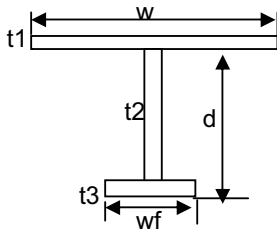


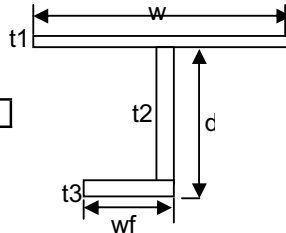
KC#590

SECTION MODULUS CALCULATION (IRS, Part 3 ,Chapter 3, Section 4)

Project:- aaaaa



<<Double Sided Flange,D>>



<<Single Sided Flange,S>>

[For Bracket Design \(LR\) CLICK>>](#)

[For Corossion allowance to SM CLICK>>>](#)

NOTE:Openings in primary WEB to be REINFORCED ALONG EDGE OF OPENING if the Opening depth>d/4 (or) 300mm (AND) Opening length>web depth,d (OR) Opening length >60% Secondary spacing

		INPUTS			
Flange (S,D for Single,Double sided flange)		S		<<<Provide Tripping Brackets>>>	
Type number of equally spaced load point on member		0		<<<Web Stiffening Required>>>	
Input 0 for stiffener/ secondary; 1 for girder/ primary		1		Web Stiff FB (Reqd.)=	56 X 10
Thickness of attached Plating (t1) mm		10		d/t2 STATUS	
Depth of Web (d)mm		560	d/t2=	56.00	Check d/t2 Max.55
Thickness of Web (t2)mm		10		wf/t3 STATUS	
Width of flange (wf)mm		150	wf/t3,D=	15.00	Wf/t3 OK N/A
Thickness of flange (t3),mm		10	wf/t3,S=	15.00	Wf/t3 OK Max. 15
Span of member (mm)		4410	C1Value=	0.77	0.77
Spacing of member (mm)		1830	C2Value=	0.46	0.46
Effective Width of attached plating (w)mm		838.99	C Value=	0.46	

		A (sqmm)	L(mm)	AL	ALL	lown
Width atached pltg (mm)	838.992273	8389.92	565	4740306	2678273082	69916.02
Thk. Attached pltg (mm)	10					
Depth of web (mm)	550	5500.00	285	1567500	446737500	138645833.33
Thk. Of web (mm)	10					
Width of flange (mm)	150	1500.00	5	7500	37500	12500.00
Thk. Of flange (mm)	10					
Area Total		15389.92		6315306	3125048082	138728249.36

Height Of N/A from BaseLine (mm)		410.35	Ymin=	159.6467
Height Of N/A from TopLine (mm)		159.65	Ymax=	410.3533
MOI about BaseLine (mm^4)		3263776331.76		
MOI about Neutral Axis (mm^4)		672269221.34		
Zmax (mm^3)=I NA/Ymin		4210982	mm^3	
Zmin (mm^3)=I NA/Ymax		1638269	mm^3	

Max.Shear Area (Web)		5700	mm^2
Total sectional area (Web+Fl.)		15390	mm^2

Note Kg/m below is EXCLUDING ATTACHED PLTG			
55.74	Kg/m (Stiffener OR Primary ONLY)		
67226.92	cm^4		I N/A
4210.98	cm^3		
1638.27	cm^3		Z min.
57.00	cm^2		A shear
153.90	cm^2		A total

For Clarifications Contact: G.Jayasankar (jayasankar007@yahoo.com)

**SUB: CSR assumption on the Effective Width of attached plating for the  
Primary Members & Section Modulus values for Primary.**

Please refer to ABS CSR 2006 for Bulk Carriers Part 5B, Chapter 3, Section 6, 5.4.1 Effective Breadth of Primary Supporting member quotes "*effective breadth of the attached plating of a primary supporting member to be considered in the actual net section modulus for the yielding check is to be taken as the mean spacing between adjacent primary supporting members*".

