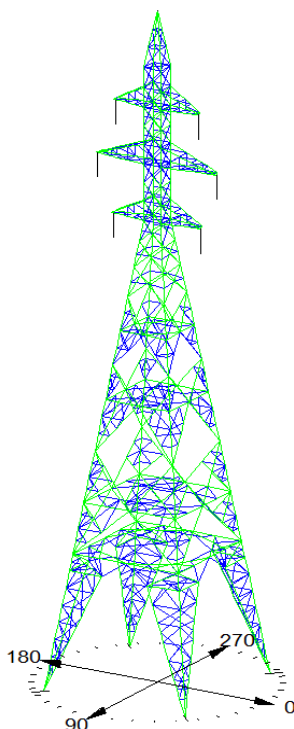


**Construction of
220 kV Loop in Loop out Paliastomi- into Ozurgeti Substation and
110 kV Double Circuit (D/C) Overhead Line from Ozurgeti Substation to Zoti HPP**

Tower Design Report of Suspension Tower "12A-NS"



2	23.08.2022	As per Comments	S.Celebi	S.Sahin	S.Nazlı
1	26.07.2022	As per Comments	O.Gonzalez	S.Sahin	S.Nazlı
0	11.04.2022	First Submission	O.Gonzalez	S.Sahin	S.Nazlı
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Tower Design Report of Suspension Tower "12A-NS"			n.a.	Page 1 of 19	

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A-GENERAL INFORMATION

1. PROJECT INFORMATION

Project : Open Programme Extension of the Transmission Network II

Tower Type : Double Circuit 110kV - 12A - NS Line Angle 0°

Extension Details : This tower includes +12, +9, +6, +3, +0, -3 Bodies with +6, +4.5, +3, +1.5, +0, -1.5, -3 Leg Extensions.

2. DESIGN DETAILS

Software : PLS-TOWER version 17.2

Applied Specifications : EN 50341- 1:2012

Material :

Bolts : DIN 7990

Minimum yield strength of the bolt 640 MPa

Minimum tensile strength of the bolt 800 MPa

Profiles: EN10025

	Fy (Mpa)	Fu (Mpa)
S235	235	360
S355	355	470

Fy Minimum yield strength

Fu Ultimate strength

B-LOAD CASES

Load cases which applied the tower for design can be summarized as the list below.

Row #	Load Case Description	Dead Load Factor	Wind Area Factor	Wind/Ice Model	Trans. Wind Pressure (Pa)	Longit. Wind Pressure (Pa)	Ice Thickness (cm)	Ice Density (N/m ³)
1	C1,C NA+	1.1	1	EN50341-1:2012F	884.9	0	0	0
2	C1-,C NA-	1.1	1	EN50341-1:2012F	-884.9	0	0	0
3	C2,C BI+	1.1	1	EN50341-1:2012F	625.7	625.7	0	0
4	C2-,C BI-	1.1	1	EN50341-1:2012F	-625.7	-625.7	0	0
5	ICE,C NA+	1.1	1	EN50341-1:2012F	0	0	3.2	6867
6	C3,C NA+	1.1	1	EN50341-1:2012F	262.2	0	3.2	6867
7	C3-,C NA-	1.1	1	EN50341-1:2012F	-262.2	0	3.2	6867
8	C4,C BI+	1.1	1	EN50341-1:2012F	185.4	185.4	3.2	6867
9	C4-,C BI-	1.1	1	EN50341-1:2012F	-185.4	-185.4	3.2	6867
10	C5,C NA+	1.1	1	EN50341-1:2012F	639.3	0	1.59	6867
11	C5-,C NA-	1.1	1	EN50341-1:2012F	-639.3	0	1.59	6867
12	C6,C BI+	1.1	1	EN50341-1:2012F	452.1	452.1	1.59	6867
13	C6-,C BI-	1.1	1	EN50341-1:2012F	-452.1	-452.1	1.59	6867
14	SC1,EW,C NA+	1.1	0	EN50341-1:2012F	0	0	0	0
15	SC1,LT,C NA+	1.1	0	EN50341-1:2012F	0	0	0	0
16	SC1,LM,C NA+	1.1	0	EN50341-1:2012F	0	0	0	0
17	SC1,LB,C NA+	1.1	0	EN50341-1:2012F	0	0	0	0
18	SC1,RT,C NA+	1.1	0	EN50341-1:2012F	0	0	0	0
19	SC1,RM,C NA+	1.1	0	EN50341-1:2012F	0	0	0	0
20	SC1,RB,C NA+	1.1	0	EN50341-1:2012F	0	0	0	0
21	SC2,C NA+	1.1	1	EN50341-1:2012F	0	0	0	0
22	SF2,C NA+	1.5	1	EN50341-1:2012F	0	0	0	0

