Bulletin C-115E

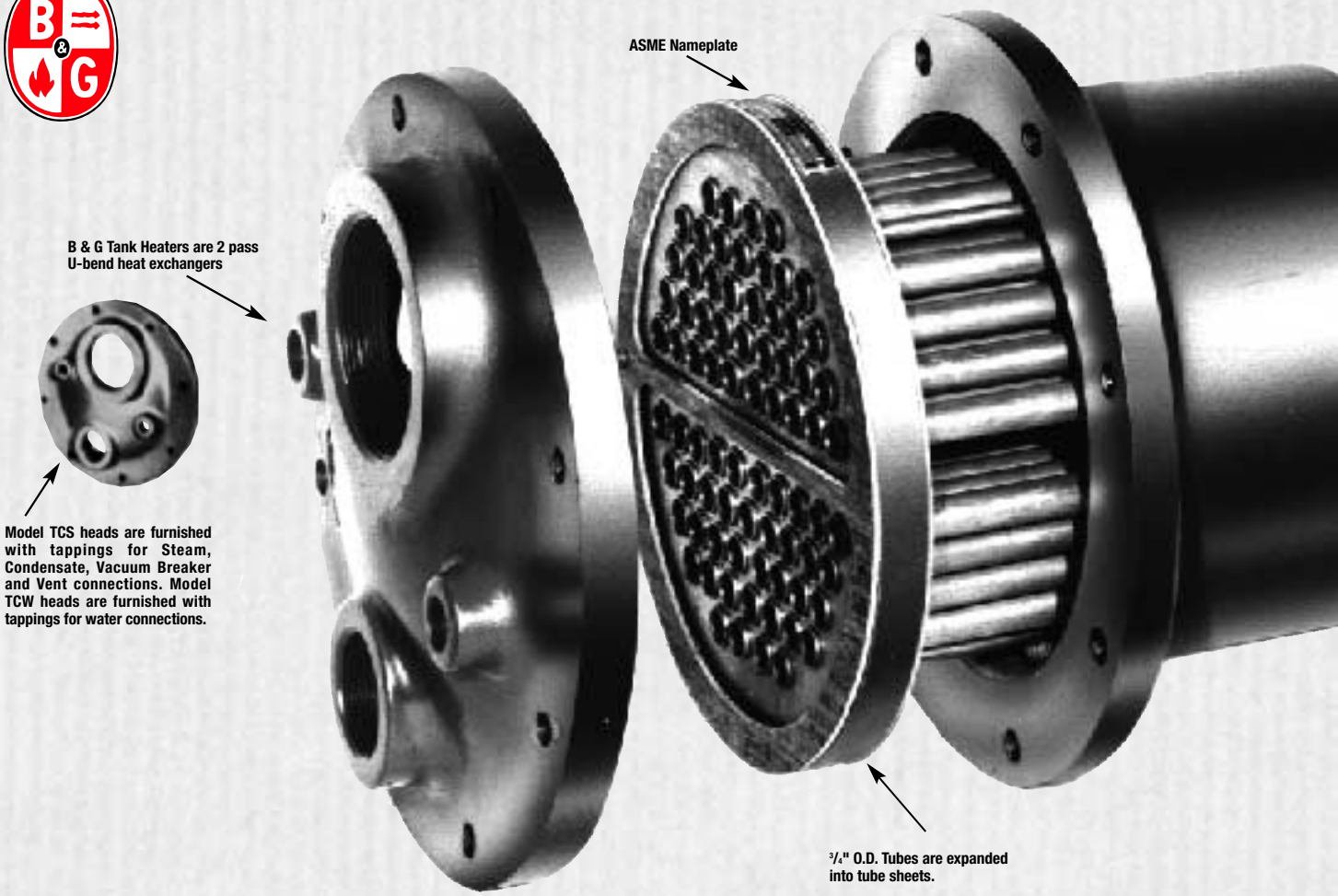
# Bell & Gossett

# Tank Heaters

## For Heating Water with Steam or Water

Part of the ESP PLUS Equipment Selection Programs

Bell & Gossett
ITT Industries




# GENERAL INFORMATION

## MATERIAL FEATURES

1. Tubes are ¾" O.D. copper.
2. Heads are cast iron. Brass can be furnished on request.
3. Tube sheets and welding collars are pressure vessel quality steel. Brass tube sheets can be furnished on request.
4. Tube supports are brass.
5. All materials furnished for pressure parts are certified to ASME specifications.
6. Units are available with stainless steel, 90/10 cupro nickel, Admiralty, and steel tubing. Consult factory for other variations.
7. Many Tank Heater applications require lining the tank with various materials i.e., epoxy phenolic, cement, etc. When the thickness of these linings exceed 0.01", oversized construction must be provided. Consult factory.

## DESIGN PRESSURES – STANDARD

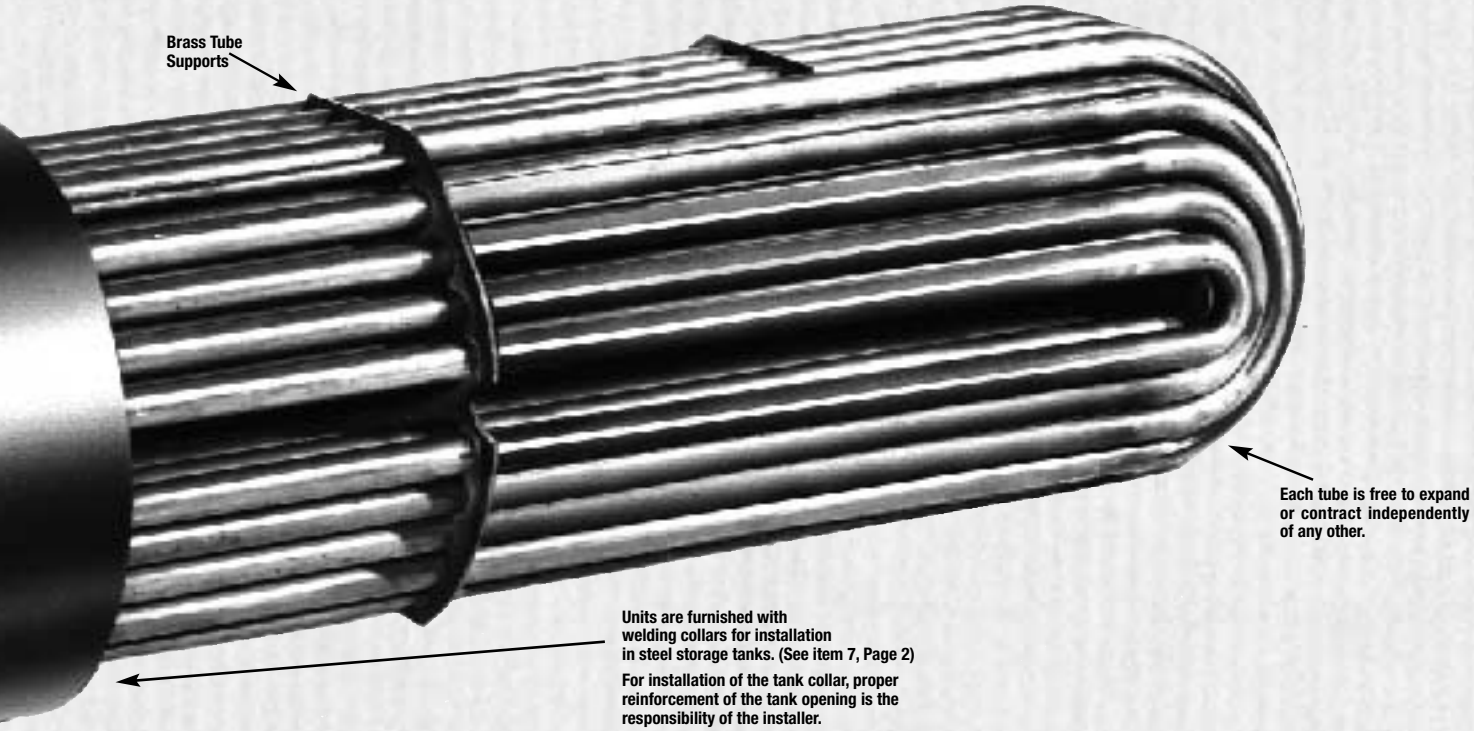
Cast Iron Head – Steel Tube Sheet – Copper Tubes – ASME Construction – Design Temperature 375° F.

