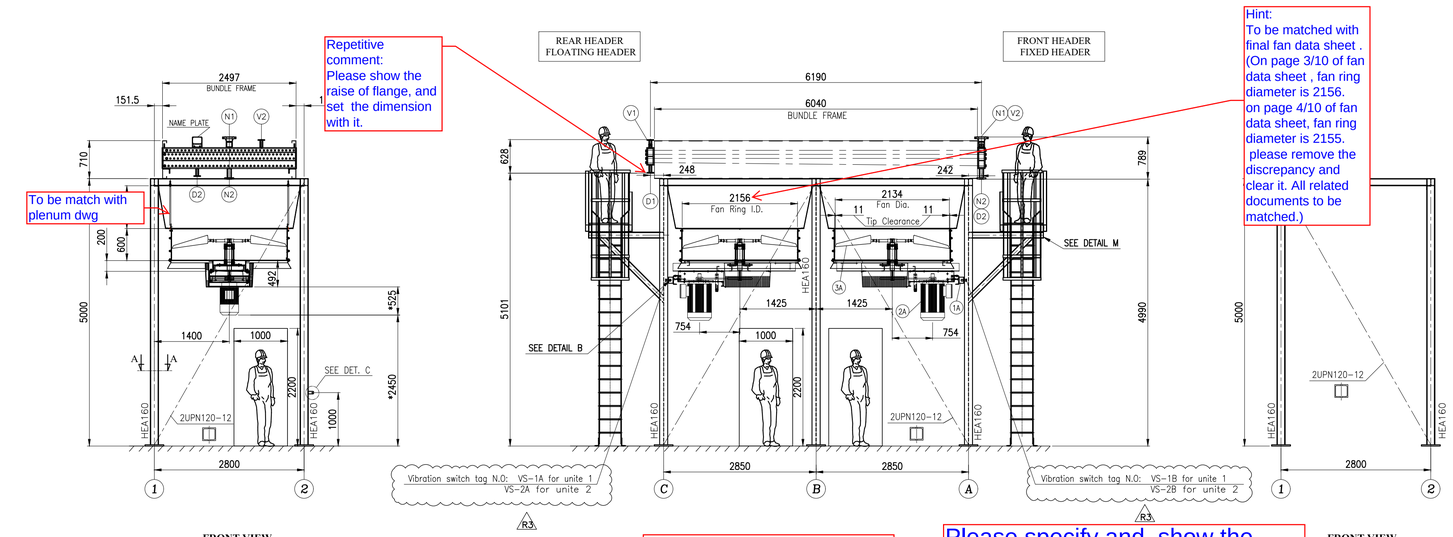


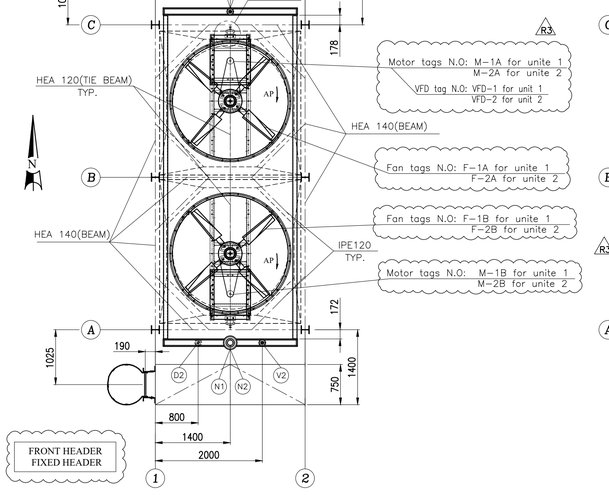

**FRONT VIEW**
**CL. A,C**

* THIS DIMENSION WILL BE FINALIZED AFTER APPROVED OF MOTOR DATA SHEET

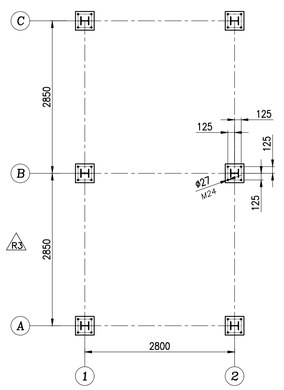
Please add a sketch for lifting the bundle.