C-GROUP SUMMARY

Group Label	Angle Type	Angle Size	Steel Strength (MPa)	Max Usage %	Usage Cont-rol	Max Use In Comp. %	Comp. Force (kN)	Comp. Control Load Case	Comp. Control Model	L/r Capacity (kN)	Comp. Connect. Shear Capacity (kN)	Comp. Connect. Bearing Capacity (kN)	RLX	RLY	RLZ	L/r	KL/r	Length Comp. Member (m)	Curve No.	No. Of Bolts Comp.	Bolt Type Comp.	Max Use In Tens. %	Tension Force (kN)	Tension Control Load Case	Tension Control Model	Net Section Capacity (kN)	No. Of Holes	Hole Diameter (cm)
1	SAE	80*80*6	355	82.5	Comp	82.5	-103.384	SC1,EW,C NA+	12A-NS_+12BE+6-3+6+6	125.314	926.493	371.273	1	1	1	111.46	1.46	1.75	5	6	M-16(8.8)	37.94	93.082	SC1,EW,C NA+	12A-NS_+12BE-3+6+6+6	245.34	2	1.75
1A	SAE	80*80*6	355	58.99	Comp	58.99	-137.076	SC1,EW,C NA+	12A-NS_+12BE+6-3+6+6	232.36	0	0	2	1	1	71.72	0.94	0.875	1	0	M-16(8.8)	43.63	107.042	SC1,EW,C NA+	12A-NS_+12BE-3+6+6+6	245.34	2	1.75
2	SAE	80*80*6	355	76.34	Comp	76.34	-185.568	SC1,EW,C NA+	12A-NS_+12BE+6-3+6+6	243.088	0	0	2	1	1	67.62	0.89	0.825	1	0	M-16(8.8)	61.91	151.899	SC1,EW,C NA+	12A-NS_+12BE-3+6+6+6	245.34	2	1.75
3	SAE	80*80*6	355	88.44	Comp	88.44	-214.987	SC1,EW,C NA+	12A-NS_-3BE-3+6+6-3	243.088	926.493	371.273	2	1	1	67.62	0.89	0.825	1	6	M-16(8.8)	70.33	172.537	C5,C NA+	12A-NS_+12BE-3+6+6+6	245.34	2	1.75
4	SAE	110*110*10	355	56.27	Comp	56.27	-261.402	C5,C NA+	12A-NS_+12BE-3+6+6+6	464.569	0	0	1	1	1	81.02	1.06	1.75	1	0	M-16(8.8)	36.17	216.622	C5,C NA+	12A-NS_+12BE-3+6+6+6	598.968	2	1.75
5	SAE	110*110*10	355	72.54	Comp	72.54	-360.079	C5-,C NA-	12A-NS_+12BE+6+6-3-3	496.404	0	0	1	1	1	76.39	1	1.65	1	0	M-16(8.8)	52.17	312.48	C5-,C NA-	12A-NS_+12BE-3+6+6+6	598.968	2	1.75
6	SAE	110*110*10	355	73.23	Comp	73.23	-458.591	C5-,C NA-	12A-NS_+12BE+6+6-3-3	626.235	0	0	2	1	1	49.11	0.64	0.825	1	0	M-16(8.8)	66.98	401.201	C5-,C NA-	12A-NS_-12BE-3-3+6+6	598.968	2	1.75
7	SAE	110*110*10	355	79.03	Comp	79.03	-488.071	C5-,C NA-	12A-NS_+0BE+6+6-3-3	617.581	617.662	825.051	2	1	1	52.08	0.68	0.875	1	8	M-16(8.8)	75.29	428.683	C5,C NA+	12A-NS_+9BE+6-3-3-3	569.358	2.5	1.75
8	SAE	120*120*10	355	87.91	Comp	87.91	-623.697	C5,C NA+	12A-NS_+9BE+6+6-3+6	709.484	772.078	1031.314	1	1	1	39.54	0.52	0.933	1	10	M-16(8.8)	84.21	536.471	C5-,C NA-	12A-NS_+9BE+6+6-3+6	637.038	2.5	1.75
9	SAE	120*120*10	355	91	Comp	91	-624.952	C5,C NA+	12A-NS_+0BE+6+6-3+6	686.768	1235.324	825.051	1	1	1	48.62	0.64	1.147	1	8	M-16(8.8)	84.64	539.16	C5-,C NA-	12A-NS_-3BE+6+6-3-3	637.038	2.5	1.75
10	SAE	120*120*10	355	93.13	Comp	93.13	-619.306	C5-,C NA-	12A-NS_-3BE-3-3+6+6	665.01	1235.324	825.051	1	1	1	55.1	0.72	1.3	1	8	M-16(8.8)	84.41	537.721	C5-,C NA-	12A-NS_-3BE+6+6-3-3	637.038	2.5	1.75
11	SAE	130*130*10	355	91.26	Comp	91.26	-634.703	C5-,C NA-	12A-NS_-3BE-3-3+6+6	695.489	1235.324	825.051	1	1	1	59.76	0.78	1.53	1	8	M-16(8.8)	77.23	539.006	C5-,C NA-	12A-NS_-3BE+6+6-3-3	697.95	2.5	1.75
12	SAE	130*130*10	355	91.8	Comp	91.8	-638.484	C5-,C NA-	12A-NS_-3BE-3-3+6+6	695.489	1235.324	825.051	1	1	1	59.76	0.78	1.53	1	8	M-16(8.8)	76.55	534.267	C5-,C NA-	12A-NS_-3BE+6+6-3-3	697.95	2.5	1.75
13T	SAE	45*45*5	235	56.66	Cross	56.66	-12.992	SC1,EW,C NA+	12A-NS_+12BE+6+6+6+6	22.928	154.416	78.994	0.5	1	0.5	175.64	1.93	2.371	8	2	M-16(8.8)	29.97	19.855	SC1,EW,C NA+	12A-NS_+12BE+6-3+6+6	66.24	1	1.75
13L	SAE	45*45*5	235	55.55	Comp	55.55	-21.595	SC1,EW,C NA+	12A-NS_+12BE-3+6+6+6	38.876	154.416	78.994	0.5	0.5	0.5	136.27	1.44	2.371	6	2	M-16(8.8)	27.74	18.373	SC1,EW,C NA+	12A-NS_+12BE-3+6+6+6	66.24	1	1.75
13AT	SAE	45*45*5	355	93.08	Cross	93.08	-24.934	SC1,EW,C NA+	12A-NS_+12BE+6+6+6+6	26.786	154.416	103.131	1	2	1	175.64	2.2	1.186	8	2	M-16(8.8)	23.67	20.466	SC1,EW,C NA+	12A-NS_+12BE+6-3+6+6	86.48	1	1.75
13AL	SAE	45*45*5	235	77.8	Cross	77.8	-17.844	C5-,C NA-	12A-NS_+12BE+6+6+6+6	22.935	154.416	78.994	0.5	1	0.5	175.64	1.93	2.371	8	2	M-16(8.8)	28.48	18.866	SC1,EW,C NA+	12A-NS_+12BE+6-3+6+6	66.24	1	1.75
14T	SAE	45*45*5	355	94.59	Comp	94.59	-44.985	C5-,C NA-	12A-NS_+12BE+6+6-3-3	47.559	154.416	103.131	1	1	1	132.09	1.62	1.149	6	2	M-16(8.8)	44.34	38.345	C5-,C NA-	12A-NS_+12BE+6+6-3+6	86.48	1	1.75
14L	SAE	45*45*5	355	92.6	Comp	92.6	-44.04	SC1,LT,C NA+	12A-NS_-3BE-3+6-3-3	47.559	154.416	103.131	0.5	0.5	0.5	132.09	1.62	2.298	6	2	M-16(8.8)	54.27	46.934	SC1,LT,C NA+	12A-NS_-3BE-3+6-3-3	86.48	1	1.75