The ABS Steel Vessels 2007 (also other Ship Rules) Part 3 Chapter 1 Section 2 13.3 stipulates "*...effective width of plating not exceeding one half of the sum of spacing on each side of the member (OR) 33% of the unsupported span of the member whichever is LESS.*"

The Effective width of attached plating for a primary seems to be over estimated in the ABS CSR for the bulk carriers. In some cases this assumption leads to higher differences; especially when the span of the primary < than the primary spacing.

**As an example** assuming a T section primary 900x10/ 150x15 spaced at 3000mm (say 600mm x 5 Spaces) and spanning 2000mm would result in different section modulus values. Attached plating say 12 mm thick.

**A) Based on ABS CSR 2006 ;**

Effective width of attached plating : 3000mm (= primary spacing)

Corresponding Section Modulus: **4420 cm<sup>3</sup>**

**B) Based on ABS Steel Vessels 2007**

Effective width of attached plating : Minimum of (0.33x2000=660mm (or) 3000mm)=660mm

Corresponding Section Modulus: **3920 cm<sup>3</sup> (88 % of CSR Section Modulus)**

**C) Based on IRS Steel Vessels (With Effective width correction)**

Effective width of attached plating : 437mm

Corresponding Section Modulus: **3722 cm<sup>3</sup> (84 % of CSR Section Modulus)**

**D) Based on LRS Steel Vessels 2003 Part 3 Chapter 3 Section 9**

Effective width of attached plating : 687mm

Corresponding Section Modulus: **4009 cm<sup>3</sup> (90 % of CSR Section Modulus)**

**The above difference in the SECTION MODULUS of PRIMARY MEMBERS seems to be significant in some cases and would require your advice.**

**Please arrange to clarify on the above and advice on the EFFECTIVE WIDTH OF ATTACHED PLATING TO BE CONSIDERED FOR PRIMARY MEMBERS.**

**(The respective calculations A, B, C & D are attached for your reference)**

**(A) ABS CSR 2006 Section Modulus Calculation (Effective width of attached plating 3000mm= Primary Spacing)**

INPUTS						
Flange (S,D for Single,Double sided flange)	D					
Type number of equally spaced load point on member	0					
Input 0 for stiffened/ secondary; 1 for girded/ primary	0					
Thickness of attached Plating (t1) mm	12	<<<Web Stiffening Required>>>				
Depth of Web (d)mm	900	df2=	90.00	Check df2	Max.55	
Thickness of Web (t2)mm	10	Web Stiff FB (Reqd.)= 90 X 10				
Width of flange (wf)mm	150	wfA3,D=	10.00	wfA3 STATUS		
Thickness of flange (t3),mm	15	wfA3,S=	10.00	WF A3 OK	Max. 30	
Span of member (mm)	2000	C1Value=	0.25	WF A3 OK	N/A	
Spacing of member (mm)	3000	C2Value=	0.15			0.25
Effective Width of attached plating (w)mm	3000.00	C Value=	0.15			0.15
Width atached pltg (mm)	3000	A (sqmm)	L(mm)	AL	ALL	lown
Thk. Attached pltg (mm)	12	36000.00	906	32616000	29550096000	432000.00
Depth of web (mm)	900	8850.00	457.5	4048875	1852360313	607500000.00
Thk. Of web (mm)	10					
Width of flange (mm)	150	2250.00	7.5	16875	126562.5	42187.50
Thk. Of flange (mm)	15					
Area Total		47100.00		36681750	31402582875	607974187.50
Height Of N/A from BaseLine (mm)		778.81	Ymin=	133.1943		
Height Of N/A from TopLine (mm)		133.19	Ymax=	778.8057		
MOI about BaseLine (mm^4)		32010557062.50				
MOI about Neutral Axis (mm^4)		3442599884.95				
Zmax (mm^3)=I NA/Ymin		25846457	mm^3		344259.99	cm^4
Zmin (mm^3)=I NA/Ymax		4420358	mm^3		25846.46	cm^3
					4420.36	cm^3
						Z min.
Max.Shear Area (Web)		9120	mm^2		91.20	cm^2
Total sectional area (Web+Fl.)		47100	mm^2		471.00	cm^2
Stiffener (or) Primary ONLY (Web+Fl.) WT/m		87.14	kg/m		87.14	Kg/m
						WT/m