Please specify and show the support of cable tray for vibration switch.(The cable route will be specified for vendor)

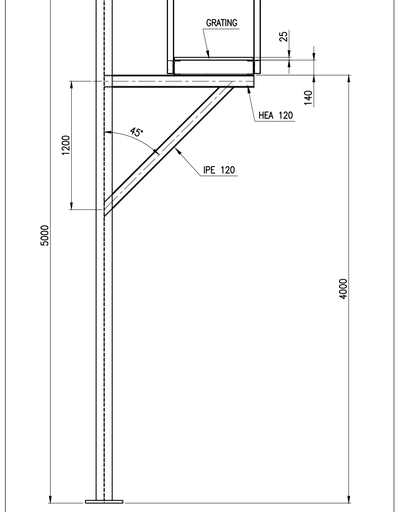
**FRONT VIEW**
**CL. B**



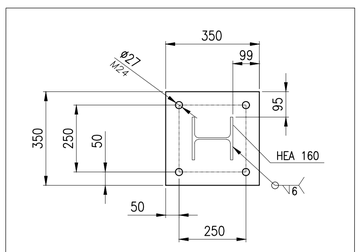

**TOP VIEW**



**BASE PLATE VIEW**

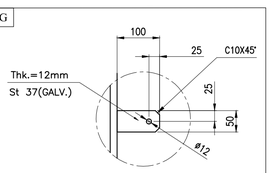



DET. M



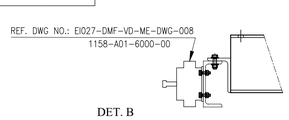

Anchor bolt ,Nut and Washer Material:
Bolt: F1554-Gr.36
Nut: ASTM A563 Gr.DH
Washer: ASTM F436

EARTHING LUG

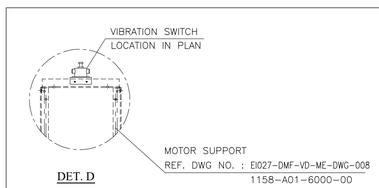



DET. C
* Only FOR COLUMNS : A1&C2

VIBRATION SWITCH




DET. B




DET. D

Table 1. Weight of equipments For 1 Units ( Total Units = 2)

| | Total No in one Unit | Total Weight in one Unit (tonf) | Total No. for One Bay | Weight for One Bay (kgf) |
|---|---|---|---|---|
| Bundle Frame | 1 | 0.865 | 1 | 865 |
| Tube Bundle & Headers | 1 | 2.635 | 1 | 2635 |
| sum | | | | **3500** |
| Water in Tubes & Headers | 1 | 0.48 | 1 | 480 |
| sum | | | | **480** |
| Plenum | 2 | 0.245 | 2 | 490 |
| Fan Ring | 2 | 0.13 | 2 | 260 |
| Motor | 2 | 0.07 | 2 | 140 |
| Fan | 2 | 0.0275 | 2 | 55 |
| Speed Reducer | 2 | 0.25 | 2 | 500 |
| Machinery Mount | 2 | 0.32 | 2 | 640 |
| Fan Guard | 2 | 0.0325 | 2 | 65 |
| sum | | | | **2150** |
| Fabrication Weight For 1 Units | | | | 5650 |
| Operation Weight For 1 Units | | | | 6130 |
| Hydrotest Weight For 1 Units | | | | 6130 |
| Total Weight of Main structure, Ladder for 1 Units | | | | **6600** |

