

INSTALLATION INSTRUCTIONS & PARTS LIST

VERTICAL STEAM AND HOT WATER UNIT HEATERS

ATTENTION: READ THIS MANUAL AND ALL LABELS ATTACHED TO THE UNIT CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THESE UNITS! CHECK UNIT DATA PLATE FOR TYPE OF GAS AND ELECTRICAL SPECIFICATIONS AND MAKE CERTAIN THAT THESE AGREE WITH THOSE AT POINT OF INSTALLATION. RECORD THE UNIT MODEL AND SERIAL No.(s) IN THE SPACE PROVIDED. RETAIN FOR FUTURE REFERENCE.

Model No. _____ Serial No. _____

▲ WARNING Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.



INSTALLER'S RESPONSIBILITY

Installer Please Note: This equipment has been tested and inspected. It has been shipped free from defects from our factory. However, during shipment and installation, problems such as loose wires, leaks or loose fasteners may occur. **It is the installer's responsibility to inspect and correct any problems that may be found.**

RECEIVING INSTRUCTIONS

Inspect shipment immediately when received to determine if any damage has occurred to the unit during shipment. After the unit has been uncrated, check for any visible damage to the unit. Turn fan by hand to determine if damage has occurred. If any damage is found, the consignee should sign the bill of lading indicating such damage and immediately file claim for damage with the transportation company.



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NOTICE: It is the owner’s responsibility to provide any scaffolding or other apparatus required to perform emergency service or annual/periodic maintenance to this equipment.

DESCRIPTION

Vertical hydronic unit heaters are designed for installation requiring down flow air delivery, offered in 15 sizes ranging from 41,300 to 705,000 BTU/Hr. (11.7 to 205.1 kW), and use with steam or hot water. Low output (increased airflow) units are available for high ceiling applications.

The designs are certified by ETL to CSA-C22.2, UL1995, and UL 60335-2-40. **Do not alter these units in any way and do not attach any ductwork to these units.** If you have any questions after reading this manual, contact the manufacturer.

Figure 1



Figure 2



The following terms are used throughout this manual, in addition to ETL requirements, to bring attention to the presence of potential hazards or to important information concerning the product:

▲ DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury or substantial property damage.

▲ CAUTION Indicates an imminently hazardous situation which, if not avoided, may result in minor injury or property damage.

▲ WARNING Indicates an imminently hazardous situation which, if not avoided, could result in death, serious injury or substantial property damage.

NOTICE: Used to notify of special instructions on installation, operation or maintenance which are important to equipment but not related to personal injury hazards.

GENERAL SAFETY INFORMATION

▲ WARNING Failure to comply with the general safety information may result in extensive property damage, severe personal injury or death.

▲ WARNING Do not alter the unit heater in any way or damage to the unit and/or severe personal injury or death may occur!

▲ WARNING Disconnect all power supplies before installing or servicing the heater. If the power disconnect is out of sight, lock it in the open position and tag it to prevent unexpected application of power. Failure to do so could result in fatal electric shock, or severe personal injury.

▲ CAUTION Ensure that all power sources conform to the requirements of the unit heater or damage to the unit will result!

Follow installation instructions CAREFULLY to avoid creating unsafe conditions. All external wiring must conform to applicable current local codes, and to the latest edition of the National Electric Code, ANSI/NFPA No. 70. In Canada, all external wiring must conform to the Canadian Electric Code, Part 1 CSA Standard C22.1. All wiring should be done and checked by a qualified electrician, using copper wire only. All steam or water connections should be made and leak-tested by a suitably qualified individual, per instructions in this manual. Also follow procedures listed on the "Unit Equipment Start-Up Sheet" located in this manual.

Make certain that the power source conforms to the electrical requirements of the heater.

▲ WARNING Do not depend upon a thermostat or other switch as sole means of disconnecting power when installing or servicing heater. Always disconnect power at main circuit breaker as described above. Failure to do so could result in fatal electric shock.

Special attention must be given to any grounding information pertaining to this heater. To reduce the risk of electrocution, the heater must be securely and adequately grounded. This should be accomplished by connecting a grounded conductor between the service panel and the heater. To ensure a proper ground, the grounding means must be tested by a qualified electrician.

Do not insert fingers or foreign objects into the heater or its air moving device. Do not block or tamper with the heater in any manner while in operation or just after it has been turned off, as some parts may be hot enough to cause injury.

The appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction. Children being supervised should not play with the appliance.

It is recommended to install a shutoff switch in the electrical power lines at the heater. Whenever a unit is serviced, shut power off to the unit.

Since these units are installed in most instances higher than 8 feet, proper type of ladders or scaffolding should be used, as set up by OSHA requirements; see notice on page 2. Never place a ladder against the unit for support.

In industrial plants, professional maintenance crews should service this equipment.

All Vertical Unit Heaters are shipped fully assembled and may be used for steam or hot water applications. Fans are balanced and motors are prelubricated. Coils are factory tested at 400 PSIG (2758 kPa) under water.

- USA: Under maximum conditions, coils are rated for 75 PSI (517 kPa) for steam pressure and up to 225 PSI (1551 kPa) or 325°F (162.8°C) for hot water.
- Canada: Under maximum conditions, coils are rated for 15 PSI (103 kPa) for steam pressure and up to 225 PSI (1551 kPa) or 325°F (162.8°C) for hot water.

Each unit is packaged individually and marked for proper identification. Use normal care in handling and during installation to prevent damage to the coils fins, fan and casing. Do not set Vertical Unit Heater on floor with the weight of the unit resting against the fan blades. In this position, the blades may be damaged.

| | |
|---|---|
| Unless otherwise specified, the following conversions may be used for calculating SI unit measurements: | |
| 1 foot = 0.305 m | 1 inch water column = 0.249 kPa |
| 1 inch = 25.4 mm | meter/second = FPM ÷ 196.8 |
| 1 psig = 6.894 kPa | liter/second = CFM x 0.472 |
| 1 pound = 0.453 kg | 1000 Btu per hour = 0.293 kW |
| 1 gallon = 3.785 L | 1000 Btu/Cu. Ft. = 37.5 MJ/m ³ |
| | 1 cubic foot = 0.028 m ³ |

To meet ETL and OSHA requirements, units mounted below 8 feet from the floor must be equipped with an OSHA fan guard.

DIMENSIONAL DATA

Figure 3 - Sizes 40-77

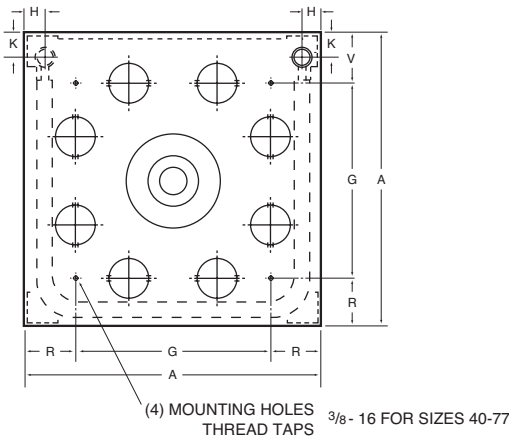


Figure 4 - Sizes 104-700

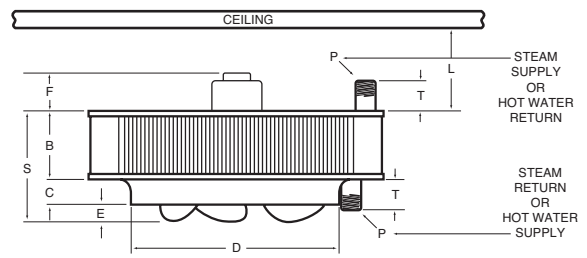
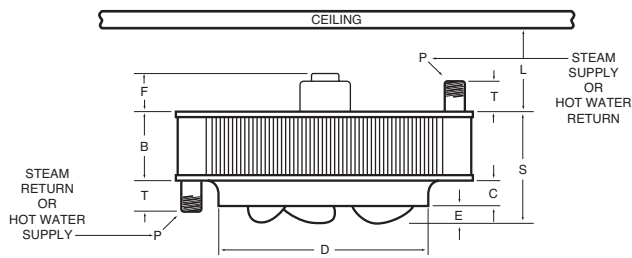
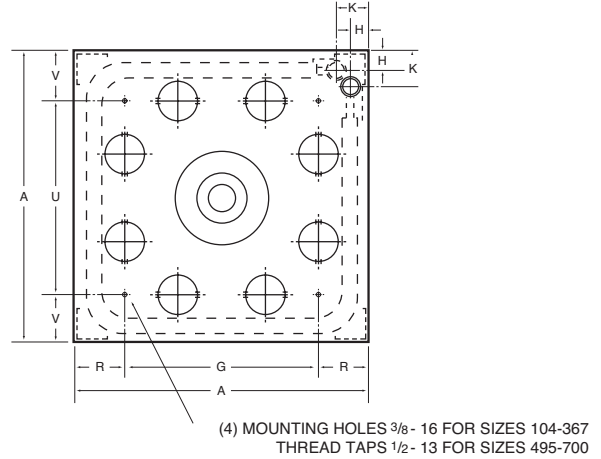


Table 1 – Figure 3 Roughing in Dimensional Data – Size 40-77

| Unit Size | Fan Dia. inches (mm) | A inches (mm) | B inches (mm) | C inches (mm) | D inches (mm) | E inches (mm) | F inches (mm) | G inches (mm) | H inches (mm) | K inches (mm) | L Min inches (mm) | P NPT inches (mm) | R inches (mm) | S inches (mm) | T inches (mm) | U inches (mm) | V inches (mm) | Approx. ShipWt. lbs (kg) |
|-----------|-------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------------|-------------------------|------------------|------------------|------------------|------------------|------------------|-----------------------------|
| 40 | 11-1/4 (286) | 18-1/4 (464) | 4-5/8 (117) | 1-1/4 (32) | 11-3/4 (298) | 3/4 (19) | 4 (102) | 11 (279) | 1-3/8 (35) | 1-7/8 (48) | 7 (178) | 1-1/2 (38) | 3-5/8 (92) | 6-5/8 (168) | 2-3/4 (70) | 11 (279) | 3-5/8 (92) | 32 (15) |
| 62 | 13-1/2 (343) | 21-1/4 (540) | 4-5/8 (117) | 1-5/8 (41) | 14 (356) | 1 (25) | 4 (102) | 14 (356) | 1-3/8 (35) | 1-7/8 (48) | 7 (178) | 1-1/2 (38) | 3-5/8 (92) | 7-1/8 (181) | 2-3/4 (70) | 14 (356) | 3-5/8 (92) | 40 (18) |
| 77 | 13-1/2 (343) | 21-1/4 (540) | 6-1/8 (156) | 1-5/8 (41) | 14 (356) | 1 (25) | 3 (76) | 14 (356) | 1-3/8 (35) | 1-7/8 (48) | 7 (178) | 1-1/2 (38) | 3-5/8 (92) | 8-5/8 (219) | 2-3/4 (70) | 14 (356) | 3-5/8 (92) | 43 (20) |

Table 2 - Figure 4 Roughing in Dimensional Data – Size 104-700

| Unit Size | Fan Dia. inches (mm) | A inches (mm) | B inches (mm) | C inches (mm) | D inches (mm) | E inches (mm) | F inches (mm) | G inches (mm) | H inches (mm) | K inches (mm) | L Min inches (mm) | P NPT inches (mm) | R inches (mm) | S inches (mm) | T inches (mm) | U inches (mm) | V inches (mm) | Approx. ShipWt. lbs (kg) |
|-----------|-------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------------|-------------------------|------------------|------------------|------------------|------------------|------------------|-----------------------------|
| 104 | 16-3/4 (425) | 25-1/4 (641) | 6-1/8 (156) | 2 (51) | 17-1/2 (445) | 1-1/8 (29) | 3 (76) | 17 (432) | 1-3/8 (35) | 2-3/4 (70) | 7 (178) | 1-1/2 (38) | 4-1/8 (105) | 9-1/8 (232) | 2-3/4 (70) | 17 (432) | 4-1/8 (105) | 63 (29) |
| 125 | 16-3/4 (425) | 25-1/4 (641) | 6-1/8 (156) | 2 (51) | 17-1/2 (445) | 1-3/4 (44) | 3 (76) | 17 (432) | 1-3/8 (35) | 2-3/4 (70) | 7 (178) | 1-1/2 (38) | 4-1/8 (105) | 9-3/4 (248) | 2-3/4 (70) | 17 (432) | 4-1/8 (105) | 64 (29) |
| 144 | 19-3/4 (502) | 29-1/2 (749) | 6-1/8 (156) | 2-3/8 (60) | 20-5/8 (524) | 1-1/4 (32) | 4 (102) | 20-1/2 (521) | 1-3/4 (44) | 3-1/2 (89) | 7 (178) | 2 (51) | 4-1/2 (114) | 9-5/8 (244) | 2-3/4 (70) | 20-1/2 (521) | 4-1/2 (114) | 80 (36) |
| 164 | 19-3/4 (502) | 29-1/2 (749) | 6-1/8 (156) | 2-3/8 (60) | 20-5/8 (524) | 1-3/4 (44) | 4 (102) | 20-1/2 (521) | 1-3/4 (44) | 3-1/2 (89) | 7 (178) | 2 (51) | 4-1/2 (114) | 10-1/8 (257) | 2-3/4 (70) | 20-1/2 (521) | 4-1/2 (114) | 80 (36) |
| 200 | 19-3/4 (502) | 29-1/2 (749) | 7-5/8 (194) | 2-3/8 (60) | 20-5/8 (524) | 2 (51) | 4 (102) | 20-1/2 (521) | 1-3/4 (44) | 3-1/2 (89) | 7 (178) | 2 (51) | 4-1/2 (114) | 12 (305) | 2-3/4 (70) | 20-1/2 (521) | 4-1/2 (114) | 86 (39) |
| 237 | 25-1/4 (641) | 37-1/2 (953) | 7-5/8 (194) | 3 (76) | 26-3/8 (670) | 1 (25) | 3-1/2 (89) | 28 (711) | 1-3/4 (44) | 3-1/2 (89) | 7 (178) | 2 (51) | 4-3/4 (121) | 11-5/8 (295) | 2-3/4 (70) | 18 (457) | 9-3/4 (248) | 134 (61) |
| 285 | 25-1/4 (641) | 37-1/2 (953) | 7-5/8 (194) | 3 (76) | 26-3/8 (670) | 1-1/4 (32) | 3-1/2 (89) | 28 (711) | 1-3/4 (44) | 3-1/2 (89) | 7 (178) | 2 (51) | 4-3/4 (121) | 11-3/4 (298) | 2-3/4 (70) | 18 (457) | 9-3/4 (248) | 139 (63) |
| 317 | 25-1/4 (641) | 37-1/2 (953) | 7-5/8 (194) | 3 (76) | 26-3/8 (670) | 2-1/8 (54) | 4 (102) | 28 (711) | 1-3/4 (44) | 3-1/2 (89) | 7 (178) | 2 (51) | 4-3/4 (121) | 12-3/4 (324) | 2-3/4 (70) | 18 (457) | 9-3/4 (248) | 139 (63) |
| 367 | 25-1/4 (641) | 37-1/2 (953) | 9-1/8 (232) | 3 (76) | 26-3/8 (670) | 2 (51) | 3-1/2 (89) | 28 (711) | 1-3/4 (44) | 3-1/2 (89) | 7 (178) | 2 (51) | 4-3/4 (121) | 14-1/8 (359) | 2-3/4 (70) | 18 (457) | 9-3/4 (248) | 146 (66) |
| 495 | 30-1/2 (775) | 42 (1067) | 9-1/8 (232) | 3-1/2 (89) | 31-1/4 (794) | 1-5/8 (41) | 3 (76) | 30 (762) | 2-1/4 (57) | 4-1/4 (108) | 7 (178) | 2-1/2 (64) | 6 (152) | 14-1/4 (362) | 3 (76) | 30 (762) | 6 (152) | 294 (133) |
| 585 | 30-1/2 (775) | 42 (1067) | 12-1/8 (308) | 3-1/2 (89) | 31-1/4 (794) | 2-1/8 (54) | 3 (76) | 30 (762) | 2-1/4 (57) | 4-1/4 (108) | 7 (178) | 2-1/2 (64) | 6 (152) | 17-3/4 (451) | 3 (76) | 30 (762) | 6 (152) | 307 (139) |
| 700 | 30-1/2 (775) | 42 (1067) | 13-5/8 (346) | 3-1/2 (89) | 31-1/4 (794) | 3 (76) | 4 (102) | 30 (762) | 2-1/4 (57) | 4-1/4 (108) | 7 (178) | 2-1/2 (64) | 6 (152) | 20-1/4 (514) | 3 (76) | 30 (762) | 6 (152) | 366 (166) |

