| | | | | |
|---|---|---|---|---|
| | **EQUIPMENT DATA SHEET**<br>**PRESSURE VESSEL**<br>**SOUR**<br>**SI UNITS** | DOC: DS116-A-C8000-1 | PAGE: 1 OF 3 | Rev |
| | | | RFQ/PO NO.: | 1 |
| | | | LOCATION: | |
| | | CLIENT PROJECT NO: 02-03887 | SERIAL: V-17090 | 1 |
| | | SERVICE: Aqueous Ammonia Bullet | TAG: 116C-8000 QTY: 1 | |
| | MANUFACTURER: Score / Vortex Production Services | MODEL: N/A | SIZE: 10' DIA X 35' S/S | |

APPLICABLE TO: ☐ PROPOSAL ☐ PURCHASE ☑ AS BUILT

## PROCESS DESIGN DATA

PROCESS FLUID: 29 wt.% Aqueous Ammonia c/w Nitrogen Blanket

☑ SWEET SERVICE ☐ SOUR SERVICE ☐ LETHAL

SPECIFIC GRAVITY: Vapour: Liquid: 0.9004 @ 15 C

| | | Min: | Normal: | Max: |
|---|---|---|---|---|
| OPERATING TEMPERATURE (°C): | | -45 | 15 | 35 |
| OPERATING PRESSURE (kPag): | | 35 | 40 | 50 |
| DESIGN FLOWRATE ($Se^3m^3/d$) | Nitrogen | 0.002 | 0.015 | 0.038 |
| ($Sm^3/d$) | Aqueous Ammonia | 2 | 11.14 | 24.5 |

## INSULATION

INSULATION TYPE: N/A

INSULATION RING: QTY: N/A SPACING: N/A

INSULATION THICKNESS: N/A

INSULATION SUPPORT CLIPS: N/A

CLADDING TYPE: N/A

CLADDING THICKNESS: N/A

## CODES AND SPECIFICATIONS

VESSEL DESIGN CODE: ASME BPVC SECTION VIII DIV 1 & CSA B51 (Note 1)

VESSEL DESIGN SPECIFICATION: (Note 1) ☑ U-STAMP REQ'D

## APPROXIMATE WEIGHTS

| | | | |
|---|---|---|---|
| WEIGHT OF INTERNALS (kg): | - | TOTAL WEIGHT (OPERATING) (kg): | 82,473 |
| DRY WEIGHT WITH MEDIA (kg): | 27,414 | TOTAL WEIGHT (TEST) (kg): | 113,371 |
| SKID (SHIPPING) WEIGHT (kg): | 27,414 | | |

## MATERIALS (Note 14)

| | |
|---|---|
| SHELL: | ASTM A516-70N |
| HEADS: | ASTM A516-70N |
| SKIRT: | N/A |
| PIPE: | ASTM A333 Gr 6 |
| EXTERNAL NOZZLES: | ASTM A333 Gr 6 |
| EXTERNAL FLANGES: | ASTM A350 LF2 Cl. 1 |
| WELDING FITTINGS: | ASTM A420-WPL-6 |
| EXTERNAL BOLTS: | ASTM A320 L7M |
| EXTERNAL NUTS: | ASTM A194 7M |
| SADDLES: | ASTM A516-70N |
| LIFTING LUGS: | ASTM A516-70N |
| INTERNALS: | ASTM A516-70N / 316L SS |
| GASKETS: | Fully Anealed 316 SS SPWD CG Flexitallic, c/w inner & outer ring |
| ANODES: | N/A |

## MECHANICAL DESIGN DATA

MINIMUM DESIGN METAL TEMPERATURE (°C): -45°C

MAXIMUM DESIGN TEMPERATURE (°C): 60°C

DESIGN PRESSURE (kPag): 1035 / Full Vacuum

HYDROTEST PRESSURE (kPag): 1345 (Note 3) 1

VESSEL ORIENTATION: Horizontal Location: Outdoors

SHELL DIAMETER (mm): ID: 3048 (10') OD: 3092 1

LENGTH - Seam-Seam (mm): 10,668 (35')

HEAD TYPE: 2:1 SE

CORROSION ALLOWANCE (mm): Shell: 3.2 (1/8")

CORROSION ALLOWANCE (mm): Head: 3.2 (1/8")

WALL THICKNESS (mm): Shell: 22.2 (7/8") Head: 20.3 (0.8") 1

JOINT EFFICIENCY (mm): Shell: 1 Head: 1

LIQUID VOLUME - GROSS ($m^3$): 86 1

RELIEF VALVE: Type: Conventional Setting: 1,035 kPag

SEISMIC LOADING: Sa(0.2)=0.12; Sa(0.5)=0.056; Sa(1.0)=0.023; Sa(2.0)=0.006

WIND LOADING: Note 5

TRANSPORT LOADING: Transportation by Others.