15T	SAE	45*45*5	235	98.15	Comp	98.15	-40.056	C5-,C NA-	12A-NS_+12BE+6+6-3-3	40.813	154.416	78.994	1	1	1	132.09	1.4	1.149	2	2	M-16(8.8)	68.56	45.413	C5-,C NA-	12A-NS_+12BE+6+6-3-3	66.24	1	1.75
15L	SAE	45*45*5	355	98.92	Comp	98.92	-47.046	SC1,LT,C NA+	12A-NS_-3BE-3+6-3-3	47.559	154.416	103.131	0.5	0.5	0.5	132.09	1.62	2.298	6	2	M-16(8.8)	50.91	44.031	SC1,LT,C NA+	12A-NS_-3BE-3+6-3-3	86.48	1	1.75
16T	SAE	50*50*5	355	75.67	Comp	75.67	-44.779	C5-,C NA-	12A-NS_+12BE+6+6-3-3	59.174	154.416	103.131	0.5	0.5	0.5	120.98	1.53	2.371	6	2	M-16(8.8)	43	43.252	C5-,C NA-	12A-NS_-3BE+6+6-3-3	100.58	1	1.75
16L	SAE	50*50*5	355	73.98	Comp	73.98	-43.779	SC1,LT,C NA+	12A-NS_-3BE-3+6-3-3	59.174	154.416	103.131	0.5	0.5	0.5	120.98	1.53	2.371	6	2	M-16(8.8)	41.59	41.835	SC1,LT,C NA+	12A-NS_+12BE+6+6+6+6	100.58	1	1.75
17T	SAE	60*60*5	355	76.07	Comp	76.07	-71.829	C5,C NA+	12A-NS_+12BE-3-3+6+6	94.422	154.416	103.131	0.5	0.5	0.5	98.22	1.3	2.298	2	2	M-16(8.8)	60.63	62.524	C5,C NA+	12A-NS_+12BE-3-3+6+6	129.532	1	1.75
17L	SAE	50*50*5	355	95.04	Comp	95.04	-58.372	SC1,RM,C NA+	12A-NS_-3BE+6-3-3-3	61.42	154.416	103.131	0.5	0.5	0.5	117.26	1.5	2.298	6	2	M-16(8.8)	60.58	60.931	SC1,RM,C NA+	12A-NS_-3BE+6-3-3-3	100.58	1	1.75
18T	SAE	55*55*5	355	91.14	Comp	91.14	-69.58	C5,C NA+	12A-NS_+12BE-3-3+6+6	76.348	154.416	103.131	1	1	1	107.4	1.4	1.149	2	2	M-16(8.8)	72.12	74.383	C5,C NA+	12A-NS_+12BE-3-3+6+6	115.432	1	1.75
18L	SAE	55*55*5	355	80.45	Comp	80.45	-61.425	SC1,RM,C NA+	12A-NS_-3BE+6-3-3+6	76.348	154.416	103.131	0.5	0.5	0.5	107.4	1.4	2.298	2	2	M-16(8.8)	56.76	58.534	SC1,RM,C NA+	12A-NS_-3BE+6-3-3-3	115.432	1	1.75
19T	SAE	70*70*5	355	77.16	Comp	77.16	-79.576	C5,C NA+	12A-NS_+9BE-3-3+6+6	129.972	154.416	103.131	1	1	1	85.91	1.16	1.186	2	2	M-16(8.8)	67.98	70.111	C5,C NA+	12A-NS_-3BE-3-3+6+6	158.484	1	1.75
19L	SAE	90*90*6	355	79.18	Cross	79.18	-111.979	C5-,C NA-	12A-NS_+9BE+6+6+6+6	141.42	231.623	185.637	0.5	1	0.5	85.91	1.42	2.371	3	3	M-16(8.8)	52.47	97.412	C5-,C NA-	12A-NS_+9BE+6+6+6+6	257.56	1	1.75
20T	SAE	65*65*5	355	63.55	Comp	63.55	-52.806	SC1,LM,C NA+	12A-NS_+0BE+6+6-3-3	83.092	154.416	103.131	1	1	1	114.9	1.48	1.494	6	2	M-16(8.8)	47.75	49.243	SC1,LM,C NA+	12A-NS_+0BE+6-3+6+6-3	144.384	1	1.75
20L	SAE	70*70*5	355	89.14	Cross	89.14	-58.104	C5-,C NA-	12A-NS_+0BE+6+6+6+6	65.186	154.416	103.131	0.983	1.755	0.983	122.51	1.74	1.494	8	2	M-16(8.8)	45.11	46.518	SC1,RM,C NA+	12A-NS_-3BE-3+6-3-3	158.484	1	1.75
21T	SAE	55*55*5	355	92.85	Comp	92.85	-37.593	SC1,LM,C NA+	12A-NS_+0BE-3+6+6-3	40.487	154.416	103.131	1.289	1.289	1.289	174.47	1.98	1.448	6	2	M-16(8.8)	38.77	39.979	SC1,LM,C NA+	12A-NS_-3BE-3+6-3-3	115.432	1	1.75
21L	SAE	55*55*5	355	90.5	Cross	90.5	-25.101	C5,C NA+	12A-NS_+9BE+6-3-3+6	27.737	154.416	103.131	1	1.769	1	200.76	2.42	1.884	8	2	M-16(8.8)	36.27	37.403	SC1,EW,C NA+	12A-NS_+0BE-3-3+6-3	115.432	1	1.75
22T	SAE	75*75*6	235	45.83	Comp	45.83	-31.483	SC1,LM,C NA+	12A-NS_+0BE+6+6-3-3	68.697	154.416	94.793	1	1	1	153.5	1.56	2.256	6	2	M-16(8.8)	30.1	28.537	SC1,LM,C NA+	12A-NS_+0BE-3+6+6-3	156.96	1	1.75
22L	SAE	75*75*6	235	89.17	Cross	89.17	-41.111	C5-,C NA-	12A-NS_+0BE+6+6+6+6	46.107	154.416	94.793	1	1.792	1	177.37	1.94	2.256	8	2	M-16(8.8)	31.8	30.143	C5-,C NA-	12A-NS_+0BE+6+6-3+6	156.96	1	1.75
23T	SAE	70*70*5	235	79.45	Comp	79.45	-31.562	SC1,LM,C NA+	12A-NS_+9BE+6+6-3+6	39.726	154.416	78.994	2	1	1	163.27	1.84	1.747	8	2	M-16(8.8)	41.79	33.008	SC1,LM,C NA+	12A-NS_+0BE+6+6-3-3	121.392	1	1.75
23L	SAE	70*70*5	235	97.47	Comp	97.47	-38.722	C5,C NA+	12A-NS_+9BE+6-3+6+6	39.726	154.416	78.994	2	1	1	163.27	1.84	1.747	8	2	M-16(8.8)	52.92	41.801	C5,C NA+	12A-NS_+0BE+6-3+6+6	121.392	1	1.75
24T	SAE	65*65*5	235	81.08	Comp	81.08	-40.419	C5-,C NA-	12A-NS_-3BE-3-3+6+6	49.85	154.416	78.994	1	1	1	153.31	1.56	1.993	6	2	M-16(8.8)	51.25	40.486	C5-,C NA-	12A-NS_-3BE-3-3+6+6	110.592	1	1.75
24L	SAE	65*65*5	235	92.49	Comp	92.49	-46.106	C5,C NA+	12A-NS_+9BE+6-3+6+6	49.85	154.416	78.994	1	1	1	153.31	1.56	1.993	6	2	M-16(8.8)	69.8	55.137	C5,C NA+	12A-NS_+0BE+6-3+6+6	110.592	1	1.75
25T	SAE	50*50*5	235	85.36	Climb	57.39	-20.026	SC1,EW,C NA+	12A-NS_+12BE+6+6+6+6	34.895	154.416	78.994	1	1	1	163.27	1.63	1.6	8	2	M-16(8.8)	20.81	16.032	SC1,EW,C NA+	12A-NS_+12BE+6+6+6+6	77.04	1	1.75
25L	SAE	50*50*5	235	85.36	Climb	38.9	-13.572	C5,C NA+	12A-NS_+12BE+6+6-3+6	34.895	154.416	78.994	1	1	1	163.27	1.63	1.6	8	2	M-16(8.8)	20.75	15.98					