**TABLE: Joint Reactions**

| Joint | OutputCase | Fx | Fy | Fz |
|---|---|---|---|---|
| Text | Text | Kgf | Kgf | Kgf |
| A-1 | DEAD_S | 16.65 | -45 | 861.98 |
| A-1 | DEAD | 49.34 | -158.83 | 1640.14 |
| A-1 | DEAD_OP | 4.08 | -14.37 | 92.37 |
| A-1 | DEAD_N | -1631.93 | 429.16 | -2881.5 |
| A-1 | LIVE | 3.34 | 25.54 | 1383.73 |
| A-1 | WX | 31.57 | 329.34 | -352.72 |
| A-1 | WY | -387.76 | 93.94 | -669.09 |
| A-1 | SNOW | 9.74 | -24.99 | 547.6 |
| A-1 | EQX | 106.43 | 1146.34 | -1764.17 |
| A-1 | EQY | -1561.76 | 337 | -3289.21 |
| A-1 | EQXO | 210.24 | 2295.43 | -3529.78 |
| A-1 | EQYO | -3123.79 | 673.24 | -6571.39 |
| A-2 | DEAD_S | -20.6 | 1.599E-13 | 380.54 |
| A-2 | DEAD | -33.06 | -0.00000289 | 811.07 |
| A-2 | DEAD_OP | -0.21 | -3.963E-07 | 55.27 |
| A-2 | DEAD_N | -10.59 | -1.13 | -378.95 |
| A-2 | LIVE | -76.47 | 6.353E-13 | 402.18 |
| A-2 | WX | 1.165E-12 | 49.87 | 8.288E-13 |
| A-2 | WY | -54.91 | -1.269E-13 | -353.83 |
| A-2 | SNOW | -19.58 | -8.653E-07 | 221.21 |
| A-2 | EQX | 0.004107 | 45.8 | 0.09216 |
| A-2 | EQY | -48.82 | -0.38 | -1465.12 |
| A-2 | EQXO | 0.00889 | 92.7 | 0.18 |
| A-2 | EQYO | -98.54 | -0.78 | -2927.34 |
| A-3 | DEAD_S | 16.65 | 45 | 861.98 |
| A-3 | DEAD | 49.34 | 158.83 | 1640.17 |
| A-3 | DEAD_OP | 4.08 | 14.37 | 92.37 |
| A-3 | DEAD_N | 39.17 | 235.02 | 482.86 |
| A-3 | LIVE | 3.34 | -25.54 | 1383.73 |
| A-3 | WX | -31.57 | 329.34 | 352.72 |
| A-3 | WY | -387.76 | -93.94 | -669.09 |
| A-3 | SNOW | 9.74 | 24.99 | 547.61 |
| A-3 | EQX | -106.49 | 1146.49 | 1764.07 |
| A-3 | EQY | -1071.77 | -428.48 | -2570.23 |
| A-3 | EQXO | -210.36 | 2295.75 | 3529.6 |
| A-3 | EQYO | -2144 | -856.2 | -5134.3 |
| B-1 | DEAD_S | 34.11 | -1.44 | 482.68 |
| B-1 | DEAD | 174.23 | -2.24 | 983.92 |
| B-1 | DEAD_OP | 16.3 | 0.03128 | 81.45 |
| B-1 | DEAD_N | -670.87 | 1.33 | 2555.04 |
| B-1 | LIVE | -43.74 | -6.51 | 64.14 |
| B-1 | WX | -255.25 | 0.99 | -374.63 |
| B-1 | WY | -1.33 | -70.96 | 504.74 |
| B-1 | SNOW | 24.65 | -1.56 | 193.87 |
| B-1 | EQX | -985.73 | 4.1 | -1834.5 |
| B-1 | EQY | -51.12 | -28.6 | 2619.38 |
| B-1 | EQXO | -1968.03 | 8.18 | -3658.39 |
| B-1 | EQYO | -102.38 | -57.85 | 5233.15 |
| B-2 | DEAD_S | -3.76E-15 | -9.82 | 342.79 |
| B-2 | DEAD | -1.168E-10 | -61.15 | 847.79 |
| B-2 | DEAD_OP | -1.602E-11 | -8.01 | 77.09 |
| B-2 | DEAD_N | -0.0003857 | -403.24 | 720.08 |
| B-2 | LIVE | 8.844E-15 | 82.81 | -147.91 |
| B-2 | WX | -56.07 | 3.583E-12 | -6.399E-12 |
| B-2 | WY | -8.004E-14 | -439.42 | 682.53 |
| B-2 | SNOW | -3.498E-11 | 3.21 | 131.34 |
| B-2 | EQX | 0.02819 | 0.04229 | -0.07544 |
| B-2 | EQY | 0.006383 | -1570.51 | 2804.88 |
| B-2 | EQXO | -0.2 | 0.08416 | -0.15 |
| B-2 | EQYO | 0.0007535 | -3138.25 | 5603.81 |
| B-3 | DEAD_S | -34.11 | -1.44 | 482.68 |
| B-3 | DEAD | -174.23 | -2.24 | 983.9 |
| B-3 | DEAD_OP | -16.3 | 0.03128 | 81.45 |
| B-3 | DEAD_N | -670.07 | 1.26 | 1104.47 |
| B-3 | LIVE | 43.74 | -6.51 | 64.14 |
| B-3 | WX | -255.25 | -0.99 | 374.63 |
| B-3 | WY | 1.33 | -70.96 | 504.74 |
| B-3 | SNOW | -24.65 | -1.56 | 193.87 |
| B-3 | EQX | -985.8 | -4.09 | 1834.58 |
| B-3 | EQY | -40.75 | -28.68 | 1900.29 |
| B-3 | EQXO | -1968.16 | -8.15 | 3658.54 |
| B-3 | EQYO | -81.36 | -57.83 | 3796.07 |

