



**BELLELI**  
ENERGY  
MANTOVA - ITALY

**HEAT EXCHANGER  
SPECIFICATION SHEET**

**DT-1119-04-001**

Rev.: 4

Sheet 1/1

|                     |                                      |            |              |                    |                                    |
|---------------------|--------------------------------------|------------|--------------|--------------------|------------------------------------|
| 1 Customer          | W.R.J.V.                             |            | Issued:      | AS BUILT           |                                    |
| 2 Address           |                                      |            | Purch. Order | 63-5310-06         |                                    |
| 3 Plant Location    | EDMONTON, ALBERTA (CANADA)           |            | Date         | 4/23/2003          |                                    |
| 4 Service of Unit   | HHPS VAPOR - STRIPPER FEED EXCHANGER |            | Item No.     | 63E-11/A/B/C/D     |                                    |
| 5 Size              | 49 x 168 inch                        | Type       | DEU Horiz.   | Units Req.d        | 1 Connected in 2 Parallel 2 Series |
| 6 Surf./Unit (Eff.) | 12635.40 (1) ft <sup>2</sup>         | Shell/Unit | 4            | Surf./Shell (Eff.) | 3158.85 (1) ft <sup>2</sup>        |

**PERFORMANCE OF ONE UNIT**

|                                     |                                  | Shell Side    |           |                 |           | Tube Side                         |           |        |           |
|-------------------------------------|----------------------------------|---------------|-----------|-----------------|-----------|-----------------------------------|-----------|--------|-----------|
|                                     |                                  | STRIPPER FEED |           |                 |           | HHPS VAPOR                        |           |        |           |
| 8 Fluid Allocation                  |                                  |               |           |                 |           |                                   |           |        |           |
| 9 Fluid Name                        |                                  |               |           |                 |           |                                   |           |        |           |
| 10 Fluid Quantity, Total            | lb/hr                            | 552709        |           |                 |           | 914874                            |           |        |           |
| 11 Vapor (In/Out)                   | lb/hr                            | 405           |           | 154880          |           | 684340                            |           | 514203 |           |
| 12 Liquid                           | lb/hr                            | 552205        |           | 397572          |           | 1620                              |           | 172254 |           |
| 13 Steam                            | lb/hr                            | 6             |           | 98              |           | 2123                              |           | 2103   |           |
| 14 Water                            | lb/hr                            |               |           |                 |           |                                   |           |        |           |
| 15 Noncondensable                   | lb/hr                            | 93            |           | 159             |           | 226791                            |           | 226314 |           |
| 16 Temperature (In/Out)             | °F                               | 104           |           | 475             |           | 535                               |           | 432    |           |
| 17 Density                          | lb/ft <sup>3</sup>               | 0.273         | V/L 47.2  | 1.629           | V/L 37.2  | 1.447                             | V/L 36.2  | 1.313  | V/L 38.2  |
| 18 Viscosity                        | cP                               | 0.011         | V/L 0.678 | 0.012           | V/L 0.189 | 0.018                             | V/L 0.212 | 0.016  | V/L 0.221 |
| 19 Molecular Weight, Vapor          |                                  | 9.6           |           | 90.9            |           | 8.2                               |           | 6.8    |           |
| 20 Molecular Weight, Noncondensable |                                  |               |           |                 |           |                                   |           |        |           |
| 21 Specific Heat                    | Btu/lb-°F                        | 0.888         | V/L 0.457 | 0.593           | V/L 0.685 | 1.232                             | V/L 0.692 | 1.348  | V/L 0.640 |
| 22 Thermal Conductivity             | Btu/hr-ft-°F                     | 0.061         | V/L 0.073 | 0.022           | V/L 0.056 | 0.125                             | V/L 0.053 | 0.120  | V/L 0.058 |
| 23 Latent Heat                      | Btu/lb@°F                        |               |           |                 |           |                                   |           |        |           |
| 24 Inlet Pressure                   | psig                             |               |           | 181.5           |           |                                   |           | 1956.2 |           |
| 25 Velocity                         | ft/sec                           |               |           | 6.54            |           |                                   |           | 51.58  |           |
| 26 Pressure Drop, Allow/Calc        | psi                              | 15            |           | 8.23            |           | 20                                |           | 16.45  |           |
| 27 Fouling Resistance (min)         | ft <sup>2</sup> -hr-°F/Btu       |               |           | 0.002           |           |                                   |           | 0.002  |           |
| 28 Heat Exchanged                   | 132520000 Btu/hr                 |               |           | MTD (Corrected) |           | 121.2 °F                          |           |        |           |
| 29 Transfer Rate, Service           | 86.53 Btu/ft <sup>2</sup> -hr-°F |               |           | Clean           |           | 140.66 Btu/ft <sup>2</sup> -hr-°F |           |        |           |

