATON | Electrical

Baltimore Aircoil Company

Contact Information

1

Local BAC Representative: Guy DeFeo Company
97 Noble Ave City Bridgeport State CT Zip 06460

Contact: Carmine DeFeo Ph: (203) 877-6811 Fax: (203) 874-5269

Job Site: Post House Apartments
(End User)

2

Address: 40 Clinton Avenue (City) Stamford (State) CT (Zip) 06902

Contact: Vin Tufo Ph: 203.977.1400 Fax: _____

3

Coordinating Contractor: Eastern Mechanical Services, Inc
64 Triangle Street City Danbury State CT Zip 06810

Contact: Ted Huizinga Ph: 203.792.7668 Fax: 203.748.0385

4

Building Management System: Honeywell

Contact: Gary Charette Ph: 203-667-7969

5

Parties requiring VFD operational overview:

Contact: _____ Ph: _____

Ted Huizinga (Printed Name) 3/26/08 Date — (Signature) 3/26/08 Date

Drives Watertown Plant 801 S. 12th Street Watertown, WI 53094 Phone: 920-262-6142 Fax: 920-262-6099 Email: SherryLHisel@eaton.com

December 20, 2006

BALTIMORE AIRCOIL COMPANY
Submittal Data Form

Your P. O. Number: 1317-1 **Our B.A.C. Number:** U070372301

Sold To: Eastern Mechanical Services, Inc.
64 Triangle Street Suite H2
Danbury, CT 06813

Project: Post House Apartments -- Stamford, CT
Engineer: AKF Engineers -- Stamford, CT
Representative: Guy DeFeo, Co., Inc. (CJD)

One (1) Model VFL-072-32N/X Closed Circuit Cooling Tower Unit
All Information is Per Unit

Certified Capacity: 250 USGPM of 40% P.G. from 95.3°F to 85.3°F at 78°F entering air wet bulb and 9.14 PSIG fluid pressure drop.

Fan Motor(s): One (1) 25 HP fan motor: totally-enclosed, fan-cooled (TEFC), inverter duty, suitable for 200 volt, 3 phase, 60 hertz electrical service. Fan drives are based on 0 inches ESP.

Pump(s): (1) 1.5 HP pump motor, totally-enclosed, fan-cooled (TEFC), one-speed, one-winding, suitable for 200 volts, 3 phase, 60 hertz.

NOTE: **Inverter Duty fan motors, furnished in accordance with NEMA Standard Mg.1 – Part 31, are required for applications using variable frequency drives for fan motor control.**

Submittal Information	Equipment Summary
BAC Terms and Conditions of Sale **Mechanical Specifications** **Sound Data** **Submittal Drawings/Diagrams** Unit Print - Right Hand (BAC-15868A) Steel Support (BAC-15814B) Heater Location (BAC-12220A) Heater Wiring (BAC-AGFM000000) Electric Water Level Control Location (BAC-13181A) Heater & Electric Water Level Wiring (BAC-BGGG000000) Vibration Cutout Switch Location (BAC-11490A) Vibration Cutout Switch Wiring (BAC-17492A) VFD Enclosure (BAC-C00754-1007) VFD Wiring (BAC-C90101-4001)	• Stainless Steel Construction in Basin Water-Contacted Areas, Galvanized Steel Elsewhere • Galvanized Steel Fan Wheel(s) • Galvanized Steel Coil with MPT Connections • Polyvinyl Chloride (PVC) Drift Eliminators • End Outlet for Integral Pump • Close-Coupled Centrifugal Spray Water Pump with Electrical Requirements Matching Fan Motor(s)' • PVC Spray Distribution Branches • Electric Immersion Heaters Sized to Maintain +40°F water at a -20°F Ambient with Electrical Requirements Matching Fan Motor(s) • Heater Control Panel with Contactor and Disconnect • Electric Water Level Control Package with High & Low Level Alarm • Mechanical Vibration Cutout Switch • Variable Frequency Drive(s) • Spare Part to Ship Loose: (1) Space Heater **See Mechanical Specifications & Drawings for more detail.**

Thank you for your order. Further processing of your order is contingent upon receipt of approved submittals. Early release is necessary to meet your project requirements.

Current Rigging and Installation Instructions, as well as Operating and Maintenance Instructions, are available at our website: **www.baltimoreaircoil.com**.

Baltimore Aircoil Company
Terms and Conditions of Sale

Pricing: Prices set forth in Seller's quotation shall remain firm for thirty (30) days. Within such period, the quotation shall convert into an order provided that all of the following have occurred: (1) Buyer submits either a purchase order or a copy of Seller's quotation displaying an authorized signature of Buyer within that thirty (30)-day period; (2) Buyer provides a release for fabrication; and (3) Buyer requests a shipment date that is no later than twelve (12) weeks from the date of Buyer's submission of a purchase order or signed quotation. In the event Buyer's requested shipment date is later than twelve (12) weeks beyond such submission date, Seller's price in effect twelve (12) weeks prior to such shipment date shall apply. In the event that Buyer requests for its convenience that Seller delay delivery of products subject to an order beyond the scheduled shipment date, pricing shall be subject to the same adjustment.

Payments: Terms of payment shall be net cash in thirty (30) days from date of invoice, subject to Seller's prior credit approval. If the Buyer shall fail to make any payments in accordance with the terms and conditions of sale, the Seller, in addition to its other rights and remedies but not in limitation thereof, may, at its option, without prior notice, cancel this order as to any undelivered products or defer shipments or deliveries hereunder, or under any other agreement between Buyer and Seller, except upon Seller's receipt of cash before shipment or such security as Seller considers satisfactory. Seller reserves the right to impose an interest charge (not exceeding the lawful maximum) on the balance of each invoice not paid on its due date for the period from the due date to the date of receipt of payment by Seller. In the event Buyer's failure to make timely payments to Seller results in Seller incurring additional costs, including but not limited to collection expenses and attorneys' fees, said costs shall be added to the amount due Seller from Buyer. Buyer shall have no right to any discount or retainage and shall not withhold payment as a set-off on Seller's invoice in any amount.

Taxes: Unless listed on the front (reverse) side of this document, prices do not include any federal, state or local sales, use or value-added taxes payable in connection with this order. All such taxes shall be paid by Buyer. Buyer shall indemnify Seller from and against such taxes, plus interest and penalties thereon, including, but not limited to, tax, interest and penalties resulting from a failure to collect such taxes because of Seller's reliance upon an invalid exemption certificate provided to Seller.

Allocation of Risk: Deliveries shall be considered made when the products subject to this order are loaded on the carrier. At such time, title to the goods and all risk of loss, damage or shortage shall pass to Buyer, and any claims based thereon must be filed by Buyer with the carrier.

Force Majeure: Seller shall under no circumstances be liable for any loss or damage resulting from delay or failure in the performance of its obligations under this contract to the extent that such performance is delayed or prevented by: fires, floods, war, terrorist activities, riots, strikes, freight embargoes or transportation delays, shortage of labor, inability to secure fuel, material, supplies or power at current prices, or on account of shortages thereof; acts of God or of the public enemy; any existing or future laws or acts of the federal, state or local government (including specifically, but not exclusively, any orders, rules or regulations issued by any official or agency of any such government) affecting the conduct of Seller's business with which Seller in its judgment and discretion deems it advisable to comply as a legal or patriotic duty, or to any case beyond the Seller's reasonable control

Warranties: Seller warrants that the equipment products sold under this contract shall be free from defects in material and workmanship for a period of twelve (12) months from the date of equipment startup or eighteen (18) months from the date of shipment , whichever occurs first. The following original equipment components only are warranted against defects in materials and workmanship for a period of five (5) years from date of shipment: fans, fan shafts, bearings, sheaves, gearboxes, driveshafts, couplings, mechanical equipment supports and fan motors. Replacement parts provided by Seller under its original equipment warranty obligations are warranted against defects in materials and workmanship for a period of twelve (12) months from date of shipment or until expiration of their original warranty, whichever is the first to occur. Parts purchased after expiration of the warranty on the original parts they replace (including those parts originally warranted for a five (5) year period) are warranted against defects in materials and workmanship for a period of twelve (12) months from date of shipment. Written notice of any defect shall be given to Seller immediately upon discovery by Buyer, and shall fully describe the claimed defect. Defective parts shall be repaired or replaced F.O.B. point of shipment, provided that inspection by Seller verifies the claimed defect(s). This shall be Buyer's exclusive remedy. **This warranty does not cover the costs of removing, shipping or reinstalling the equipment. Repairs made without the prior written approval of Seller shall void all**

warranties covering material and workmanship. Any descriptions of the product(s) in the contract are for the sole purpose of identification and do not constitute a warranty. In the interest of product improvement, Seller reserves the right to change specifications and product design without incurring any liability therefore. The foregoing express warranties or those set forth elsewhere on this document are the only warranties of Seller applicable to the product(s) sold under this contract. **All other warranties, whether verbal or written, and all warranties implied by law, including any warranties of merchantability or fitness for a particular purpose, are hereby excluded. Failure on the part of Buyer or of other parties to properly maintain the product(s) sold under this contract, or the operation of such product(s), by Buyer and/or other parties under conditions more severe than those for which such product(s) were designed, shall void all warranties covering materials and workmanship. Seller's warranties do not apply to defects in product(s) for which payment in full has not been received by Seller, and said warranties do not cover normal wear and tear or the erosion, corrosion and/or deterioration of the product(s) from unusual causes. No warranties by Seller shall apply to accessories manufactured by others,** inasmuch as they are warranted separately by their respective manufacturers, except as stated above. Buyer assumes liability for and shall bear the costs of compliance with all laws, regulations, codes standards or ordinances applicable to the location, operation and maintenance of the product(s) sold under this contract, including those requirements pertaining to the distances between such product(s) and air-conditioning system duct intakes. No representative or agent of Seller is authorized to enlarge upon the express warranties of Seller.

Cancellation/Changes/Returns: Cancellation of or changes in any order by Buyer shall not be effective without Buyer's notice thereof received, agreed to, and confirmed in writing by Seller. If Seller, in its absolute discretion, approves Buyer's cancellation of an order, Buyer agrees to pay a reasonable cancellation charge. Seller's prior written consent must be obtained before Buyer returns any products, and when so returned will be subject to a handling charge and transportation costs payable by Buyer.

Liability/Indemnification: Seller shall not be liable for any damages caused by delay in delivery of the products. Buyer shall hold harmless and indemnify Seller from and against all liability, claims, losses, damages, and expenses (including attorneys' fees) for personal injury and property damage arising out of Buyer's improper unloading, handling, or use of the products subject to this order, and for Buyer's infringement of another's property rights. The Seller's maximum liability from any cause whatsoever, whether in breach of contract, tort (including negligence), strict liability, or otherwise, shall not exceed the contract price. Neither Buyer nor Seller shall in any event be liable to the other, whether such liability arises out of breach of contract, tort (including negligence), strict liability or any other cause or form of action, for any consequential, special, indirect or incidental damages, including but not limited to loss of actual or anticipated profits or loss of use arising out of this contract, other than such damages resulting from the willful misconduct of Buyer or Seller.

Government Contracts: If Buyer's purchase order is for products to be used in the performance of a U.S. Government contract, those clauses of applicable procurement regulations mandatorily required by federal law to be included in U.S. Government subcontracts shall be incorporated herein by reference.

Export Transactions: Buyer shall comply with all applicable export laws and regulations of the U.S. Government, and shall hold harmless and indemnify Seller from and against all liability, damages, and expenses (including attorneys' fees) incurred by Seller as a result of Buyer's violation of any U.S. Government export and/or international antiboycott laws or regulations.

Agreement of Sale: Buyer's order is accepted on the terms and conditions stated herein and Seller's acceptance of Buyer's order is expressly made conditional upon Buyer's assent to such terms and conditions, including any of Seller's terms and conditions which may be additional to or different from those contained in Buyer's purchase order or otherwise. Such assent shall be deemed to have been given unless written notice of objection to any such terms and conditions (including inconsistencies between Buyer's purchase order and this acceptance) is given by Buyer to Seller promptly upon receipt of this acknowledgment. Any agreement or understanding, oral or written, which modifies or waives the terms and conditions herein (whether contained in Buyer's purchase order or other documentation) shall be deemed material and shall be rejected unless hereafter agreed to in writing and signed by Seller's authorized officer. Waiver by Seller of any breach or default hereunder shall not be deemed a waiver by Seller of any other or subsequent breach or default which may thereafter occur Neither the rights nor the obligations of either Buyer or Seller are assignable without the prior written consent of the other party. This agreement of sale and all rights and obligations of Buyer and Seller shall be governed by and construed in accordance with the laws of the State of Maryland.

(Revision -- 03/15/2004)

Baltimore Aircoil Company
Mechanical Specifications

12/20/2006

Project:	Post House Apartments
Customer:	Eastern Mechanical Services Inc
Purchase Order No.:	1317-1
Engineer:	AKF Engineers
Model:	One (1) Model VFL-072-32N/X Closed Circuit Cooling Tower Unit
B.A.C. Serial No.:	U070372301

All Information is Per Unit

Unit Type:

Factory-assembled, counterflow, forced draft design closed circuit cooling tower with single side air entry.

Quality Assurance:

Each unit is manufactured under closely-controlled conditions using standardized parts to ensure each unit is built precisely to the same high-quality design and construction standards. The design, manufacture, and business processes of Baltimore Aircoil Company are ISO 9001:2000 certified.

Fan Motor:

One (1) 25 HP fan motor: totally-enclosed, fan-cooled (TEFC), inverter duty, suitable for 200 volt, 3 phase, 60 hertz electrical service. Inverter Duty fan motors, furnished in accordance with NEMA Standard Mg.1 -- Part 31, are required for applications using variable frequency drives for fan motor control.

Materials of Construction:

Heavy gauge panel construction utilizing double break flanges for maximum strength, rigidity, and reliable sealing at watertight joints. Circular access doors provided for interior inspection, cleaning, and adjustments are constructed of Type 304 stainless steel and are held in place with phenolic knob screws. The heat transfer casing section is heavy gauge panel construction of G-235 (Z700 metric) hot-dip galvanized steel.

The fan(s) is located in the dry air stream to provide greater reliability and ease of maintenance. Fan wheels are forwardly curved, centrifugal, squirrel-cage type which are statically and dynamically balanced, and are mounted on a steel shaft supported by heavy-duty, self-aligning, relubricatable bearings with cast iron housings. Fan housings have curved inlet rings for efficient air entry. Fan upper housings are constructed of G-235 (Z700 metric) hot-dip galvanized steel. The lower fan housings are constructed of Type 304 stainless steel. The fan housings are of split design to facilitate fan wheel and shaft removal.

V-belt sheaves, selected for 150% motor nameplate horsepower, are mounted and aligned at the factory. Drive and all moving parts are protected by removable screens and panels made of G-235 (Z700 metric) hot-dip galvanized steel. The fan(s), fan shaft(s), bearings, mechanical equipment support and fan motors are warranted against defects in materials and workmanship for five (5) years from date of shipment.

Fan Wheel Material:

Forwardly curved, centrifugal, squirrel cage type fan wheels, constructed from G-235 (Z700 metric) hot-dip galvanized steel, are statically and dynamically balanced. Fan housings have curved inlet rings for efficient air entry.

Coil Type:

For single coil Series V model(s), coil(s) will be configured in an internally circuited arrangement. For dual coil Series V model(s), coil(s) will be configured in an external circuited arrangement with two coil segments joined by an external crossover pipe to allow the fluid to flow through the two segments in series. Coils(s) will be 1.05" O.D. all prime surface steel tubes encased in steel framework with entire assembly hot-dip galvanized after fabrication. Tubes will be sloped for liquid drainage. Coil(s) will be pressure tested at 375 psig (2685kPa) air pressure under water.

Drift Eliminators:

Drift eliminators are constructed of polyvinyl chloride (PVC), and are removable in easily handled sections. They impart three distinct changes in air direction to effectively strip entrained moisture from the leaving airstream with minimum air resistance. Drift loss limited to 0.02% of total water circulated.

Wet Deck:

The BACount® Wet Deck Surface and integral drift eliminators are formed from self-extinguishing (per ASTM D-568) polyvinyl chloride (PVC), having a flame spread rating of 5 per ASTM Standard E84-77a, and are impervious to rot, decay, and fungus or biological attack. The wet deck surface is elevated above the cold water basin floor to facilitate cleaning. The eliminators are designed to effectively strip entrained moisture from the leaving airstream with a minimum of air resistance. This wet deck is suitable for a maximum entering water temperature of 130°F (54.44°C).

Water Outlet:

The spray water outlet is a pipe stub, sized for pump suction, and located at the standard pump suction location. A large area lift out strainer screen matching the cold water basin material of construction is included with an anti-vortexing hood to prevent air entrainment.

Spray Water Pump Assembly:

A close-coupled, bronze-fitted pump with a mechanical seal is mounted on the pan. The pump motor is totally enclosed, fan cooled (TEFC). A water bleed line with a metering valve to control the bleed rate is installed between the pump discharge and the overflow connection. The external circulating water piping matches the material of construction of the internal spray piping.

Spray Piping:

Spray header with schedule 40 PVC removable branches and 360° spray pattern plastic spray nozzles are held in place with snap-in rubber grommets.

Basin Heaters:

A minimum number of high-watt-density electric immersion heater elements, sized to maintain +40°F (+4°C) basin water at -20°F (-29°C) ambient with a 10 mph (16 km/h) wind speed, is provided. Wiring is not included.

Basin Heater Controls:

An electric immersion heater control package which includes a control panel in a NEMA 4 enclosure is provided. It includes contactor(s), disconnect, thermostat, 24V transformer, and Type 316 stainless steel probe for water level and water temperature sensing. Panel ships loose for field mounting and wiring by others.

Basin Water Level Control:

Probe-type electric water level control package including solid-state relay, electrode head, stainless steel electrodes, and a solenoid valve in the make-up water connection. The electrodes are make-up on, make-up off, high level alarm, low level alarm, and ground.

Vibration Cutout Switch:

Fan system is provided with an appropriate number of vibration cutout switches to limit collateral damage to the unit in the event of a catastrophic fan failure. The vibration switch(es), including external alarm capability, is mechanically tripped with a frequency range of 0 to 3,600 RPM and trip point of 0.2 to 2.0 g's. Switch rating is 10 amperes at a maximum 480 VAC, and 1/4 ampere at 250 Vdc. The remote reset and bypass time delay on start-up solenoid coil is powered by 110 Vac. Field wiring is by others.

BAC Control Package

Qty per Order	BAC Control Package Selection	
1	BAC Control Package	
	System Voltage:	200
	System Frequency:	60

Each BAC Control Package Includes:

Variable Frequency Drives

Enclosure:	NEMA 1
Disconnect Type:	Circuit Breaker
Bypass:	3-Contactor Bypass
Communication Protocol:	LONWORKS

Qty	Item	
1	VFD for 25 HP Main Fan Motor; Includes Temperature Sensor with Transmitter and Thermowell	
	Catalog Number:	BAC02511N1C4K9P6
	Enclosure Drawing:	BAC-C00754-1007
	Wiring Diagram:	BAC-C90101-4001
1	VFD Startup Service	

Baltimore Aircoil Company

Sound Rating Program, 5/26/2006 Release

Series V VFL

Model : VFL-072-32N
Total Fan Motor Horse Power : 25 HP
Fan Speed & Total Fan Power Used : Full Speed, 25 BHP
Accessories : None

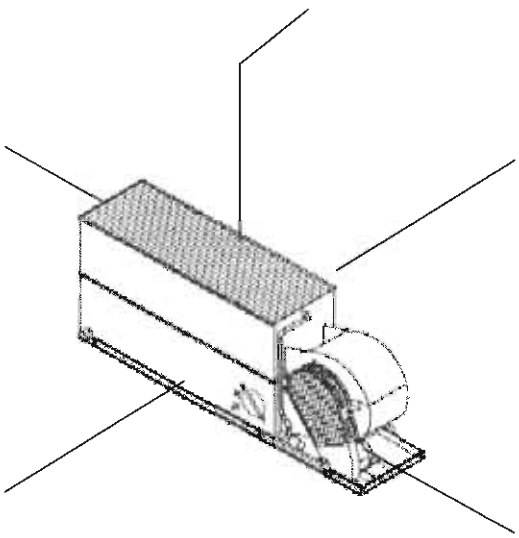
Octave band and A-weighted sound pressure levels (Lp) are expressed in decibels (dB) reference 0.0002 microbar. Sound power levels (Lw) are expressed in decibels (dB) reference one picowatt. Octave band 1 has a center frequency of 63 Hertz.

Top Lp
Sound Pressure (dB)

Octave Band	Distance 5 ft	Distance 50 ft
1	76	64
2	78	63
3	76	60
4	78	62
5	75	61
6	74	59
7	72	57
8	69	52
A-wgtd	**81**	**66**

Back Lp
Sound Pressure (dB)

Octave Band	Distance 5 ft	Distance 50 ft
1	74	67
2	71	64
3	70	59
4	66	56
5	61	52
6	57	48
7	55	48
8	51	40
A-wgtd	**68**	**58**



End Lp
Sound Pressure (dB)

Octave Band	Distance 5 ft	Distance 50 ft
1	76	66
2	71	64
3	71	64
4	73	60
5	71	60
6	71	58
7	68	56
8	62	51
A-wgtd	77	**65**

End Lp
Sound Pressure (dB)

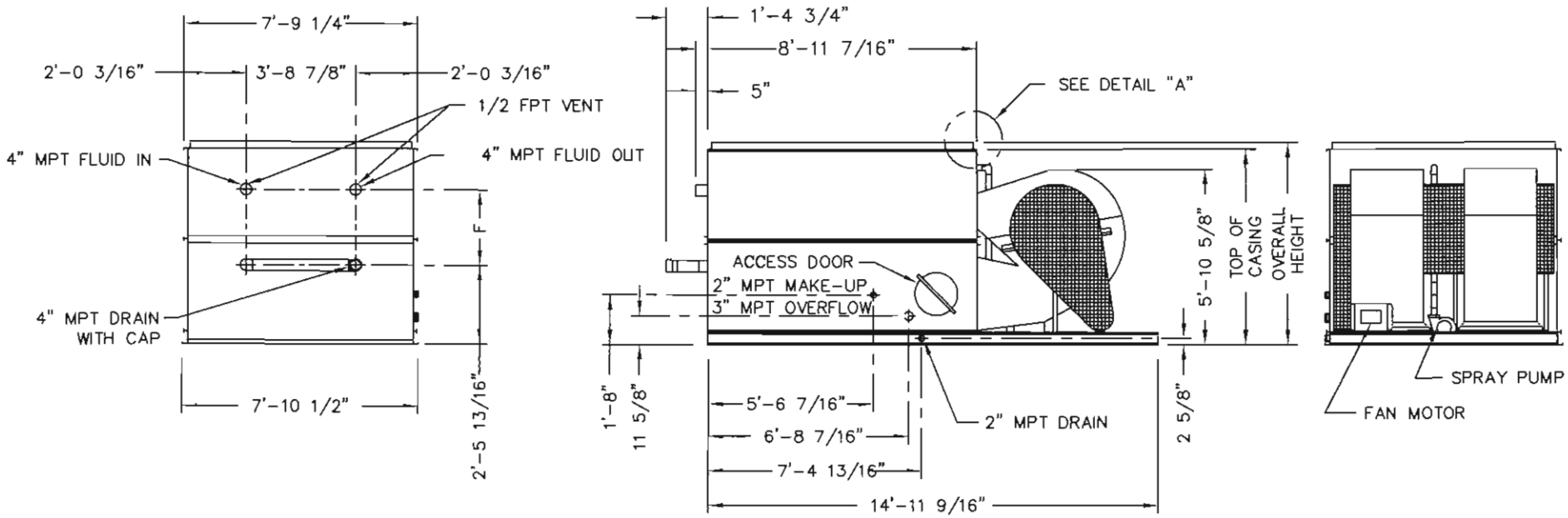
Octave Band	Distance 5 ft	Distance 50 ft
1	76	66
2	71	64
3	71	64
4	73	60
5	71	60
6	71	58
7	68	56
8	62	51
A-wgtd	77	**65**

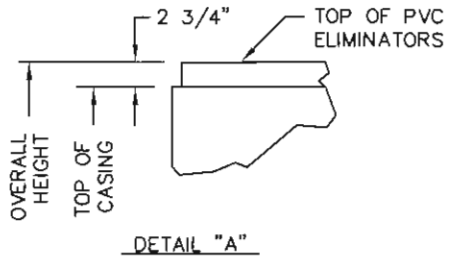
Fan Side Lp
Sound Pressure (dB)

Octave Band	Distance 5 ft	Distance 50 ft
1	82	71
2	73	66
3	76	64
4	76	60
5	76	61
6	73	60
7	70	58
8	65	50
A-wgtd	**80**	**66**

Sound Power (dB)

Octave Band	Center Frequency (Hertz)	Lw
1	63	99
2	125	96
3	250	95
4	500	92
5	1000	92
6	2000	90
7	4000	88
8	8000	82



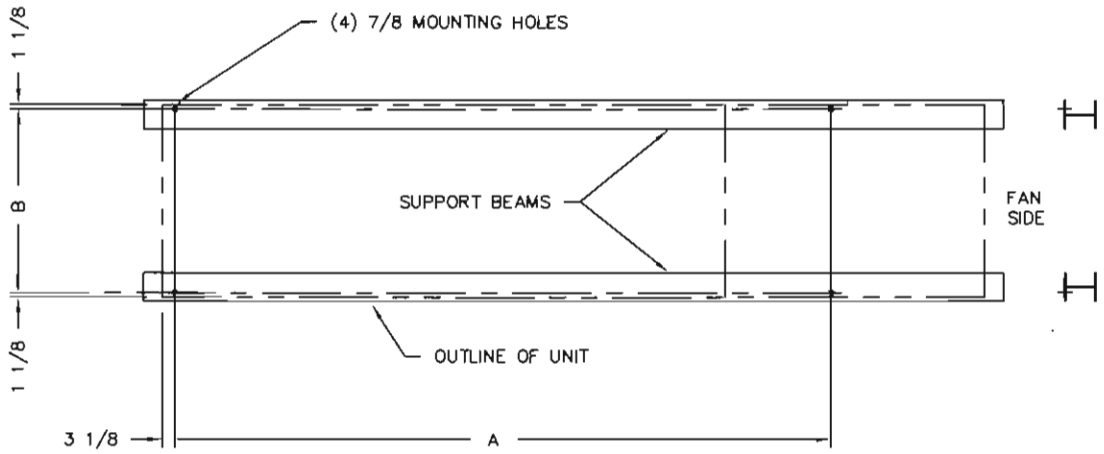


TYPICAL ONLY WHERE OVERALL HEIGHT EXCEEDS TOP OF CASING

MODEL NO.	APPROX. SHIPPING WEIGHT (LBS)	APPROX. OPERATING WEIGHT (LBS)	F	TOP OF CASING	OVERALL HEIGHT
VFL-072-22M	8755	13555	2'-9 1/4"	6'-10 1/4"	6'-10 1/4"
VFL-072-22N	8755	13555	2'-9 1/4"	6'-10 1/4"	7'-1"
VFL-072-220	8755	13555	2'-9 1/4"	6'-10 1/4"	7'-1"
VFL-072-22P	8755	13555	2'-9 1/4"	6'-10 1/4"	7'-1"
VFL-072-32N/X	9920	15190	3'-6 1/2"	7'-8 3/4"	7'-8 3/4"
VFL-072-320	9920	15190	3'-6 1/2"	7'-8 3/4"	7'-11 1/2"
VFL-072-32P	9920	15190	3'-6 1/2"	7'-8 3/4"	7'-11 1/2"
VFL-072-42N	10950	16590	4'-3 3/4"	8'-4 3/4"	8'-4 3/4"
VFL-072-420	10950	16590	4'-3 3/4"	8'-4 3/4"	8'-7 1/2"
VFL-072-42P	10950	16590	4'-3 3/4"	8'-4 3/4"	8'-7 1/2"

NOTES:
1. ALL DIMENSIONS ARE IN FEET AND INCHES. WEIGHTS ARE IN POUNDS.
2. UNLESS OTHERWISE INDICATED, ALL CONNECTIONS 6 INCHES AND SMALLER ARE MPT AND CONNECTIONS 8 INCHES AND LARGER ARE BEVELED FOR WELDING AND GROOVED FOR VICTAULIC CONNECTION.
3. DIMENSIONS SHOWING LOCATION OF COIL CONNECTIONS ARE APPROXIMATE AND SHOULD NOT BE USED FOR PREFABRICATION OF CONNECTING PIPING.
4. FOR SUPPORT REQUIREMENTS, REFER TO THE SUGGESTED STEEL SUPPORT DRAWING.

B.A.C. ORDER NO.: U070272301 DATE: 12/20/06	BALTIMORE AIRCOIL COMPANY	RIGHT HAND UNIT STANDARD OUTLET WITH PUMP DWG NO. BAC-15868A B



VTL COOLING TOWER MODEL NO.	VFL INDUSTRIAL COOLER MODEL NO.	VCL EVAPORATIVE CONDENSER MODEL NO.	A	B	MAXIMUM ALLOWABLE BEAM DEFLECTION
VTL016-E THRU VTL039-H	VFL-012-02F THRU VFL-012-32H	VCL016-D THRU VCL035-G	4'-6"	3'-11"	1/4"
VTL045-H THRU VTL079-K	VFL-024-12H THRU VFL-024-32J	VCL038-G THRU VCL079-J	7'-11 1/2"	3'-11"	3/8"
VTL082-K THRU VTL095-K	VFL-036-22J THRU VFL-036-32M	VCL087-H THRU VCL120-K	10'-11 1/4"	3'-11"	1/2"
VTL105-K THRU VTL137-M	VFL-048-22K THRU VFL-048-42M	VCL134-K THRU VCL155-L	13'-11 1/2"	3'-11"	1/2"
VTL152-M THRU VTL227-0	VFL-072-22M THRU VFL-072-42P	VCL167-K THRU VCL234-M	10'-11 1/4"	7'-8 1/4"	1/2"
VTL245-P VTL272-P	VFL-096-41N THRU VFL-096-42P	VCL257-M THRU VCL299-0	13'-11 1/2"	7'-8 1/4"	1/2"

NOTES:

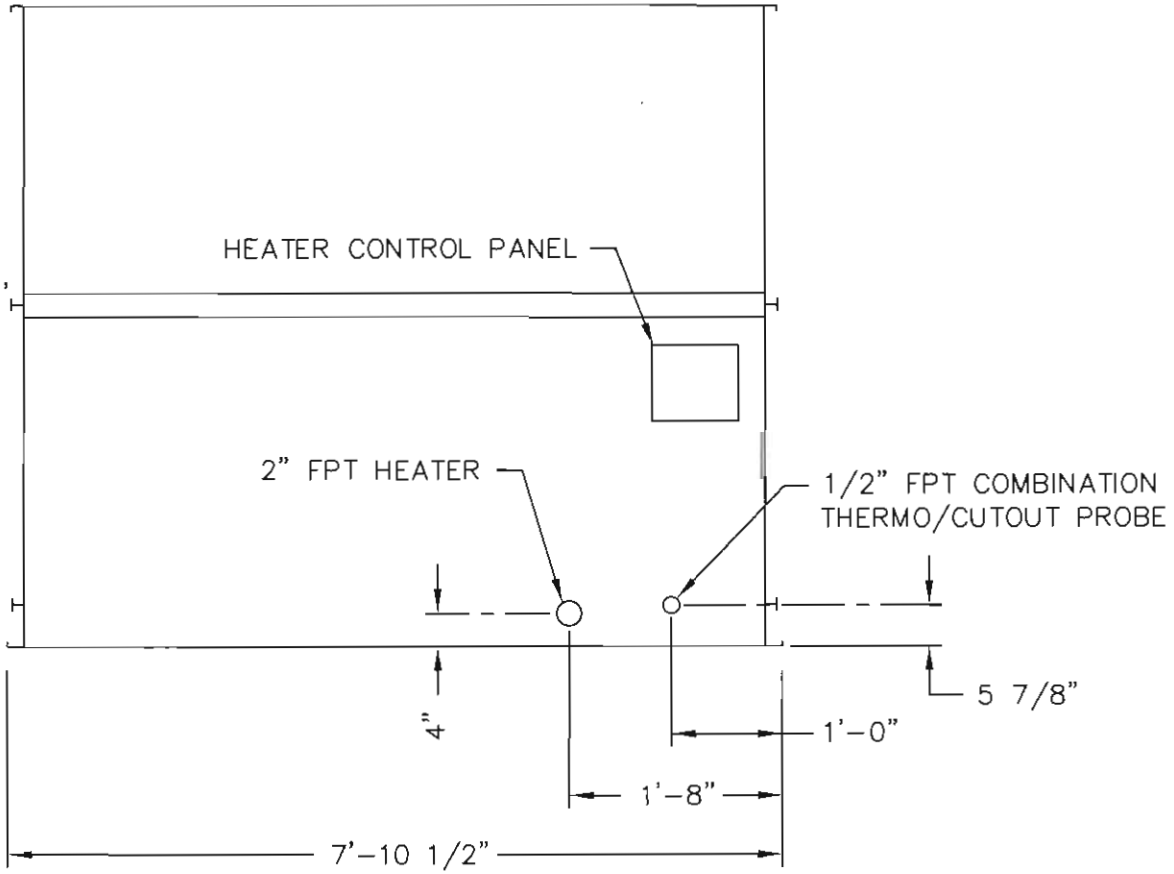
1. THE RECOMMENDED SUPPORT ARRANGEMENT CONSISTS OF TWO PARALLEL I-BEAMS EXTENDING THE FULL LENGTH OF THE UNIT. SUPPORTS AND ANCHOR BOLTS ARE TO BE DESIGNED AND FURNISHED BY OTHERS.
2. ALL SUPPORTING BEAMS ARE TO BE FLUSH AND LEVEL AT TOP ANO MUST BE ORIENTED RELATIVE TO GAGE LINE AS SHOWN.
3. RECOMMENDED DESIGN LOADS FOR EACH BEAM SHOULD BE 70% OF THE TOTAL UNIT OPERATING WEIGHT APPLIED AS A UNIFORM LOAD TO EACH BEAM. BEAMS SHOULD BE DESIGNED IN ACCORDANCE WITH STANDARD STRUCTURAL PRACTICE. THE MAXIMUM ALLOWABLE DEFLECTION OF BEAMS UNDER THE UNIT SHALL BE AS SHOWN IN THE TABLE.
4. ALL MOUNTING HOLES ARE 7/8 INCH DIAMETER AT THE LOCATIONS SHOWN.
5. IF VIBRATION ISOLATORS ARE USED, A RAIL OR CHANNEL MUST BE PROVIDED BETWEEN THE UNIT AND THE ISOLATORS TO PROVIDE CONTINUOUS UNIT SUPPORT. ADDITIONALLY, THE SUPPORT BEAMS MUST BE DESIGNED TO ACCOMODATE THE OVERALL LENGTH AND MOUNTING HOLE LOCATION OF THE ISOLATORS WHICH MAY DIFFER FROM THOSE OF THE UNIT. REFER TO VIBRATION ISOLATOR DRAWINGS FOR THIS DATA.

B.A.C. ORDER NO: U070372301 DATE: 12/20/06	BALTIMORE AIRCOIL COMPANY	SUGGESTED STEEL SUPPORT DRAWING NUMBER: BAC-15814B –

VTL COOLING TOWER MODEL NO.	VFL CLOSED CIRCUIT TOWER MODEL NO.		VCL EVAPORATIVE CONDENSER MODEL NO.	QTY OF HEATERS	KW EACH
VTL-152-M THRU VTL-227-0	VFL-072-31N THRU VFL-072-41P	VFL-072-22M THRU VFL-072-42P	VCL-167-K THRU VCL-234-M	1	7
VTL-245-P THRU VTL-272-P	–	VFL-096-42N THRU VFL-096-42P	VCL-257-M THRU VCL-299-0	1	9

NOTE

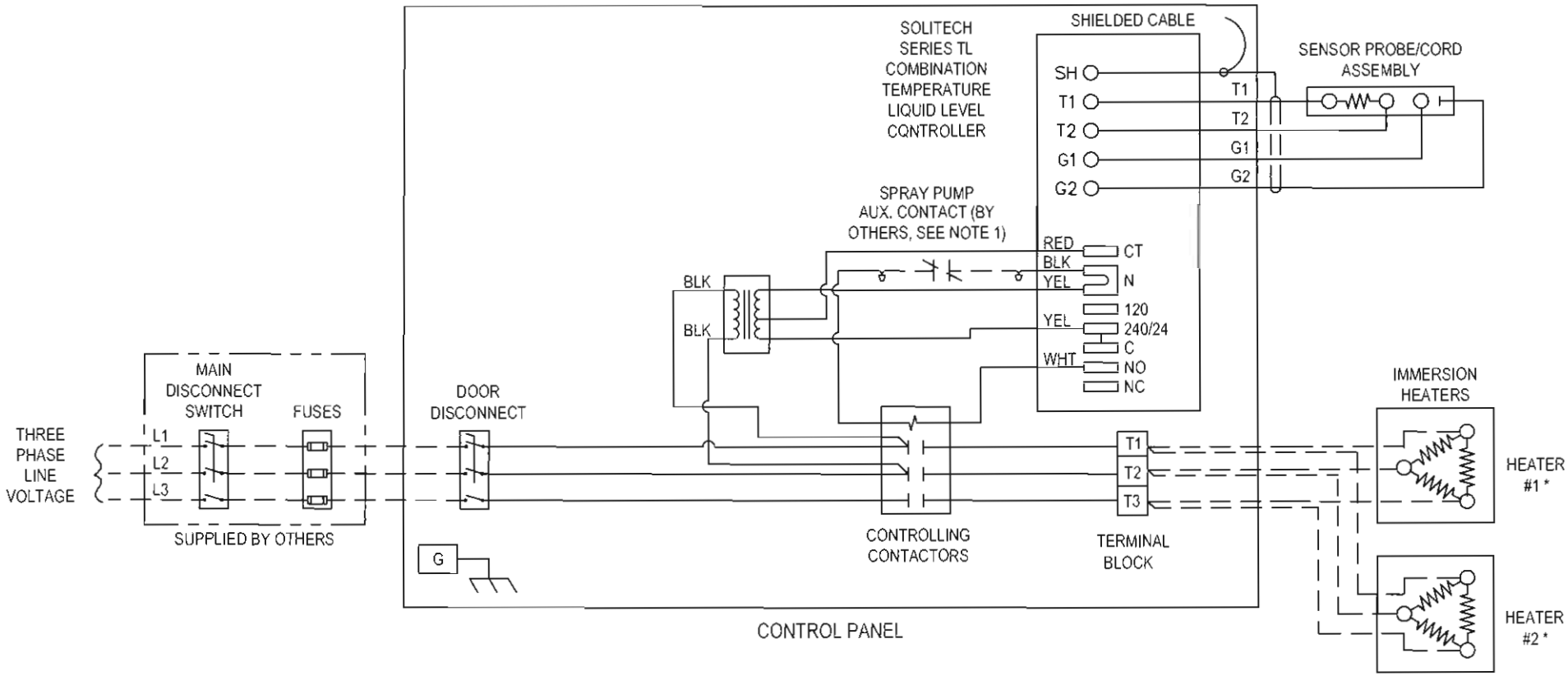
1. THE ARRANGEMENT SHOWN IS FOR RIGHT HAND UNITS.
2. HEATERS: 200 VOLT, 3 PHASE, 60 HERTZ, -20°F AMBIENT TEMPERATURE.



ELEVATION OF UNIT OPPOSITE END FROM FAN

[INDEECO CONTROL PANEL]

B.A.C. ORDER NO: U070372301 DATE: 12/20/06	BALTIMORE AIRCOIL COMPANY	ELECTRIC HEATER PACKAGE DRAWING NUMBER: BAC-12220A A



* Refer to heater package drawings for heater power values.

NOTES.

1. INTERLOCK IMMERSION HEATERS WITH SPRAY WATER CIRCULATING PUMP TO DE-ENERGIZE HEATERS WHEN SPRAY PUMP IS RUNNING.
2. CONTROL THERMOSTAT IS TO BE AT 40°F. DO NOT SET THERMOSTAT LOWER THAN 40°F.
3. FUSE PROTECTION AND POWER SUPPLY WIRING ARE TO BE SIZED TO MATCH HEATER REQUIREMENTS. WIRING MUST COMPLY WITH APPLICABLE CODES AND ORDINANCES.

SYMBOLS	DESCRIPTION
- - - -	BROKEN LINES INDICATE WIRING AND COMPONENTS SUPPLIED BY OTHERS.
———	SOLID LINES INDICATE WIRING AND COMPONENTS SUPPLIED BY BAC.

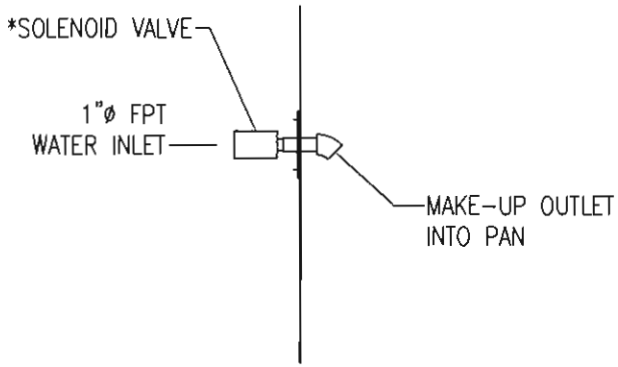
ORDER NO: U070372301

DATE: 12/20/06

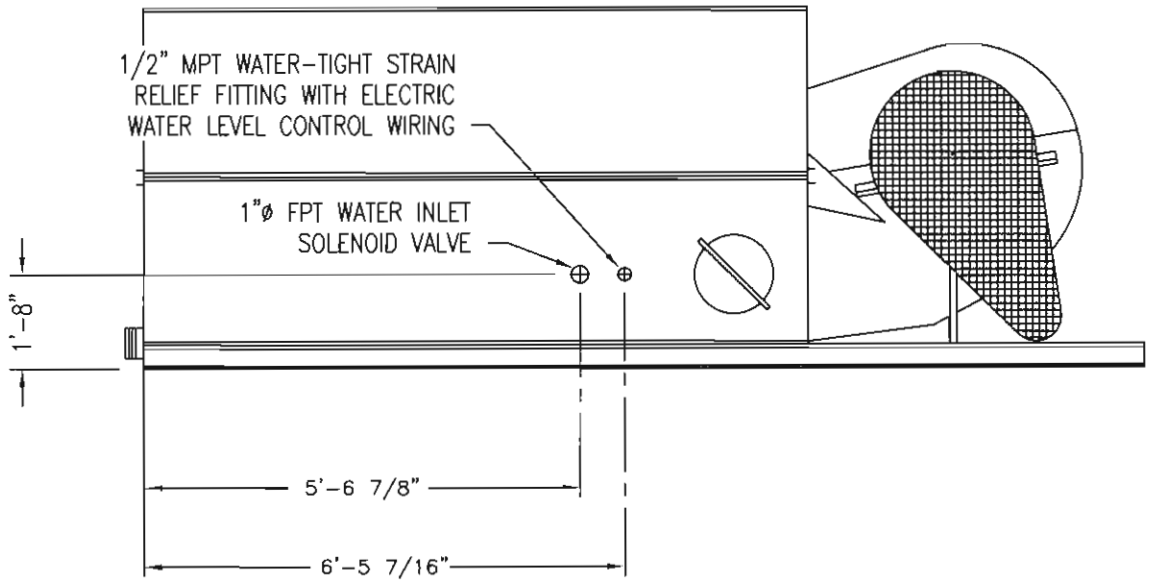
Baltimore Aircoil

IMMERSION HEATER WIRING DIAGRAM
SINGLE CONTACTOR WITH TERMINAL BLOCK

DRAWING NUMBER:
BAC-AGFM000000



MAKE–UP DETAIL

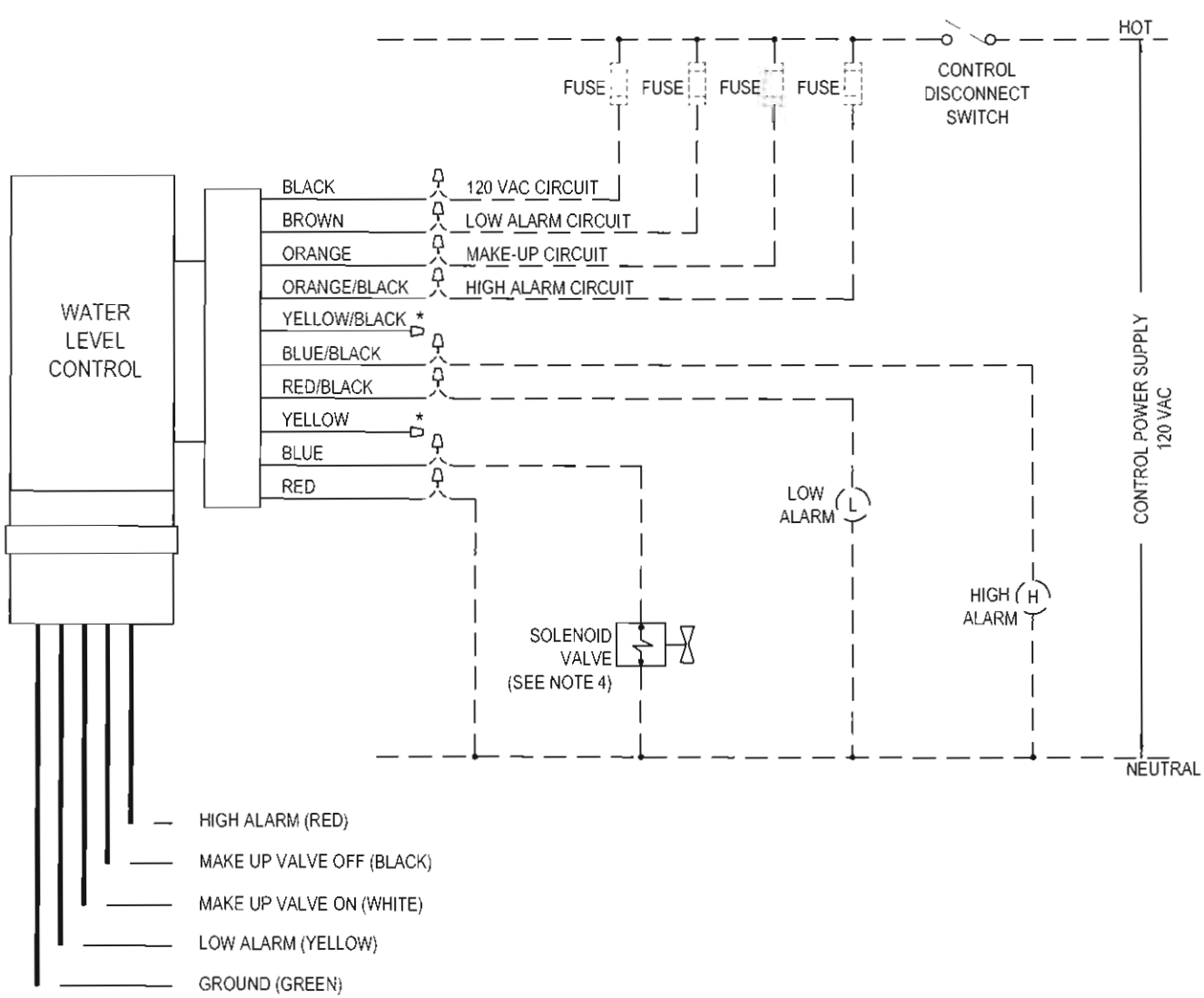


RIGHT HAND UNIT SHOWN, LEFT HAND UNIT MIRROR IMAGE.

MODEL NUMBERS		
VTL152 THRU VTL227	VFL–072	VCL167 THRU VCL234

NOTES:
1. REFER TO THE APPROPRIATE WIRING DIAGRAM FOR WIRING DETAILS

B.A.C. ORDER NO: U070372301	BALTIMORE AIRCOIL COMPANY	ELECTRIC WATER LEVEL CONTROL LOCATION
DATE: 12/20/06		DRAWING NUMBER: BAC–13181A — A



NOTES:

1. WIRING AND COMPONENTS INDICATED BY DASHED LINES ARE TO BE SUPPLIED BY FIRMS OTHER THAN "BAC". ALL WIRING MUST COMPLY WITH APPLICABLE CODES AND ORDINANCES.

2. THE WATER LEVEL CONTROL BOARD IS WIRED IN THE INVERSE MODE SO THAT THE SOLENOID MAKE-UP VALVE WILL CLOSE IF THERE IS A LOSS OF POWER TO THE CONTROL BOARD. WHEN THE WATER LEVEL RISES TO THE BOTTOM OF THE MAKE-UP VALVE OFF PROBE AND MAINTAINS CONTACT FOR AT LEAST 6 SECONDS, THE CONTROL DE-ENERGIZES THE VALVE. THE VALVE REMAINS DE-ENERGIZED UNTIL THE WATER LEVEL RECEDES BELOW THE BOTTOM OF THE MAKE-UP VALVE ON PROBE AND REMAINS AT THAT LEVEL FOR AT LEAST 6 SECONDS. THE CONTROL THEN ENERGIZES THE VALVE.

3. EACH WATER LEVEL CONTROL FUNCTION UTILIZES CONTACTS THAT ARE RATED AT 3A RESISTIVE. THE WATER LEVEL CONTROL BOARD REQUIRES 4.4 VA.