For Clarifications Contact: G.Jayasankar (jayasankar007@yahoo.com)

**(B) ABS Steel Vessels 2007 Section Modulus Calculation (Effective width of attached plating =Minimum of 1 Primary Spacing OR 33% of Span=33x2000=660mm)**

INPUTS						
Flange (S,D for Single,Double sided flange)	D					
Type number of equally spaced load point on member	0					
Input 0 for stiffened/ secondary; 1 for girded/ primary	0					
Thickness of attached Plating (t1) mm	12	<<<Web Stiffening Required>>>				
Depth of Web (d)mm	900	df2=	90.00	Check df2	Max.55	
Thickness of Web (t2)mm	10	Web Stiff FB (Reqd.)= 90 X 10				
Width of flange (wf)mm	150	wfA3,D=	10.00	wfA3 STATUS		
Thickness of flange (t3),mm	15	wfA3,S=	10.00	WF A3 OK	Max. 30	
Span of member (mm)	2000	C1Value=	0.86	WF A3 OK	N/A	
Spacing of member (mm)	660	C2Value=	0.55			0.86
Effective Width of attached plating (w)mm	660.00	C Value=	0.55			0.55
Width atached pltg (mm)	660	A (sqmm)	L(mm)	AL	ALL	lown
Thk. Attached pltg (mm)	12	7920.00	906	7175520	6501021120	95040.00
Depth of web (mm)	900	8850.00	457.5	4048875	1852360313	607500000.00
Thk. Of web (mm)	10					
Width of flange (mm)	150	2250.00	7.5	16875	126562.5	42187.50
Thk. Of flange (mm)	15					
Area Total		19020.00		11241270	8353507995	607637227.50
Height Of N/A from BaseLine (mm)		591.02	Ymin=	320.9763		
Height Of N/A from TopLine (mm)		320.98	Ymax=	591.0237		
MOI about BaseLine (mm^4)		8961145222.50				
MOI about Neutral Axis (mm^4)		2317288691.85				
Zmax (mm^3)=I NA/Ymin		7219500	mm^3		231728.87	cm^4
Zmin (mm^3)=I NA/Ymax		3920805	mm^3		7219.50	cm^3
					3920.87	cm^3
						Z min.
Max.Shear Area (Web)		9120	mm^2		91.20	cm^2
Total sectional area (Web+Fl.)		19020	mm^2		190.20	cm^2
Stiffener (or) Primary ONLY (Web+Fl.) WT/m		87.14	kg/m		87.14	Kg/m
						WT/m

For Clarifications Contact: G.Jayasankar (jayasankar007@yahoo.com)