STEAM PERFORMANCE DATA**

Table 3 - Standard Units

| Unit Size | Output BTU/HR (kW) | Condensate lbs/hr (kg/hr) | EDR Sq. ft. (Sq. m) | Final Air Temp °F (°C) | Motor | | Nominal CFM (m ³ /s) | Outlet Velocity FPM (m/s) | Sound Rating |
|-----------|--------------------------|---------------------------------|---------------------------|---------------------------------|-------------|-------------|---------------------------------------|------------------------------------|-----------------|
| | | | | | HP† (kW) | RPM | | | |
| 040 | 41,300 | 43 | 172 | 124 | | 1550 | 595 | 877 | I |
| | (12.1) | (19.5) | (16.0) | (51) | 1/40 | | (.278) | (4.455) | |
| | <i>33,600</i> | <i>55</i> | <i>140</i> | <i>131</i> | (.019) | <i>1150</i> | <i>436</i> | <i>658</i> | |
| | <i>(9.8)</i> | <i>(24.9)</i> | <i>(13.0)</i> | <i>(55)</i> | | | <i>(.203)</i> | <i>(3.343)</i> | |
| 062 | 65,500 | 68 | 273 | 121 | | 1550 | 989 | 1005 | II |
| | (19.2) | (30.8) | (25.4) | (49) | 1/20 | | (.462) | (5.105) | |
| | <i>52,800</i> | <i>55</i> | <i>220</i> | <i>129</i> | (.037) | <i>1150</i> | <i>706</i> | <i>727</i> | |
| | <i>(15.5)</i> | <i>(24.9)</i> | <i>(20.5)</i> | <i>(54)</i> | | | <i>(.329)</i> | <i>(3.693)</i> | |
| 077 | 80,600 | 83 | 336 | 122 | | 1550 | 1200 | 1220 | II |
| | (23.6) | (37.6) | (31.3) | (50) | 1/20 | | (.560) | (6.198) | |
| | <i>65,100</i> | <i>67</i> | <i>271</i> | <i>130</i> | (.037) | <i>1150</i> | <i>858</i> | <i>894</i> | |
| | <i>(19.1)</i> | <i>(30.4)</i> | <i>(25.2)</i> | <i>(54)</i> | | | <i>(.400)</i> | <i>(4.542)</i> | |
| 104 | 101,800 | 106 | 424 | 123 | | 1070 | 1490 | 980 | II |
| | (29.8) | (48.0) | (39.4) | (51) | 1/8 | | (.695) | (4.978) | |
| | <i>87,900</i> | <i>91</i> | <i>366</i> | <i>129</i> | (.093) | <i>850</i> | <i>1180</i> | <i>783</i> | |
| | <i>(25.8)</i> | <i>(41.2)</i> | <i>(34.0)</i> | <i>(54)</i> | | | <i>(.551)</i> | <i>(3.978)</i> | |
| 125 | 124,400 | 129 | 518 | 124 | 1/6 | 1100 | 1790 | 1170 | III |
| | (36.4) | (58.4) | (48.2) | (51) | (.124) | | (.835) | (5.944) | |
| 144 | 152,000 | 157 | 633 | 123 | 1/6 | 1100 | 2220 | 1045 | III |
| | (44.5) | (71.1) | (58.9) | (51) | (.124) | | (1.036) | (5.309) | |
| 164 | 173,000 | 179 | 720 | 121 | 1/6 | 1100 | 2620 | 1230 | IV |
| | (50.7) | (81.1) | (67.0) | (49) | (.124) | | (1.223) | (6.248) | |
| 200 | 210,200 | 208 | 838 | 118 | 1/4 | 1100 | 3200 | 1495 | III |
| | (61.6) | (94.2) | (78.0) | (48) | (.186) | | (1.493) | (7.595) | |
| 237 | 249,800 | 260 | 1040 | 115 | 1/4 | 1100 | 4180 | 1205 | IV |
| | (73.2) | (117.8) | (96.7) | (46) | (.186) | | (1.951) | (6.121) | |
| 285 | 283,800 | 294 | 1180 | 119 | 1/2 | 1100 | 4430 | 1275 | IV |
| | (83.2) | (133.2) | (109.8) | (48) | (.373) | | (2.067) | (6.477) | |
| 317 | 333,400 | 345 | 1390 | 119 | 3/4 | 1140 | 5210 | 1500 | IV |
| | (97.7) | (156.3) | (129.3) | (48) | (.559) | | (2.431) | (7.620) | |
| 367 | 386,000 | 400 | 1610 | 118 | 3/4 | 1140 | 6140 | 1770 | IV |
| | (113.1) | (181.2) | (149.8) | (48) | (.559) | | (2.865) | (8.992) | |
| 495 | 496,000 | 514 | 2070 | 117 | 1-1/2 | 1175 | 8020 | 1640 | IV |
| | (145.3) | (232.8) | (192.6) | (47) | (1.119) | | (3.743) | (8.331) | |
| 585 | 585,000 | 605 | 2440 | 117 | 1-1/2 | 1175 | 9450 | 1930 | IV |
| | (171.4) | (274.1) | (227.0) | (47) | (1.119) | | (4.410) | (9.804) | |
| 700 | 705,000 | 729 | 2940 | 119 | 3 | 1165 | 11,000 | 2250 | IV |
| | (206.6) | (330.2) | (273.5) | (48) | (2.237) | | (5.133) | (11.430) | |

EDR = Equivalent Direct Radiation

NOTES:

Constant speed units are rated at capacities shown in regular type; capacities shown in italic faced type apply only to units with multi-speed motors.

** Performance data based on 2 psi (13.8 kPa) steam pressure at heater with air entering @60°F (16°C).

To determine BTU per hour capacities at various steam pressures and entering air temperatures, use correction factors from Table 5. Final temperatures at new conditions can be calculated by applying basic formula.

† Motor HP listed is applicable to standard motor type only. For explosion proof motor HP, see Motor Data section.

STEAM PERFORMANCE DATA**

Table 4 - “Low Output” Standard Vertical Units with All Air Ports Open

| Unit Size | Output BTU/HR (kW) | Condensate lbs/hr (kg/hr) | EDR Sq. ft. (Sq. m) | Final Air Temp °F (°C) | Motor | | Nominal CFM (m³/s) | Outlet Velocity FPM (m/s) | Sound Rating |
|-----------|--------------------------|---------------------------------|---------------------------|---------------------------------|------------------|------|--------------------------|------------------------------------|-----------------|
| | | | | | HP† (kW) | RPM | | | |
| 040L | 34,800 (10.2) | 36 (16.3) | 145 (13.5) | 108 (42) | 1/40 (.019) | 1550 | 668 (.312) | 950 (4.826) | I |
| | <i>26,000</i> (7.6) | <i>27</i> (12.2) | <i>108</i> (10.0) | <i>111</i> (44) | | | <i>470</i> (.219) | <i>672</i> (3.414) | |
| 062L | 57,200 (16.8) | 59 (26.7) | 238 (22.1) | 104 (40) | 1/20 (.037) | 1550 | 1200 (.560) | 1190 (6.045) | I |
| | <i>45,800</i> (13.4) | <i>48</i> (21.7) | <i>191</i> (17.8) | <i>109</i> (43) | | | <i>862</i> (.402) | <i>858</i> (4.359) | |
| 077L | 68,000 (19.9) | 71 (32.2) | 283 (26.3) | 106 (41) | 1/20 (.037) | 1550 | 1360 (.635) | 1350 (6.858) | II |
| | <i>55,000</i> (16.1) | <i>57</i> (25.8) | <i>229</i> (21.3) | <i>111</i> (44) | | | <i>995</i> (.464) | <i>992</i> (5.039) | |
| 104L | 85,400 (25.0) | 89 (40.3) | 356 (33.1) | 108 (42) | 1/8 (.093) | 1070 | 1640 (.765) | 1050 (5.334) | II |
| | <i>71,200</i> (20.9) | <i>74</i> (33.5) | <i>296</i> (27.5) | <i>111</i> (44) | | | <i>1290</i> (.602) | <i>827</i> (4.201) | |
| 125L | 111,000 (32.5) | 115 (52.1) | 462 (43.0) | 107 (42) | 1/6 (.124) | 1100 | 2180 (1.017) | 1390 (7.061) | III |
| 144L | 125,000 (36.6) | 130 (58.9) | 524 (48.7) | 109 (43) | 1/6 (.124) | 1100 | 2360 (1.101) | 1080 (5.486) | III |
| 164L | 149,000 (43.7) | 154 (69.8) | 620 (57.7) | 107 (42) | 1/6 (.124) | 1100 | 2920 (1.363) | 1340 (6.807) | IV |
| 200L | 176,800 (51.8) | 183 (82.9) | 736 (68.5) | 108 (42) | 1/4 (.186) | 1100 | 3390 (1.582) | 1560 (7.925) | III |
| 237L | 214,900 (63.0) | 224 (101.5) | 895 (83.3) | 104 (40) | 1/4 (.186) | 1100 | 4500 (2.100) | 1270 (6.452) | IV |
| 285L | 251,800 (73.8) | 260 (117.8) | 1050 (97.7) | 106 (41) | 1/2 (.373) | 1100 | 5040 (2.352) | 1420 (7.214) | IV |
| 317L | 291,000 (85.3) | 302 (136.8) | 1210 (112.6) | 107 (42) | 3/4 (.559) | 1140 | 5700 (2.660) | 1610 (8.179) | IV |
| 367L | 344,000 (100.8) | 356 (161.3) | 1430 (133.0) | 108 (42) | 3/4 (.559) | 1140 | 6600 (3.080) | 1870 (9.500) | IV |
| 495L | 428,000 (125.4) | 446 (202.0) | 1785 (166.0) | 102 (39) | 1-1/2 (1.119) | 1175 | 9380 (4.377) | 1860 (9.449) | IV |
| 585L | 515,000 (150.9) | 533 (241.4) | 2140 (199.1) | 106 (41) | 1-1/2 (1.119) | 1175 | 10,300 (4.807) | 2060 (10.465) | IV |
| 700L | 620,000 (181.7) | 642 (290.8) | 2580 (240.0) | 108 (42) | 3 (2.237) | 1165 | 11,900 (5.553) | 2380 (12.090) | IV |

EDR = Equivalent Direct Radiation

NOTES:

Constant speed units are rated at capacities shown in regular type; capacities shown in italic faced type apply only to units with multi-speed motors.

** Performance data based on 2 psi (13.8 kPa) steam pressure at heater with air entering @60°F (16°C).

To determine BTU per hour capacities at various steam pressures and entering air temperatures, use correction factors from Table 5. Final temperatures at new conditions can be calculated by applying basic formula.

† Motor HP listed is applicable to standard motor type only. For explosion proof motor HP, see Motor Data section.

STEAM CALCULATIONS AND CORRECTION FACTORS

EXAMPLE: –
 UNIT SIZE _____ 40
 Steam Pressure ____ 10 PSI
 Entering Air Temp. __ 40°F

| | | |
|--|--|--|
| I. CAPACITY | | |
| A. For 2 lbs. steam, 60°F entering air | Read output directly from Table 3: 41,300 BTU/HR. | |
| B. For higher steam pressures and/or EAT's above or below 60°F | Multiply output from Table 3 by appropriate correction factor from Table 5 (below). | 41,300 x 1.27 = 52,451 BTU/HR. |
| II. FINAL AIR TEMPERATURE | | |
| A. For 2 lbs. steam, 60°F entering air | Read temperature directly from Table 3: 124°F. | |
| B. For capacities calculated in IB (above) | $\frac{\text{Output from IB}}{1.085 \times \text{CFM from Table 3}} + \text{EAT} = \text{Final Air Temp}$ | $\frac{52,451}{1.085 \times 595} + 40 = 121.0^\circ\text{F}$ |
| III. FINAL AIR VOLUME | | |
| A. For 2 lbs. steam, 60°F entering air | $\frac{460 + \text{Final Air Temp from Table 3}}{530} \times \frac{\text{Nom. CFM from Table 3}}{\text{Final Air Volume}} =$ | $\frac{460 + 124}{530} \times 595 = 655 \text{ CFM}$ |
| B. For final air temperatures calculated in IIB (above) | $\frac{460 + \text{Final Air Temp from IIB}}{530} \times \frac{\text{Nom. CFM from Table 3}}{\text{Final Air Volume}} =$ | $\frac{460 + 121.0}{530} \times 595 = 652 \text{ CFM}$ |
| IV. CONDENSATE PER HOUR | | |
| A. For 2 lbs. steam, 60°F entering air | Read lbs. per hour from Table 3: 43 LBS./HR. | |
| B. For capacities calculated in IB (above) | $\frac{\text{Output from IB}}{\text{Latent Heat From Table 6}} = \text{lbs. per hour of condensate}$ | $\frac{52,451}{953} = 55.0 \text{ LBS./HR.}$ |

TABLE 5 — STEAM CORRECTION FACTORS BASED ON 2 LBS. STEAM 60°F EAT

| ENTERING AIR TEMPERATURE °F (°C) | STEAM PRESSURE — LBS PER SQUARE INCH (SATURATED) | | | | | | | | | |
|----------------------------------|--|----------|----------|-----------|------------|------------|------------|------------|------------|------------|
| | 0 (.0) | 2 (13.8) | 5 (34.5) | 10 (68.9) | 15 (103.4) | 20 (137.9) | 30 (206.8) | 40 (275.8) | 50 (344.7) | 75 (517.1) |
| 30° (-1°) | 1.18 | 1.22 | 1.27 | 1.34 | 1.40 | 1.45 | 1.53 | 1.61 | 1.67 | 1.79 |
| 40° (4°) | 1.11 | 1.15 | 1.20 | 1.27 | 1.32 | 1.37 | 1.46 | 1.53 | 1.59 | 1.71 |
| 50° (10°) | 1.03 | 1.07 | 1.12 | 1.19 | 1.25 | 1.30 | 1.39 | 1.46 | 1.52 | 1.64 |
| 60° (16°) | 0.96 | 1.00 | 1.05 | 1.12 | 1.18 | 1.23 | 1.32 | 1.39 | 1.45 | 1.57 |
| 70° (21°) | 0.90 | 0.93 | 0.98 | 1.05 | 1.11 | 1.16 | 1.25 | 1.32 | 1.38 | 1.49 |
| 80° (27°) | 0.83 | 0.86 | 0.91 | 0.98 | 1.04 | 1.09 | 1.18 | 1.25 | 1.31 | 1.42 |
| 90° (32°) | 0.76 | 0.80 | 0.85 | 0.91 | 0.97 | 1.02 | 1.11 | 1.18 | 1.24 | 1.36 |
| 100° (38°) | 0.69 | 0.73 | 0.78 | 0.85 | 0.90 | 0.96 | 1.04 | 1.11 | 1.17 | 1.29 |

TABLE 6 — PROPERTIES OF SATURATED STEAM

| | STEAM PRESSURE IN LBS PER SQUARE INCH GAUGE | | | | | | | | | |
|--------------------------------------|---|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | 0 (.0) | 2 (13.8) | 5 (34.5) | 10 (68.9) | 15 (103.4) | 20 (137.9) | 30 (206.8) | 40 (275.8) | 50 (344.7) | 75 (517.1) |
| Steam Temperature-°F (°C) | 212.0 (100.0) | 218.5 (103.6) | 227.1 (108.4) | 239.4 (115.2) | 249.8 (121.0) | 258.8 (126.0) | 274.0 (134.4) | 286.7 (141.5) | 297.7 (147.6) | 319.9 (159.9) |
| Latent Heat of Steam-Btu/lbm (KJ/Kg) | 970 (2256) | 966 (2247) | 961 (2235) | 953 (2217) | 946 (2200) | 940 (2186) | 929 (2161) | 920 (2140) | 912 (2121) | 891 (2072) |

NOTE 1: Ratings apply only to free inlet and discharge without diffusers.

NOTE 3: For specific motor data refer to motor specifications in Tables 13 and 14.

NOTE 2: All motors are constant speed and operate at top speed as indicated in motor data. Sizes 40 through 104 can be run at reduced speed with addition of optional variable speed switch. This switch is factory-calibrated for low and high speed ratings, with intermediate speeds infinitely controllable. Sizes 164 through 700 operate at constant speed as indicated in motor data.

NOTE 4: To correct for entering air temperatures, use 1° temperature rise for each foot in mounting height. As an example, 60°F air is required at work area (5 ft. above floor) units are to be mounted at (20 ft.) above floor. Mounting height (20 ft.) minus work height (5 ft.) equals differential (15 ft.) or, 15° rise in air temperature at unit air inlet. Correct for actual inlet air temperature of 75°F (60°F + 15°F = 75°F EAT) on Table 5.