4. THE SOLENOID ACTUATED MAKE-UP VALVE IS RATED AT 6.1 WATTS, 16 VA HOLDING, 30 VA INRUSH.

5. THE NORMALLY CLOSED SOLENOID VALVE HAS A SLOW CLOSING FEATURE WHICH MINIMIZES WATER HAMMER AND IS DESIGNED TO OPERATE AT MAKE-UP WATER LINE PRESSURES OF 10 TO 125 PSIG. TO FURTHER MINIMIZE THE POTENTIAL FOR WATER HAMMER, MAKE-UP WATER LINE PRESSURES AT THE HIGHER END OF THE RANGE SHOULD BE AVOIDED, AND MAKE-UP PIPING SHOULD BE WELL SUPPORTED.

* NOTE: A WATERPROOF WIRE NUT IS PROVIDED ON THE END OF EACH WIRE SHOWN WITH AN ASTERISK (*). DO NOT REMOVE THESE WIRE NUTS. DO NOT USE THESE WIRES.

ORDER NO: U070372301	Baltimore Aircoil	EWLC WITH HIGH & LOW ALARM WIRING DIAGRAM
DATE: 12/20/06		DRAWING NUMBER: BAC-BGGG000000 A

OPERATING INSTRUCTIONS

Follow the installation drawings and wiring diagram (see chart below) to ensure the proper operation of the vibration switch. Direct any questions to your local BAC Representative.

NOTE

Moisture inside the switch can lead to switch failure. Care must be taken when replacing the cover on the vibration switch to ensure that the proper watertight seal is obtained.

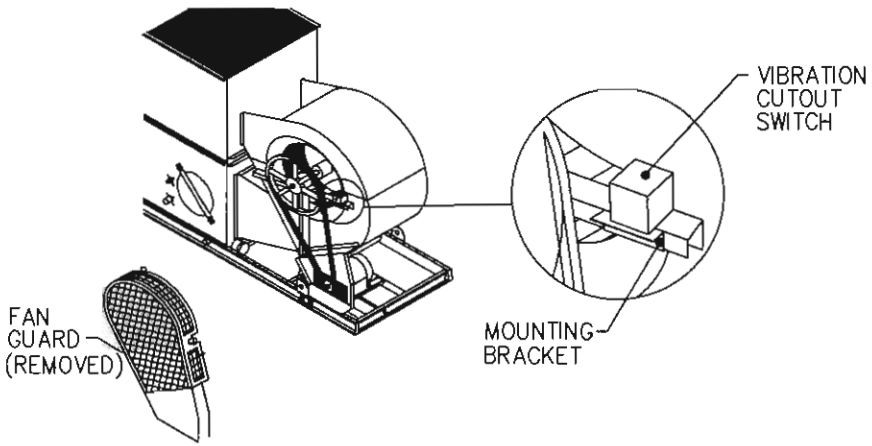
CAUTION

Before performing any maintenance, adjustment or inspection of the switch, make certain that all power has been disconnected and locked in the off position.

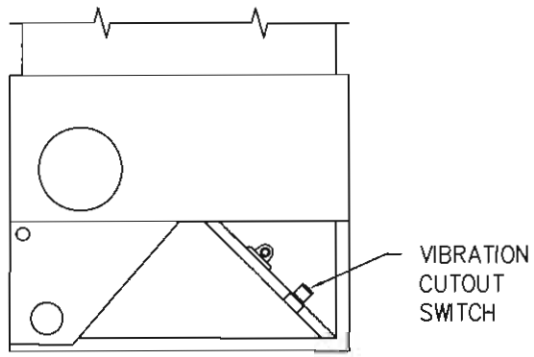
WIRING DIAGRAM CHART

BAC–17491A=Shut down with local reset
BAC–17492A=Shut down & alarm, with remote or local reset & time delay on start (110 Vac)
BAC–17493A=Shut down & alarm, with remote or local reset & time delay on start (220 Vac)

SWITCH LOCATION
LOW PROFILE SERIES V



SWITCH LOCATION
SERIES V



B.A.C. ORDER NO: U070372301 DATE: 12/20/06	BALTIMORE AIRCOIL COMPANY	MECHANICAL VCOS LOCATION CENTRIFUGAL FAN UNITS DRAWING NUMBER: BAC–11490A –

NOTES:

1. LOCAL PUSH BUTTON RESET.
2. TO MAINTAIN HAZARDOUS DUTY RATINGS, THE FACTORY INSTALLED WATER TIGHT CONNECTION FITTINGS MUST BE REMOVED AND THE NINE CONDUCTOR CABLE MUST BE ROUTED INSIDE OF A SUITABLE EXPLOSION PROOF CONDUIT. NOTE: THE CONNECTORS CAN EASILY BE REMOVED WITHOUT HAVING TO UN-WIRE THE CONDUCTORS FROM INSIDE THE CUTOUT SWITCH.
3. THE MECHANICAL VIBRATION CUTOUT SWITCH COMES WITH TWO WATER TIGHT CONDUIT/CABLE CONNECTORS. ONE CONNECTOR IS USED TO PROVIDE A WATER TIGHT CONNECTION TO THE VIBRATION CUTOUT SWITCH AND THE OTHER IS PROVIDED FOR THE ELECTRICIAN TO CONNECT THE WIRE CABLE TO A JUNCTION BOX LOCATED IN THE VICINITY OF THE VIBRATION CUTOUT SWITCH.
4. THE SWITCHES IN THE NORMALLY CLOSED CIRCUITS (BLACK WIRE FOR SW-1 AND YELLOW WIRE FOR SW-2) WILL OPEN WHEN THE DEVICE EXPERIENCES VIBRATION LEVELS ABOVE THE SETPOINT VALUE. IF REVERSE CONTROL LOGIC IS DESIRED, CUT OFF BUTT END CONNECTORS ON WHITE AND/OR BROWN WIRES AND THEN INSTALL WIRE NUT OR BUTT CONNECTOR ON NORMALLY CLOSED WIRES (BLACK AND/OR YELLOW).
5. THIS MECHANICAL VIBRATION CUTOUT SWITCH COMES WITH TWO SINGLE POLE DOUBLE THROW SWITCHES. BOTH SWITCH CONTACTS ARE "DRY CONTACTS" WHICH CAN BE SUCCESSFULLY USED DIRECTLY IN THE FAN STARTER CONTROL CIRCUIT (TYPICALLY A/C VOLTAGE) CIRCUIT OR IN A BUILDING MANAGEMENT SYSTEM (TYPICALLY D/C VOLTAGE). CONTACT RATINGS: 3 AMPS@ 125 OR 480 VAC, 1/2 AMP@ 125 VDC, 1/4 AMP@ 25D VDC.
6. CAUTION: MOISTURE INSIDE THE SWITCH CAN LEAD TO SWITCH FAILURE. CARE MUST BE TAKEN WHEN REPLACING THE COVER ON THE VIBRATION SWITCH TO ENSURE THAT THE PROPER WATERTIGHT SEAL IS OBTAINED.

ADJUSTMENTS OF BAC MECHANICAL VIBRATION CUTOUT SWITCH

BAC RECOMMENDS THAT EACH VIBRATION CUTOFF SWITCH BE FIELD ADJUSTED AT START-UP TO OPTIMIZE THE TRIP POINT RELATIVE TO THE FINAL MOUNTING POSITION AND VIBRATIONAL CHARACTERISTICS OF THE INSTALLED EQUIPMENT.

NOTE: INSTALLATION AND ADJUSTMENT MUST BE PERFORMED BY A QUALIFIED, COMPETENT TECHNICIAN

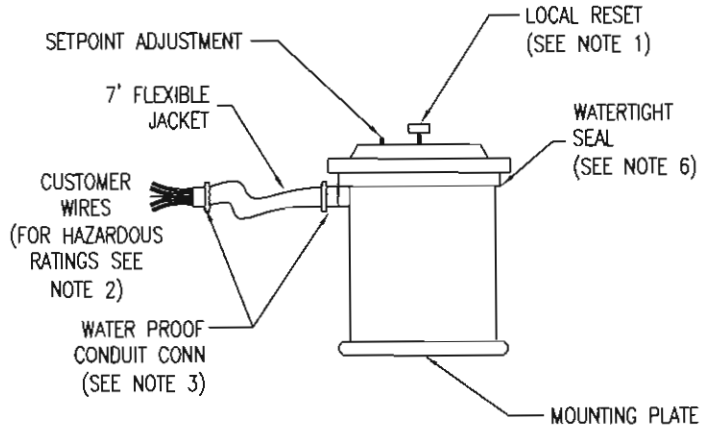
1. FOR SAFETY SAKE, TURN OFF, THEN LOCK & TAG-OUT THE ELECTRICAL SUPPLY TO THE FAN MOTOR(S).
2. TURN ADJUSTMENT SCREW COUNTERCLOCKWISE (CCW) 1/8 TURN AT A TIME UNTIL YOU HEAR THE CONTROL TRIP.
3. ONCE TRIPPED, ROTATE ADJUSTMENT SCREW 1/4 TURN CLOCKWISE (CW) AND THEN PUSH IN MANUAL RESET BUTTON.
4. START UP FAN(S) TO DETERMINE IF THE START-UP WILL CAUSE THE CUT-OUT SWITCH TO TRIP.
5. IF THE VIBRATION CUTOUT SWITCH DOES NOT TRIP, THEN START AND STOP THE FAN TWO MORE TIMES AND IF THE CUTOUT SWITCH STILL DOES NOT TRIP, THEN CALIBRATION IS COMPLETE. IF THE VIBRATION CUTOUT SWITCH DID TRIP, THEN TURN OFF, THEN LOCK & TAG-OUT THE ELECTRICAL SUPPLY TO THE FAN MOTOR(S). ADJUST THE SET POINT SCREW AN ADDITIONAL 1/4 TURN CW AND THEN DEPRESS THE RESET BUTTON. RE-START THE FAN(S) TO DETERMINE IF THE START-UP WILL CAUSE THE SWITCH TO TRIP. REPEAT THIS ADJUSTMENT PROCESS UNTIL THE CONTROL DOES NOT TRIP. ONCE THE FINAL ADJUSTMENT HAS BEEN MADE, START AND STOP THE FAN TWO MORE TIMES AND IF THE CUTOUT SWITCH STILL DOES NOT TRIP, THEN CALIBRATION IS COMPLETE.

COMBINATION REMOTE ELECTRICAL RESET AND TIME DELAY START-UP:

1. THE REMOTE RESET AND TIME DELAY ON START-UP SOLENOID ELECTRICAL CIRCUIT SHOULD BE ENERGIZED (VOLTAGE APPUED) WHENEVER THE FAN IS ON AND DE-ENERGIZED WHENEVER THE FAN IS OFF.
2. THE REMOTE RESET AND TIME DELAY ON START-UP CIRCUIT CONSISTS OF AN ELECTRICAL SOLENOID IN SERIES WITH A THERMISTOR. WHEN THE RATED VOLTAGE IS CONTINUALLY PROVIDED TO THE SOLENOID CIRCUIT AT START-UP, THE RESET SOLENOID BECOMES ENERGIZED FOR APPROXIMATELY 30 SECONDS AFTER WHICH TIME THE HEATED THERMISTOR CAUSES THE SOLENOID TO AUTOMATICALLY BECOME DE-ENERGIZED. THIS ACTION PROVIDES A TRIP LOCKOUT (BYPASS) DURING MACHINE START-UP FOR APPROXIMATELY 30 SECONDS.
3. WHEN THE FAN(S) IS SHUT DOWN, THE VOLTAGE TO THE SOLENOID ELECTRICAL CIRCUIT MUST BE REMOVED TO ALLOW THE THERMISTOR TIME TO COOL OTHERWISE THE START-UP DELAY WILL BE BYPASSED. ONCE THE THERMISTOR COOLS DOWN, THE SWITCH CAN BE REMOTELY RESET BY MOMENTARILY APPLYING VOLTAGE TO THE SOLENOID ELECTRICAL CIRCUIT. IT CAN ALSO BE RESET MANUALLY BY DEPRESSING THE PUSH BUTTON SWITCH. IF START-UP BYPASS IS UNDESIRED, THEN THE VOLTAGE MAY BE LEFT ON WHEN THE FAN IS OFF HOWEVER THE REMOTE RESET WILL NOT FUNCTION UNTIL THE VOLTAGE IS REMOVED AND THE THERMISTOR HAS HAD TIME TO COOL DOWN.

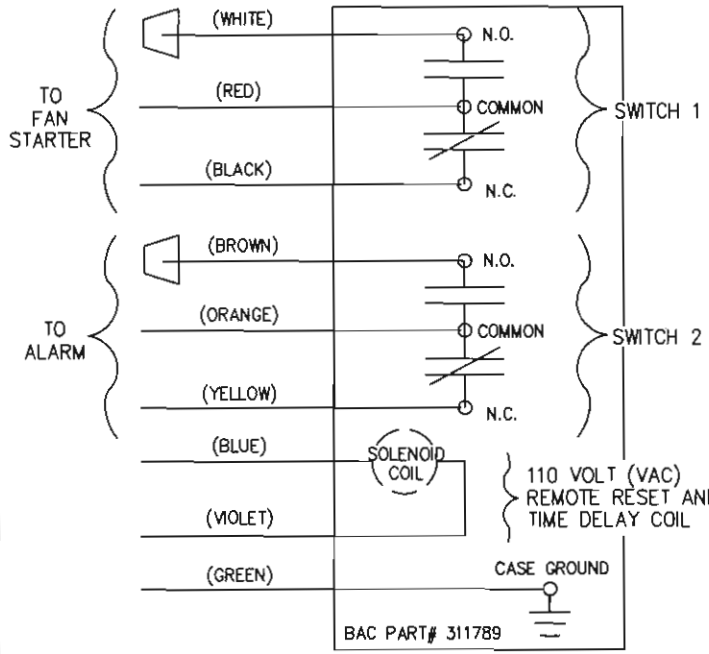
MECHANICAL VIBRATION CUT-OUT SWITCH

(SEE NOTE 5)



WIRING DIAGRAM

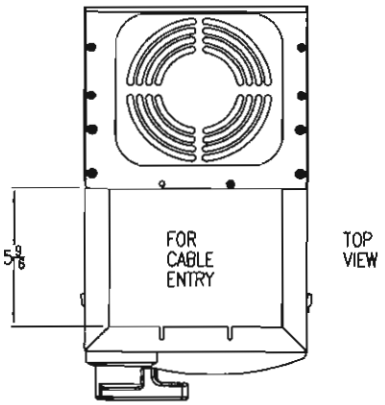
(TWO-SINGLE POLE DOUBLE THROW SWITCHES - SEE NOTE 5)

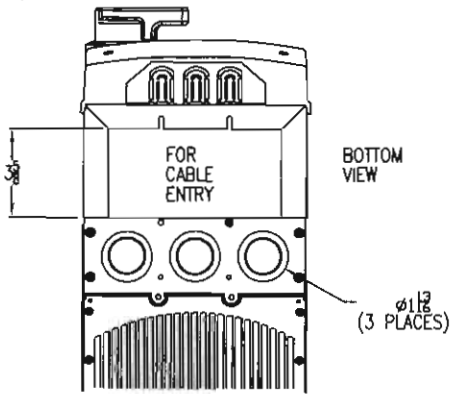


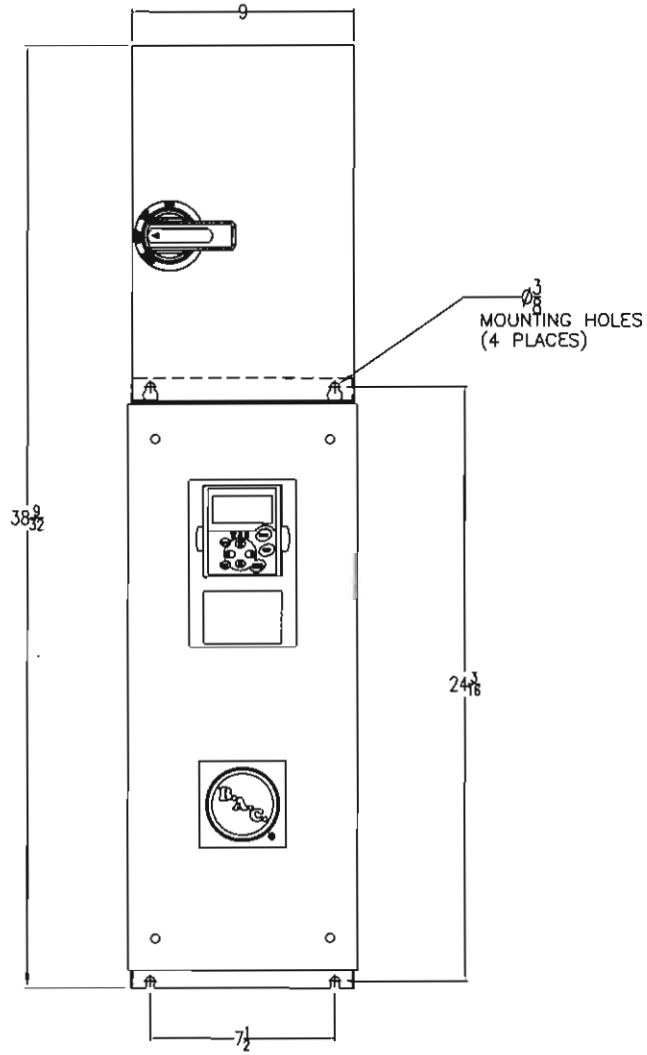
BEFORE PERFORMING ANY MAINTENANCE, ADJUSTMENT OR INSPECTION OF THE SWITCH, MAKE CERTAIN THAT ALL POWER HAS BEEN DISCONNECTED AND LOCKED IN THE OFF POSITION.

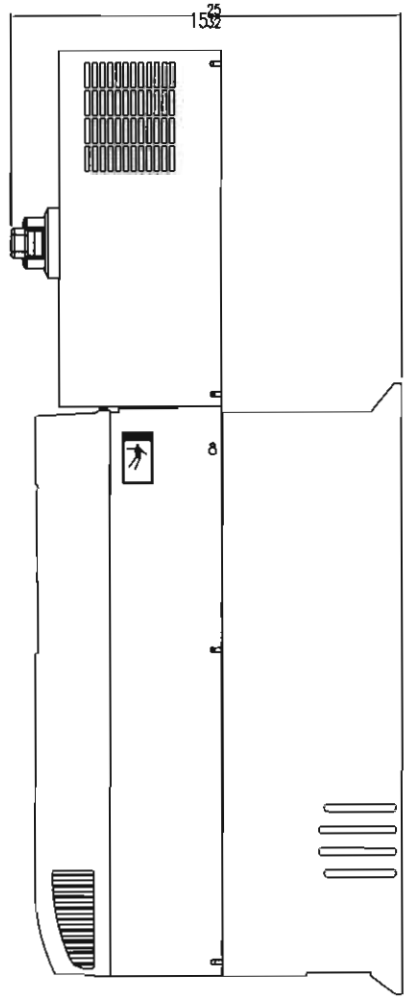
SHUT OFF & ALARM WITH REMOTE/LOCAL RESET & DELAY ON START

B.A.C. ORDER NO: U070372301 DATE: 12/20/06	BALTIMORE AIRCOIL COMPANY	MECHANICAL VCOS W/ALARM 110 VAC WIRING DIAGRAM DRAWING NUMBER: BAC-17492A B



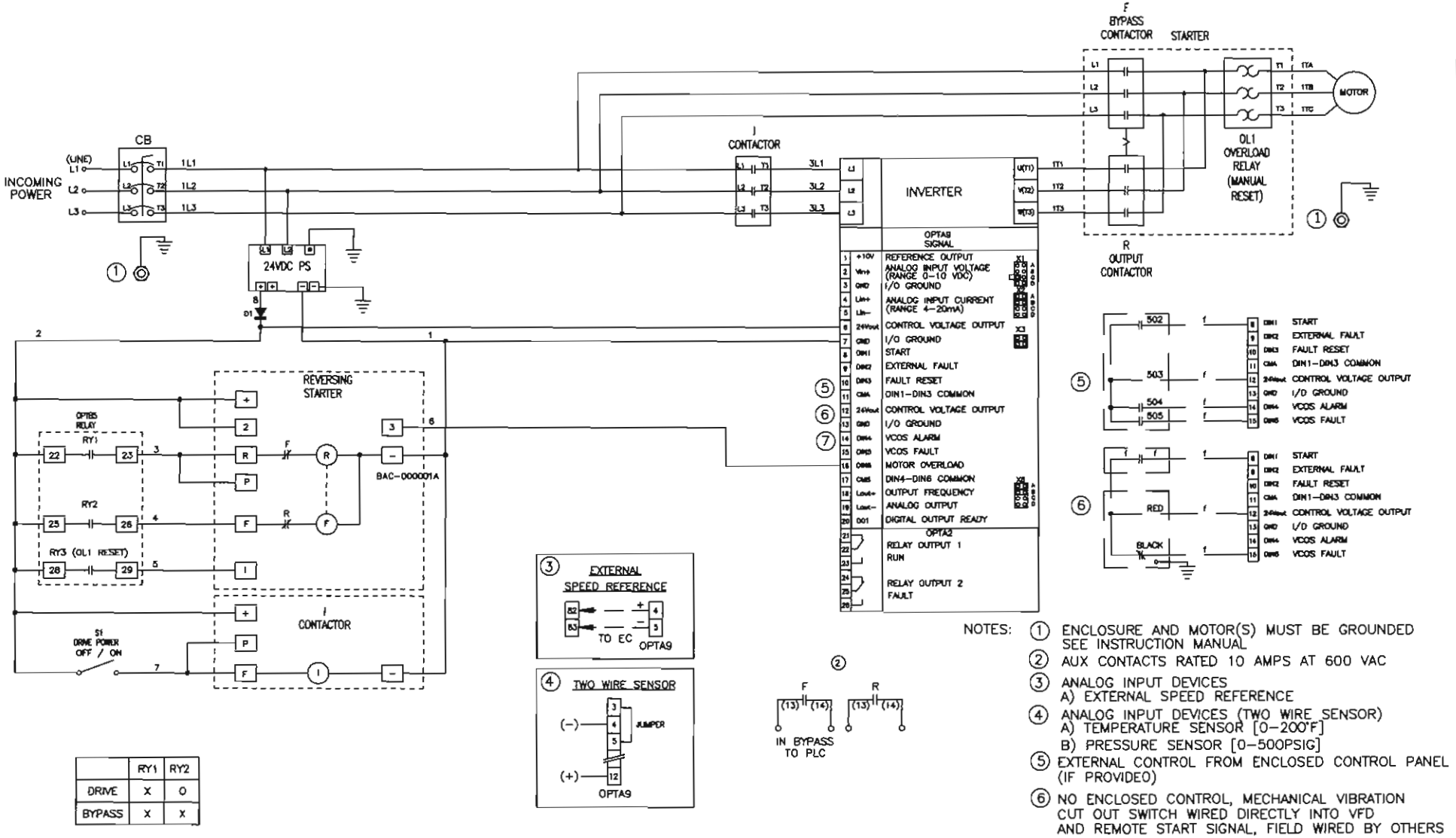






NOTES:
WEIGHT: 108 LBS.
DIMENSIONS: INCHES
VFD SHIPS LOOSE, FIELD INSTALLATION
AND WIRING BY OTHERS

ORDER NO: U070372301	Baltimore Aircoil	NEMA 1 VFD WITH BYPASS FRAME SIZE 7
DATE: 12/20/06		DRAWING NUMBER: BAC-C00754-1007A — A



	RY1	RY2
DRIVE	X	O
BYPASS	X	X

NOTES:
1. ENCLOSURE AND MOTOR(S) MUST BE GROUNDED SEE INSTRUCTION MANUAL
2. AUX CONTACTS RATED 10 AMPS AT 600 VAC
3. ANALOG INPUT DEVICES
   A) EXTERNAL SPEED REFERENCE
4. ANALOG INPUT DEVICES (TWO WIRE SENSOR)
   A) TEMPERATURE SENSOR [0-200°F]
   B) PRESSURE SENSOR [0-500PSIG]
5. EXTERNAL CONTROL FROM ENCLOSED CONTROL PANEL (IF PROVIDED)
6. NO ENCLOSED CONTROL, MECHANICAL VIBRATION CUT OUT SWITCH WIRED DIRECTLY INTO VFD AND REMOTE START SIGNAL, FIELD WIRED BY OTHERS
7. REFERENCE USER MANUAL FOR MORE DETAILED INFORMATION, AVAILABLE ON BALTIMOREAIRCOIL.COM

— f — FIELD WIRED BY OTHERS

ORDER NO: U070372301

DATE: 12/20/06

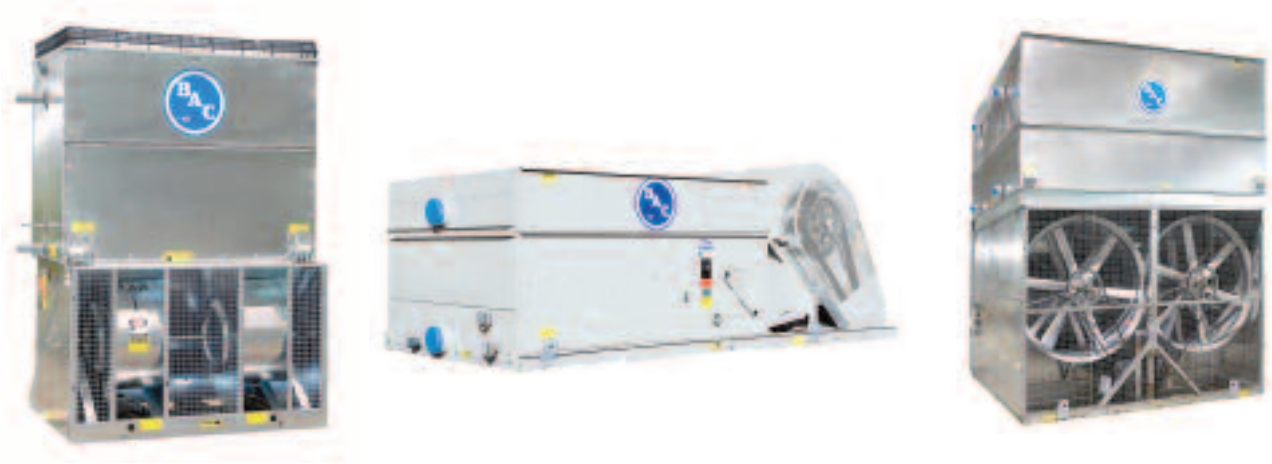
Baltimore Aircoil

VFD WIRING DIAGRAM
STANDARD

DRAWING NUMBER:
BAC-C90101-4001A

A

Series V & Low Profile Series V Cooling Towers
Closed Circuit Cooling Towers
Evaporative Condensers



Baltimore Aircoil Company Series V equipment has been designed to give long, trouble-free service when properly installed, operated and maintained. **To obtain optimum performance and maximum service life, it is important that a program of regular inspection and maintenance be carried out**. This manual is published as a guide to establishing such a program.

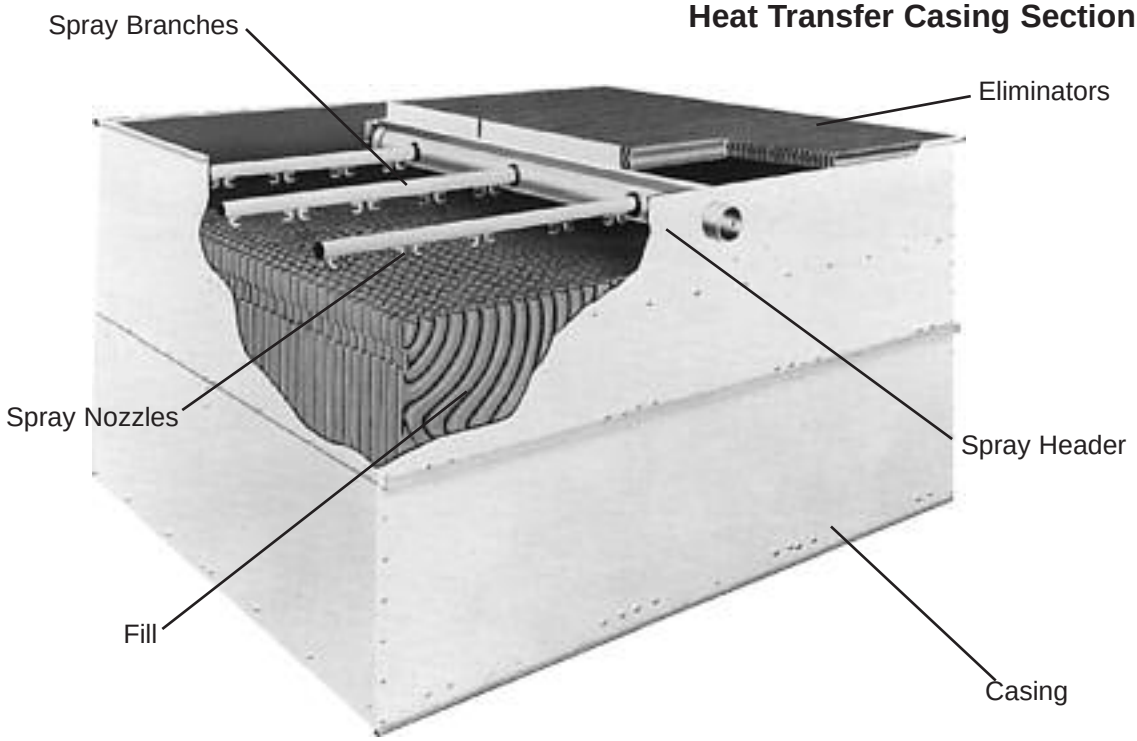
Included in the bulletin are the recommended services for start-up, operation and shutdown and the approximate frequency for each. **Note that the recommendations on frequency of service are minimums. Where operating conditions are severe, the services should be performed more often**. For each required service, follow the procedures outlined under the "Maintenance Procedures" section of this manual. The VT1, VT0, VTL, VF1, VFL, VC1, VC2 and VCL models are illustrated in a cutaway form on pages N50 thru N53 with the major points of inspection and service identified. A copy of the unit certified drawing should also be available for reference. If you need additional information about operation or maintenance, contact your local BAC Representative whose name and telephone number are on the label at the connection end of the unit. The model and serial number of the unit are also located in this area.

Table of Contents . . . . . Page

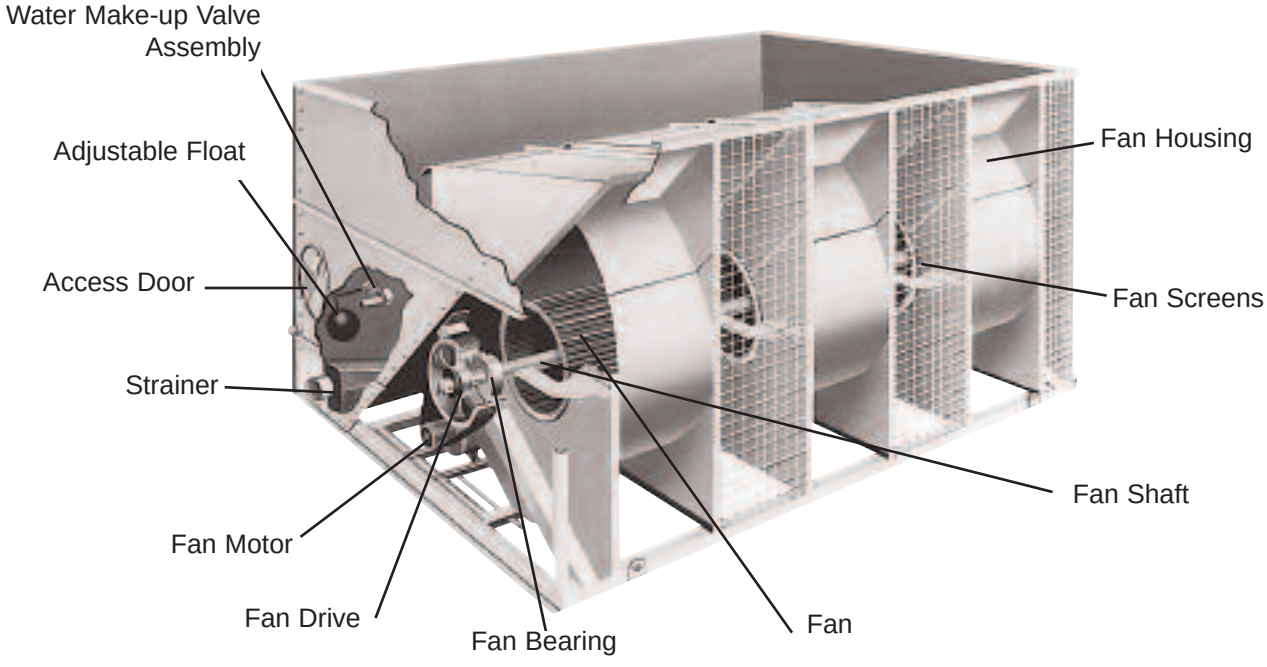
Construction Details

Series V
Model VT1 and VT0 Cooling Towers

Heat Transfer Casing Section



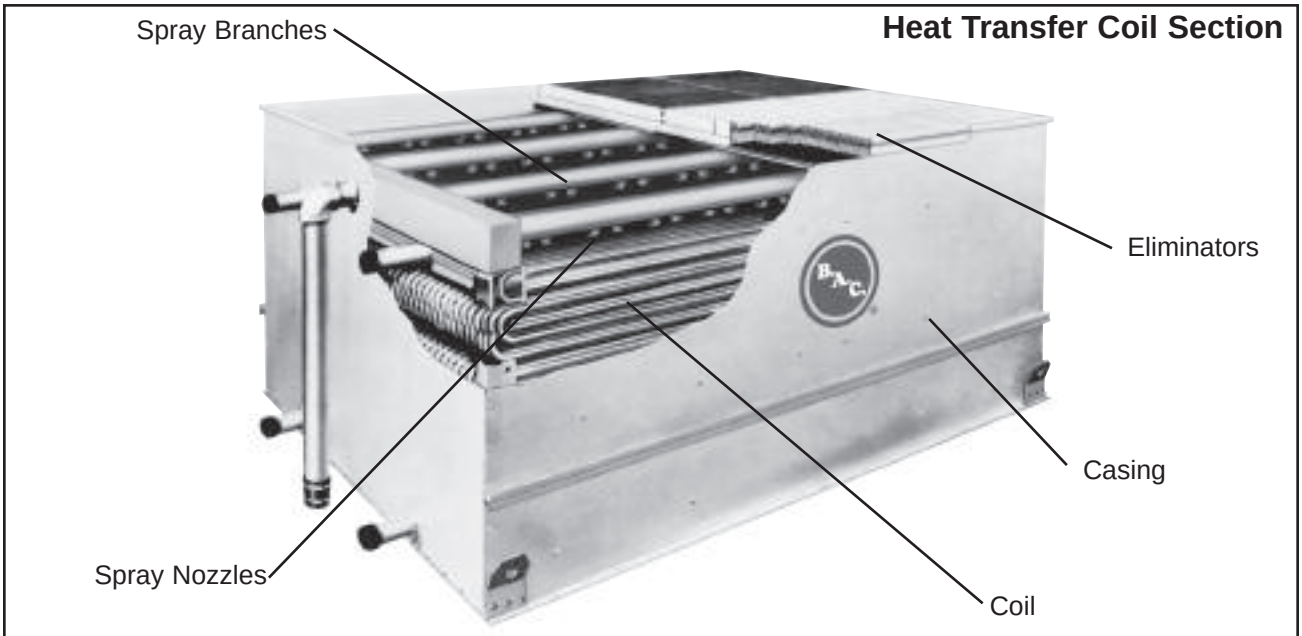
Basin Section



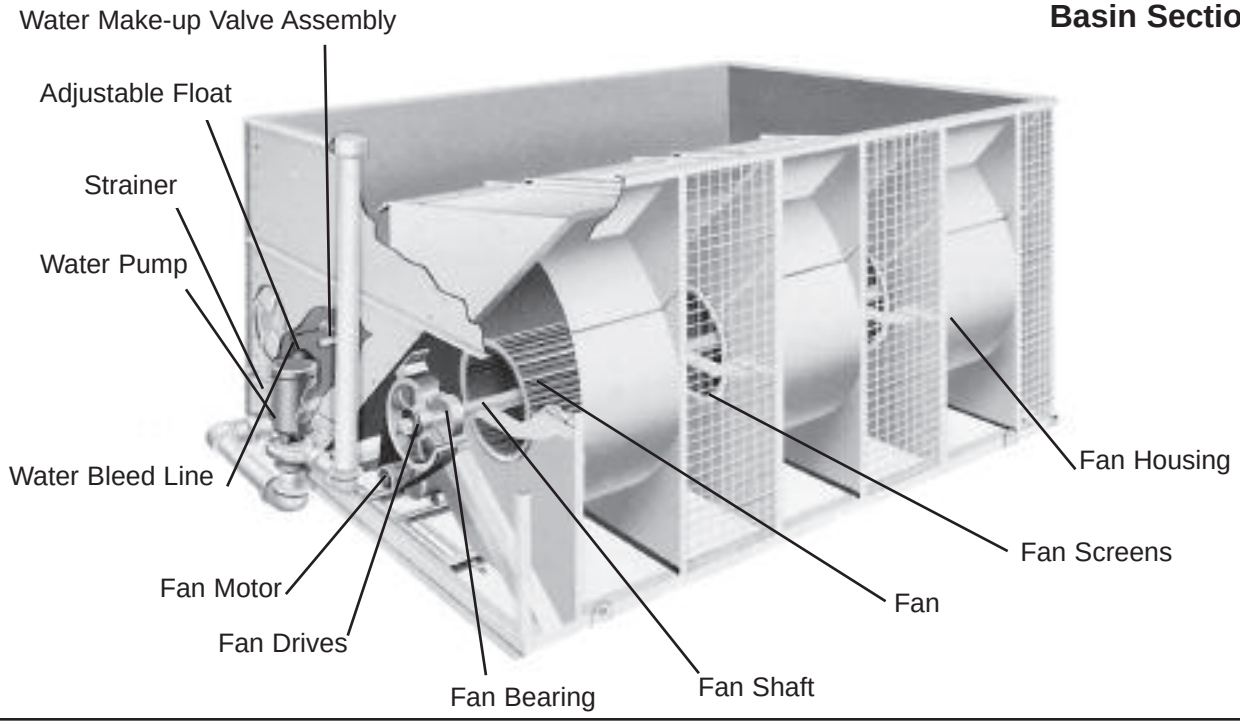
Construction Details

Series V
Model VF1 Closed Circuit Cooling Towers
Model VC1 Evaporative Condensers

Heat Transfer Coil Section



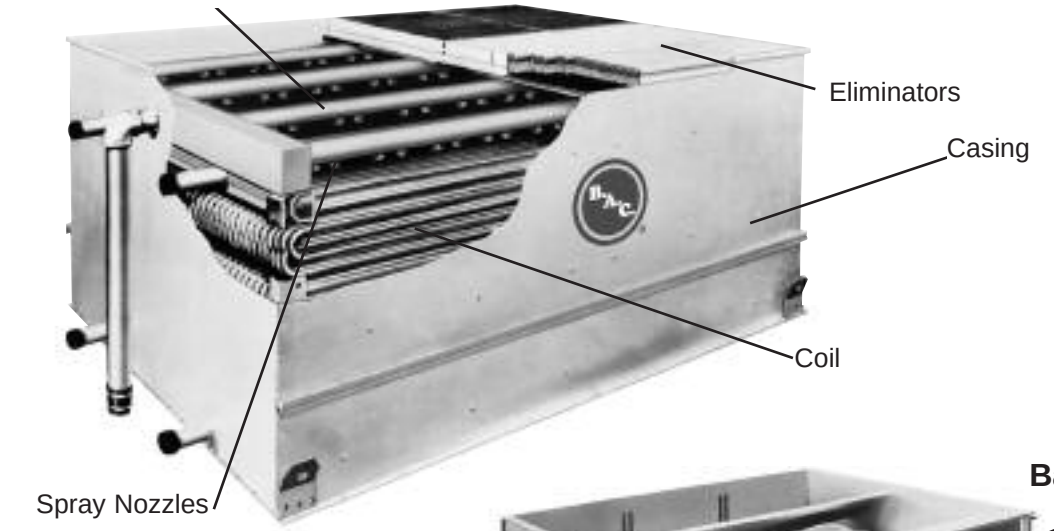
Basin Section



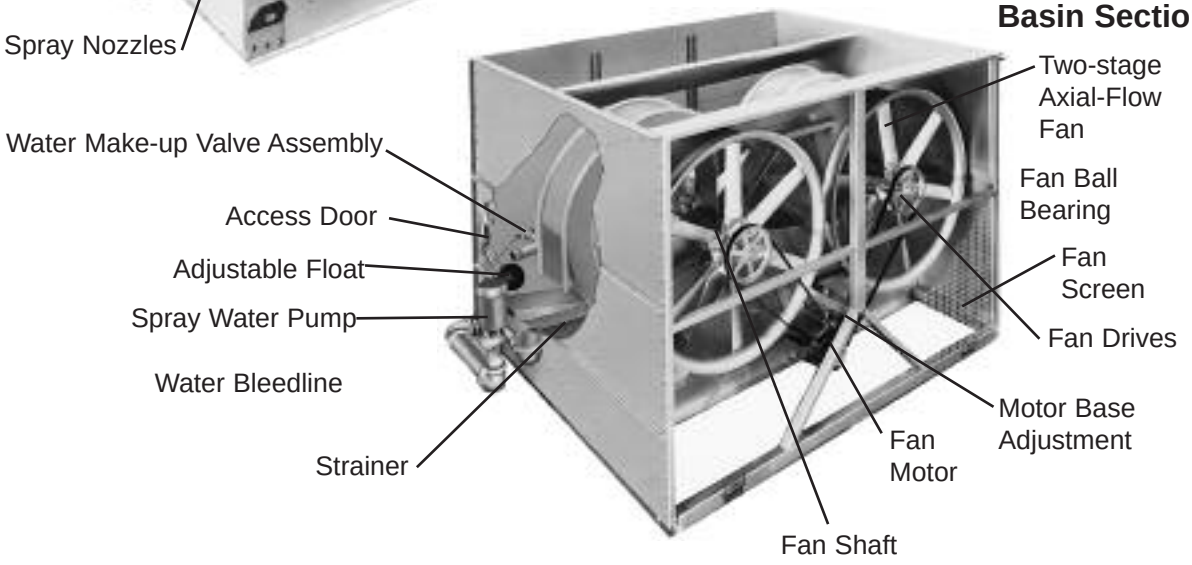
Construction Details

Series V
Model VC2 Evaporative Condensers

Heat Transfer Coil Section

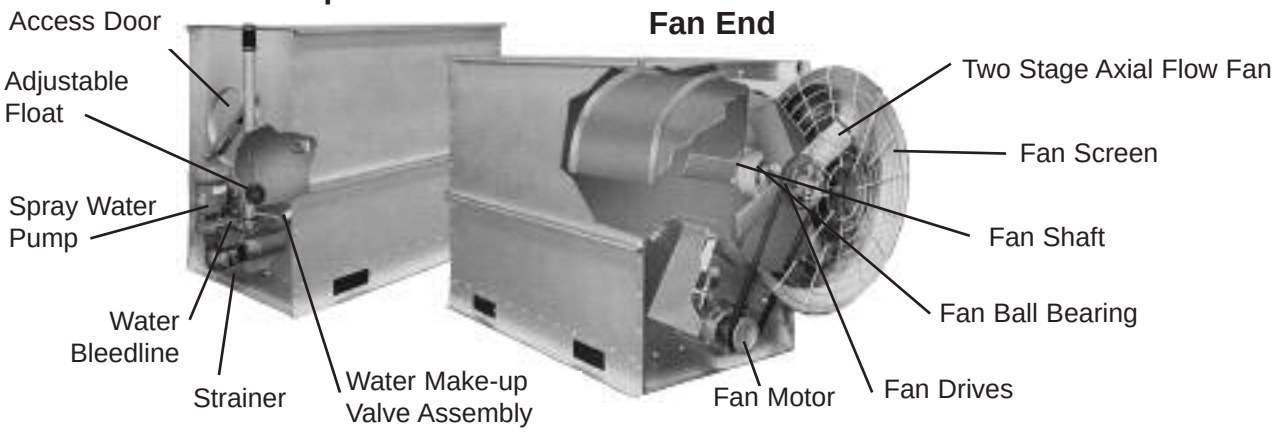


Basin Section



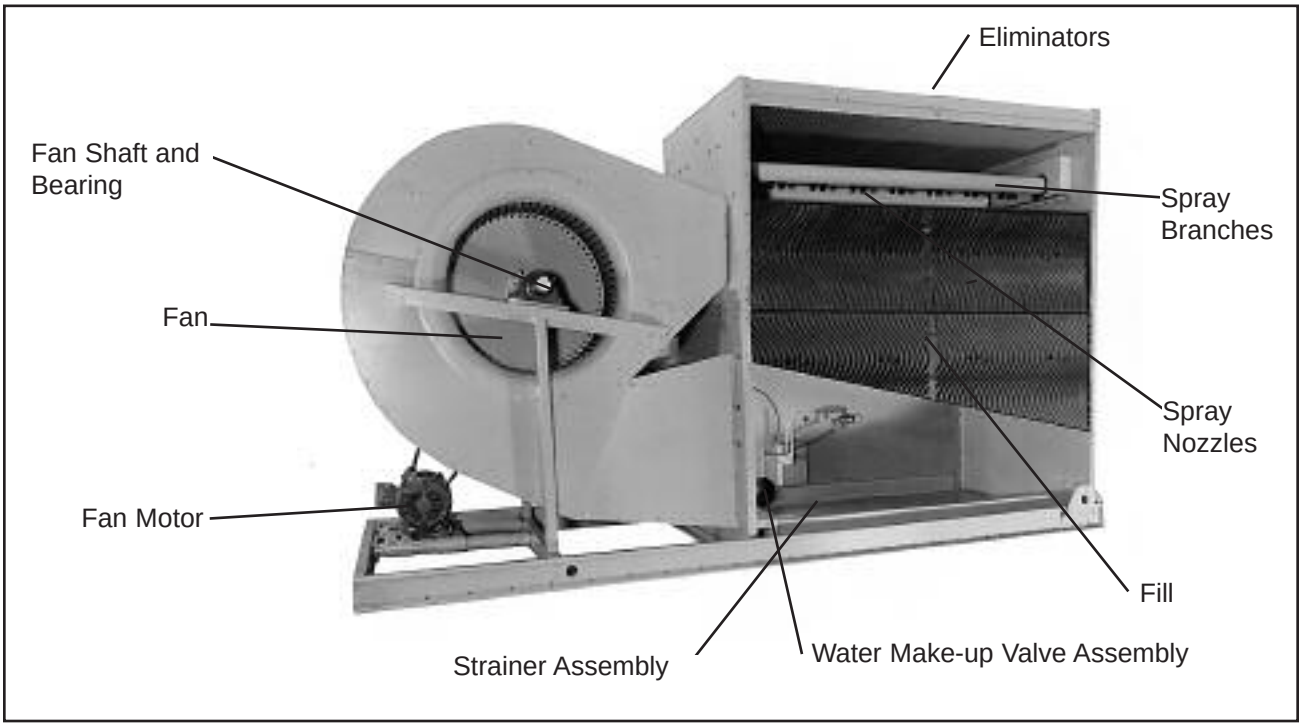
Pump End

Fan End

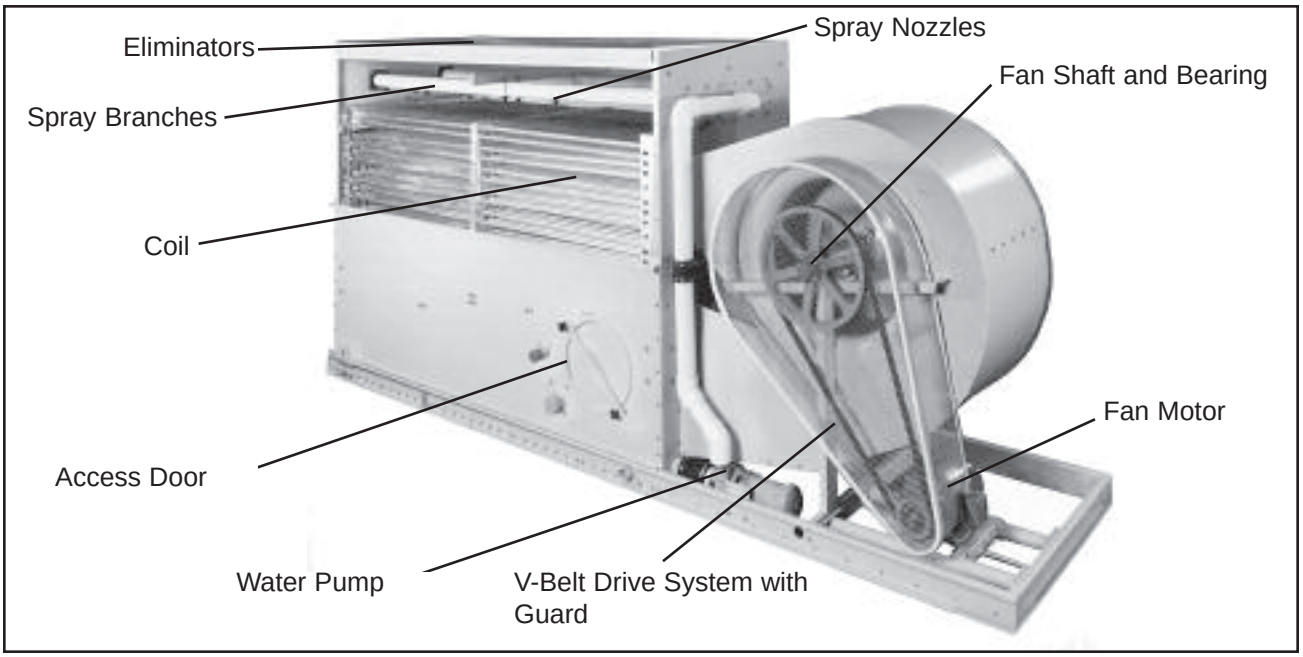


Construction Details

Low Profile Series V
Model VTL Cooling Towers



Model VFL Closed Circuit Cooling Towers
Model VCL Evaporative Condensers



Operation and Maintenance Schedule

Table 1: Recommended Maintenance Services for Series V and Low Profile Series V Equipment.