Group Label	Angle Type	Angle Size	Steel Strength (MPa)	Max Usage %	Usage Cont-rol	Max Use In Comp. %	Comp. Force (kN)	Comp. Control Load Case	Comp. Control Model	L/r Capacity (kN)	Comp. Connect. Shear Capacity (kN)	Comp. Connect. Bearing Capacity (kN)	RLX	RLY	RLZ	L/r	KL/r	Length Comp. Member (m)	Curve No.	No. Of Bolts Comp.	Bolt Type Comp.	Max Use In Tens. %	Tension Force (kN)	Tension Control Load Case	Tension Control Model	Net Section Capacity (kN)	No. Of Holes	Hole Diameter (cm)
31	SAE	45*45*5	235	83.09	Climb	7.57	-3.16	SC1,LT,C NA+	12A-NS_-3BE+6-3-3-3	41.721	154.416	78.994	0.5	0.5	0.5	130.04	1.39	2.263	2	2	M-16(8.8)	5.67	3.755	SC1,LT,C NA+	12A-NS_-3BE+6-3-3-3	66.24	1	1.75
32	SAE	45*45*5	235	83.09	Climb	39.71	-16.568	SC1,RT,C NA+	12A-NS_-3BE+6-3-3-3	41.721	154.416	78.994	0.5	0.5	0.5	130.04	1.39	2.263	2	2	M-16(8.8)	17.02	11.274	SC1,RT,C NA+	12A-NS_-3BE+6-3-3-3	66.24	1	1.75
33	SAE	45*45*5	235	83.09	Climb	78.48	-32.742	SC1,RM,C NA+	12A-NS_-3BE+6-3-3-3	41.721	154.416	78.994	0.5	0.5	0.5	130.04	1.39	2.263	2	2	M-16(8.8)	35.17	23.3	SC1,RM,C NA+	12A-NS_-3BE+6-3-3-3	66.24	1	1.75
34	SAE	45*45*5	235	83.09	Climb	65.17	-27.19	SC1,LB,C NA+	12A-NS_-3BE+6-3-3-3	41.721	154.416	78.994	0.5	0.5	0.5	130.04	1.39	2.263	2	2	M-16(8.8)	26.6	17.618	SC1,LB,C NA+	12A-NS_-3BE+6-3-3-3	66.24	1	1.75
35	SAE	65*65*5	355	45.35	Climb	11.64	-5.996	C6-,C BI-	12A-NS_+0BE+6-3+6+6	51.518	154.416	103.131	1	1	1	166.52	1.92	2.165	6	2	M-16(8.8)	3.32	3.424	C2,C BI+	12A-NS_+9BE+6+6+6-3	144.384	1	1.75
36	SAE	50*50*5	355	78.81	Comp	78.81	-27.206	C5-,C NA-	12A-NS_-3BE+6+6-3-3	34.52	154.416	103.131	1	1	1	156.2	2.04	1.531	5	2	M-16(8.8)	26.75	26.91	C5-,C NA-	12A-NS_-3BE+6+6-3-3	100.58	1	1.75
51	SAE	75*75*6	355	70.86	Comp	70.86	-104.417	SC1,EW,C NA+	12A-NS_+12BE-3+6+6+6	147.351	308.831	247.515	1	1	1	97.38	1.27	1.432	1	4	M-16(8.8)	59.24	98.014	SC1,EW,C NA+	12A-NS_+12BE-3+6+6+6	165.44	2	1.75
52	SAE	60*60*6	355	35.72	Tens	7.9	-8.044	SC1,RT,C NA+	12A-NS_+12BE+6+6-3-3	101.88	231.623	185.637	1.5	1	1	105.36	1.38	1.233	2	3	M-16(8.8)	35.72	40.423	SC1,LT,C NA+	12A-NS_+12BE+6+6-3+6	113.176	2	1.75
53	SAE	65*65*6	355	48.5	Comp	48.5	-67.279	SC1,LT,C NA+	12A-NS_-3BE_-3-3-3-3	138.719	231.623	185.637	1.5	1	1	85.5	1.2	1.086	2	3	M-16(8.8)	31.97	41.831	SC1,LT,C NA+	12A-NS_+12BE+6+6+6+6	130.848	2	1.75
54	SAE	60*60*6	355	55.54	Tens	16.27	-8.443	SC1,LM,C NA+	12A-NS_+12BE+6+6-3+6	51.886	231.623	185.637	1	1	1	152.69	2	1.786	5	3	M-16(8.8)	55.54	62.855	SC1,RT,C NA+	12A-NS_-3BE+6-3-3-3	113.176	2	1.75
55	SAE	75*75*7	355	86.02	Comp	86.02	-107.75	SC1,RM,C NA+	12A-NS_-3BE+6-3-3-3	125.256	231.623	216.576	1	1	1	116.45	1.52	1.689	5	3	M-16(8.8)	33.16	62.659	SC1,RM,C NA+	12A-NS_+12BE+6+6+6+6	188.94	2	1.75
56	SAE	60*60*6	355	48.45	Tens	12.68	-11.359	SC1,RB,C NA+	12A-NS_+9BE+6+6-3+6	89.562	231.623	185.637	1.5	1	1	113.6	1.49	1.329	5	3	M-16(8.8)	48.45	54.83	SC1,LM,C NA+	12A-NS_+9BE+6+6+6-3	113.176	2	1.75
57	SAE	70*70*6	355	48.74	Comp	48.74	-71.897	SC1,LB,C NA+	12A-NS_+0BE+6+6+6-3	147.514	231.623	185.637	1.5	1	1	87.16	1.22	1.194	2	3	M-16(8.8)	29.07	42.959	SC1,LB,C NA+	12A-NS_+0BE+6+6-3-3	147.768	2	1.75
58	DAE	80*80*8	355	12.87	Comp	12.87	-19.868	SC1,LT,C NA+	12A-NS_+12BE+6+6-3-3	655.961	154.416	330.021	2	2	2	16.53	0.85	0.2	3	2	M-16(8.8)	12.53	19.343	SC1,RT,C NA+	12A-NS_+12BE+6+6+6+6	579.04	2	1.75
59	DAE	80*80*8	355	12.72	Comp	12.72	-19.646	SC1,LM,C NA+	12A-NS_+12BE+6+6-3-3	655.961	154.416	330.021	2	2	2	16.53	0.85	0.2	3	2	M-16(8.8)	12.65	19.531	SC1,RM,C NA+	12A-NS_+12BE+6+6+6-3	579.04	2	1.75
60	DAE	80*80*8	355	12.96	Comp	12.96	-20.015	SC1,RB,C NA+	12A-NS_+0BE+6-3-3+6	655.961	154.416	330.021	2	2	2	16.53	0.85	0.2	3	2	M-16(8.8)	12.42	19.186	SC1,LB,C NA+	12A-NS_+9BE-3+6+6-3	579.04	2	1.75
61	DAE	70*70*6	355	4.86	Comp	4.86	-15.01	C5,C NA+	12A-NS_+12BE+6-3+6+6	392.479	308.831	541.44	2	2	2	30.52	0.97	0.325	3	4	M-16(8.8)	4.36	13.459	C5,C NA+	12A-NS_+12BE+6+6-3+6	374.496	2	1.75
101	SAE	130*130*10	355	96.31	Comp	96.31	-735.685	C5-,C NA-	12A-NS_-3BE-3-3+6+6	763.843	1235.324	825.051	1	1	1	39.84	0.52	1.02	1	8	M-16(8.8)	88.04	614.487	C5-,C NA-	12A-NS_-3BE+6+6-3-3	697.95	2.5	1.75
111	SAE	75*75*5	235	68.81	Comp	68.81	-27.498	C5-,C NA-	12A-NS_-3BE+6+6-3-3	39.964	154.416	78.994	3	2	2	177.16	1.9	1.329	8	2	M-16(8.8)	55.64	43.949	C5-,C NA-	12A-NS_-3BE+6+6-3+6	132.192	1	1.75