NOZZLE LOADS: Note 16

## FABRICATION AND INSPECTION REQUIREMENTS (Note 6)

INSPECTION AUTHORITY: ABSA

REGISTRATION: Y4618.2 / A668258 1

RADIOGRAPHY: Note 14 ULTRASONIC: Note 14 1

MAGNETIC PARTICLE: Note 14 DYE PENETRANT: N/A 1

HYDROTEST: Note 3 IMPACT TESTS: ASME Sec VIII Div 1

POSTWELD HEAT TREATMENT: Note 7 HARDNESS TEST: Note 14

SPECIAL HEAT TREATMENT: N/A HIC TEST: Not Required

## VESSEL ACCESSORIES (Note 17)

| | | | | |
|---|---|---|---|---|
| | | As per applicable Spec. | ☐ DOWN COMER | |
| ☐ | SKIRT | | ☐ MANWAY HINGE | |
| ☑ | LEGS/SADDLES | Y (NOTE 33) | ☑ PAINTERS TROLLEY | |
| ☐ | DEMISTER PAD | | ☐ PIPE COIL | |
| ☐ | DEMISTER PAD SUPPORT | | ☑ GROUND LUG | Y, TWO 1 |
| ☐ | PLATFORM CLIPS | | ☑ LIFTING LUGS | Y 1 |
| ☐ | PLATFORM | | ☑ MANWAY DAVIT | Y 1 |
| ☐ | WEIR PLATE | | ☐ TOP DAVIT | |
| ☐ | LADDER | | ☑ BLIND FLANGES | Spare/Manway Nozzles 1 |
| ☐ | SAFETY CAGE | | ☐ SPECTACLE BLINDS | |
| ☐ | DEFLECTOR | | ☐ SIGHT GLASS | |
| ☑ | SPARE GASKETS | Spare/Manway Nozzles | ☑ VORTEX BREAKER | Y |

## PAINTING AND COATING

| | PAINT/ COATING SYSTEM | SURFACE PREPARATION | PRIMER COAT | FINISH COAT | PRIMER DFT (micron) | FINISH DFT (micron) |
|---|---|---|---|---|---|---|
| INTERNAL LINING: | N/A | N/A | N/A | N/A | N/A | N/A |
| EXTERNAL FINISH | | | | | | |
| SHELL: | NC1 | SSPC-SP 10 | Carboguard 553 | Carbocrylic 3359 DTM | - | - |
| HEADS: | NC1 | SSPC-SP 10 | Carboguard 553 | Carbocrylic 3359 DTM | - | - |
| PIPING: | N/A | N/A | N/A | N/A | N/A | N/A |
| STRUCTURAL STEEL: | N/A | N/A | N/A | N/A | N/A | N/A |

REMARKS

* INDICATES INFORMATION TO BE COMPLETED BY VENDOR

A, B, C, ...: INDICATES A PRE-ORDER REVISION 0: INDICATES AN ORDER REVISION 1, 2, 3, ... : INDICATES A POST-ORDER REVISION

| REV | DATE | BY | CHECKED | MECH | PROCESS | ELECTRICAL | INST | APPROVED | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0A1 | 3-Feb-17 | RR | YM | RR | IJ | - | - | NL | ISSUED FOR QUOTE |
| 0A2 | 23-Feb-17 | RR | YM | RR | IJ | - | - | EC | ISSUED FOR PURCHASE |
| 1 | 15-Feb-18 | BC | YM | YM | IJ | - | - | NM | ISSUE FOR AS-BUILT |

| | | | | |
|---|---|---|---|---|
| EQUIPMENT DATA SHEET<br>PRESSURE VESSEL<br>SOUR<br>SI UNITS | DOC: DS116-A-C8000-1<br>EP PROJECT NO.:<br>CLIENT:<br>CLIENT PROJECT NO:<br>SERVICE: Aqueous Ammonia Bullet | PAGE: 2 OF 3<br>RFQ/PO NO.<br>LOCATION:<br>SERIAL: V-17090<br>TAG: 116C-8000 QTY: 1 | Rev<br>1<br><br>1 |
| MANUFACTURER: Score / Vortex Production Services | MODEL: N/A | SIZE: 10' DIA X 35' S/S | |