HOT WATER PERFORMANCE DATA**

Table 7 - Standard Output Units

| Unit Size | Water Temp Drop °F (°C) | Output MBH (kW) | Flow Rate GPM (L/s) | Pressure Drop ft/water (m/water) | Final Air Temp °F (°C) | Motor HP† (kW) | Motor RPM | Nominal CFM (m³/s) | Outlet Velocity FPM (m/s) | Sound Rating |
|-----------|-------------------------|------------------------|------------------------|----------------------------------|---------------------------|----------------|-----------|--------------------|---------------------------|--------------|
| 040 | 10° (5.6°) | 28.8 (8.4) | 5.93 (.374) | .37 (.113) | 104.6° (40.3°) | 1/40 (.019) | 1550 | 595 (.278) | 877 (4.455) | I |
| | 20° (11.1°) | 22.7 (6.7) | 2.34 (.148) | .06 (.018) | 95.2° (35.1°) | | | | | |
| | 30° (16.7°) | 16.7 (4.9) | 1.15 (.073) | .02 (.006) | 85.9° (29.9°) | | | | | |
| 040* | 10° (5.6°) | 22.9 (6.7) | 4.71 (.297) | .24 (.073) | 108.3° (42.4°) | 1/40 (.019) | 1150 | 436 (.203) | 658 (3.343) | I |
| | 20° (11.1°) | 18.1 (5.3) | 1.87 (.118) | .04 (.012) | 98.3° (36.8°) | | | | | |
| | 30° (16.7°) | 13.4 (3.9) | .92 (.058) | .01 (.003) | 88.4° (31.3°) | | | | | |
| 062 | 10° (5.6°) | 48.1 (14.1) | 9.92 (.626) | 1.05 (.320) | 104.8° (40.4°) | 1/20 (.037) | 1550 | 989 (.462) | 1005 (5.105) | II |
| | 20° (11.1°) | 39.6 (11.6) | 4.08 (.257) | .19 (.058) | 96.9° (36.1°) | | | | | |
| | 30° (16.7°) | 31.1 (9.1) | 2.14 (.135) | .06 (.018) | 89.0° (31.7°) | | | | | |
| 062* | 10° (5.6°) | 38.1 (11.2) | 7.85 (.495) | .67 (.204) | 109.7° (43.2°) | 1/20 (.037) | 1150 | 706 (.329) | 727 (3.693) | II |
| | 20° (11.1°) | 31.5 (9.2) | 3.24 (.204) | .13 (.040) | 101.1° (38.4°) | | | | | |
| | 30° (16.7°) | 24.8 (7.3) | 1.71 (.108) | .04 (.012) | 92.4° (33.6°) | | | | | |
| 077 | 10° (5.6°) | 58.7 (17.2) | 12.11 (.764) | .98 (.299) | 105.1° (40.6°) | 1/20 (.037) | 1550 | 1200 (.560) | 1220 (6.198) | II |
| | 20° (11.1°) | 48.4 (14.2) | 4.99 (.315) | .18 (.055) | 97.2° (36.2°) | | | | | |
| | 30° (16.7°) | 38.1 (11.2) | 2.62 (.165) | .05 (.015) | 89.3° (31.8°) | | | | | |
| 077* | 10° (5.6°) | 46.5 (13.6) | 9.59 (.605) | .63 (.192) | 110.0° (43.3°) | 1/20 (.037) | 1150 | 858 (.400) | 894 (4.542) | II |
| | 20° (11.1°) | 38.5 (11.3) | 3.97 (.250) | .12 (.037) | 101.2° (38.4°) | | | | | |
| | 30° (16.7°) | 30.5 (8.9) | 2.09 (.132) | .03 (.009) | 92.7° (33.7°) | | | | | |
| 104 | 10° (5.6°) | 77.2 (22.6) | 15.91 (1.004) | 2.06 (.628) | 106.6° (41.4°) | 1/8 (.093) | 1070 | 1528 (.713) | 980 (4.978) | II |
| | 20° (11.1°) | 68.3 (20.0) | 7.03 (.443) | .44 (.134) | 101.2° (38.4°) | | | | | |
| | 30° (16.7°) | 59.3 (17.4) | 4.08 (.257) | .16 (.049) | 95.8° (35.4°) | | | | | |
| 104* | 10° (5.6°) | 63.7 (18.7) | 13.13 (.828) | 1.43 (.436) | 108.6° (42.6°) | 1/8 (.093) | 850 | 1208 (.564) | 783 (3.978) | II |
| | 20° (11.1°) | 56.5 (16.6) | 5.82 (.367) | .31 (.095) | 103.1° (39.5°) | | | | | |
| | 30° (16.7°) | 49.2 (14.4) | 3.38 (.213) | .11 (.034) | 97.6° (36.4°) | | | | | |
| 125 | 10° (5.6°) | 94.9 (27.8) | 19.55 (1.233) | 3.04 (.927) | 108.9° (42.7°) | 1/6 (.124) | 1100 | 1790 (.835) | 1170 (5.944) | III |
| | 20° (11.1°) | 83.7 (24.5) | 8.63 (.544) | .65 (.198) | 103.1° (39.5°) | | | | | |
| | 30° (16.7°) | 72.5 (21.2) | 4.98 (.314) | .23 (.070) | 97.3° (36.3°) | | | | | |

**Performance based on 200°F (93.3°C) EWT, 20°F (11.1°C) TD, 60°F (15.6°C) EAT.

Performance at 10°F (5.6°C) & 30°F (16.7°C) TD is also shown.

For capacities at other conditions, use the correction multipliers in the tables on page 12.

*Speed controller option is required for reduced ratings.

† Motor HP listed is applicable to standard motor type only. For explosion proof motor HP, see Motor Data section.

HOT WATER PERFORMANCE DATA**

Table 7 - Standard Output Units

| Unit Size | Water Temp Drop °F (°C) | Output MBH (kW) | Flow Rate GPM (L/s) | Pressure Drop ft/water (m/water) | Final Air Temp °F (°C) | Motor HP† (kW) | Motor RPM | Nominal CFM (m³/s) | Outlet Velocity FPM (m/s) | Sound Rating |
|-----------|-------------------------|--------------------------|--------------------------|----------------------------------|---------------------------|------------------|-----------|--------------------|---------------------------|--------------|
| 144 | 10° (5.6°) | 117.6 (34.5) | 24.24 (1.529) | 4.32 (1.318) | 108.8° (42.7°) | 1/6 (.124) | 1100 | 2220 (1.036) | 1045 (5.309) | III |
| | 20° (11.1°) | 105.2 (30.8) | 10.84 (.684) | .96 (.293) | 103.7° (39.8°) | | | | | |
| | 30° (16.7°) | 92.8 (27.2) | 6.38 (.402) | .36 (.110) | 98.5° (36.9°) | | | | | |
| 164 | 10° (5.6°) | 132.4 (38.8) | 27.29 (1.722) | 3.67 (1.119) | 106.6° (41.4°) | 1/6 (.124) | 1100 | 2620 (1.223) | 1230 (6.248) | IV |
| | 20° (11.1°) | 118.6 (34.7) | 12.22 (.771) | .81 (.247) | 101.7° (38.7°) | | | | | |
| | 30° (16.7°) | 104.8 (30.7) | 7.20 (.454) | .30 (.092) | 96.9° (36.1°) | | | | | |
| 200 | 10° (5.6°) | 156.2 (45.8) | 32.20 (2.031) | 5.02 (1.531) | 105.0° (40.6°) | 1/4 (.186) | 1100 | 3200 (1.493) | 1495 (7.595) | III |
| | 20° (11.1°) | 139.7 (40.9) | 14.40 (.908) | 1.11 (.339) | 100.2° (37.9°) | | | | | |
| | 30° (16.7°) | 123.2 (36.1) | 8.47 (.534) | .41 (.125) | 95.5° (35.3°) | | | | | |
| 237 | 15° (8.3°) | 188.9 (55.3) | 25.95 (1.637) | 3.92 (1.196) | 101.8° (38.8°) | 1/4 (.186) | 1100 | 4162 (1.942) | 1205 (6.121) | IV |
| | 20° (11.1°) | 180.1 (52.8) | 18.56 (1.171) | 2.10 (.641) | 99.9° (37.7°) | | | | | |
| | 30° (16.7°) | 162.7 (47.7) | 11.18 (.705) | .82 (.250) | 96.0° (35.6°) | | | | | |
| 285 | 15° (8.3°) | 215.4 (63.1) | 29.60 (1.867) | 5.02 (1.531) | 104.8° (40.4°) | 1/2 (.373) | 1100 | 4430 (2.067) | 1275 (6.477) | IV |
| | 20° (11.1°) | 205.4 (60.2) | 21.17 (1.335) | 2.68 (.817) | 102.7° (39.3°) | | | | | |
| | 30° (16.7°) | 185.3 (54.3) | 12.73 (.803) | 1.04 (.317) | 98.5° (36.9°) | | | | | |
| 317 | 15° (8.3°) | 254.9 (74.7) | 35.03 (2.210) | 6.88 (2.098) | 105.1° (40.6°) | 3/4 (.559) | 1140 | 5210 (2.431) | 1500 (7.620) | IV |
| | 20° (11.1°) | 242.9 (71.2) | 25.03 (1.579) | 3.67 (1.119) | 103.0° (39.4°) | | | | | |
| | 30° (16.7°) | 218.9 (64.1) | 15.04 (.949) | 1.42 (.433) | 98.7° (37.1°) | | | | | |
| 367 | 15° (8.3°) | 294.7 (86.3) | 40.49 (2.554) | 6.60 (2.013) | 104.2° (40.1°) | 3/4 (.559) | 1140 | 6140 (2.865) | 1770 (8.992) | IV |
| | 20° (11.1°) | 280.8 (82.3) | 28.94 (1.826) | 3.52 (1.074) | 102.2° (39.0°) | | | | | |
| | 30° (16.7°) | 253.1 (74.2) | 17.39 (1.097) | 1.36 (.415) | 98.0° (36.7°) | | | | | |
| 495 | 15° (8.3°) | 451.2 (132.2) | 62.00 (3.911) | 8.78 (2.678) | 104.0° (40.0°) | 1-1/2 (1.119) | 1160 | 8020 (3.743) | 1640 (8.331) | IV |
| | 20° (11.1°) | 368.1 (107.9) | 37.93 (2.393) | 5.81 (1.772) | 102.3° (39.1°) | | | | | |
| | 30° (16.7°) | 333.6 (97.7) | 22.92 (1.446) | 2.29 (.698) | 98.3° (36.8°) | | | | | |
| 585 | 15° (8.3°) | 451.2 (132.2) | 62.00 (3.911) | 8.78 (2.678) | 104.0° (40.0°) | 1-1/2 (1.119) | 1160 | 9450 (4.410) | 1930 (9.804) | IV |
| | 20° (11.1°) | 431.1 (126.3) | 44.43 (2.803) | 4.72 (1.440) | 102.0° (38.9°) | | | | | |
| | 30° (16.7°) | 391.0 (114.6) | 26.86 (1.694) | 1.86 (.567) | 98.1° (36.7°) | | | | | |
| 700 | 15° (8.3°) | 451.2 (132.2) | 62.00 (3.911) | 8.78 (2.678) | 104.0° (40.0°) | 3 (2.237) | 1165 | 11,000 (5.133) | 2250 (11.430) | IV |
| | 20° (11.1°) | 519.4 (152.2) | 53.52 (3.376) | 5.29 (1.613) | 103.5° (39.7°) | | | | | |
| | 30° (16.7°) | 470.9 (138.0) | 32.35 (2.041) | 2.08 (.634) | 99.5° (37.5°) | | | | | |

**Performance based on 200°F (93.3°C) EWT, 20°F (11.1°C) TD, 60°F (15.6°C) EAT.

Performance at 10°F (5.6°C) & 30°F (16.7°C) TD is also shown.

For capacities at other conditions, use the correction multipliers in the tables on page 12.

*Speed controller option is required for reduced ratings.

† Motor HP listed is applicable to standard motor type only. For explosion proof motor HP, see Motor Data section.

HOT WATER PERFORMANCE DATA**

Table 8 - Low Output Units Standard Vertical Unit with All Air Ports Open

| Unit Size | Water Temp Drop °F (°C) | Output MBH (kW) | Flow Rate GPM (L/s) | Pressure Drop ft/water m/water | Final Air Temp °F (°C) | Motor HP† (kW) | Motor RPM | Nominal CFM (m³/s) | Outlet Velocity FPM (m/s) | Sound Rating |
|-----------|-------------------------|------------------------|------------------------|--------------------------------|--------------------------|----------------|-----------|--------------------|---------------------------|--------------|
| 040L | 10° (5.6°) | 23.9 (7.0) | 4.92 (.310) | .26 (.079) | 92.9° (33.8°) | 1/40 (.019) | 1550 | 668 (.312) | 950 (4.826) | I |
| | 20° (11.1°) | 18.9 (5.5) | 1.95 (.123) | .04 (.012) | 86.1° (30.1°) | | | | | |
| | 30° (16.7°) | 14.0 (4.1) | .96 (.061) | .01 (.003) | 79.3° (26.3°) | | | | | |
| 040L* | 10° (5.6°) | 16.7 (4.9) | 3.45 (.218) | .13 (.040) | 92.8° (33.8°) | 1/40 (.019) | 1150 | 470 (.219) | 672 (3.414) | I |
| | 20° (11.1°) | 13.5 (4.0) | 1.39 (.088) | .02 (.006) | 86.4° (30.2°) | | | | | |
| | 30° (16.7°) | 10.0 (2.8) | .85 (.057) | .01 (.003) | 79.3° (26.3°) | | | | | |
| 062L | 10° (5.6°) | 41.5 (12.2) | 8.56 (.540) | .80 (.244) | 91.9° (33.3°) | 1/20 (.037) | 1550 | 1200 (.560) | 1190 (6.045) | II |
| | 20° (11.1°) | 34.2 (10.0) | 3.53 (.223) | .15 (.046) | 86.3° (30.2°) | | | | | |
| | 30° (16.7°) | 27.0 (7.9) | 1.85 (.117) | .04 (.012) | 80.7° (27.1°) | | | | | |
| 062L* | 10° (5.6°) | 32.4 (9.5) | 6.68 (.421) | .50 (.153) | 94.7° (34.8°) | 1/20 (.037) | 1150 | 862 (.402) | 858 (4.359) | II |
| | 20° (11.1°) | 26.9 (7.9) | 2.77 (.175) | .09 (.027) | 88.7° (31.5°) | | | | | |
| | 30° (16.7°) | 21.3 (6.2) | 1.46 (.092) | .03 (.009) | 82.8° (28.2°) | | | | | |
| 077L | 10° (5.6°) | 48.9 (14.3) | 10.09 (.637) | .69 (.210) | 93.2° (34.0°) | 1/20 (.037) | 1550 | 1360 (.635) | 1350 (6.858) | II |
| | 20° (11.1°) | 40.5 (11.9) | 4.17 (.263) | .13 (.040) | 87.4° (30.8°) | | | | | |
| | 30° (16.7°) | 32.0 (9.4) | 2.20 (.139) | .04 (.012) | 81.7° (27.6°) | | | | | |
| 077L* | 10° (5.6°) | 38.5 (11.3) | 7.94 (.501) | .44 (.134) | 95.7° (35.4°) | 1/20 (.037) | 1150 | 995 (.464) | 992 (5.039) | II |
| | 20° (11.1°) | 32.0 (9.4) | 3.29 (.208) | .08 (.024) | 89.6° (32.0°) | | | | | |
| | 30° (16.7°) | 25.4 (7.4) | 1.75 (.110) | .02 (.006) | 83.5° (28.6°) | | | | | |
| 104L | 10° (5.6°) | 63.7 (18.7) | 13.13 (.828) | 1.43 (.463) | 93.5° (34.2°) | 1/8 (.093) | 1070 | 1752 (.818) | 1050 (5.334) | II |
| | 20° (11.1°) | 56.5 (16.6) | 5.82 (.367) | .31 (.095) | 89.7° (32.1°) | | | | | |
| | 30° (16.7°) | 49.2 (14.4) | 3.38 (.213) | .11 (.034) | 85.9° (29.9°) | | | | | |
| 104L* | 10° (5.6°) | 54.5 (16.0) | 11.24 (.709) | 1.06 (.323) | 93.5° (34.2°) | 1/8 (.093) | 850 | 1499 (.700) | 827 (4.201) | II |
| | 20° (11.1°) | 48.5 (14.2) | 4.99 (.315) | .23 (.070) | 89.8° (32.1°) | | | | | |
| | 30° (16.7°) | 42.4 (12.4) | 2.91 (.184) | .08 (.024) | 86.1° (30.1°) | | | | | |
| 125 | 10° (5.6°) | 83.7 (24.5) | 17.24 (1.088) | 2.40 (.732) | 95.4° (35.2°) | 1/6 (.124) | 1100 | 2180 (1.017) | 1390 (7.061) | III |
| | 20° (11.1°) | 73.9 (21.7) | 7.62 (.481) | .51 (.156) | 91.3° (32.9°) | | | | | |
| | 30° (16.7°) | 64.2 (18.8) | 4.41 (.278) | .18 (.055) | 87.1° (30.6°) | | | | | |

**Performance based on 200°F (93.3°C) EWT, 20°F (11.1°C) TD, 60°F (15.6°C) EAT.

Performance at 10°F (5.6°C) & 30°F (16.7°C) TD is also shown.

For capacities at other conditions, use the correction multipliers in the tables on page 12.

*Speed controller option is required for reduced ratings.

† Motor HP listed is applicable to standard motor type only. For explosion proof motor HP, see Motor Data section.