121	SAE	80*80*6	355	17.24	Climb	15.72	-17.657	C5,C NA+	12A-NS_-3BE-3+6+6-3	112.337	0	0	2	1	1	123.57	1.55	1.508	6	0	M-16(8.8)	4.81	13.523	C1-,C NA-	12A-NS_-3BE-3+6+6-3	280.872	1	1.75
122	SAE	80*80*6	355	51.88	Climb	41.77	-24.487	C2-,C BI-	12A-NS_-3BE-3+6+6+6	58.622	154.416	123.758	2	1	1	174.76	2.2	2.132	8	2	M-16(8.8)	19.33	23.92	C2,C BI+	12A-NS_-3BE-3+6+6+6	221.84	1	1.75
201	SAE	130*130*10	355	97.23	Comp	97.23	-676.235	C5-,C NA-	12A-NS_+0BE-3-3+6+6	695.518	1235.324	825.051	1	1	1	59.75	0.78	1.53	1	8	M-16(8.8)	81.74	570.511	C5-,C NA-	12A-NS_+0BE+6+6-3-3	697.95	2.5	1.75
202	SAE	130*130*10	355	90.45	Comp	90.45	-709.116	C5-,C NA-	12A-NS_+0BE-3-3+6+6	783.95	1235.324	825.051	1	1	1	29.88	0.39	0.765	1	8	M-16(8.8)	85.38	595.916	C5-,C NA-	12A-NS_+0BE+6+6-3-3	697.95	2.5	1.75
211	SAE	80*80*6	235	93.84	Comp	93.84	-62.168	C5,C NA+	12A-NS_+0BE+6-3+6+6	66.246	154.416	94.793	2	1.5	1.5	166.6	1.65	1.744	6	2	M-16(8.8)	65.41	62.002	C5-,C NA-	12A-NS_+0BE+6+6-3+6	169.92	1	1.75
221	SAE	65*65*5	355	68.74	Climb	55.62	-42.128	C6,C BI+	12A-NS_+0BE-3+6+6+6	75.745	154.416	103.131	1	1	1	124.14	1.56	1.614	6	2	M-16(8.8)	33.77	34.83	C2-,C BI-	12A-NS_+0BE-3+6+6+6	144.384	1	1.75
222	SAE	60*60*5	235	84.64	Climb	71.75	-24.003	C5-,C NA-	12A-NS_+9BE+6+6-3-3	33.454	154.416	78.994	1	1	1	195.08	1.85	2.282	6	2	M-16(8.8)	54.32	23.467	C2,C BI+	12A-NS_+0BE-3+6+6+6	63.216	1	1.75
223	SAE	65*65*5	235	47.21	Climb	40.28	-16.048	C5,C NA+	12A-NS_+0BE-3+6+6-3	39.841	154.416	78.994	2	1	1	152.28	1.76	1.508	8	2	M-16(8.8)	16.52	13.051	C1-,C NA-	12A-NS_+0BE-3+6+6-3	110.592	1	1.75
224	SAE	80*80*6	235	78.37	Climb	7.09	-3.556	C2-,C BI-	12A-NS_+0BE+0+0+0+0	50.149	154.416	94.793	2	1	1	174.76	1.92	2.132	8	2	M-16(8.8)	3.67	3.477	C2,C BI+	12A-NS_+0BE+0+0+0+0	169.92	1	1.75
231	DAE	50*50*5	355	51.07	Comp	51.07	-73.818	C6,C BI+	12A-NS_+0BE+6+6+6+6	144.533	308.831	206.263	1	1	1	104.21	1.36	1.574	1	2	M-16(8.8)	32	64.368	C6,C BI+	12A-NS_+0BE+6+6+6+6	201.16	2	1.75
232	SAE	65*65*5	355	86.18	Comp	86.18	-38.061	C2-,C BI-	12A-NS_+0BE-3+6+6+6	44.167	154.416	103.131	2	1	1	160.9	2.08	1.593	8	2	M-16(8.8)	41.19	42.484	C6,C BI+	12A-NS_+0BE-3+6+6+6	144.384	1	1.75
233	SAE	50*50*4	235	35.31	Comp	35.31	-6.256	C2-,C BI-	12A-NS_+0BE-3+6+6-3	17.718	77.208	34.56	1	1	1	196.49	2.09	1.926	7	1	M-16(8.8)	16.44	5.683	C2,C BI+	12A-NS_+0BE-3+6+6-3	38.88	1	1.75
234	SAE	65*65*4	355	88.4	Climb	44.33	-11.085	C2-,C BI-	12A-NS_+0BE-3-3+6+6	25.007	77.208	45.12	1	0.65	0.65	185.16	2.4	3.666	7	1	M-16(8.8)	24.21	10.923	C2-,C BI-	12A-NS_+0BE-3+6+6-3	74.824	1	1.75
301	SAE	130*130*10	355	97.06	Comp	97.06	-675.067	C5-,C NA-	12A-NS_+3BE-3-3+6+6	695.488	1235.324	825.051	1	1	1	59.76	0.78	1.53	1	8	M-16(8.8)	81.15	566.391	C5-,C NA-	12A-NS_+3BE+6+6-3-3	697.95	2.5	1.75
302	SAE	130*130*10	355	95.98	Comp	95.98	-752.454	C5-,C NA-	12A-NS_+3BE-3-3+6+6	783.95	1235.324	825.051	1	1	1	29.88	0.39	0.765	1	8	M-16(8.8)	90.1	628.875	C5-,C NA-	12A-NS_+3BE+6+6-3-3	697.95	2.5	1.75
311	SAE	70*70*5	355	86.58	Comp	86.58	-59.925	C5-,C NA-	12A-NS_+6BE-3-3+6+6	69.217	154.416	103.131	1.5	1	1	140.83	1.69	1.944	6	2	M-16(8.8)	56.09	57.846	C5-,C NA-	12A-NS_+6BE-3-3+6+6	158.484	1	1.75
321	SAE	65*65*5	355	41.79	Comp	41.79	-27.072	C6-,C BI-	12A-NS_+3BE+6-3+6+6	64.788	0	0	1	1	1	140.5	1.7	1.826	4	0	M-16(8.8)	19.31	19.918	C1,C NA+	12A-NS_+3BE+6+6+6+6	144.384	1	1.75
322	SAE	65*65*5	355	88.13	Climb	82.33	-26.225	C2,C BI+	12A-NS_+3BE-3+6+6+6	31.854	77.208	56.4	3	1	1	206.27	2.46	1.361	8	1	M-16(8.8)	46.06	25.979	C2-,C BI-	12A-NS_+3BE-3+6+6+6	92.684	1	1.75
323	SAE	65*65*5	235	47.21	Climb	40.51	-16.138	C5,C NA+	12A-NS_+3BE-3+6+6-3	39.841	154.416	78.994	2	1	1	152.28	1.76	1.508	8	2	M-16(8.8)	16.76	13.239	C2-,C BI-	12A-NS_+3BE-3-3+6+6	110.592	1	1.75
324	SAE	80*80*6	235	78.37	Climb	8.4	-4.212	C2-,C BI-	12A-NS_+3BE-3+6+6+6	50.15	154.416	94.793	2	1	1	174.75	1.92	2.132	8	2	M-16(8.8)	4.33	4.107	C2,C BI+	12A-NS_+3BE-3+6+6+6	169.92	1	1.75
331	DAE	50*50*5	355	71.54	Comp	71.54	-70.676	C1,C NA+	12A-NS_+3BE+6+6+6+6	98.792	308.831	206.263	1	1	1	115.06	1.69	1.737	8	2	M-16(8.8)	34.72	69.846	C1,C NA+	12A-NS_+3BE+6+6+6+6	201.16	2	1.75
332	SAE	60*60*5	355	75.43	Comp	75.43	-27.465	C2-,C BI-	12A-NS_+3BE-3+6+6+6	36.413	154.416	103.131	2	1	1	175.04	2.2	1.593	8	2	M-16(8.8)	31.22	32.196	C1,C NA+	12A-NS_+3BE+6+6+6-3	129.532	1	1.75
333	SAE	50*50*4	235	25.72	Comp																							

