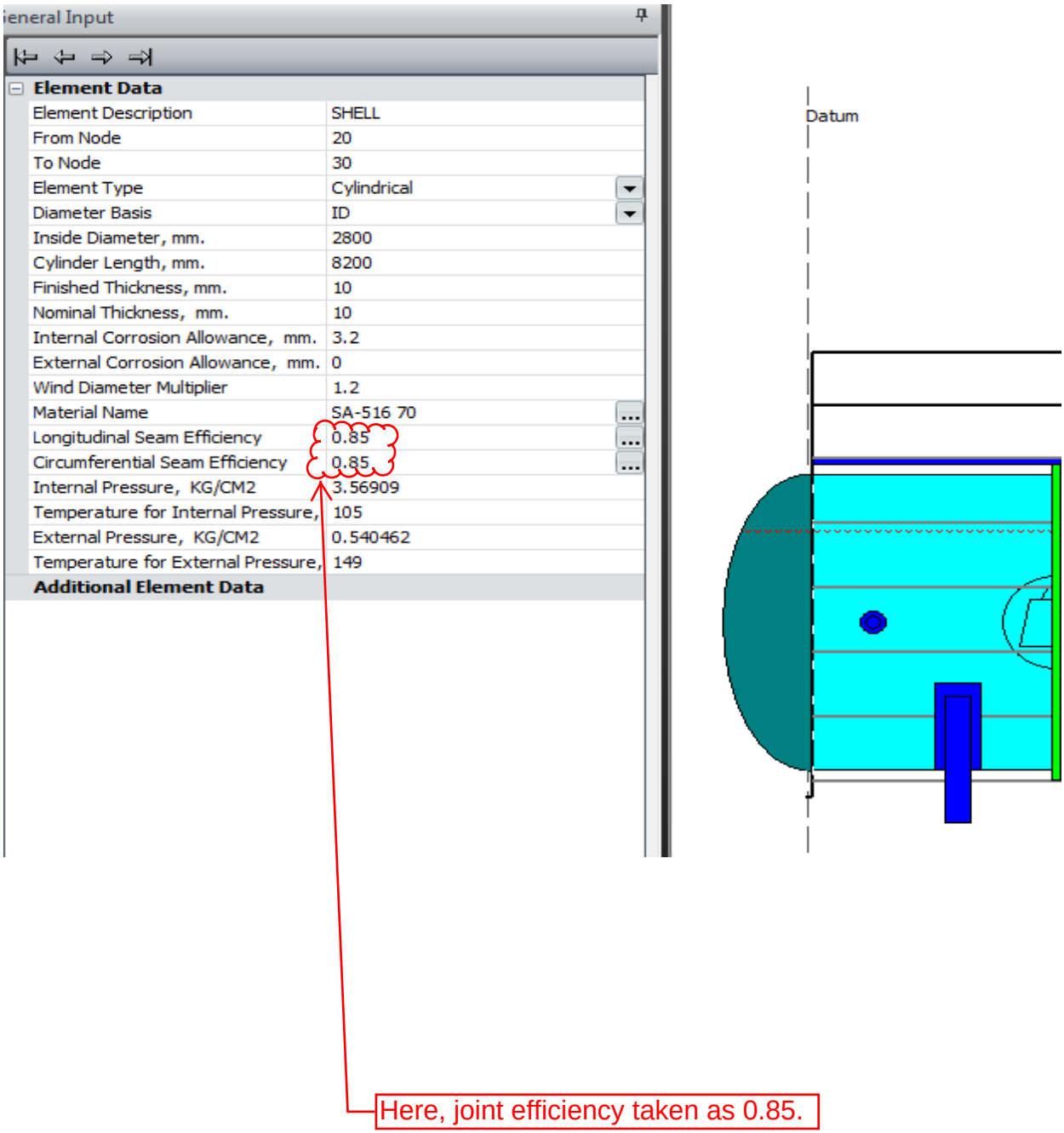
PV Elite Input File :

For shell taken Spot radiography (Joint erfficency) as 0.85



PV Elite Output :

ASME Horizontal Vessel Analysis: Stresses for the Left Saddle
(per ASME Sec. VIII Div. 2 based on the Zick method.)

Horizontal Vessel Stress Calculations : Operating Case

Input and Calculated Values:

Vessel Mean Radius	Rm	1406.60	mm.
Stiffened Vessel Length per 4.15.6	L	8300.00	mm.
Distance from Saddle to Vessel tangent	a	1000.00	mm.
Saddle Width	b	228.00	mm.
Saddle Bearing Angle	theta	120.00	degrees
Wear Plate Width	b1	415.00	mm.
Wear Plate Bearing Angle	theta1	132.00	degrees
Wear Plate Thickness	tr	10.0	mm.
Wear Plate Allowable Stress	Sr	1406.14	KG/CM2
Inside Depth of Head	h2	703.20	mm.
Shell Allowable Stress used in Calculation		1406.14	KG/CM2
Head Allowable Stress used in Calculation		1406.14	KG/CM2
Circumferential Efficiency in Plane of Saddle		1.00	
Circumferential Efficiency at Mid-Span		1.00	
Saddle Force Q, Operating Case		45245.94	KG