Type of Service	Start-Up	Monthly	Every Six Months	Shutdown	Annually
Inspect General Condition of Unit	X	X			
Clean Debris from Unit	X	X		X	
Clean and Flush Basin	X	X		X	
Clean Basin Strainer	X	X		X	
Check and Adjust Basin Water Level	X	X			
Inspect Heat Transfer Section	X	X			
Inspect Spray Nozzles	X	X		X	
Check and Adjust Fan Belt Tension	X	X			
Check and Adjust Bleed Rate	X	X			
Check Operation of Make-up Valve	X	X			
Check Unit for Unusual Noise or Vibration	X	X			
Check Fan Bearing Locking Collars	X		X		
Check Motor Voltage and Current	X		X		
Lubricate Fan Shaft Bearings	X		X	X	
Lubricate Fan Motor Bearings	X				
Lubricate Motor Base Adjusting Screw	X		X	X	
Check Fan for Rotation Without Obstruction	X				
Check Fan and Pump Motor for Proper Rotation	X				
Drain Basin and Piping				X	
Inspect Protective Finish					X

WARNING: Before performing any maintenance or inspection, make certain that all power has been disconnected and locked in the off position.

SAFETY: The operation, maintenance, and repair of this equipment must be undertaken only by qualified personnel. All qualified personnel should be thoroughly familiar with the equipment, the associated system and controls, and the procedures set forth in this manual. Proper care, procedures, and tools must be used in handling, lifting, installing, operating, maintaining and repairing this equipment to prevent personal injury and/or property damage.

WARNING: When the fan speed of the cooling tower is changed from the factory set speed, including changes achieved by the use of a variable fan speed control device, steps must be taken to avoid operating at or near the fan's "critical speed" which could result in fan failure and possible injury or damage. Consult with your local BAC Representative on any such applications.

Lockout Warning: For the protection of authorized service and maintenance personnel, each fan and pump motor associated with this equipment must be installed with a lockable disconnect switch located within sight of the cooling tower. No service work should be performed on or near the fans, motors, and drives or inside the unit without first ensuring the fan and pump motors have been disconnected and locked out.

Electrical Hazard: All electrical, mechanical, and rotating machinery constitute a potential hazard, particularly for those not familiar with its design, construction, and operation. Accordingly, adequate safeguards (including the use of protective enclosures where necessary) should be taken with this equipment both to safeguard the public from injury and to prevent damage to the equipment, its associated system, and the premises.

WARNING: PVC eliminators on this product are not designed to support the weight of a person or to be used as a storage or work surface for any equipment or tools. Use of these PVC eliminators as walking, working or storage surfaces may result in injury to personnel or damage to equipment. Units with PVC eliminators should not be covered with a plastic tarpaulin.

Access: Depending upon site conditions, it also may be necessary to install bottom air inlet screens, ladders, safety cages, stairways, access platforms, hand rails and toe boards for the safety and convenience of authorized service and maintenance personnel.

At no time should this equipment be operated without all fan screens, access panels, and access doors in place.

Caution: The recirculating water system may contain chemicals or biological contaminants, including Legionella, which could be harmful if inhaled or ingested. Accordingly, personnel who may be exposed directly to the discharge airstream and the associated drift, mists generated during operation of the water distribution system and/or fans, or mists produced by high pressure water jets or compressed air, should these be used to clean portions of components of the recirculating water system, should wear **respiratory protection equipment** approved for such use by OSHA and/or local occupational safety and health authorities.

WARRANTIES- Please refer to the Limitation of Warranties applicable to and in effect at the time of sale/purchase of these products.

FREEZE PROTECTION - These products must be protected by mechanical and operational methods against damage and/or reduced effectiveness due to possible freeze-up. Please refer to the Cold Weather Operation Guidelines (page N61) or contact your local BAC Representative for recommended protection alternatives.

Operation and Maintenance Procedures

Initial and Seasonal Start-Up:

Prior to initial start-up or after a shut down period, the unit should be thoroughly inspected and cleaned:

1. Clean all debris from the inlet air screens, fans, eliminators, heat transfer sections, and the cold water basin.
2. Drain the cold water basin (with basin strainers in place) and flush to remove accumulated dirt.
3. Remove, clean, and replace basin strainers.
4. Turn the fan(s) by hand to ensure rotation without obstruction.
5. Check the locking collar on each fan bearing assembly and tighten as required.
6. Check and, if necessary, adjust the fan belt tension.
7. Prior to seasonal start-up, lubricate the fan shaft. The motor marked “cooling tower duty” has permanently lubricated and sealed bearings designed for the life of the motor and cannot be greased.
8. Check float operated make-up valve to be sure it is operating freely.
9. Fill the cold water basin with fresh water to the over-flow level.
   a. The initial biocide treatment should be applied at initial start-up or before restart-up, where the basin was completely drained. (see Water Treatment section)
   b. Following a shutdown period, where the basin was not completely drained: **It is recommended that an initial shock treatment of appropriate biocides be administered at restart-up to eliminate accumulated biological contaminants.**
10. Set the float on the make-up valve to shut off the valve when the float is approximately 1/2” below the overflow level.
11. On Closed Circuit Cooling Towers and Evaporative Condensers, start the pump and check for the proper rotation as indicated by the arrow on the pump cover. On installations where the unit pump was not furnished by the factory, a globe valve should be installed in the pump discharge line and the pump flow rate adjusted to the correct water flow and pressure (2 psig at spray header connection). **Pressure greater than 10.0 psig may cause damage to the distribution system.**
12. Inspect the spray nozzles and heat transfer section.
13. Start the fan and check for the proper rotation as indicated by the arrow on the fan housing.
14. Check the voltage and current of all three legs of the fan and pump motors. **The current should not exceeded the service factor of the nameplate rating.** After prolonged shutdowns, the motor insulation should be checked with a megger insulation tester prior to restarting the motor. To prevent motor overload, do not operate the fan motor without design water flow over unit.
15. Check the bleed system to be sure it is fully functional and the bleed rate has been properly adjusted prior to putting the unit into operation (see “Water Treatment”).

After 24 Hours:

After 24 hours of operating under load, the following services should be performed:

1. Check the unit for any unusual noise or vibration.
2. Check the operating water level in the cold water basin. Adjust the make-up float valve if necessary.
3. Readjust the fan belt tension.
4. Inspect the spray nozzles and heat transfer section.

Operation:

During operation, the unit should be inspected, cleaned, and lubricated on a regular basis. The required services and recommended frequency for each are summarized in Table 1 on page N54 of this manual.

Seasonal Shut-Down:

The following services should be performed whenever the unit is to be shut-down for more than three days:

1. **Drain the cold water basin and all piping that will be exposed to freezing temperatures.**
2. Clean and flush the cold water basin with the basin strainers in place. Leave the cold water basin drain open so rain and melting snow will drain from the unit.
3. Clean the basin strainers and reinstall.
4. Lubricate the fan shaft and motor bearings, motor base, and motor adjusting screw.
5. Close the shut-off valve in the make-up water line (by others) and drain all exposed make-up water piping.
6. Inspect the protective finish on the unit. Clean and refinish as required (see page N60).
7. For VF1 and VFL closed circuit cooling towers, follow the coil freeze protection guidelines explained on page N61.

Maintenance Procedures

Cold Water Basin

The cold water basin should be inspected regularly. Any trash or debris which may have accumulated in the basin or on the strainers should be removed. Each month, the entire cold water basin should be drained, cleaned and flushed with fresh water to remove the silt and sediment which normally collects in the basin during operation. **If not removed periodically, this sediment can become corrosive and cause deterioration of the protective finish.** When flushing the basin, the strainers should be left in place to prevent the sediment from re-entering the system. After the basin has been flushed, the strainers should be removed, cleaned, and replaced before refilling the basin with fresh water.

CAUTION: Do not use acid to clean the strainers

The operating water level in the cold water basin will vary somewhat with system thermal load (evaporation rate), the bleed rate employed and the make-up water supply pressure. Because the typical winter load is less than the summer load, the winter evaporation rate is frequently less than the summer evaporation rate. With this reduced evaporation rate in the winter, the water level in the cold water basin will increase unless the float is re-adjusted. **The operating water level should be checked monthly and the float re-adjusted as necessary to maintain the recommended operating level.**

The water level in the basin of equipment designed for remote sump operation is a function of the circulating water flow rate, water outlet connection size, quantity and location, and outlet piping size and configuration. The remote sump unit is supplied without a water make-up assembly and the basin operating level during remote sump operation is not adjustable.

WARNING: Openings and/or submerged obstructions may exist in the bottom of the cold water basin. Use caution when walking inside the equipment.

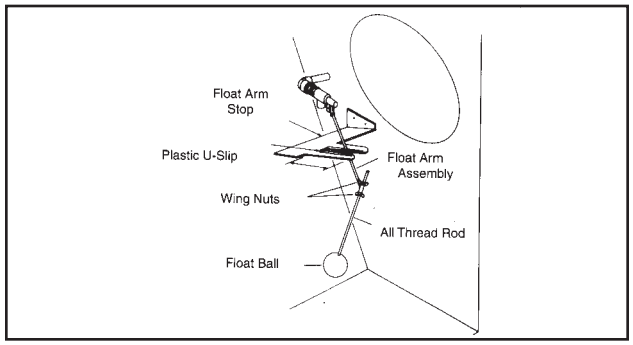


Figure 1: Water Make-Up Valve Assembly

Make-Up Valve

A float operated mechanical water make-up assembly is furnished as standard equipment on all Series V and Low Profile Series V equipment unless the unit has been ordered with the optional electric water level control package or for remote sump application. It is located inside the unit cold water basin within easy reach from the access door at the connection end of each unit.

The standard make-up assembly (See Figure 1) consists of a bronze make-up valve connected to a float arm assembly and actuated by a large diameter polystyrene filled plastic float. The float is mounted on an all-thread rod which is held in place by wing nuts. The operating water level in the cold water basin can be adjusted by repositioning the float and all-thread rod using the wing nuts provided.

The make-up assembly should be inspected monthly and adjusted as necessary. The valve itself should be inspected annually for leakage and the valve seat replaced if necessary. The make-up water supply pressure should be maintained between 15 and 50 psig for proper operation of the valve. To set the initial basin water level, adjust the wing nuts so that the make-up valve is completely closed when the water level in the cold water basin is 1/2" below the overflow connection. Under design thermal load and with average city water pressure (15 to 50 psig) at the valve, this setting should produce the operating water levels stated in Table 2. Note that if the thermal load is less than the design load at the time of unit start-up, the procedure may produce operating levels greater than that shown. **It may be necessary to re-adjust the float in order to attain the recommended operating level.** The unit basin should be closely monitored and water level adjusted as necessary during the first 24 hours of operation.

Table 2: Operating Water Level

Model Number	Operating Height (measured from basin bottom)
VTL, VFL, VCL	5 1/2"
VF1-009 thru VF1-036, VC1-10 thru 135	13 1/2"
VF1-048, VC1-150 thru 205	16 1/2"
VF1-072, VC1-N208 thru N230	17"
VT0-12 to VT0-116	12 7/8"
VT0-132 to VT0-176	15 1/2"
All VT1-N, VF1-096, VF1-144N, VF1-192, VF1-288N, VC1-N243 thru N470, VC1-C216 thru C469	17"
All VT1, VF1-144, VF1-216, VF1-288, VF1-432, VC1-386 thru 1608	14"
VC2-N138-N191	8 7/8"
VC2-N206-N235	9 5/8"
VC2-N261-N446	6"
VC2-319-1914	12 1/8"
VC2-N870 thru VC2-N1204	14"

Maintenance Procedures (continued)

As an option, an electric water level control package is available in lieu of the above described mechanical make-up assembly. The package consists of a probe-type liquid level control assembly and a slow closing solenoid valve. Stainless steel electrodes, factory set at predetermined lengths, extend from a NEMA 4 electrode holder into the cold water basin. **These electrodes should be periodically wiped clean to prevent accumulations of scale, corrosion, sludge or biological growth from interfering with the electrical circuit.** With the electrical water level control package, the water level is maintained at the recommended operating level regardless of the system thermal load. Therefore, it is not necessary, nor is it recommended that the operating level be adjusted. During initial and seasonal start-up, the probe type level control assembly should be bypassed to fill the cold water basin to approximately 1/2" below the overflow connection. Unit operation at the recommended water level will ensure that the unit basin contains sufficient water volume to prevent air entrainment in the circulating pump during system start-up and to provide sufficient excess basin capacity to accept the total system pull-down volume. The cooling tower "total-system pull-down volume" is the quantity of water suspended in the tower during pump operation plus that contained in the water distribution system, external piping, and any heat exchangers which could drain to the tower cold water basin when the circulating pump is shut down.

Fan Shaft Bearings

The fan shafts on VT0, VT1, VTL, VF1, VFL, VC1, and VCL units are supported at each end by ball bearings (see Figure 2), each equipped with a lubrication fitting and locking collar. Models VT0-65 to 116, VF1-027, VF1-036, and VC1-72 thru 135 also have a sleeve bearing (see Figure 3) located midway on the shaft. The fan shafts on VC2 units are supported by ball bearings (see Figure 2A) in the middle of the shaft with fans at each end. Each bearing is equipped with a lubrication fitting and locking collar. Lubrication lines are extended to the outside of the unit as standard.

Ball Bearings

Under normal operating conditions, the bearings should be greased every 2,000 operating hours or at least every six months. The bearings should also be greased at seasonal start-up and shutdown. **Only lubricate the bearings with one of the following water resistant inhibited greases which are good for ambient temperatures ranging from -65ºF (-53.9ºC) to 250ºF (121.1ºC):**

Amoco - Rycon Premium #3	Chevron - SRI
Texaco - Regal AFB 2	Mobil - SHC 32
Shell - Alvania 3	Shell - Dolium "R"

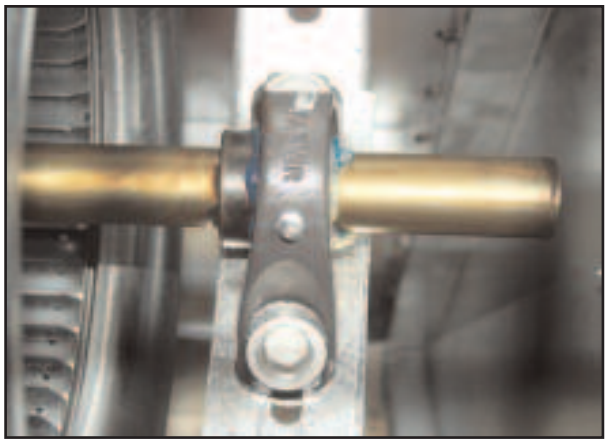


Figure 2: Ball bearing

Only lubricate the bearings with a hand grease gun. Do not use high pressure grease guns sine they may rupture the bearing seals. When lubricating, purge the old grease from the bearing by gradually adding grease until a bead of new grease appears at the seal.

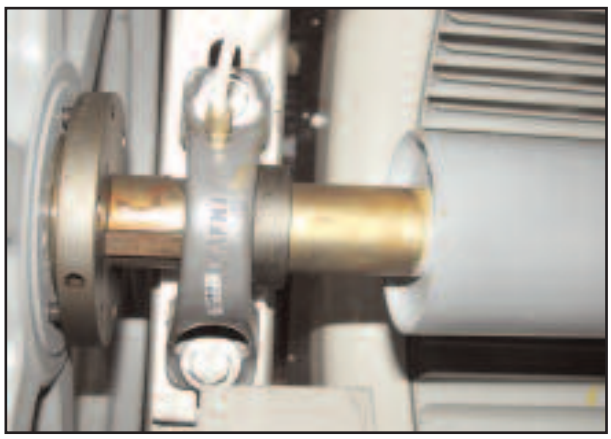


Figure 2A: Ball bearing

Sleeve Bearings

Prior to start-up and during the first week of operation, the bearing oil cup (see Figure 3) must be refilled with an industrial-type mineral oil (see Table 3) to saturate the felt wick in the bearing reservoir. After the initial start-up, fill the bearing oil cup every 1,000 operating hours or at least every six months. When ambient temperatures below 0˚F are expected, a light oil must be used. With such light oils, the bearing oil cup should be checked and refilled several times during the first several hours of operation until the bearings reach operating temperature.

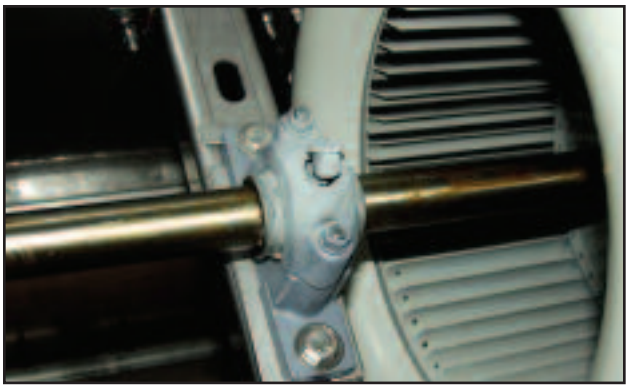


Figure 3: Sleeve bearing

Table 3: Sleeve Bearing Lubricants

TEMP AMBIENT	BAC P/N	TEXACO	EXXON
70˚F to 100˚F 30˚F to 70˚F 5˚F to 30˚F -25˚F to 5˚F	#582628PI #582627PI	Regal R & O 320 Regal R & O 150 Regal R & O 32 Capella 32	Teresstic 220 Teresstic 100 Teresstic 32

Caution: Do not use oils containing detergents for bearing lubrication. Detergent oils will remove the graphite in the bearing sleeve and cause bearing failure. Also, do not disturb bearing alignment by tightening the bearing cap adjustment on a new unit as it is torque-adjusted at the factory.

Fan Motor Bearings

All Cooling Tower Duty Totally Enclosed Fan-Cooled (TEFC) fan motor bearings are permanently lubricated and sealed for life.

Locking Collars

Each eccentric locking collar should be checked every six months to ensure that the inner bearing race is secured to the fan shaft. The locking collar can be set using the following procedure (see Figure 4):

1. Loosen the set screw.
2. Using a drift pin or center punch, tap the collar (in the hole provided) tangentially in the direction of rotation while holding the shaft.
3. Retighten the set screw.

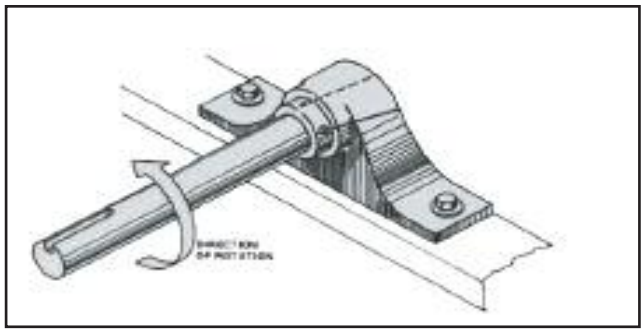


Figure 4: Locking collar assembly

Adjustable Motor Base

The motor base slides and adjusting screw (see Figure 5) should be coated twice a year using a good quality corrosion inhibiting grease such as one of those recommended for lubricating the fan shaft bearings (see page N57).

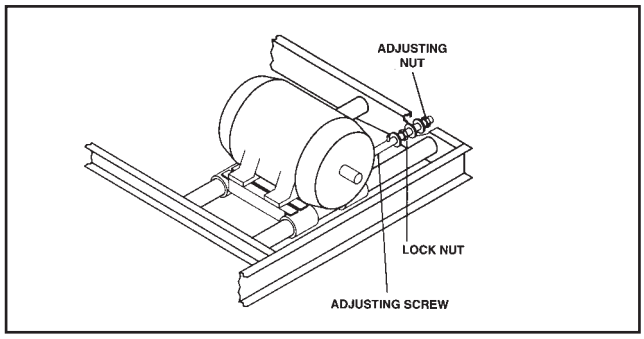


Figure 5: Adjustable motor base
VT0, VT1, VTL, VF1, VFL, VC1, VCL

Adjustable Motor Base

The motor base hangers, hinges, and adjusting screw (see Figure 5A and 5B) should be coated twice a year using a good quality corrosion inhibiting grease such as one of those recommended for lubricating the fan shaft bearings (see page N57).

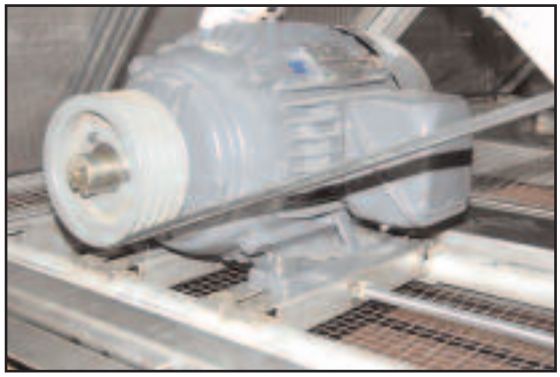


Figure 5A: Adjustable motor base
VC2-N138-N446

Figure 5B: Adjustable Motor Base VC2-319-1914

Fan Belt Adjustment

Some of the smaller axial fan models use individual V-belts, but most of the models use multi-groove, banded belts. **Belt tension should be checked and adjusted (as needed) every month**. To properly adjust the belt tension, position the fan motor so that moderate pressure on the belt midway between the sheaves will produce 1/2" deflection in centrifugal fan units and the deflection shown in Table 4 below for axial fan units. The position of the fan motor can easily be changed by adjusting the rod which extends from the frame to the motor base.

1. Loosen the locking nut (See figure 5, 5A, 5B)
2. Rotate the adjusting nut
   a. To loosen belt tension, turn clockwise (on models VTL, VFL and VCL turn counterclockwise)
   b. To tighten belt tension, turn counterclockwise (on models VTL, VFL and VCL turn clockwise).
3. Tighten the locking nut - failure to do so may result in the motor base vibrating free, which will loosen the belt tension.

Note: *There should be no "chirp" or "squeal" when the fan motor is started.*

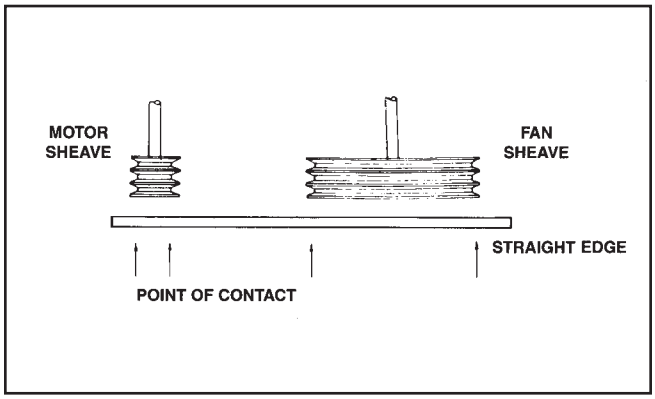
Table 4: Fan Belt Deflection for VC2 Models

Model Number	Deflection (inches)
VC2-N138-N191	9/16"
VC2-N206-N235	11/16"
VC2-N261-N301	11/16"
VC2-N356-N446	13/16"
VC2-319-1914	13/16"

Fan Drives

The drive alignment should be checked annually to ensure maximum belt life. This can be done by placing a straight edge across both sheaves as shown in Figure 6. When the drive is properly aligned, the straightedge will contact all four points as indicated. If re-alignment is necessary, loosen the motor sheave and align it with the fan sheave. Allow approximately 1/4" for draw-up as the motor sheave is pulled tight on the bushing, then retighten the bushing screw:

Figure 6: Checking Sheave Alignment



Motor Replacement

On rare occasions, the fan motor will have to be replaced. On the VC2 models, make sure the drain holes are pointing in the downward direction. This may require that the end bell be reversed on some motors.

Spray Nozzles and Heat Transfer Section

The spray nozzles and heat transfer section should be inspected and cleaned each month. The inspection procedure is as follows:

1. Shut off the fan, but leave the pump running.
2. Remove the eliminators.
3. Check to see if the nozzles are producing the spray pattern shown in figure 7 for coil products only.
4. Clean any nozzles which are clogged. If necessary, the nozzle and rubber grommet may be removed for cleaning.
5. Inspect the coil or fill surface. Any corrosion, damage, or obstructions must be corrected.
6. Some VF1, VFL, VC1, VC2, and VCL units are provided with an extended surface finned coil. During the winter season, when the ambient temperature is well below design, units with this coil can operate with the spray pump off. The coil is designed for seasonal dry operation followed by seasonal wet operation, and *not* for frequent cycling of the spray pump. **Frequent spray pump cycling may lead to excessive scale buildup.**

Caution: Do not use steam or high pressure water to clean cooling tower fill or materials other than steel.

Maintenance Procedures (continued)

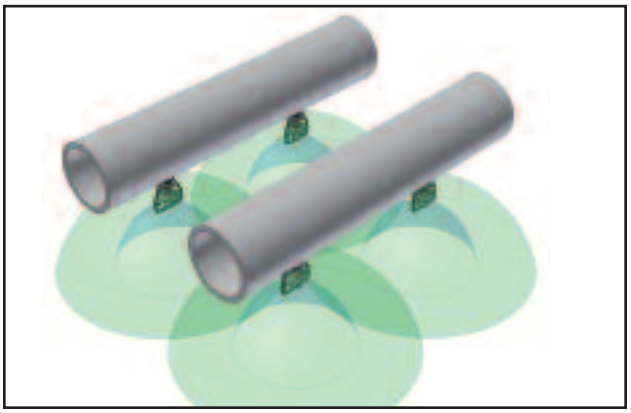


Figure 7 - Nozzle Spray Distribution

Corrosion Protection

Series V units feature corrosion-resistant materials. The fill and eliminators of the VT1, VT0 and VTL are made of polyvinyl chloride (PVC) which requires no protection against rot, decay, rust, or biological attack. The standard coil of the VF1, VFL, VC1, VC2, and VCL is constructed of all prime surface steel, hot-dip galvanized after fabrication. The balance of the construction in all units is either heavy-gauge galvanized steel, the optional BALTIBOND® Corrosion Protection System, or Series 300 stainless steel.

Galvanized Steel Construction

The standard Series V and Low Profile Series V units are constructed of hot-dip galvanized steel. **These units should be inspected annually.** Inspect the inside of the unit for blemishes or corrosion on the galvanized steel. Affected areas should be thoroughly wire brushed and recoated with a cold galvanizing compound such as Zinc-Rich Compound (ZRC).

BALTIBOND® Corrosion Protection System

The Series V and Low Profile Series V units can be constructed of hot-dip galvanized steel, protected with the BALTIBOND® Corrosion Protection System as an option. Scratches and scrapes on parts which do not require extraordinary corrosion protection can be touched up with a repair kit (BAC Part No. 16-133P). In the unlikely event that the damage is more extensive than simple scratches or dents, contact your local BAC Representative.

Cold Weather Operation

Series V and Low Profile Series V equipment can be operated in subfreezing ambient conditions provided proper measures are taken:

1. Protection against basin water freezing when the unit is idle.
2. Capacity control to prevent ice formation in heat transfer sections during operation.
3, Protection against coil freezing (VF1 and VFL Closed Circuit Cooling Towers and cooling circuits in VC1,VC2, and VCL Evaporative Condensers).

Cold weather applications should be reviewed with your local BAC Representative to ensure that the unit selection, location, control, and accessories are adequate for reliable operation. The following paragraphs are general guidelines, which should be followed to minimize the possibility of freeze-up.

Protection Against Basin Water Freezing

When the unit is shutdown and exposed to subfreezing ambient temperatures, the basin water may freeze. A remote sump located in a heated indoor area is an ideal method of protection, since the water in the unit and connecting piping will drain by gravity whenever the circulating pump has stopped. Alternatively, basin heaters, electrical immersion heaters, steam coil, or hot water coil can be used to maintain the basin water at a minimum temperature of 40˚F (4.4ºC). **In addition, to protect the cold water basin, all exposed water piping, including pump piping below the overflow level and makeup water lines, should be traced with electrical heater tape and insulated.**

Capacity Control

It is necessary to prevent the recirculating water from approaching freezing conditions when the unit is operating under load. Capacity control on centrifugal fan units may be achieved through fan cycling, capacity control dampers, the ENERGY-MISER® Fan System, two-speed motors, or inverter duty motors. Capacity control dampers and VFD fan speed control offer the greatest protection and should be used for close temperature control. Capacity control on axial fan units (VC2 only) may be achieved by fan cycling, two-speed fan motors, or VFD fan speed control.

WARNING: Rapid on-off cycling can cause the fan motor to overheat, leading to premature failure. It is required that controls be set to allow a maximum of six on-off cycles per hour.

Multiple fan motors serving a single coil, fill section, or fan section must be cycled simultaneously. This applies to models VT1-478 through VT1-600, VF1-216, VF1-432, VC1-540 through 804, VC1-1158-1608, and VC2-319 through 1914.

Units with two-speed motors should have a 15-second time delay during switch down from high to low speed to avoid overloads on the low speed windings of the motor. Units with the ENERGY-MISER® Fan System should also have a 15-second time delay during the switch down from high to low speed to avoid overloads on the lower horsepower motor.

Please note that capacity control dampers allow the unit to operate longer and with closer control than the ENERGY-MISER® Fan System, two-speed motor, and/or fan cycling. **The use of a modulating spray water by-pass or pump cycling is *not* a recommended method of capacity control.**

Variable Frequency Drives

Motors: Applications employing variable frequency drives (VFDs) for fan motor control must use inverter duty electric motors built in compliance with NEMA Standard MG.1, Part 31. **The standard fan motors normally furnished with BAC products are not intended for this duty and will not be warranted if so applied.**

WARNING: When the fan speed of a Series V Evaporative Cooling Product is to be changed from the factory set speed, including the use of a variable speed control device, steps must be taken to avoid operating at or near the fan's "critical speed" with resulting excessive vibration and stresses and the risk of personal injury and/or property damage. Consult your local BAC Representative on any application utilizing variable speed control to determine whether any critical speeds may be encountered and if any modifications may be required.

Recommended Operating Speeds: For optimum system performance and equipment longevity, fan motors should be operated below 10%. **Fans must not be operated in excess of 100% speed without prior consultation with your local BAC Representative,** nor within 10% of any unit frequencies.

WARNING: Before performing any maintenance or inspection, make certain all electric power has been disconnected and locked in the off position.

Maximum Allowable Wire Runs: Good practice suggests locating the VFD close to the inverter duty motor; however lead length is not limited when using a VFD with a BAC supplied standard inverter duty motor. If using a non-standard motor, consult your local BAC Representative for lead length guidelines.

Protection Against Coil Freezing (Models VF1 and VFL Only)

The best protection against coil freeze-up is the use of an anti-freeze solution. An industrial grade inhibited ethylene glycol or propylene glycol solution is recommended for most installations.

When anti-freeze solution is not possible, the system must be operated to meet **both** of the following conditions.

1. Maintain the minimum recommended flow through the coil at all times (see Table 5 below).
2. Maintain a heat load on the circulating fluid so that the temperature of the fluid leaving the coil will not fall below 50˚F (10ºC).

Table 5: VF1 and VFL Minimum Coil Flow Requirements

If the process load is extremely light or shut off, it may be necessary to apply an auxiliary heat load to the circulating fluid to maintain the leaving fluid temperature at 50˚F (10ºC) when freezing conditions exist.*

Model Number	Minimum Coil Flow (gpm)
VF1-009, VF1-018 VF1-027, VF1-036	50
VF1-048	75
VF1-072	100
VF1-096, VF1-144N	125
VF1-144, VF1-216N	200
VF1-192, VF1-288N	250
VF1-288, VF1-432	400
VFL-012 thru VFL-048	65
VFL-072 thru VFL-096	125

Draining the coil is not recommended as a normal method of freeze protection. Frequent draining promotes corrosion inside the coil tube. However, draining is acceptable as an emergency method of freeze protection if the coil is not protected by an anti-freeze solution. Your local BAC Representative should be consulted for guidelines on the installation of an emergency coil drain system.

** For evaporative chilling applications only, the coil leaving fluid temperature can be maintained as low as 45˚F(7.2ºC) with glycol solutions. Consult your local BAC Representative for necessary precautionary measures.*

MECHANICAL MARKETING INC.
MANUFACTURERS REPRESENTATIVE

105 Woodmont Road Milford CT 06460

Area Code 203-877-5800/800-665-4737 FAX 203-783-9042

June 10, 2008

Eastern Mechanical Services
64 Triangle Street
Danbury CT 06813

Subject: Post House Apartments Boiler Startup Report

Dear Ted,

This letter shall serve as a report of startup on the Laars Pennant 750 boiler installed at Post Road Apartments on Clinton Avenue in Stamford during the construction. Laars Heating Systems has no official startup report form, so I trust this letter from us as the rep will suffice.

The initial startup of the boiler was done by me as the area Laars commercial representative on February 4, 2008. At that time the system was just being filled and initiated floor by floor, and the controls were still being worked out. The boiler was piped as shown on the engineer's plan, and as intended by the boiler manufacturer. There is a three way valve for return water temperature protection to guard against return temps into the boiler of less than 120F. The integral operating controller was adjusted to external (Mode 6) so the actual operation of the boiler is being controlled by the building automation system. All safety controls and operational controls were tested and the boiler was left on for temporary heat.

On February 20, 2008, I returned to the job with Tod Hebert, Regional sales Manager for Laars in this region. We set the gas pressure regulator on the incoming gas line. And the boiler combustion adjustments were made, using gas samples from the stack with a digital combustion analyzer. The CO2 was adjusted to 8.5% at 100% firing input as recommended by the Lars manual for the boiler. At that time the ATC had control of the three way valve and we verified it was in operation.

With the safeties tested, combustion adjustments made, and operation being taken care of as needed by the BAS, the boiler is started and commissioned as intended. If there is any other information needed, please do not hesitate to call on me. Thank you for your valued support and the opportunity to work with Eastern Mechanical on this project.

Sincerely,

Mike Skoldberg

Mike Skoldberg
MGS/pwp

GUY DEFEO COMPANY

Manufacturers' Representative

June 12, 2008

Eastern Mechanical Services Inc.
64 Triangle Street Suite H2
Danbury, CT 06813

ATT: Ted Huizinga

RE: Post House Apartments

Start-up and training was accomplished for B.A.C Model VFL072-32N; Serial Number U070372301 on April 14, 2008.

The fan motor was bumped to verify proper fan rotation.
The fan shaft bearings were checked for tightness and lubrication.
The belt tension was checked and adjusted.
The vibration cutout switch was set.

The strainer in the cold water basin was checked for proper installation and cleanliness.
The cold water basin was filled with water to the overflow level.
The spray pump motor was bumped for proper rotation and then allowed to run.
The spray nozzles were checked for proper water distribution.
The manual bleed line was set at gpm flow. This should remain operational until automatic water treatment is established.
The electric water level control was checked for proper operation.

The fan motor was operated at design fan speed. No excessive vibration or water carryover was observed. Fan motor amperage is within nameplate.

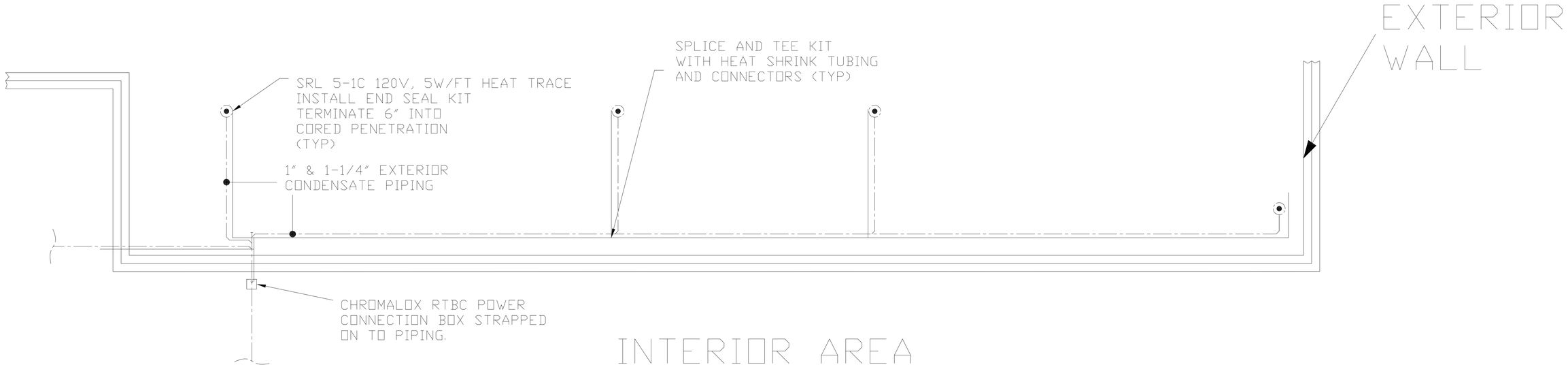
The sump heater package was checked that low temperature would energize the heater element.

It is important that proper periodic maintenance be maintained as outlined in the manufacturer's Operating and Maintenance Manual. This includes among other items:
Adjustment to belt tension
Greasing of bearings
Cleaning the water strainer
Cleaning the spray nozzles and checking for proper water distribution
Checking for excessive vibration
Checking for leaks
Verify proper concentration of and proper inhibitors in glycol.

Sincerely,

Carmine Defeo

Carmine DeFeo
97 Noble Avenue • Milford, Connecticut 06460
(203) 877-6811 • FAX (203) 874-5269



NOTES:

1) ALL PIPING IS TYPE L COPPER WITH 1" THICK INSULATION OVER HEAT TRACE.

2) TOTAL FOOTAGE IS 150'

3) ONE ELECTRICAL SUPPLY CONNECTION WILL BE PROVIDED BY OTHERS AT RTBC AS SHOWN.

4) HEAT TRACING TO BE LINEAR AND INSTALLED AS PER INSTALLATION INSTRUCTIONS.

POST HOUSE APTS

STAMFORD, CT

EASTERN MECHANICAL SERVICES, INC.
64 TRIANGLE STREET SUITE H2
DANBURY, CT 06810

HEAT TRACE PLAN

M 1

DRAWN BY: T. H.	*SCALE: 1/4"=1'-0"*	*DATE: 1/14/08*	*JOB NO.: 1317*

DL

Post House Apts
Heat Trace

Single Point On/Off Temperature Controls

Ambient Sensing
- **120 - 480 Vac**
- **0 - 225°F Temp. Rating**
- **9/16" OD x 4" SS Probe**
- **Ordinary & Hazardous (Div. 2) Areas**

Bulb & Capillary
- **120 - 480 Vac**
- **0 - 400°F Set Point Range**
- **1/4" OD x 7-1/4" SS Bulb, SS Capillary**
- **Ordinary & Hazardous (Div. 2) Areas**

Solid State
- **20A @ 120 - 240 Vac**
- **Ordinary Areas**
- **Set Point Ratings:**
  0 - 100°F
  50 - 250°F
  200 - 600°F

Description

The DL Series Single Point On/Off Temperature Controls from Chromalox represents the state of the art in heat tracing accessories and are available in five models to handle a broad range of applications. Models include two ambient sensing thermostats, two line sensing thermostats and a line sensing solid state controller. These high-quality models combine a variety of functions in a convenient, easy to use and economical package.

Applications

- Freeze Protection
- Hydrocarbon and Chemical Product Piping
- Process Temperature Maintenance
- Fluid Flow and Viscosity Maintenance

Approvals*

UL Listed for use in ordinary areas

CSA Certified for use in ordinary and
Class I, Div. 2, Groups A, B, C, D
Class II, Div. 2, Groups F, G

FM - Factory Mutual Certified for use in ordinary and
Class I, Div. 2, Groups B, C, D
Class II, Div. 2, Groups F, G
Class III, Div. 2 areas

* Depends on specific model

Features

- Integrated controls and power connections reduce installation hardware
- Molded of durable plastic material (Ryton® PPS)
- High service temperature
- Corrosion resistant
- Thermal stability
- Non-flammability
- High strength and rigidity
- Stainless Steel sensor sheaths
- Sealed Switches on EP models permit control in Div. 2 hazardous areas
- Stainless steel hardware to ensure the integrity of the system
- Cable terminations inside enclosure reduce installation time and cost
- Liquid-resistant design prevents moisture from reaching the electrical connections. All models are rated NEMA 4X.
- UL, FM, CSA is carried by most models, consult specific product information.

Ryton® is a registered trade name of Phillips Chemical Company.

Chromalox®
PRECISION HEAT AND CONTROL

PH: 615-793-3900 • FX: 615-793-3563 www.chromalox.com

DL — Single Point On/Off Temperature Controls

Post House Apts
Heat Trace

Available Models

RTAS & RTAS-EP
Ambient Sensing
Model RTAS is an ambient-sensing thermostat which is generally used for freeze protection in ordinary (non-hazardous) areas. The thermostat is mounted through the end of the oblique sided enclosure lid. In fact, because there is so much room in this model, multiple heating cables can be terminated. The stainless steel sheathed, inverted bellows probe provides good sensitivity, resulting in more accurate control.

Model RTAS-EP is a modified version of the Model RTAS which utilizes a sealed switch. Since this switch has no arcing contacts it can be used in Division 2 Hazardous Areas.

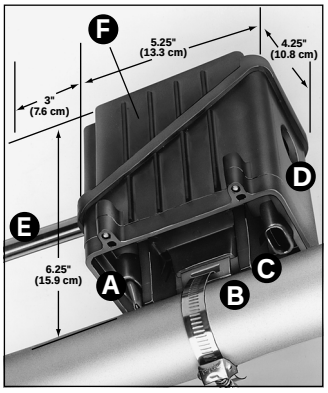
RTBC & RTBC-EP
Bulb & Capillary
Model RTBC is a line-sensing thermostat which is generally used for process temperature maintenance applications in ordinary (non-hazardous) areas. The thermostat is mounted within the enclosure and the capillary is brought out through one of the openings in the bottom of the box. This design provides extra protection for the capillary, especially when the control is mounted on a pipe, for heat tracing applications. The three foot long stainless steel capillary provides good flexibility in mounting locations.

Model RTBC-EP is a modified version of the RTBC which utilizes a sealed switch. Since this switch has no arcing contacts it can be used in Division 2 Hazardous Areas.

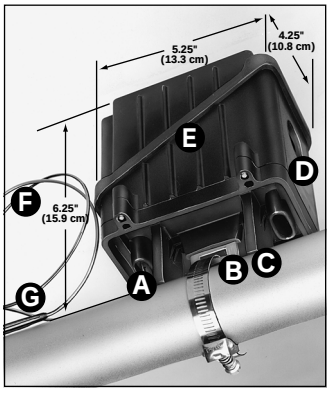
RTSS
Solid State*
Model RTSS is a line-sensing solid state controller which is used for process temperature maintenance applications where more precise temperature control is required. This control is supplied with a specially designed RTD sensor. The sensor has a stainless steel sheath and water resistant insulated TFE lead wires. The controller provides excellent accuracy and high current switching ability in a small enclosure.

*UL, FM, CSA not available.

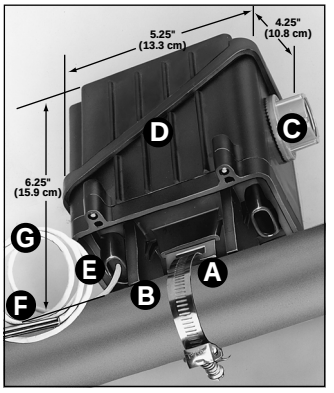
Exterior Construction



- Ⓐ Strategically placed cable entries allow maximum flexibility for insulation (Heating cable cut away for clarity)
- Ⓑ Stainless steel tiedown support provides positive attachment to pipes
- Ⓒ Heavy duty support legs give stable mounting and provide conduit clearance for applications with up to three inches of insulation
- Ⓓ Opening for 3/4-inch (20 mm) conduit hub
- Ⓔ Stainless steel sheath temperature sensor
- Ⓕ Oblique sided box and cover allow easy access for wiring



- Ⓐ Strategically placed cable entries allow maximum flexibility for insulation (Heating cable cut away for clarity)
- Ⓑ Stainless steel tiedown support provides positive attachment to pipes
- Ⓒ Heavy duty support legs give stable mounting and provide conduit clearance for applications with up to three inches of insulation
- Ⓓ Opening for 3/4-inch (20 mm) conduit hub
- Ⓔ Oblique sided box and cover allow easy access for wiring
- Ⓕ Stainless steel capillary (3 feet/ 1 meter long)
- Ⓖ Stainless steel sensing bulb



- Ⓐ Stainless steel tiedown support provides positive attachment to pipes
- Ⓑ Heavy duty support legs give stable mounting and provide conduit clearance for applications with up to three inches of insulation
- Ⓒ Opening for 3/4-inch (20mm) conduit hub (Conduit hub not included)
- Ⓓ Oblique sided box and cover permit easy access for wiring
- Ⓔ Entry brings the RTD leads into the box through a special grommet
- Ⓕ RTD and leadwire
- Ⓖ RTD leads with sealed TFE sheath (3 foot/1 meter long)

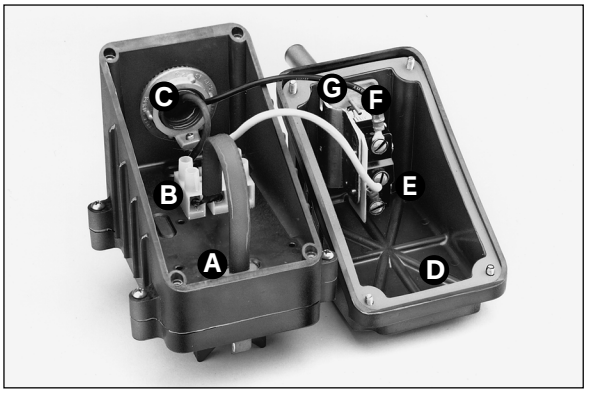
Chromalox® • 1382 Heil Quaker Blvd. • LaVergne, TN 37086 • PH: 615-793-3900 • FX: 615-793-3563 • www.chromalox.com

Post House Apts
Heat Trace

Interior Construction

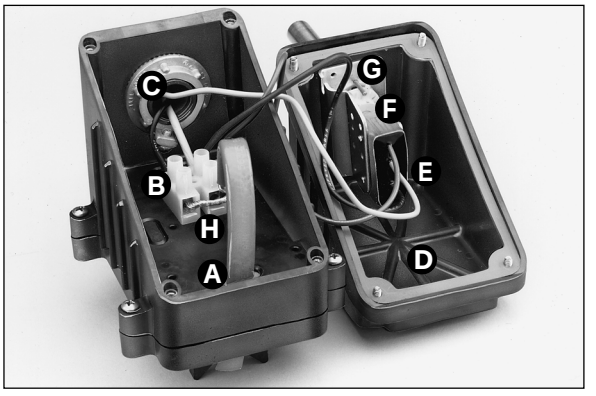
Each model consists of a NEMA 4X corrosion resistant wiring and control enclosure with terminal block, enclosure support, on/off thermostatic control and sensor. The enclosure has a 3/4" opening to accept a conduit hub (CCH-2 or equivalent). A pipe strap (PS Series pipe straps or equivalent) is required to mount the enclosure on a pipe. A mounting plate (MP Series) is required to mount the enclosure to a flat surface.