HOT WATER PERFORMANCE DATA**

Table 8 - Low Output Units Standard Vertical Unit with All Air Ports Open

| Unit Size | Water Temp Drop °F (°C) | Output MBH (kW) | Flow Rate GPM (L/s) | Pressure Drop ft/water (m/water) | Final Air Temp °F (°C) | Motor HP† (kW) | Motor RPM | Nominal CFM (m³/s) | Outlet Velocity FPM (m/s) | Sound Rating |
|-----------|-------------------------|--------------------------|--------------------------|----------------------------------|-------------------------|------------------|-----------|--------------------|---------------------------|--------------|
| 144L | 10° (5.6°) | 95.4 (28.0) | 19.66 (1.240) | 2.92 (.891) | 97.3° (36.3) | 1/6 (.124) | 1100 | 2360 (1.101) | 1080 (5.486) | III |
| | 20° (11.1°) | 85.5 (25.1) | 8.81 (.556) | .65 (.198) | 93.4° (34.1) | | | | | |
| | 30° (16.7°) | 75.6 (22.2) | 5.20 (.328) | .24 (.073) | 89.5° (31.9) | | | | | |
| 164L | 10° (5.6°) | 112.3 (32.9) | 23.15 (1.460) | 2.70 (.824) | 95.4° (35.2) | 1/6 (.124) | 1100 | 2920 (1.363) | 1340 (6.807) | IV |
| | 20° (11.1°) | 100.7 (29.5) | 10.38 (.655) | .60 (.183) | 91.8° (33.2) | | | | | |
| | 30° (16.7°) | 89.2 (26.1) | 6.13 (.387) | .22 (.067) | 88.1° (31.2) | | | | | |
| 200L | 10° (5.6°) | 135.8 (39.8) | 27.98 (1.765) | 3.85 (1.174) | 96.9° (36.1) | 1/4 (.186) | 1100 | 3390 (1.582) | 1560 (7.925) | III |
| | 20° (11.1°) | 121.8 (35.7) | 12.52 (.790) | .85 (.259) | 93.0° (33.9) | | | | | |
| | 30° (16.7°) | 107.3 (31.4) | 7.37 (.465) | .32 (.098) | 89.2° (31.8) | | | | | |
| 237L | 10° (5.6°) | 168.5 (49.4) | 34.72 (2.190) | 6.75 (2.059) | 94.5° (34.7) | 1/4 (.186) | 1100 | 4507 (2.103) | 1270 (6.452) | IV |
| | 20° (11.1°) | 153.8 (45.1) | 15.85 (1.000) | 1.56 (.476) | 91.4° (33.0) | | | | | |
| | 30° (16.7°) | 139.1 (40.8) | 9.56 (.603) | .61 (.186) | 88.4° (31.3) | | | | | |
| 285L | 10° (5.6°) | 188.9 (55.3) | 25.95 (1.637) | 3.92 (1.196) | 94.5° (34.7) | 1/2 (.373) | 1100 | 5040 (2.352) | 1420 (7.214) | IV |
| | 20° (11.1°) | 180.1 (52.8) | 18.56 (1.171) | 2.10 (.641) | 92.9° (33.8) | | | | | |
| | 30° (16.7°) | 162.7 (47.7) | 11.18 (.705) | .82 (.250) | 89.7° (32.1) | | | | | |
| 317L | 10° (5.6°) | 220.9 (64.7) | 30.35 (1.915) | 5.26 (1.604) | 95.7° (35.4) | 3/4 (.559) | 1140 | 5700 (2.660) | 1610 (8.179) | IV |
| | 20° (11.1°) | 210.6 (61.7) | 21.70 (1.369) | 2.81 (.857) | 94.1° (34.5) | | | | | |
| | 30° (16.7°) | 189.9 (55.6) | 13.05 (.823) | 1.09 (.332) | 90.7° (32.6) | | | | | |
| 367L | 10° (5.6°) | 260.7 (76.4) | 35.82 (2.260) | 5.24 (1.598) | 96.4° (35.8) | 3/4 (.559) | 1140 | 6600 (3.080) | 1870 (9.500) | IV |
| | 20° (11.1°) | 248.5 (72.8) | 25.61 (1.616) | 2.80 (.854) | 94.7° (34.8) | | | | | |
| | 30° (16.7°) | 224.2 (65.7) | 15.40 (.971) | 1.09 (.332) | 91.3° (32.9) | | | | | |
| 495L | 10° (5.6°) | 394.4 (115.6) | 54.19 (3.418) | 6.83 (2.083) | 95.3° (35.2) | 1-1/2 (1.119) | 1160 | 9380 (4.377) | 1860 (9.449) | IV |
| | 20° (11.1°) | 310.5 (91.0) | 32.00 (2.019) | 4.23 (1.290) | 90.5° (32.5) | | | | | |
| | 30° (16.7°) | 281.7 (82.5) | 19.35 (1.221) | 1.67 (.509) | 87.7° (30.9) | | | | | |
| 585L | 10° (5.6°) | 411.7 (110.5) | 28.28 (1.483) | 1.62 (.442) | 91.9° (33.3) | 1-1/2 (1.119) | 1160 | 10,300 (4.807) | 2060 (10.465) | IV |
| | 20° (11.1°) | 377.0 (110.5) | 38.85 (2.451) | 3.68 (1.122) | 93.7° (34.3) | | | | | |
| | 30° (16.7°) | 342.2 (100.3) | 23.51 (1.483) | 1.45 (.442) | 90.6° (32.6) | | | | | |
| 700L | 10° (5.6°) | 411.7 (110.5) | 28.28 (1.483) | 1.62 (.442) | 91.9° (33.3) | 3 (2.237) | 1165 | 11,900 (5.553) | 2380 (12.090) | IV |
| | 20° (11.1°) | 453.7 (132.9) | 46.76 (2.950) | 4.11 (1.254) | 95.1° (35.1) | | | | | |
| | 30° (16.7°) | 411.7 (120.6) | 28.28 (1.784) | 1.62 (.494) | 91.9° (33.3) | | | | | |

**Performance based on 200°F (93.3°C) EWT, 20°F (11.1°C) TD, 60°F (15.6°C) EAT.

Performance at 10°F (5.6°C) & 30°F (16.7°C) TD is also shown.

For capacities at other conditions, use the correction multipliers in the tables on page 12.

*Speed controller option is required for reduced ratings.

† Motor HP listed is applicable to standard motor type only. For explosion proof motor HP, see Motor Data section.

HOT WATER CALCULATIONS AND CORRECTION FACTOR

EXAMPLE: –
 UNIT SIZE _____ 40
 Entering Water Temp. _____ 160°F
 Entering Air Temp. _____ 40°F
 Water Temperature Drop _____ 10°F

| | | |
|--|---|---|
| I. CAPACITY @ 20°F TD: A. For 200°F EWT, 60°F EAT | Read output directly from Tables 7 & 8, 22,700 BTU/HR (Ref., Std. 40, p. 8). | |
| B. For EWT and/or EAT above or below Standard | Multiply output from Tables 7 & 8 by factor from Table 9 (below). | 22,700 x .878 = 19,931 BTU/HR. |
| II. CAPACITY AT OTHER TD's A. For TD's from 5 to 60°F | Multiply output obtained in IA or IB (above) by appropriate factor from Table 10 (below) | IA - 22,700 x 1.15 = 26,105 BTU/HR. – OR – IB - 19,931 x 1.15 = 22,921 BTU/HR. |
| III. GPM AT OTHER TD's A. For TD's from 5 to 60°F | Multiply GPM of unit for 20°F TD, from Tables 7 & 8 by appropriate factor from Table 10 (below). | 2.34 x 2.30 = 5.38 GPM (Applies only to units with Std. 200°F EWT, 60°F EAT) For all others calculate using formula – $GPM = \frac{BTU}{500 \times TD}$ |
| IV. PRESSURE LOSS AT OTHER TD's A. For TD's from 5 to 60°F | Multiply P.D. of unit for 20°F TD, from Tables 7 & 8 by appropriate factor from Table 10 (below). | .06 x 5.00 = .30 Ft. H ₂ O |

**TABLE 9 – HOT WATER CONVERSION FACTORS BASED ON 200°F ENTERING WATER
60°F ENTERING AIR 20°F TEMPERATURE DROP**

| ENTERING AIR TEMPERATURE °F (°C) | ENTERING WATER TEMPERATURE – 20°F WATER TEMPERATURE DROP | | | | | | | | | | |
|----------------------------------|--|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| | 100° (38°) | 120° (49°) | 140° (60°) | 160° (71°) | 180° (82°) | 200° (93°) | 220° (104°) | 240° (116°) | 260° (127°) | 280° (138°) | 300° (149°) |
| 30° (-1) | 0.518 | 0.666 | 0.814 | 0.963 | 1.120 | 1.268 | 1.408 | 1.555 | 1.702 | 1.850 | 1.997 |
| 40° (4) | 0.439 | 0.585 | 0.731 | 0.878 | 1.025 | 1.172 | 1.317 | 1.464 | 1.609 | 1.755 | 1.908 |
| 50° (10) | 0.361 | 0.506 | 0.651 | 0.796 | 0.941 | 1.085 | 1.231 | 1.375 | 1.518 | 1.663 | 1.824 |
| 60° (16) | 0.286 | 0.429 | 0.571 | 0.715 | 0.857 | 1.000 | 1.143 | 1.286 | 1.429 | 1.571 | 1.717 |
| 70° (21) | 0.212 | 0.353 | 0.494 | 0.636 | 0.777 | 0.918 | 1.060 | 1.201 | 1.342 | 1.483 | 1.630 |
| 80° (27) | 0.140 | 0.279 | 0.419 | 0.558 | 0.698 | 0.837 | 0.977 | 1.117 | 1.257 | 1.397 | 1.545 |
| 90° (32) | 0.069 | 0.207 | 0.345 | 0.483 | 0.621 | 0.759 | 0.897 | 1.035 | 1.173 | 1.311 | 1.462 |
| 100° (38) | 0 | 0.137 | 0.273 | 0.409 | 0.546 | 0.682 | 0.818 | 0.955 | 1.094 | 1.230 | 1.371 |

To obtain the BTU capacity for conditions other than those in the basic capacity tables, multiply the basic rating (200°F entering water, 60°F entering air,) by the proper constant from the above tables.

TABLE 10 – HOT WATER BTU, GPM AND PRESSURE LOSS FACTORS BASED ON STANDARD CONDITIONS OF 200°F ENTERING WATER 60°F ENTERING AIR & 20°F WATER DROP

| USE FACTORS FROM THIS TABLE TO OBTAIN APPROXIMATE RESULTS | TEMPERATURE DROP °F (°C) | | | | | | | | |
|--|--------------------------|--------|--------|---------|---------|---------|---------|---------|---------|
| | 5 (3) | 10 (6) | 15 (8) | 20 (11) | 25 (14) | 30 (17) | 40 (22) | 50 (28) | 60 (33) |
| To obtain BTU for other Water Temperature Drops, multiply basic BTU rating by applicable Factor. | 1.25 | 1.15 | 1.08 | 1.00 | .94 | .90 | .83 | .76 | .72 |
| To obtain GPM for other Water Temperature Drops, multiply basic GPM rating by applicable Factor.* | 5.00 | 2.30 | 1.44 | 1.00 | .74 | .59 | .40 | .30 | .24 |
| To obtain Pressure Loss Feet of Water for other temperature Drops, multiply Basic loss at 20°F drop by Factor. | 10.00 | 5.00 | 2.00 | 1.00 | .60 | .40 | .20 | .13 | .07 |

***TABLE 11 – MINIMUM WATER FLOW – GPM**

| UNIT SIZE | 40 | 62 | 77 | 104 | 144 | 164 | 200 | 237 | 317 | 367 |
|----------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|----------------|----------------|----------------|
| MIN. GPM (L/s) | .55 (.035) | .55 (.035) | .55 (.035) | .55 (.035) | .82 (.052) | .82 (.052) | 1.10 (.069) | 1.10 (.069) | 1.10 (.069) | 1.10 (.069) |

***TABLE 12 – HEATING CAPACITY FACTORS FOR VARIOUS RATES OF WATER FLOW**

| % of Rated Water Flow | 25% | 50% | 75% | 100% | 125% | 150% | 175% |
|-------------------------|-----|-----|-----|------|------|------|------|
| Btu/Hr Heating Capacity | .80 | .89 | .96 | 1.00 | 1.04 | 1.07 | 1.10 |

TECHNICAL DATA

The performance data listed in Tables 3, 4, 7 and 8 include sound ratings. The ratings provide a guide in determining the acceptable degree of loudness in particular occupancy situations.

Certain general rules apply to specific selection of unit heaters with regard to degree of quietness (or loudness);

- The greater the fan diameter, the higher the sound level.
- The higher the motor RPM, the higher the sound level. Note that on most units the lower the speed mode results in lowering the sound rating one increment.
- Selecting a larger number of smaller units generally results in lower overall noise levels than fewer large units.

All vertical steam and hot water unit heater motors, whether fan guard or shelf-mounted, are isolated from the mechanical mount by resilient isolators. This mounting along with balanced fan blades and excellent overall construction integrity, assures you the utmost in quiet operation.

The following table outlines sound ratings for various applications. The lower the number, the quieter the unit and the lower the sound requirement.

| CATEGORY OF AREA | SOUND RATING |
|--|--------------|
| Apartment, assembly hall, classrooms churches, courtrooms, executive offices, hospitals, libraries, museums, theatres. | I |
| Dining rooms, general offices, recreation areas, small retail stores. | II |
| Restaurants, banks, cafeterias, depart- ment stores, public buildings, service stations. | III |
| Gymnasiums, health clubs, laundromats, supermarkets. | IV |
| Garages, small machine shops, light manufacturing. | V |
| Factories, foundries, steel mills. | III - VII* |
| *Depending on specific use in these facilities, size of operation, etc. | |

CORRECTIONS WHEN USING GLYCOL SOLUTION IN SYSTEM

| | Propylene Glycol | | Propylene Glycol |
|--|---------------------|---|---------------------|
| 1. Heat transfer @180°F with no increase in flow rate | .97* | 7. Freezing Point | - |
| 20% solution | | 55% by volume | |
| 50% solution | .90* | 50% | -28°F (-33.3°C) |
| 2. G.P.M. Req'd. @180°F, 20° Δ t (no correction to pump curve) | 1.10%* | 40% | -13°F (-25°C) |
| | | 30% | + 4°F (-15.6°C) |
| 3. Pump Head Req'd. @180°F w/increase in G.P.M. | 1.23%* | 20% | +17°F (-8.3°C) |
| | | *Compared to water. | |
| 4. Specify gravity (water = 1.0) | 1.045-1.055* | <hr/> Approximate factors at varying altitudes <hr/> | |
| 5. Pounds/Gallons @60°F (water = 8.3453 Pound/Gallon) | 8.77 | Altitude | Factor |
| | | Sea level - 1000 ft. (0 - 305 m) | 1.00 |
| | | 1000 ft. - 3000 ft. (305 - 914 m) | .958 |
| | | 3000 ft. - 5000 ft. (914 - 1524 m) | .929 |
| | | 5000 ft. - 7000 ft. (1524 - 2134 m) | .900 |
| | | 7000 ft. - 10000 ft. (2134 - 3048 m) | .871 |
| 6. pH @ 50% by volume | 9.5 | | |

MOTOR DATA

NOTE 1: All motors are constant speed and operate at top speed as indicated in motor data. Motors through 1/8 H.P. can be run at reduced speed with addition of optional variable speed switch. This switch is factory-calibrated for low and high speed ratings, with intermediate speeds infinitely controllable. Sizes 164 through 700 operate at constant speed as indicated in motor data.

NOTE 2: Stated draw is Full Load (FLA). AMP draw varies by motor manufacturer ± .2 AMPS. Verify FLA on motor data plate.

CAUTION: Select appropriate AMP MCA, and MOP for the multiple voltage motors. For example, the AMP, MCA, and MOP for size 40 with a 230 volt Totally Enclosed motor is 1.1, 1.4, and 2.5 respectively.

NOTICE: For units with explosion proof motors, junction box is field provided.