## GENERAL DATA

| | |
|---|---|
| ITEM NO. | – |
| DESIGN CODE BUNDLE/STRUCTURE | ASME SEC.VIII DIV.1(2019), API661(2013-7th EDITION)/Standard No. 2800 |
| INLET PRESSURE/PRESSURE DRO. (ALLOWABLE/CALC.) | 19.8 Bar /(0.1/0.016) Bar |
| DESIGN PRESSURE | 22+F.V. (barg) |
| HYDROSTATIC TEST PRESSURE | 28.6 (bar) |
| TEMPERATURE IN/OUT(TUBE SIDE) | 73.5°C/56.32°C |
| DESIGN TEMPERATURE | 120 °C |
| MINIMUM DESIGN METAL TEMPERATURE | -45°C |
| AIR INLET/OUTLET TEMPERATURE (AIR SIDE) | 48 / 52.28 °C |
| MINIMUM DESIGN AMBIENT TEMPERATURE | 5 °C |
| CORROSION ALLOWANCE | 3 mm |
| ULTRASONIC TEST | YES(Full)[See note 8] |
| RADIOGRAPHY | YES(Full)[See note 8] |
| STRESS RELIEVING | YES |
| BARE/FINNED SURFACE PER UNIT | 68.101/1579.2 m2 |
| NUMBER OF BUNDLE PER BAY | 1 |
| NUMBER OF UNIT | 2 |
| NUMBER OF BAY PER UNIT | 1 |
| NOZZLE SIZE(INLET/OUTLET/RATING/TYPE) | 1x4"/1x2"/SCH.160/#300 |
| PROCESS FLUID NAME | PROPANE |
| SERVICE | PROPANE |
| PASSES PER BUNDLE | 4 |
| FINNED-TUBES/BUNDLE | NO.140 TUBES,OD=25.4,SEAMLESS MIN.W,BWG16,THK.=1.65,L=6096 mm |
| Tube to tube sheet joint | STRENGTH WELD + EXPANDED |
| Fin (Type,material, OD,FPI) | EXTRUDE,AL 1060,57.15,11 |
| STEAM COIL | NO |
| LOUVER/TYPE | NO/– |
| PLENUM / FAN RING | FORCED TYPE/CONICAL L/D=0.05 |
| VIBRATION SWITCH | YES,(FOR EACHFAN) MANUAL & ELECTRIC RESET |
| FAN SPECIFICATION :RPM/DIAMETER | 382/7 Ft |
| Pitch angle (for fan) | 8.5° R3. |
| BLADE NO./ MATERIAL | 4/ALUMINIUM |
| AIR QUANTITY FOR FAN | 26.879 m3/S |
| STATIC PRESSURE | 102.95 Pa |
| AIR TEMPERATURE IN/OUT | 48°C/52.28°C |
| SPEED REDUCER TYPE | V BELLT |
| REDUCTION RATIO | 3.76 |
| MOTOR TYPE | ELECTRIC-Exe,IIB-T3-IP55 |
| VOLTAGE/Freq./PHASES | 400/50/3 |
| RPM./KW. | 1500/7.5 Kw |
| Motor VFD per unit | 50% R3. |
| S.P.L. 1m all side of fan: | <85 dB(A)1m all sides |