RTAS



- Ⓐ Cable grommet provides water resistant seal between base and box
- Ⓑ Three position terminal block for easy wiring
- Ⓒ Power wiring entry. Conduit hub not included
- Ⓓ Gasket provides water resistant seal between box and lid. It is affixed to the lid and captures the mounting hardware
- Ⓔ Thermostat switch
- Ⓕ Set point adjustment knob
- Ⓖ Set point indicator

RTAS-EP

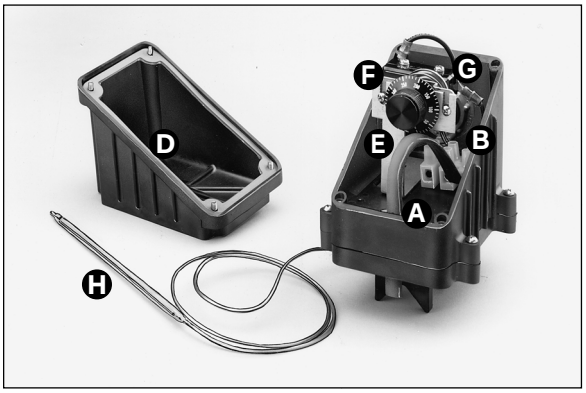


- Ⓐ Cable grommet provides water resistant seal between base and box
- Ⓑ Three position terminal block for easy wiring
- Ⓒ Power wiring entry. Conduit hub not included
- Ⓓ Gasket provides water resistant seal between box and lid. It is affixed to the lid and captures the mounting hardware
- Ⓔ Hermetically sealed thermostat switch
- Ⓕ Set point adjustment knob
- Ⓖ Set point indicator
- Ⓗ Ground wire connector

Post House Apts
Heat Trace

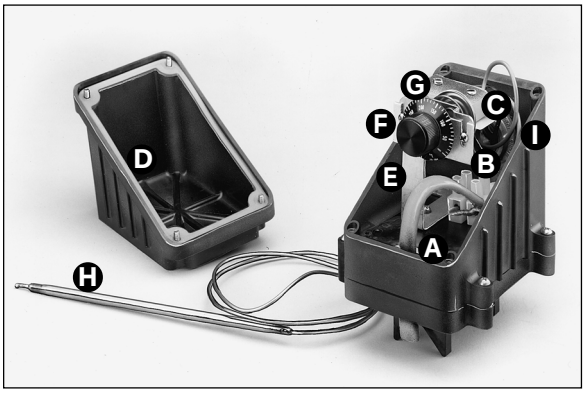
Interior Construction

RTBC



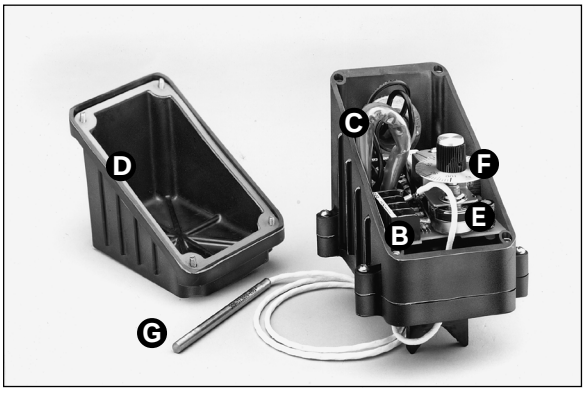
- Ⓐ Cable grommet provides water resistant seal between base and box
- Ⓑ Three position terminal block for easy wiring
- Ⓒ Power wiring entry. Conduit hub not included (Not shown in picture)
- Ⓓ Gasket provides water resistant seal between box and lid. It is affixed to the lid and captures the mounting hardware
- Ⓔ Thermostat mounting bracket
- Ⓕ Set point adjustment knob
- Ⓖ Thermostat switch
- Ⓗ Stainless steel sensing bulb

RTBC-EP



- Ⓐ Cable grommet provides water resistant seal between base and box
- Ⓑ Three position terminal block for easy wiring
- Ⓒ Power wiring entry. Conduit hub not included (Not shown in picture)
- Ⓓ Gasket provides water resistant seal between box and lid. It is affixed to the lid and captures the mounting hardware
- Ⓔ Thermostat mounting bracket
- Ⓕ Set point adjustment knob
- Ⓖ Hermetically sealed thermostat switch
- Ⓗ Stainless steel sensing bulb
- Ⓘ Ground wire connection

RTSS*



- Ⓐ Cable grommet provides water resistant seal between base and box (not visible)
- Ⓑ Built-in terminal blocks for easy wiring
- Ⓒ Power wiring entry. Conduit hub not included
- Ⓓ Gasket provides water resistant seal between box and lid. It is affixed to the lid and captures the mounting hardware
- Ⓔ Solid state controller
- Ⓕ Set point adjustment knob
- Ⓖ RTD sensor with stainless steel sheath

*UL, FM, CSA not available

Post House Apts
Heat Trace

Enclosure Specifications for RTAS & RTBC

Model Number	PCN	Switch Rating (Volts/Amps)	Max. Continuous Exposure Temperature °F	Max. Continuous Exposure Temperature °C	Max. Intermittent Exposure Temperature °F	Max. Intermittent Exposure Temperature °C	Wt. (Lbs.)
RTBC	384850	22A @ 120 - 480	400	200	500	260	2
RTBC-EP	384841	11A @ 120 - 250	400	200	500	260	2
RTAS	384833	22A @ 120 - 480	400	200	500	260	2
RTAS-EP	384825	11A @ 120 - 250	400	200	500	260	2

The appropriate grommet must be ordered separately to provide a water tight seal to the accessory. Select the appropriate grommet from table and order 1 grommet for every cable which must enter the accessory.

Model Number	Used With	PCN	Stock	Wt. (Lbs.)
GR-1	SRL-C	385027	S	0.2
GR-2	SRL-CR, SRL-CT	385035	S	0.2
GR-3	CWM-C	385043	S	0.2
GR-4	CWM-CT	385051	S	0.2
GR-5	SRL-MC	385060	S	0.2
GR-6	SRL-MCR, SRL-MCT	385078	S	0.2
GR-7	SRM/E-C	385086	S	0.2
GR-8	SRM/E-CT	385094	S	0.2

Thermostat Specifications for All RTAS & RTBC

Temperature Set Point Range ..... 0 to 400°F (-18 to 200°C) for RTBC Only;
0 to 225°F (-18 to 107°C) for RTAS

Microswitch® Rating ..... 22 Amps SPDT for RTAS and RTBC; 11 Amps at 250V for EP models

Scale Division ..... 10°F (5.6°C)

Maximum Sensor Exposure Temp. ..... 450°F (230°C)

Sensor Dimensions ..... 1/4" OD x 7-1/4" L Bulb, 3' Capillary - RTBC
9/16" OD x 4" L Stainless Steel Probe - RTAS

Operating Ambient Temp. Range ..... -40 to 160°F (-40 to 71°C)

Factory Preset and Calibrated ..... 200°F (93°C) for RTBC
40°F for RTAS

Enclosure Specifications for RTSS

Model Number	PCN	Switch Rating (Volts/Amps)	Max. Continuous Exposure Temperature °F	Max. Continuous Exposure Temperature °C	Max. Sensor Exposure Temperature °F	Max. Sensor Exposure Temperature °C	Wt. (Lbs.)
RTSS-A	385908	20A @ 120 - 240	400	200	450	232	2
RTSS-B	385916	20A @ 120 - 240	400	200	450	232	2
RTSS-C	385924	20A @ 120 - 240	400	200	450	232	2

Thermostat Specifications for RTSS

Temperature Set Point Ranges ..... **A** = 0 to 100°F (-18 to 38°C)
B = 50 to 250°F (10 to 121°C)
C = 200 to 600°F (93 to 316°C)
Relay Contact Rating ..... 20 Amps @ 120 to 240 Vac, SPST
Scale Divisions ..... **A** = 2°F
B = 5°F
C = 10°F
Operating Ambient Temperature Range ..... 0 to 150°F (-18 to 66°C)
Dead Band ..... 10°F or 2°F
Accuracy ..... ± 2.5% of set point span over mid 75% of scale
Temperature Coefficient ..... Less than 0.1°F/°F temperature change
Line Effect ..... Less than 0.1% of span for ±10% variation in line voltage
Sensor Dimensions ..... 1/4" OD x 4" L, 100 Ohm RTD, 3' Teflon leads

Model Numbers

RT — **AS** — **EP** — **A**

Temperature Range** (specify for model RTSS Only)
A - 0 to 100°F
B - 50 to 250°F
C - 200 to 500°F

Approved Locations
Hazardous Div. 2 Areas ..... RTAS and RTBC Controls Only

Control Type	Switch Rating	Sensor
AS - Ambient Sensing	22 Amp*, 120 - 480 Vac	9/16" OD x 4" L Stainless Steel Probe
BC - Bulb & Capillary	22 Amp*, 120 - 480 Vac	1/4" OD x 7-1/4" L SS Bulb, 3' SS Capillary
SS - Solid State	20 Amp, 120 - 240 Vac	1/4" OD x 4" L 100 Ohm RTD, 3' Teflon® Leads

RT
NEMA 4X Enclosure, Ryton® PPS and Stainless Steel Controller

Notes: * Switch rating reduced to 11 Amps, 120 to 250 Vac for EP models.
** Temperature range for all RTAS models is 0 to 225°F; For all RTBC models is 0 to 400°F.

Chromalox®

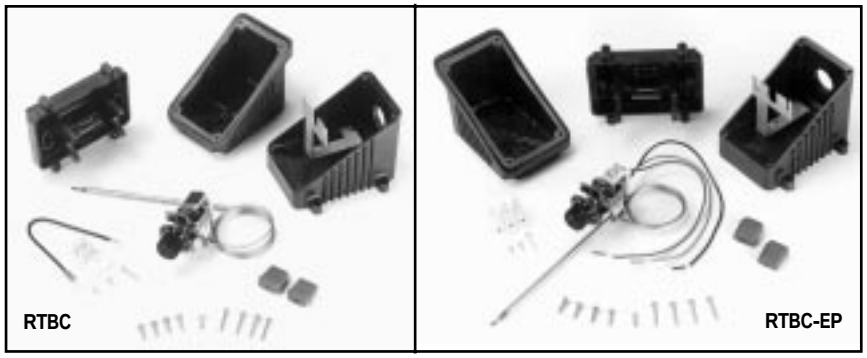
Post House Apartments
Heat trace

Installation Instructions

NOTICE: These thermostats are designed for temperature control service only. Because they may not fail safe, they should not be used for temperature limiting duty.
WARNING: *Users should install adequate back-up controls and safety devices with their electric heating equipment. Where the consequences of failure may be severe, back-up controls are essential. Although the safety of the installation is the responsibility of the user, Chromalox will be glad to make equipment recommendations.*

SERVICE REFERENCE		
DIVISION 4	SECTION RT	
SALES REFERENCE	(Supersedes PJ454-5)	PJ454-6
		161-562765-001
DATE	OCTOBER, 1998	

RTBC and RTBC-EP Power Connection Kit With Integral Thermostat



RTBC Kit Parts:
1 — Molded Enclosure consisting of Base — Box — Lid
1 — Three Position Terminal Block
1 — Mounting Screw for Terminal Block
1 — Uninsulated Barrel Connector (RTBC-EP Only)
1 — Eight Inch Length of 14AWG Insulated Wire with Connector (RTBC Only)
1 — Ring Connector (RTBC Only)
1 — Thermostat with Mounting Screws (2)
1 — Capillary Grommet
1 — Cover Gasket
4 — Cover Screws, 5/8” Long
4 — Box Screws, 1” Long

GENERAL

WARNING: *Hazard of Electric Shock. Disconnect all power before starting. All installations must be effectively grounded in accordance with the National Electrical Code to eliminate shock hazard.*

Note: All electrical wiring, including GFCI (Ground Fault Circuit Interrupters), must be done according to National Electrical or local codes by a qualified person.

These kits are designed to provide temperature control as well as power termination for one run of Rapid Trace Heating Cable. Select and purchase one grommet for terminating the cable. Please refer to the list below to insure that you purchase the proper grommet for the cable you are installing.

GR1 for SRL-C
GR2 for SRL-CR or SRL-CT
GR3 for CWM-C
GR4 for CWM-CT
GR5 for SRL-MC
GR6 for SRL-MCR or SRL-MCT
GR7 for SRM/E-C
GR8 for SRM/E-CT

Each kit contains enough material to make one power connection. Materials required for installation include: Standard electrical cutters, sharp utility knife, screwdriver and a pipestrap (Chromalox PS type or equal).

Wipe inside lip of cover with a clean cloth. Removing protective backing from the gasket and affix it to the cover lip. Press firmly all around for proper adhesion.

INSTALLATION

Note: These instructions are for all Self-Regulating and Constant Wattage Heating Cables in ordinary locations. Consult factory for installation of braided cable in hazardous locations. Not all instructions, however, are for all cases. Each step of the instructions will have a heading in boldface stating which type of cable or connection each instruction is intended for.

1. FOR CONSTANT WATTAGE CABLE:
Cut the cable 12 inches past the last module point (indentation in cable). **Note:** Cutting the cable between module points creates a non-heating cold lead. See Figure 1.

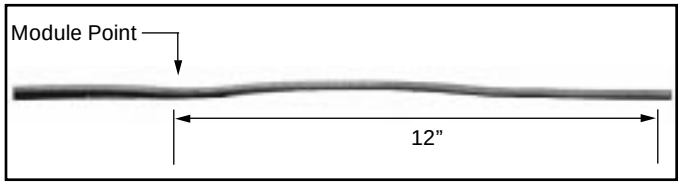


Figure 1

2. FOR CABLE WITH EXPOSED METAL BRAID (-C):
Push the braid back 12 inches on the cable. See Figure 2.

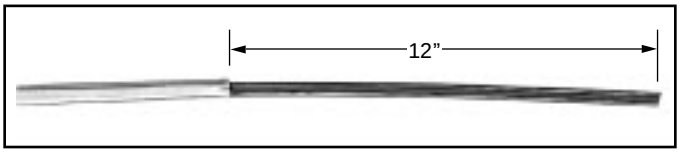


Figure 2

3. FOR ALL CABLE:
Feed the end of the cable through the appropriate hole in the base. Allow 8 inches of cable to extend above the top of the base. See Figure 3.

4. FOR ALL CABLE:
Slide cable grommet over the end of the cable and insert it into the opening in the base. Attach the base to the pipe by threading the appropriate sized pipestrap through the slot in the mounting plate. Tighten the pipestrap until the base is loosely attached to the pipe. See Figure 4.

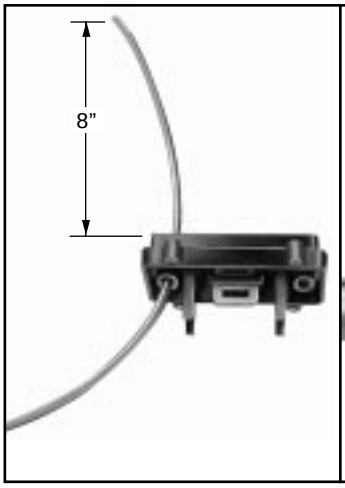


Figure 3

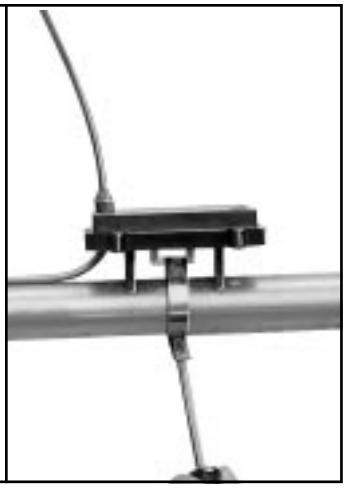


Figure 4

5. FOR OVERCOATED CABLES (-CR or -CT):
Score the outer insulation 1-1/2 inches from the end of the cable. Remove the jacket to expose the metal braid. See Figure 5. **WARNING:** *Do not damage the braid or the base cable insulation.*

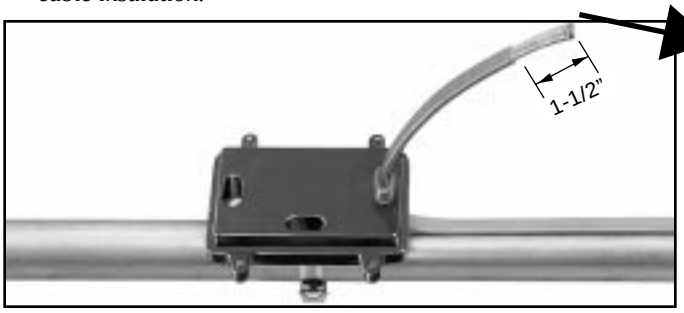


Figure 5

6. FOR ALL CABLE:
Punch out the knockouts on the bottom of the box which correspond to the openings in the base through which the heating cable passes. For these kits, the openings to be knocked out are the ones opposite the conduit entry and the one by the side of the box. Be careful to punch out only those knockouts to be used. If one is mistakenly punched, blank grommets can be ordered to re-establish the watertight seal. See Figure 6.

7. FOR ALL CABLE:
Feed the capillary of thermostat through the side hole of the box and side hole of the base. Slip the grommet over the capillary between the box and the base. See Figure 7.

Figure 6

Figure 7

8. FOR ALL CABLE:
Feed the cable through the end hole in the box. Allow 3/4 inches of stainless steel capillary to extend above the bottom of the box. Secure box to base using all four large (8-32) screws. See Figure 8.

9. FOR OVERCOATED CABLE:
Starting from the end of the cable, unravel 1-1/2 inches of the braid. Twist the strands together to form a pigtail. See Figure 9.

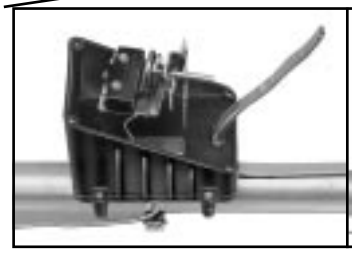


Figure 8

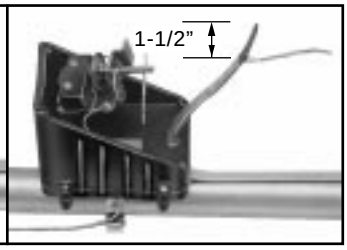


Figure 9

10. FOR SELF-REGULATING CABLE:
Using standard electrical cutters, cut a 3/4 inch long notch out of the cable between the conductor wires. Bare a 3/8 inch length of each conductor by stripping off the outside insulation and the inner black core material. See Figure 10.

11. FOR CONSTANT WATTAGE CABLE:
Score the outer jacket 3/4 inch from the end of the cable and remove the jacket. Cut off the exposed nichrome wire, pushing any remainder back under the jacket. Constant Wattage cables have an inner layer of insulation which is also to be removed as described above. Separate the buss wires and strip off the last 3/8 inch of insulation from both buss wires. See Figure 11.

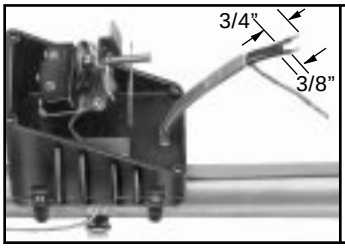


Figure 10

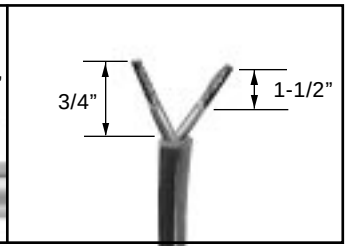


Figure 11

12. FOR OVERCOATED CABLE (RTBC ONLY):
Insert the end of the braid pigtail into the opening in the terminal block which will be nearest the center of the box. Tighten the screw firmly to hold the braid in place. See Figure 12.

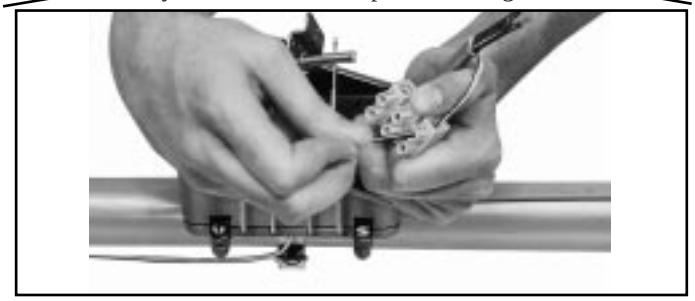


Figure 12

13. FOR ALL CABLE:
Insert the bared ends of the conductors into two adjacent openings in the terminal block. Tighten screws firmly to hold conductors in place. See Figure 13.

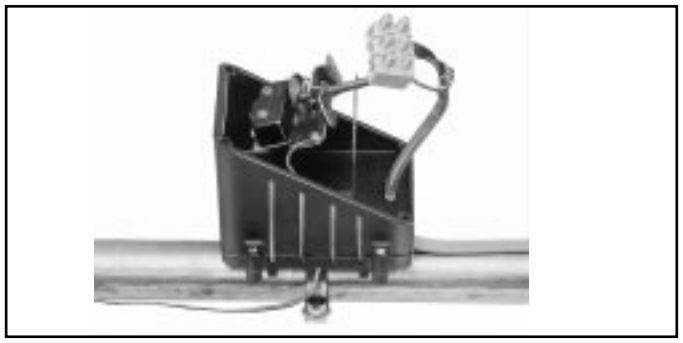


Figure 13

14. FOR RTBC ONLY:
Remove the screw and collar from the NORMALLY CLOSED terminal of the thermostat. Discard the collar. Push the screw through the opening in the connector attached to the insulated wire and screw it back into the normally closed terminal. See Figure 14.

15. FOR ALL CABLE:
Connect conduit hub (Chromalox CCH-1 or equal) to the box. Attach conduit to hub and bring 8 inches of power leads into the box. See Figure 15.

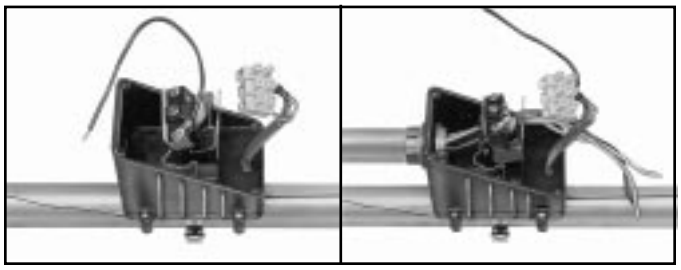


Figure 14

Figure 15

16. FOR ALL CABLE:
Strip a 3/8 inch length of each conductor of the power wiring. See Figure 16.

17. FOR RTBC ONLY:
Crimp the ring connector onto the end of the "HOT" conductor. Remove the screw and collar from the COMMON terminal. Discard the collar. Push the screw through the opening in the ring connector. Drive the screw back into the COMMON terminal. See Figure 17.

Figure 16

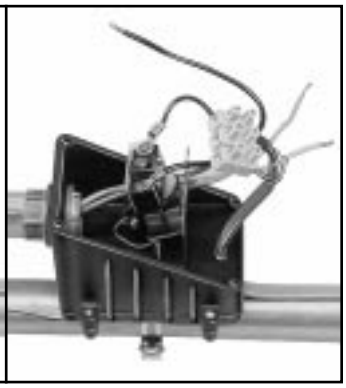


Figure 17

18. FOR RTBC ONLY:
Insert the bared end of the ground wire into the opening of the terminal block which is opposite of the braid (or is empty). Insert the ends of the other hot (or neutral) and the 8 inch long wire into the two remaining openings in the terminal block. Tighten screws firmly to hold conductors in place. See Figure 18.

19. FOR RTBC-EP ONLY:
Slide the bared end of the hot power lead into the opening in the terminal block which is opposite of the empty terminal. Slide the bared end of the other hot or the neutral power lead into the middle opening of the terminal block. Tighten the screws firmly to hold the wires in place. See Figure 19.

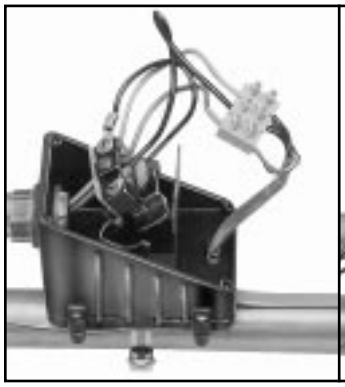


Figure 18

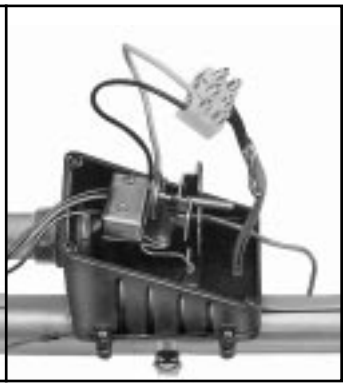


Figure 19

20. FOR RTBC-EP ONLY:
A. Slide the bared end of the black (NORMALLY CLOSED) thermostat wire into the opening of the terminal block which is next to the incoming power leads.
B. Slide the bared end of the purple (COMMON) thermostat wire into the opening opposite of the hot power lead. Tighten the screws firmly to hold the wires in place. See Figures 20A and 20B.

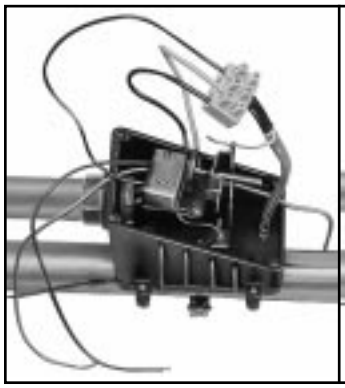


Figure 20A

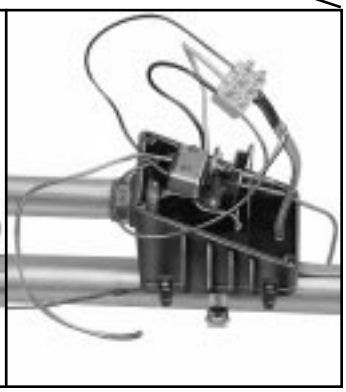


Figure 20B

21. FOR RTBC-EP ONLY:
Trim the blue (NORMALLY OPEN) thermostat wire so that it is only 2 inches long. Tape over the end of the wire using fiberglass tape. See Figure 21.

22. FOR RTBC-EP WITH OVERCOATED CABLE ONLY:
Slide the bared end of the ground wire into the end of the uninsulated barrel connector. Crimp it on using a crimping tool. Slide the end of the braid pigtail into the other end of the uninsulated barrel connector and crimp it on. See Figure 22.

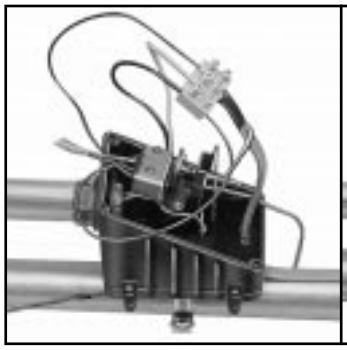


Figure 21

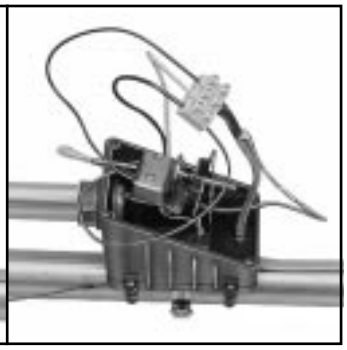


Figure 22

23. FOR ALL CABLE:
Mount terminal block to bottom of the box by driving the 6-32 self-tapping screw into the mounting hole as shown. See Figure 23.

24. FOR ALL CABLE:
Thread the screws into the outside pair of mounting holes of the thermostat leaving approximately 1/8 inch of thread. Slide the screws into the slots in the mounting bracket. Push the thermostat down as far as it will go and tighten the screws firmly. See Figure 24.

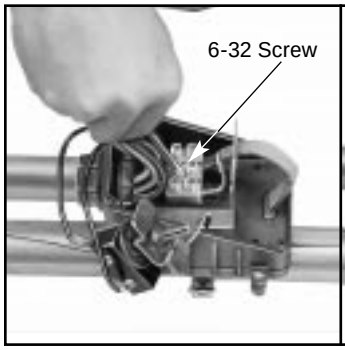


Figure 23

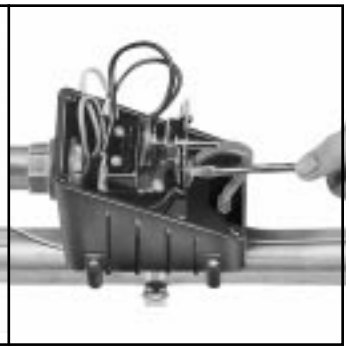


Figure 24

25. FOR ALL CABLE:
Push the knob onto the shaft of the thermostat. Adjust thermostat to desired temperature setting. See Figure 25.

26. FOR ALL CABLE:
Carefully push wires into the box. Secure lid to box. See Figure 26.

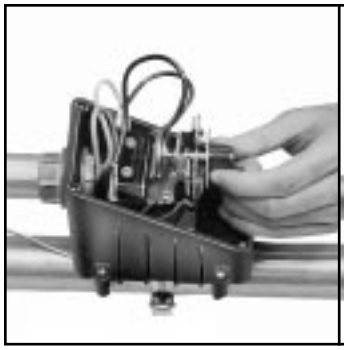


Figure 25

Figure 26

27. FOR CABLE WITH EXPOSED METAL BRAID:
Unravel four inches of braid from the cable and twist into a pigtail. Connect to appropriate grounding source. See Figure 27.

Figure 27

28. FOR ALL CABLE:
Extend capillary to allow bulb to be placed in desired location. The bulb should be placed on the bottom half of the pipe spaced 90˚ from the nearest heating cable or centered between equally spaced heaters. Do not locate the bulb within 3feet of a pipe support or other heat sink.

WARRANTY AND LIMITATION OF REMEDY AND LIABILITY

Chromalox warrants only that the Products and parts manufactured by Chromalox, when shipped, and the work performed by Chromalox when performed, will meet all applicable specification and other specific product and work requirements (including those of performance), if any, and will be free from defects in material and workmanship under normal conditions of use. All claims for defective or nonconforming (both hereinafter called defective) Products, parts or work under this warranty must be made in writing immediately upon discovery, and in any event, within one (1) year from delivery, provided, however all claims for defective Products and parts must be made in writing no later than eighteen (18) months after shipment by Chromalox. Defective and nonconforming items must be held for Chromalox's inspections and returned to the original f.o.b. point upon request. THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

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Post House Apartments
Heat trace

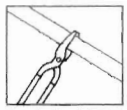
SRL

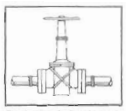
Self-Regulating Low Temperature Heating Cable

- Self-Regulating, Energy Efficient
- 16 AWG Buss Wire
- Circuit Lengths to 660 Feet
- Process Temperature Maintenance to 150°F (65°C)
- Maximum Continuous Exposure Temperature (Power Off) 185°F (85°C)
- Industrial Freeze Protection Applications
- Freeze Protection of Fire Protection System Piping
- Field Splicing Without Disrupting Heat Output
- 3, 5, 8 and 10 Watts per Foot
- 120 and 208-277 Volts Available From Stock
- Approximate Size 3/8" x 1/8"
- Minimum Bend Radius is 1-1/8"

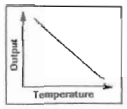
UL ◀FM▶ CSA

Chromalox®
PRECISION HEAT AND CONTROL


Cut to Any Length in Field


Can be Single Overlapped

Low Temperature



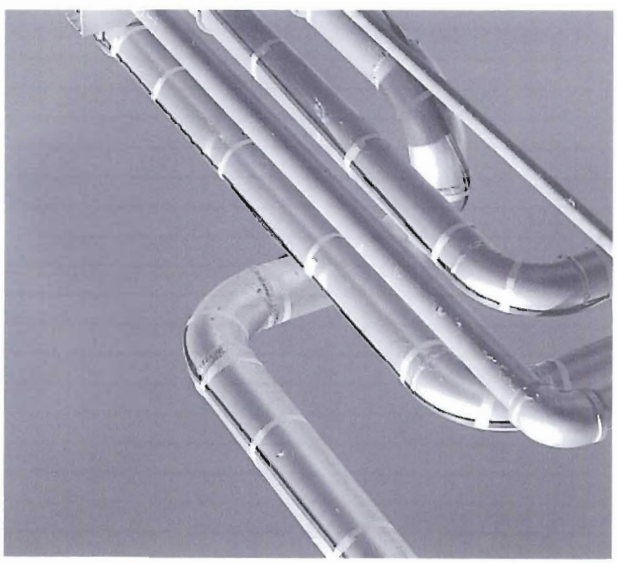
Self Regulating

Description

Chromalox SRL self-regulating heating cable provides safe, reliable heat tracing for freeze protection of pipes, valves, tanks and similar applications. Constructed of industrial grade 16 AWG buss wire with a tinned copper braid and optional overjacketing, SRL ensures operating integrity in Div. 2 hazardous environments as well as certain corrosive industrial environments. SRL heating cable has a maximum maintenance temperature rating of 150°F (65°C).

Features

- Energy efficient, self-regulating SRL uses less energy when less heat is required.
- Easy to install, SRL can be cut to any length (up to maximum circuit length) in the field.
- Field splices can be performed easily in minutes with no scrap or wasted cold sections.
- SRL features lower installed cost than steam tracing, less maintenance expense, and less downtime.
- SRL can be single overlapped without burnout, which simplifies heat tracing of in-line process equipment such as valves, elbows and pumps.
- Because SRL is self-regulating, overtemperature conditions are virtually impossible.
- Chromalox termination, splice, tee and end seal kits reduce installation time.
- UL listed for use on fire protection System piping



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Post House Apartments
Heat trace

SRL – Self-Regulating Low Temperature Heating Cable

Construction

Twin 16 AWG Copper Buss Wires	Provide reliable electrical current capability.
Semiconductive Polymer Core Matrix	"Self-Regulating" component of the cable, its electrical resistance varies with temperature. As process temperature drops, the core's heat output increases; as process temperature rises, the heat output decreases.
Water Resistant Polyolefin Jacket	Flame retardant, electrically insulates the matrix and buss wires and provides resistance to water and some inorganic chemical solutions.
Tinned Copper Braid	Provides additional mechanical protection in any environment, and a positive ground path.
High Temperature Fluoropolymer or TPR Overjacket (Optional)	Corrosion resistant, flame retardant overjacket is highly effective in many environments. TPR coatings protect against certain inorganic chemical solutions. Fluoropolymer coatings are used for exposure to organic or corrosive solutions. These coatings also protect against abrasion and impact damage.

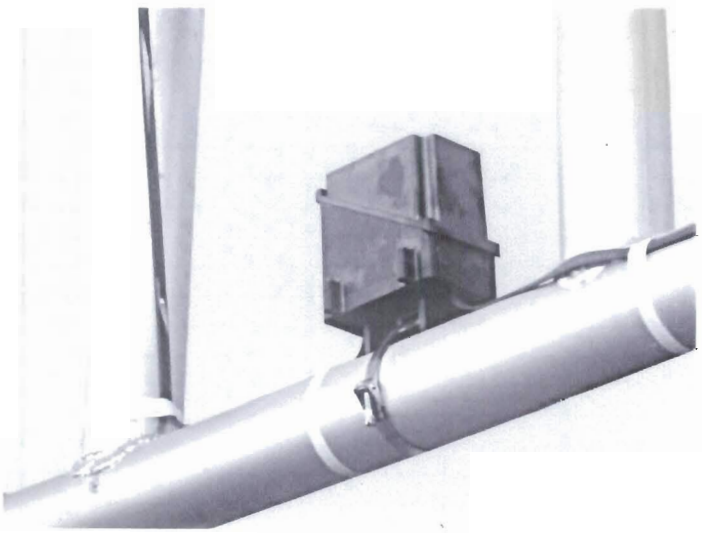
Approvals

FM – Factory Mutual approved for ordinary areas.
UL Listed, CSA Certified for ordinary areas.
UL Listed for fire protection system piping
FM approved for hazardous (classified) areas when used with Chromalox accessories:

- Class I, Div. 2, Groups B, C, D (gases, vapors)
- Class II, Div. 2, Groups F, G (combustible dust)
- Class III, Div. 2 (easily ignitable fibers and filings)
- 3 Watt rated T6 temperature class
- 5 and 8 Watt rated T5 temperature class
- 10 Watt rated T4A temperature class

CSA Certified for hazardous (classified) areas when used with Chromalox accessories:

- Class I, Div. 2, Groups A, B, C, D;
- Class II, Div. 2, Groups F, G



Applications

- Process Temperature Maintenance
- Freeze Protection of Pipes
- Freeze Protection of Fire Protection System Piping
- Fluid Flow and Viscosity Maintenance

Self-Regulating Low Temperature Heating Cable – SRL

Heating Cable System Design

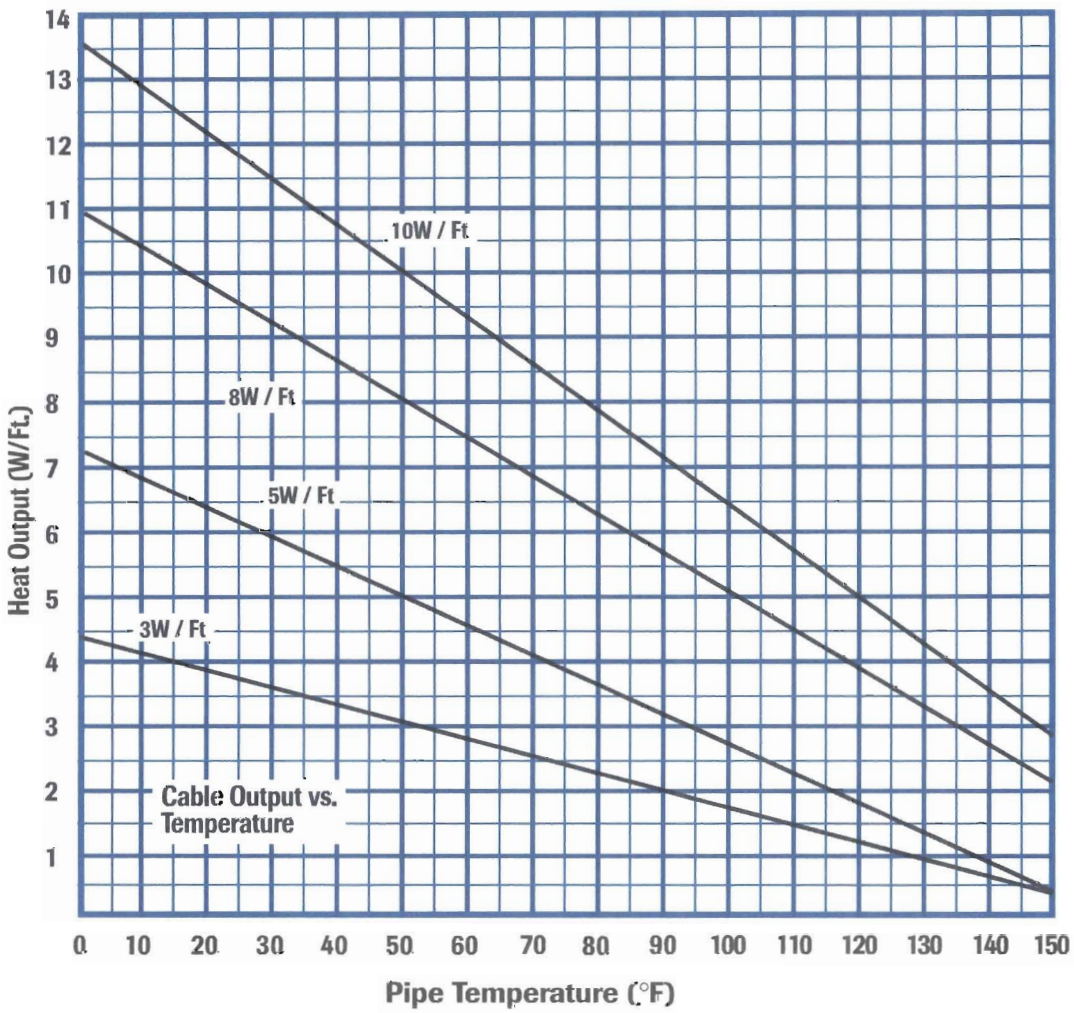
1. Calculate Heat Loss

Using the Chromalox Design Guide (PJ 304) for Heat Tracing, calculate the heat loss of the system. To calculate the heat loss (Watts) you will need to know pipe diameter, insulation type and thickness, minimum ambient temperature and the pipe maintenance temperature.

2. Select Cable Rating

After calculating the heat loss in the pipe and adjusting for any application deviations, you may determine which cable rating to choose. Using the SRL Thermal Output Ratings graph, select the lowest cable rating that will provide the pipe maintenance temperature. Adjust the cable output for line voltage if necessary. See figures from output wattage at alternative voltages table on page 5.

Thermal Output Ratings On Insulated Metal Pipe



Post House Apartments
Heat trace

SRL — Self-Regulating Low Temperature Heating Cable

3. Determine Total Cable Length

In addition to the system piping, in-line equipment such as valves, flanges and pipe supports require additional heat tracing to maintain the system operating temperatures.

Total feet of traced pipe + Cable allowance for components = Total cable length

Component Cable Allowances

Component	Cable Allowance (Ft.)		# of Components		Total Additional Cable
Flange Pair	1.5	x	_____	=	_____
Pipe Support	2.0	x	_____	=	_____
Butterfly Valve	2.5	x	_____	=	_____
Ball Valve	2.7	x	_____	=	_____
Globe Valve	4.0	x	_____	=	_____
Gate Valve	5.0	x	_____	=	_____

If spiral wrapping or multiple runs of cable are being used, adjust the allowance by multiplying by the wrapping factor or the number of runs being used on the pipe.
Guidelines for tracing tanks and vessels are also given in the Chromalox Design Guide (PJ304).

4. Determine Circuits/Circuit Protection

Circuit protection depends on the breaker size being used and the start-up temperature. The National Electric Code (NEC 1999) requires the use of ground fault protection breakers for heating cable. The following chart shows the maximum circuit length for a given breaker rating. To determine the number of circuits required for each pipe, divide the total cable (circuit) length found in Step 3 by the maximum circuit length found in the chart. Round up to the next higher number.

$$\textit{Number of Circuits} = \frac{\textit{Heater Length}}{\textit{Maximum Circuit Length}}$$

Maximum Circuit Length (Ft.) by Start-up Temperature (°F) and Breaker Size (Amps)

Cable Rating	50°F Start-Up (Ft.) Circuit Breaker	10 A	15 A	20 A	25 A	30 A	40 A	0°F Start-Up (Ft.) Circuit Breaker	10 A	15 A	20 A	25 A	30 A	40 A	-20°F Start-Up (Ft.) Circuit Breaker	10 A	15 A	20 A	25 A	30 A	40 A
SRL3-1C		205	305	360	NR	NR	NR		135	200	270	330	360	NR		120	185	245	300	360	NR
SRL3-2C		400	600	660	NR	NR	NR		275	415	555	660	NR	NR		245	370	495	600	660	NR
SRL5-1C		125	185	250	270	NR	NR		90	135	180	225	270	NR		80	120	160	205	245	270
SRL5-2C		250	375	505	540	NR	NR		180	270	360	450	540	NR		160	245	325	405	490	540
SRL8-1C		100	150	200	215	NR	NR		70	110	145	180	215	NR		65	100	130	165	200	210
SRL8-2C		185	285	375	420	NR	NR		135	200	265	335	395	420		120	175	235	300	350	420
SRL10-1C		60	95	130	160	180	NR		50	80	105	130	155	180		45	70	95	120	140	180
SRL10-2C		100	160	210	260	315	360		80	125	170	210	255	340		75	120	160	195	240	320

*Thermal magnetic circuit breakers are recommended since magnetic circuit breakers could "nuisance trip" at low temperature.
NR = Not Required. Maximum circuit length has been reached in a smaller breaker size.

Post House Apartments
Heat trace

Self-Regulating Low Temperature Heating Cable – SRL

Specifications

Cable Ratings

Model Number	Output @ 50°F (W/Ft.)	Nominal Voltage (Vac)	Maximum Circuit Length* (Ft.)
SRL3-1C	3	120	360
SRL3-2C	3	208-277	660
SRL5-1C	5	120	270
SRL5-2C	5	208-277	540
SRL8-1C	8	120	215
SRL8-2C	8	208-277	420
SRL10-1C	10	120	180
SRL10-2C	10	208-277	360

*See chart on page 4 for maximum circuit lengths by start-up temperature and circuit breaker size

Output Wattage at Alternate Voltages (50°F) W/Ft.

Cable Rating	208 Volts	% Change In Output	220 Volts	% Change In Output	277 Volts	% Change In Output
SRL3	2.4	-20	2.6	-13	3.4	+15
SRL5	4.1	-18	4.5	-10	5.6	+13
SRL8	6.88	-14	7.28	-9	8.96	+12
SRL10	8.7	-13	9.2	-8	11.1	+10

Ordering Information

Output (W/Ft.)	Voltage (Vac)	Model Number	PCN
3	120	SRL3 - 1C	382678
		SRL3 - 1CR	382731
		SRL3 - 1CT	383400
	208-277	SRL3 - 2C	382686
		SRL3 - 2CR	382740
		SRL3 - 2CT	383419
5	120	SRL5 - 1C	382694
		SRL5 - 1CR	382758
		SRL5 - 1CT	383443
	208-277	SRL5 - 2C	382707
		SRL5 - 2CR	382766
		SRL5 - 2CT	383451
8	120	SRL8 - 1C	382555
		SRL8 - 1CR	382598
		SRL8 - 1CT	383460
	208-277	SRL8 - 2C	382563
		SRL8 - 2CR	382600
		SRL8 - 2CT	383478
10	120	SRL10 - 1C	382820
		SRL10 - 1CR	382846
		SRL10 - 1CT	383486
	208-277	SRL10 - 2C	382838
		SRL10 - 2CR	382854
		SRL10 - 2CT	383494

To Order: Specify length, Model Number, PCN and Installation Accessories.

SRL — Self-Regulating Low Temperature Heating Cable

Model Numbers

SRL **5** - **1** **C** **T**

Overcoat Options
T = Fluoropolymer corrosion resistant overjacket over braid for hostile/ corrosive environments
R = TPR overjacket over braid for protection against certain inorganic chemical solutions

Braid
C = Standard tinned-copper metallic braid for ground path

Voltage
1 = 120 Volts
2 = 208-277 Volts

Output (watts)
3, 5, 8, 10 Watts per Foot

SRL
Self-Regulating, Low Temperature Heating Cable

Accessories

Chromalox has a complete line of accessories specifically designed for use with SRL cable. Use only Chromalox accessories to ensure the performance of the heat trace system.

	Model	Description
Thermostat	RTAS	DL Series air-sensing thermostat with Microswitch® for local control of circuit.
	RTBC	DL Series pipewall-sensing thermostat with Microswitch® for local control of circuit.
Power Connection	RTPC	DL Series power connection set kit.
	RTST	DL Series splice and tee set kit.
	RTES	DL Series end seal kit.
Pipe Straps	PS-1, PS-3, PS-10	Pipe straps to affix thermostat and power connection splice kits to pipes.
Fiberglass Tape	FT-2	Tape to affix cable to pipe, 66' x 1/2" roll, install on 12" centers.
Aluminum Tape	AT-1	Tape to aid heat transfer, 180 foot roll. Apply over cable along entire length of circuit.
Caution Labels	CL-1	"Electrical Heat Tracing" caution labels, 5 per package. Install every 10 feet.
Control Panels		Contact your Chromalox representative for Control Panel information.

Note - For PCN's, refer to the DL Series connection system accessories product data sheet.

Post House Apartments
Heat trace

DL

Series Connection System Accessories

Power Connection Box
- NEMA 4X Enclosure
- Cable Entry up to 3 Cables
- 3/4" Conduit Hub Opening

Splice & Tee Box
- NEMA 4X Enclosure
- Cable Entry, up to 3 Cables
- Straight or Tee Connections

End Seal Fitting
- NEMA 4X Enclosure
- Fits all pipe sizes
- Feet for Installing on Flat Surfaces

Description

The DL Series Connection System for Chromalox heating cable products represents the state of the art in heat tracing accessories. Each model in the series is designed to satisfy the demands of a particular operation. These high-quality models combine a variety of functions in a convenient, easy to use and economical package.

Applications

Connection of all Rapid Trace Heating Cables to Customer Supplied Power Wiring in any of the following applications:

- Freeze Protection
- Hydrocarbon and Chemical Product Piping
- Process Temperature Maintenance
- Fluid Flow and Viscosity Maintenance

Approvals*

UL Listed for use in ordinary areas

CSA Certified for use in ordinary areas and
Class I, Div. 2, Groups A, B, C, D
Class II, Div. 2, Groups F, G

FM - Factory Mutual Certified for use in ordinary and
Class I, Div. 2, Groups B, C, D
Class II, Div. 2, Groups F, G
Class III, Div. 2 areas

* Depends on specific model

Features

- Molded of durable plastic material (Ryton®, PPS)
- High service temperature
- Corrosion resistant
- Thermal stability
- Non-flammable
- High strength and rigidity
- Stainless Steel hardware to ensure the integrity of the system
- Liquid tight design prevents moisture from reaching the electrical connections. All models are rated NEMA 4X.
- UL, FM, CSA approved for most models, consult specific product information.

Ryton®, is a registered trade name of Phillips Chemical Company.

Chromalox®
PRECISION HEAT AND CONTROL

PH: 615-793-3900 • FX: 615-793-3563 www.chromalox.com

DL - Series Connection System Accessories

Available Models

RTPC
Power Connection Box
Model RTPC Power Connection Box is a NEMA 4X rated junction box designed to connect all Chromalox Rapid Trace Heating Cables to customer supplied power wiring. This kit provides water resistant cable entry for up to three cables, enclosure support, terminal block and a water resistant, corrosion resistant wiring enclosure with a 3/4" opening to accept a conduit hub (CCH-2 or equal). A pipe strap (Chromalox PS Series or equal) is required to attach this model to a pipe.

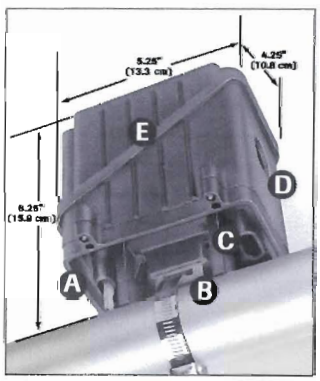
*** Also available with signal light option**

RTST
Splice & Tee Box
Model RTST Splice & Tee Box is a NEMA 4X rated junction box designed to make straight or tee splices for all Chromalox Rapid Trace Heating Cables. This model provides water resistant cable entry (for two cables for a splice or three cables for a tee), enclosure support, terminal block and a water resistant, corrosion resistant wiring enclosure. A pipe strap (Chromalox PS Series or equal) is required to attach this model to a pipe.

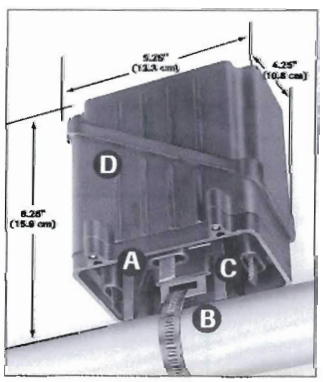
*** Also available with signal light option**

RTES
End Seal Fitting
Model RTES End Seal Fitting is a NEMA 4X rated enclosure designed to terminate all Chromalox Rapid Trace Heating Cables. This model provides water resistant cable entry for one cable, enclosure support and a water resistant corrosion resistant enclosure. The fitting has two different curved mounting surfaces. One side has a 1-1/2" radius curved surface that provides stable support on pipes with a diameter of 3" or more. The other side has a 1/2" radius curved surface which permits a better fit on smaller pipes. In addition, this side also has four "feet" for installation on flat surfaces.