Group Label	Angle Type	Angle Size	Steel Strength (MPa)	Max Usage %	Usage Cont- rol	Max Use In Comp. %	Comp. Force (kN)	Comp. Control Load Case	Comp. Control Model	L/r Capacity (kN)	Comp. Connect. Shear Capacity (kN)	Comp. Connect. Bearing Capacity (kN)	RLX	RLY	RLZ	L/r	KL/r	Length Comp. Member (m)	Curve No.	No. Of Bolts Comp.	Bolt Type Comp.	Max Use In Tens. %	Tension Force (kN)	Tension Control Load Case	Tension Control Model	Net Section Capacity (kN)	No. Of Holes	Hole Diameter (cm)
502	SAE	130*130*11	355	90.5	Comp	90.5	-750.086	C5-,C NA-	12A-NS_+9BE-3-3+6+6	828.863	1235.324	907.557	1	1	1	45	0.59	1.147	1	8	M-16(8.8)	80.13	617.92	C5-,C NA-	12A-NS_+9BE+6+6-3-3	771.129	2.5	1.75
503	SAE	130*130*11	355	89.16	Comp	89.16	-771.498	C5-,C NA-	12A-NS_+9BE-3-3+6+6	865.251	1235.324	907.557	1	1	1	30	0.39	0.765	1	8	M-16(8.8)	81.75	630.401	C5-,C NA-	12A-NS_+9BE+6+6-3-3	771.129	2.5	1.75
511	SAE	75*75*5	235	96.19	Comp	96.19	-66.667	C5-,C NA-	12A-NS_+9BE-3-3+6+6	69.305	154.416	78.994	1.5	1	1	132.58	1.41	1.989	2	2	M-16(8.8)	74.91	59.173	C5-,C NA-	12A-NS_+9BE-3-3+6+6	132.192	1	1.75
512	SAE	110*110*6	235	56.99	Comp	56.99	-49.268	C6,C BI+	12A-NS_+9BE-3-3+6+6	86.453	154.416	94.793	2	1	1	173.44	1.67	2.983	6	2	M-16(8.8)	52.1	49.391	C6-,C BI-	12A-NS_+9BE-3-3+6+6	252	1	1.75
521	SAE	80*80*6	355	52.17	Comp	52.17	-48.527	C6-,C BI-	12A-NS_+9BE+6-3+6+6	93.014	154.416	123.758	1	1	1	143.42	1.72	2.252	6	2	M-16(8.8)	36.35	44.99	C2,C BI+	12A-NS_+9BE+6-3+6+6	221.84	1	1.75
522	SAE	80*80*6	355	82.31	Comp	82.31	-38.648	C2,C BI+	12A-NS_+9BE-3+6+6+6	46.952	77.208	67.68	3	1	1	206.35	2.47	1.678	8	1	M-16(8.8)	57.7	39.052	C2-,C BI-	12A-NS_+9BE-3+6+6+6	145.136	1	1.75
523	SAE	65*65*5	235	47.22	Climb	38.55	-15.357	C5,C NA+	12A-NS_+9BE-3+6+6-3	39.838	154.416	78.994	2	1	1	152.29	1.76	1.508	8	2	M-16(8.8)	15.87	12.538	C1-,C NA-	12A-NS_+9BE-3+6+6-3	110.592	1	1.75
524	SAE	80*80*6	235	78.38	Climb	13.6	-6.821	C2-,C BI-	12A-NS_+9BE-3+6+6+6	50.145	154.416	94.793	2	1	1	174.77	1.92	2.132	8	2	M-16(8.8)	7.05	6.685	C2,C BI+	12A-NS_+9BE-3+6+6+6	169.92	1	1.75
531	DAE	65*65*5	355	81.32	Comp	81.32	-106.062	C1,C NA+	12A-NS_+9BE+6+6+6+6	130.421	308.831	206.263	1	1	1	115.03	1.69	2.278	8	2	M-16(8.8)	48.44	99.917	C1,C NA+	12A-NS_+9BE+6+6+6+6	288.392	2	1.75
532	SAE	75*75*5	355	88.81	Comp	88.81	-53.683	C2,C BI+	12A-NS_+9BE+6+6+6+6	60.45	154.416	103.131	2	1	1	137.92	1.86	1.593	8	2	M-16(8.8)	52.89	54.551	C6-,C BI-	12A-NS_+9BE+6+6+6+6	172.584	1	1.75
533	SAE	50*50*4	235	21.59	Comp	21.59	-5.348	C6,C BI+	12A-NS_+9BE-3+6+6+6	24.766	77.208	34.56	1	1	1	164.5	1.75	1.612	7	1	M-16(8.8)	12.67	4.378	C2-,C BI-	12A-NS_+9BE-3+6+6+6	38.88	1	1.75
534	SAE	65*65*4	355	99.06	Climb	52.67	-11.332	C2-,C BI-	12A-NS_+9BE-3+6+6+6	21.514	77.208	45.12	1	0.58	0.58	203.14	2.6	4.022	7	1	M-16(8.8)	23.79	10.736	C2,C BI+	12A-NS_+9BE-3+6+6+6	74.824	1	1.75
601	SAE	130*130*10	355	94.08	Comp	94.08	-706.812	C5-,C NA-	12A-NS_+12BE-3-3+6+6	751.267	1235.324	825.051	1	1	1	44.82	0.59	1.147	1	8	M-16(8.8)	83.51	582.84	C5-,C NA-	12A-NS_+12BE+6+6-3-3	697.95	2.5	1.75
602	SAE	130*130*10	355	94.8	Comp	94.8	-712.227	C5-,C NA-	12A-NS_+12BE-3-3+6+6	751.267	1235.324	825.051	1	1	1	44.82	0.59	1.147	1	8	M-16(8.8)	83.12	580.124	C5-,C NA-	12A-NS_+12BE+6+6-3-3	697.95	2.5	1.75
603	SAE	130*130*11	355	92.74	Comp	92.74	-802.405	C5-,C NA-	12A-NS_+12BE-3-3+6+6	865.251	1235.324	907.557	1	1	1	30	0.39	0.765	1	8	M-16(8.8)	84.17	649.056	C5-,C NA-	12A-NS_+12BE+6+6-3-3	771.129	2.5	1.75
611	SAE	110*110*6	235	60.69	Comp	60.69	-43.224	C6,C BI+	12A-NS_+12BE-3-3+6+6	71.216	154.416	94.793	4	2	2	169.51	1.85	1.458	8	2	M-16(8.8)	43.2	40.946	C5-,C NA-	12A-NS_+12BE+6+6-3-3	252	1	1.75
612	SAE	80*80*6	235	93.38	Comp	93.38	-78.208	C6,C BI+	12A-NS_+12BE-3+6+6+6	83.752	154.416	94.793	2	1	1	137.38	1.45	1.676	6	2	M-16(8.8)	71.11	67.405	C2-,C BI-	12A-NS_+12BE-3+6+6+6	169.92	1	1.75
621	SAE	80*80*6	355	52.24	Climb	18.79	-10.075	C6-,C BI-	12A-NS_+12BE-3-3+6+6	53.609	0	0	2	1	1	175.85	2.3	2.145	4	0	M-16(8.8)	3.77	4.665	C2,C BI+	12A-NS_+12BE+6-3-3+6	221.84	1	1.75
622	SAE	70*70*5	355	66.25	Comp	66.25	-24.438	C2-,C BI-	12A-NS_+12BE-3+6+6+6	36.885	77.208	56.4	1	1	1	219.85	2.35	3.034	6	1	M-16(8.8)	44.77	25.253	C2,C BI+	12A-NS_+12BE-3+6+6+6	102.084	1	1.75
