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Detailed review report of member 7803 - 7801

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Units: Length -(cm) Force -(kN) Stress -(N/mm2)

Design Code - ISO 19902:2007(E)

(Ultimate limit state)

- Resistance Factors

Tension 1.0500 Compression 1.1800

Bending 1.0500 Shear 1.0500

Hoop Buckling 1.2500

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\*\*\*\*\*\* Member Infomation \*\*\*\*\*\*

Group DL7

Section Name CONE53

Total Length 1.50 (m)

Location 0.74 (m)

Segment 2 of 2

LC Option List

Critical LC OP08

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\*\*\*\*\*\* Basic Properties \*\*\*\*\*\*

Section Type Cone

Larger Outside Diameter 134.62

Wall Thickness 3.80

Smaller Outside Diameter 106.68

Cylinder Thickness A 2.54

Cylinder Thickness B 3.80

Half Apex Angle (Deg.) 10.35

Elastic Modulus 210.00 1000(N/mm2)

Shear Modulus 77.00 1000(N/mm2)

Yield Strength 248.00 (N/mm2)

Axial Area A 1394.96

Mom. of Inertia Iy 2.4E+006

Mom. of Inertia Iz 2.4E+006

Shear Area Y 1394.96

Shear Area Z 1394.96

Tors. Constant J 4.8E+006

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\*\*\*\*\*\* Member's Properties \*\*\*\*\*\*

Slenderness Ratio (KL/r)y 29.77

Slenderness Ratio (KL/r)z 29.77

Radius of Gyration ry 41.33

Radius of Gyration rz 41.33

Eff. Length Factor Ky 2.00

Eff. Length Factor Kz 2.00

Overall Buck. Length Ly 6.10 (m)

Overall Buck. Length Lz 6.10 (m)

Final (K\*L)y 12.20 (m)

Final (K\*L)z 12.20 (m)

- Segmented Member: Overall buckling length is re-calculated

from apprximate buckling load effectively at this segment.

Leffy 1.52 (m)

Leffz 1.52 (m)

- KL/r of cone calculated by the averaged diameter (half of two ends)

TUB Ring Spacing INF

Reduction Factor Cmy 0.85

Reduction Factor Cmz 0.85

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\*\*\*\*\*\* End Forces and Moments ((kN), (kN-m)) \*\*\*\*\*\*

Tor. Moment Mx 45.5124

Bending Moment My -1530.8928

Bending Moment Mz 2127.1609

Axial force fx -11235277.0000

Shear force fy -908008.1875

Shear force fz 130213.6016

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\*\*\*\*\*\* Acting Stresses (N/mm2) \*\*\*\*\*\*

Axial stress fa -73.0961

Bending Major fby -30.4393

Bending Minor fbz 42.2952

Shear fv 5.8708

Torsional Shear fvt 0.4427

Hydro Hoop Stress fh 0.0000

- NOTE: Equivalent axial and bending stresses within cone (Eq 13.6-1~3).

Ds = 134.62 at section of consideration.

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CHECK AS EQUIVALENT TUBULAR SECTION

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\*\*\*\*\*\* Basic Allowable Stresses (w/o. Rsist Fact.) (N/mm2) \*\*\*\*\*\*

Axial Tension Ft 248.0001 (Eq 13.2-1)

Shear Fv 143.1829 (Eq 13.2-16)

Axial Compression Fc 240.6894 (Eq 13.2-5,6)

(Lambda) 0.3256 (Eq 13.2-7)

Local Buckling Fyc 248.0001 (Eq 13.2-8,9)

Elastic Local Buckling Fxe 3498.8188 (Eq 13.2-10)

Bending Fb 324.6060 (Eq 13.2-13~15)

Euler Buckling Y Fey 2338.7856 (Eq 13.3-5)

Euler Buckling Z Fez 2338.7856 (Eq 13.3-6)

- NOTE: DE = DMAX/cos(Alpha) = 136.85 at larger end of cone (except Fey,Fez).