Exterior Construction



- **A** Strategically placed cable entries allow maximum flexibility for insulation (Heating cable cut away for clarity)
- **B** Stainless steel tiedown support provides positive attachment to pipes (Pipe strap not included)
- **C** Heavy duty support legs give stable pipe mounting and provide conduit clearance for applications with up to three inches of insulation
- **D** Opening for 3/4-inch (20 mm) conduit hub
- **E** Oblique sided box and cover allow easy access for wiring



- **A** Strategically placed cable entries allow maximum flexibility for insulation (Heating cable cut away clarity)
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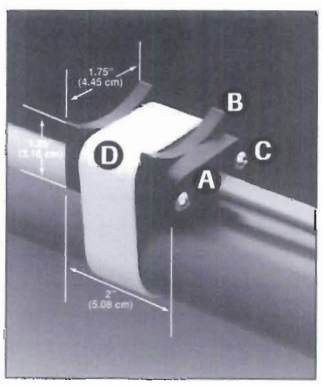
- **C** Heavy duty support legs give stable pipe mounting and provide conduit clearance for applications with up to three inches of insulation
- **D** Oblique sided box and cover permit easy access for wiring

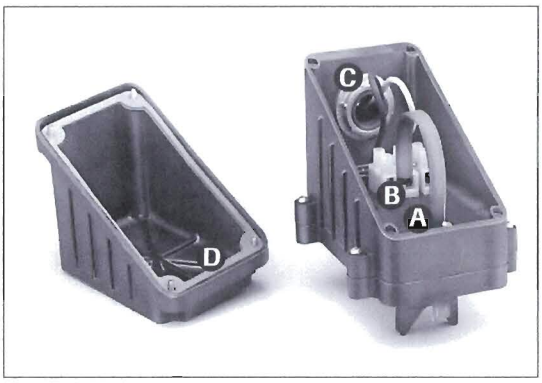


- **A** Cable entry
- **B** Three inch diameter curved mounting surface
- **C** Stainless steel hardware
- **D** One inch wide strapping channel for secure mounting

DL - Series Connection System Accessories

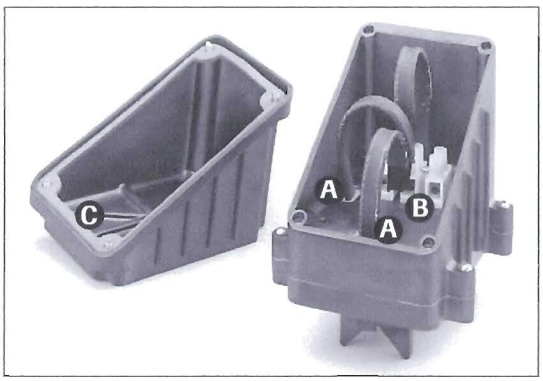
Interior Construction

RTPC



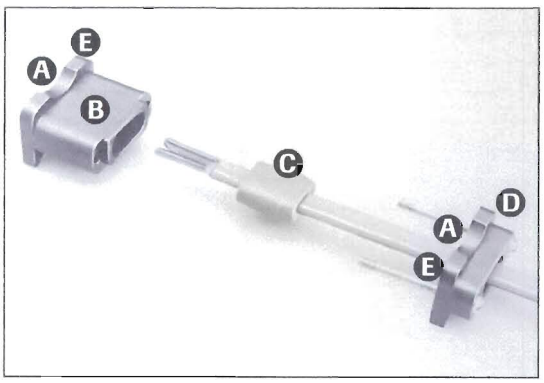
- Ⓐ Cable grommet provides watertight seal between base and box
- Ⓑ Three position terminal block for easy wiring
- Ⓒ Power wiring entry. Conduit hub not included
- Ⓓ Gasket provides water resistant seal between box and lid. It is affixed to the lid and captures the mounting hardware

RTST



- Ⓐ Cable grommets provide water resistant seal between base and box
- Ⓑ Three position terminal block for easy wiring
- Ⓒ Gasket provides water resistant seal between box and lid. It is affixed to the lid and captures the mounting hardware

RTES



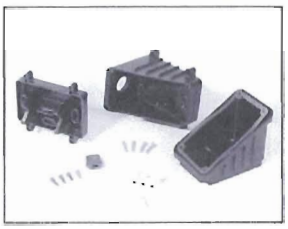
- Ⓐ One-half inch radius curved mounting surface
- Ⓑ End cap
- Ⓒ Cable grommet provides water resistant seal between end cap and pressure plate
- Ⓓ Pressure plate
- Ⓔ Mounting feet for installation on flat surfaces

Post House Apartments
Heat trace

Series Connection System Accessories - DL

Ordering Information

RTPC
384796

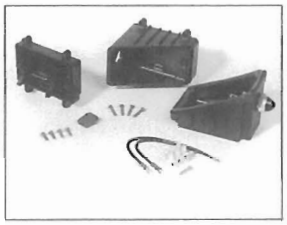


Power Connection Kit

1 molded junction box consisting of:
- 1 base
- 1 box w/conduit opening
- 1 lid

1 three position terminal block*
1 mounting screw for terminal block
cable grommet(s) must be ordered separately

RTPC-SL1 388877
RTPC-SL2 388885
RTPC-SL3 388893



Power Connection Kit w/ Signal Light

1 molded junction box consisting of:
- 1 base
- 1 box w/conduit opening
- 1 lid *w/signal light installed*

1 three position terminal block*
1 mounting screw for terminal block
cable grommet(s) must be ordered separately

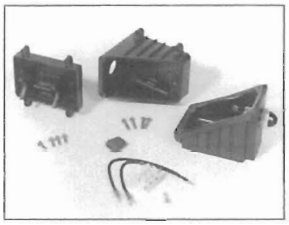
RTST
384809

Splice & Tee Kit

1 molded junction box consisting of:
- 1 base
- 1 box
- 1 lid

1 three position terminal block*
1 mounting screw for terminal block
cable grommet(s) must be ordered separately

RTST-SL1 389140
RTST-SL2 389159
RTST-SL3 389167



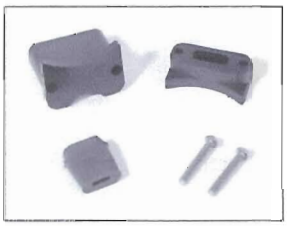
Splice & Tee Kit w/Signal Light

1 molded junction box consisting of:
- 1 base
- 1 box
- 1 lid *w/signal light installed*

1 three position terminal block*
1 mounting screw for terminal block
cable grommet(s) must be ordered separately

** Signal light option approved for ordinary areas only. For signal lights in hazardous locations, please see EL Series Data Sheet PJ321-1

RTES
384817



End Seal Kit

1 end cap
1 pressure plate
cable grommet(s) must be ordered separately

* Four position terminal block required for monitor wire cables. Contact factory for details.

Kits

Model	PCN	Stock	Wt.(Lbs.)
RTPC	384796	S	1
RTST	384809	S	1
RTES	384817	S	1
RTPC-SL1 (120V)	388877	S	2
RTPC-SL2 (208-240V)	388885	S	2
RTPC-SL3 (277V)	388893	S	2
RTST-SL1 (120V)	389140	S	2
RTST-SL2 (208-240V)	389159	S	2
RTST-SL3 (277V)	389167	S	2

The appropriate grommet must be ordered separately to provide a water tight seal to the accessory. Select the appropriate grommet from the table and order 1 grommet for every cable which must enter the accessory.

Grommets

Model	Used With	PCN	Stock	Wt.(Lbs.)
GR-1	SRL-C	385027	S	0.2
GR-2	SRL-CR, SRL-CT	385035	S	0.2
GR-3	CWM-C	385043	S	0.2
GR-4	CWM-CT	385051	S	0.2
GR-5	SRL-MC	385060	S	0.2
GR-6	SRL-MCR, SRL-MCT	385078	S	0.2
GR-7	SRM/E-C	385086	S	0.2
GR-8	SRM/E-CT	385094	S	0.2

Series Connection System Accessories - DL

Ordering Information (Cont.)

PS-1
382352

Metal Pipe Strap Kit Attachments

1/2" to 3/4" pipes

PS-3
382360

Metal Pipe Strap Kit Attachments

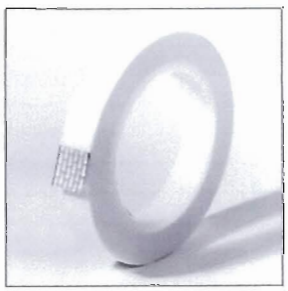
1" to 3 1/2" pipes

PS-10
382379

Metal Pipe Strap Kit Attachments

2 1/2" to 9" pipes with RTPC and RTST kits. Interlock straps for larger diameter pipes.

FT-1
382520



Fiberglass Tape Cable Attachments

180 foot roll glass cloth tape with pressure-sensitive thermosetting adhesive 3/4" wide. 310°F (155°C) rating. Strap at one foot intervals at minimum application temperatures of 40°F (5°C).

FT-2
383611

Fiberglass Tape Cable Attachments

66 foot roll glass cloth tape with pressure-sensitive thermosetting silicone adhesive 1/2" wide. 310°F (155°C) rating. Strap at one foot intervals at minimum application temperatures of 40°F (5°C).

AT-1
383355

Aluminum Tape Cable Attachments

180 foot roll aluminum foil installation tape with pressure sensitive acrylic adhesive. 2-mil thickness with high tensile strength; 2 1/2" wide. 200°F (93°C) rating. Minimum application temperatures 40°F (5°C).

DL - Series Connection System Accessories

Ordering Information (Cont.)

CCH-1
385166

Conduit Hub Cable Attachments

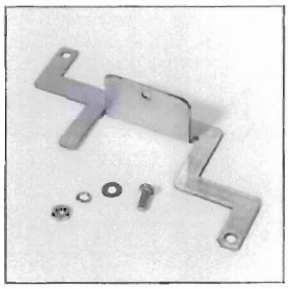
Corrosion Resistant for 3/4" Conduit
Fits opening in RTPC.

CCH-2
385650

Conduit Hub Cable Attachments

Corrosion Resistant for 3/4" Conduit
Fits opening in RTPC. Includes a ground connector.

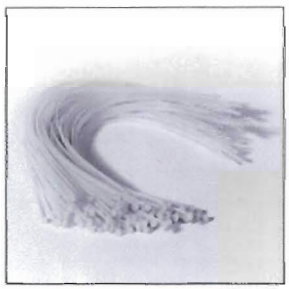
MP-1
385780



Mounting Plate Kit Attachments

For installing RTPC and RTST kits on flat surfaces. Kit includes:
1 mounting plate
1 lock washer
1 bolt
1 washer
1 nut

CT-100
383283



Cable Tie Cable Attachments

100 nylon cable ties. Economical and strong for snug fit. UL component recognized to 185°F (85°C). No tools necessary; apply at 1' intervals. Straps can interlock for larger diameter pipes; where,
1 strap accommodate up to 3" dia. pipe
2 straps accommodate up to 6" dia. pipe
3 straps accommodate up to 10" dia. pipe
4 straps accommodate up to 16" dia. pipe

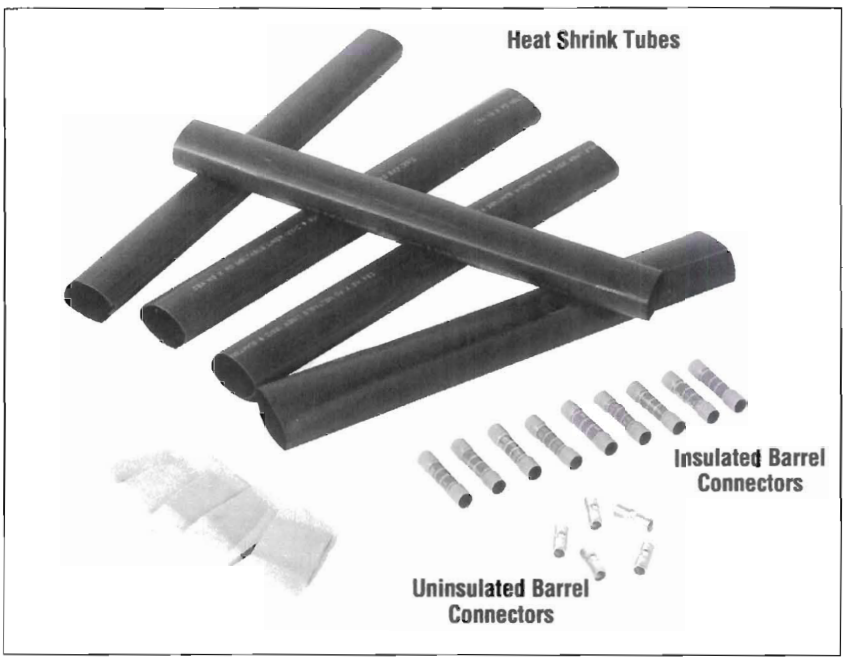
Chromalox®

Post House Apartments
Heat trace

Installation Instructions

SERVICE REFERENCE		
DIVISION 4	SECTION RT	
SALES REFERENCE	(Supersedes PJ445-7)	PJ445-8
		161-511934-001
DATE	MARCH, 2004	

RT-RST Splice & Tee Kit for Self-Regulating Rapid-Trace Heating Cable



RT-RST Splice and Tee Kit Parts:

5 - 8" Long Heat Shrink Tubes
5 - 1/2" Lengths of Sealant Tape
10 - Insulated Barrel Connectors
5 - Uninsulated Barrel Connectors

GENERAL

⚠WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power before installing or servicing heating cable and accessories. A qualified person must perform installation and service of heating cable and accessories. Heating cable must be effectively grounded in accordance with the National Electrical Code. Failure to comply can result in personal injury or property damage.

The RT-RST Kit is used to make straight and tee splices for base, braided (-C) and overcoated (-CR & -CT) cables in ordinary locations. Consult factory for installation of braided cable in hazardous locations. Check the kit label to insure you have the proper kit for the cable you are installing. This kit contains enough parts to make five (5) splices. Materials required include: sharp utility knife, standard electrical cutters, propane torch or heat gun, needle nose pliers, Thomas & Betts crimping tool WT-145C and fiberglass tape (Chromalox FT-1 or equal).

Electrical connections must be in accordance with the National Electrical or local codes by a qualified person. Ground fault protection is required. Verify with the codes whether personnel protection, GFCI or equipment protection, EPD is required.

Post House Apartments
Heat trace

INSTALLATION

NOTE: These instructions are for Self-Regulating heating cables in ordinary locations. Consult factory for installation of braided cable in hazardous locations. Not all instructions are for all cables. Each step has a heading in boldface stating what type of cable that instruction is for.

1. **FOR OVERCOATED CABLE (-CR & -CT):**
   Score the outer jacket 1-1/2 inches form the end of each cable. Remove the jacket to expose the braid. See Figure 1.

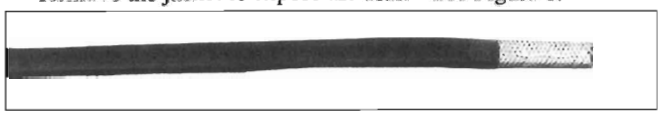


Figure 1

2. **FOR BRAIDED (-C) AND OVERCOATED CABLE (-CR & -CT):**
   Unravel 1-1/2 inches of braid, then pigtail the strands together. For straight splices, arrange the pigtails on top of both cables. For tee splices, arrange the pigtails on the corresponding sides of all three cables. See Figure 2A and 2B.

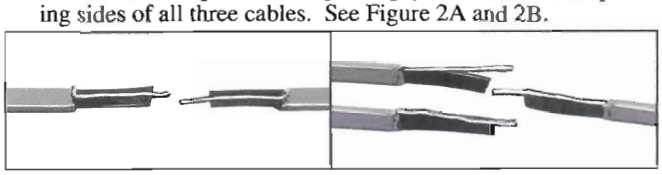


Figure 2a **Figure 2b**

3. **FOR ALL CABLE:**
   Using standard electrical cutters, cut a 3/4 inch long notch out of each cable between the conductor wires. Bare a 3/8 inch length of each conductor by stripping off the outside insulation and the inner black core material. See Figure 3.

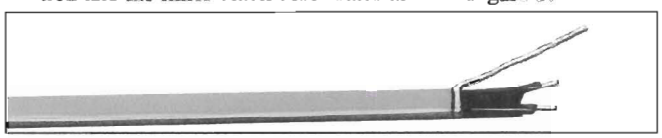


Figure 3

4. **FOR TEE SPLICES ONLY:**
   Tape two of the heating cables together using the fiberglass tape 3 inches from the end of the conductors. Twist the corresponding conductors of each cable together. See Figure 4.

⚠WARNING

ELECTRIC SHOCK HAZARD. Do not cross connect two conductors from two heating cables together nor connect two conductors of one heat cable together as either will cause a short circuit. Failure to comply can result in personal injury or property damage.

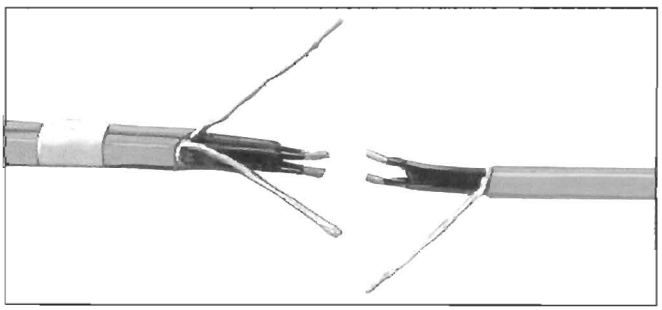


Figure 4

5. **FOR ALL CABLE:**
   Slide an insulated barrel connector over the bare portion of each conductor of one of the cables (or paired cable). Crimp the connector onto the bare portion of the conductors using the T & B crimping tool. See Figure 5.

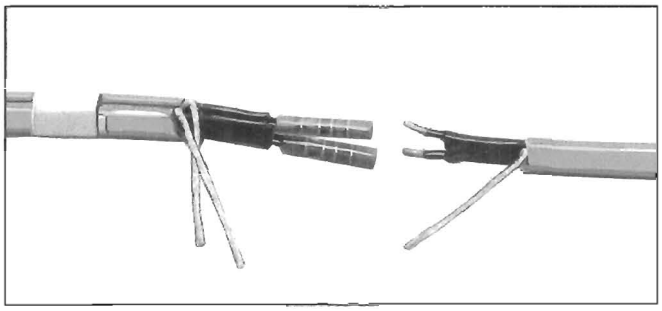


Figure 5

6. **FOR BRAIDED (-C) AND OVERCOATED CABLE (-CR & -CT):**
   Position the metal braided pigtail (or twisted pigtails for the tee splice) on top of and between the two insulated barrel connectors. Cut the pigtail so that it just reaches the midpoint of the insulated barrel connectors. See Figure 6.

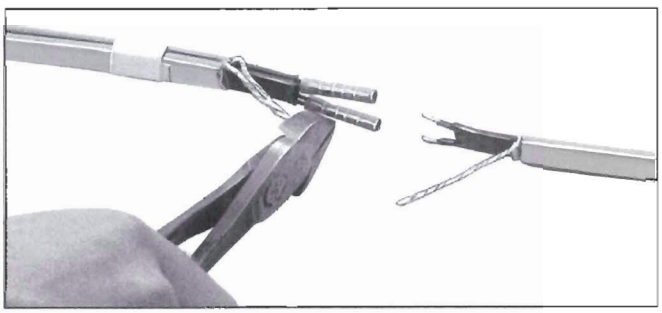


Figure 6

7. **FOR BRAIDED (-C) AND OVERCOATED CABLE (-CR & -CT):**
   Slide one end of an uninsulated barrel connector over the end of the pigtail. Crimp using a standard crimping tool for uninsulated barrel connectors. See Figure 7.

Figure 7

8. **FOR ALL CABLE:**
   (For braided cables (-C only), first push the braids back 10" on the cable with the barrel connectors attached). Carefully slide a length of heat shrink tubing over the cable(s) with the crimped on barrel connectors past the connection area, but DO NOT SHRINK THE TUBE. See Figure 8.

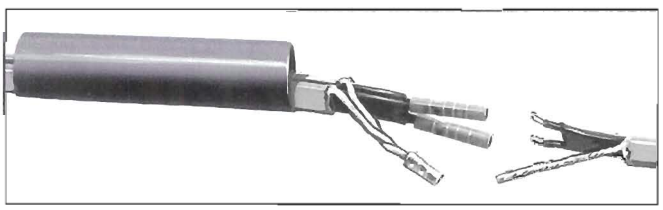


Figure 8

INSTALLATION

9. **FOR ALL CABLE:**
Insert the bared ends of the conductors of the other cable into the uncrimped ends of the insulated barrel connectors. Crimp the insulated barrel connectors onto the bare portions of the conductors using the T & B crimping tool No. WT-145C. See Figure 9.

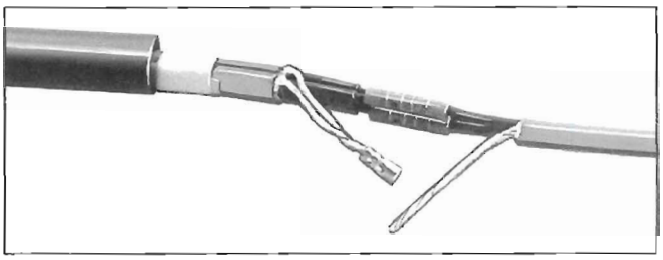


Figure 9

10. **FOR BRAIDED (-C) AND OVERCOATED CABLE (-CR & -CT):**
   A. Wrap the cutting area of the crimped insulated barrel connectors with the fiberglass tape.
   B. Fold the other metal braid pigtail over 1/4" and insert into the open end of the uninsulated barrel connector. Crimp using the standard crimping tool for uninsulated barrel connectors. See Figure 10.

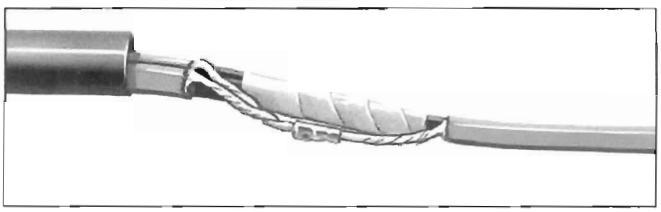


Figure 10

11. **FOR TEE SPLICES ONLY:**
Insert a piece of sealant tape lengthwise between the paired cables and force the cables together. See Figure 11.

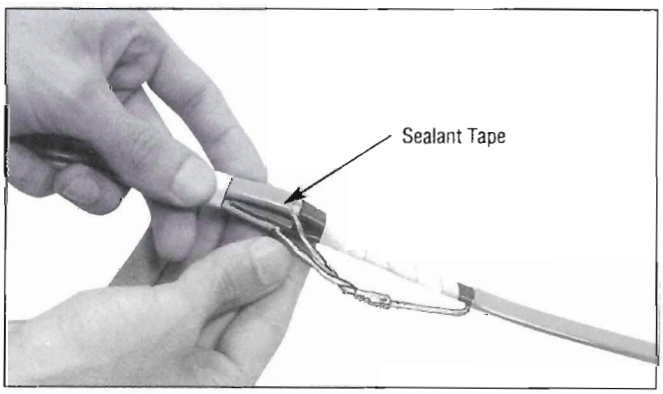


Figure 11

12. **FOR ALL CABLE:**
Slide the length of heat shrink tubing over the splice so that the barrel connectors are centered in the tubing. See Figure 12.

Figure 12

13. **FOR ALL CABLE:**
Using a propane torch or heat gun, apply heat evenly until the tube shrinks around the cable and the adhesive liner melts. Pinch both ends of the tube for 30 seconds or until cool. Both ends should remain visibly sealed when cool. If not, gently reheat and pinch again. See Figure 13.

⚠WARNING

FIRE/EXPLOSION HAZARD. In hazardous location environments (Div. 2) verify that the area is not hazardous before utilizing heat gun on heat shrink tubing. Do not overheat tube or cable. Keep the heat source moving at all times.

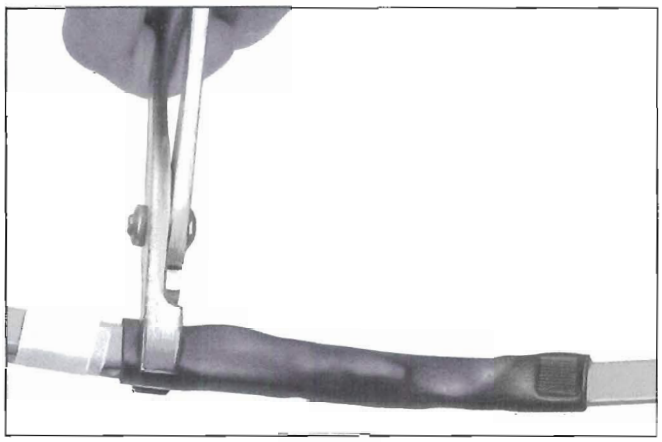


Figure 13

14. **FOR BRAIDED CABLE (-C):**
Extend the braids over the heat shrink connection. Insert the bare metal braided pigtail into the open end of the uninsulated barrel connector. Crimp using a standard crimping tool for uninsulated barrel connectors. See Figure 14.

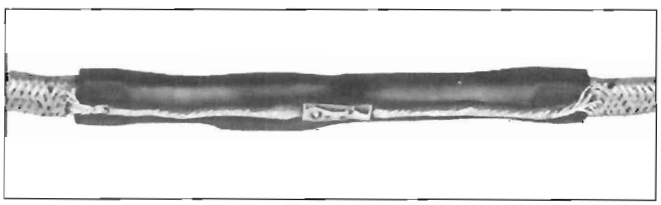


Figure 14

15. **FOR ALL CABLE:**
Secure all cables to the pipe(s). See Figure 15.

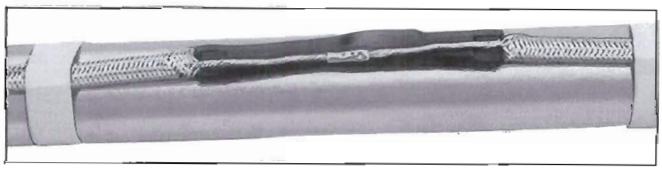


Figure 15

Post House Apartments
Heat trace

WARRANTY AND LIMITATION OF REMEDY AND LIABILITY

Chromalox warrants only that the Products and parts manufactured by Chromalox, when shipped, and the work performed by Chromalox when performed, will meet all applicable specification and other specific product and work requirements (including those of performance), if any, and will be free from defects in material and workmanship under normal conditions of use. All claims for defective or nonconforming (both hereinafter called defective) Products, parts or work under this warranty must be made in writing immediately upon discovery, and in any event, within one (1) year from delivery, provided, however all claims for defective Products and parts must be made in writing no later than eighteen (18) months after shipment by Chromalox. Defective and nonconforming items must be held for Chromalox's inspections and returned to the original f.o.b. point upon request. THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Notwithstanding the provisions of this WARRANTY AND LIMITATION Clause, it is specifically understood that Products and parts not manufactured and work not performed by Chromalox are warranted only to the extent and in the manner that the same are warranted to Chromalox by Chromalox's vendors, and then only to the extent that Chromalox is reasonably able to enforce such warranty, it being understood Chromalox shall have no obligation to initiate litigation unless Buyer undertakes to pay all cost and expenses therefor, including but not limited to attorney's fees, and indemnities Chromalox against any liability to Chromalox's vendors arising out of such litigation.

Upon Buyer's submission of a claim as provided above and its substantiation, Chromalox shall at its option either (i) repair or replace its Products, parts or work at the original f.o.b. point of delivery or (ii) refund an equitable portion of the purchase price.

THE FOREGOING IS CHROMALOX'S ONLY OBLIGATION AND BUYER'S EXCLUSIVE REMEDY FOR BREACH OF WARRANTY, AND IS BUYER'S EXCLUSIVE REMEDY AGAINST CHROMALOX FOR ALL CLAIMS ARISING HEREUNDER OR RELATING HERETO WHETHER SUCH CLAIMS ARE BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES. BUYER'S FAILURE TO SUBMIT A CLAIM AS PROVIDED ABOVE SHALL SPECIFICALLY WAIVE ALL CLAIMS FOR DAMAGES OR OTHER RELIEF, INCLUDING BUT NOT LIMITED TO CLAIMS BASED ON LATENT DEFECTS. IN NO EVENT SHALL BUYER BE ENTITLED TO INCIDENTAL OR CONSEQUENTIAL DAMAGES AND BUYER SHALL HOLD CHROMALOX HARMLESS THEREFROM. ANY ACTION BY BUYER ARISING HEREUNDER OR RELATING HERETO, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES, MUST BE COMMENCED WITHIN ONE (1) YEAR AFTER THE DATE OF SHIPMENT OR IT SHALL BE BARRED.

W2008M

Chromalox®
PRECISION HEAT AND CONTROL
1382 HEIL QUAKER BLVD., LAVERGNE, TN 37086
Phone: (615) 793-3900 www.chromalox.com

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TA - Q4 - EF
Litho in U.S.A.

HERBERT S. NEWMAN AND PARTNERS, PC
300 YORK STREET, NEW HAVEN, CT 06511
203-772-1990 FAX: 203-772-1997

TRANSMITTAL

To: Emil Canaan **From:** Peter Bowman, AIA

Company: Viking Construction
76 Progress Drive
Stamford, CT 06901 **Re:** Post House Apartments

Date: January 25, 2007 **Project #:** 0605.00

WE TRANSMIT:	☒ ENCLOSED	☐ UNDER SEPARATE COVER		
FOR YOUR:	☐ APPROVAL	☐ REVIEW AND COMMENT	☒ USE	☐
THE FOLLOWING:	☐ DRAWING	☐ SPECIFICATIONS	☐ SHOP DRAWING	☐ CHANGE ORDER
	☐ SKETCH	☐ COPY OF LETTER	☒ SUBMITTAL	☐

COPIES	DATE	DESCRIPTION	NOTATION
2	01/03/07	Sub. #32/15000 CWP 1 & 2, VFD's, Air Separator, Expansion Tank, Hydronic Accessories	FAC
2	01/03/07	Sub. #29/15030 Pennant Gas Fired Hot Water Boiler and Accessories	Reviewed
2	01/03/07	Sub. #31/15050 Cooling Towers w/Fans, Motors, Pumps, etc.	FAC
2	01/03/07	Sub. #30/15220 Unit Heaters and Cabinet Unit Heaters	Reviewed; Provide Samples of Available Finishes

REMARKS:

SEND VIA: ☒ OVERNIGHT ☐ 2ND DAY ☐ FIRST CLASS ☐ YOUR MESSENGER ☐ OUR MESSENGER ☐ MODEM

COPIES: ☒ file ☒ V. Tufo (1) ☐ _____ ☐ _____

MECHANICAL MARKETING INC.
MANUFACTURERS REPRESENTATIVE

105 Woodmont Road Milford CT 06460

Area Code 203 877-5800 FAX 203-783-9042

SUBMITTAL DATA & MATERIAL LIST

Project: Post House Apartments Stamford, CT

Engineer: AKF Engineers Stamford, CT

Contractor: Eastern Mechanical Danbury, CT

Materials Submitted for Approval

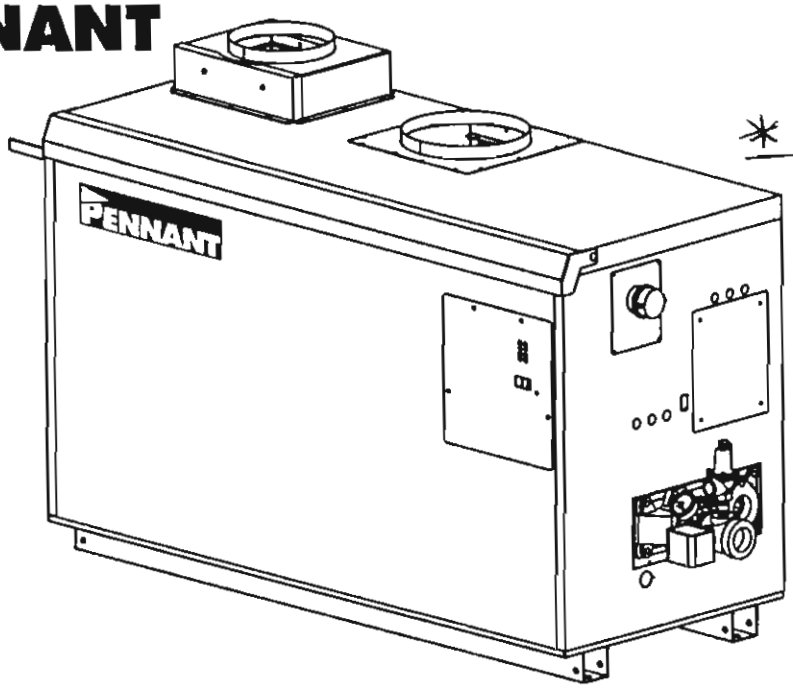
Quantity	Model	Manufacturer	Description
One(1)	PNCH0750NACK2CXN	Laars Htg Systems	Pennant Gas Fired Hot Water Boiler, complete and consisting of: Finned Copper Tube Heat Exchanger, Enamel Glass Lined Cast Iron Headers Two Pass, ASME Stamped for 160 psig Working Pressure, Flanged Water Connections, Natural Gas 750 mbh Input Stainless Steel Burners, Hot Surface Ignition, Burner Sightglass 110/1/60 Power, 24v Control Circuit Multiple Gas Valves/Pressure Regulators Sequence Staged Firing Built In Draft Fan for Category I or III Venting Air Pressure Proving Switch Low Water Cutoff – Probe Style Automatic Reset High Limit Control Master Manual Reset High Limit Control Flow Switch Mounted & Wired ASME Pressure Relief Valve – 75 psig Setpoint Temperature/Pressure Gauge, Flow Switch On/Off Switch, Electronic PID Staging Temperature Controller Intake Air Filter & Housing Integral Pump, Mounted & Wired, Time Delay

Note - Dimensions, Quantity, and Designation per Enclosed Factory Pages

One(1) Supervision of Startup Mechanical Marketing

Prepared by: Robert Smith **Dated:** December 18, 2006

PENNANT



Boiler & Water Heater

PNCH	Hydronic Heater
PNCV	Volume Water Heater

Indoor/Outdoor Sizes 500-2000

Submittal Data LAARS Heating Systems Company

Standard Equipment

- ASME 160 psi working pressure heat exchanger
- ASME "H" stamp
- Flanged water connections
- Glass-lined headers
- External header gaskets
- 75 psi (517 kPa) ASME rated pressure relief valve (PNCH)
- 125 psi (861 kPa) ASME rated pressure relief valve (PNCV)
- Flow switch
- Multiple operating gas valve/ pressure regulators
- Temperature pressure gauge
- Manual "A" gas valve
- Intake air filter
- Multiple, removable burner trays
- Stainless steel burners
- Built-in draft fan for Category I or III vent systems
- Air pressure switch
- Burner site glass
- 24V control system
- 115/24VAC transformer
- Manual reset high limit
- Automatic reset high limit
- Electronic PID staging control with LCD and touchpad
- PC board for electrical connections
- External controller connections with selector switch
- Hot surface ignition
- On/Off toggle switch
- Pump time delay
- Diagnostic lights
- Less than 10 ppm NOx

Sizing Data

Indoor Model	Input[1,3] MBTU/h	Output[1,3] MBTU/h	IBR Net[1,3] Rating MBTU/h	Gas Conn. Size inches[2]	Water Conn. Size inches[2]	Shipping Weight lbs.	kg
500	500	425	361	1¼	2	425	*193*
750	750	638	542	1¼	2	505	*229*
1000	999	849	722	1½	2½	615	*279*
1250	1250	1063	903	2	2½	675	*306*
1500	1500	1275	1084	2	2½	760	*345*
1750	1750	1488	1264	2	2½	825	*375*
2000	1999	1699	1444	2	2½	955	*434*

NOTES:
1. Input and output must be derated 4% per 1000 feet above sea level when installed above 2000 feet altitude.
2. Dimensions are nominal.
3. For other boiler ratings:
   Boiler Horsepower: HP = $\frac{\text{Output}}{33{,}475}$ Radiation Surface: EDR sq. ft. = $\frac{\text{Output}}{150}$ IBR sq. ft. = $\frac{\text{Net IBR Rating}}{150}$

Firing Rates

Sizes	Firing Rate
500/750	2-Stage
1000	3-Stage
1250/1500/1750/2000	4-Stage

Water Flow Requirements

TEMPERATURE RISE IN DESGREES

	20°F		*11°C*		25°F		*14°C*		30°F		*17°C*		35°F		*19°C*	
Size	Flow gpm	H/L feet	*Flow lpm*	*H/L m*	Flow gpm	H/L feet	*Flow lpm*	*H/L m*	Flow gpm	H/L feet	*Flow lpm*	*H/L m*	Flow gpm	H/L feet	*Flow lpm*	*H/L m*
500	43	1.7	*161*	*0.5*	34	1.1	*129*	*0.3*	28	0.9	*107*	*0.3*	24	0.7	*92*	*0.2*
750	64	3.3	*241*	*1.0*	51	2.3	*193*	*0.7*	43	1.7	*161*	*0.5*	36	1.2	*138*	*0.4*
1000	85	5.0	*321*	*1.5*	68	3.6	*257*	*1.1*	57	3.1	*214*	*0.9*	49	2.2	*184*	*0.7*
1250	106	8.1	*401*	*2.5*	85	6.1	*322*	*1.9*	71	4.7	*269*	*1.4*	61	3.4	*231*	*1.0*
1500	128	10.0	*483*	*3.0*	102	7.2	*386*	*2.2*	85	5.5	*322*	*1.7*	73	4.2	*276*	*1.3*
1750	N/R	N/R	*N/R*	*N/R*	119	10.5	*451*	*3.2*	99	8.4	*375*	*2.6*	85	5.8	*322*	*1.8*
2000	N/R	N/R	*N/R*	*N/R*	136	12.5	*515*	*3.8*	113	10.4	*429*	*3.2*	97	8.3	*368*	*2.5*

	Hard Water				Normal Water				Soft Water			
Size	Flow gpm	H/L feet	*Flow lpm*	*H/L m*	Flow gpm	H/L feet	*Flow lpm*	*H/L m*	Flow gpm	H/L feet	*Flow lpm*	*H/L m*
500	90	3.5	*341*	*1.1*	68	2.3	*257*	*0.7*	45	1.8	*170*	*0.5*
750	90	6.0	*341*	*1.8*	68	3.0	*257*	*0.9*	45	2.1	*170*	*0.6*
1000	90	6.1	*341*	*1.9*	68	3.6	*257*	*1.1*	45	2.3	*170*	*0.7*
1250	90	6.3	*341*	*1.9*	68	3.8	*257*	*1.2*	68	3.8	*257*	*1.2*
1500	90	6.5	*341*	*2.0*	68	3.9	*257*	*1.2*	68	3.9	*257*	*1.2*
1750	90	6.7	*341*	*2.0*	68	4.0	*257*	*1.2*	68	4.0	*257*	*1.2*
2000	112	10.0	*424*	*3.0*	112	10.0	*424*	*3.0*	112	10.0	*424*	*3.0*

NOTE: Headloss shown is for the Pennant heat exchanger only.

Recovery Data

WATER TEMPERATURE RISE IN DEGREES

	40°F	*22°C*	50°F	*28°C*	60°F	*33°C*	70°F	*39°C*	80°F	*44°C*	90°F	*50°C*	100°F	*56°C*	120°F	*67°C*	140°F	*78°C*
Size	GPH	*L/h*	GPH	*L/h*	GPH	*L/h*	GPH	*L/h*	GPH	*L/h*	GPH	*L/h*	GPH	*L/h*	GPH	*L/h*	GPH	*L/h*
500	1276	*4821*	1020	*3857*	850	*3214*	729	*2755*	638	*2411*	567	*2143*	510	*1929*	425	*1607*	364	*1378*
750	1913	*7232*	1531	*5786*	1276	*4821*	1093	*4133*	957	*3616*	850	*3214*	765	*2893*	638	*2411*	547	*2066*
1000	2548	*9633*	2039	*7707*	1699	*6422*	1456	*5505*	1274	*4817*	1133	*4281*	1019	*3853*	849	*3211*	728	*2752*
1250	3189	*12054*	2551	*9643*	2126	*8036*	1822	*6888*	1594	*6027*	1417	*5357*	1276	*4821*	1063	*4018*	911	*3444*
1500	3827	*14464*	3061	*11571*	2551	*9643*	2187	*8265*	1913	*7232*	1701	*6429*	1531	*5786*	1276	*4821*	1093	*4133*
1750	4464	*16875*	3571	*13500*	2976	*11250*	2551	*9643*	2232	*8438*	1984	*7500*	1786	*6750*	1488	*5625*	1276	*4821*
2000	5099	*19276*	4080	*15421*	3400	*12851*	2914	*11015*	2550	*9638*	2266	*8567*	2040	*7710*	1700	*6425*	1457	*5507*

Note: GPH = gallons per hour, L/h = Liters per hour

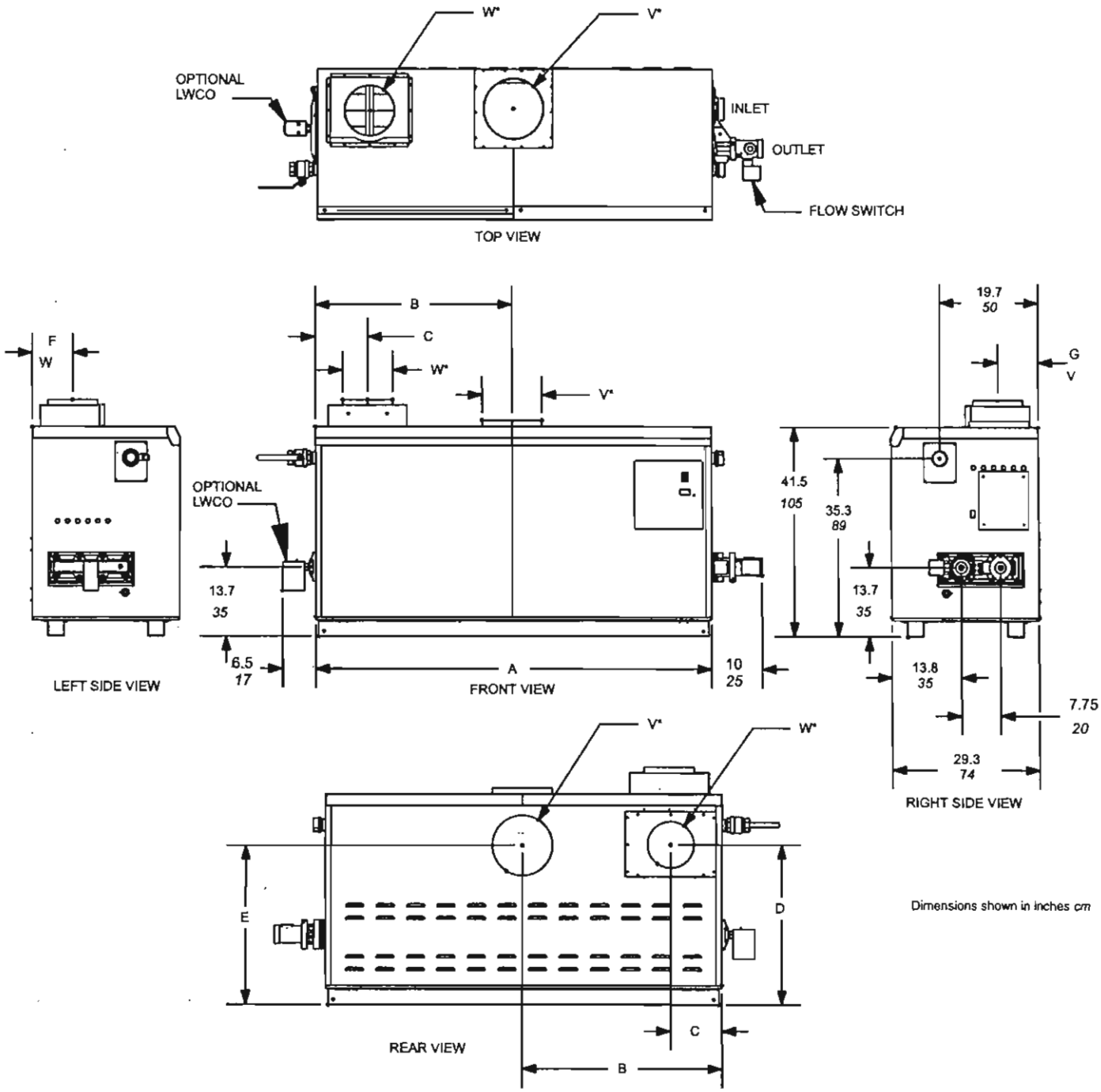
Clearances

Appliance Surface	Required Clearance From Combustible Material		Suggested Service Access Clearances	
Left Side	1	*2.5*	24	*61*
Right Side	1	*2.5*	24	*61*
Top	1	*2.5*	12	*30*
Back*	1	*2.5*	12	*30*
Front	1	*2.5*	36	*91*
Vent	Per venting system supplier's instructions			

Dimensions in inches *cm*

*When vent and/or air is connected to the back, 36" (91cm) is suggested.

Dimensional Data



Dimensions shown in inches *cm*

Size	A		B		C		D		E		F		G		Air Conn. W*		Vent Conn. V*		Horiz Vent Pipe	
500	33½	*85*	15¾	*40*	5¾	*15*	29¾	*76*	32¾	*83*	7¾	*20*	8¾	*22*	6	*15*	6	*15*	6	*15*
750	45½	*116*	21¾	*55*	5¾	*15*	29¾	*76*	32¾	*83*	7¾	*20*	8¾	*22*	6	*15*	8	*20*	6	*15*
1000	57½	*146*	28¾	*73*	5¾	*15*	29¾	*76*	32¾	*83*	7¾	*20*	7	*18*	8	*20*	10	*25*	8	*20*
1250	68	*172*	34	*86*	10⅛	*26*	30¾	*78*	29½	*75*	8¾	*22*	8¾	*22*	8	*20*	12	*30*	8	*20*
1500	78½	*199*	39¾	*101*	10⅛	*26*	30¾	*78*	29½	*75*	8¾	*22*	8¾	*22*	8	*20*	12	*30*	8	*20*
1750	89	*226*	44½	*113*	10⅛	*26*	30¾	*78*	29½	*75*	8¾	*22*	8¾	*22*	8	*20*	14	*36*	8	*20*
2000	99½	*253*	49¾	*126*	10⅛	*26*	30¾	*78*	29½	*75*	8¾	*22*	8¾	*22*	12	*30*	14	*36*	12	*30*

*Air and vent connections may be on top or back of the Pennant, and are field convertible.

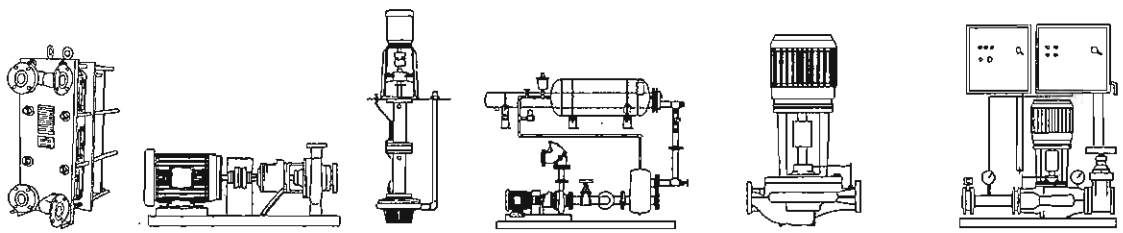
Dimensions in inches *cm*.

Mechanical Solutions Inc.