Table 13 - Standard (Totally Enclosed) Motor Type [MT=1]

| Unit Size | AMP | MCA | MOP | HP | RPM |
|------------------------|--------|-----|------|-------|------|
| 115/1/60 [SV=1] | | | | | |
| 40 | 1.23** | 1.6 | 2.8 | 1/40* | 1550 |
| 62 | 2.1** | 2.6 | 4.7 | 1/20* | 1550 |
| 77 | | | | | |
| 104 | 1.2** | 1.5 | 2.7 | 1/8* | 1070 |
| 125 | 2.3** | 2.9 | 5.2 | 1/6 | 1100 |
| 144 | | | | | |
| 164 | | | | | |
| 200 | 3.6** | 4.5 | 8.1 | 1/4 | 1100 |
| 237 | 3.6** | 4.5 | 8.1 | 1/4 | 1100 |
| 285 | 5.4** | 6.8 | 12.2 | 1/2 | 1100 |

208-230/460/3/60 [SV=4, 5 or 6]

| | | | | | |
|-----|----------------|---------------|----------------|-------|------|
| 40 | 0.98-1.1/0.55† | 1.2-1.4/0.7 | 2.2-2.5/1.2 | 1/6 | 1140 |
| 62 | 0.98-1.1/0.55† | 1.2-1.4/0.7 | 2.2-2.5/1.2 | 1/6 | 1140 |
| 77 | | | | | |
| 104 | 0.98-1.1/0.55† | 1.2-1.4/0.7 | 2.2-2.5/1.2 | 1/6 | 1140 |
| 125 | 0.98-1.1/0.55† | 1.2-1.4/0.7 | 2.2-2.5/1.2 | 1/6 | 1140 |
| 144 | | | | | |
| 164 | | | | | |
| 200 | | | | | |
| 237 | 1.2-1.4/0.7† | 1.5-1.8/0.9 | 2.7-3.2/1.6 | 1/4 | 1140 |
| 285 | 1.8-2.0/1.0† | 2.3-2.5/1.3 | 4.1-4.5/2.3 | 1/2 | 1140 |
| 317 | 3.1-3.2/1.6† | 3.9-4.0/2.0 | 7.0-7.2/3.6 | 3/4 | 1140 |
| 367 | 3.5-3.6/1.8† | 4.4-4.5/2.3 | 7.9-8.1/4.1 | 1 | 1155 |
| 495 | 5.0-4.4/2.2† | 6.3-5.5/2.8 | 11.9-11.3/5.6 | 1-1/2 | 1160 |
| 585 | | | | | |
| 700 | 9.6-8.2/4.1† | 12.0-10.3/5.1 | 22.3-22.1/11.0 | 3 | 1165 |

575/3/60 [SV=7]

| | | | | | |
|-----|------|-----|-----|-------|------|
| 40 | 0.6† | 0.8 | 1.4 | 1/3 | 1140 |
| 62 | | | | | |
| 77 | | | | | |
| 104 | | | | | |
| 125 | | | | | |
| 144 | | | | | |
| 164 | | | | | |
| 200 | | | | | |
| 237 | 0.8† | 1.0 | 1.8 | 1/2 | 1140 |
| 285 | | | | | |
| 317 | 1.3† | 1.6 | 2.9 | 3/4 | 1140 |
| 367 | | | | | |
| 495 | 2.0† | 2.5 | 4.5 | 1-1/2 | 1160 |
| 585 | | | | | |
| 700 | 3.8† | 4.7 | 8.4 | 3 | 1165 |

Table 14 - Explosion Proof with Thermal Overload Motor Type [MT=2]

| Unit Size | AMP | MCA | MOP | HP | RPM |
|------------------------|-------|-----|------|-----|------|
| 115/1/60 [SV=1] | | | | | |
| 40 | 3.8** | 4.8 | 8.6 | 1/6 | 1140 |
| 62 | 3.8** | 4.8 | 8.6 | 1/6 | 1140 |
| 77 | | | | | |
| 104 | 3.8** | 4.8 | 8.6 | 1/6 | 1140 |
| 125 | 3.8** | 4.8 | 8.6 | 1/6 | 1140 |
| 144 | | | | | |
| 164 | | | | | |
| 200 | 4.4** | 5.5 | 9.9 | 1/4 | 1140 |
| 237 | 4.4** | 5.5 | 9.9 | 1/4 | 1140 |
| 285 | 7.8** | 9.8 | 17.6 | 1/2 | 1140 |

208-230/460/3/60 [SV=4, 5 or 6]

| | | | | | |
|-----|---------------|-------------|---------------|-------|------|
| 40 | 2.2-2.3/1.1** | 2.8-2.9/1.4 | 5.0-5.2/2.5 | 1/2 | 1175 |
| 62 | 2.2-2.3/1.1** | 2.8-2.9/1.4 | 5.0-5.2/2.5 | 1/2 | 1175 |
| 77 | 2.2-2.3/1.1** | 2.8-2.9/1.4 | 5.0-5.2/2.5 | 1/2 | 1175 |
| 104 | 2.2-2.3/1.1** | 2.8-2.9/1.4 | 5.0-5.2/2.5 | 1/2 | 1175 |
| 125 | 2.2-2.3/1.1** | 2.8-2.9/1.4 | 5.0-5.2/2.5 | 1/2 | 1175 |
| 144 | 2.2-2.3/1.1** | 2.8-2.9/1.4 | 5.0-5.2/2.5 | 1/2 | 1175 |
| 164 | 2.2-2.3/1.1** | 2.8-2.9/1.4 | 5.0-5.2/2.5 | 1/2 | 1175 |
| 200 | 2.2-2.3/1.1** | 2.8-2.9/1.4 | 5.0-5.2/2.5 | 1/2 | 1175 |
| 237 | 2.2-2.3/1.1** | 2.8-2.9/1.4 | 5.0-5.2/2.5 | 1/2 | 1175 |
| 285 | 2.2-2.3/1.1** | 2.8-2.9/1.4 | 5.0-5.2/2.5 | 1/2 | 1175 |
| 317 | 3.1-3.2/1.6** | 3.9-4.0/2.0 | 7.0-7.2/3.6 | 3/4 | 1145 |
| 367 | 3.1-3.2/1.6** | 3.9-4.0/2.0 | 7.0-7.2/3.6 | 3/4 | 1145 |
| 495 | 4.6-4.7/2.3** | 5.8-5.9/2.9 | 10.4-10.6/5.2 | 1-1/2 | 1175 |
| 585 | 4.6-4.7/2.3** | 5.8-5.9/2.9 | 10.4-10.6/5.2 | 1-1/2 | 1175 |
| 700 | 10.0/5.0 †‡ | 12.5/6.3 | 22.5/11.3 | 3 | 1150 |

*Optional variable speed switch is available.

** These motors have automatic thermal overload protection or impedance protection.

† These motors are without thermal overload protection. Motors without thermal overload protection must be installed with the optional manual starter or other field provided overload protection.

‡ These motors are 230/460 volts only.

NOTE: Sizes 317 through 700 are not available for either Totally Enclosed or Explosion Proof with Overload 115/1/60 motor types.

INSTALLATION

It is assumed that the design engineer has selected, sized, and located in the area to be heated by the design engineer. However, the information given here may be of additional help to the installer.

Vertical unit heaters should be located to give spot heating or a circulatory distribution, preferably near the outer perimeter of the building. The units should be spaced to properly blanket the areas with warm air. Place the units at points of greatest heat loss. Blanket outside doorway and provide ample coverage of window areas. Keep units away from obstructions that will impede the full and natural air delivery of the units.

Install unit heaters to meet ETL and OSHA requirements; Vertical Unit Heaters mounted lower than 2.4 meters (8 feet) from the floor must be equipped with an OSHA fan guard. Weldnuts are provided at the top of all units for suspension purposes. The unit should be suspended from connections provided in the unit by means of rods. The rods should then be attached to solid supports of the building.

Units must hang level vertically and horizontally.

Provide sufficient clearance around units for maintenance purposes. This includes at least 7 inches above all Vertical Unit Heaters even though the motor is removable through the bottom. To provide efficient airflow to the unit, maintain a clearance of 2 feet (0.61m) around all sides of the unit.

Maximum altitude for this unit is 14,000 feet (4,267 meters) unless otherwise noted. For altitudes higher than 14,000 feet (4,267 meters), contact your customer service representative.

Isolators are not required but may be desirable for some applications. Refer to Table 15 for Unit Weights.

Table 15 – Unit Weights-Lbs

| VERTICAL UNIT HEATERS | |
|-----------------------|-------------------------------------|
| Unit Size | Approx. Ship Weight lbs. (kg) |
| 40 | 32 (15) |
| 62 | 40 (18) |
| 77 | 43 (20) |
| 104 | 63 (29) |
| 125 | 64 (29) |
| 144 | 80 (36) |
| 164 | 80 (36) |
| 200 | 86 (39) |
| 237 | 134 (61) |
| 285 | 139 (63) |
| 317 | 139 (63) |
| 367 | 146 (66) |
| 495 | 294 (133) |
| 585 | 307 (139) |
| 700 | 366 (166) |

▲ WARNING Make certain that the lifting methods used to lift the heater and the method of suspension used in the field installation of the heater are capable of uniformly supporting the weight of the heater at all times. Failure to heed this warning may result in property damage or personal injury!

▲ WARNING Make certain that the structure to which the heater is mounted is capable of supporting its weight. Under no circumstances must the piping or the electrical conduit be used to support the heater; or should any other objects (i.e. ladder, person) lean against the heater or the electrical conduit for support.

▲ CAUTION Unit heaters must be hung level from side to side and from front to back. Failure to do so will result in poor performance and or premature failure of the unit.

▲ WARNING Ensure that all hardware used in the suspension of each unit heater is more than adequate for the job. Failure to do so may result in extensive property damage, severe personal injury or death. Washers should not be used between the unit nutsert and jam nut. Use of a washer may cause the nutsert to become dislodged from the unit.

EXAMPLE

Table 18 lists maximum mounting height and floor spread data of warm air coverage at floor level with louver cone diffusers. Correction factors for various water temp. and PSI of steam are in Table 19.

An approximation of the floor spread when operating on other than 2 psi (13.8 kPa) Steam or 219°F (104°C) hot water may be obtained by ratioing the new floor spread and the maximum mounting height to that at 2 psi (13.8 kPa) steam or 219°F (104°C) hot water.

Following is an example:

Determine the floor spread and the maximum mounting height of a std. size 77 unit heater with a cone diffuser set at 90 degrees, operating on 280°F (138°C) hot water.

From Table 18, maximum mounting height of a size 77 at 219°F (104°C) hot water is 18.5 ft. (5.64 m) with floor coverage of 14.0 ft. (4.27 m) diameter. The maximum mounting height correction factor at 280°F (138°C) hot water is 0.80.

18.5 ft. (5.64 m) x 0.80 = 14.8 ft. (4.51 m)
Maximum mounting height of a size 77 using 280°F (138°C) hot water.

“X” = floor spread of size 77 using 280°F (138°C) hot water.

$$X = 14.8 \times 14.0 / 18.5 \quad (4.51 \times 4.27 / 5.64)$$

$$X = 207.2 / 18.5 \quad (63.15 / 5.64)$$

$$X = 11.2 \text{ ft.} \quad (3.41 \text{ m})$$

Table 16 - Maximum Mounting Height in Feet with and without Louver Cone Diffuser

| Unit Size | Steam Pressure PSI (kPa) | | | | | Unit Size | Steam Pressure PSI (kPa) | | | | |
|-----------|--------------------------|----------------------|----------------------|----------------------|----------------------|-----------|--------------------------|----------------------|----------------------|----------------------|----------------------|
| | 2 (13.8) | 5 (34.5) | 10 (68.9) | 50 (344.7) | 75 (517.1) | | 2 (13.8) | 5 (34.5) | 10 (68.9) | 50 (344.7) | 75 (517.1) |
| 40 | 10.5 (3.2) | 10.0 (3.0) | 10.0 (3.0) | 9.0 (2.7) | 8.0 (2.4) | 77L | 18.0 (5.5) | 17.5 (5.3) | 17.5 (5.3) | 15.0 (4.6) | 14.0 (4.3) |
| | 12.5 (3.8) | 12.0 (3.7) | 12.0 (3.7) | 11.0 (3.4) | 10.0 (3.0) | | 22.0 (6.7) | 21.0 (6.4) | 21.0 (6.4) | 19.0 (5.8) | 18.0 (5.5) |
| 40* | 7.5 (2.3) | 7.5 (2.3) | 7.5 (2.3) | 7.5 (2.3) | 7.5 (2.3) | 77L* | 13.0 (4.0) | 12.5 (3.8) | 12.0 (3.7) | 11.0 (3.4) | 10.5 (3.2) |
| | 9.0 (2.7) | 8.5 (2.6) | 8.5 (2.6) | 7.5 (2.3) | 7.5 (2.3) | | 17.0 (5.2) | 16.5 (5.0) | 16.0 (4.9) | 14.0 (4.3) | 13.5 (4.1) |
| 40L | 12.5 (3.8) | 12.0 (3.7) | 12.0 (3.7) | 10.5 (3.2) | 9.5 (2.9) | 104 | 14.0 (4.3) | 13.5 (4.1) | 13.0 (4.0) | 11.5 (3.5) | 11.0 (3.4) |
| | 14.5 (4.4) | 14.0 (4.3) | 13.5 (4.1) | 12.0 (3.7) | 11.5 (3.5) | | 17.0 (5.2) | 16.5 (5.0) | 16.0 (4.9) | 14.0 (4.3) | 13.5 (4.1) |
| 40L* | 9.0 (2.7) | 8.5 (2.6) | 8.5 (2.6) | 7.5 (2.3) | 7.5 (2.3) | 104* | 11.0 (3.4) | 10.5 (3.2) | 10.5 (3.2) | 9.5 (2.9) | 9.0 (2.7) |
| | 10.5 (3.2) | 10.0 (3.0) | 10.0 (3.0) | 9.0 (2.7) | 8.5 (2.6) | | 13.5 (4.1) | 13.0 (4.0) | 13.0 (4.0) | 12.0 (3.7) | 11.5 (3.5) |
| 62 | 12.0 (3.7) | 11.5 (3.5) | 11.5 (3.5) | 10.0 (3.0) | 9.5 (2.9) | 104L | 17.5 (5.3) | 17.0 (5.2) | 16.5 (5.0) | 15.0 (4.6) | 14.5 (4.4) |
| | 14.5 (4.4) | 14.0 (4.3) | 14.0 (4.3) | 12.0 (3.7) | 11.5 (3.5) | | 21.5 (6.6) | 21.0 (6.4) | 20.5 (6.2) | 18.5 (5.6) | 17.5 (5.3) |
| 62* | 9.5 (2.9) | 9.0 (2.7) | 9.0 (2.7) | 8.0 (2.4) | 8.0 (2.4) | 104L* | 15.0 (4.6) | 14.5 (4.4) | 14.5 (4.4) | 13.0 (4.0) | 12.5 (3.8) |
| | 11.5 (3.5) | 11.0 (3.4) | 11.0 (3.4) | 9.5 (2.9) | 9.0 (2.7) | | 18.5 (5.6) | 18.0 (5.5) | 18.0 (5.5) | 16.0 (4.9) | 15.0 (4.6) |
| 62L | 15.0 (4.6) | 14.5 (4.4) | 14.5 (4.4) | 12.5 (3.8) | 12.0 (3.7) | 125 | 16.0 (4.9) | 15.5 (4.7) | 15.5 (4.7) | 14.0 (4.3) | 13.5 (4.1) |
| | 19.0 (5.8) | 18.5 (5.6) | 18.5 (5.6) | 16.5 (5.0) | 16.0 (4.9) | | 19.5 (5.9) | 19.0 (5.8) | 18.5 (5.6) | 17.0 (5.2) | 16.0 (4.9) |
| 62L* | 11.5 (3.5) | 11.0 (3.4) | 11.0 (3.4) | 9.5 (2.9) | 9.0 (2.7) | 125L | 21.0 (6.4) | 20.5 (6.2) | 20.0 (6.1) | 17.5 (5.3) | 17.0 (5.2) |
| | 14.0 (4.3) | 13.5 (4.1) | 13.5 (4.1) | 12.0 (3.7) | 11.5 (3.5) | | 26.0 (7.9) | 25.5 (7.8) | 25.0 (7.6) | 22.5 (6.9) | 21.5 (6.6) |
| 77 | 15.0 (4.6) | 14.5 (4.4) | 14.0 (4.3) | 12.0 (3.7) | 11.5 (3.5) | 144 | 15.5 (4.7) | 15.0 (4.6) | 14.5 (4.4) | 13.0 (4.0) | 12.0 (3.7) |
| | 18.5 (5.6) | 18.0 (5.5) | 17.5 (5.3) | 15.5 (4.7) | 15.0 (4.6) | | 19.0 (5.8) | 18.5 (5.6) | 18.0 (5.5) | 16.0 (4.9) | 15.5 (4.7) |
| 77* | 11.0 (3.4) | 10.5 (3.2) | 10.5 (3.2) | 9.0 (2.7) | 8.5 (2.6) | 144L | 18.0 (5.5) | 17.5 (5.3) | 17.5 (5.3) | 15.0 (4.6) | 14.0 (4.3) |
| | 13.5 (4.1) | 13.0 (4.0) | 13.0 (4.0) | 11.5 (3.5) | 11.0 (3.4) | | 22.5 (6.9) | 22.0 (6.7) | 21.5 (6.6) | 18.5 (5.6) | 18.0 (5.5) |

NOTES:

* = Low Speed

L = Low output model with all air ports open

Figures in bold face show maximum mounting height with louver cone diffusers set vertically.

Above table based on 60°F (15.6°C) entering air temperature. In providing for the use of diffusers, it must be remembered that adjustment of a LCD to deflect air toward horizontal immediately lowers the mounting height limit.