| Tube Bundle Diameter (Nominal) | Design Pressure | Test Pressure |
|---|---|---|
| 4" | 150 PSI | 300 PSI |
| 6" | 150 PSI | 300 PSI |
| 8" | 150 PSI | 300 PSI |
| 10" | 125 PSI | 250 PSI |
| 12" | 125 PSI | 250 PSI |
| 14" | 125 PSI | 250 PSI |

For design pressure and design temperature for brass construction please consult factory.

For design pressures and temperatures higher than standard consult factory.

For diameters larger than shown consult factory.




Standard tank heaters are constructed according to ASME requirements for pressures and temperature noted in table on page 2. A Manufacturer's Partial Data Report for Pressure Vessels, Form No. U-2 as required by the provisions of the ASME Code Rules is furnished with each unit upon request.

This form is signed by an authorized inspector, holding a National Board Commission, and who is employed by an authorized inspection agency, certifying that construction comforms to the latest ASME code for pressure vessels. The ASME "U" symbol is stamped on each vessel.

## 1. Determine Capacity Required:

To determine the heat transfer capacity of the heat exchanger the following conditions of operation must be known:

a. The amount of water to be heated in gallons per hour.

b. Inlet temperature of water and outlet or final water temperature.

c. The steam pressure available at the heat exchanger. (Be sure allowance is made for pressure drop through the steam controller.) **Or** if boiler water is the heating medium, the inlet temperature of the water.

## 2. Select Unit

Select the proper unit by using the tables on Pages 5 thru 7 as follows:

a. First refer to proper temperature rise.

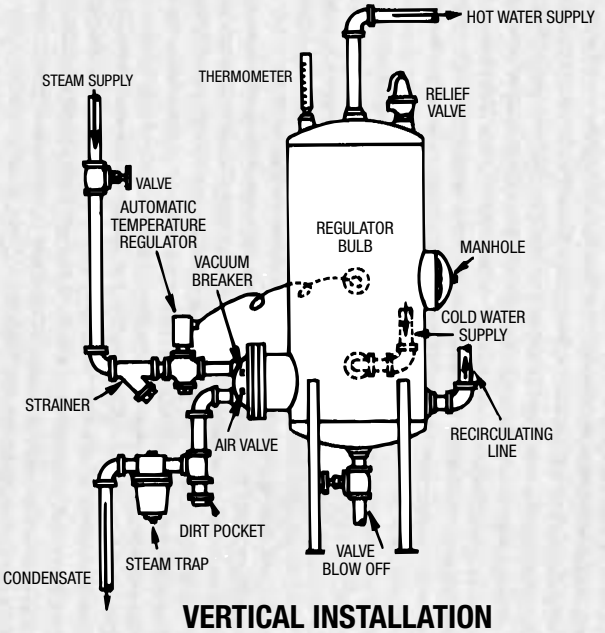
b. Next refer to proper steam temperature or boiler water temperature.

c. Select unit from appropriate table or tables.

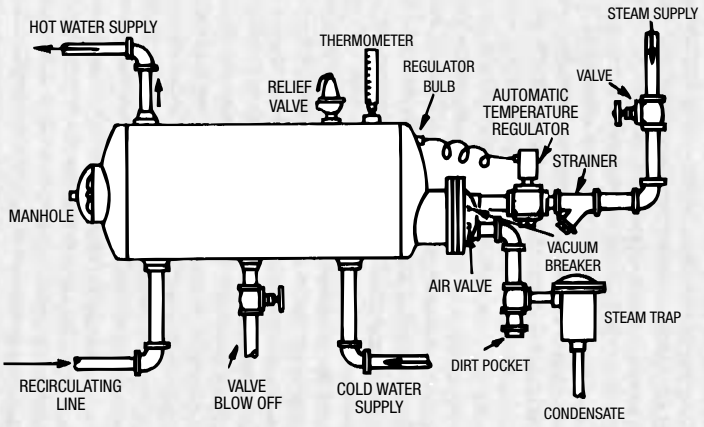
d. Consult factory for all temperature conditions not covered by tables.

TANK AND HEATER ASSEMBLY

# TYPICAL INSTALLATIONS (TANK AND HEATER UNITS)




VERTICAL INSTALLATION




HORIZONTAL INSTALLATION

## *Table A....Hot Water Demand per Fixtures for Various Types of Buildings

Gallons of water per hour per fixture, calculated at a final temperature of *140°* F.

| | Apartment House | Club | Gym-nasium | Hospital | Hotel | Industrial Plant | Office Building | Private Residence | School | Y.M.C.A. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Basins, private lavatory | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2. Basins, public lavatory | 4 | 6 | 8 | 6 | 8 | 12 | 6 | .... | 15 | 8 |
| 3. Bathtubs | 20 | 20 | 30 | 20 | 20 | .... | .... | 20 | .... | 30 |
| 4. Dishwashers[a] | 15 | 50-150 | .... | 50-150 | 50-200 | 20-100 | .... | 15 | 20-100 | 20-100 |
| 5. Foot basins | 3 | 3 | 12 | 3 | 3 | 12 | .... | 3 | 3 | 12 |
| 6. Kitchen sink | 10 | 20 | .... | 20 | 30 | 20 | 20 | 10 | 20 | 20 |
| 7. Laundry, stationary tubs | 20 | 28 | .... | 28 | 28 | .... | .... | 20 | .... | 28 |
| 8. Pantry sink | 5 | 10 | .... | 10 | 10 | .... | 10 | 5 | 10 | 10 |
| 9. Showers | 30 | 150 | 225 | 75 | 75 | 225 | 30 | 30 | 225 | 225 |
| 10. Slop sink | 20 | 20 | .... | 20 | 30 | 20 | 20 | 15 | 20 | 20 |
| 11. Hydro-therapeutic showers | | | | 400 | | | | | | |
| 12. Hubbard baths | | | | 600 | | | | | | |
| 13. Leg baths | | | | 100 | | | | | | |
| 14. Arm baths | | | | 35 | | | | | | |
| 15. Sitz baths | | | | 30 | | | | | | |
| 16. Continous-flow baths | | | | 165 | | | | | | |
| 17. Circular wash sinks | | | | 20 | 20 | 30 | 20 | | 30 | |
| 18. Semi-circular wash sinks | | | | 10 | 10 | 15 | 10 | | 15 | |
| 19. Demand factor | 0.30 | 0.30 | 0.40 | 0.25 | 0.25 | 0.40 | 0.30 | 0.30 | 0.40 | 0.40 |
| 20. Storage capacity factor[b] | 1.25 | 0.90 | 1.00 | 0.60 | 0.80 | 1.00 | 2.00 | 0.70 | 1.00 | 1.00 |