**MAJOR NOZZLE/CONNECTION SCHEDULE (NOTE 16, 17)**

| MARK | SERVICE | QTY | NPS | FACE | TYPE | RATING | OUTSIDE PROJECTION (mm) | REMARKS | |
|---|---|---|---|---|---|---|---|---|---|
| N1 | Inlet | 1 | 4 | RF | HB | 150# | 200 | | 1 |
| N2 | Outlet | 1 | 2 | RF | LWN | 150# | 200 | Flush; c/w Vortex Breaker | |
| N3 | Vapour Outlet | 1 | 2 | RF | LWN | 150# | 200 | | |
| N4 | Nitrogen Inlet | 1 | 2 | RF | LWN | 150# | 200 | | |
| N5 A/B | LIT | 2 | 3 | RF | LWN | 150# | 200 | | |
| N6 | PSV | 1 | 3 | RF | LWN | 150# | 200 | | |
| N7 | PIT | 1 | 2 | RF | LWN | 150# | 200 | | |
| N8 | PG | 1 | 2 | RF | LWN | 150# | 200 | | |
| N9 | Vent | 1 | 10 | RF | HB | 150# | 250 | c/w Blind Flanges | 1 |
| N10 | Drain | 1 | 3 | RF | HB | 150# | 200 | Flush; c/w Blind Flanges | 1 |
| N11 | Purge | 1 | 2 | RF | HB | 150# | 200 | c/w Blind Flanges | 1 |
| M1 | Manway | 1 | 24 | RF | WN | 150# | 200 | c/w Blind Flange & Davit Arm | 1 |

**NOTES**

1. Design shall meet the following industry codes latest editions and Suncor Specifications:
   Refer to Technical Documents and Attachments for a full list of Suncor Specifications.
   - CSA B51 - ASME B31.3
   - NACE MR0175/ ISO 15156 - ASME VIII Div 1 c/w Addenda
2. Drawings and data shall be as per the attached VENDOR DRAWING AND DOCUMENT REQUIREMENTS sheet (VDDR). Vessel drawings with calculations shall be P.Eng stamped (AB). Manufacturer data report (U1-A/AB-25) for vessel and copies of AB-41 for all registered pressure fittings shall be provided as a part of documentation package.
3. Hydrotesting shall be as per ASME Section VIII Div 1, Paragraph UG-99; Suncor CTS 0601 Pressure Vessels specification.
4. Deleted
5. The following loads should be considered for vessel design per NBC: - hourly wind pressure 1/50 - 0.35 kPa; 1/10- 0.27 kPa; snow loads 1.4 kPa, 589 m elevation m; PGA = 0.059.
6. Inspection shall be as per ASME Section VIII Div. 1, ASME B31.3 and applicable Suncor Specifications (Pressure Vessels - CTS 0601; Shop and Field Welding - CTS 0903.
7. PWHT is required for vessel and other wetted carbon steel components. PWHT procedure shall be provided for approval as a part of documentation package. Hardness shall not exceed HBW 200. All welded attachments shall be installed prior to PWHT.
8. Threaded connections for wetted components are not allowed in this service.
9. Deleted
10. Lifting lugs shall be provided, tested and attached in accordance with applicable Suncor specifications (min 100% MPI).
11. All structural welding, it's inspection and procedures shall be CWB certified. Fabricators responsible for structural welding shall be certified by CWB to the requirements of CSA W47.1 Div 1 or 2. Welders and welding operators performing structural welding shall be qualified in accordance with CSA W47.1. Inspection of structural welding shall be undertaken by CWB certified organization to the requirements of CSA W178.1.
12. Vessel shall be marked as required in CTS 0601 Pressure Vessels specification. In additional marking with warnings should be provided on each side of PWHT vessel "STRESS RELIEVED - DO NOT WELD OR CUT". Vessel nameplate shall be completed in stainless steel.
13. All NDEs shall be performed after PWHT and before hydrotest.
14. NDEs required for Vessel shall be performed per section 5.5 of CTS 0601 requirements. List below is a summary of requirements, however additional inspections may be required as outlined within CTS 0601. Vendor is responsible to review the specification and adhere to the requirements outlined within:
    - 100% RT, RT-1 per CTS 0601 Section 5.5.3.3
    - Plate required to be 100% UT examined per SA-578 S1.1 to acceptance level C
    - Material shall comply with requirements outlined in CTS 0601 with some additions and exceptions as per following:
      Intentional additions of micro alloying elements such as Boron, Titanium, Selenium, Nb, V, Lead, or any other similar elements are prohibited.
      Carbon Equivalent, CE shall be calculated using the following formula: CE = C + Mn / 6 + (Ni + Cu) / 15 + (Cr + Mo + V) / 5. Numerical values are all in wt.%
      Carbon Equivalent for plates shall be:
      for < 1" (25mm) thick ≤ 0.43
      for ≥ 1" (25mm) ≤ 0.45
      C ≤ 0.23 wt.% maximum for plates.
      S ≤ 0.003 wt.% V ≤ 0.015 wt.% V + Cb ≤ 0.02 wt%
      P ≤ 0.012 wt.% Cb ≤ 0.015 wt.%
      Tensile strength less than or equal to 70ksi.
    - 100% UT all pressure envelope corner welds