Table 16 - Maximum Mounting Height in Feet with and without Louver Cone Diffuser

| Unit Size | Steam Pressure PSI (kPa) | | | | | Unit Size | Steam Pressure PSI (kPa) | | | | |
|-----------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| | 2 (13.8) | 5 (34.5) | 10 (68.9) | 50 (344.7) | 75 (517.1) | | 2 (13.8) | 5 (34.5) | 10 (68.9) | 50 (344.7) | 75 (517.1) |
| 164 | 18.0 (5.5) | 17.5 (5.3) | 17.0 (5.2) | 14.5 (4.4) | 14.0 (4.3) | 317L | 29.0 (8.8) | 28.5 (8.7) | 28.0 (8.5) | 25.0 (7.6) | 24.0 (7.3) |
| | 22.5 (6.9) | 22.0 (6.7) | 21.5 (6.6) | 19.0 (5.8) | 18.0 (5.5) | | 36.0 (11.0) | 35.0 (10.7) | 34.0 (10.4) | 30.0 (9.1) | 29.0 (8.8) |
| 164L | 22.0 (6.7) | 21.5 (6.6) | 21.0 (6.4) | 18.5 (5.6) | 17.5 (5.3) | 367 | 28.5 (8.7) | 28.0 (8.5) | 27.5 (8.4) | 24.0 (7.3) | 23.0 (7.0) |
| | 27.5 (8.4) | 27.0 (8.2) | 26.5 (8.1) | 23.5 (7.2) | 22.5 (6.9) | | 35.5 (10.8) | 35.0 (10.7) | 34.0 (10.4) | 30.0 (9.1) | 29.0 (8.8) |
| 200 | 22.0 (6.7) | 21.5 (6.6) | 21.0 (6.4) | 18.5 (5.6) | 17.5 (5.3) | 367L | 32.5 (9.9) | 31.5 (9.6) | 30.5 (9.3) | 27.5 (8.4) | 26.5 (8.1) |
| | 27.5 (8.4) | 27.0 (8.2) | 26.5 (8.1) | 24.0 (7.3) | 23.0 (7.0) | | 41.0 (12.5) | 40.0 (12.2) | 39.0 (11.9) | 35.0 (10.7) | 33.5 (10.2) |
| 200L | 25.5 (7.8) | 25.0 (7.6) | 24.5 (7.5) | 22.0 (6.7) | 21.0 (6.4) | 495 | 29.5 (9.0) | 29.0 (8.8) | 28.5 (8.7) | 25.0 (7.6) | 24.0 (7.3) |
| | 31.5 (9.6) | 31.0 (9.4) | 30.5 (9.3) | 27.0 (8.2) | 26.0 (7.9) | | 36.5 (11.1) | 36.0 (11.0) | 35.5 (10.8) | 32.0 (9.8) | 30.5 (9.3) |
| 237 | 20.0 (6.1) | 19.5 (5.9) | 19.0 (5.8) | 17.0 (5.2) | 16.0 (4.9) | 495L | 35.0 (10.7) | 34.0 (10.4) | 33.0 (10.1) | 29.0 (8.8) | 28.0 (8.5) |
| | 25.0 (7.6) | 24.0 (7.3) | 23.5 (7.2) | 20.5 (6.2) | 19.5 (5.9) | | 43.5 (13.3) | 42.5 (13.0) | 41.5 (12.6) | 35.0 (10.7) | 34.0 (10.4) |
| 237L | 24.0 (7.3) | 23.5 (7.2) | 23.0 (7.0) | 20.0 (6.1) | 19.0 (5.8) | 585 | 34.0 (10.4) | 33.0 (10.1) | 32.0 (9.8) | 28.0 (8.5) | 27.0 (8.2) |
| | 29.5 (9.0) | 28.5 (8.7) | 28.0 (8.5) | 24.5 (7.5) | 23.5 (7.2) | | 42.5 (13.0) | 41.5 (12.6) | 40.5 (12.3) | 36.0 (11.0) | 34.5 (10.5) |
| 285 | 21.0 (6.4) | 20.5 (6.2) | 20.0 (6.1) | 17.5 (5.3) | 17.0 (5.2) | 585L | 37.0 (11.3) | 36.0 (11.0) | 35.0 (10.7) | 31.0 (9.4) | 30.0 (9.1) |
| | 26.0 (7.9) | 25.5 (7.8) | 25.0 (7.6) | 22.0 (6.7) | 21.0 (6.4) | | 46.5 (14.2) | 45.5 (13.9) | 44.5 (13.6) | 39.0 (11.9) | 37.0 (11.3) |
| 285L | 25.5 (7.8) | 25.0 (7.6) | 24.5 (7.5) | 21.0 (6.4) | 20.0 (6.1) | 700 | 38.5 (11.7) | 37.5 (11.4) | 36.5 (11.1) | 32.0 (9.8) | 30.5 (9.3) |
| | 32.0 (9.8) | 31.0 (9.4) | 30.0 (9.1) | 26.0 (7.9) | 25.0 (7.6) | | 48.0 (14.6) | 47.0 (14.3) | 46.0 (14.0) | 40.0 (12.2) | 39.0 (11.9) |
| 317 | 24.0 (7.3) | 23.0 (7.0) | 22.0 (6.7) | 20.0 (6.1) | 19.0 (5.8) | 700L | 42.5 (13.0) | 41.5 (12.6) | 40.5 (12.3) | 35.0 (10.7) | 33.5 (10.2) |
| | 30.0 (9.1) | 29.0 (8.8) | 28.0 (8.5) | 25.0 (7.6) | 24.0 (7.3) | | 53.0 (16.2) | 52.0 (15.8) | 51.0 (15.5) | 44.0 (13.4) | 42.0 (12.8) |

NOTES:

* = Low Speed

L = Low output model with all air ports open

Figures in bold face show maximum mounting height with louver cone diffusers set vertically.

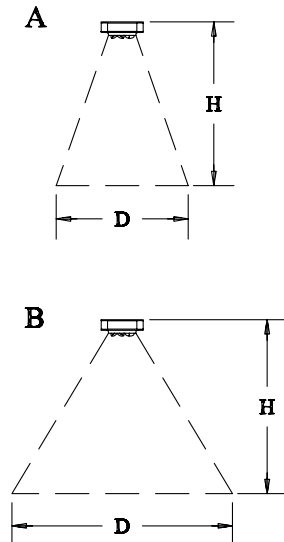
Above table based on 60°F (15.6°C) entering air temperature. In providing for the use of diffusers, it must be remembered that adjustment of a LCD to deflect air toward horizontal immediately lowers the mounting height limit.

Table 17 - Maximum Spread

| | | | | | | | | | | | | | | | |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| Unit Size | 40 | 62 | 77 | 104 | 125 | 144 | 164 | 200 | 237 | 285 | 317 | 367 | 495 | 585 | 700 |
| Spread | 15 | 17 | 20 | 24 | 26 | 27 | 28 | 32 | 35 | 37 | 45 | 50 | 54 | 57 | 60 |
| ft (m) | (4.6) | (5.2) | (6.1) | (7.3) | (7.9) | (8.2) | (8.5) | (9.8) | (10.7) | (11.3) | (13.7) | (15.2) | (16.5) | (17.4) | (18.3) |

Note: The "spread" is the diameter of the comfort zone at floor level. The above table represents the spread for standard units without a louver cone diffuser and mounted at its maximum height at 2 PSI (13.8 kPa) steam pressure and 60°F (16°C) entering air. (See Table 16 for maximum mounting heights.)

Figure 5



See Example

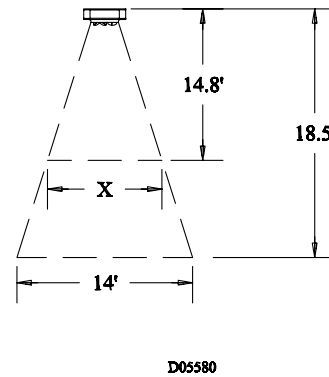


Table 18 - Maximum Mounting Height and Diameter at Floor (Based on 60°F EAT and 219°F EWT or 2 PSI steam)

| Unit Size | Diffuser Cone 90° See Figure 5A | | | | Diffuser Cone 45° See Figure 5B | | | |
|-----------|------------------------------------|----------------|----------------|----------------|------------------------------------|----------------|----------------|----------------|
| | Standard | | Low Output | | Standard | | Low Output | |
| | H ft (m) | D ft (m) | H ft (m) | D ft (m) | H ft (m) | D ft (m) | H ft (m) | D ft (m) |
| 40 | 12.5 (3.8) | 11.0 (3.4) | 14.5 (4.4) | 16.0 (4.9) | 9.0 (2.7) | 20.0 (6.1) | 11.0 (3.4) | 25.0 (7.6) |
| 62 | 14.5 (4.4) | 12.0 (3.7) | 19.0 (5.8) | 19.0 (5.8) | 10.0 (3.0) | 24.0 (7.3) | 12.0 (3.7) | 29.0 (8.8) |
| 77 | 18.5 (5.6) | 14.0 (4.3) | 22.0 (6.7) | 23.0 (7.0) | 12.5 (3.8) | 26.0 (7.9) | 15.0 (4.6) | 31.0 (9.4) |
| 104 | 17.0 (5.2) | 18.0 (5.5) | 21.5 (6.6) | 26.0 (7.9) | 11.0 (3.4) | 31.0 (9.4) | 14.0 (4.3) | 35.0 (10.7) |
| 125 | 19.5 (5.9) | 19.0 (5.8) | 26.0 (7.9) | 29.0 (8.8) | 13.0 (4.0) | 33.0 (10.1) | 16.0 (4.9) | 38.0 (11.6) |
| 144 | 19.0 (5.8) | 20.0 (6.1) | 22.5 (6.9) | 30.0 (9.1) | 12.0 (3.7) | 39.0 (11.9) | 15.5 (4.7) | 44.0 (13.4) |
| 164 | 22.5 (6.9) | 21.0 (6.4) | 27.5 (8.4) | 31.0 (9.4) | 13.0 (4.0) | 42.0 (12.8) | 18.0 (5.5) | 48.0 (14.6) |
| 200 | 27.5 (8.4) | 25.0 (7.6) | 31.5 (9.6) | 35.0 (10.7) | 14.0 (4.3) | 45.0 (13.7) | 21.0 (6.4) | 53.0 (16.2) |
| 237 | 25.0 (7.6) | 27.0 (8.2) | 29.5 (9.0) | 38.0 (11.6) | 13.0 (4.0) | 47.0 (14.3) | 19.0 (5.8) | 55.0 (16.8) |
| 285 | 26.0 (7.9) | 29.0 (8.8) | 32.0 (9.8) | 40.0 (12.2) | 15.0 (4.6) | 50.0 (15.2) | 21.0 (6.4) | 60.0 (18.3) |
| 317 | 30.0 (9.1) | 34.0 (10.4) | 36.0 (11.0) | 47.0 (14.3) | 18.0 (5.5) | 55.0 (16.8) | 24.0 (7.3) | 66.0 (20.1) |
| 367 | 35.5 (10.8) | 39.0 (11.9) | 41.0 (12.5) | 52.0 (15.8) | 20.0 (6.1) | 59.0 (18.0) | 28.0 (8.5) | 71.0 (21.6) |
| 495 | 36.5 (11.1) | 42.0 (12.8) | 43.5 (13.3) | 57.0 (17.4) | 24.0 (7.3) | 65.0 (19.8) | 30.0 (9.1) | 76.0 (23.2) |
| 585 | 42.5 (13.0) | 45.0 (13.7) | 46.5 (14.2) | 60.0 (18.3) | 26.0 (7.9) | 70.0 (21.3) | 34.0 (10.4) | 78.0 (23.8) |
| 700 | 48.0 (14.6) | 46.0 (14.0) | 53.0 (16.2) | 63.0 (19.2) | 28.0 (8.5) | 75.0 (22.9) | 38.0 (11.6) | 87.0 (26.5) |

Table 19 - Mounting Height Correction Factors

| | | | | | | | |
|-------------------|-------|------|------|------|------|------|------|
| Water Temperature | °F | 150 | 160 | 170 | 180 | 190 | 200 |
| | (°C) | (66) | (71) | (77) | (82) | (88) | (93) |
| Steam Pressure | PSI | — | — | — | — | — | — |
| | (kPa) | — | — | — | — | — | — |
| Correction Factor | | 1.32 | 1.27 | 1.23 | 1.18 | 1.14 | 1.09 |

| | | | | | | | |
|-------------------|-------|------|--------|--------|--------|---------|---------|
| Water Temperature | °F | 210 | 219 | 227 | 239 | 250 | 259 |
| | (°C) | (99) | (104) | (108) | (115) | (121) | (126) |
| Steam Pressure | PSI | — | 2 | 5 | 10 | 15 | 20 |
| | (kPa) | — | (13.8) | (34.5) | (68.9) | (103.4) | (137.9) |
| Correction Factor | | 1.05 | 1.00 | 0.97 | 0.94 | 0.89 | 0.86 |

| | | | | | | | |
|-------------------|-------|---------|---------|---------|---------|---------|---------|
| Water Temperature | °F | 267 | 280 | 287 | 298 | 307 | 320 |
| | (°C) | (131) | (138) | (142) | (148) | (153) | (160) |
| Steam Pressure | PSI | 25 | 35 | 40 | 50 | 60 | 75 |
| | (kPa) | (172.4) | (241.3) | (275.8) | (344.7) | (413.6) | (517.1) |
| Correction Factor | | 0.83 | 0.80 | 0.76 | 0.73 | 0.70 | 0.69 |

To meet OSHA requirements, units mounted lower than 8 feet from the floor must be equipped with an OSHA fan guard.

PIPING

To provide proper coil operation, follow all piping recommendations listed in this manual.

Threaded pipe headers are provided on all Vertical Units for piping connections. See Figure 5. Connections are given in Figures 3 and 4 and Tables 1 and 2.

Follow standard practices and codes when installing the piping. Provide swing joints for expansion purposes, unions and shut-off valves for servicing purposes and as illustrated in Figures 6 through 9, valves and traps for control purposes. Use 45 degree angle run-offs from all supply and return mains.

Dirt pockets should be the same pipe size as the return tapping of the unit heater. Also, pipe size in the branch-off should be the same size as the tapping in the traps. Beyond the trap, the return lateral pipe should be increased one size up to the return main.

Properly support all piping to unit! Do not allow piping to place a strain on the coil or unit. Noise or coil failure may occur.

It is assumed that the type of system to be used has been selected by design engineer. The sketches shown are for different type of steam systems or hot water systems. For sizing of piping, traps, filter, etc., consult ASHRAE guides of the manufacturer's literature on these products.

Figure 6 – Forced Hot Water

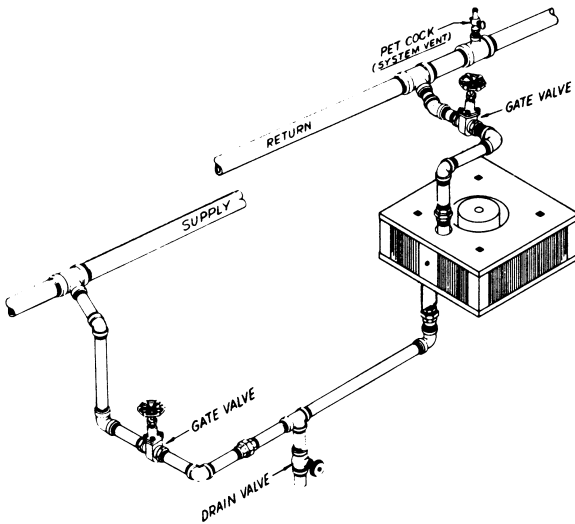


Figure 7 – High Pressure Steam

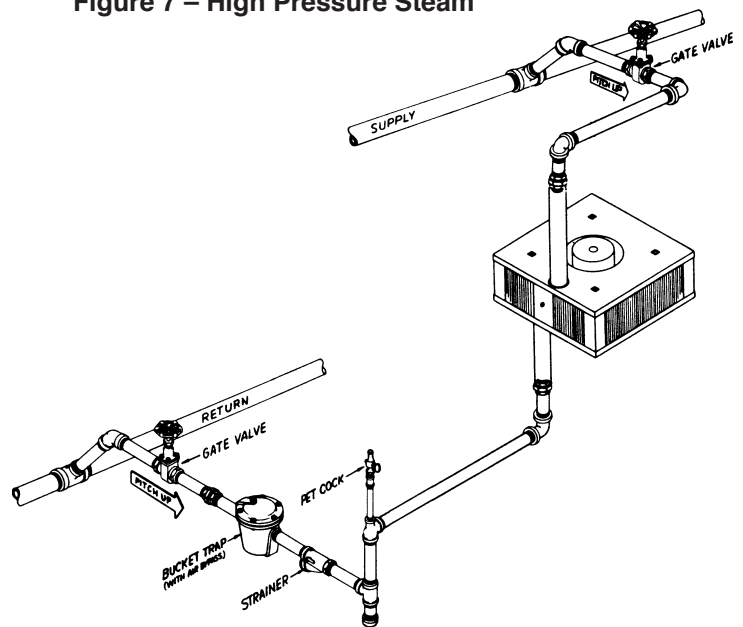


Figure 8 – Low Pressure Steam (Gravity)

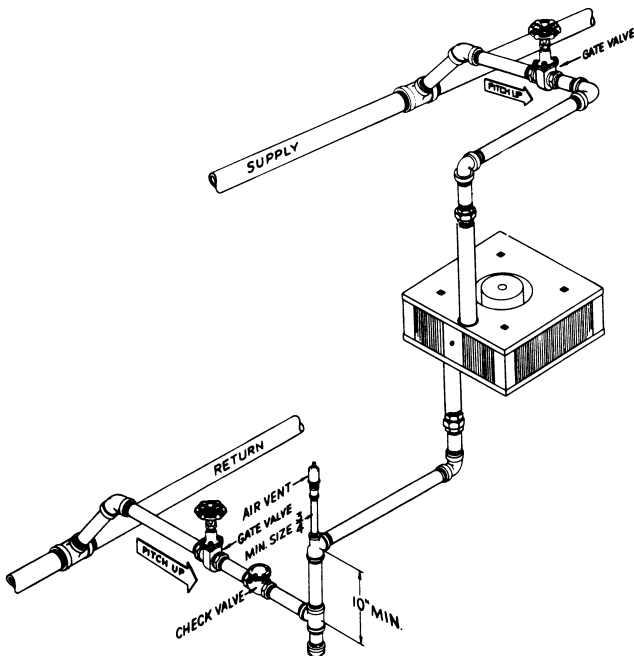
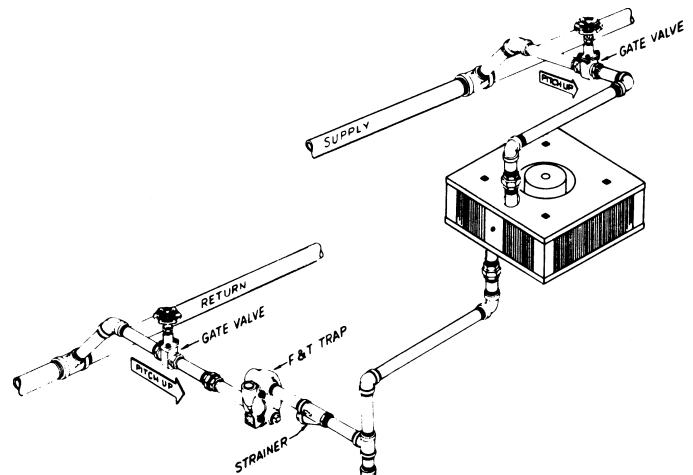


Figure 9 – Low Pressure Vapor or Vacuum



ELECTRICAL CONNECTIONS

| | |
|---|---|
|  | <p>▲ WARNING</p> <p>HAZARDOUS VOLTAGE! disconnect ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING. Failure to disconnect power before servicing can cause severe personal injury or death.</p> |
|---|---|

Standard units are shipped for use on 115 volt, 60 hertz single phase electric power. The motor nameplate and electrical rating on the transformer should be checked before energizing the unit heater electrical system. All external wiring must conform to the latest edition of the National Electric Code, ANSI/NFPA No. 70 and applicable current local codes; in Canada, to the Canadian Electrical Code, Part 1 CSA Standard C22.1. The short-circuit current rating (SCCR) for this unit is 5kA.