[a]Dishwasher requirements should be taken from this table or from manufacturer's data for the model to be used, if this is known.
[b]Ratio of storage tank capacity to probable maximum demand per hour. Storage capacity may be reduced where an unlimited supply of steam is available from a central street steam system or larger boiler plant.
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## EXAMPLE – USING TABLE A:

Suppose we consider an apartment building having the following fixtures:

| | | |
|---|---|---|
| Private lavatories | 12 at 2 gals. each = | 24 G.P.H. |
| Public lavatories | 4 at 4 gals. each = | 16 G.P.H. |
| Bath tubs | 12 at 20 gals. each = | 240 G.P.H. |
| Dishwashers | 5 at 15 gals. each = | 75 G.P.H. |
| Kitchen sinks | 12 at 10 gals. each = | 120 G.P.H. |
| Laundry tubs | 12 at 20 gals. each = | 240 G.P.H. |
| Slop sinks | 2 at 20 gals. each = | 40 G.P.H. |
| | Possible max. demand | 755 G.P.H. |

The demand factor is .30, therefore the recovery rate or probable Max. demand is 755 G.P.H. x .30 or 266 G.P.H. at 140°.

The storage capacity factor is 1.25, therefore, the storage capacity is 266 G.P.H. x 1.25 or 282 gallons.

Assuming the tank is horizontal and uncirculated, 30" in diameter at 96" long with steam at 10 PSIG available at the coil and holding the coil as near to 50 to 75% of the tank length – choose a TCS-466. Reference Selection Procedure, Page 5.

**CAUTION:** It is up to the installer to provide adequate support for units (2) two feet or longer when installing this unit in a tank. Failure to provide adequate support may result in premature tube failure and/or failure of the tube/tubesheet mechanical roll joint.

# RATINGS ... B & G TANK HEATERS
# TABLE 1 – TYPE TCS CAPACITY – GPH/SQ. FT.
## (HEATING WATER)

(Red indicates capacity on circulated tank
Black indicates capacity based on uncirculated (stagnant) tank)

| WATER TEMP. | | STEAM (TUBE SIDE) – PSIG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM | TO | 0 | 2 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 75 | 100 | 125 |
| 40 | 120 | 53.5 | 56.3 | 60.0 | 65.3 | 69.7 | 73.5 | 80.0 | 85.4 | 90.0 | 99.5 | 107.1 | 113.4 |
| | | 29.1 | 30.9 | 33.3 | 36.5 | 39.5 | 41.9 | 46.2 | 49.6 | 52.6 | 59.2 | 64.1 | 68.7 |
| 40 | 140 | 38.4 | 40.8 | 43.8 | 48.1 | 51.7 | 54.8 | 60.0 | 64.4 | 68.2 | 75.8 | 81.8 | 86.9 |
| | | 23.1 | 24.7 | 26.7 | 29.6 | 32.2 | 34.2 | 37.9 | 41.1 | 43.7 | 49.4 | 53.7 | 57.6 |
| 40 | 160 | 28.0 | 30.0 | 32.7 | 36.3 | 39.4 | 42.1 | 46.5 | 50.2 | 53.4 | 59.8 | 64.9 | 69.2 |
| | | 18.1 | 19.6 | 21.5 | 24.1 | 26.4 | 28.4 | 31.7 | 34.4 | 36.9 | 41.8 | 45.9 | 49.4 |
| 40 | 180 | 19.9 | 21.8 | 24.3 | 27.6 | 30.4 | 32.8 | 36.7 | 39.9 | 42.7 | 48.3 | 52.8 | 56.4 |
| | | 13.8 | 15.2 | 17.1 | 19.6 | 21.7 | 23.5 | 26.6 | 29.2 | 31.4 | 36.0 | 39.7 | 42.7 |
| 50 | 120 | 59.2 | 62.4 | 66.6 | 72.6 | 77.6 | 82.0 | 89.4 | 95.5 | 100.8 | 111.6 | 120.2 | 127.4 |
| | | 32.5 | 34.4 | 37.0 | 40.8 | 43.9 | 46.7 | 51.6 | 55.4 | 59.2 | 66.4 | 71.9 | 77.2 |
| 50 | 140 | 41.3 | 43.8 | 47.2 | 51.9 | 55.9 | 59.4 | 65.2 | 70.0 | 74.1 | 82.6 | 89.3 | 95.0 |
| | | 24.9 | 26.6 | 28.8 | 32.0 | 34.9 | 37.2 | 41.3 | 44.6 | 47.6 | 53.9 | 58.9 | 63.0 |
| 50 | 160 | 29.5 | 31.6 | 34.5 | 38.5 | 41.9 | 44.7 | 49.6 | 53.6 | 57.0 | 64.0 | 69.6 | 74.2 |
| | | 19.2 | 20.8 | 22.8 | 25.7 | 28.1 | 30.1 | 33.8 | 36.9 | 39.4 | 45.0 | 49.4 | 52.9 |
| 50 | 180 | 20.6 | 22.7 | 25.3 | 28.9 | 31.8 | 34.4 | 38.6 | 42.0 | 45.0 | 51.0 | 55.8 | 59.7 |
| | | 14.4 | 15.9 | 17.9 | 20.5 | 22.8 | 24.8 | 28.1 | 30.7 | 33.2 | 38.0 | 42.0 | 45.4 |
| 60 | 120 | 66.7 | 70.4 | 75.3 | 82.2 | 88.1 | 93.2 | 101.8 | 108.9 | 115.1 | 127.6 | 137.7 | 146.1 |
| | | 36.3 | 38.6 | 41.6 | 46.0 | 49.6 | 52.8 | 58.4 | 62.8 | 66.8 | 75.5 | 82.4 | 87.9 |
| 60 | 140 | 44.8 | 47.6 | 51.4 | 56.7 | 61.1 | 65.0 | 71.5 | 76.9 | 81.6 | 91.1 | 98.6 | 104.9 |
| | | 27.0 | 28.8 | 31.3 | 34.9 | 37.9 | 40.5 | 45.1 | 49.1 | 52.3 | 59.1 | 64.7 | 69.2 |
| 60 | 160 | 31.2 | 33.6 | 36.7 | 41.1 | 44.7 | 47.9 | 53.2 | 57.5 | 61.3 | 69.0 | 75.1 | 80.2 |
| | | 20.3 | 22.0 | 24.2 | 27.4 | 30.0 | 32.2 | 36.2 | 39.6 | 42.4 | 48.2 | 53.0 | 57.2 |
| 60 | 180 | 21.5 | 23.7 | 26.4 | 30.3 | 33.5 | 36.2 | 40.7 | 44.4 | 47.6 | 54.1 | 59.2 | 63.5 |
| | | 15.0 | 16.6 | 18.7 | 21.6 | 24.0 | 26.1 | 29.6 | 32.5 | 35.2 | 40.3 | 44.6 | 48.0 |

The capacity of a tank heater depends on a number of factors which include the orientation of the tank heater (vertical or horizontal), the location of the tank heater (top or bottom of tank), the duty of the tank heater (cooling or heating), and whether the tank is circulated or uncirculated.