Hint: Electrical specifications should be match with Final electrical motor data sheet

## NOTES:

1) Loading Data
   WIND :ASCE7-16,VELOCITY :125Km/h, EXPOSURE : C
   Earthquake: Standard No. 2800,A=0.3,B=2.75,I=1.4,R=3.5,SOIL TYPE=IV
2) Fans
   –100% AP(Adjustable pitch-manual)
3) Miscellaneous
   – The Inlet Header Boxes Are Fixed In The Direction Of Fin Tubes, Refer To Table For The Lateral Displacement In Y Direction
   – Flange Face Detail : ASME ANSI B16.5
4) All Dimensions Are In Millimeter Unless Otherwise Specified.
5) All Dimensions Tolerances Are According to API 661.(Figure 10)
6) Bolts which are used for fixing headers to side frame , on sliding side should be removed after erection.
7) PROTECTION(SEE Galvanizing Specification and Inspection Procedure: EI027-DMF-VD-QC-PRO-024
8) RADIOGRAPHIC TEST (FULL/SPOT) SHALL BE IN COMPLIANCE WITH THE REQUIREMENTS OFNASME SEC. VIII DIV.1 UW-11 & UW-12.
9) 50% motors per unit to be VFD.

Repetitive comment: Please add the below also: - All motors to be VFD compatible"

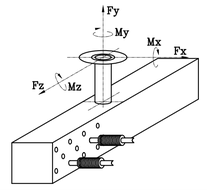
LOAD D

| | |
|---|---|
| DEAD | DEAD LOAD(PLENUMS+FAN RINGS+FAN GUARDS+FAN+MOTOR+SPEED REDUCERS+GRATING+TUBE BUNDLE EMPTY)+HEADER WALK WAY |
| DEAD OP | WEIGHT OF LIQUID WITHIN EACH TUBE BUNDLE& STEAM COIL(WATER) |
| DEADS | SELF WEIGHT OF STRUCTURE |
| DEADN | NOZZEL LOAD |
| LIVE | WALKWAY LOAD 250 Kg/m2 |
| EQX | SEISMIC LOAD DIR.X |
| EQY | SEISMIC LOAD DIR.Y |
| WX | WIND LOAD DIR.X |
| WY | WIND LOAD DIR.Y |
| SNOW | 66 Kg/m2 |

* Further Definition Check the Steel Structure Calculation.Doc No.: EI027-DMF-VD-ST-CAL-004
1158-A01-0030-00

**THE MAXIMUM ALLOWABLE MOMENTS AND FORCES PER EACH NOZZLE (IF LOADS ARE DIVIDED EQUALLY FOR NOZZLES ACCORDING TO 3xAPI 661(7.1.10.1)**

| SIZE | Fx(N) | Fy(N) | Fz(N) | Mx(N.m) | My(N.m) | Mz(N.m) |
|---|---|---|---|---|---|---|
| 4" | 10020 | 8010 | 10020 | 2430 | 3660 | 2430 |
| 2" | 3060 | 3990 | 3060 | 450 | 720 | 450 |




