

CLIENT DELTA 1  
P.O. NO.: PO-ENER-MME-2024-100-002  
PROJECT: BOC  
JOB NO.: MPE-007  
SERVICE: PROPANE REFERIGERATION PACKAGE

| NO. | BY  | APP | DATE     | DESCRIPTION  |
|-----|-----|-----|----------|--------------|
| 0   | SES | IES | 05/28/24 | FOR APPROVAL |
| 1   | DGJ | IES | 07/03/24 | FOR APPROVAL |

| GENERAL              | 1  |  | Tag No.  | LCV-0001A/B   |
|----------------------|----|--|--|---|
|                      | 2  |  | Qty  | 2   |
|                      | 3  |  | Service / Line Size-Schedule   | CHILLER EXPANSION LINE / 1.5"-SCH80 Inlet / 4"-SCH40 Outlet |
|                      | 4  |  | Line No. / Vessel No.  | TBA / CHILLER   |
|                      | 5  |  | Function   | LEVEL CONTROL VALVE EXPANSION TYPE                          |
| BODY                 | 6  |  | Type of Body   | UN-BALANCED PLUG  |
|                      | 7  |  | Body Size / Port Size / Travel   | 1" / 1" 25.40 mm / 3/4" 19.0 mm                             |
|                      | 8  |  | Guiding / No. of Ports   | STEM GUIDED WITH CONTOUR PLUG / 1                           |
|                      | 9  |  | End Conn. & Rating   | 300# ANSI R.F. FLANGE                                       |
|                      | 10 |  | Body Material / Bolt-Nut   | LOW TEMP SA350-LF2 / SA320-L7M / SA194-7M                   |
|                      | 11 |  | Packing Type / Material  | V-RING / PTFE   |
|                      | 12 |  | Lubricator / Isolating Valve   | ----  |
|                      | 13 |  | Bonnet Type  | LOW TEMP SA352-LCB/LCC/GRAPHITE/316 SST GASKET              |
|                      | 14 |  | Trim Characteristic  | REDUCED TRIM, LINEAR TRIM, UN-BALANCED, & PLUG DOWN         |
|                      | 15 |  | Trim Material : Seat/Plug Stem   | 316 SST / 316 SST HD<br>316 SST                             |
|                      | 16 |  | Required Seat Tightness  | ANSI / FCI 70-2-1991 CLASS IV                               |
|                      | 17 |  | Maximum Allow. Sound Level   | 82 dbA @ 3 ft   |
|                      | 18 |  | Flow Direction (FTO or FTC)  | FLOW TO OPEN  |
| ACTUATOR             | 19 |  | MFR / Model No. / Size (NOTE 14 & 17)  | VSI / PISTON L-Act / 50                                     |
|                      | 20 |  | Type of Actuator / Service   | SPRING OPPOSED DIAPHRAGM / DIRECT ACTING (AIR-TO-OPEN)      |
|                      | 21 |  | Close at / Open at   | 6 PSIG / 30 PSIG 0.41 / 2.07 BarG                           |
|                      | 22 |  | Flow Action to / Direction   | OPEN / UP   |
|                      | 23 |  | Fail Position  | CLOSE (PLUG DOWN) (AIR-TO-OPEN; FAIL-TO-CLOSE)              |
|                      | 24 |  | Air Supply Pressure Nor /Max (NOTE 16)   | 101.5 PSIG / 108.75 PSIG 7.00 / 7.50 BarG                   |
|                      | 25 |  | Handwheel / Location   | NONE / ---  |
| POSITIONER           | 26 |  | MFR / Model No. (NOTE 10)  | ROTORK / 4-20 Ma HART YT-3300                               |
|                      | 27 |  | Filter Reg. / Gauges / Bypass (NOTE 21)  | REQ'D SITECNA FR304 / REQ'D / NOT REQ'D                     |
|                      | 28 |  | Input Signal   | 4-20 mA HART  |
|                      | 29 |  | Output Signal  | 0 - 100 % LYI-TBA/LYI-TBA                                   |
|                      | 30 |  | Action (NOTE 14)   | DIRECT ACTING   |
| TRANSDUCER (AIR SET) | 31 |  | Make / Model No. / Tag   | PART OF POSITIONER  |
|                      | 32 |  | Input / Output Signal  |   |
|                      | 33 |  | Filter Reg   |   |
|                      | 34 |  | Installation   |   |
|                      | 35 |  | Air Supply   |   |
| SOLENOID             | 36 |  | Assembly   | N/A   |
|                      | 37 |  | MFR / Mo   |   |
|                      | 38 |  | MYCOM  |   |
|                      | 39 |  | Tag Num  |   |
|                      | 40 |  | Assembly   |   |
| OPTIONS              | 41 |  | Flow Units   | LPM   |
|                      | 42 |  | Fluid  | 100% PROPYLENE LIQUID                                       |
|                      | 43 |  | Flashing has been occurred at control valve outlet, vapor fraction at outlet is 42.94% (based on MME PFD). | CALCULATED 33 GPM / 7,209.0 lb/h 3,273 kg/h / 1.48          |
|                      | 44 |  |  | (SELECTED) 29 GPM / 6,270.9 lb/h 2,847 kg/h / 1.27 / 9      |
|                      | 45 |  |  | TBA @ 100% FLOW 18.68 BarG 14.8 Bar                         |
|                      | 46 |  |  | 19 BarG 15.2 Bar  |
|                      | 47 |  |  | 22 BarG 3.86 BarG   |
|                      | 48 |  | Max. Inlet Shut Off / Discharge Pressure   | 57.0 °C / 56.0 °C   |
|                      | 49 |  | Temperature Max / Operating  |   |
|                      | 50 |  | Viscosity / Mol Wt.  | 0.437   |
|                      | 51 |  | Operating viscosity to be corrected to 0.059 cP (based on MME PFD).  | 0.069 cP / ---  |
|                      | 52 |  | Flash % Flash  | ---   |
|                      | 53 |  | % Solids   | ---   |
|                      | 54 |  | Vapor Pressure / Crit. Pressure  | BarG 18.7 / NOT AVAILABLE                                   |
|                      | 55 |  | Predicted Sound Level dbA  | 82 dbA @ 3 ft @ 1m NORMAL                                   |
|                      | 56 |  | Manufacturer   | VSI   |
|                      | 57 |  | Model No. (NOTE 2)   | 1" -300# ANSI RF / Globe / G-Stream                         |