Table 1 capacities are based on a horizontal tank heater, which is heating the tank water, with the unit located along the lower portion of the tank (Reference Typical Installations). Furthermore, there are two capacities shown for each set of conditions of water temperature and steam pressure. The capacities in "Black" are GPH/Sq. Ft. for an uncirculated (Stagnant) tank. The capacities in "Red" are GPH/Sq. Ft. for a circulated tank having the cold water inlet directed across the tube bundle or heat transfer surface.

### 1. Selection Procedure

### Example

Size tank heater unit capable of heating 1000 GPH from 40°F to 160°F with 20 PSIG saturated steam.

### Solution

Step 1 – Determine wether tank is circulated or uncirculated.

Step 2 – Refer to Table 1 Capacity. Based on water temperature and steam pressure, obtain capacity, 42.1 for circulated and (28.4) for uncirculated tank.

Step 3 – $\frac{1000 \text{ GPH}}{42.1 \text{ GPH/Sq. Ft.}}$ or $\frac{1000 \text{ GPH}}{28.4 \text{ GPH/Sq. Ft.}}$

= 23.7 or (35.2)

(Required clean tube heating surface)

**Note:** A DTCS Diamondback™ double wall unit may be selcted by multiplying capacity in Step 3 by 1.05 (for uncirculated tank) or 1.17 (for circulated tank).

Step 4 – Select a tank heater from Table 4 – Dimensions – with required heating surface available, TCS-666 or (TSC-696).

Allowance for fouling can be made by either increasing length of unit or by selecting a unit in the next larger diameter.

# RATINGS . . . B & G TANK HEATERS (UNCIRCULATED TANK)

Capacities of B & G Tank Heaters in table below are in GPH (gallons per hr.) when installed in steel tanks.

## TABLE 2 – TYPE TCW (¾" O. D. COPPER TUBES) HEATING WATER 40°-140°F

| | BOILER WATER IN TUBES | | | |
|---|---|---|---|---|
| HEATER NO. | 180° PUMPED | MIN** B. W. REQ'D. | 212° PUMPED | MIN.** B. W. REQ'D. |
| TCW-412 | 12 | 1 | 25 | 2 |
| TCW-418 | 23 | 2 | 50 | 5 |
| TCW-424 | 38 | 3 | 77 | 7 |
| TCW-430 | 53 | 5 | 103 | 9 |
| TCW-436 | 70 | 6 | 130 | 11 |
| TCW-442 | 86 | 7 | 159 | 14 |
| TCW-448 | 104 | 9 | 187 | 16 |
| TCW-454 | 122 | 10 | 216 | 19 |
| TCW-460 | 138 | 12 | 243 | 21 |
| TCW-466 | 156 | 14 | 272 | 23 |
| TCW-472 | 173 | 15 | 301 | 26 |
| TCW-484 | 209 | 18 | 359 | 31 |
| TCW-496 | 244 | 21 | 409 | 35 |
| TCW-612 | 19 | 3 | 32 | 3 |
| TCW-618 | 34 | 3 | 79 | 7 |
| TCW-624 | 64 | 6 | 132 | 12 |
| TCW-630 | 94 | 8 | 184 | 16 |
| TCW-636 | 127 | 11 | 240 | 21 |
| TCW-642 | 160 | 14 | 294 | 25 |
| TCW-648 | 194 | 17 | 351 | 30 |
| TCW-654 | 228 | 20 | 407 | 35 |
| TCW-660 | 263 | 23 | 464 | 40 |
| TCW-666 | 297 | 26 | 520 | 45 |
| TCW-672 | 332 | 29 | 578 | 50 |
| TCW-684 | 402 | 34 | 692 | 60 |
| TCW-696 | 473 | 40 | 806 | 69 |
| TCW-818 | 71 | 6 | 161 | 14 |
| TCW-824 | 121 | 11 | 249 | 22 |
| TCW-830 | 175 | 15 | 341 | 30 |
| TCW-836 | 230 | 20 | 434 | 37 |
| TCW-842 | 286 | 25 | 528 | 45 |
| TCW-848 | 358 | 31 | 647 | 56 |
| TCW-854 | 423 | 36 | 754 | 65 |
| TCW-860 | 489 | 42 | 863 | 74 |
| TCW-866 | 548 | 47 | 960 | 82 |
| TCW-872 | 607 | 52 | 1056 | 91 |
| TCW-884 | 742 | 63 | 1274 | 109 |
| TCW-896 | 876 | 75 | 1493 | 128 |
| TCW-1024 | 224 | 19 | 456 | 39 |
| TCW-1030 | 325 | 28 | 628 | 54 |
| TCW-1036 | 429 | 37 | 803 | 69 |
| TCW-1042 | 536 | 46 | 981 | 84 |
| TCW-1048 | 629 | 54 | 1134 | 97 |
| TCW-1054 | 738 | 63 | 1314 | 113 |
| TCW-1060 | 848 | 72 | 1495 | 128 |
| TCW-1066 | 959 | 82 | 1676 | 144 |
| TCW-1072 | 1070 | 91 | 1858 | 159 |
| TCW-1084 | 1293 | 110 | 2222 | 190 |
| TCW-1096 | 1518 | 129 | 2588 | 222 |
| TCW-10108 | 1745 | 148 | 2957 | 253 |
| TCW-1236 | 625 | 53 | 1167 | 100 |
| TCW-1242 | 780 | 67 | 1428 | 122 |
| TCW-1248 | 938 | 80 | 1690 | 145 |
| TCW-1254 | 1098 | 93 | 1952 | 167 |
| TCW-1260 | 1245 | 106 | 2193 | 188 |
| TCW-1266 | 1407 | 120 | 2460 | 211 |
| TCW-1272 | 1570 | 133 | 2724 | 233 |
| TCW-1278 | 1734 | 147 | 2990 | 256 |
| TCW-1284 | 1883 | 160 | 3238 | 277 |
| TCW-1296 | 2214 | 188 | 3770 | 323* |
| TCW-12108 | 2546 | 216 | 4310 | 369* |
| TCW-12120 | 2862 | 243 | 4832 | 413* |
| TCW-1436 | 891 | 76 | 1658 | 142 |
| TCW-1442 | 1119 | 95 | 2038 | 175 |
| TCW-1448 | 1320 | 112 | 2370 | 203 |
| TCW-1454 | 1539 | 131 | 2732 | 234 |
| TCW-1460 | 1759 | 150 | 3091 | 265 |
| TCW-1466 | 1980 | 168 | 3455 | 296 |
| TCW-1472 | 2188 | 186 | 3794 | 325 |
| TCW-1478 | 2415 | 205 | 4160 | 356 |
| TCW-1484 | 2622 | 223 | 4495 | 385 |
| TCW-1496 | 3072 | 261 | 5230 | 448 |
| TCW-14108 | 3508 | 298 | 5940 | 508 |
| TCW-14120 | 3948 | 335 | 6650 | 569 |