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| | | | | |
|---|---|---|---|---|
| | **EQUIPMENT DATA SHEET** | DOC: DS116-A-C8000-1 | PAGE: 3 OF 3 | Rev |
| | **PRESSURE VESSEL** | EP PROJECT NO.: | RFQ/PO NO.: | 1 |
| | **SOUR** | CLIENT: | LOCATION: | |
| | **SI UNITS** | CLIENT PROJECT NO: | SERIAL: V-17090 | 1 |
| | | SERVICE: Aqueous Ammonia Bullet | TAG: 116C-8000 QTY: 1 | |
| MANUFACTURER: | Score / Vortex Production Services | MODEL: N/A | SIZE: 10' DIA X 35' S/S | |

## NOTES

14. Note Continue:

- 100% MPI bevelled edges
- 100% MPI (WFMT) all process wetted welds (including internal welds); back gauged areas before back welding ; areas of temporary attachments; saddles to vessel welds; 100% WFMT examination of the formed head per CTS 0601, all external and internal attachment welds, welds between nozzles and reinforcing pads.
- 100% MPI full penetration welds for lifting lugs.
- Brinell hardness test per ASTM A833 (BM, WM, HAZ) one on each circumferential weld, one on each longitudinal weld, nozzle neck and nozzle attachment weld and each representative internal attachment weld; on internal and external surface of the weld, where accessible (after PWHT - max HBW 200; min HBW 140).
- Certified material test reports shall be provided for all pressure retaining components and for all service materials that are attached to pressure retaining components.

15. Weld procedures shall be in compliance with Suncor specification Shop and Field Welding: CTS 0903. All weld procedures shall be completed with applicable PQRs and laboratory testing analysis and provided for client review 1 week ARO.

16. All nozzles and manways shall be set-in through type with continuous full penetration welds. Allowable nozzles loads shall be in accordance with Suncor specification CTS 0601 Pressure Vessels.

17. Vessel accessories shall comply with Suncor standard details.

18. Deleted

19. Deleted

20. Deleted

21. Deleted

22. Deleted

23. Deleted

24. Deleted

25. Deleted

26. Deleted

27. Deleted

28. Deleted

29. Deleted

30. Deleted

31. Vessel shall be designed for flooded conditions. All loads as noted in sections 5.2.3 - 5.2.7 of CTS 0601 shall be considered in the design and vessel calculations.

32. Weld spacing requirements as noted in sections 5.2.10.17 and 5.2.10.18 of CTS 0601 shall be met.

33. Saddle plates shall be provided as per section 5.2.11.17 of CTS 0601.

34. External reinforcing pads shall be provided for all support attachments (as applicable).

35. Vessel heads shall be supplied in compliance with section 5.3.2.2 of CTS 0601.

36. Reinforcing pads, if any, shall be tested as per section 5.5.9 of CTS 0601.

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