Inlet pressure could not possible to equal vapor pressure. By considering liquid static head, inlet pressure could be higher (18.78 barg).

Flashing has been occurred at control valve outlet, vapor fraction at outlet is 42.94% (based on MME PFD).

Operating viscosity to be corrected to 0.059 cP (based on MME PFD).

Vapor pressure is 18.68 barg. In addition critical pressure to be specified.

TEMPERATURE: FV to 22.0 BarG @ 120 °C  
GASKETS & 2H NUTS, WETTED MATERIAL SHALL BE 316 STAINLESS STEEL

- 3 INSTRUMENT SHALL BE SUITABLE FOR OFF-SHORE SERVICE AND TROPICAL CLIMATE
- 4 MATERIAL TEST REPORT  REQUIRED  NOT REQUIRED WITH CHАРY IMPACT TEST PER ASME
- 5 MANUFACTURER CALCULATION / SIZING SHEET  REQUIRED  NOT REQUIRED
- 6 DIE- STAMPED STAINLESS STEEL NAMEPLATE  REQUIRED  NOT REQUIRED
- 7 CUSTOMER SPECIFICATION: N/A & N/A
- 8 HARD COPY OF IEC-79, EExi IIB-T5 CERTIFICATE
- 9 AREA CLASSIFICATION: IEC-79, ZONE 2, GROUP IIB, T3
- 10 DIGITAL VALVE POSITIONER USING HART PROTOCOL COMMUNICATION
- 11 ALL DOCUMENTS TO BE SUBMITTED IN BOTH HARD AND ELECTRONIC FORMAT
- 12 INDIVIDUAL PART WEIGHT MUST BE CERTIFIED
- 13 MATERIAL SHALL BE PER APPROVED BY CLIENT
- 14 DIRECT ACTING CONTROLLER BY PURCHASER. ACTUATOR SIGNAL PRESSURE DECREASE AS CONTROLLER OUTPUT DECREASES
- 15 INSTRUMENT MOUNTING HARDWARE, FASTENERS, LINKAGES & WINGES SHALL BE 316 SS
- 16 MIN AIR SUPPLY PRESSURE IS 4.5 barg
- 17 MECHANICAL SCALE INDICATOR / POINTER SHALL BE SUPPLIED
- 18 PNEUMATIC TUBING SHALL BE 316 STAINLESS STEEL
- 19 PAINTING SHALL BE HIGH BUILT, HIGH TEMP EPOXY FOR ONSHORE SERVICE
- 20 ELECTRICAL CONNECTION:M20
- 21 REGULATOR SET @ 2.75 barg