623	SAE	65*65*5	235	47.21	Climb	41.62	-16.582	C6,C BI+	12A-NS_+12BE-3+6+6-3	39.847	154.416	78.994	2	1	1	152.26	1.76	1.507	8	2	M-16(8.8)	18.02	14.238	C2-,C BI-	12A-NS_+12BE-3+6+6-3	110.592	1	1.75
624	SAE	80*80*6	235	78.36	Climb	9.41	-4.718	C2-,C BI-	12A-NS_+12BE-3+6+6+6	50.157	154.416	94.793	2	1	1	174.73	1.92	2.132	8	2	M-16(8.8)	5.04	4.773	C2,C BI+	12A-NS_+12BE-3+6+6+6	169.92	1	1.75
625	SAE	90*90*6	355	82.4	Comp	82.4	-87.88	C1,C NA+	12A-NS_+12BE+6+6+6+6	106.649	0	0	1	1	1	138.44	1.62	2.464	4	0	M-16(8.8)	70.44	87.171	C1,C NA+	12A-NS_+12BE+6+6+6+6	257.56	1	1.75
626	SAE	75*75*6	355	87.63	Comp	87.63	-30.813	C2,C BI+	12A-NS_+12BE-3+6+6+6	35.161	77.208	67.68	3	1	1	241.68	2.77	1.837	8	1	M-16(8.8)	49.65	33.603	C6-,C BI-	12A-NS_+12BE+6-3+6+6	133.856	1	1.75
631	DAE	75*75*5	355	84.14	Comp	84.14	-126.943	C1,C NA+	12A-NS_+12BE+6+6+6+6	150.878	308.831	206.263	1	1	1	113.02	1.65	2.611	8	2	M-16(8.8)	60.75	125.304	C1,C NA+	12A-NS_+12BE+6+6+6+6	346.296	2	1.75
632	SAE	80*80*6	355	88.01	Comp	88.01	-73.646	C1,C NA+	12A-NS_+12BE+6+6+6+6	83.679	154.416	123.758	2	1	1	130.55	1.82	1.593	8	2	M-16(8.8)	59.12	73.165	C1,C NA+	12A-NS_+12BE+6+6+6+6	221.84	1	1.75
633	SAE	50*50*4	235	16.78	Comp	16.78	-4.458	C6-,C BI-	12A-NS_+12BE-3-3+6+6	26.564	77.208	34.56	1	1	1	158.39	1.69	1.552	7	1	M-16(8.8)	9.58	3.31	C2-,C BI-	12A-NS_+12BE-3+6+6+6	38.88	1	1.75
634	SAE	65*65*5	355	83.71	Climb	36.6	-9.349	C2-,C BI-	12A-NS_+12BE-3+6+6+6	25.545	77.208	56.4	1	0.56	0.56	209.87	2.76	4.155	7	1	M-16(8.8)	15.03	8.479	C2,C BI+	12A-NS_+12BE-3+6+6+6	92.684	1	1.75
1000	SAE	130*130*11	355	93.62	Comp	93.62	-810.026	C5-,C NA-	12A-NS_+12BE-3-3+6+6	865.251	1235.324	907.557	1	1	1	30	0.39	0.765	1	8	M-16(8.8)	84.3	650.071	C5-,C NA-	12A-NS_+12BE+6+6-3-3	771.129	2.5	1.75
1001	SAE	130*130*11	355	77.6	Comp	77.6	-654.093	C6-,C BI-	12A-NS_+12BE-1.5-1.5-1.5-1.5	842.881	1235.324	907.557	1	1	1	40	0.52	1.02	1	8	M-16(8.8)	64.46	497.101	C6,C BI+	12A-NS_+12BE-1.5-1.5-1.5-1.5	771.129	2.5	1.75
1002	SAE	130*130*11	355	84.5	Comp	84.5	-647.708	C6,C BI+	12A-NS_+12BE+0+0+0+0	766.559	1235.324	907.557	1	1	1	59.99	0.79	1.53	1	8	M-16(8.8)	63.77	491.737	C6-,C BI-	12A-NS_+12BE+0+0+0+0	771.129	2.5	1.75
1003	SAE	130*130*11	355	84.3	Comp	84.3	-646.207	C5-,C NA-	12A-NS_+12BE+1.5+1.5+1.5+1.5	766.526	1235.324	907.557	1	1	1	59.99	0.79	1.53	1	8	M-16(8.8)	63.11	486.66	C6,C BI+	12A-NS_+12BE+1.5+1.5+1.5+1.5	771.129	2.5	1.75
1004	SAE	130*130*11	355	83.94	Comp	83.94	-643.442	C5-,C NA-	12A-NS_+12BE+3+3+3+3	766.526	1235.324	907.557	1	1	1	59.99	0.79	1.53	1	8	M-16(8.8)	62.41	481.256	C5-,C NA-	12A-NS_+12BE+3+3+3+3	771.129	2.5	1.75
1005	SAE	130*130*11	355	83.78	Comp	83.78	-642.226	C5-,C NA-	12A-NS_+12BE+4.5+4.5+4.5+4.5	766.526	1235.324	907.557	1	1	1	59.99	0.79	1.53	1	8	M-16(8.8)	61.88	477.2	C5-,C NA-	12A-NS_+12BE+4.5+4.5+4.5+4.5	771.129	2.5	1.75
1006	SAE	130*130*11	355	94.17	Comp	94.17	-721.824	C5,C NA+	12A-NS_+12BE+6+6-3+6	766.526	1235.324	907.557	1	1	1	59.99	0.79	1.53	1	8	M-16(8.8)	72.26	557.188	C5-,C NA-	12A-NS_+12BE+6+6-3+6	771.129	2.5	1.75
1010	SAE	75*75*6	355	88.35	Comp	88.35	-95.017	C2,C BI+	12A-NS_+12BE-3+6+6+6	107.546	231.623	185.637	1	1	1	121.28	1.53	1.783	6	3	M-16(8.8)	47.39	87.966	C2-,C BI-	12A-NS_+12BE-3+6+6+6	204.92	1	1.75
1011	SAE	75*75*6	355	38.33	Comp	38.33	-50.38	C1,C NA+	12A-NS_+12BE-1.5-1.5-1.5-1.5	131.441	231.623	185.637	1.5	1	1	103.95	1.37	1.528	2	3	M-16(8.8)	24.54	45.547	C1,C NA+	12A-NS_+12BE-1.5-1.5-1.5-1.5	204.92	1	1.75
1012	SAE	80*80*6	355	56.81	Comp	56.81	-63.673	C1,C NA+	12A-NS_+12BE+0+0+0+0	112.085	231.623	185.637	1.5	1	1	123.8	1.55	1.944	6	3	M-16(8.8)	32.08	59.551	C1,C NA+	12A-NS_+12BE+0+0+0+0	221.84	1	1.75
1013	SAE	75*75*6	355	76.81	Comp	76.81	-81.825	C1,C NA+	12A-NS_+12BE+1.5+1.5+1.5+1.5	106.522	231.623	185.637	1.5	1	1	122.24	1.54	1.797	6	3	M-16(8.8)	42.21	78.362	C1,C NA+	12A-NS_+12BE+1.5+1.5+1.5+1.5	204.92	1	1.75
1014	SAE	80*80*6	355	72.18	Comp	72.18	-93.396	C1,C NA+	12A-NS_+12BE+3+3+3+3	129.401	231.623	185.637	1.5	1	1	109.59	1.43	1.721	4	3	M-16(8.8)	54.49	101.158	C1,C NA+	12A-NS_+12BE+3+3+3+3	221.84	1	1.75
1015	SAE	80*80*6	355	84.72	Comp	84.72	-114.529	C1,C NA+	12A-NS_+12BE+4.5+4.5+4.5+4.5	135.19	231.623	185.637	1	1	1	106.71	1.4	1.675	1	3	M-16(8.8)	65.77	122.095	C1,C NA+	12A-NS_+12BE+4.5+4.5+4.5+4.5	221.84	1	1.75
1016	SAE	90*90*6	355	83.61	Comp	83.61	-155.202	C1,C NA+	12A-NS_+12BE+6+6+6+6	260.651	231.623	185.637	1	1	1	61.65	0.9	1.097	2									