**MAXIMUM BOILER WATER CAPACITIES**

**Pumped Circulation in TCW Unit**

| Heater Diameter | Boiler Water In Tubes |
|---|---|
| 4" | 51 GPM |
| 6" | 102 GPM |
| 8" | 187 GPM |
| 10" | 323 GPM |
| 12" | 467 GPM |
| 14" | 637 GPM |

**Note:** A DTCW Diamondback™ double wall unit for uncirculated tank conditions may be selected by dividing GPH (Gallons Per Hr.) by 1.10.

Pressure drop through all TCW heaters at maximum flow is approximately .55 ft. for each foot of free tube length.

*Require Fabricated Steel Heads at additional cost. Consult Factory for Dimensions.

**Minimum Boiler Water (BW) required is given in GPM (gallons per minute) based on an approximate 20° drop. Size piping and select B&G Circulating Pump for not less than capacity shown.

Allowance for fouling can be made by either increasing length of unit or by selecting a unit in the next larger diameter.

# RATINGS . . . B & G TANK HEATERS (CIRCULATED TANK)

Capacities of B & G Tank Heaters in table below are in GPH (gallons per hr.) when installed in steel tanks.

## TABLE 3 – TYPE TCW (¾" O. D. COPPER TUBES) HEATING WATER 40 °-140°F

| | BOILER WATER IN TUBES | | | |
|---|---|---|---|---|
| HEATER NO. | 180° PUMPED | MIN** B. W. REQ'D. | 212° PUMPED | MIN.** B. W. REQ'D. |
| TCW-412 | 15 | 1 | 44 | 4 |
| TCW-418 | 41 | 4 | 92 | 8 |
| TCW-424 | 71 | 6 | 143 | 12 |
| TCW-430 | 100 | 9 | 190 | 16 |
| TCW-436 | 133 | 12 | 243 | 21 |
| TCW-442 | 166 | 14 | 296 | 25 |
| TCW-448 | 200 | 17 | 350 | 30 |
| TCW-454 | 234 | 20 | 403 | 35 |
| TCW-460 | 265 | 23 | 452 | 39* |
| TCW-466 | 298 | 26 | 506 | 43* |
| TCW-472 | 334 | 28 | 561 | 48* |
| TCW-484 | 402 | 34 | 596 | 51* |
| TCW-496 | 469 | 40* | — | — |
| TCW-612 | 37 | 5 | 77 | 9 |
| TCW-618 | 85 | 10 | 155 | 15 |
| TCW-624 | 151 | 17 | 243 | 21 |
| TCW-630 | 200 | 20 | 342 | 30 |
| TCW-636 | 240 | 21 | 446 | 39 |
| TCW-642 | 304 | 26 | 548 | 47 |
| TCW-648 | 371 | 32 | 665 | 56 |
| TCW-654 | 436 | 37 | 758 | 65 |
| TCW-660 | 505 | 43 | 865 | 74 |
| TCW-666 | 570 | 49 | 967 | 83* |
| TCW-672 | 639 | 54 | 1075 | 92* |
| TCW-684 | 776 | 66 | 1259 | 98* |
| TCW-696 | 912 | 78* | — | — |
| TCW-818 | 198 | 26 | 315 | 30 |
| TCW-824 | 274 | 29 | 460 | 40 |
| TCW-830 | 356 | 34 | 632 | 54 |
| TCW-836 | 435 | 37 | 806 | 69 |
| TCW-842 | 544 | 46 | 981 | 84 |
| TCW-848 | 683 | 58 | 1202 | 103 |
| TCW-854 | 810 | 69 | 1406 | 121 |
| TCW-860 | 940 | 80 | 1608 | 138 |
| TCW-866 | 1052 | 89 | 1790 | 154 |
| TCW-872 | 1168 | 99 | 1965 | 168 |
| TCW-884 | 1430 | 121 | 2295 | 171 |
| TCW-896 | 1692 | 144 | — | — |
| TCW-1024 | 479 | 48 | 842 | 72 |
| TCW-1030 | 635 | 57 | 1165 | 100 |
| TCW-1036 | 813 | 69 | 1490 | 128 |
| TCW-1042 | 1020 | 87 | 1825 | 156 |
| TCW-1048 | 1200 | 102 | 2110 | 181 |
| TCW-1054 | 1414 | 120 | 2445 | 209 |
| TCW-1060 | 1625 | 138 | 2781 | 238 |
| TCW-1066 | 1844 | 157 | 3120 | 267 |
| TCW-1072 | 2060 | 175 | 3465 | 297 |
| TCW-1084 | 2490 | 211 | 4043 | 315* |
| TCW-1096 | 2930 | 249 | — | — |
| TCW-10108 | 3370 | 286 | — | — |
| TCW-1236 | 1180 | 100 | 2170 | 186 |
| TCW-1242 | 1484 | 126 | 2650 | 227 |
| TCW-1248 | 1790 | 152 | 3147 | 269 |
| TCW-1254 | 2107 | 179 | 3625 | 310 |
| TCW-1260 | 2385 | 203 | 4080 | 349* |
| TCW-1266 | 2705 | 230 | 4580 | 392* |
| TCW-1272 | 3020 | 256 | 5010 | 408* |
| TCW-1278 | 3340 | 284 | 5440 | 423* |
| TCW-1284 | 3630 | 308 | 5890 | 458* |
| TCW-1296 | 4270 | 362* | — | — |
| TCW-12108 | 4910 | 417* | — | — |
| TCW-12120 | 5505 | 467* | — | — |
| TCW-1436 | 1689 | 144 | 3078 | 264 |
| TCW-1442 | 2131 | 181 | 3790 | 324 |
| TCW-1448 | 2525 | 214 | 4410 | 377 |
| TCW-1454 | 2950 | 251 | 5085 | 435 |
| TCW-1460 | 3376 | 287 | 5750 | 492 |
| TCW-1466 | 3805 | 323 | 6430 | 550 |
| TCW-1472 | 4215 | 358 | 7060 | 604 |
| TCW-1478 | 4645 | 394 | 7655 | 624 |
| TCW-1484 | 5050 | 429 | 8180 | 636 |
| TCW-1496 | 5930 | 503 | — | — |
| TCW-14108 | 6780 | 575 | — | — |
| TCW-14120 | 7500 | 606 | — | — |

**MAXIMUM BOILER WATER CAPACITIES**

**Pumped Circulation in TCW Unit**

| Heater Diameter | Boiler Water In Tubes |
|---|---|
| 4" | 51 GPM |
| 6" | 102 GPM |
| 8" | 187 GPM |
| 10" | 323 GPM |
| 12" | 467 GPM |
| 14" | 637 GPM |

**Note:** A DTCW Diamondback™ double wall unit for circulated tank conditions may be selected by dividing GPH (Gallons Per Hr.) by 1.20.