▲ CAUTION Do not use any tools (i.e. screwdriver, pliers, etc.) across the terminals to check for power. Use a voltmeter.

It is recommended that the electrical power supply to each unit heater be provided by a separate, fused and permanently live electrical circuit. A disconnect switch of suitable electrical rating for each unit heater should be located as close to the controls as possible. Each unit heater must be electrically grounded in accordance with the latest edition of the National Electric Code, ANSI/NFPA No. 70 or and applicable current local codes; In Canada to the Canadian Electrical Code, Part 1, CSA C22.1. Sample wiring connections are depicted in Figures 14 through 24.

OPERATION

Most basic unit heater systems are controlled by a room thermostat. Locate thermostat on inner wall or column so that optimum control could be obtained for that area. Set thermostat for desired temperature.

On steam systems a low limit may be used to prevent fan from blowing cold air unless the heater has steam passing through the coil.

Small hot water systems could have the circulating pump controlled directly by the room thermostat. On large systems, zone valves could be used to control the individual unit heater where constant water circulation is used on the main system.

THERMOSTAT WIRING AND LOCATION

NOTICE: The thermostat must be mounted on a vertical vibration-free surface free from air currents and in accordance with the furnished instructions.

Mount the thermostat approximately 5 feet (1.5 m) above the floor in an area where it will be exposed to a free circulation of average temperature air. Always refer to the thermostat instructions as well as our unit wiring diagram and wire accordingly. Avoid mounting the thermostat in the following locations:

1. Cold areas - Outside walls or areas where drafts may affect the operation of the control.
2. Hot areas - Areas where the sun's rays, radiation, or warm air currents may affect control operation.
3. Dead areas - Areas where air cannot circulate freely, such as behind doors or in corners.

NOTICE: For all wiring connections, refer to the wiring diagram on the motor nameplate (refer to pages 21 and 22). Should any original wire supplied with the heater have to be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C.

MOTORS

The standard 115/1/60 motors provided on Vertical Unit Heaters are totally enclosed, Class "B" insulated and have built-in thermal overload protection.

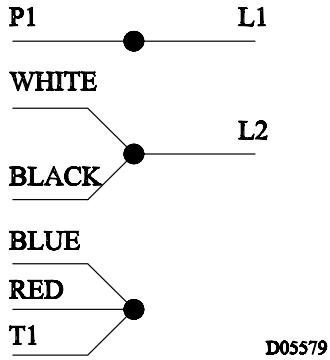
Vertical Units 40 through 72 use sleeve type bearings. Vertical Units 125 through 285 use permanent split capacitor motors with ball bearings.

All sleeve bearing motors have oil holes to allow lubrication. Ball bearing motors are permanently lubricated although some three phase or special motors have removable plugs which will allow field installation of grease fittings.

The standard 40 through 104 motors can be converted to variable speed operation with the addition of the solid state speed control.

See Figures 10 through 24 for typical wiring diagrams.

Figure 10 - Fan Motor Connections
 Low Voltage with
 Protector Select
 Rotation (CCW shown)
 (Marathon)



For CW Rotation Interchange
 (Red and black lead)

Figure 11 - Fan Motor Connections
 Low Voltage CCW
 Internal (Marathon)

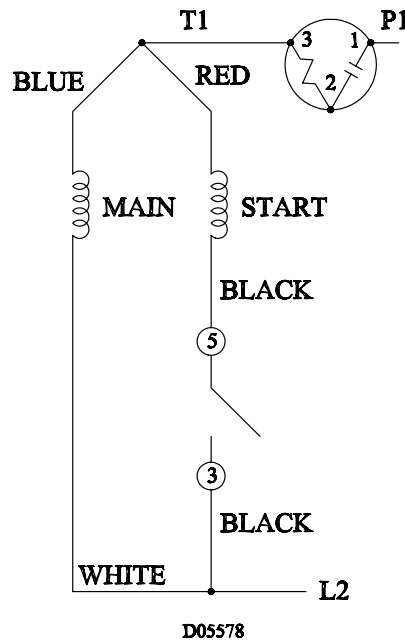


Figure 12 - Fan Motor Connections
 115/1/60 Constant
 Speed, Two Lead (GE,
 Marathon, Universal)

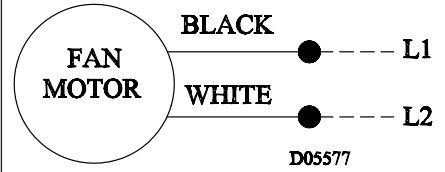
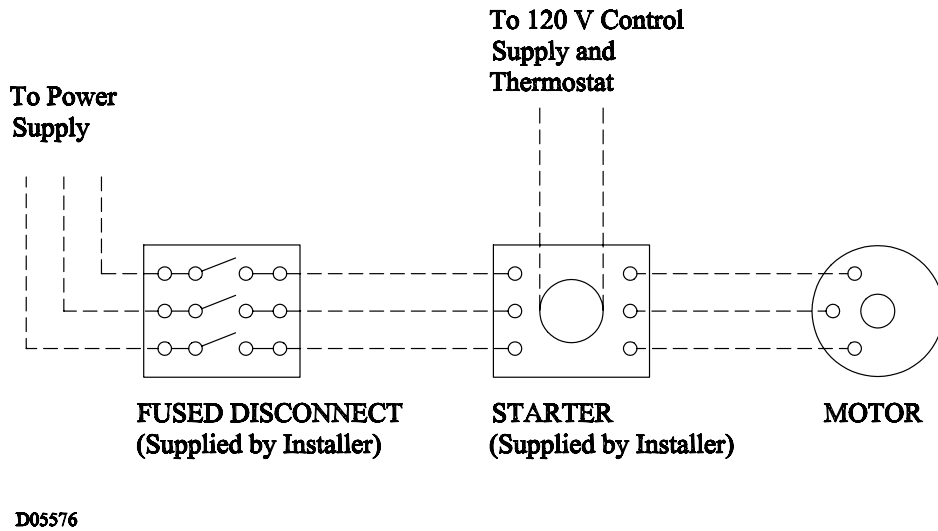


Figure 13 - Fan Motor Connections 3 Phase Wiring



NOTE: Motors without overload protection must be installed with the optional manual starter or other field provided overload protection. See Motor Data section to identify motors without overload protection.

WIRING INSTALLATION

Figure 14 - MANUAL CONTROL WITH SINGLE PHASE MOTOR

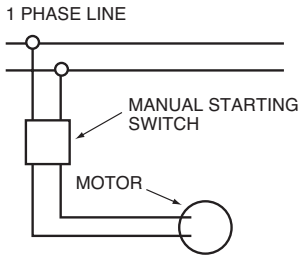


Figure 15 - THERMOSTATIC CONTROL WITH MANUAL STARTER

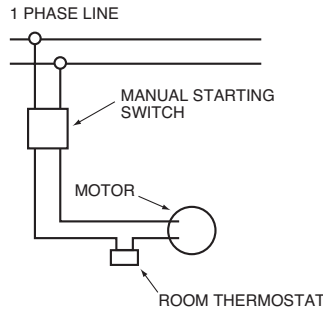


Figure 16 - THERMOSTATIC CONTROL WITH REVERSE ACTING CONTROLLER AND MANUAL STARTER

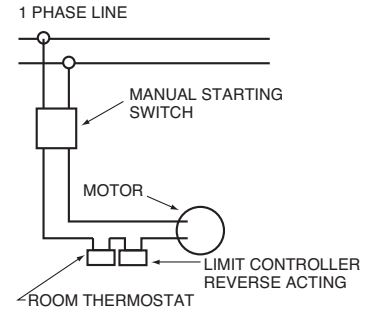


Figure 17 - THERMOSTATIC CONTROL USING MAGNETIC STARTER OPERATING SEVERAL UNITS

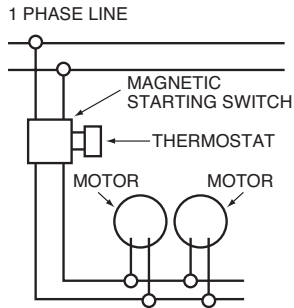


Figure 18 - THREE POSITION SELECTOR SWITCH USED FOR EITHER MANUAL OR THERMOSTATIC CONTROL

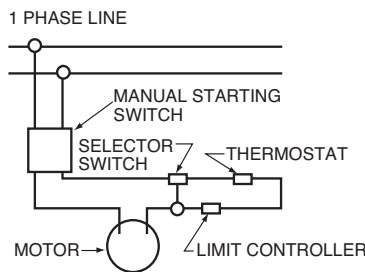


Figure 19 - THREE POSITION SELECTOR SWITCH BUILT INTO MAGNETIC STARTER FOR MANUAL OR THERMOSTATIC CONTROL

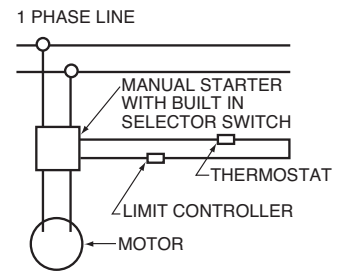


Figure 20 - SPEED CONTROLLER WITH MANUAL STARTING SWITCH

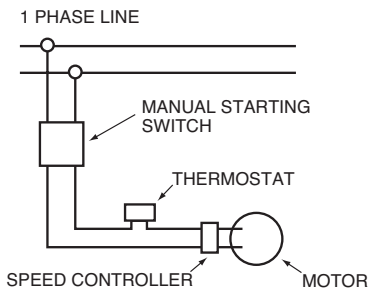


Figure 21 - SPEED CONTROLLERS WITH MAGNETIC STARTING SWITCH FOR OPERATING SEVERAL UNITS

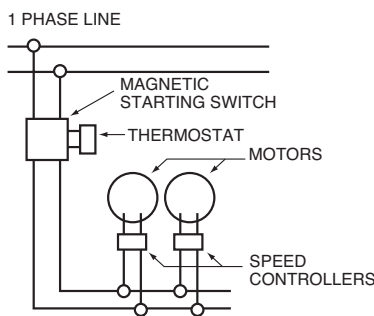


Figure 22 - MANUAL CONTROL WITH THREE PHASE MOTOR

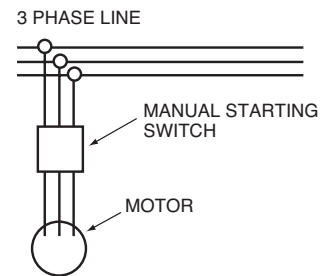


Figure 23 - THERMOSTATIC CONTROL WITH LIMIT CONTROLLER FOR THREE PHASE MOTOR

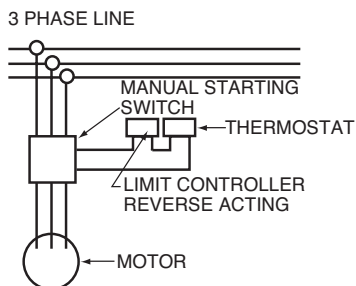
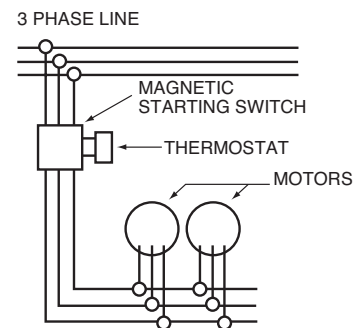


Figure 24 - THERMOSTATIC CONTROL OF SEVERAL THREE PHASE UNITS



NOTICE

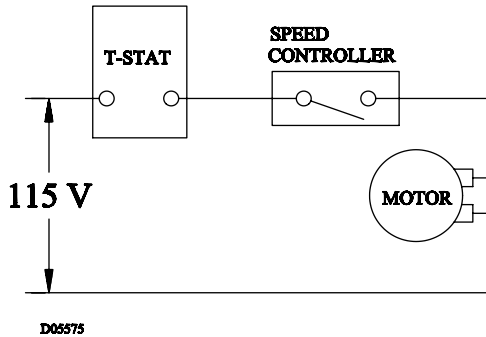
1. When using a speed controller, always locate the thermostat between the speed controller and the line, not between the motor and the controller.
2. For internal wiring and over-load protection on all starters, consult the control manufacturer for details.
3. When using thermostatic control with a manual starter, be sure that the electrical rating of the thermostat is sufficient to carry the motor current.

OPTIONS

VARIABLE SPEED CONTROL 115 Volt Only (optional)

The Solid State speed controller may be installed at any convenient location and is suitable for surface or flush type mounting. A standard electrical single or double gang wall box is recommended as in Figure 25.

Figure 25 - Wiring Diagram of Speed Control Installation



Installation procedure:

1. Attach the control's leads to the electrical leads in the control box using wire nuts. The speed control is to be wired in series with the motor. See wiring diagram in Figure 25.
2. Make certain wire nuts are tight with no copper wire being exposed.
3. Place wires and wire nuts back into box allowing room for the control to fit in box also.
4. Mount speed control to box using number 6 flathead screws provided.

Setting the control:

1. Turn the control shaft fully clockwise. If the motor is not running at the desired low speed, adjust the trim on the face of the control for low speed setting using a small screwdriver.
2. Rotate the control shaft counter clockwise. The speed will increase smoothly from minimum to maximum and then switch off.

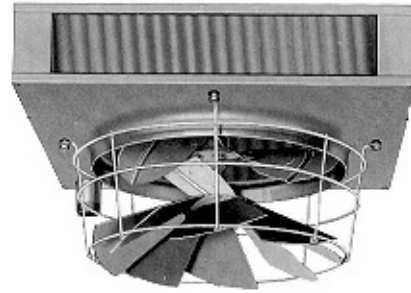
VERTICAL LOUVER CONE DIFFUSER (optional)

Washers and bolts are provided with each louver cone diffuser. Attach the diffuser to the bottom of the unit heater as shown in Figure 26. Mounting holes are provided in the unit base plate.

Adjust the diffuser to provide the desired air pattern.

NOTICE: To meet ETL and OSHA requirements, units mounted below 8 feet (2.4m) must be equipped with an OSHA fan guard. Vertical unit heaters can support either an OSHA fan guard or the Louvered Cone Diffuser - both items cannot be installed on the same unit.

Figure 26 - Louver Cone Diffuser
Attached to Vertical Unit Heater



STRAP-ON WATER CONTROL

A SPDT strap-on type hot water control with 100° to 240°F (38 to 116°C) rated at 10 amps at 120V is also available. Control can be used for direct or reverse acting applications as high or low limit.

STEAM PRESSURE CONTROL

SPDT switch opens on a rise in pressure. Control is automatically reset, has a range of 0 to 15 PSI (0 to 103 kPa) and has an adjustable differential. **Other actions, ranges, circuits and manual reset models are available on request.**

THERMOSTATS

Line voltage wall thermostats are in stock for immediate shipment. All models are SPST with bimetal thermometer, LCD display, push button controls, 44 to 95°F (7 to 35°C) range and selector switches. Standard duty models with "auto-off-fan" switching are available. Optional, 7-day programmable thermostats are also available. Available line voltage thermostats are for use with 115-1-60 supply voltage units only.