The larger value of KL/r at the average section (in member properties list) is applied

--- Reported Allowable Stresses (with Resist. Factors)

Axial 210.1696

Major Axis Bending 309.1486

Minor Axis Bending 309.1486

Shear in Local Y 136.3647

Shear in Local Z 136.3647

Euler Buckling 2338.7856

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\*\*\*\*\*\*\*\* Unity Checks without Hydro Pressure \*\*\*\*\*\*\*\*

Compression + Bending (Eq 13.3-7) 0.5063

(Eq 13.3-8) 0.5164

Euler Buckling 0.0313

Local Buckling (Eq 13.6-8) 0.5957

Combined Shear (Eq 13.2-17,19) 0.0463

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CHECK AT CONE-TUBE JUNCTION

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--- CONE-TUBE Junction

CONE Diameter at Junction D 134.62

CONE Thickness at Junction T 3.80

TUBE Diameter at Junction DC 134.62

TUBE Thickness at Junction TC 2.54

Half Apex Angle (Deg.) Alpha 10.35

- NOTE: Junction at LARGE end.

--- Global actions and localized stresses (N/mm2)

Global Axial (TUBE) fat -106.6014

Global Bending (TUBE) fbt 76.7261

Global Axial (CONE) fa -73.0961

Global Bending (CONE) fb 52.1098

Local Bending at CONE 1 fbjc1 -16.8215 (Eq 13.6-5)

CONE 2 fbjc2 -103.2240

Local Bending at TUBE 1 fbjt1 -37.6500 (Eq 13.6-4)

TUBE 2 fbjt2 -231.0364

Hoop stress at CONE 1 fhc1 11.9467 (Eq 13.6-7)

CONE 2 fhc2 73.3101

Hoop stress at TUBE 1 fht1 17.8731 (Eq 13.6-6)

TUBE 2 fht2 109.6766

Hydro Hoop in CONE fhc\_P 0.0000

Hydro Hoop in TUBE fht\_p 0.0000

--- Allowable stresses at junction (N/mm2)

CONE TUBE

Fy 248.0039 248.0039

Fxe 3498.8188 2377.3601 (Eq 13.2-10)

Fyc 248.0001 248.0001 (Eq 13.2-5~6)

Fhe 2371.1201 1584.9066 (Eq 13.6-17)

Fh 248.0001 248.0001 (Eq 13.6-17)

- NOTE: Diameter, Thickness of cone and tube at junction are applied, respectively.

DE = 136.85 for cone side.

--- Junction Yielding and Buckling check (Sec 13.6.3.3~4)

\*\*\* Capped-end pressure NOT included \*\*\*

fh,j S\_max 1 S\_max 2 UC\_YLD UC\_BUK | UC

CONE 1 11.947 -37.808 -4.165 0.1905 0.0000 | 0.1905

CONE 2 73.310 -228.430 -21.982 1.1541 0.0000 | 1.1541

TUBE 1 17.873 -67.525 7.775 0.3303 0.0000 | 0.3303

TUBE 2 109.677 -414.364 47.709 2.0268 0.0000 | 2.0268

- NOTE: Check the junction of either larger or smaller end of cone.

Two locations to be analyzed on each side (cone and tubular).

S\_max 1, 2 are the possible maximum axial tensile and

compressive stresses on two points at each location. Unit (N/mm2)

fh,j is the total hoop stress (Eq 13.6-26). Unit (N/mm2)

UC\_YLD is calculated from (Eq 13.6-13,14) when fh,j is positive.

UC\_BUK is calculated from (Eq 13.6-18,21,22) when fh,j is negative.

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\*\*\*\*\*\*\*\* Reported Unity Ratios \*\*\*\*\*\*\*\*

Critical Unity Ratio 2.0268 (C 13.6.3.3 ) JCT YLD

Combined Unity Ratio 2.0268

Axial Component 2.0268

Bending Major Y-Y 0.0000

Bending Minor Z-Z 0.0000

Shear 0.0463

Torsional Shear 0.0032

Euler Buckling 0.0313