Horizontal Vessel Analysis Results:	**Actual**	**Allowable**	
Long. Stress at Top of Midspan	277.33	1406.14	KG/CM2
Long. Stress at Bottom of Midspan	479.63	1406.14	KG/CM2
Long. Stress at Top of Saddles	508.46	1406.14	KG/CM2
Long. Stress at Bottom of Saddles	306.43	1406.14	KG/CM2
Tangential Shear in Shell	377.76	1124.91	KG/CM2
Circ. Stress at Horn of Saddle	1153.08	1757.68	KG/CM2
Circ. Compressive Stress in Shell	132.95	1406.14	KG/CM2

As per ASME Div-2, clause no. 4.15.3.3 (ref. below attachment), allowable stress shall for s1 to s4 shall be E*S.
As per Input E=0.85, S=1406 So, E*S = 0.85*1406=1195 Kg/ cm2.
But in output it indicate as 1406 kg/cm2.

Longitudinal Stress at Top of Shell (4.15.6) [Sigma1]:

$= P * Rm/(2t) - M2/(pi*Rm^2t)$

$= 3.66 * 1406.600/(2*6.800) - 42736.3/(pi*1406.6^2*6.800)$

$= 277.33$ KG/CM2

Longitudinal Stress at Bottom of Shell (4.15.7) [Sigma2]:

$= P * Rm/(2t) + M2/(pi * Rm^2 * t)$

$= 3.66 * 1406.600/(2 * 6.800) + 42736.3/(pi * 1406.6^2 * 6.800)$

$= 479.63$ KG/CM2

Longitudinal Stress at Top of Shell at Support (4.15.10) [Sigma*3]:

$= P * Rm/(2t) - M1/(K1*pi*Rm^2t)$

$= 3.66*1406.600/(2*6.800)--5854.9/(0.1066*pi*1406.6^2*6.800)$

$= 508.46$ KG/CM2

Longitudinal Stress at Bottom of Shell at Support (4.15.11) [Sigma*4]:

$= P * Rm/(2t) + M1/(K1* * pi * Rm^2 * t)$

$= 3.66*1406.600/(2*6.800)+-5854.9/(0.1923*pi*1406.6^2*6.800)$

$= 306.43$ KG/CM2

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CLAUSE NO. 4.15.3.3 FOR SADDLE SUPPORT ALLOWABLE STRESS :

4.15.3.3 Longitudinal Stress

a) The longitudinal membrane plus bending stresses in the cylindrical shell between the supports are given by the following equations.

$$\sigma_1 = \frac{PR_m}{2t} - \frac{M_1}{\pi R_m^2 t} \qquad (top\ of\ shell) \qquad (4.15.6)$$

$$\sigma_2 = \frac{PR_m}{2t} + \frac{M_1}{\pi R_m^2 t} \qquad (bottom\ of\ shell) \qquad (4.15.7)$$

b) The longitudinal stresses in the cylindrical shell at the support location are given by the following equations. The values of these stresses depend on the rigidity of the shell at the saddle support. The cylindrical shell may be considered as suitably stiffened if it incorporates stiffening rings at, or on both sides of the saddle support, or if the support is sufficiently close defined as $a \le 0.5R_m$, to a torispherical or elliptical head (a hemispherical head is not considered a stiffening element), a flat cover, or tubesheet.

1) Stiffened Shell – The maximum values of longitudinal membrane plus bending stresses at the saddle support are given by the following equations.

$$\sigma_3 = \frac{PR_m}{2t} - \frac{M_1}{\pi R_m^2 t} \qquad (top\ of\ shell) \qquad (4.15.8)$$

$$\sigma_4 = \frac{PR_m}{2t} + \frac{M_1}{\pi R_m^2 t} \qquad (bottom\ of\ shell) \qquad (4.15.9)$$

2) Unstiffened Shell – The maximum values of longitudinal membrane plus bending stresses at the saddle support are given by the following equations. The coefficients K_1 and K_1^* are given in Table 4.15.1.

$$\sigma_3^* = \frac{PR_m}{2t} - \frac{M_1}{K_1 \pi R_m^2 t} \qquad (points\ A\ and\ B\ in\ Figure\ 4.15.5) \qquad (4.15.10)$$

$$\sigma_4^* = \frac{PR_m}{2t} + \frac{M_1}{K_1^* \pi R_m^2 t} \qquad (bottom\ of\ shell) \qquad (4.15.11)$$

c) Acceptance Criteria

1) The absolute value of σ_1, σ_2, and σ_3, σ_4 or σ_3^*, σ_4^*, as applicable shall not exceed SE.

Allowable stress for s1 to s4 as per ASME Div-2.