121 Commerce Way
P.O. Box 790
So. Windsor, CT 06074

TEL: (860) 290-1564
FAX: (860) 290-1825
Email:jkirk@msipump.com

PROJECT: **POST HOUSE**
ENGINEER:
CONTRACTOR: **EASTERN MECHANICAL**
SPECIFICATION SECTION: **15500**
EQUIPMENT DESCRIPTION: **PROJECT SUBMITTALS** **Refer To Attached Equipment List**

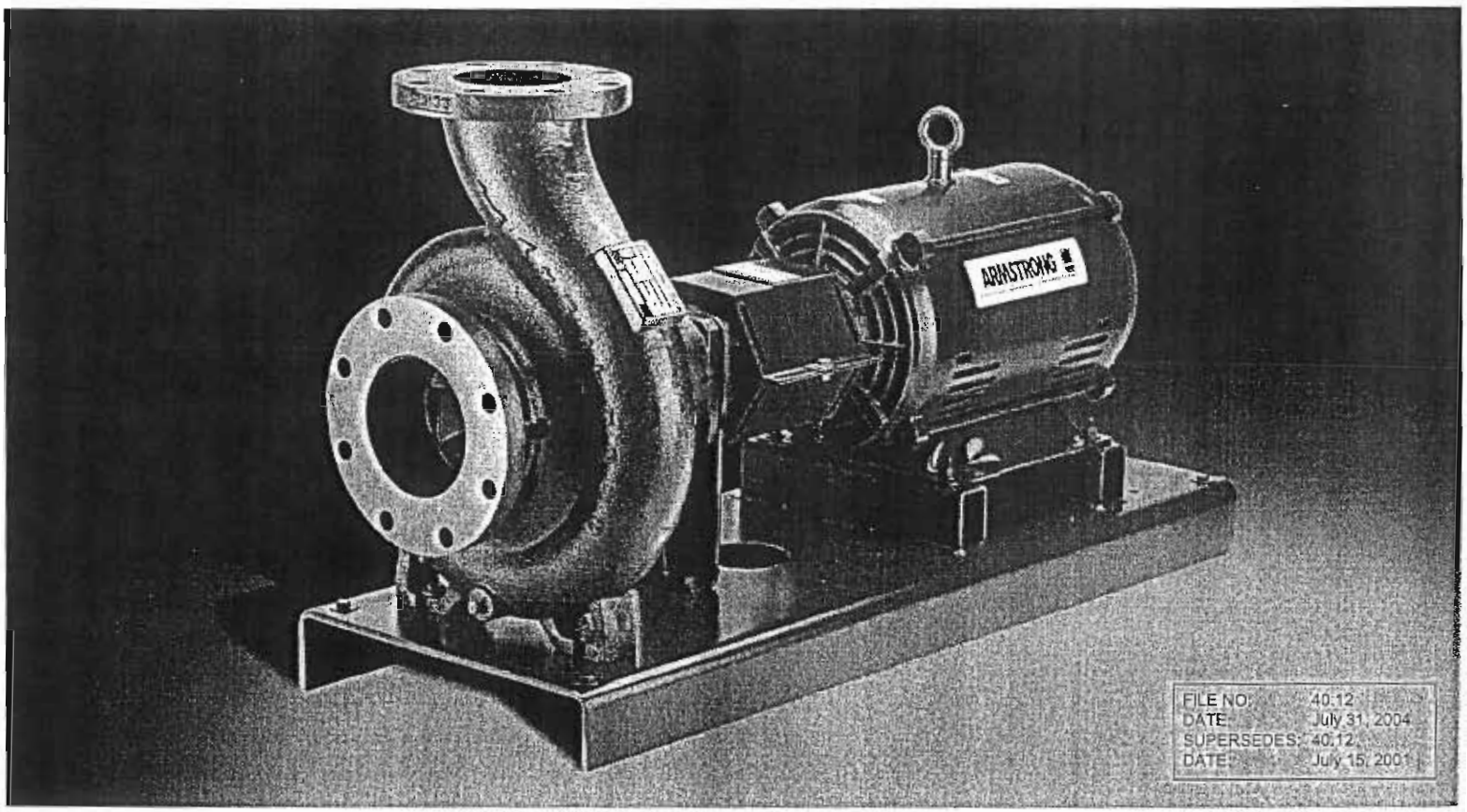


BILL of MATERIAL

Item	Qty	Description	Weight
		HVAC	
A	2	(CWP-1,2) Armstrong Model 4030 4x3x11.5 Base Mounted End Suction Pump rated for 300 gpm at 120' of head with a 20HP, ODP Premium Efficient Motor, 208V-3P and 1800RPM, Spare Seal and Cyclone Separator	360
	2	Square D Model EconoFlex Variable Frequency Drive, 20 hp, Type 1 Enclosure, 208V, With Bypass Package, Hand/Off/Comm Control, Start/Stop Control, Speed Pot, On/Run/Fault/Bypass Lights, MODBUS Serial Card	150
	2	4x4 Armstrong Model SG44 Suction Diffuser. #516860-021	72
	2	4" Armstrong Model FTV-4 Triple Duty Valve with Flanged Connections. #570200-378	59
	4	4" Metraflex Model Metra Mini Flex Connector - Flanged, Braided Hose Type. MM-4	18
C	1	(AS-1) 3" Armstrong Model VAS-3 Vortex Air Separator with Stainless Steel Strainer.#570289-002	130
D	1	(ET-1) Armstrong Model AX-200V Vertical Diaphragm Type Expansion Tank, ASME, 111 Gallon Tank, 53 Gallon Acceptance. #572006-106	296
	1	3/4" Metraflex Model MV-15A High Capacity Air Vent.	10
	1	3/4" Armstrong Model HRD-70 Pressure Reducing Valve. #207936-300	20

ARMSTRONG

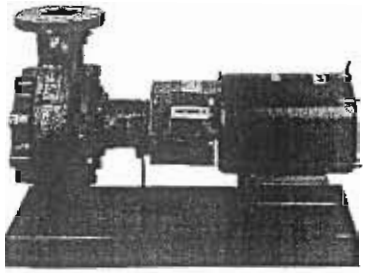
Series 4030



Horizontal Base Mounted Pumps

Series 4030
Armstrong Pumps - Hallmark of Quality

- Armstrong - Manufacturer of pumps since 1934
- Base mounted pump designs continuously updated
- Traditional features combined with cutting edge concepts



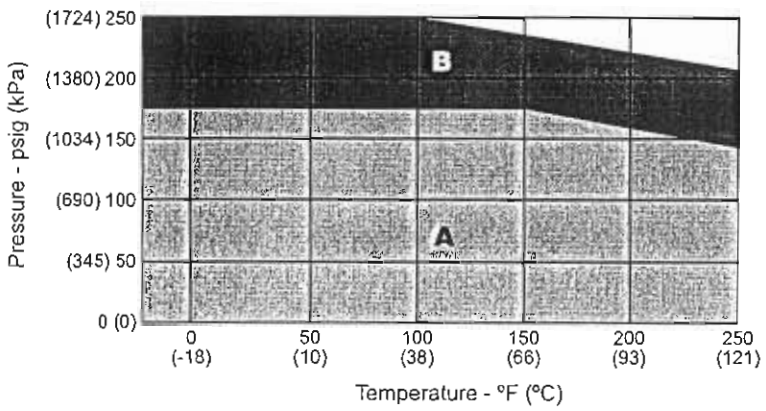
Traditional Features:

- Back Pull Out Design
- One Piece Baseplate
- Base Supported Radially-Split Casing
- Flexible Coupling, with Guard
- Drain and Gauge Connections
- Cast Iron Housing, Bronze-Fitted Construction
- All Iron and Ductile Iron Construction available
- Designed, Manufactured and Inspected to Exacting Standards

Current Design Concepts:

- ANSI style Centerline Discharge Casing
- Large Flow Range
- ANSI Flanged Casing
- Pre-Lubricated and Sealed Ball Bearings
- Confined Casing Gasket
- Mechanical Seal with O-Ring Mounted Seat
- Stainless Steel Shaft Sleeve
- Dynamically Balanced Impellers
- OSHA Coupling Guard

Pressure①/Temperature Chart② Series 4030



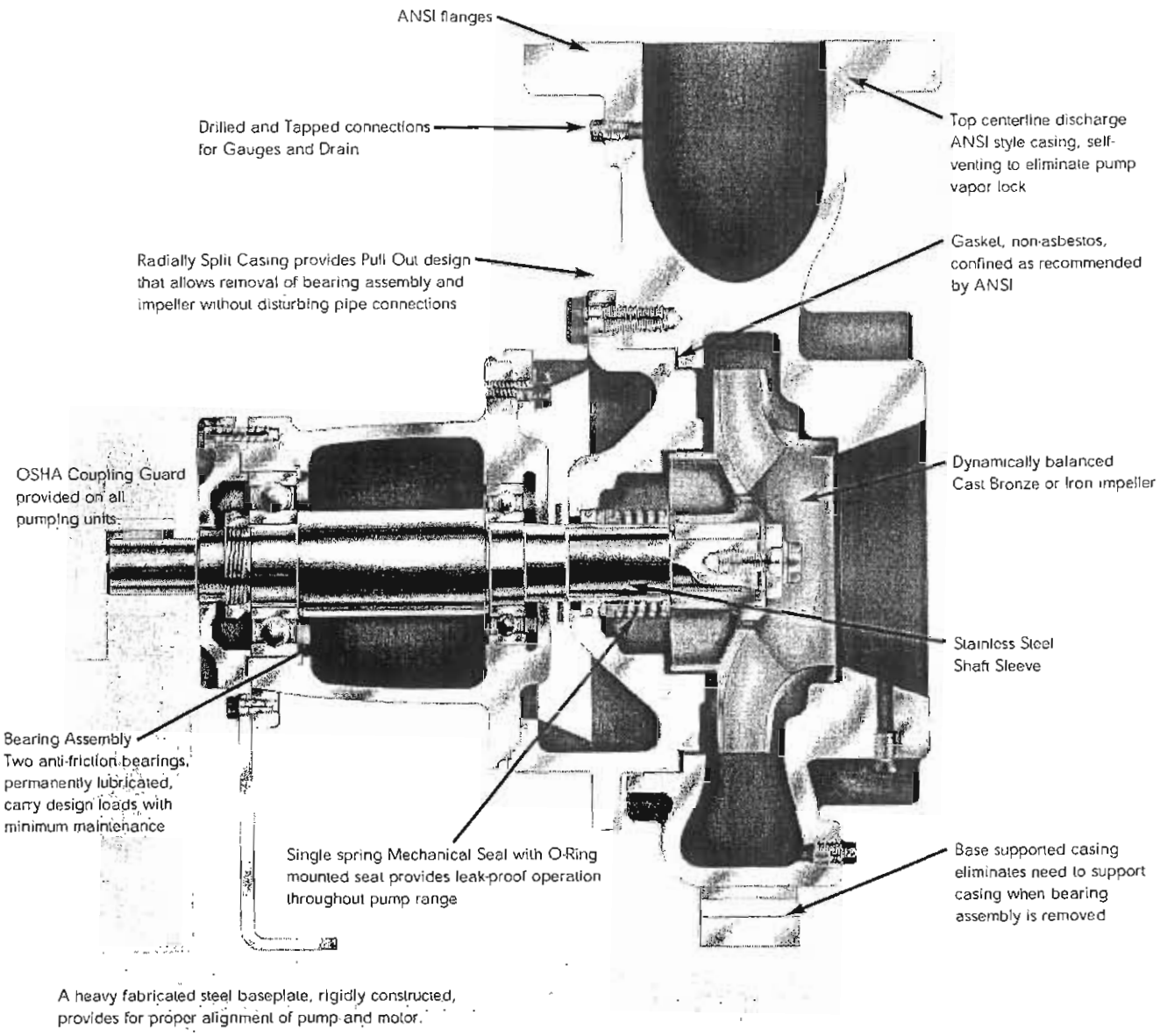
A. CAST IRON - 125 psig flanges
Standard seal

B. DUCTILE IRON - 250 psig flanges
Tungsten Carbide seal

① Hydrostatic test pressure at ambient temperature is 150% maximum working pressure.

② All values are based on clear, clean water. Values may change with other liquids.

Base Mounted Centrifugal Pumps



Armstrong Series 4030 – simply the best base mounted pump design in today's HVAC industry!

Typical Specification

Furnish and install, as indicated on the plans and specifications, Armstrong Series 4030 base mounted centrifugal pumps.

The pump shall be single, end suction type with radially split, top center-line discharge, self-venting casing. The casing-to-cover gasket shall be confined on the atmospheric side to prevent blow-out possibility.

Pump construction shall be cast iron, bronze fitted (all iron, all bronze, ductile iron) and shall be fitted with a long-life, product lubricated, drip-tight mechanical seal, with O-ring seat retainer, designed for the specified maximum temperature and pressure.

The shaft shall be fitted with a Stainless Steel shaft sleeve and be supported by two heavy duty ball bearings. The design shall allow Back Pull Out servicing, enabling the complete rotating assembly to be removed without disturbing the casing piping connections.

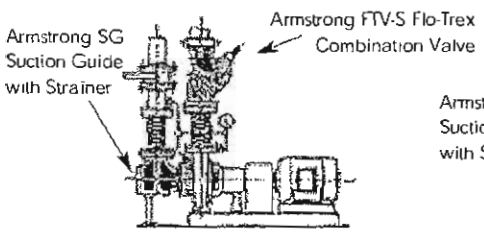
The pump shall be mounted on a rigid, single piece baseplate, with grouting hole, and connected by flexible coupling, with OSHA guard, to a ____ hp, ____ Hz, ___ phase, ____ Volts, _____ rpm, _____ enclosure squirrel cage, induction type motor of Federal approved (premium, ____%) efficiency level and suitable for across-the-line (wye-delta, part wind) starting.

The housing shall be hydrostatically tested to 150% maximum working pressure.

The unit shall be suitable for the conditions shown on the pump schedule.

Need to reduce space requirements and installation costs?

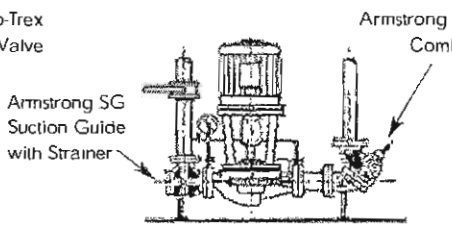
Base mounted



Base mounted pump with Suction Guide and Flo-Trex valve eliminates cost and space of:

Suction:	Y-Strainer
	Long Radius Elbow
	Min. Straight Pipe Run
Discharge:	Check Valve
	Isolating Valve
	Throttling Valve

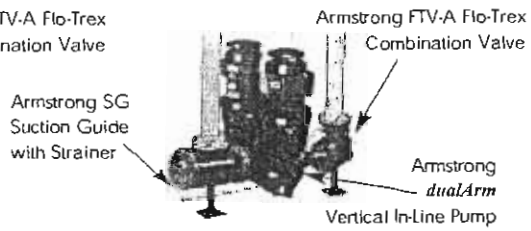
Vertical In-Line



Vertical In-Line with Suction Guide and Flo-Trex valve eliminates cost and space of all the items listed under base mounted pump, plus the following:

- Inertia Base with spring mounts
- Long Radius Elbow
- Flexible Pipe Connectors
- Grouting
- Field Alignment
- Split Couplings available for ease of mechanical seal replacement

dualArm



dualArm Vertical In-Line incorporates two pumps in a casing with single inlet and outlet connections. Enables standby or parallel operation with only one set of piping. Casing design and port valves allow one pump to be removed for service with the second pump still operating. When installed with a Suction Guide and Flo-Trex valve the ***dualArm*** represents the greatest Life Cycle Value in today's commercial HVAC market.

Armstrong Pumps Inc.
93 East Avenue
North Tonawanda, New York
U.S.A. 14120-6594
Tel: (716) 693-8813
Fax: (716) 693-8970

S.A. Armstrong Limited
23 Bertrand Avenue
Toronto, Ontario
Canada, M1L 2P3
Tel: (416) 755-2291
Fax: (416) 759-9101

Armstrong Pumps Limited
Peartree Road, Stanway
Colchester, Essex
United Kingdom, CO3 0LP
Tel: +44 (0) 1206 579491
Fax: +44 (0) 1206 760532

Armstrong Darling
9001 De L'Innovation, Suite 200
Montreal (Anjou), Quebec
Canada, H1J 2X9
Tel: (514) 352-2424
Fax: (514) 352-2425

www.armstrongpumps.com

ARMSTRONG SUBMITTAL

Series 4030
4x3x11.5
Centerline Disc. End Suction Basemounted Pump

Project Number: 120706L	**Representative:** Mechanical Solutions
Name: Post House	121 Commerce Way, South Windsor, CT
Reference:	Phone: 860-290-1564, Fax: 860-290-1825
Location:	**Order No:** **Date:**
Engineer:	**Submitted by:** Julie Kirk **Date:** 12/7/2006
Contractor: Eastern Mechanical	**Approved by:** **Date:**

PUMP DESIGN DATA

Tag Num:	CWP-1,2
Service:	
Location:	
No. of Pumps:	2
Capacity:	300 usgpm
Head:	120 ft
Piping:	Single
Suction Pressure:	0 ft
Liquid:	Water
Op. Temperature:	70 °F
Viscosity:	31 ssu
Sp.Gravity:	1.00
Suction Size:	4 in
Discharge Size:	3 in

MOTOR DESIGN DATA

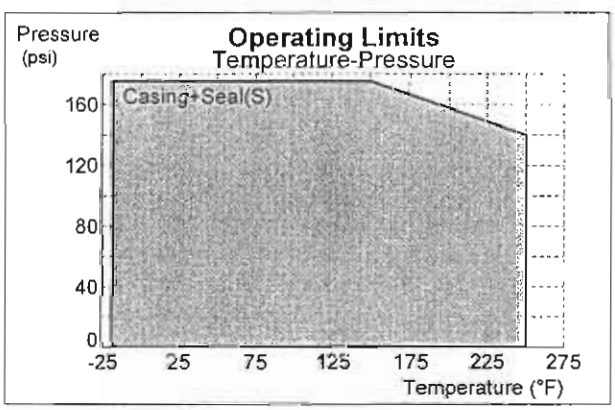
Motor Supplier:	Factory Choice
Motor Size:	20 hp @ 1800 rpm
Frame Size:	256T
Enclosure:	ODP
Cycle/Phase/Voltage:	60/3/208
Motor Eff:	NEMA Premium (Inverter Ready
Insulation:	Class "B" Insulation (266.0 °F)
Starter Config:	DOL
Full Load/Starting (A)	59.7 / 320.7

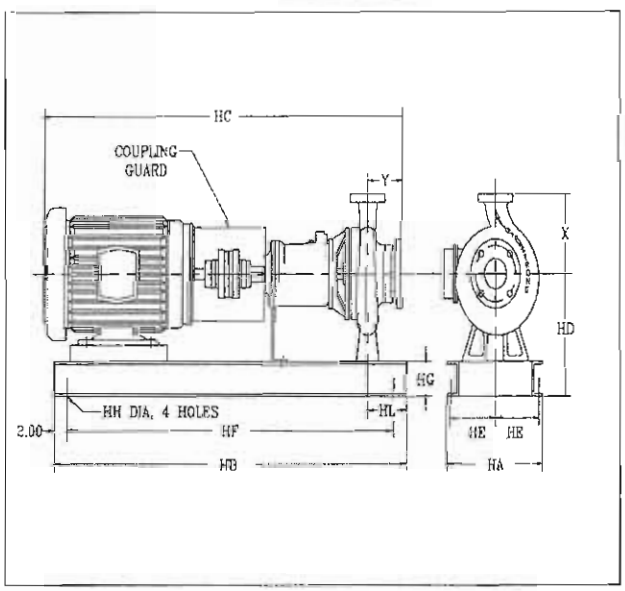
MATERIALS OF CONSTRUCTION

Construction	BF (Bronze Fitted)
ANSI Flange Rating	125 lb. (Cast Iron)
Connection (Suct/Dis)	Flanged/Flanged
Impeller	Bronze (B584-844)
Casing	Cast Iron (A48-30)
Casing Gasket	Confined Non-Asbestos Fiber
Bearing Frame	Cast Iron (A48-30)
Bearings	Anti-Friction Grease Lubricated
Pump Shaft	Carbon Steel
Shaft Sleeve	Stainless Steel

MECHANICAL SEAL DESIGN DATA

Manufacturer	Armstrong
Manu. Code [21A]	21A
Seal Type	Inside Unbalanced
Rotating Face	Carbon
Stationary Seat	Ceramic
Secondary Seal	EPDM
Springs	Stainless Steel
Rotating Hardware	Stainless Steel



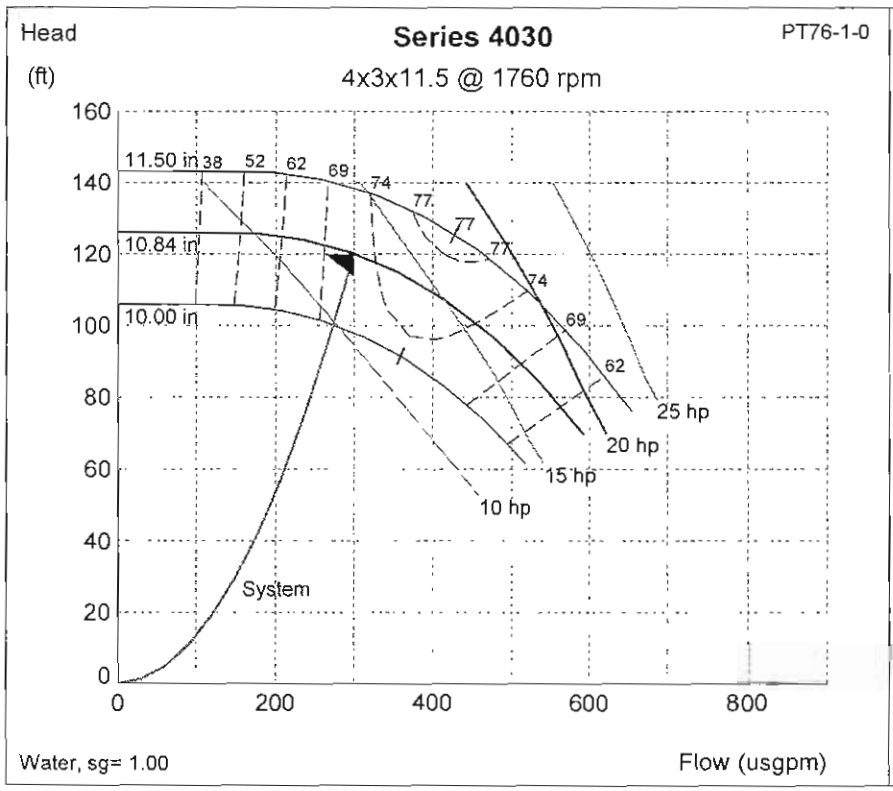


DIMENSIONAL DATA (in, lbs, hp) NOT for CONSTRUCTION

HA	HB	HC	HD	HE	HF	HG	HH	HL	X	Y	M.Wgt	P.Wgt	Wgt.
18	40	39.38	11.25	7.38	36	3	0.75	6.5	11	6	160	200	360

ARMSTRONG SUBMITTAL

Series 4030
4x3x11.5
Centerline Disc. End Suction Basemounted Pump

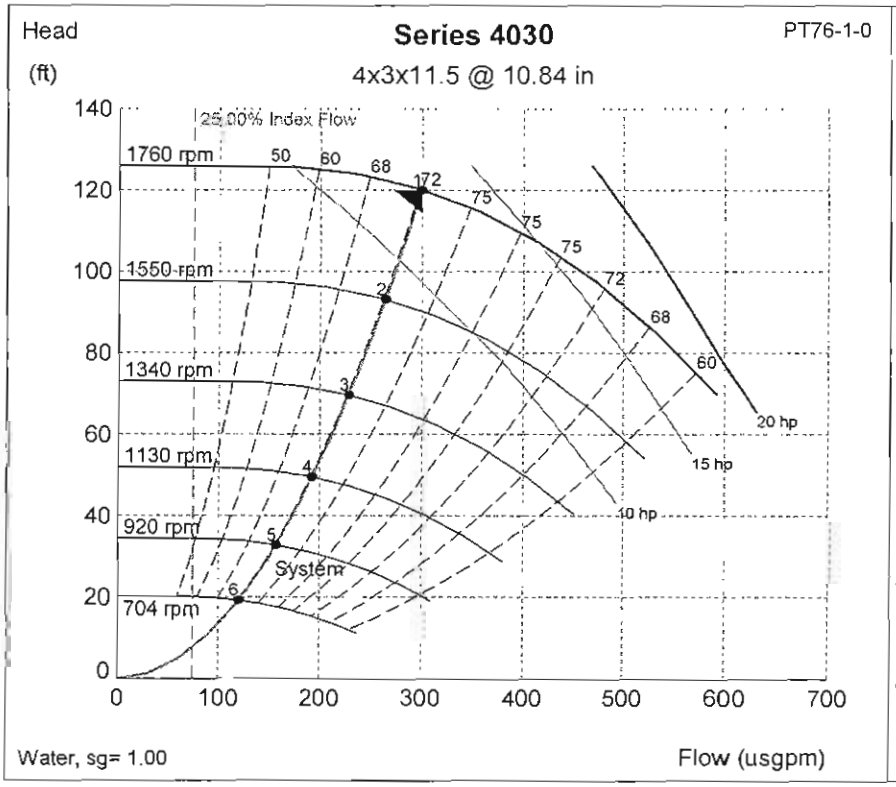


--- Admin Data ---
Tag Num: CWP-1,2
Service:
Location:

--- Motor Data ---
Motor Size: 20 hp
Motor Speed: 1800 rpm

--- Design Duty Point ---
Flow: 300 usgpm
Head: 120 ft
Impeller: 10.84 in

--- Performance Data ---
- NPSHR: 9.629 ft
- Eff. @ Design: 71.92 %
- BHP @ Design: 12.64 hp
- %Mtr Safety: 58.22%
- BEP @ Design Imp.: 74.90 % @ 397.2 usgpm
- Impeller Max BHP @ Flow: 18.46 hp @ 592.0 usgpm
- %max imp. range: 56.12 %
- Outlet Velocity: 13.02 ft/s



--- Admin Data ---
Tag Num: CWP-1,2
Service:
Location:

--- Motor Data ---
Motor Size: 20 hp
Motor Speed: 1800 rpm

--- Design Duty Point ---
Flow: 300 usgpm
Head: 120 ft
Impeller: 10.84 in

--- System Intersect Data ---
1. System @ 1760 rpm:
- 300 @ 120, 12.64 hp
2. System @ 1550 rpm:
- 264.3 @ 93.1, 8.64 hp
3. System @ 1340 rpm:
- 228.5 @ 69.6, 5.58 hp
4. System @ 1130 rpm:
- 192.7 @ 49.5, 3.35 hp
5. System @ 920 rpm:
- 156.9 @ 32.8, 1.81 hp
6. System @ 704 rpm:
- 120 @ 19.2, 0.81 hp

ARMSTRONG SUBMITTAL

Series 4030
4x3x11.5
Centerline Disc. End Suction Basemounted Pump

OPTIONAL EQUIPMENT	
Pump	Cyclone Separator with Sight Flow Indicator (250 psi)

SQUARE D
Schneider Electric

MSP
Mechanical Solution Partners

EQUIPMENT SCHEDULE SUMMARY

Q2C Number:	Quote Number: 1	Revision Number: 0
Project Name: POST HOUSE		Quote Name: MSP Program

Item No.	Designation	Qty	Catalog Number / Description	HP	Volts	Output Amps	Enclosure Type	Drawing Number
001	20HP 208V	2	**883958EKG2VYE07B08M09** Class 8839 Enclosed EconoFlex Drive	20	208	59.4	NEMA 1	(W)8839-450-5 (D)8839-450-8
	TOTAL =	2	CONSISTING OF Class 8839 Econo-Flex Variable Torque AC Drive NEMA Type 1 Steel Enclosure Power Circuit Y: - Bypass Package w/ isolation & bypass contactors - Main Circuit Breaker - 22kAIC coordinated equipment rating (std.) - AFC-Off-Bypass Selector Switch - Test-Normal Selector Switch - Door interlocked operating handle Mod E07 - Hand Off Comm switch & Start Stop Push Buttons & Manual Speed Pot Mod B08 - Pilot Lights - Red Power On Pilot Light - Green AFC Run Pilot Light - Yellow AFC Fault Pilot Light - Yellow Bypass run Mod M09 – MODBUS Serial Communication Card **Standard Features:** Auxiliary Form C AFC FAULT contact Auxiliary Form C AFC RUN contact Fire/Freeze stat interlock 4-20mA Auto Speed Reference Signal Input 0/4-20mA Analog Output Door mounted keypad w/LCD display for program diagnostics					(D)=Dimension (W)=Wiring

SQUARE D
Schneider Electric

MSP
Mechanical Solution Partners

EQUIPMENT MOD DESCRIPTIONS

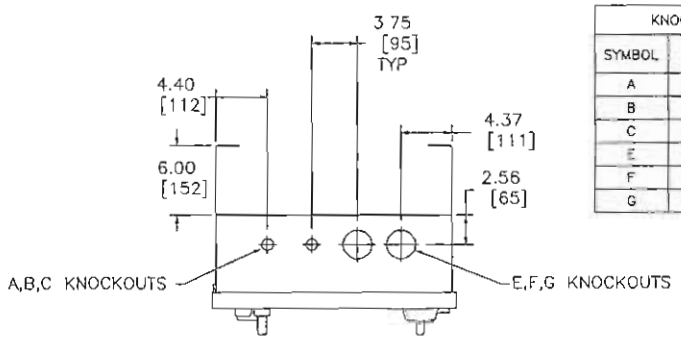
Q2C Number:	Quote Number: 1	Revision Number: 0
Project Name: POST HOUSE		Quote Name: MSP Program

Mod #	Modification Description
Y	**BYPASS: "Power Circuit Y"** *Bypass Package* consists of:: • Isolation and bypass contactors with Class 20 overloads. (Class 10 for 1HP @460V) • Control transformer, 120 V fused. • Circuit breaker disconnect with means for locking in the open position • AFC-Off-Bypass switch. • Test-Normal switch. • Power converter Note: Test-Normal selector switch provides drive controller testing capability without turning the motor and allows drive controller testing if bypass mode is selected. The isolation contactor is sequenced to provide motor isolation if the drive is not running.
E07	**MOD "E07" Hand-Off-Comm, Start/Stop, and Speed Potentiometer** This control option provides a door-mounted Hand-Off-Comm (H-O-C) selector switch, a Start push button, a Stop push button, and a manual speed potentiometer (graphic keypad knob or remotely mounted potentiometer) to operate the power converter.
B08	**MOD "B08" Pilot Light Cluster** Provides visual indication of protective functions and circuit status. Only available on power circuit Y. The pilot devices are rated 120 V. Included within this configuration are: • **Power On (Red):** Illuminates whenever mains power is applied to the controller. • **AFC Run (Green):** Illuminates whenever drive output relay R2 (programmed for running state) is high, to annunciate a drive run condition. • **Bypass Run (Yellow):** Illuminates whenever the bypass contactor coil is energized. • **AFC Fault (Yellow):** Illuminates (via relay ADFR) whenever drive output relay R1 (programmed for fault state) is low, to annunciate a fault condition. This light is normally off until a drive protective circuit causes an abnormal shutdown.
M09	**MOD "M09" MODBUS® Serial Communication** Provides factory-installed plug-in MODBUS card and separate user termination to D-shell interface device. Serial communication is factory-installed for register monitoring.

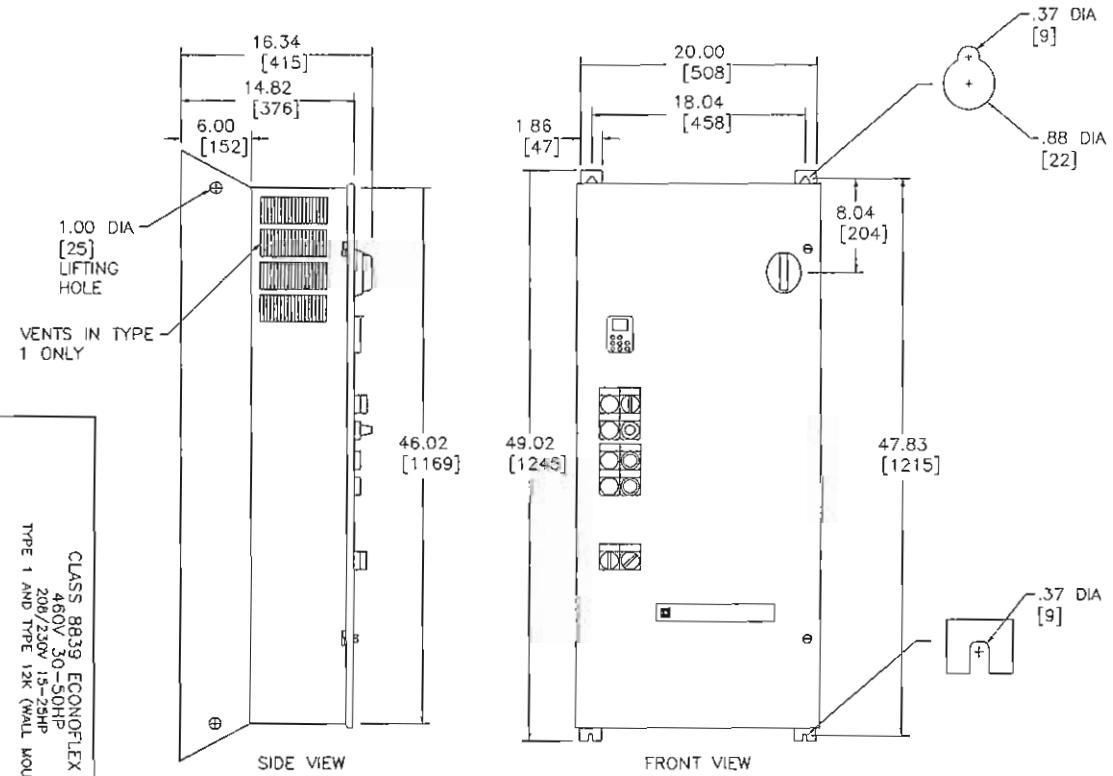
APRIL 2002

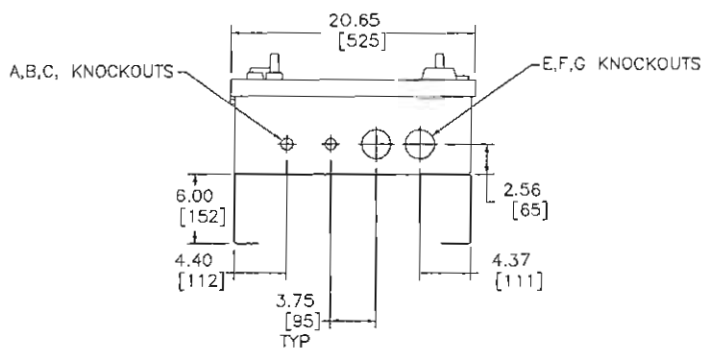
CLASS 8839 ECONOFLEX
460V 30–50HP
208/230V 15–25HP
TYPE 1 AND TYPE 12K (WALL MOUNT)

KNOCKOUTS		
SYMBOL	IN	MM
A	.50	13
B	.75	19
C	1.00	25
E	1.50	38
F	2.00	51
G	2.50	64



CONDUIT ENTRY – TOP VIEW





CONDUIT ENTRY – BOTTOM VIEW

DUAL DIMENSIONS: INCHES / MILLIMETERS

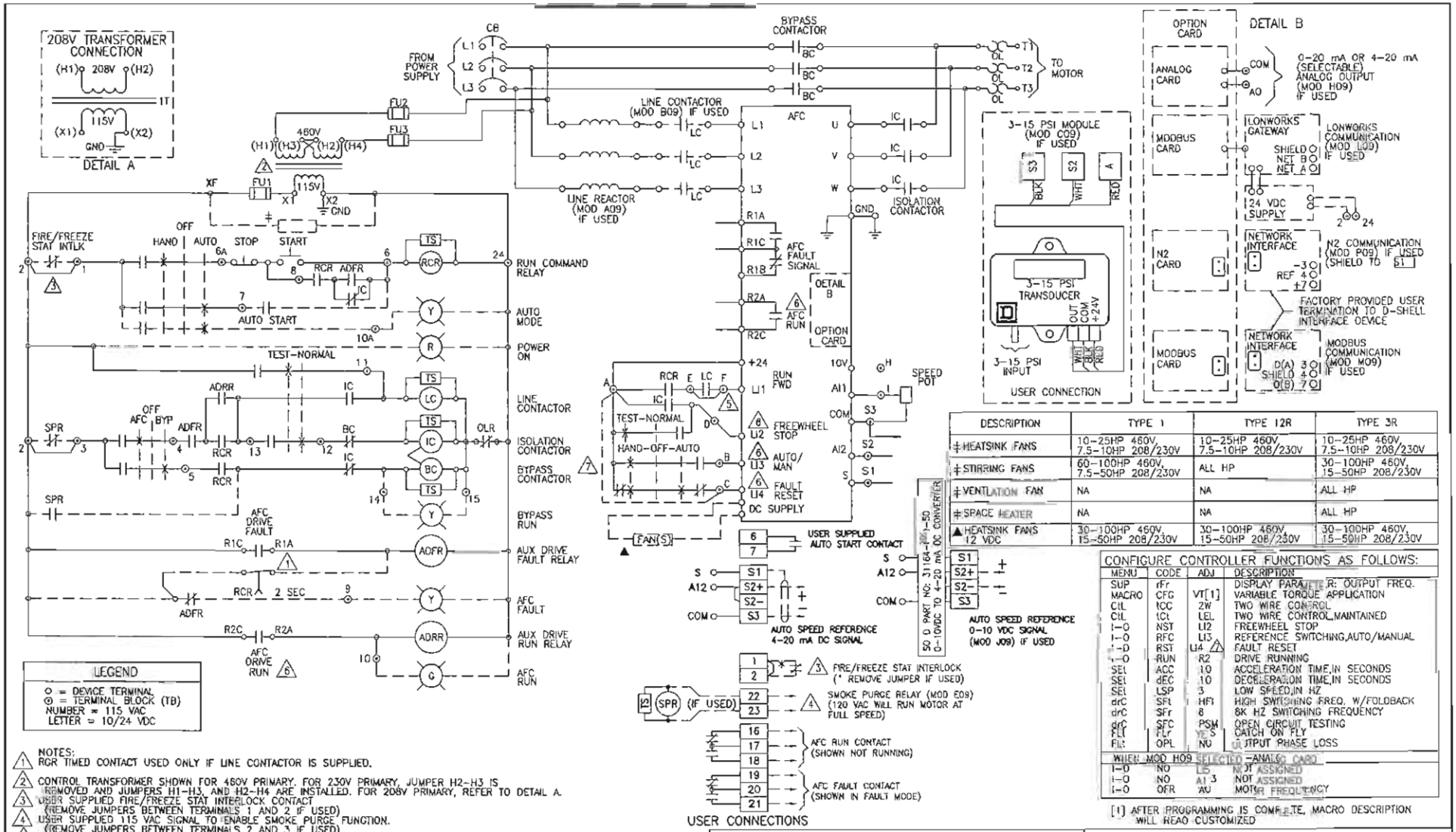
HP	HP	WEIGHT	
460V	208/230V	LB	KG
30 TO 50	15 TO 25	180	81.6

NOTE:
PROVIDE AT LEAST 3.00 [76] OF MOUNTING CLEARANCE ON EACH SIDE OF THE DRIVE CONTROLLER.
PROVIDE AT LEAST 6.00 [152] OF MOUNTING CLEARANCE ON TOP AND BOTTOM OF THE DRIVE CONTROLLER.

CLASS 8839 ECONOFLEX
460V 30–50HP
208/230V 15–25HP
TYPE 1 AND TYPE 12K (WALL MOUNT)

SQUARE D COMPANY

DWG NO. 8839-450-8



DESCRIPTION	TYPE 1	TYPE 12R	TYPE 3R
‡ HEATSINK FANS	10–25HP 460V, 7.5–10HP 208/230V	10–25HP 460V 7.5–10HP 208/230V	10–25HP 460V, 7.5–10HP 208/230V
‡ STIRRING FANS	60–100HP 460V, 7.5–50HP 208/230V	ALL HP	30–100HP 460V, 15–50HP 208/230V
‡ VENTILATION FAN	NA	NA	ALL HP
‡ SPACE HEATER	NA	NA	ALL HP
▲ HEATSINK FANS 12 VDC	30–100HP 460V, 15–50HP 208/230V	30–100HP 460V, 15–50HP 208/230V	30–100HP 460V, 15–50HP 208/230V

CONFIGURE CONTROLLER FUNCTIONS AS FOLLOWS:

MENU	CODE	ADJ	DESCRIPTION
SUP	dFr		DISPLAY PARAMETER: OUTPUT FREQ.
MACRO	CFG	VT[1]	VARIABLE TORQUE APPLICATION
CtL	tCC	2W	TWO WIRE CONTROL
CtL	tCt	LEL	TWO WIRE CONTROL,MAINTAINED
I-O	nST	LI2	FREEWHEEL STOP
I-O	rFC	LI3	REFERENCE SWITCHING,AUTO/MANUAL
I-O	rST	LI4 [7]	FAULT RESET
I-O	rUn	R2	DRIVE RUNNING
SEt	ACC	10	ACCELERATION TIME,IN SECONDS
SEt	dEC	10	DECELERATION TIME,IN SECONDS
SEt	LSP	3	LOW SPEED,IN HZ
drC	SFt	HFI	HIGH SWITCHING FREQ. W/FOLDBACK
drC	SFr	8	8K HZ SWITCHING FREQUENCY
drC	SFC	PSM	OPEN CIRCUIT TESTING
FLt	FLr	YES	CATCH ON FLY
FLt	OPL	NO	OUTPUT PHASE LOSS
WHEN MOD H09 SELECTED -ANALOG CARD			
I-O	NO	LI5	NOT ASSIGNED
I-O	NO	AI 3	NOT ASSIGNED
I-O	OFR	AO	MOTOR FREQUENCY

[1] AFTER PROGRAMMING IS COMPLETE, MACRO DESCRIPTION WILL READ CUSTOMIZED

NOTES:
1. RCR TIMED CONTACT USED ONLY IF LINE CONTACTOR IS SUPPLIED.
2. CONTROL TRANSFORMER SHOWN FOR 460V PRIMARY. FOR 230V PRIMARY, JUMPER H2–H3 IS REMOVED AND JUMPERS H1–H3, AND H2–H4 ARE INSTALLED. FOR 208V PRIMARY, REFER TO DETAIL A.
3. USER SUPPLIED FIRE/FREEZE STAT INTERLOCK CONTACT (REMOVE JUMPERS BETWEEN TERMINALS 1 AND 2 IF USED)
4. USER SUPPLIED 115 VAC SIGNAL TO ENABLE SMOKE PURGE FUNCTION. (REMOVE JUMPERS BETWEEN TERMINALS 2 AND 3 IF USED)
5. CIRCUIT SHOWN WITHOUT LINE CONTACTOR. (REMOVE JUMPER BETWEEN TERMINALS E AND F IF USED, IF LINE CONTACTOR IS SUPPLIED)
6. PROGRAMMED I/O SEE CONTROLLER FUNCTION CONFIGURATION TABLE.
7. FACTORY JUMPER PROVIDED BETWEEN TERMINALS A AND C IF SERIAL COMMUNICATIONS OPTION SELECTED. L14 PROGRAMMED FOR FORCED LOCAL, CODE FLO.

CLASS 8839 ECONFLEX
POWER CIRCUIT Y
(BYPASS)
HAND–OFF–AUTO, START–STOP
AND SPEED POTENTIOMETER

SQUARE D COMPANY

DWG# NO. 8839–450–5

FILE NO.: 5035.10
DATE: Aug. 1, 1990
SUPERSEDES: 5035.10
DATE: Feb 1, 1988

product bulletin

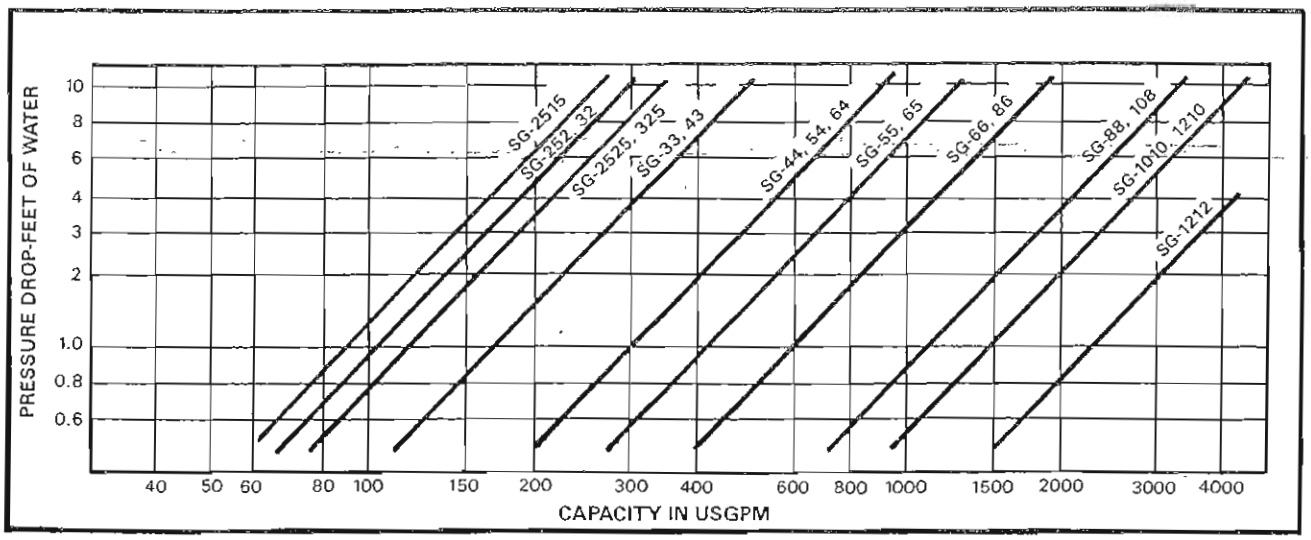
Suction Guides Model SG

designed for direct mounting to suction side of horizontal or vertical pumps

Design Features:

- Fine mesh start-up strainer (furnished as standard) helps to prevent mechanical seal failures and instrumentation damage during the initial running period.
- Guide vanes provide proper flow conditions by reducing water turbulence to minimize stress on pump parts.
- Strainer design with ⅛" diameter holes provides free flow area without jeopardizing the size of the Suction Guide or the pressure drop.
- Available with inlet and outlet of equal size or with reduced outlet, eliminating the need for a reducing fitting.
- Overall system pressure drop is reduced since less pipe and fittings are required for each pump installed.
- Optional magnet for collection of small metallic particles.

Pressure Drop Curves



Typical Specification

Furnish and install on the suction of each pump, an Armstrong Suction Guide with Cast Iron Body, Outlet Guide Vanes, Removable Stainless Steel Strainer and Fine Mesh Start-up Strainer. The mechanical contractor shall inspect the Strainer prior to start-up of pump and shall remove the Fine Mesh Brass Strainer after a short running period. Space shall be provided for removal of Strainer and connection of blowdown valve.

Maximum Operating Conditions

Maximum Working Pressure
175 PSIG

Maximum Working Temperature
300° F

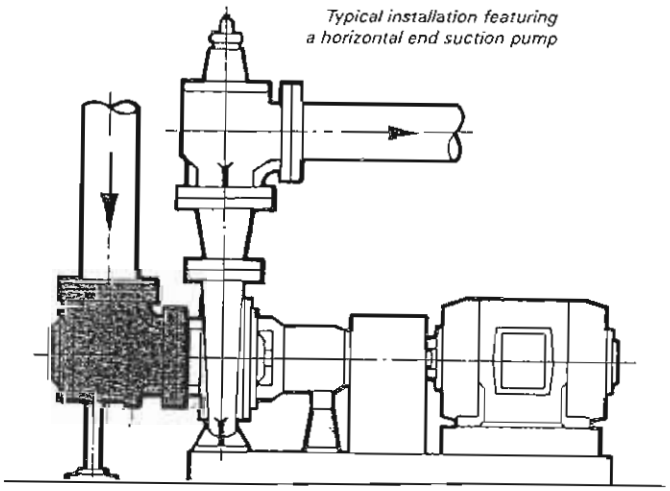
*All sizes available for 250 PSIG working pressure in Ductile Iron.

Materials of Construction

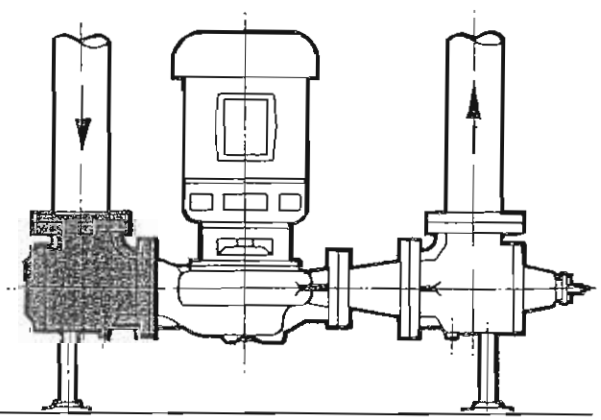
Part Name	Material
Body	Cast Iron
Guide	Cast Iron
Strainer	Stainless Steel (⅛" Dia. Holes)
Start-up Strainer	Fine Mesh Brass
Guide Vanes (Integral with Body)	Steel* Cast Iron**
Shaft Sleeve	Stainless Stl.* (Optional) Cast Iron**

*8" Pump suction connection and smaller.
**10" Pump suction connection and larger. Guide vanes are cast integral with body.