**(C ) IRS Steel Vessels (Effective Width of attached plating of primary= 437mm only)**

INPUTS																																																					
Flange (S,D for Single,Double sided flange)	D	<<<Provide Tripping Brackets>>>																																																			
Type number of equally spaced load point on member	0	<<<Web Stiffening Required>>>																																																			
Input 0 for stiffener/ secondary, 1 for girder/ primary	1	Web Stiff FB (Reqd.)=		90	X 10																																																
Thickness of attached Plating (t1) mm	12			dA2 STATUS																																																	
Depth of Web (d)mm	900	dA2=	90.00	Check dA2	Max.55																																																
Thickness of Web (t2)mm	10			wA3 STATUS																																																	
Width of flange (wf)mm	150	wA3,D=	10.00	WtA3 OK	Max. 30																																																
Thickness of flange (t3),mm	15	wA3,S=	10.00	WtA3 OK	N/A																																																
Span of member (mm)	2000	C1Value=	0.25		0.25																																																
Spacing of member (mm)	3000	C2Value=	0.15		0.15																																																
Effective Width of attached plating (w)mm	436.89	C Value=	0.15																																																		
<table border="1"> <thead> <tr> <th></th> <th>A (sqmm)</th> <th>L(mm)</th> <th>AL</th> <th>ALL</th> <th>lown</th> </tr> </thead> <tbody> <tr> <td>Width attached pltg (mm)</td> <td>436.88503</td> <td>5242.62</td> <td>906</td> <td>4749814</td> <td>4303331505</td> </tr> <tr> <td>Thk. Attached pltg (mm)</td> <td>12</td> <td></td> <td></td> <td></td> <td>62911.44</td> </tr> <tr> <td>Depth of web (mm)</td> <td>900</td> <td>8850.00</td> <td>457.5</td> <td>4048875</td> <td>1852360313</td> </tr> <tr> <td>Thk. Of web (mm)</td> <td>10</td> <td></td> <td></td> <td></td> <td>607500000.00</td> </tr> <tr> <td>Width of flange (mm)</td> <td>150</td> <td>2250.00</td> <td>7.5</td> <td>16875</td> <td>126562.5</td> </tr> <tr> <td>Thk. Of flange (mm)</td> <td>15</td> <td></td> <td></td> <td></td> <td>42187.50</td> </tr> <tr> <td>Area Total</td> <td>16342.62</td> <td></td> <td></td> <td>8815564</td> <td>6155818380</td> </tr> </tbody> </table>							A (sqmm)	L(mm)	AL	ALL	lown	Width attached pltg (mm)	436.88503	5242.62	906	4749814	4303331505	Thk. Attached pltg (mm)	12				62911.44	Depth of web (mm)	900	8850.00	457.5	4048875	1852360313	Thk. Of web (mm)	10				607500000.00	Width of flange (mm)	150	2250.00	7.5	16875	126562.5	Thk. Of flange (mm)	15				42187.50	Area Total	16342.62			8815564	6155818380
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Height Of N/A from BaseLine (mm)	539.42	Ymin=	372.5783																																																		
Height Of N/A from TopLine (mm)	372.58	Ymax=	539.4217																																																		
MOI about BaseLine (mm^4)	6763423478.62																																																				
MOI about Neutral Axis (mm^4)	2008116957.94			200811.70	cm^4																																																
Zmax (mm^3)=I NA/Ymin	5389785	mm^3		5389.79	cm^3																																																
Zmin (mm^3)=I NA/Ymax	3722722	mm^3		3722.72	cm^3																																																
					Z min.																																																
Max.Shear Area (Web)	9120	mm^2		91.20	cm^2																																																
Total sectional area (Web+Fl.)	16343	mm^2		163.43	cm^2																																																
Stiffener (or) Primary ONLY (Web+Fl.) Wt/m	87.14	kg/m		87.14	Kg/m																																																
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**(D) LRS Steel Vessels 2003 Part 3 Chapter 3 Section 9 (Effective width of attached plating = 687mm)**

SECTION MODULUS CALCULATION : LLOYD REGISTER RULES																																			
(Refer LRS 2003 Part 3 Chapter 3 Section 3)																																			
INPUTS		If in doubt ask....Jay																																	
Primary (OR) Secondary	Primary																																		
b(m)=	3	(Half of sum of spacing between adjacent stiffeners)		l/b (1)	0.67																														
l(m)=	2	(Length of supporting member)		l/b (2)	0.67																														
a(cm^2)=	22.5	(Face plate area in cm^2)		f=	0.23																														
dww(mm) Clear Inside Depth=	900	(Web depth in mm)																																	
tw (mm)=	10	(Web plate thickness in mm)																																	
tp (mm)=	12	(Thickness of attached plating in mm)																																	
<table border="1"> <tbody> <tr> <td>40x tp (mm)=</td> <td>480</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>A (cm^2)=</td> <td>82.42</td> <td colspan="4">&lt;&lt; Effective Area of Attached Plating considered is 8800mm X 12mm</td> </tr> <tr> <td>Z1=</td> <td>2025.0</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Z2=</td> <td>1350.00</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Z3=</td> <td>1.47</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>						40x tp (mm)=	480					A (cm^2)=	82.42	<< Effective Area of Attached Plating considered is 8800mm X 12mm				Z1=	2025.0					Z2=	1350.00					Z3=	1.47				
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Z3=	1.47																																		
EFFECTIVE WIDTH OF ATTACHED PLATING CONSIDERED IN SM CALC. (mm)=				Eff. W (m)	686.83																														
AVAILABLE SECTION MODULUS (PLATE WITH ATTACHED STIFFENER) cm^3=				Z (cm^3)	4009.84																														