**CONSTRUCTION OF ONE SHELL**

|                             |              | Shell Side         |  | Tube Side          |  |
|-----------------------------|--------------|--------------------|--|--------------------|--|
| 31                          |              |                    |  |                    |  |
| 32 Design / Vacuum Pressure | psig         | 1635 / FV @ 105 °F |  | 2125 / FV @ 350 °F |  |
| 33 Design Temp. (Max/Min)   | °F           | 600 / -20          |  | 700 / -20          |  |
| 34 No Passes per Shell      |              | 1                  |  | 2                  |  |
| 35 Corrosion Allowance      | inch         | 0.125              |  | 0.125              |  |
| 36 Connections              | In           | 6" - 900# WNRF     |  | 18" - 1500# WNRF   |  |
| 37 Size & Rating            | Out          | 12" - 900# WNRF    |  | 18" - 1500# WNRF   |  |
|                             | Intermediate | 10" - 900# WNRF    |  | 18" - 1500# WNRF   |  |

Sketch (Bundle/Nozzle Orientation)

|                            |  |                    |                             |   |             |
|----------------------------|--|--------------------|-----------------------------|---|-------------|
| 39 Tube No. 459 U          | O.D. 1.00 in   | Thk. 0.083 in      | M.W. Length 14 ft           | Pitch 1.25 inch   | Layout 90°  |
| 40 Tube type               | PLAIN  |                    | Material                    | SA 268 Tp. 405  |             |
| 41 Shell                   | I.D. 49 inch   | O.D. 53 17/64 inch | Shell Head                  | SA 387 Gr.11 Cl.2 (Hemispherical)   |             |
| 42                         | material: SA 387 Gr.11 Cl.2                            |                    | Channel Cover (5)           | SA 336 Gr.F22 Cl.3  |             |
| 43 Channel or Bonnet(5)    | SA 336 Gr.F22 Cl.3 + S.S. Tp. 347 W.O.                 |                    | Tubesheet-Stationary        | SA 336 Gr.F22 Cl.3 + INCONEL 625 W.O. (CHANNEL SIDE OF BOTH 11A and 11B)) |             |
| 44 Tubesheet-Stationary    |  |                    | Impingement Protector(Rods) | SA 479 Tp. 405  |             |
| 45 Floating Head Cover     |  |                    | Seal Type                   |   |             |
| 46 Baffles-Cross           | SA 240 Tp. 405   | Type: HORIZ. SEGM. | %Cut (Diam): 28.1           | Spacing: c/c 11.6   | Inlet: inch |
| 47 Baffles-Long            |  |                    |                             |   |             |
| 48 Supports-Tube           | S.S. Tp. 405   | Type               | U-BEND SUPPORT              |   |             |
| 49 Bypass Seal Arrangement |  |                    | Tube-Tubesheet Joint        | 2 GROOVES, EXPAND & WELDED (2)  |             |
| 50 Expansion Joint         |  |                    | Type                        |   |             |
| 51 Rho-V2-Inlet Nozzle     | 1854 / 503 lb/ft-sec <sup>2</sup>                      | Shell Entrance     | lb/ft-sec <sup>2</sup>      | Shell Exit 512 / 209 lb/ft-sec <sup>2</sup>                               |             |
| 52 Gaskets-Shell Side      | SPIRAL WOUND S.S. Tp. 321 with INNER RING S.S. Tp. 321 |                    | Tube Side                   | SPIRAL WOUND S.S. Tp. 321 with INNER RING S.S. Tp. 321                    |             |
| 53 -Floating Head          |  |                    |                             |   |             |

|  |                        |                               |
|--|------------------------|-------------------------------|
| 54 Code Requirements                   | ASME SECT. VIII DIV. 1 | TEMA Class "R"                |
| 55 Weight (11A/11B) Empty:             | 91510 / 91280          | Full of Water 106500 / 106280 |
| 56 Tube Bundle (integral with channel) | 60200 / 60200 lb       |                               |

- 57 Remarks:
- 58 (1) U-BEND SURFACE NOT CONSIDERED EFFECTIVE FOR HEAT TRANSFER
  - 59 (2) TUBE ENDS SHALL BE STRENGTH WELDED
  - 60 (3) MAWP SHELL SIDE OF 1656 psi
  - 61 (4) MAXIMUM EXTERNAL DESIGN PRESSURE OF 1098 psi FOR TUBES
  - 62 (5) CHANNEL, TUBESHEET AND CHANNEL COVER FOR 11B IS SA 336 Gr F11 CL3, NO WELD OVERLAY ON CHANNEL