Typical installation featuring a horizontal end suction pump



Typical installation featuring a vertical in-line pump



S.A. Armstrong Limited
23 Bertrand Avenue
Scarborough, Ontario
Canada, M1L 2P3
Tel: (416) 755-2291
Fax: (416) 759-9101

Armstrong Pumps Limited
Peartree Road, Stanway
Colchester, Essex
United Kingdom, C03 5JX
Tel: 0206-579491
Fax: 0206-760532

Armstrong Pumps Inc.
93 East Avenue
North Tonawanda, New York
U.S.A. 14120-6594
Tel: (716) 693-8813
Fax: (716) 693-8970

Armstrong Darling Inc.
2200 Place Transcanadienne
Dorval, Quebec
Canada, H9P 2X5
Tel: (514) 421-2424
Fax: (514) 421-2436

Printed in Canada

ARMSTRONG SUBMITTAL

SUCTION GUIDES
Model: SG
Style: Angle

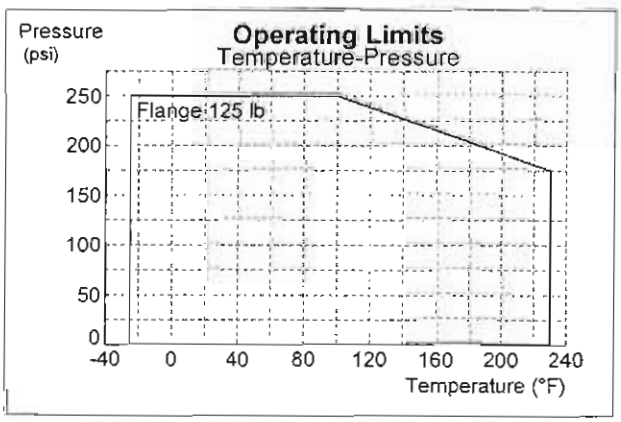
Project Number: 120706L	**Representative:** Mechanical Solutions
Name: Post House	121 Commerce Way, South Windsor, CT
Reference:	Phone: 860-290-1564, Fax: 860-290-1825
Location:	**Order No:** **Date:**
Engineer:	**Submitted by:** Julie Kirk **Date:** 12/7/2006
Contractor: Eastern Mechanical	**Approved by:** **Date:**

DESIGN DATA (Angle)

Tag	Qty	Model	System	Pump	P.Drop	Attached Pump Description
CWP-1,2	2	SG-44	4 in	4 in	1.099 ft	CWP-1,2:Series 4030,4x3x11.5,300 usgpm @ 120 ft

MATERIALS OF CONSTRUCTION

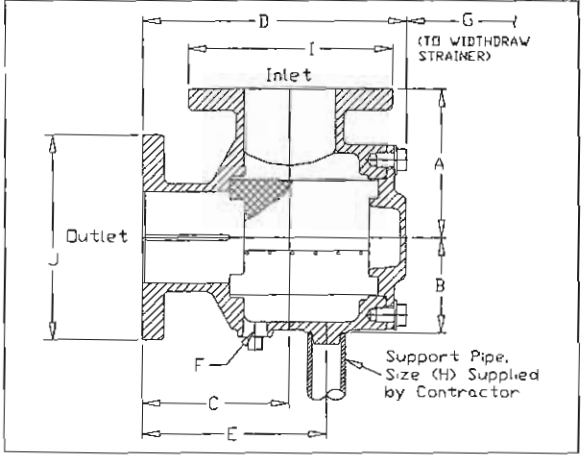
ANSI Flange Rating	125 lb. (Cast Iron)
Valve Body	Cast Iron (A48-30)
Strainer	Stainless Steel, 0.13 in Dia. Openings
Start-up Strainer	Fine Mesh Galvanized
Guide Vanes	Cast Iron
Cover O Ring	EPDM



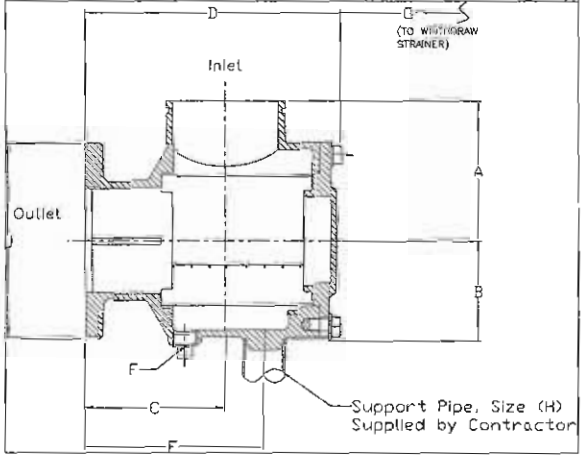
ARMSTRONG SUBMITTAL

SUCTION GUIDES
Model: SG & SGHH & SGG & SGGHH
Style: Flanged-Flanged & Grooved-Flanged

SG & SGHH (Flanged-Flanged)



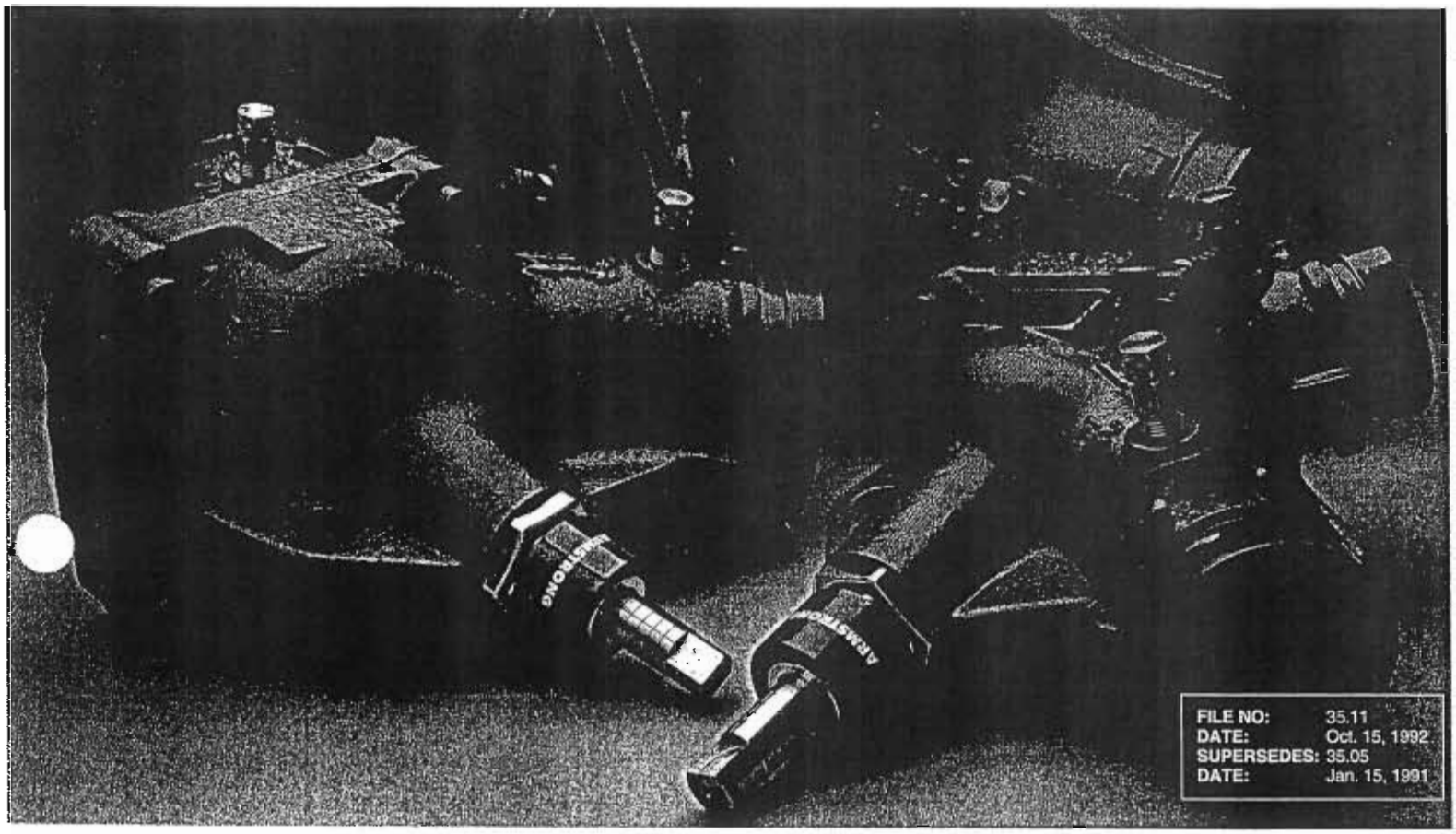
SGG & SGGHH (Grooved-Flanged)



DIMENSIONS												
Model	Str.FA	A	B	C	D	E	F	G	H	I	J	Wgt
SG-44	79 in²	6.5 in	4.19 in	6.5 in	11.75 in	8.13 in	0.75 in	7 in	1.25 in	9 in	9 in	72 lbs
Str.FA = Strainer Free Area, E = Inlet Flange OD												

ARMSTRONG

F T V



FILE NO:	35.11
DATE:	Oct. 15, 1992
SUPERSEDES:	35.05
DATE:	Jan. 15, 1991

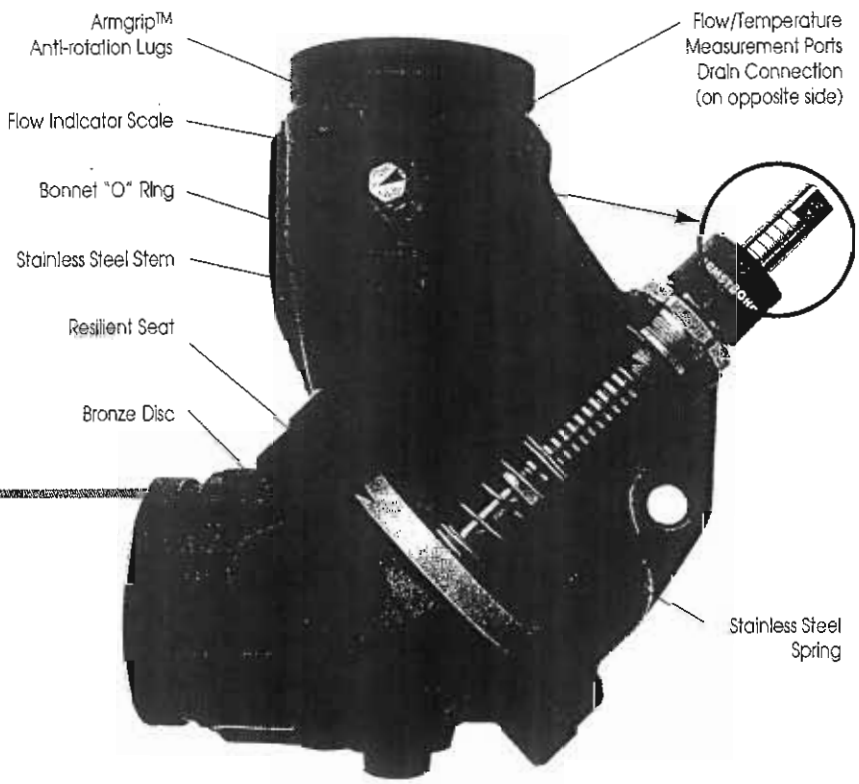
Flo-Trex Combination Valve 2½" – 12"

ENGINEERED ECONOMY

Armstrong Model FTV Flo-Trex Combination Valves are designed for installation on the discharge side of centrifugal pumps. This results in savings in space, as well as installation and material costs.

The Armstrong Model FTV Flo-Trex Combination Valve incorporates three functions in one valve:

- Drip-tight shutoff valve
- Spring-closure design, non-slam check valve
- Flow throttling valve



ARMSTRONG™ MODEL FTV-A

INNOVATIVE FEATURES

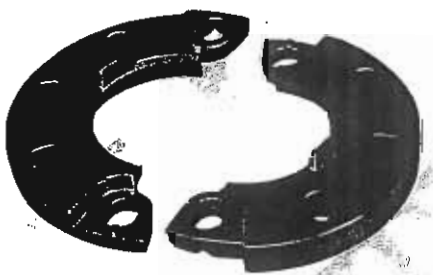
The Armstrong convertible body design permits the valve to be changed on site from the straight to the angle configuration.

Flow measurement (where an approximate indication is acceptable) is obtained by flow measuring ports on each side of the valve seat. Pressure differential is easily recorded using the Armstrong Compuflo Meter or other differential pressure measurement devices. If precision accuracy is required, we recommend that an Armstrong Model CBV Circuit Balancing Valve be installed downstream from the FTV valve.

Design Benefits

■ Reduced field installation and material cost ■ Ductile iron valve body with standard grooved ends ■ Eliminates requirement of three valves on pump discharge and, in some cases, a 90° elbow, thus saving space ■ Soft seat to ensure tight shut-off ■ Spring-closure design, non-slam silent check valve feature for vertical or horizontal mounting ■ Flow measurement and pump throttling capabilities ■ Temperature measurement capability ■ Spring-closure design check valve prevents gravity or reverse circulation when pump is not operating ■ Bonnet "O" Ring can be replaced under full system pressure by back seating of valve stem ■ Suitable for maximum working pressure to 375 psi (2586 kPa) and temperatures to 230°F. (110°C). ■ Valve seat can be changed in the field without use of special tools ■ Low pressure drop due to "Y" pattern valve design ■ Valve Cv designed to ASHRAE flow recommendations for quiet system operation

ARMSTRONG ARMGRIP™ FLANGE ADAPTER AND GASKET

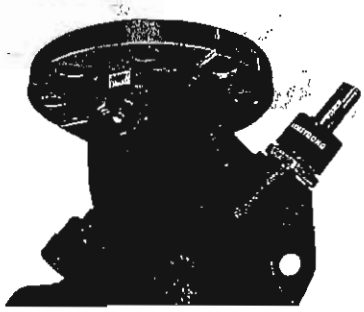


Flow Indicator Scale

The valve stem with its grooved rings and positioning sleeve indicates the throttled position of the valve. The quarter turn graduations on the sleeve, with the scribed line on the stem, provide for approximate flow measurement.

Armgrip™ Flange Adaptor

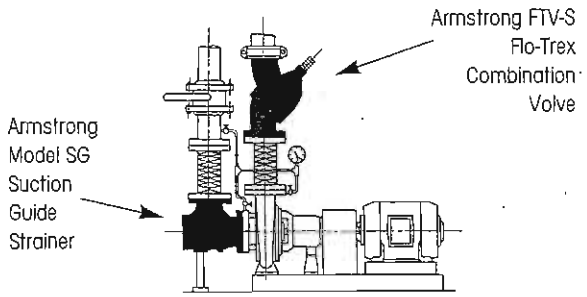
The combination of the Armstrong flange adapter and Flo-Trex body, equipped with the unique Armgrip™ anti-rotation lugs, ensures a rigid pump installation.



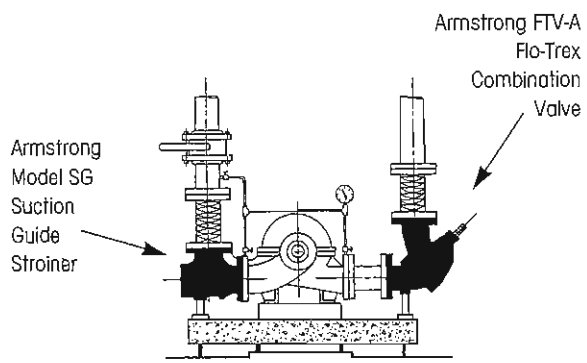
Reduce Field Installation and Material

Armstrong Method

- **FEWER COMPONENTS REQUIRED**
- **FEWER CONNECTIONS REQUIRED**
- **LESS INSTALLATION TIME REQUIRED**
- **LESS INSTALLATION SPACE REQUIRED**



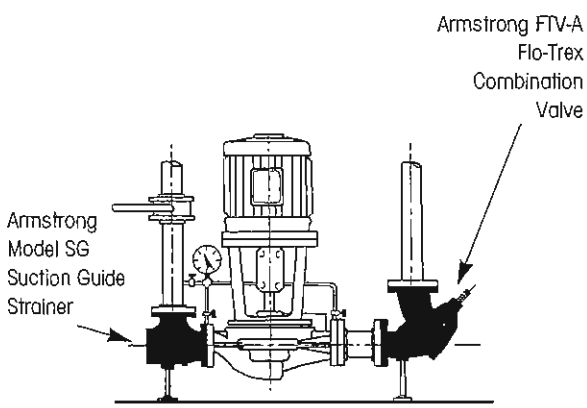
BASE MOUNTED SINGLE SUCTION PUMP



BASE MOUNTED OOUBLE SUCTION PUMP

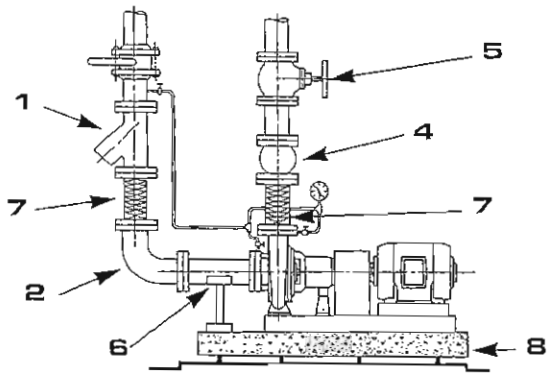
THE SMART CHOICE!

The Armstrong Vertical In-Line Pump Installation requires the fewest components, maximizing savings, and minimizing installation time.

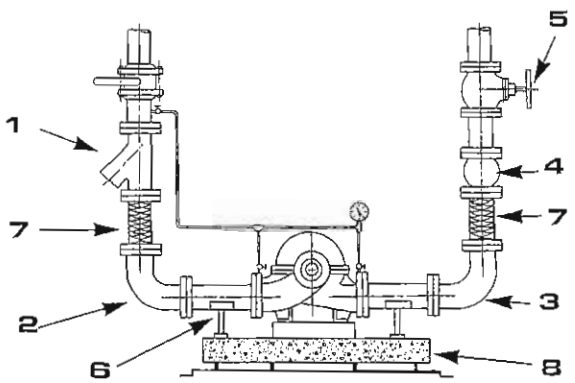


VERTICAL IN-LINE PUMP

Conventional Method



BASE MOUNTED SINGLE SUCTION PUMP



BASE MOUNTED DOUBLE SUCTION PUMP

Components eliminated using Armstrong Flo-Trex Valves and Suction Guide Strainer

(BASE MOUNTED SINGLE AND DOUBLE SUCTION PUMP INSTALLATIONS):

1 "Y" Strainer

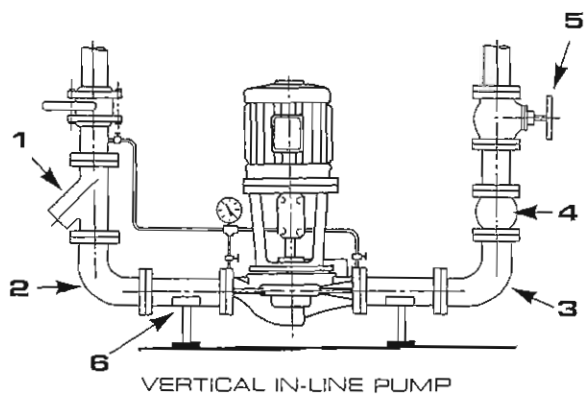
2 Suction long radius elbow

3 Discharge long radius elbow

4 Discharge check valve

5 Discharge globe valve

6 Suction spool piece



VERTICAL IN-LINE PUMP

Components eliminated using Armstrong Flo-Trex Valves and Suction Guide Strainer

(VERTICAL IN-LINE PUMP INSTALLATIONS):

1 "Y" Strainer

2 Suction long radius elbow

3 Discharge long radius elbow

4 Discharge check valve

5 Discharge globe valve

6 Suction spool piece

7 Flexible connector

8 Inertia base

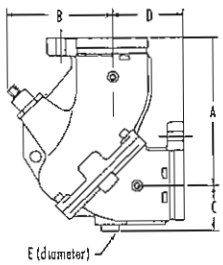
Dimensions and Materials of Construction

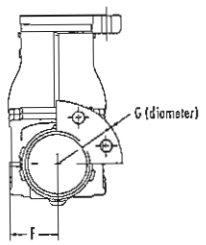
Model		FTV-S (STRAIGHT) Inches (mm)							
Connection Size		2½	3	4	5	6	10	12	
Dimensions	A	12 (305)	12 (305)	14 (356)	17½ (445)	20¹¹/₁₆ (525)	28¹/₁₆ (716)	30 (762)	38¹/₁₆ (967)
	B (fully open)	7 (178)	7¹³/₁₆ (198)	8 (203)	10⅛ (257)	10³/₈ (264)	22¹³/₁₆ (579)	28⅝ (727)	32⅝ (829)
	C	2¾ (70)	2⁷/₁₆ (62)	3 (76)	3⅝ (92)	4⁷/₁₆ (113)	5¹¹/₁₆ (144)	6⁹/₁₆ (167)	7⅝ (194)
	D	-	-	-	-	-	-	-	-
	E	1 (25)	1 (25)	1¼ (32)	1¼ (32)	2 (51)	2¼ (57)	2¼ (57)	2¼ (57)
	F	2⁹/₁₆ (65)	3 (76)	3⁷/₁₆ (87)	4¹⁵/₁₆ (125)	5⅞ (149)	7⅞ (200)	9¹⁵/₃₂ (241)	12⅝ (321)
	G (Flange 125/150 PSI)	7 (178)	7½ (191)	9¼ (235)	10 (254)	11 (279)	13½ (343)	16 (409)	19 (483)
	G (Flange 250/300 PSI)	7½ (191)	8¼ (210)	10 (254)	11 (279)	12½ (318)	15 (381)	17½ (445)	20½ (521)
Weight LBS (kg)		19 (9)	24 (11)	42 (19)	81 (37)	120 (54)	300 (136)	450 (204)	860 (390)

Model		FTV-A (ANGLE) Inches (mm)							
Connection Size		2½	3	4	5	6	10	12	
Dimensions	A	7½ (187)	8¹/₁₆ (208)	9⅝ (244)	12 (305)	14⅛ (359)	18¹⁵/₁₆ (481)	20⁵/₁₆ (516)	24¹/₁₆ (611)
	B (fully open)	7 (178)	7¹³/₁₆ (198)	8 (203)	10⅛ (257)	10⅜ (264)	18¾ (476)	24 (610)	26¼ (667)
	C	2¼ (70)	2¹/₁₆ (62)	3 (76)	3⅝ (92)	4⁷/₁₆ (113)	5¹¹/₁₆ (144)	6⁹/₁₆ (167)	7⅝ (194)
	D	4⅝ (117)	3⅞ (98)	4⅜ (111)	5½ (140)	6⅝ (168)	9²/₁₆ (233)	9¾ (248)	14 (356)
	E	1 (25)	1 (25)	1¼ (32)	1¼ (32)	2 (51)	2¼ (57)	2¼ (57)	2¼ (57)
	F	2⁹/₁₆ (65)	3 (76)	3⅜ (87)	4¹⁵/₁₆ (125)	5⅞ (149)	7⅞ (200)	9¹⁵/₃₂ (241)	12⅝ (321)
	G (Flange 125/150 PSI)	7 (178)	7½ (191)	9¼ (235)	10 (254)	11 (279)	13½ (343)	16 (409)	19 (483)
	G (Flange 250/300 PSI)	7½ (191)	8¼ (210)	10 (254)	11 (279)	12½ (318)	15 (381)	17½ (445)	20½ (521)
Weight LBS (kg)		19 (9)	24 (11)	42 (19)	81 (37)	120 (54)	300 (136)	450 (204)	860 (390)

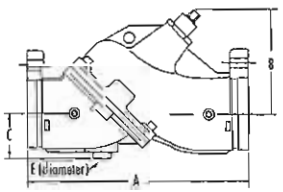
Materials of Construction		
	Body	Ductile Iron ASTM A536 GR 65-45-12
	Disc	Bronze ASTM B584 C-84400
	Seat	High Strength Engineered Resin
	Stem	Stainless Steel ASTM A582 Type 416
	Spring	Stainless Steel ASTM A302
	"O" Rings	BUNA
	Flanges	Ductile Iron ASTM A536 Grade 65 45-12 with EPDM[2] Gaskets (optional)
	Insulation	Optional[1]
	Pressure Metering Ports 1/4" (2)	NPT Brass Body with EPDM[2] Check and Gasketted Cap
	Drain Tappings 1/4" (2)	Brass Plug

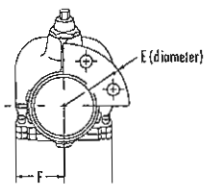
Notes: 1. Optional pre-formed insulation is available to meet ASTM D1784 Class 14253-C, MEA #7-87, ASTM E84 and ASTM E136 with a flame spread rating of 25 or less and a smoke development rating of 50 or less.
2. EPDM is not suitable for oil service.





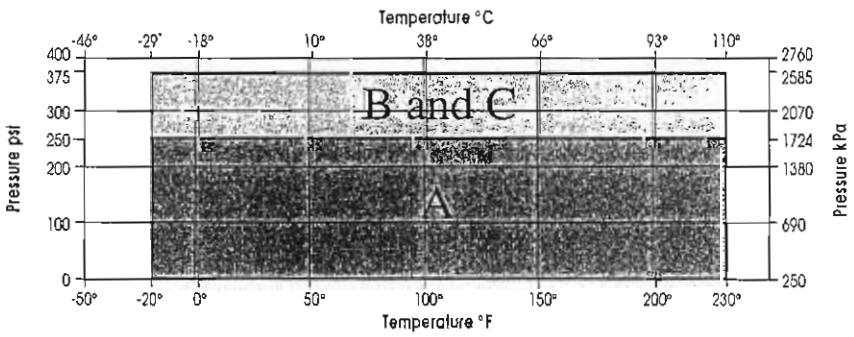
MODEL FTV-A





MODEL FTV-S

Pressure-Temperature Limits



Note. for temperatures between 230°F and 300°F (110°C and 149°C) specify Viton Elastomers.

LEGEND	
A	Armgrip™ ductile iron flange adapters for ANSI 150# flanges
B	Armgrip™ ductile iron flange adapters for ANSI 300# flanges
C	Grooved end with 375 psi rated pipe coupling

Flo-Trex Performance Curves

with Valve in Full Open Position

Valve Selection Criteria

1 Minimum Flow Rate – To ensure sufficient flow to hold disc in full open position during operation; size valves in shaded area only of Flo-Trex Performance Curve.

2 Maximum Flow Rate – Select valve in shaded area only. However, consideration should be given to selecting the valve with the lowest pressure drop and velocity in accordance with ASHRAE practice. This will ensure a quiet, energy-efficient system and maximum valve life.

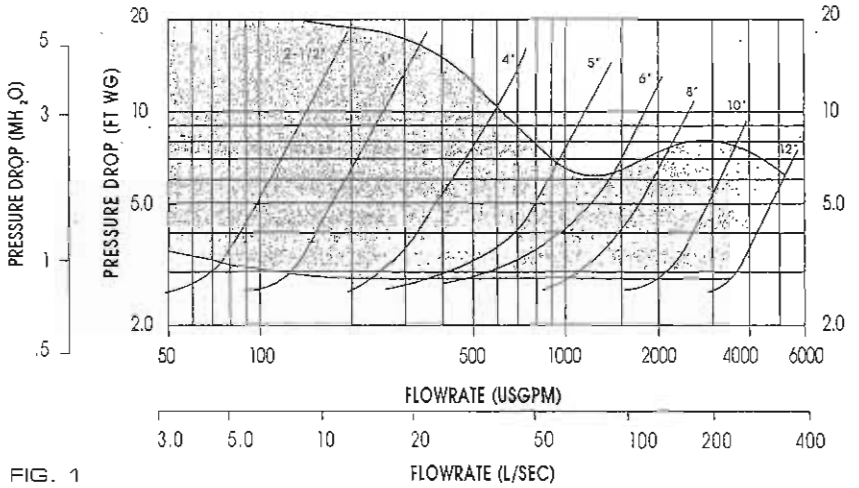


FIG. 1

Inherent Flow Characteristic Curves

with Valve in Throttled Position

Determining Flow Rate

1 Record the size of valve and stem position using the Flow Indicator Scale. Calculate percentage of valve opening referring to table below:

Valve Size	2½	3	4	5	6	8	10	12
Number of Rings (valve full open)	5	5	6	9	10	12	18	28

2 Measure and record the differential pressure across the valve in the throttled position.

3 Locate percentage of valve opening on the bottom scale of Flow Characteristic Curve (Fig. 2). Project line vertically up to intersect with the Valve Characteristic Curve and from this point project line horizontally across to the left of the chart and record the percentage of maximum flow rate.

4 On the Flo-Trex Performance Curve (Fig. 1) locate the differential pressure obtained in Step 2 and project line horizontally across to intercept with Valve Performance Curve. Drop a line vertically down to read the flow rate at the bottom of the chart.

5 To calculate flow rate of valve in the throttled position, multiply the flow rate from Step 4 by the percentage flow rate from Step 2 divided by 100.

Example: Valve size 4 in.
Differential Pressure in 5.4 ft. (1.65 m)
Number of rings open 3, $\frac{3 \text{ rings}}{6 \text{ rings}}$ x 100 = 50% throttled

1 From Flo-Trex Performance Curve (Fig. 1), a 4 in. valve with 5.4 ft. pressure drop (1.65m.) represents a flow of 400 USgpm (25.2 l/s).

2 From Flow Characteristic Curve (Fig. 2), a 4 in. valve, 50% open, represents 34% of maximum flow.

3 Approximate flow of a 4 in. valve, with a 5.4 ft. (1.65m) pressure drop when 50% throttled is

$\frac{400 \times 34}{100} = 136$ USgpm $\quad \frac{(25.2 \times 34}{100} = 8.57$ l/s)

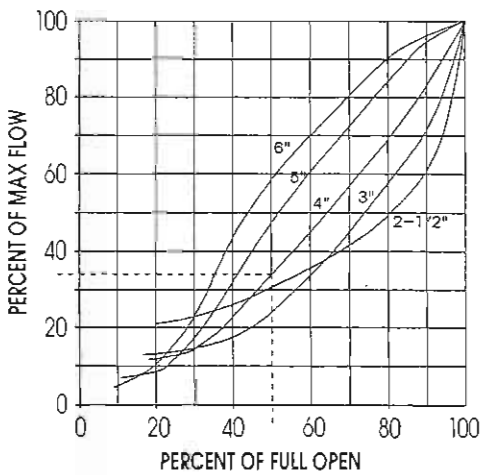
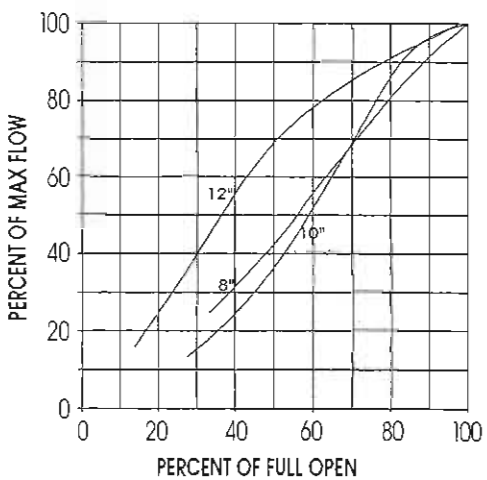


FIG. 2



NOTES:

1. Above charts are applicable for straight and angle type valves
2. It is not recommended to operate the valve with more than a 25 ft. pressure drop for prolonged periods. Trimming the pump impeller should be considered whenever the Flo-Trex Valve must operate in the throttled position.

ARMSTRONG SUBMITTAL

FLO-TREX VALVES
Model: FTV-SF & FTV-AF
Style: Flanged: Straight & Angle

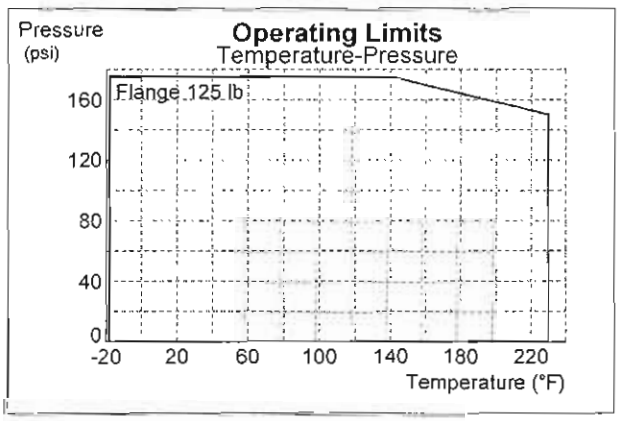
Project Number: 120706L	**Representative:** Mechanical Solutions
Name: Post House	121 Commerce Way, South Windsor, CT
Reference:	Phone: 860-290-1564, Fax: 860-290-1825
Location:	**Order No:** Date:
Engineer:	**Submitted by:** Julie Kirk Date: 12/7/2006
Contractor: Eastern Mechanical	**Approved by:** Date:

DESIGN DATA (Flanged: Straight & Angle)

Tag	Qty	Size	Flange Ratings	P.Drop	Attached Pump Description
CWP-1,2	2	FTV-4S-F	Flange 125 lb	3.421 ft	CWP-1,2:Series 4030,4x3x11.5,300 usgpm @ 120 ft

MATERIALS OF CONSTRUCTION

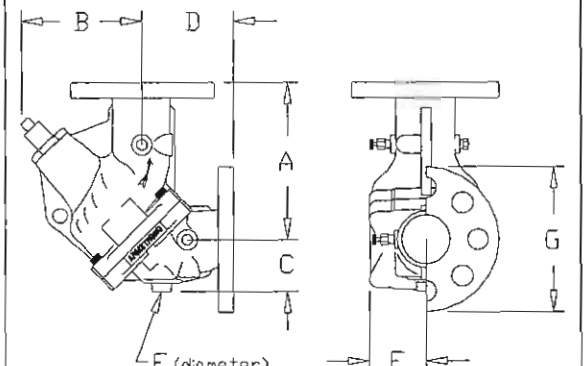
Valve Body	Cast Iron ASTM A48 Class 30B
Disc	Bronze (B584-844)
Seat	EPDM
Stem	Stainless Steel ASTM A582 Type 416
Spring	SS ASTM A313 Type 302
O-Ring	EPDM
Metering Ports (2)	NPT Brass Body with EPT Check and Gasketted Cap
Drain Tappings (2)	0.25 in with Brass Plug
Insulation	Optional



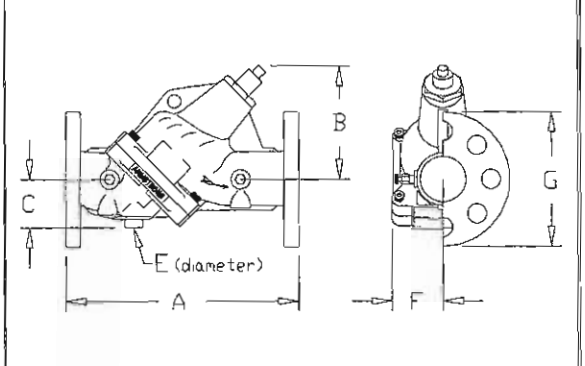
ARMSTRONG SUBMITTAL

FLO-TREX VALVES
Model: FTV-AF & FTV-SF
Style: Flanged-Angle & Flanged-Straight

(Flanged-Angle) FTV-AF



(Flanged-Straight) FTV-SF

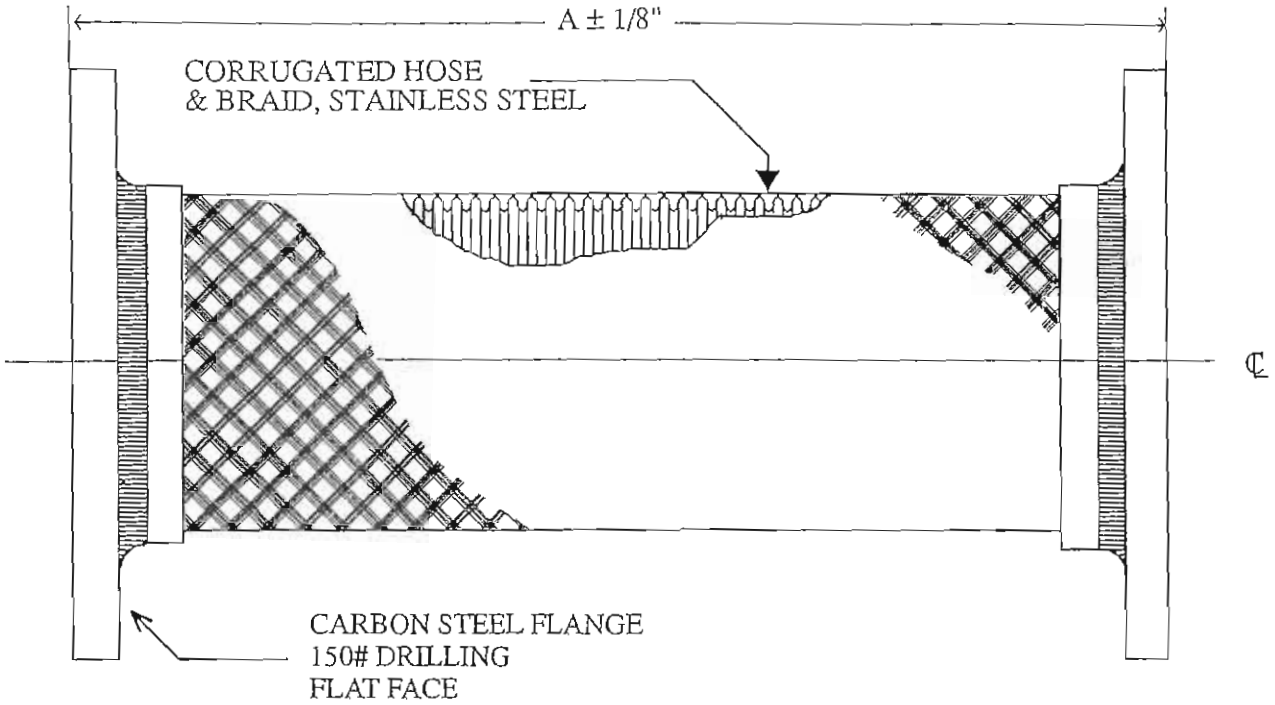


DIMENSIONS (Flanged-Angle) FTV-AF

Size	Flange	A	B Open	C	D	E	F	G	Wgt

DIMENSIONS (Flanged-Straight) FTV-SF

Size	Flange	A	B Open	C	D	E	F	G	Wgt
4.0 in	125 lbs	14 in	8 in	3 in	0 in	1 in	3 in	9 in	59 lbs



FOR TEMP. ABOVE 70° F.	
TEMP.°F.	FACTOR
70	1.00
200	.92
300	.86
400	.82
500	.77
600	.73

* FOR SAFE WORKING PRESSURE ABOVE 70° F. MULTIPLY PRESSURE SHOWN AT 70° F. TIMES CORRECTION FACTOR OF REQUIRED TEMP.

QTY.	PIPE SIZE	A	PRESS. @ 70°F.*	NOTES
	2"	9"	455	
	2.5"	9"	345	
	3"	9"	289	
4	4"	9"	300	
	5"	11"	220	
	6"	11"	200	
	8"	12"	190	
	10"	13"	150	
	12"	14"	125	
	14"	14"	105	

MAX. PERMANENT OFFSET FROM ℄ 3/8"
MAX. INTERMITTENT OFFSET FROM ℄ 1/8"

CUSTOMER _____

PROJECT _____

ENGINEER _____

ARCHITECT _____

INQ. OR P.O. NO _____

the Metraflex company
CHICAGO ILLINOIS

DESCRIPTION:
METRA-MINI
STAINLESS STEEL PUMP CONNECTOR

DRAWN BY :	DATE:	DRAWING NO:
J R	4/99	150 SF-MM

ARMSTRONG®

FILE NO:	37.15
DATE:	Feb. 27. 2004
SUPERSEDES:	35.15
DATE:	Nov. 30, 1998

Vortex Air Separator

PRODUCT DATA SHEET

The Air Removal Requirement

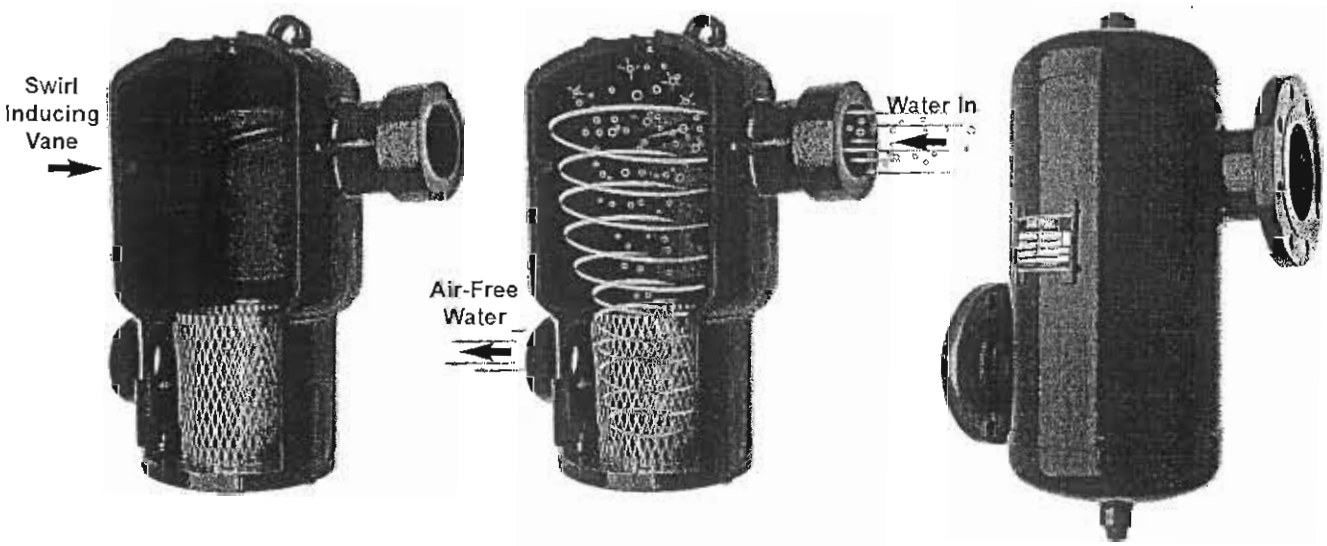
Air is introduced to a hydronic system:

- During initial fill
- During routine equipment maintenance
- While maintaining system pressure
- In a cooling tower operation

Fill water at 50°F (10°C) can hold up to 9% entrained air at 30 psig (207 kPa). When heated up to 200°F (93°C), the water can hold up to 4.5% entrained air. The remaining 4.5% air is released into the system as air pockets, bubbles, and microbubbles, that can negatively impact the performance of fluid flow or heat transfer equipment.

Models VA/VAS 2", 2½", 3"
Cast Iron

Models VA/VAS 4" - 24"
Fabricated Steel



How the Vortex Air Separator Removes Air

Circulating the water through the Vortex Air Separator creates a vortex or whirlpool action, sending the heavier air-free water to the outer portion of the tank and allowing the lighter air-entrained water mixture to move into the lower velocity center. At the centre of the vortex the air is released from the water forms bubbles and exits through an air vent or compression tank installed above. Instead of relying entirely on low velocity separation, the Vortex Air Separator offers the advantage of efficient separation in a much smaller tank.

The Benefits & Advantage of an Air Free System

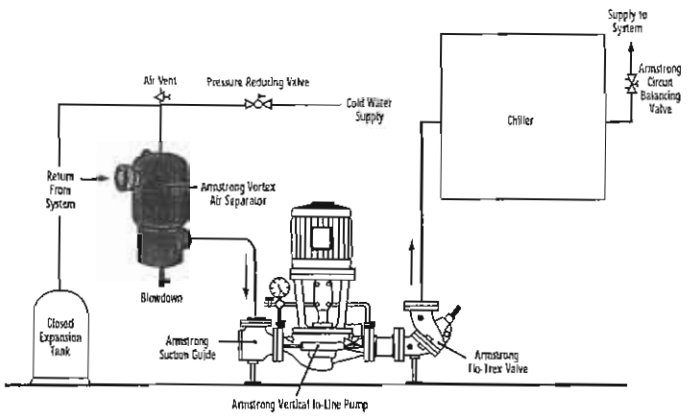
Air-free water flow means improved systems operation and lower operating costs.

The Vortex Air Separators eliminate entrained air from heating and cooling systems providing these benefits:

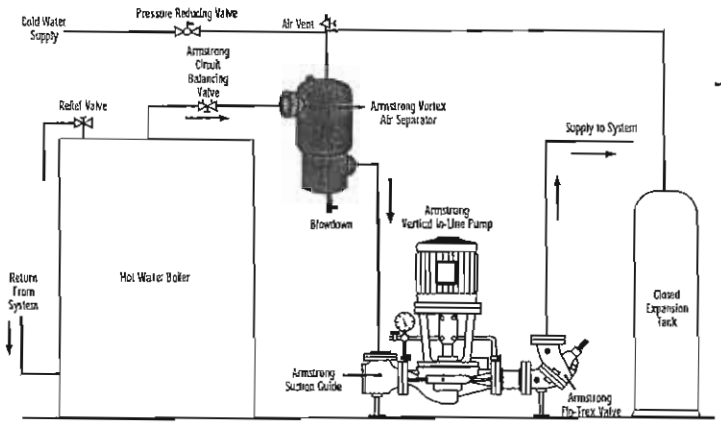
- Allows quick venting of air at start-up
- Reduces annoying noise caused by air entrained in the system
- Reduces service costs due to air-bound piping
- Extends the life of the system by reducing corrosion and erosion
- Improves heat transfer efficiency in boilers, fan coils, chillers, etc.
- Reduces the overall energy costs of your system
- Optimizes pump performance by reducing incidences of 'air lock'

Installation Schematics

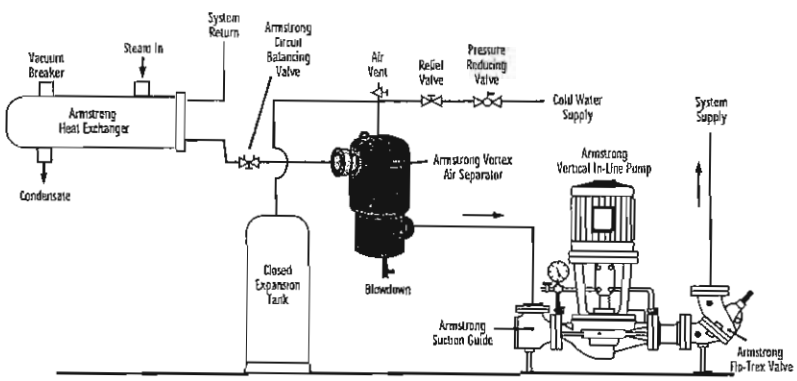
Vortex Air Separators should be installed at the highest temperature and the lowest pressure points in the system. Where this is not possible, the best location is at the point of highest temperature. Ideally, a separator should be located on the outlet side of the boiler, and the suction side of the pump.



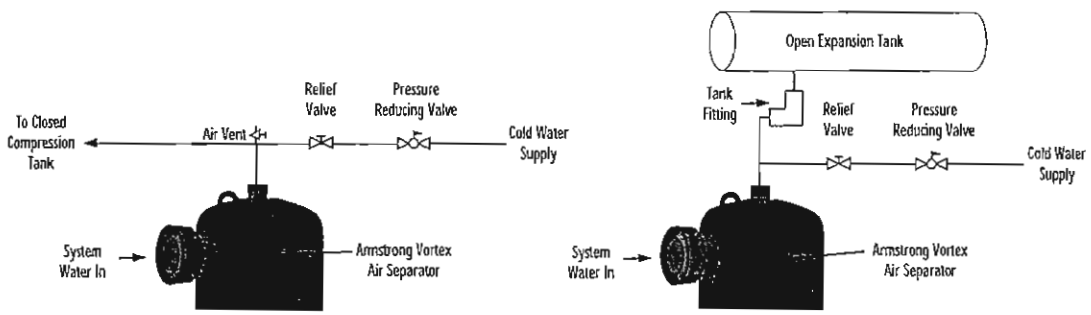
For Chiller Applications



For Boiler Applications



For Heat Exchanger Applications



Typical Piping Connections to an Air Separator

Armstrong Pumps Inc.
93 East Avenue
North Tonawanda, New York
U.S.A. 14120-6594
Tel: (716) 693-8813
Fax: (716) 693-8970

S.A. Armstrong Limited
23 Bertrand Avenue
Toronto, Ontario
Canada, M1L 2P3
Tel: (416) 755-2291
Fax: (416) 759-9101

Armstrong Pumps Limited
Peartree Road, Stanway
Colchester, Essex
United Kingdom, CO3 0LP
Tel: +44 (0) 1206 579491
Fax: +44 (0) 1206 760532

Armstrong Darling
9001 De L'Innovation, Suite 200
Montreal (Anjou), Quebec
Canada, H1J 2X9
Tel: (514) 352-2424
Fax: (514) 352-2425

www.armstrongpumps.com

ARMSTRONG®

FILE NO:	37.620
DATE:	Sept. 5, 2003
SUPERSEDES:	37.62
DATE:	Aug. 1, 2000

Vortex Air Separators - Models VA / VAS: 2" to 3"

SUBMITTAL

JOB: _____ REPRESENTATIVE: _____

ORDER NO: _____ DATE: _____

ENGINEER: _____ SUBMITTED BY: _____ DATE: _____

CONTRACTOR: _____ APPROVED BY: _____ DATE: _____

MODEL NO. ORDERED: _____ QTY.: _____

TAG NO.: _____

ASME CONSTRUCTION: ☐ YES ☐ NO

TECHNICAL DATA

Max. Working Temperature	350°F (176°C)
Max. Working Pressure	160 psi (1105 kPa)
Connection Type	Threaded NPT

MATERIALS OF CONSTRUCTION

Shell	Cast Iron
Strainer	Stainless Steel Mesh (1/4" x 3/4")
Gasket	Non-Asbestos

TYPICAL SPECIFICATION

ASME Coded Units

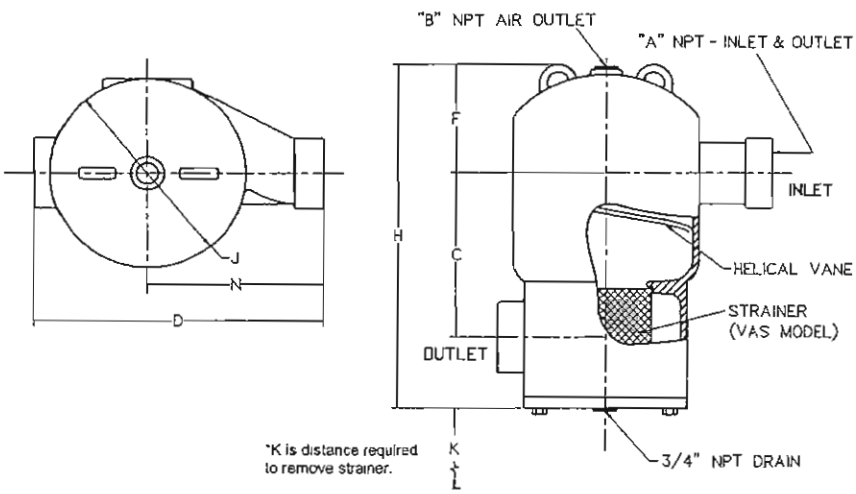
Furnish & install an Armstrong Vortex® Air Separator, Model ___ VA or Model ___ VAS (with strainer) with NPT tangential connections as shown on plans. The unit shall be designed and built in accordance with the latest revisions of ASME Pressure Vessel Code, Section VIII, Division 1. A blowdown connection is provided for routine cleaning of the unit.