Pressure drop through all TCW heaters at maximum flow is approximately .55 ft. for each foot of free tube length.

*Require Fabricated Steel Heads at additional cost. Consult Factory for Dimensions.

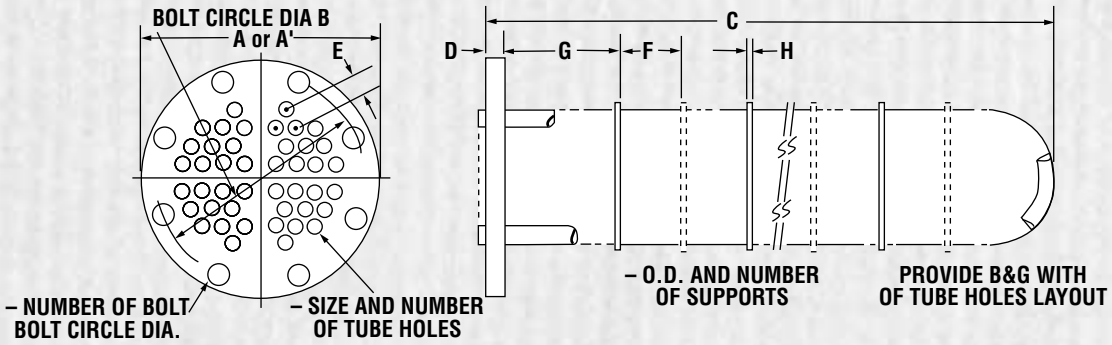
**Minimum Boiler Water (BW) required is given in GPM (gallons per minute) based on an approximate 20° drop. Size piping and select B&G Circulating Pump for not less than capacity shown.

Allowance for fouling can be made by either increasing length of unit or by selecting a unit in the next larger diameter.

# TUBE BUNDLE REPLACEMENT

Bell & Gossett will manufacture a replacement tube bundle assembly for a tank heater of another manufacturer's design at the maximum allowable pressure and temperature based on the data given below. The tubesheet will be of conventional design and the tube supports will be spaced as per B&G standard unless otherwise indicated.

The tube bundle will be constructed according to ASME requirements for the pressures and temperatures given below. The ASME "U" symbol will be stamped on each tube bundle.




Manufacturer of existing unit _____

Model No. _____ Design Pressure & Temperature _____

A. Diameter of Tubesheet Full Tubesheet (A') _____ O.D. or

Conventional Tubesheet (A) _____ O.D.

B. If full Tubesheet Design, Diameter of bolt hole circle (B) _____

Number of bolt holes _____ . Diameter of bolt holes _____ .
Do bolt holes straddle centerline as indicated in above bundle drawing?

Yes/No. If No, describe _____

C. Diameter of Collar _____ O.D. and _____ I.D. (include thickness of collar lining, if any).

D. Length of Tube Bundle (C) _____ Actual? _____ Approx.? _____

Length or diameter of tank _____ .

E. Thickness of Tubesheet (D) _____ . Material _____ .

F. Tube O.D _____ . Material _____ , Gauge _____ BWG

or Wall Thickness _____ .

G. Number of Tubeholes in Tubesheet _____ . Tube Pitch (E) _____ .

Tube Layout Triangular/Square. (Triangular indicated in above bundle drawing).

H. Tube Support Spacing (F) _____ . Distance to first tube support (G) _____

Tube Support material _____ . Diameter _____ Thickness (H) _____

Total number of tube supports _____ .

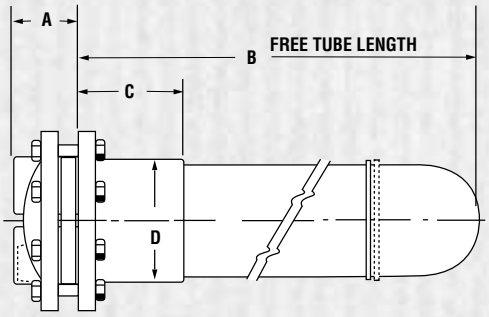
Note: Bell & Gossett will attempt to duplicate the dimensions above in the manufacturing of the tank heater replacement tube bundle. Since the standards, tolerances, and material thicknesses of Bell & Gossett may be different in comparison to other manufacturers, variations to the above dimensional data may occur.

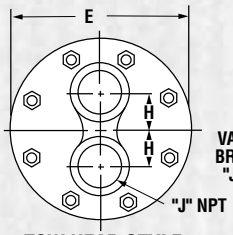
# DIMENSIONS (in inches)

NOTE:

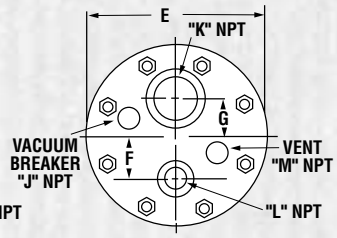
**TCW & TCS**

**Indicates ¾" OD Copper Tubes**




TCW HEAD STYLE FOR BOILER WATER IN TUBES




TCS OR TCY HEAD STYLE FOR STEAM IN TUBES

Please indicate head and tube style when ordering.