WALL MOUNTED SPEED CONTROLLERS

Motors up to and including 1/8 HP (115V) can be operated at reduced speeds by addition of optional speed controller. Controller is 5 amps, pre-set at factory for maximum and minimum speeds, with intermediate speeds infinitely controllable. All 1/3, 1/2 HP and 230V motors operate only at rated speed and CFM – See Charts.

MANUAL STARTERS

Single and three-phase models are available. Standard models are single-speed, toggle-operated, NEMA Type 1 and are surface-mounted. **Note: While these manual starters can be used with explosion-proof motors, they do not meet requirements for use in explosion-proof applications.**

NOTICE: When using electrical accessories, always refer to the accessory manufacturer's installation manual for proper use, location and wiring instructions.

MAINTENANCE

▲ WARNING Open all disconnect switches and secure in that position before servicing unit. Failure to do so may result in personal injury or death from electrical shock.

▲ CAUTION All rotating fans must stop before servicing to avoid serious injury to fingers and hands.

MOTOR LUBRICATION

Sleeve Bearings

Motors with oilers or oil holes are lubricated before shipment with a good grade of electric motor oil. Refill when necessary, with the motor at stand-still, until oil reaches the proper level.

Use SAE 20W non-detergent oil for motors operating in ambient temperatures of 32°F to 100°F (0°C to 38°C). Above 100°F (38°C), use an SAE 30W to SAE 50W non-detergent oil. Below 32°F (0°C), a SAE 10W non-detergent oil will be required.

The frequency of oiling will depend upon operating conditions and length of running time. Inspect the oilers or oil holes when cleaning the unit. If the unit has a fractional horse-power motor, lubricate at least once a year. Under high ambient conditions or constant fan operation, fractional horse-power motors should be lubricated every 90 days. On those motors without oilers or oil holes, follow the instructions given on the motor nameplate.

Ball Bearings

Ball bearing motors are pre-lubricated and normally not equipped with grease fittings. However, motors are equipped with removable grease plugs to allow installation of grease fittings if desired by the owner.

Motor manufacturers do not recommend or require on the job lubrication of ball bearing motors. If on the job lubrication is required by the owner, use the following procedure: With the motor at a stand-still, remove the vent and grease plugs. Install grease fitting and add grease sparingly. Remove the old grease from the vent relief chamber. Operate the motor a few minutes before reinstalling the vent plug to allow excess grease to escape. If there is evidence of grease working out around the motor shaft, less grease should be added and the greasing periods lengthened. If grease continues to appear, take the motor to the motor manufacturer's authorized service station for repair.

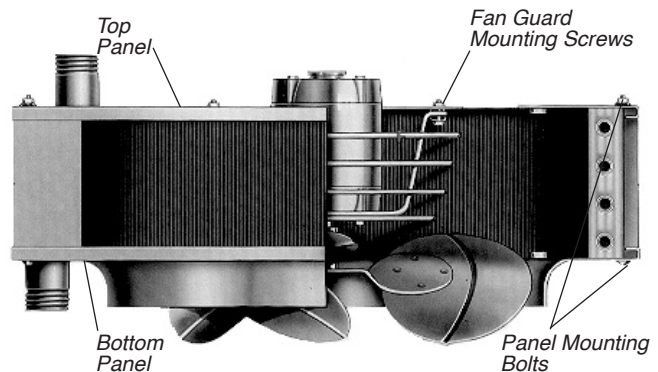
NOTICE: Consult local motor manufacturer's service facility for information on type of grease and oil to be used.

FAN AND MOTOR ASSEMBLY

For cleaning or maintenance purposes, the fan and motor assembly may be removed easily from the Unit Heater. The motor is attached to the fan guard which is, in turn, mounted to the top or back panel of the unit as shown in Figure 27.

On Vertical Units, reach up through the fan and remove the fan guard mounting screws. Lower the motor, fan and fan guard assembly down through the fan outlet. If desired, the top and bottom panels may be removed from the coil by taking out the four panel mounting bolts. See Figure 27.

Figure 27 – Cross Section View



CLEANING THE UNIT

The unit casing, fan, diffuser and coil should be cleaned thoroughly once a year. Coil heat transfer efficiency depends on cleanliness. The following recommended procedures may be performed when lubricating the motor and cleaning the coil.

1. Wipe all excess lubricant from the motor, fan and casing. Clean the motor thoroughly. A dirty motor will run hot and eventually cause internal damage.
2. Clean the coil:
 - a) Loosen the dirt with a brush on the fan side of the coil. Operate the motor allowing the fan to blow the loosened dirt through the unit.
 - b) Use air pressure or steam on the side of the coil away from the fan.

NOTICE: A piece of cheesecloth or a burlap bag may be used to collect the large particles during the cleaning process.

3. Clean the casing, fan blades, fan guard and diffuser using a damp cloth. Any rust spots on the casing should be cleaned and repainted.
4. Tighten the fan guard, motor frame and fan bolts. Check the fan for clearance in the panel orifice and free rotation.

Table 20 - Troubleshooting Guide

| SYMPTOMS | POSSIBLE CAUSE(S) | CORRECTIVE ACTION |
|---------------------------------------|---|--|
| A. Leaking coil. | <ol style="list-style-type: none"> 1. Frozen coil. 2. Defective coil. 3. Corrosion. 4. Leak in joint. | <ol style="list-style-type: none"> 1. Replace. 2. Replace. 3. Replace 4. Braze joint if joint is exposed where leak has occurred. |
| B. Poor output on steam. | <ol style="list-style-type: none"> 1. Check for air in coil. 2. Lint on coil fins. | <ol style="list-style-type: none"> 1. Repair or replace thermostatic air vent. 2. Clean coil and fins. Check filter and clean. |
| C. Poor output on steam or hot water. | <ol style="list-style-type: none"> 1. No circulation of water through coil. 2. Short cycling of motor. 3. Backward rotating motor. | <ol style="list-style-type: none"> 1. Check circulation pump. Check for blocked tubes. 2. Check voltage and correct. Check for linted coil and clean. Check for defective overload and repair or replace motor. 3. On single phase motor replace motor. On three phase motor, reverse two leads to change rotation. |
| D. Noisy or vibrating unit. | <ol style="list-style-type: none"> 1. Damaged fan blade. 2. Dirty fan blade. | <ol style="list-style-type: none"> 1. Change fan blade. 2. Clean fan blade. |

HOW TO ORDER REPLACEMENT PARTS

Please send the following information to your local representative; If further assistance is needed, contact the manufacturer's customer service department.

- Model number
- Serial Number (if any)
- Part description and Number as shown in the Replacement Parts Catalog.

LIMITED WARRANTY VERTICAL STEAM AND HOT WATER UNIT HEATERS

The Manufacturer warrants to the original owner (hereinafter "Owner"), or entity designated by Owner to file claim on Owner's behalf, e.g. distributor, installation contractor, end-user ("Owner Designate") at the original installation site ("Site") that the components that comprise the VERTICAL STEAM AND HOT WATER UNIT HEATERS ("Product" or "Products") will be free from defects in material and workmanship for a period of for one (1) year from the date of shipment from the factory.

All warranty claims are subject to, and contingent upon, Owner or Owner Designate following the terms of the Warranty Claim Service Procedure and additional conditions set forth below. Failure to follow the Warranty claim service procedure will void the warranty

Warranty claim service procedure:

1. Owner or Owner Designate should perform the following in order to insure prompt warranty service:
 - a. Notify the installer, who in turn should notify the distributor, promptly upon discovery of a condition believed to be caused by a defect in manufacture.
 - b. Owner must first obtain a Return Material Authorization ("RMA") and shipping instructions from the Manufacturer before returning any Products or components thereof.
 - c. Products or components thereof must be returned to the Manufacturer 's factory address set forth when obtaining the RMA, fully prepaid at sender's expense, and risk of loss or damage, including packaging, transportation and any applicable VAT and import duty costs, Warranty excludes all Expenses associated with the prepaid return of Products to Manufacturer and remain the responsibility of the sender. Collect shipments will be refused.
 - d. Manufacturer shall evaluate the returned Products or components thereof purported to be defective due to defects in material or Manufacturer's workmanship and will determine in its reasonable and sole discretion if indeed such defects have occurred.
 - e. If indeed the Product or portion thereof is determined to be defective due to defects in material or Manufacturer's workmanship, Manufacturer shall either repair or replace, at its option, the portion of the Product deemed defective. Any warranty credits will be subject to verification of a defect by the manufacturer and any returned Products or components thereof shall become the property of the Manufacturer.
 - f. Repaired or replacement Products or components thereof shall be returned to Owner on a pre-paid basis with reasonable standard freight and transit insurance covered by Manufacturer. The repair or replacement of a Product shall not extend the effective period of the original warranty on the Product.

Additional Conditions:

- g. All Products are inspected prior to shipment from factory. If Products or components thereof received are damaged, claims must be made to the delivering carrier, and such damages should be noted on the bill of lading. Claims for shortages must be noted on the bill of lading and the factory notified immediately.
- h. Returned Products or components thereof will be subject to a minimum of 25% restock/handling charge if Manufacturer's evaluation determines Products or components returned are not defective due to defects in material or Manufacturer's workmanship.

EXCLUSIONS TO WARRANTY COVERAGE (all exclusions will be determined in the sole discretion of Manufacturer):

1. On-site labor or services including but not limited to those of those of the Manufacturer or any expenses for removal of Products for evaluation or reinstallation of replacement Products all of which are the responsibility of Owner.
2. Any damage caused by fire or other casualties; flooding from hurricanes or otherwise exposure to the elements; settlement, distortion, collapse or cracking of any foundation area, beams or pipes surrounding the Product.
3. Damage due to corrosion by chemicals, including halogenated hydrocarbons, precipitated in the air.
4. Damage associated with or caused by the installation of the Products regardless of whether the installer, provided by the Owner, is considered, or was authorized by Manufacturer, to be a qualified contractor, to perform the installation. The installation contractor is solely and exclusively responsible for its own work and the results thereof.
5. Damage or loss occurring during original shipment of Product to Owner or return of Products to Manufacturer for warranty evaluation. All expenses associated with the prepaid return of Products to Manufacturer for warranty evaluation are the responsibility of the sender.
6. Damage, whether unintentional or not, from misuse or neglect.
7. Products that were not properly installed, maintained (serviced annually) or operated by a qualified contractor in accordance with the Manufacturer's furnished written instructions, and meets the good practice as defined by the industry's accepted authority, or were altered or modified in anyway by any person other than those authorized in writing by the Manufacturer to do so.
8. Auxiliary Products or components thereof furnished by the Manufacturer but manufactured by another party, ("Third Party Items") which may be incorporated in the Products shall bear no warranties other than the warranties extended by and enforceable against the original manufacturer of the Third Party Items at the time of shipment to Owner). Other parts or any other components of the Products not specifically listed herein.

THIS WARRANTY IS THE EXCLUSIVE WARRANTY APPLICABLE TO THE PRODUCT(S) HEREIN AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, OF ANY KIND AND SUPERSEDES ALL OTHER WARRANTIES, INCLUDING THOSE CONTAINED IN OTHER DOCUMENTS WHICH MIGHT HAVE BEEN INCLUDED WITH THE PRODUCTS AT THE TIME OF SHIPMENT. THE REMEDIES UNDER THIS WARRANTY ARE EXCLUSIVE TO THE ORIGINAL OWNER ("OWNER") AT THE ORIGINAL PLACE OF INSTALLATION AND MANUFACTURER NEITHER ASSUMES NOR AUTHORIZES ANYONE TO OFFER OR ASSUME FOR IT ANY OTHER OBLIGATIONS. IN NO EVENT SHALL MANUFACTURER, INC. BE LIABLE FOR ANY DIRECT DAMAGES THAT EXCEED THE SALE PRICE OF THE PRODUCT(S) OR SECTIONS OR COMPONENTS THEREOF FOUND BY THE MANUFACTURER TO BE DEFECTIVE, OR ANY SPECIAL, INDIRECT, CONSEQUENTIAL, PUNITIVE OR INCIDENTAL DAMAGES OF ANY KIND, OR ON-SITE LABOR, EXPENSES OF ANY KIND, LOST PROFITS, LOST OPPORTUNITIES, OR SIMILAR DAMAGES OF ANY KIND; AND REGARDLESS OF THE LEGAL THEORY OR CAUSES OF ACTION BY WHICH CLAIMS FOR ANY SUCH DAMAGES AS SET FORTH IN THE ENTIRETY OF THE DOCUMENTS RELATED TO THE SALE OF THE PRODUCTS ARE ADVANCED, WHETHER OR NOT MANUFACTURER HAS BEEN ADVISED OF THE POSSIBILITY OF ANY SUCH DAMAGES.

In the interest of product improvement, we reserve the right to make changes without notice.

OSHA Fan Guard/Louver Cone Diffuser Installation Detail

The figures below show how both the OSHA Fan Guard and the Louver Cone Diffuser are installed on the Vertical Steam and Hot Water Unit Heater. Figures 28 and 29 detail how the louver cone diffuser and OSHA guard are attached to the unit. Figures 30 and 31 show full views of the vertical steam and hot water unit with a Louver Cone Diffuser and OSHA Fan Guard attached.

⚠ WARNING Do not mount either the Louver Cone Diffuser or OSHA Fan Guard while unit is in operation or severe personal injury may occur. Disconnect all power supplies to the unit before installing the Louver Cone Diffuser or OSHA Fan Guard.

NOTICE: To meet ETL and OSHA requirements, units mounted below 8 feet (2.4m) must be equipped with an OSHA fan guard. Vertical unit heaters can support either an OSHA fan guard or the Louvered Cone Diffuser - both items cannot be installed on the same unit.

The same screws and washers are provided with both the OSHA fan guard and Louver Cone Diffuser. The screws and washers are used in conjunction with the Nutserts to support the wire guard or diffuser to the orifice panel (bottom of vertical unit).

Figure 28 – Louver Cone Diffuser

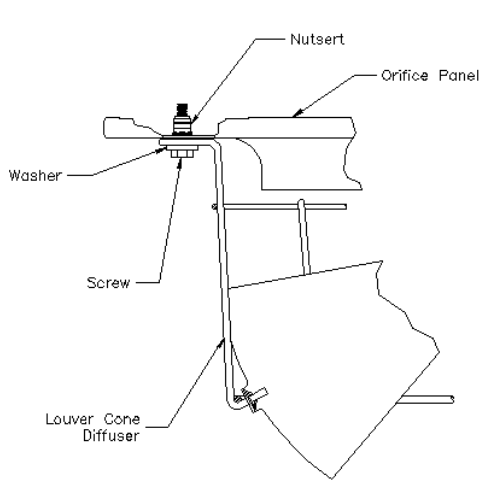


Figure 29 – OSHA Fan Guard

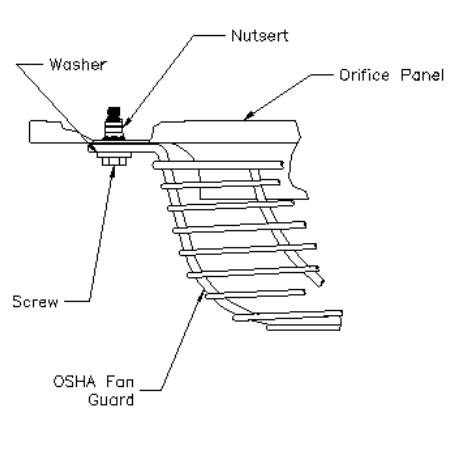


Figure 30 – Vertical Unit with Louver Cone Diffuser

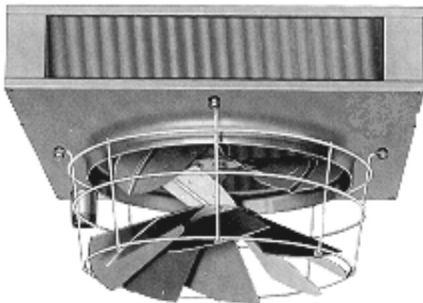


Figure 31 – Vertical Unit with OSHA Fan Guard



EQUIPMENT START-UP

Customer _____ Job Name & Number _____

PRE-INSPECTION INFORMATION

With power and water/steam off.

Type of Equipment: _____ Unit Heater

Serial Number _____ Model Number _____

Name Plate Voltage: _____ Name Plate Amperage: _____

Steam Hot Water Rating: _____ BTU @ _____ °F

_____ kw @ _____ °C

- Are all panels in place?
- Has the unit suffered any external damage? Damage _____
- Does the piping and electric wiring appear to be installed in a professional manner?
- Has the piping and electric been inspected by the local authority having jurisdiction?
- Is the supply properly sized for the equipment?
- Were the installation instructions followed when the equipment was installed?
- Have all field installed controls been installed?
- Do you understand all the controls on this equipment? *If not, contact your wholesaler or rep. (DO NOT START this equipment unless you fully understand the operation of this equipment.)*

FAN

With power on

- Check voltage L1 _____ L2 _____ L3 _____
- Check fan rotation.
- Check motor amps L1 _____ L2 _____ L3 _____