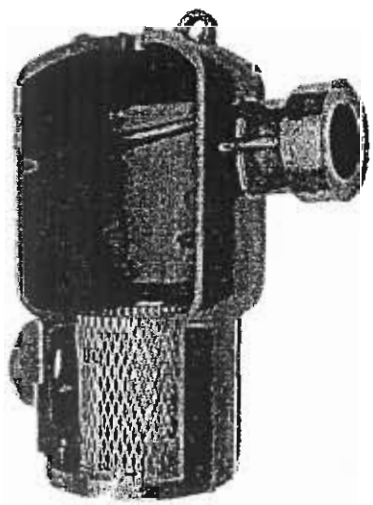
Non-ASME Coded Units

Furnish & install an Armstrong Vortex® Air Separator, Model ___ VA or Model ___ VAS (with strainer) with NPT tangential connections as shown on plans. The unit is considered as "part of the piping" and no Code Inspection applies. A blowdown connection is provided for routine cleaning of the unit.

MODEL		DIMENSIONS inches (mm)									FLOW RATE in USgpm (L/s) for LINE VELOCITY ft/s (m/s)			WEIGHT lbs. (kg)		STRAINER SCREEN FREE AREA
LESS STRAINER	WITH STRAINER	A	B	C	D	F	H	J	K	N	4 (1.22)	6 (1.83)	8 (2.44)	VA	VAS	Sq. in. (Sq. cm)
VA-2	VAS-2	2.00 (51)	0.75 (19)	7.50 (191)	12.75 (324)	4.75 (121)	15.75 (400)	8.63 (219)	7.00 (178)	7.75 (197)	42 (2.6)	63 (4.0)	84 (5.3)	70 (32)	70 (32)	40 (258)
VA-2-1/2	VAS-2-1/2	2.50 (64)	0.75 (19)	9.25 (235)	15.50 (394)	6.15 (156)	19.00 (483)	10.70 (272)	7.88 (200)	9.50 (241)	60 (3.8)	90 (5.7)	120 (7.6)	100 (45)	100 (45)	67 (432)
VA-3	VAS-3	3.00 (76)	0.75 (19)	9.25 (235)	15.50 (394)	6.15 (156)	19.00 (483)	10.70 (272)	7.88 (200)	9.50 (241)	93 (5.9)	140 (8.8)	185 (11.7)	100 (45)	100 (45)	67 (432)

Note: Dimension "K" applies to only VAS Models.





Armstrong Pumps Inc.
93 East Avenue
North Tonawanda, New York
U.S.A. 14120-6594
Tel: (716) 693-8813
Fax: (716) 693-8970
www.armstrongpumps.com

S.A. Armstrong Limited
23 Bertrand Avenue
Toronto, Ontario
Canada, M1L 2P3
Tel: (416) 755-2291
Fax: (416) 759-9101

Armstrong Pumps Limited
Peartree Road, Stanway
Colchester, Essex
United Kingdom, CO3 0LP
Tel: +44 (0) 1206 579491
Fax: +44 (0) 1206 760532

Armstrong Darling
9001 De L'Innovation, Suite 200
Montreal, Quebec
Canada, H1J 2X9
Tel: (514) 352-2424
Fax: (514) 352-2425

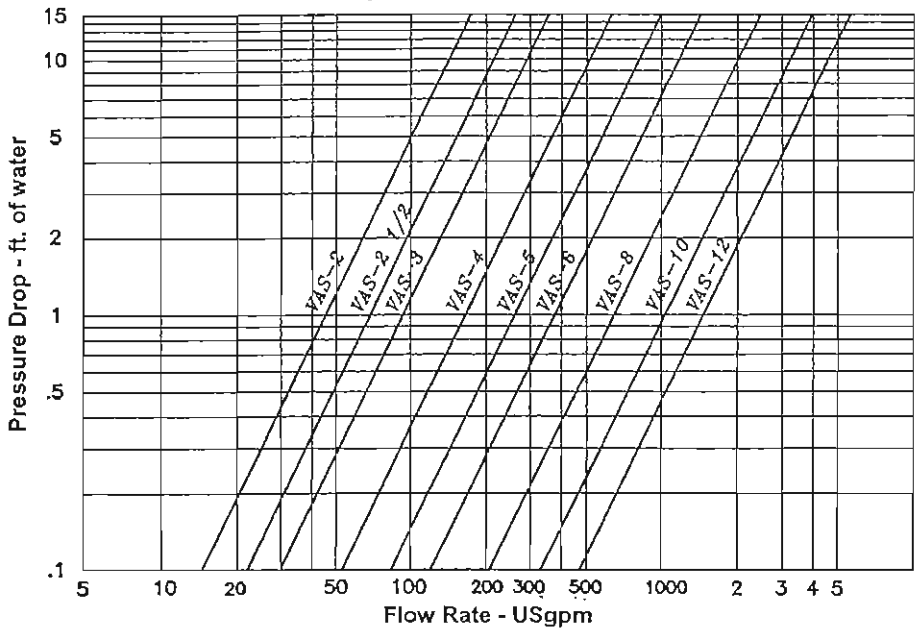
ARMSTRONG®

FILE NO:	37.631
DATE:	Sept. 5, 2003
SUPERSEDES:	New
DATE:	New

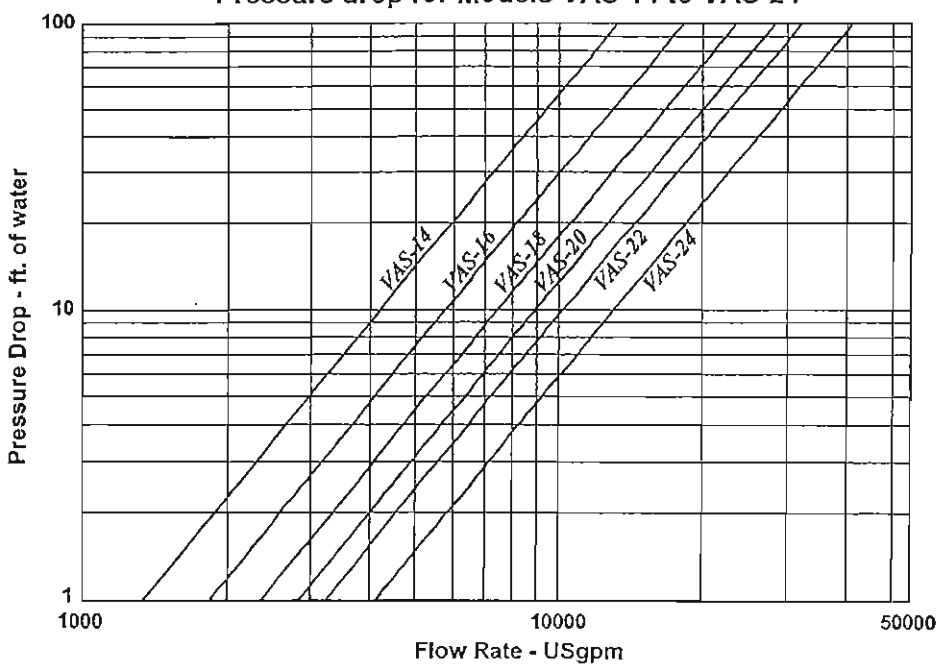
Vortex Air Separator - Model VAS (with Strainer)

PRESSURE DROP CHARTS

Pressure drop for Models VAS-2 to VAS-12



Pressure drop for Models VAS-14 to VAS-24



Armstrong Pumps Inc.
93 East Avenue
North Tonawanda, New York
U.S.A. 14120-6594
Tel: (716) 693-8813
Fax: (716) 693-8970
www.armstrongpumps.com

S.A. Armstrong Limited
23 Bertrand Avenue
Toronto, Ontario
Canada, M1L 2P3
Tel: (416) 755-2291
Fax: (416) 759-9101

Armstrong Pumps Limited
Peartree Road, Stanway
Colchester, Essex
United Kingdom, CO3 0LP
Tel: +44 (0) 1206 579491
Fax: +44 (0) 1206 760532

Armstrong Darling
9001 De L'Innovation, Suite 200
Montreal, Quebec
Canada, H1J 2X9
Tel: (514) 352-2424
Fax: (514) 352-2425

ARMSTRONG

FILE NO.:	5037.10
DATE:	Nov. 30, 1995
SUPERSEDES:	5037.10
DATE:	Feb. 1, 1988

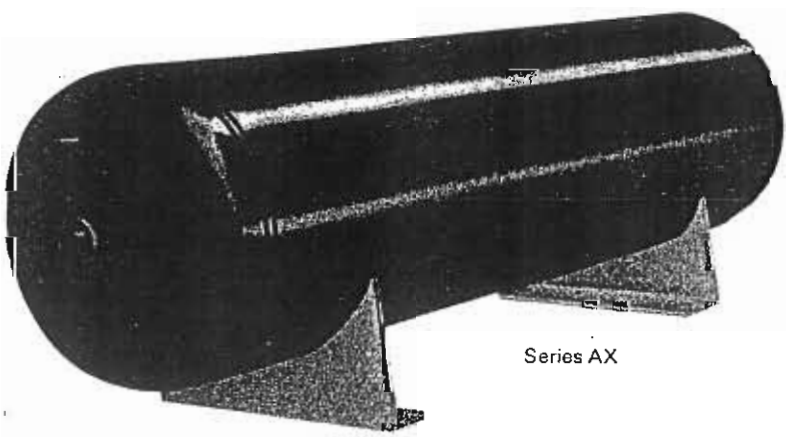
product bulletin

Expansion Tanks Series AX and L

Pre-Charged ASME Diaphragm and Bladder type tanks separate air and water for space savings and improved system operation.

Series L

Series AX-V



Series AX

Armstrong's Expansion Tanks, Series AX and L

Allow for freedom in the design of Hydronic Systems

Manufactured in accordance with ASME Section VIII for unfired pressure vessels, the Armstrong pre-charged diaphragm and bladder type tanks separate the air and water within the tank for the following benefits:

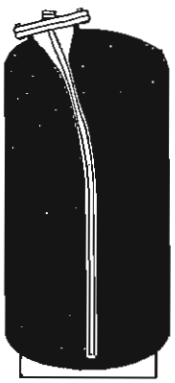
- Tank size up to 80% smaller than conventional tank.
- Improved System Performance.
- Reduced System Corrosion.
- Reduced Chemical Treatment.
- Eliminates Water-Logged Expansion Tanks.

The Pre-Charge is the Key

When the tank is pre-charged to the minimum system operating pressure (Pf), it accepts only the expanded system water as the temperature increases. The highest temperature condition will have compressed the pre-charge to the maximum system operating pressure (Po). As the temperature decreases, the expanded water is pushed back into the system by the tank pressure. This design allows for a smaller tank, since space for charge water to compress air at atmospheric pressure to Pf is no longer necessary, as it is when using a conventional expansion tank.

Understanding How An Armstrong Bladder Style Expansion Tank Functions

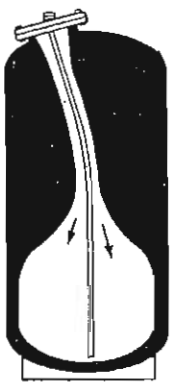
Condition 1 – System Pressure at 12 PSI Cold Water, Pf



System filled to minimum operating pressure, Pf. In this example, 12 psi also equals the pre-charge condition of tank as shipped from factory.

Minimum system operating pressure (Pf). Bladder is empty.

Condition 2 – System Pressure at 20 PSI Heated Water

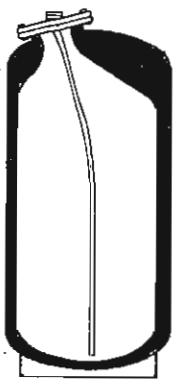


System water heated to about half of maximum system temperature.

Expanded water enters bladder.

Air pressure in tank now equals system pressure, or 20 psi.

Condition 3 – System Pressure at 25 PSI at Maximum Temperature.

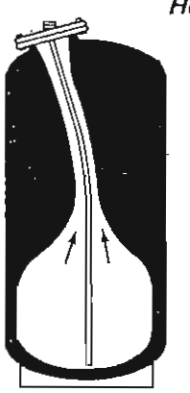


System water heated to maximum system temperature.

Expanded water fills bladder.

Air pressure in tank now equals maximum system pressure of 25 psi (Po).

Condition 4 – System Pressure at 20 PSI Heated Water



System water cools down to about half of maximum temperature.

Expanded water in bladder now is drawn back into system.

Air pressure in tank now equals system pressure of 20 psi.

Helps Eliminate Air from the System

The proper location of the air separator and air vents will provide for an air elimination system. Removing the air, rather than attempting to control it, reduces the amount of corrosion along with the need for costly chemical treatment. The separation of air and water within a diaphragm or bladder tank eliminates the need to drain and re-fill, as with a conventional tank. Another benefit is the flexibility of locating the tank in the system; since the system air is directed to the vents, the tank no longer needs to be suspended above the boiler.

Design Information

Series AX

Materials of Construction

Shell	Steel
Diaphragm	Heavy Duty Butyl

Maximum Operating Conditions

Working Temperature	240° F
Working Pressure	125 PSIG

Typical Specification

Furnish and install, as shown on the plans, Armstrong Model AX-_____ ASME Pre-charged Diaphragm Expansion Tank, stamped 125 PSI working pressure.

Tank shall be supplied with a heavy duty butyl diaphragm.

Tank shall be supplied with an NPT system connection.

An air charging valve connection (standard tire valve) shall be provided to facilitate adjusting pre-charge pressure to meet actual system conditions.

Series AX-V

Materials of Construction

Shell	Steel
Diaphragm	Heavy Duty Butyl

Maximum Operating Conditions

Working Temperature	240° F
Working Pressure	125 PSIG

Typical Specification

Furnish and install, as shown on the plans, Armstrong Model AX-200V ASME Pre-charged Diaphragm Expansion Tank, stamped 125 PSI working pressure.

Tank shall be supplied with a heavy duty butyl diaphragm.

Tank shall be supplied with a ring base, lifting rings, and an NPT system connection.

An air charging valve connection (standard tire valve) shall be provided to facilitate adjusting pre-charge pressure to meet actual system conditions.

Series L

Materials of Construction

Shell	Steel
Bladder	Heavy Duty Butyl

Maximum Operating Conditions

Working Temperature	240° F
Working Pressure	125 PSIG

Typical Specification

Furnish and install, as shown on the plans, Armstrong Model _____-L ASME Pre-charged Bladder Expansion Tank, stamped 125 PSI working pressure.

Tank shall be supplied with a ring base, lifting rings, and an NPT system connection.

An air charging valve connection (standard tire valve) shall be provided to facilitate adjusting pre-charge pressure to meet actual system conditions.

ARMSTRONG®

FILE NO:	37.51
DATE:	Sept. 5, 2003
SUPERSEDES:	37.51
DATE:	Apr. 16, 2001

AX-V Series - Pre-Charged (ASME) Vertical Expansion Tank

SUBMITTAL

JOB: _____ REPRESENTATIVE: _____

_____ ORDER NO: _____ DATE: _____

ENGINEER: _____ SUBMITTED BY: _____ DATE: _____

CONTRACTOR: _____ APPROVED BY: _____ DATE: _____

MODEL NO. ORDERED: _____ QTY.: _____

TAG NO.: _____

CHARGE PRESSURE: _____ psi/kPa

Standard factory charge is 12 psi (83 kPa) unless otherwise specified.

- **Not for Domestic Potable Water Systems.**
- **California Code Sight-Glass available upon request.**
- **Designed and Constructed per ASME Section VIII, Division 1.**

MAXIMUM OPERATING CONDITIONS

Working Temperature	240°F (115°C)
Working Pressure	125 psi (862 kPa)

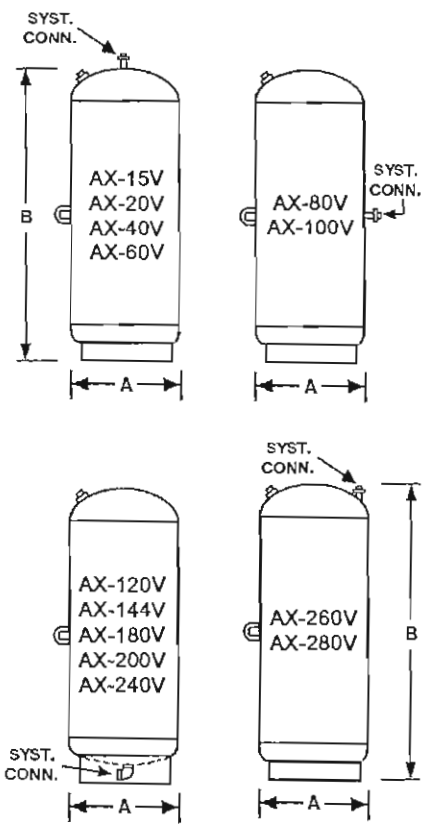
MATERIALS OF CONSTRUCTION

Shell	Steel
Diaphragm	Heavy Duty Butyl

TYPICAL SPECIFICATION

Furnish and install, as shown on the plans, Armstrong Model AX-____V ASME Pre-charged Diaphragm Expansion Tank, stamped 125 psi (862 kPa) working pressure. Each tank will be supplied with a heavy duty butyl diaphragm. Tank shall be supplied with a ring base, lifting rings, NPT system connection. An air charging valve connection (standard tire valve) shall be provided to facilitate adjusting pre-charge pressure to meet actual system conditions.

Model	Tank Volume	Acceptance Volume	A	B	System Connection NPT	Shipping Weight
	gal. (L)	gal. (L)	in. (mm)	in. (mm)	in. (mm)	lbs. (kg)
AX-15V	8.0 (30.3)	2.8 (10.6)	12 (305)	19 (483)	0.50 (13)	44 (20)
AX-20V	11.0 (41.6)	2.8 (10.6)	12 (305)	26 (660)	0.50 (13)	47 (21)
AX-40V	22.0 (83.3)	5.6 (21.2)	16 (406)	30 (762)	0.50 (13)	91 (41)
AX-60V	34.0 (128.7)	12.5 (47.3)	16 (406)	45 (1143)	0.50 (13)	111 (50)
AX-80V	44.0 (166.5)	23.2 (87.8)	16 (406)	56 (1422)	0.50 (13)	147 (67)
AX-100V	56.0 (212.0)	23.2 (87.8)	16 (406)	69 (1753)	0.50 (13)	167 (76)
AX-120V	67.0 (253.6)	35.6 (134.7)	24 (610)	44 (1118)	1.00 (25)	225 (102)
AX-144V	77.0 (291.4)	42.5 (160.9)	24 (610)	50 (1270)	1.00 (25)	245 (111)
AX-180V	91.0 (344.4)	42.5 (160.9)	24 (610)	56 (1422)	1.00 (25)	265 (120)
AX-200V	111.0 (420.1)	53.0 (200.6)	24 (610)	67 (1702)	1.00 (25)	295 (134)
AX-240V	132.0 (499.6)	69.3 (262.3)	30 (762)	54 (1372)	1.00 (25)	425 (193)
AX-260V	158.0 (598.0)	79.0 (299.0)	30 (762)	60 (1524)	1.25 (32)	475 (216)
AX-280V	211.0 (798.6)	114.8 (434.5)	30 (762)	78 (1981)	1.25 (32)	746 (339)



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Colchester, Essex
United Kingdom, CO3 0LP
Tel: +44 (0) 1206 579491
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9001 De L'Innovation, Suite 200
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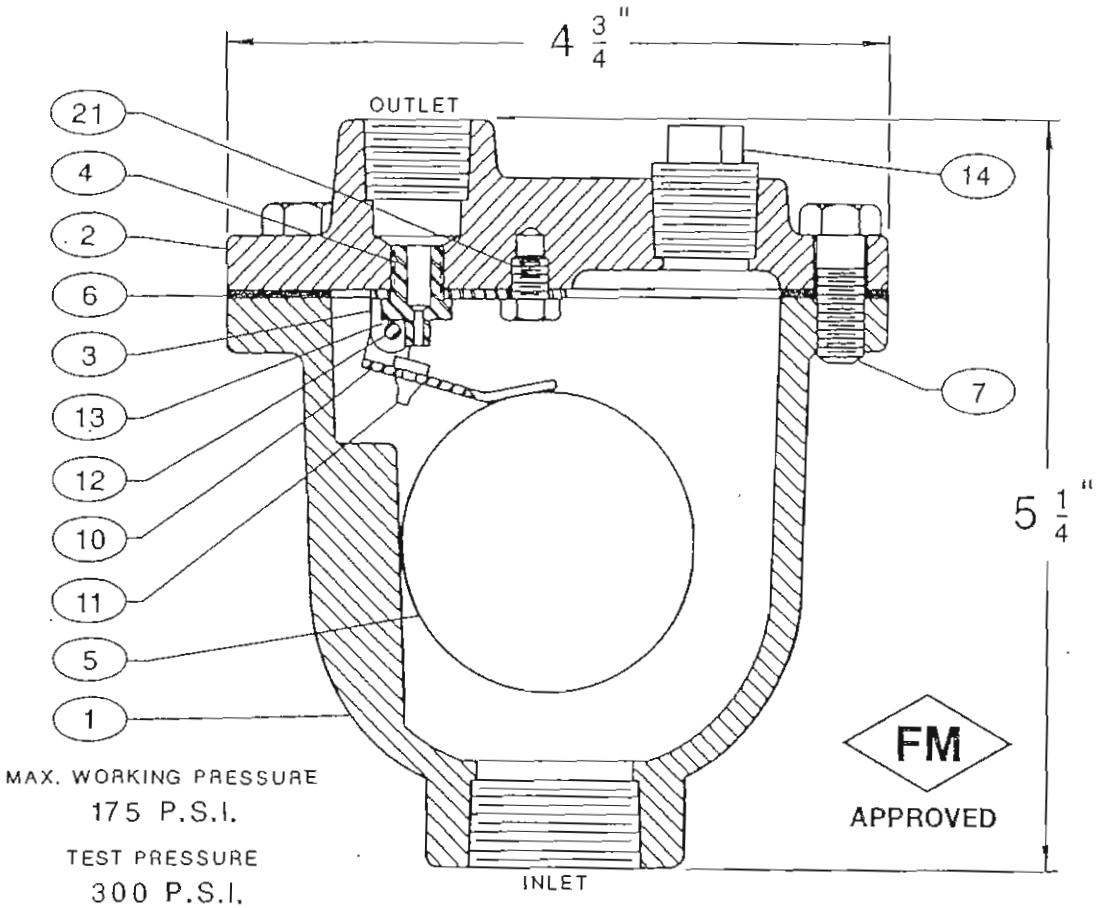
Canada, H1J 2X9
Tel: (514) 352-2424
Fax: (514) 352-2425



PART NO.	NAME	MATERIAL / ASTM NO.
1	BODY	CAST IRON - A126, CLASS B
2	COVER	CAST IRON - A126, CLASS B
3	LEVER FRAME	STAINLESS STEEL-T304, A240
4	SEAT	STAINLESS STEEL-T303, A276
5	FLOAT	STAINLESS STEEL-T304, A240
6	GASKET	NON ASBESTOS
7	COVER BOLT	CARBON STEEL-SAE GRADE 5

PART NO.	NAME	MATERIAL / ASTM NO.
10	FLOAT ARM	STAINLESS STEEL-T304,A240
11	ORIFICE BUTTON	VITON
12	PIVOT PIN	STAINLESS STEEL- T303, A276
13	PIN RETAINER *	STAINLESS STEEL- PH 15-7 MO
14	PIPE PLUG 1/2"	MALLEABLE IRON
21	LOCATOR	STAINLESS STEEL-T18-8, A276

* NOT SHOWN

QUANTITY	VALVE SIZE	MODEL NO.	MAX. TEMP.	INLET SIZE	OUTLET SIZE	ORIFICE SIZE	SHIP WEIGHT LBS.
	1/2"	1/2" - MV15A	250° F.	1/2" N.P.T.	1/2" N.P.T.	1/16"	5 1/2
	3/4"	3/4" - MV15A	250° F.	3/4" N.P.T.	1/2" N.P.T.	1/16"	5 1/2
	1"	1" - MV15A	250° F.	1" N.P.T.	1/2" N.P.T.	1/16"	5 1/2

CUSTOMER _____

PROJECT _____

ENGINEER _____

ARCHITECT _____

INQ. OR P.O. NO _____

the Metraflex company
CHICAGO ILLINOIS

DESCRIPTION :

METRAVENT AUTOMATIC AIR VENT, MODEL MV-15A

DRAWN BY :	DATE:	DRAWING NO:
J R	3-7-87	MV-15A

ARMSTRONG

File No.:	5011.95
Date:	January 1, 1994
Supersedes:	5011.95
Date:	July 31, 1980

SUBMITTAL DATA

RELIEF AND REDUCING VALVES

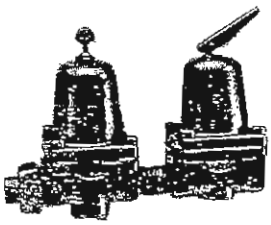
JOB: - _____ ORDER NO. _____ DATE _____

_____ QUOTATION REFERENCE: - _____

ENGINEER: - _____ REPRESENTATIVE: - _____

CONTRACTOR: - _____

COMBINATION UNITS



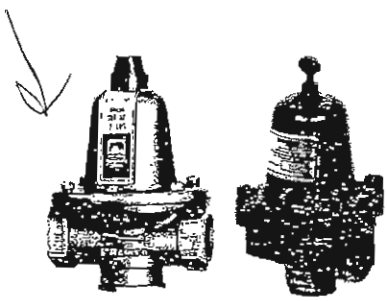
Note: Reducing Valve factory set at 12 psi, adjustable 7 to 25 psi. Reducing Valve equipped with strainer, anti-syphon check, composition disc and brass valve seat.

	Model No.	Size	Relief Setting	Body	Approx. Shipping Wt.	Face to Face DIM.	No. Req'd.
††	C-11	½"	30 PSI	BRASS	2½ Lbs.	7-7/8"	

RELIEF VALVES

Model No.	Size	Relief Setting	Body	Approx. Shipping Wt.	Face to Face DIM.	No. Req'd.
RL-11	½"	30 PSI	BRASS	1¼ Lbs.	2½"	

REDUCING VALVES



Typical RD-40 RD-50 HRD-70

Typical RD-11

Note: RD-11 Reducing Valve same as used in C-11 Combination Unit. Units complete with strainer and anti-syphon check.

Model No.	Size	Std. Del. Setting	Body	Approx. Shipping Wt.	Face to Face DIM.	No. Req'd.
† 11 T/S	½"	12 PSI *	BRASS	1¼ Lbs.	4-1/8"	
RD-40	¾"	12 PSI *	BRASS	3¼ Lbs.	3⁹⁄₁₆"	
RD-50	¾"	12 PSI *	IRON	3¼ Lbs.	3⁹⁄₁₆"	
HRD-70	¾"	45 PSI †	BRASS	3¼ Lbs.	3⁹⁄₁₆"	

*Adjustable 7 PSI to 25 PSI.
†Adjustable 25 PSI to 125 PSI. Maximum Initial Pressure 150 PSI.
††With Fast Fill Feature

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93 East Avenue
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Armstrong Darling
2200 Place Transcanadier
Montreal, Quel
Canada, H9P

Post House Valve Chart

Boiler room

Pump # 1
#1 4” Butterfly glycol return
#2 4” Triple duty glycol supply
#3 ¾” Ball valve drain in Suction Diffuser

Pump #2
#4 4” Butterfly glycol return
#5 4” Triple duty glycol supply
#6 ¾” Ball valve drain in Suction Diffuser

Boiler
#7 2” Outlet ball valve
#8 2” Inlet ball valve
#9 ¾”Boiler drain outlet (supply)
#10 ¾”Boiler drain inlet (return)
#11 2” Circuits setter
#12 3” Butterfly boiler outlet (Supply isolation to main loop)
#13 3” Butterfly boiler inlet (Return isolation to main loop)
#14 2” Mixing valve boiler supply and return 3 way control valve
#15 ¾” Air separator vent
#16 ¾” Lock shield ball valve from separator to expansion tank
#17 4” 3 way valve power activated.
#18 4” Manual butterfly 3 way valve inlet.
#19 ¾” ball valve return cooling tower drain
#20 ¾” ball valve return main loop drain.

Corridor at east stairwell

#21 2” Main supply shut off to risers 11 and 12
#22 2” Main return shut off to risers 11 and 12
#23 2” Supply (room 109c)
#24 2” Return (room 109c)
#25 ¾” Ball valve drain supply riser 11 (room 109c)
#26 ¾” Ball valve drain return riser 11 (room 109c)
#27 2” Riser 11 return circuit setter (room 109)
#28 2” Supply riser 12 (room 109a)

#29 2” Return riser 12 (room 109a)
#30 2” riser 12 return circuit setter (room 109 a)
#31 ¾” Ball valve drain supply riser 12 (boiler room)
#32 ¾” Ball valve drain return riser 12 (boiler room)

Corridor - across form Room 110

#33 2” Supply to riser 9
#34 2” Return to riser 9
#34 2” Riser 9 return circuit setter

Corridor – across from room 110 WSHP-G

#36 1 ½” Supply to heat pump
#37 1 ½” Return to heat pump
#38 ¾” Return drain from heat pump
#39 ¾” Supply drain from heat pump
#40 ¾” Ball valve drain supply riser 9 (room 109e)
#41 ¾” Ball valve drain return riser 9 (room 109d)

Corridor – across from room 106 WSHP-H

#42 1 ¼” Supply to heat pump
#43 1 ½” Return to heat pump
#44 Circuit setter from heat pump
#45 ¾” Supply drain from heat pump
#46 ¾” Return drain from heat pump

Garage area valves - Between columns 5 and 6

#48 2” Main supply shut off to risers 8 and 10
#49 2” Main return shut off to risers 8 and 10 (room 110 a)
#50 1-½” Supply to riser 8
#51 1-½” Riser 8 return circuit setter
#52 ¾” Ball valve drain supply riser 8
#53 ¾” Ball valve drain return riser 8

Garage area valves - Between columns 6 and 7

#54 2” Supply to riser 10

#55 2” Riser 10 return circuit setter
#56 ¾” Ball valve drain supply riser 10
#57 ¾” Ball valve drain return riser 10

Corridor – across from room 108 and 110a

#58 2” Supply to riser 7
#59 2” Return to riser 7
#60 ¾” Ball valve drain supply riser 7 (room 109f)
#61 ¾” Ball valve drain return riser 7 (room 109f)
#62 2” Riser 7 return circuit setter

Corridor – across from room 106

#63 2” Supply to riser 5
#64 2” Return to riser 5
#65 2” Riser 5 return circuit setter
#66 ¾” Ball valve drain supply riser 5 (room 105)
#67 ¾” Ball valve drain return riser 5 (room 105)

Corridor – across from west corner room 106

#68 2” Supply to riser 6
#69 2” Return to riser 6
#70 2” Riser 6 return circuit setter (room 106)

West corner - room 106 WSHP-F

#71 1 ¼” Supply to heat pump
#72 1 ½” Return to heat pump
#73 Circuit setter from heat pump

East corner - room 106 WSHP-E

#74 1¼” Supply to heat pump
#75 1 ½” Return to heat pump
#76 Circuit setter from heat pump

#77 ¾” Ball valve drain supply riser 6 (garage -between columns 4 and 5)

#78 ¾” Ball valve drain return riser 6 (garage -between columns 4 and 5)

Corridor – Between room 104a and 104b

#79 2” Supply to riser 3
#80 2” Return to riser 3
#81 2” Riser 3 return circuit setter
#82 ¾” Ball valve drain supply riser 3 (room 103)
#83 ¾” Ball valve drain return riser 3 (room 103)

Corridor – Across from 104a

#84 2” Supply to riser 4
#85 2” Return to riser 4
#86 2” Riser 4 return circuit setter
#87 ¾” Ball valve drain supply riser 4 (garage -between columns 3 and 4)
#88 ¾” Ball valve drain return riser 4 (garage -between columns 3 and 4)

Corridor - by elevator

#89 2” Main supply end of main shut off
#90 2” Main return end of main shut off
#91 1 ¼” Circuit setter
#92 ½” Boiler drain

Corridor – By elevator WSHP-D

#93 1” Supply to heat pump
#94 1” Return to heat pump
#95 Circuit setter from heat pump
#96 ½” Boiler drain

Hallway room 101 by room 101a

#97 2” Supply to riser 1a
#98 2” Return to riser 1a
#99 1 ¼” Riser 1a return circuit setter
#100 ¾” Ball valve drain supply riser 1a
#101 ¾” Ball valve drain return riser 1a

WSHP G Hallway room 101 by room 101b

#102 ¾ ” Supply to heat pump
#103 ¾ ” Return to heat pump
#104 Circuit setter from heat pump
#105 ¾” boiler drain
#106 C
#107 1” Inlet isolation for circuit setter loop
#107 1” Outlet isolation for circuit setter loop

Hallway room 101 by room 101b

#109 2” Supply to riser 1b
#110 2” Return to riser 1b
#111 2” Riser 1b return circuit setter
#112 ¾” Ball valve drain supply at directional change (room 101)
#113 ¾” Ball valve drain return at directional change (room 101)
#114 ¾” Ball valve drain supply riser 1b
#115 ¾” Ball valve drain return riser 1b
#116 2” Riser 2 return circuit setter (room 102a)
#117 1 ½ Shut off valve supply to riser 1b (room 101)
#118 2” Return to riser 1b (room 102a)
#119 2” Supply to riser 1b (room 102a)
#120 ¾” Ball valve drain supply riser 2 (room 102a)
#121 ¾” Ball valve drain return riser 2 (room 102a)

Cooling Tower - Roof

#122 4” Butterfly valve supply to tower
#123 4” Butterfly valve supply to tower
#124 4” Circuit setter return form cooling tower
#125 1” Riser drain at riser on return piping
#126 1” Riser drain at riser on supply piping
#127 ½” main drain for cooling tower coil
#128 2” Main sump drain for cooling tower
#129 ½” Glycol supply inlet Hoffman vent isolation
#130 1” Start up vent valve (in soffit area on return piping penetration through 6th floor)

#131 ½” Glycol return outlet Hoffman vent isolation

WSHP-F in room 109

#132 ¾ ” Supply to heat pump
#133 ¾ ” Return to heat pump
#134 ¾ ” Supply drain
#135 ¾ ” Return drain

Boiler room

#136 1 ¼” Primary gas isolation valve
#137 1 ¼” Secondary gas isolation valve

Make up water line to expansion valve

#138 ¾” Inlet ball valve to PRV
#139 ¾” Outlet ball valve from PRV
#140 ¾” By-pass for PRV

#141 ¾” Expansion tank drain valve

CFM **TEST & BALANCE CORPORATION**

14 DEPOT SQUARE

BETHEL, CONNECTICUT 06801

(203) 778-1900

TESTING AND BALANCING SUBMITTAL

FOR

POST HOUSE APARTMENTS

40 CLINTON AVENUE

STAMFORD, CT

MARCH 25, 2008

CFM #4184

CFM TEST & BALANCE CORPORATION	POST HOUSE APARTMENTS 40 CLINTON AVENUE STAMFORD, CT	DATA SHEET #
14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900 FAX (203) 778-1710	DATE 3/24/08 BY RW	1 CFM 4184

PUMP NO.	CWP-1
MANUFACTURER	ARMSTRONG
SIZE	4X3X11.5
IMPELLER	10.84
SERVICE	CONDENSER WATER

TEST DATA	GPM	FT. HD.	BHP
DESIGN	300	120	12.6
ACTUAL	290	121.3	15.1
DISCHARGE	79.8		
SUCTION	27.3		
ΔP	52.5 X 2.31 = 121.3 FT. HD.		

BLOCK OFF	
DISCHARGE	89.0
SUCTION	32.6
ΔP	56.4 X 2.31 = 130.2 FT. HD.

MOTOR MFG.	BALDOR	
H.P.	20	
RPM	1765	
AMPS	54.3	ACT: 38.6/39.8/39.9
VOLTS	200	ACT: 213/213/215

4" TRIPLE DUTY VALVE SET 100%.

PUMP NO.	CWP-2
MANUFACTURER	ARMSTRONG
SIZE	4X3X11.5
IMPELLER	10.84
SERVICE	CONDENSER WATER

TEST DATA	GPM	FT. HD.	BHP
DESIGN	300	120	12.6
ACTUAL	290	121.0	14.5
DISCHARGE	79.7		
SUCTION	27.3		
ΔP	52.4 X 2.31 = 121.0 FT. HD.		

BLOCK OFF	
DISCHARGE	88.9
SUCTION	32.3
ΔP	56.6 X 2.31 = 130.7 FT. HD.

MOTOR MFG.	BALDOR	
H.P.	20	
RPM	1765	
AMPS	54.3	ACT: 38.7/39.5/39.6
VOLTS	200	ACT: 214/213/214

4" TRIPLE DUTY VALVE SET 100%.

SYSTEM DIFFERENTIAL PRESSURE SET POINT = 40 PSI

CFM TEST & BALANCE CORPORATION
14 DEPOT SQUARE, BETHEL, CT 06801
TEL (203) 778-1900 FAX (203) 778-1710

POST HOUSE APARTMENTS
40 CLINTON AVENUE
STAMFORD,CT

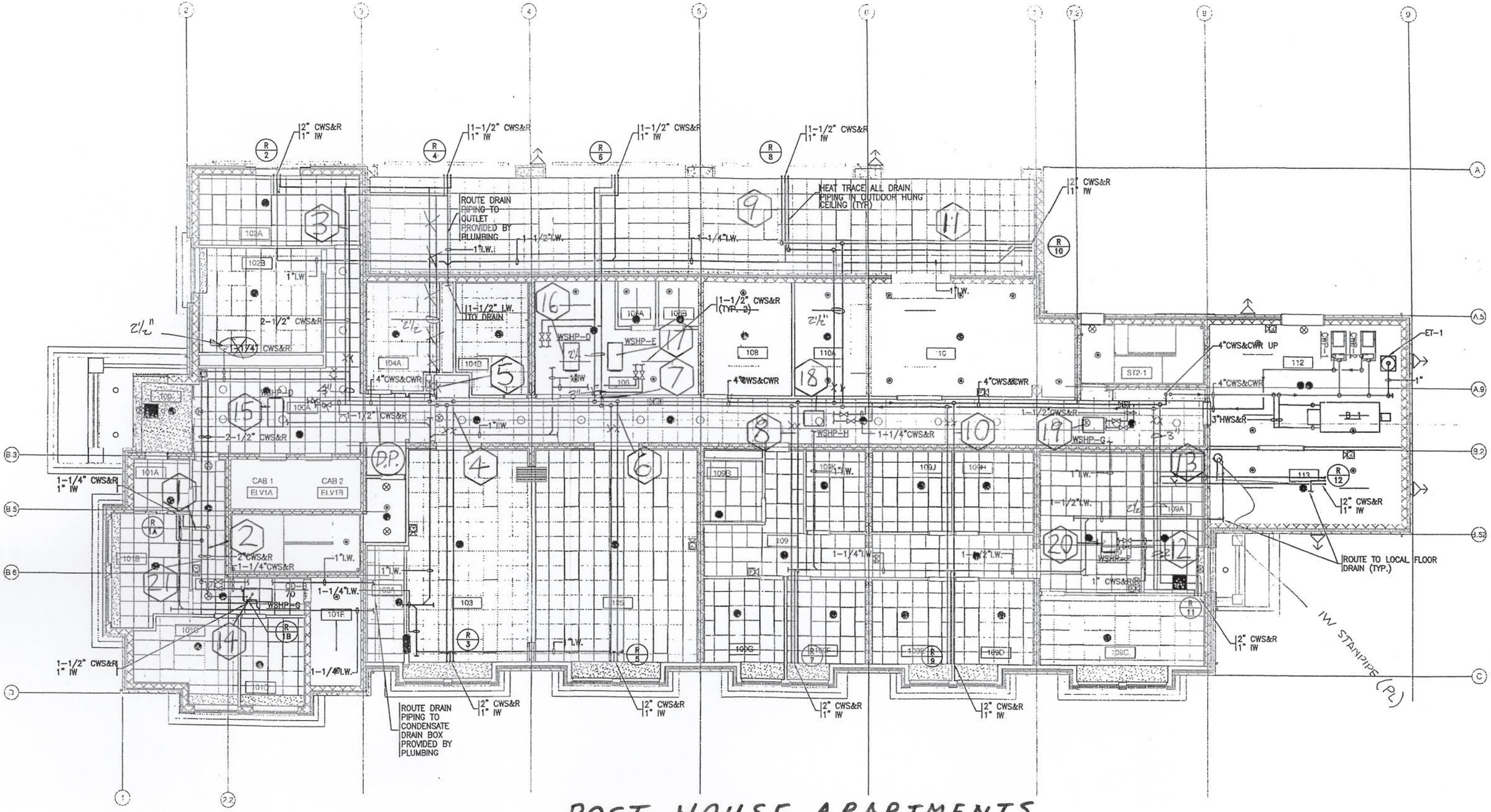
DATE 3/25/08 BY RW

DATA SHEET # 2

CFM 4184

CIRCUIT SETTERS

LOCATION	#	MODEL	SIZE	DESIGN GPM	VALVE SETTING	FINAL	
						PD	GPM
CONDENSER WATER SYSTEM							
R-1A	1	B&G	1-1/4"	11.0	10°	3.5'	11.5
R-1B & HP-G	2	B&G	2"	24.0	22°	5.5'	25.0
R-2	3	B&G	2"	24.4	30°	12.5'	24.5
R-3	4	B&G	2"	23.8	30°	12.0'	24.0
R-4	5	B&G	2"	17.0	28°	5.0'	17.0
R-5	6	B&G	2"	23.8	30°	12.0'	24.0
R-6, HP-D & HP-E	7	B&G	2"	44.0	10°	5.5'	44.0
R-7	8	B&G	2"	23.8	28°	10.0'	24.4
R-8	9	TACO	1-1/2"	17.0	45°	1.6'	18.0
R-9	10	B&G	2"	23.8	30°	11.0'	23.2
R-10	11	B&G	2"	25.0	30°	13.5'	25.5
R-11	12	B&G	2"	25.0	30°	13.0'	25.0
R-12	13	B&G	2"	25.0	30°	13.0'	25.0
HP-G RM 101D	14	B&G	3/4"	7.5	0°	11.0'	7.5
HP-D RM 100A	15	B&G	1"	12.0	0°	10.0'	12.1
HP-D RM 106	16	B&G	1-1/4"	12.0	24°	11.0'	12.8
HP-E RM 106	17	B&G	1-1/4"	15.0	20°	10.0'	14.2
HP-H RM 100A	18	B&G	1"	6.0	10°	5.0'	6.2
HP-G RM 100A	19	B&G	1"	7.5	0°	11.0'	7.5
HP-F RM 169	20	B&G	3/4"	4.5	0°	4.5'	4.8
END RUN BY-PASS	21	B&G	1"	3.0	50°	85.0'	3.2



POST HOUSE APARTMENTS

ROOF MECHANICAL ROOM
LOW VOLT PANEL
HIGH VOLT PANEL
EXHAUST FAN CONTROLLERS AND SENSORS
LON NETWORK
ROOFTOP MAKE-UP AIR UNIT
REFER TO PAGE 812-XX
40 16G THHN
#20 18/8
#24 18/4
#25 18/4
SPF-1 MOTOR STARTER
SPF-1 MOTOR STARTER
MOTOR STARTER LOCATIONS TO BE DETERMINED
JUNCTION BOX
PACKAGED SPRAY WATER PUMP
1" MAKE-UP WATER
3" DRAIN TO LOCAL ROOF DRAIN
CT-1
#21 18/4
7TH FLOOR/ROOF ELEV.
CLC TOWER SUMP TEMP
TS-4
INSTALLED IN WELL LOCATED IN TOWER SUMP
TS-5
#22 18/4
COOLING TOWER SUPPLY TEMP
TS-6
#23 18/4
COOLING TOWER RETURN TEMP
6TH FLOOR ELEV.
5TH FLOOR ELEV.
4TH FLOOR ELEV.
3RD FLOOR ELEV.
2ND FLOOR ELEV.
1ST FLOOR ELEV.
4" CW SUPPLY AND RETURN
VALVE LOCATED IN BASEMENT MECHANICAL ROOM
ALL DEVICES AND EQUIPMENT INSIDE DASHED LINE LOCATED IN FIRST FLOOR MECHANICAL ROOM
DIFFERENTIAL PRESSURE SENSOR
TO DRAINS (TYP.)
HEAT PUMP LOOP RETURN TEMP
TS-2
V-2
NC
NO
C
MOD
LON NETWORK FROM FIRST FLOOR DEVICES
LON NETWORK TO FIRST FLOOR DEVICES
JACE POWER PANEL
JACE 201 DDC CONTROL PANEL
JACE 403 DDC CONTROL PANEL
#1 18/4
#11 18/12
#12 18/4
#13 18/4
LON NETWORK
LON NETWORK (SPARE FROM ROOF)
CAT5e ETHERNET
#3 18/4
#14 18/4
#2 18/4
#9 18/4
#8 18/8
#10 18/6
#7 18/4
#6 18/8
#5 18/4
TS-OA
OUT AIR TEMP
TS-1
HEAT PUMP LOOP SUPPLY SEMP
V-1
#15 18/6
#4 18/4
TS-3
BLR RET WTR TEMP SENSOR
JUNCTION BOX
DIFF PRESS SWTICH (ONE PER PUMP)
18/4
18/4
JB
OP
DP
CWP-1 VFD
CWP-2 VFD
#16 18/10
#17 18/4
#18 18/6
#19 18/4
DA-1
DA-2
COMB AIR DAMPER
COMB AIR DAMPER
RUN LON NETWORK AND ETHERNET TOGETHER IN SEPARATE PIPE

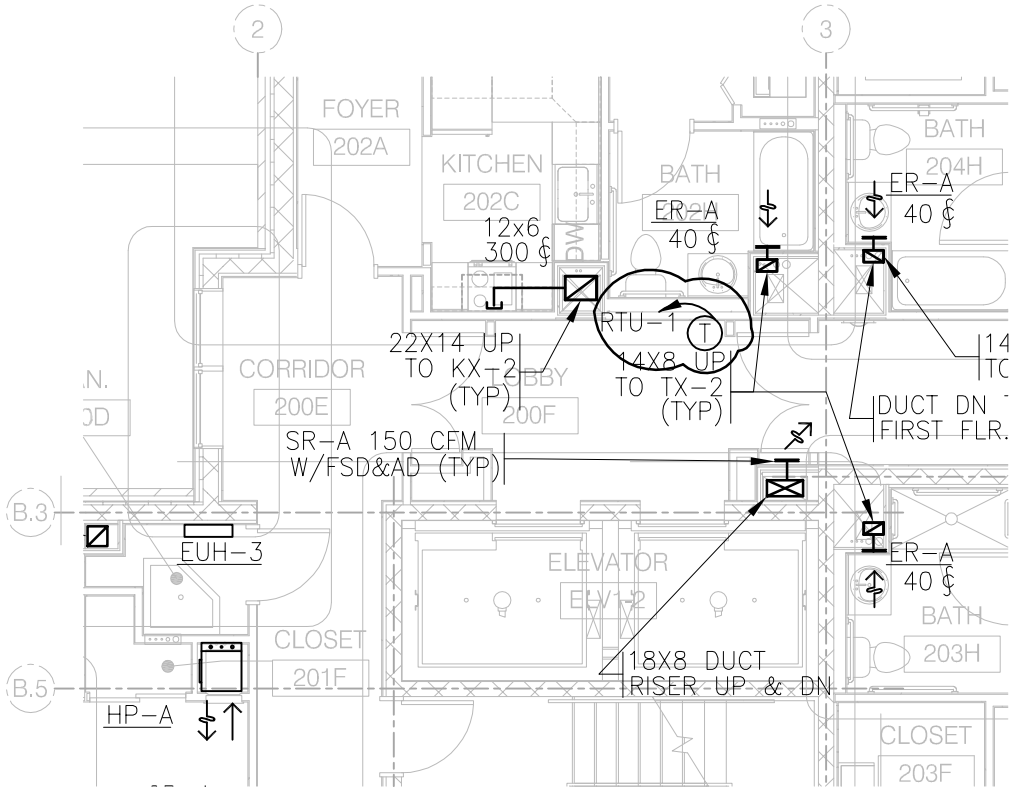
REV	DESCRIPTION	DATE	BY
0	SUBMITTAL DRAWING	7/6/2007	RJK

CONTROL WIZARDS, INC.

PROJECT
POST HOUSE APARTMENTS DDC CONTROL SYSTEM

DRAWING DESCRIPTION
HEAT PUMP LOOP LAYOUT AND WIRE PULLS

PROJ MGR	PROJ ENG	DRAWN BY	DWG NO:
CB	RJK	RJK	812 - 15



AKF engineers

Project Post House/Advocate

Title RTU-1 Thermostat location on 2nd floor

Project No. S060003 **Date** 2/6/08 **Chkd By** PFD

Sketch No. SKH-102-A

Scale 1/8"

BARCLAY
BETTER WORKING WATER

LABORATORY REPORT

CLIENT: **EASTERN MECHANICAL SERVICES**
ADDRESS: P.O. Box 246 64 Triangle St
Danbury, CT 06810

REPORT NO. **080666**
SAMPLE DATE: 4/25/08
REPORT DATE: 05/01/08

ATTENTION: Ted Huizinga

FIELD ENGINEER: Ron Dion

REFERENCE: POST HOUSE

CONSTITUENTS	GLYCOL LOOP			
pH, Units	9.2			
Iron, Dissolved, mg/L	1.10			
Copper, Dissolved, mg/L	0.19			
Zinc, Dissolved, mg/L	<0.05			
Aluminum, Dissolved, mg/L	<0.05			
Ortho Phosphate as PO_4, mg/L	6250			
Ethylene Glycol, by Volume, %	37			
Freezing Point, °F	-2			
Reserve Alkalinity, mL N/10 HCl	13.7			

COMMENTS:

At the time of sampling the Post House Glycol Loop contained 37% by volume propylene glycol, giving it a freezing point of -2°F. The concentration of phosphate inhibitor was sufficient to provide excellent corrosion protection. The reserve alkalinity was above the recommended minimums of 8 mL for chilled systems and 12 mL for hot systems.

Yours truly,

Mark Payton

Mark Payton, Chemist