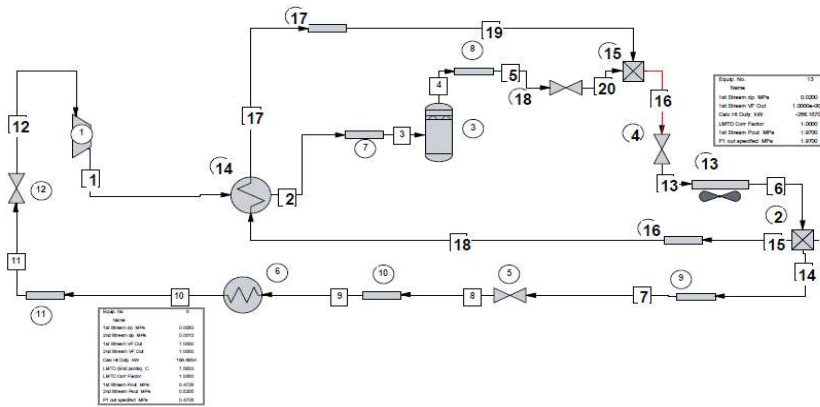
| LEVEL         |     |     |          | MME DOC.:    | MPE-007 | 20502 | A |
|---------------|-----|-----|----------|--------------|---------|-------|---|
| CONTROL VALVE |     |     |          | CLIENT DOC.: |         |       |   |
| NO.           | BY  | APP | DATE     | DESCRIPTION  |         |       |   |
| 0             | SES | IES | 05/28/24 | FOR APPROVAL |         |       |   |
| 1             | DGJ | IES | 07/03/24 | FOR APPROVAL |         |       |   |
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**A. SELECTED VALVE DATA**

**MAYEKAWA VALVE SIZING CALCULATION**

**HYSIS SIMULATION**



Stream No. 7

|                     |           |
|---------------------|-----------|
| Name                |           |
| - - Overall - -     |           |
| Molar flow kmol/h   | 64.5523   |
| Mass flow kg/h      | 2846.5000 |
| Temp C              | 56.3228   |
| Pres MPa            | 1.9682    |
| Vapor mole fraction | 0.0000    |
| Enth kW             | -2089.8   |
| Tc C                | 96.6700   |
| Pc MPa              | 4.2496    |
| Std. sp gr. wtr = 1 | 0.508     |
| Std. sp gr. air = 1 | 1.523     |
| Degree API          | 147.2079  |
| Average mol wt      | 44.0960   |
| Actual dens kg/m3   | 436.7512  |
| Actual vol m3/h     | 6.5174    |
| Std liq m3/h        | 5.6067    |
| Std vap 0 C m3/h    | 1446.8534 |
| - - Vapor only - -  |           |
| Molar flow kmol/h   | 64.5523   |
| Mass flow kg/h      | 2846.5000 |
| Average mol wt      | 44.0960   |
| Actual dens kg/m3   | 436.7512  |
| Actual vol m3/h     | 6.5174    |
| Std liq m3/h        | 5.6067    |
| Std vap 0 C m3/h    | 1446.8534 |
| Cp kJ/kg-K          | 3.5933    |
| Z factor            | 0.0730    |
| Visc cP             | 0.06919   |
| Th cond Btu/hr-ft-F | 0.0439    |
| - - Liquid only - - |           |
| Molar flow kmol/h   | 64.5523   |
| Mass flow kg/h      | 2846.5000 |
| Average mol wt      | 44.0960   |
| Actual dens kg/m3   | 436.7512  |
| Actual vol m3/h     | 6.5174    |
| Std liq m3/h        | 5.6067    |
| Std vap 0 C m3/h    | 1446.8534 |
| Cp kJ/kg-K          | 3.5933    |
| Z factor            | 0.0730    |
| Visc cP             | 0.06919   |
| Th cond Btu/hr-ft-F | 0.0439    |
| Surf. tens. dyne/cm | 3.5382    |

**HYSIS SIZING**

Control Valve Sizing for Stream # 7

**Loadings and Properties**

|                           | Vapor          | Liquid         |
|---------------------------|----------------|----------------|
| Flow rate                 | 0.0000 kg/h    | 2846.5000 kg/h |
| Flow rate                 | 0.0000 m3/h    | 6.5174 m3/h    |
| Density                   | 0.0000 kg/m3   | 436.7512 kg/m3 |
| Total flow                | 2846.5000 kg/h |                |
| Upstream pressure         | 1.9682 MPa     |                |
| Downstream pressure       | 0.4860 MPa     |                |
| Critical flow factor      | 0.9800         |                |
| Corr. factor for reducers | 1.0000         |                |
| Static head               | 0.0000 mm      |                |
| Seat type                 | Single-Seat    |                |
| Flow type                 | Two phase flow |                |
| Calc. coefficient Cvc     | 1.6216         |                |
| Capacity coefficient Cv   | 9.0000         |                |
| Cvc / Cv ratio            | 0.1802         |                |
| Valve size                | 1.0000 in      |                |

**VENDOR RECOMMENDED VALVE SIZE 1"/ANSI/CL300 IS ACCEPTABLE.**