| HEATING SURFACE SQ. FT. | | A | | B | C | D | E | F | G | H | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HEATER NO.** | **TCW TCS** | **TCW** | **TCS** | **TCW TCS** | | | | | | | | | | | |
| TCW-TCS-412 | 2.1 | 2 1/8 | 2 1/8 | 11 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-418 | 3.3 | 2 1/8 | 2 1/8 | 17 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-424 | 4.5 | 2 1/8 | 2 1/8 | 23 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-430 | 5.6 | 2 1/8 | 2 1/8 | 29 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-436 | 6.8 | 2 1/8 | 2 1/8 | 35 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-442 | 8.0 | 2 1/8 | 2 1/8 | 41 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-448 | 9.2 | 2 1/8 | 2 1/8 | 47 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-454 | 10.4 | 2 1/8 | 2 1/8 | 53 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-460 | 11.5 | 2 1/8 | 2 1/8 | 59 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-466 | 12.7 | 2 1/8 | 2 1/8 | 65 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-472 | 13.9 | 2 1/8 | 2 1/8 | 71 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-484 | 16.3 | 2 1/8 | 2 1/8 | 83 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-496 | 18.6 | 2 1/8 | 2 1/8 | 95 1/4 | 6 1/8 | 4 1/2 | 7 1/4 | 1 11/16 | 1 5/16 | 1 5/16 | 1 1/2 | 1 1/4 | 3/4 | 1/2 | 1/4 |
| TCW-TCS-612 | 3.3 | 2 3/4 | 2 1/2 | 9 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-618 | 5.6 | 2 3/4 | 2 1/2 | 15 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-624 | 8.0 | 2 3/4 | 2 1/2 | 21 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-630 | 10.3 | 2 3/4 | 2 1/2 | 27 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-636 | 12.7 | 2 3/4 | 2 1/2 | 33 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-642 | 15.0 | 2 3/4 | 2 1/2 | 39 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-648 | 17.4 | 2 3/4 | 2 1/2 | 45 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-654 | 19.7 | 2 3/4 | 2 1/2 | 51 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-660 | 22.1 | 2 3/4 | 2 1/2 | 57 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-666 | 24.1 | 2 3/4 | 2 1/2 | 63 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-672 | 26.8 | 2 3/4 | 2 1/2 | 69 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-684 | 31.5 | 2 3/4 | 2 1/2 | 81 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-696 | 36.2 | 2 3/4 | 2 1/2 | 93 1/8 | 6 1/8 | 6 5/8 | 10 1/2 | 2 9/16 | 1 7/8 | 1 7/8 | 2 | 2 | 1 | 1/2 | 1/2 |
| TCW-TCS-818 | 11.0 | 3 3/8 | 3 3/8 | 16 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-824 | 15.0 | 3 3/8 | 3 3/8 | 22 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-830 | 19.0 | 3 3/8 | 3 3/8 | 28 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-836 | 23.0 | 3 3/8 | 3 3/8 | 34 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-842 | 27.0 | 3 3/8 | 3 3/8 | 40 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-848 | 32.0 | 3 3/8 | 3 3/8 | 46 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-854 | 36.5 | 3 3/8 | 3 3/8 | 52 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-860 | 41.0 | 3 3/8 | 3 3/8 | 58 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-866 | 45.0 | 3 3/8 | 3 3/8 | 64 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-872 | 49.0 | 3 3/8 | 3 3/8 | 70 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-884 | 58.0 | 3 3/8 | 3 3/8 | 82 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |
| TCW-TCS-896 | 67.0 | 3 3/8 | 3 3/8 | 94 1/4 | 8 | 8 5/8 | 12 1/2 | 3 3/8 | 2 1/4 | 2 1/2 | 3 | 3 | 1 1/4 | 1/2 | 1/2 |

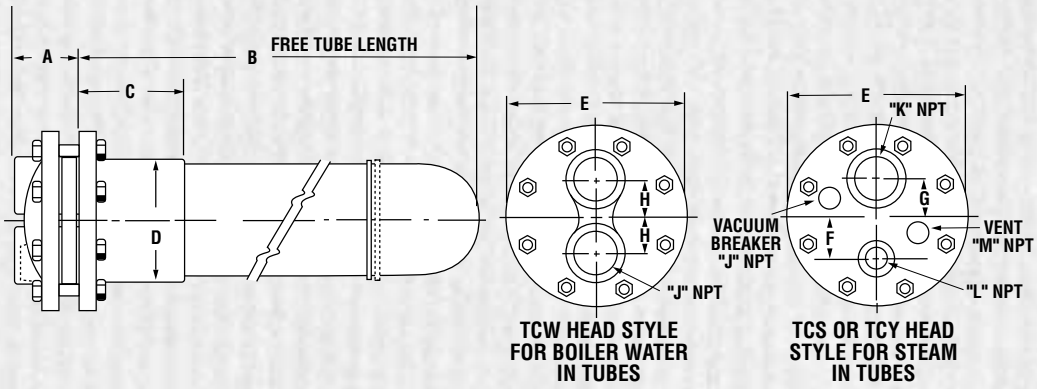
Dimensions are subject to change. If exact diemsnions are needed for layout, write for certified prints.

# DIMENSIONS (in inches) – continued

NOTE:

**TCW & TCS**

**Indicates ¾" OD Copper Tubes**




TCW HEAD STYLE FOR BOILER WATER IN TUBES

TCS OR TCY HEAD STYLE FOR STEAM IN TUBES

Please indicate head and tube style when ordering.

| HEATING SURFACE SQ. FT. | | A | | B | C | D | E | F | G | H | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HEATER NO.** | **TCW TCS** | **TCW** | **TCS** | **TCW TCS** | | | | | | | | | | | |
| TCW-TCS-1024 | 27 | 3 3/8 | 3 3/8 | 23 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1030 | 34.5 | 3 3/8 | 3 3/8 | 29 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1036 | 42 | 3 3/8 | 3 3/8 | 35 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1042 | 49.5 | 3 3/8 | 3 3/8 | 41 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1048 | 56 | 3 3/8 | 3 3/8 | 47 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1054 | 63.5 | 3 3/8 | 3 3/8 | 53 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1060 | 71 | 3 3/8 | 3 3/8 | 59 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1066 | 78.5 | 3 3/8 | 3 3/8 | 65 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1072 | 86 | 3 3/8 | 3 3/8 | 71 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1084 | 101 | 3 3/8 | 3 3/8 | 83 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1096 | 116 | 3 3/8 | 3 3/8 | 95 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-10108 | 131 | 3 3/8 | 3 3/8 | 107 3/8 | 8 1/4 | 10 3/4 | 14 5/8 | 4 1/16 | 2 13/16 | 2 15/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1236 | 61 | 3 7/8 | 5 1/8 | 36 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1242 | 72 | 3 7/8 | 5 1/8 | 42 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1248 | 83 | 3 7/8 | 5 1/8 | 48 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1254 | 94 | 3 7/8 | 5 1/8 | 54 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1260 | 104 | 3 7/8 | 5 1/8 | 60 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1266 | 115 | 3 7/8 | 5 1/8 | 66 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1272 | 126 | 3 7/8 | 5 1/8 | 72 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1278 | 137 | 3 7/8 | 5 1/8 | 78 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1284 | 147 | 3 7/8 | 5 1/8 | 84 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1296 | 169 | 3 7/8 | 5 1/8 | 96 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-12108 | 191 | 3 7/8 | 5 1/8 | 108 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-12120 | 212 | 3 7/8 | 5 1/8 | 120 1/4 | 10 1/4 | 12 3/4 | 16 5/8 | 5 1/16 | 3 11/16 | 3 11/16 | 4 | 4 | 2 | 3/4 | 3/4 |
| TCW-TCS-1436 | 86 | 6 3/8 | 6 3/8 | 37 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-1442 | 102 | 6 3/8 | 6 3/8 | 43 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-1448 | 116 | 6 3/8 | 6 3/8 | 49 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-1454 | 131 | 6 3/8 | 6 3/8 | 55 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-1460 | 146 | 6 3/8 | 6 3/8 | 61 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-1466 | 161 | 6 3/8 | 6 3/8 | 67 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-1472 | 175 | 6 3/8 | 6 3/8 | 73 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-1478 | 190 | 6 3/8 | 6 3/8 | 79 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-1484 | 204 | 6 3/8 | 6 3/8 | 85 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-1496 | 234 | 6 3/8 | 6 3/8 | 97 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-14108 | 263 | 6 3/8 | 6 3/8 | 109 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |
| TCW-TCS-14120 | 292 | 6 3/8 | 6 3/8 | 121 1/2 | 10 1/4 | 14 | 17 7/8 | 5 1/8 | 3 5/8 | 4 | 6 | 6 | 3 | 3/4 | 3/4 |

Dimensions are subject to change. If exact diemsnions are needed for layout, write for certified prints.