## CONNECTIONS

please remove schedule for LWN nozzle

| NO. | REP. | QTY. PER BAY/2UNIT | DIA | DESIGNATION R3. |
|---|---|---|---|---|
| N1 | INLET NOZZLE/FLANGE | 1/2 | 4" | FLANGE ANSI B16.5,#300,WN,RF,SCH.160,SA-350 Gr.6 /SA-350 LF2 CL.1N,THK.=13.49 |
| N2 | OUTLET NOZZLE/FLANGE | 1/2 | 2" | FLANGE ANSI B16.5,#300,SCH.160,WN,RF,SA-350 LF2 CL.1N,THK.=16.6 |
| V1&V2 | VENT | 2/4 | 1" | FLANGE ANSI B16.5,#300,LWN,SA-350 LF2 CL1 N,THK.=14.3 |
| D1&D2 | DRAIN | 2/4 | 1" | FLANGE ANSI B16.5,#300,LWN,SA-350 LF2 CL1 N,THK.=14.3 |
| 1A | VIBRATION SWITCH | 2/4 | – | SEE FAN DRIVE ASSEMBLY DRAWING |
| 2A | MOTOR(7.5Kw) | 2/4 | – | SEE FAN DRIVE ASSEMBLY DRAWING |
| 3A | FAN | 2/4 | 7ft | SEE FAN DRIVE ASSEMBLY DRAWING |

**LATERAL DISPLACEMENT OF HEADERS (DIRECTION X) INSIDE BUNDLE FRAME IN RELATION WITH EXPANSION FORCES ON NOZZLES (mm) (ACCORDING TO API661 7-1-1-2)**

| MAXIMUM DISPLACEMENT | INLET/OUTLET : ±9 |
|---|---|

* FOR MORE DETAILS FOR EACH COMPONENT OF AIR COOLER REFER TO BELOW DRAWING & DOCUMENTS.

**REFERENCED DWG&DOC.**

| TITLE | VENDOR DOCUMENT NO. | CLIENT DOCUMENT NO. |
|---|---|---|
| Tube Bundle Drawing | 1158-A01-2000-00 | EI027-DMF-VD-ME-DWG-005 |
| Bundle Frame Drawing | 1158-A01-2400-00 | EI027-DMF-VD-ME-DWG-007 |
| Fan Drive Assembly Drawing | 1158-A01-6000-00 | EI027-DMF-VD-ME-DWG-008 |
| Fan Ring Drawing | 1158-A01-5067-00<br>1158-A01-5167-00 | EI027-DMF-VD-ME-DWG-009 |
| Support Mechanism Drawing | 1158-A01-6307-00 | EI027-DMF-VD-ME-DWG-010 |
| Plenum Drawing | 1158-A01-5110-00 | EI027-DMF-VD-ME-DWG-011 |
| Steel Structure Drawing | 1158-A01-1100-00 | EI027-DMF-VD-ST-DWG-013 |
| Header Walkway Drawing | 1158-A01-1200-00 | EI027-DMF-VD-ST-DWG-014 |
| Ladder Drawing | 1158-A01-1520-00 | EI027-DMF-VD-ST-DWG-015 |
| Surface Preparation and Painting Procedure for Air Cooler | 1158-A01-QS01-00 | EI027-DMF-VD-QC-PRO-024 |

| REV | DATE | DESCRIPTION | DRAWN BY | CHECKED BY | APPROVED BY | FINAL APPROVED BY |
|---|---|---|---|---|---|---|
| R3 | 08/21/2024 | ISSUED FOR APPROVAL | F.SZ | J.M. | J.B.L | A.GHZ |
| R2 | 08/10/2024 | ISSUED FOR APPROVAL | F.SZ | J.M. | J.B.L | A.GHZ |
| R1 | 07/22/2024 | ISSUED FOR APPROVAL | F.SZ | J.M. | J.B.L | A.GHZ |
| R0 | 06/30/2024 | ISSUED FOR APPROVAL | F.SZ | J.M. | J.B.L | A.GHZ |

CLIENT:

CONTRACTOR:

PROJECT :
**AIR COOLER FOR**
**…ati Gohar Ofogh Petrochemical Co.**
**…al Arrangement Drawing**
1158-A01-1000-00

| DWG. NO. | EI027-DMF-VD-ME-DWG-003 | |
|---|---|---|
| SCALE : N.T.S. | SIZE : A1 | REV. : R3 |

Damafin
thermal technology
Factory : Km 14 special Karaj road