# HEAD AND PRESSURE EQUIVALENTS

## FEET HEAD OF WATER AND EQUIVALENT PRESSURES

| Feet Head | Pounds per Sq. In. | Feet Head | Pounds per Sq. In. | Feet Head | Pounds per Sq. In. | Feet Head | Pounds per Sq. In. |
|---|---|---|---|---|---|---|---|
| 1 | .43 | 30 | 12.99 | 140 | 60.63 | 300 | 129.93 |
| 2 | .87 | 40 | 17.32 | 150 | 64.96 | 325 | 140.75 |
| 3 | 1.30 | 50 | 21.65 | 160 | 69.29 | 350 | 151.58 |
| 4 | 1.73 | 60 | 25.99 | 170 | 73.63 | 400 | 173.24 |
| 5 | 2.17 | 70 | 30.32 | 180 | 77.96 | 500 | 216.55 |
| 6 | 2.60 | 80 | 34.65 | 190 | 82.29 | 600 | 259.85 |
| 7 | 3.03 | 90 | 38.98 | 200 | 86.62 | 700 | 303.16 |
| 8 | 3.46 | 100 | 43.31 | 225 | 97.45 | 800 | 346.47 |
| 9 | 3.90 | 110 | 47.64 | 250 | 108.27 | 900 | 389.78 |
| 10 | 4.33 | 120 | 51.97 | 275 | 119.10 | 1000 | 433.09 |
| 20 | 8.66 | 130 | 56.30 | ..... | ..... | ..... | ..... |

## PRESSURES AND EQUIVALENT FEET HEAD OF WATER

| Lbs. per Sq. In. | Feet Head | Lbs. per Sq. In. | Feet Head | Lbs. per Sq. In. | Feet Head | Lbs. per Sq. In. | Feet Head |
|---|---|---|---|---|---|---|---|
| 1 | 2.31 | 20 | 46.18 | 120 | 277.07 | 225 | 519.51 |
| 2 | 4.62 | 25 | 57.72 | 125 | 288.62 | 250 | 577.24 |
| 3 | 6.93 | 30 | 69.27 | 130 | 300.16 | 275 | 643.03 |
| 4 | 9.24 | 40 | 92.36 | 140 | 323.25 | 300 | 692.69 |
| 5 | 11.54 | 50 | 115.45 | 150 | 346.34 | 325 | 750.41 |
| 6 | 13.85 | 60 | 138.54 | 160 | 369.43 | 350 | 808.13 |
| 7 | 16.16 | 70 | 161.63 | 170 | 392.52 | 375 | 865.89 |
| 8 | 18.47 | 80 | 184.72 | 180 | 415.61 | 400 | 922.58 |
| 9 | 20.78 | 90 | 207.81 | 190 | 438.90 | 500 | 1154.48 |
| 10 | 23.09 | 100 | 230.90 | 200 | 461.78 | 1000 | 2309.00 |
| 15 | 34.63 | 110 | 253.98 | ..... | ..... | ..... | ..... |

# CONVERSION FACTORS

| TO CONVERT FROM | TO | MULTIPLY BY |
|---|---|---|
| | **Pressure** | |
| Atmospheres | ft. of water | 33.9 |
| Atmospheres | mm. of mercury | 760.0 |
| Atmospheres | pounds/sq. in. | 14.696 |
| Feet of water (40°F) | pounds/sq. in. | 0.4335 |
| Inches of mercury (32°F) | feet of water (40°F) | 1.133 |
| Inches of mercury (32°F) | pounds/sq. in. | 0.49116 |
| Inches of water (40°F) | pounds/sq. in. | 0.03614 |
| mm. of mercury (32°F) | pounds/sq. in. | 0.01934 |
| Pounds/sq. in. | feet of water (40°F) | 2.3066 |
| Pounds/sq. in. | inches of mercury (32°F) | 2.036 |
| | **Volume** | |
| Barrels (oil) | gallons | 42.0 |
| Barrels (breweries) | gallons | 31.0 |
| Cubic cm | cubic inches | 0.061023 |
| Cubic ft. | cubic inches | 1728.0 |
| Cubic ft. | cubic meters | 0.02832 |
| Cubic ft. | gallons | 7.481 |
| Cubic meters | gallons | 264.17 |
| Gallons | cubic ft. | 0.1337 |
| Gallons | cubic inches | 231.0 |
| Gallons | gallons (British) | 0.83268 |
| Gallons | liters | 3.7853 |
| Liters | gallons | 0.2642 |
| Liters | quarts | 1.0567 |
| | **Heat** | |
| Boiler horsepower (BHP) | BTU/hr | 33479.0 |
| BTU | calories (gram) | 252.0 |
| BTU | calories (kg) | 0.252 |
| Calories (gram)/gram/°C | BTU/pound/°F | 1.0 |
| Calories (gram) per gram | BTU/pound | 1.8 |
| Horsepower | BTU/hr | 2545.0 |
| K.W. hours | BTU | 3413.0 |

| TO CONVERT FROM | TO | MULTIPLY BY |
|---|---|---|
| | **Temperature** | |
| Centigrade degrees | Fahrenheit degrees | 1.8 and add 32° |
| Fahrenheit degrees. | Centigrade degrees | Subtract 32° and multiply by 0.5555 |
| | **Measure** | |
| Centimeters | inches | 0.3937 |
| Feet | meters | 0.3048 |
| Inches | centimeters | 2.54 |
| Kilometers. | miles | 0.6214 |
| Meters | feet | 3.2808 |
| Microns. | millimeters | 0.001 |
| Sq. meters | sq. feet | 10.764 |
| | **Weight** | |
| Cubic ft. of water (60°F) | pounds | 62.37 |
| Gallons | pounds of water (60°F) | 8.34 |
| Grains | pounds | 1/7000 |
| Grains/gal | parts per million | 17.12 |
| Grams | grains | 15.43 |
| Kilograms | pounds | 2.2046 |
| Pounds | grams | 453.59 |
| Tons (long) | tons (short) | 1.12 |
| | **Volumetric Rate** | |
| Cubic ft./sec. | gallons/min. | 448.83 |
| Gallons/min. | cu. ft./sec. | 0.00223 |
| | **Power** | |
| Horsepower | ft. lbs./sec. | 550.0 |
| Horsepower | K.W. | 0.745 |
| | **Viscosity** | |
| Centipoises | lbs.sec./ft. | 0.000672 |
| Poises | centipoises | 0.01 |
| | **Velocity** | |
| Ft./sec. | meters/sec. | 0.3048 |
| Meters/sec. | ft./sec. | 3.2808 |

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