Group Label	Angle Type	Angle Size	Steel Strength (MPa)	Max Usage %	Usage Cont-rol	Max Use In Comp. %	Comp. Force (kN)	Comp. Control Load Case	Comp. Control Model	L/r Capacity (kN)	Comp. Connect. Shear Capacity (kN)	Comp. Connect. Bearing Capacity (kN)	RLX	RLY	RLZ	L/r	KL/r	Length Comp. Member (m)	Curve No.	No. Of Bolts Comp.	Bolt Type Comp.	Max Use In Tens. %	Tension Force (kN)	Tension Control Load Case	Tension Control Model	Net Section Capacity (kN)	No. Of Holes	Hole Diameter (cm)
R7	SAE	45*45*4	235	25.85	Comp	25.85	-2.957	C4-,C BI-	12A-NS_+12BE+6-3+6+6	11.439	77.208	34.56	1	1	1	233.23	2.48	2.052	7	1	M-16(8.8)	0	0		12A-NS_-3BE+6+6+6+6	33.12	1	1.75
R8	SAE	45*45*4	235	7.74	Redun	7.74	-2.518	C1,C NA+	12A-NS_-3BE+6-3-3-3	32.551	77.208	34.56	1	1	1	132.58	1.42	1.167	3	1	M-16(8.8)	7.6	2.518	C1,C NA+	12A-NS_-3BE+6-3-3-3	33.12	1	1.75
R9	SAE	45*45*4	355	91.99	Climb	30.81	-4.672	C4,C BI+	12A-NS_+12BE+6+6+6+6	15.163	77.208	45.12	1	1	1	203.01	2.66	1.786	7	1	M-16(8.8)	0	0		12A-NS_-3BE+6+6+6+6	43.24	1	1.75
R10	SAE	45*45*4	235	5.96	Redun	5.71	-1.974	C1,C NA+	12A-NS_-3BE+6-3-3-3	53.694	77.208	34.56	1	1	1	66.29	1.01	0.583	3	1	M-16(8.8)	5.96	1.974	C1,C NA+	12A-NS_-3BE+6-3-3-3	33.12	1	1.75
R11	SAE	45*45*4	355	97.71	Climb	23.69	-2.905	C3-,C NA-	12A-NS_+9BE+6-3+6+6	12.261	77.208	45.12	1	1	1	226.44	2.96	1.993	7	1	M-16(8.8)	0	0		12A-NS_-3BE+6+6+6+6	43.24	1	1.75
R12	SAE	45*45*4	235	4.74	Redun	4.54	-1.569	C1,C NA+	12A-NS_+0BE+6+6-3-3	43.375	77.208	34.56	1	1	1	99.43	1.19	0.875	3	1	M-16(8.8)	4.74	1.569	C1,C NA+	12A-NS_+0BE+6+6-3-3	33.12	1	1.75
R13	SAE	45*45*5	235	73.82	Climb	2.65	-1.211	SC1,LT,C NA+	12A-NS_+12BE+6+6-3+6	45.625	154.416	78.994	0.572	0.572	0.572	121.82	1.31	1.855	2	2	M-16(8.8)	4.26	2.821	SC1,LT,C NA+	12A-NS_-3BE-3+6+6+6	66.24	1	1.75
R13B	SAE	45*45*5	235	64.26	Climb	9.61	-3.422	C3-,C NA-	12A-NS_-3BE_-3-3-3-3	35.612	154.416	78.994	0.6	1	0.6	116.54	1.52	1.573	3	2	M-16(8.8)	3.21	2.127	SC1,RT,C NA+	12A-NS_+12BE+6+6+6-3	66.24	1	1.75
R13D	SAE	45*45*5	235	59.8	Climb	9.47	-5.257	SC1,RT,C NA+	12A-NS_+12BE+6+6+6+6	55.521	154.416	78.994	0.667	0.667	0.667	103.94	1.16	1.356	2	2	M-16(8.8)	18.71	12.396	SC1,RT,C NA+	12A-NS_-3BE-3-3-3+6	66.24	1	1.75
R14	SAE	45*45*5	235	73.78	Climb	11.7	-5.712	SC1,LT,C NA+	12A-NS_-3BE+6-3-3-3	48.841	154.416	78.994	0.572	0.572	0.572	115.63	1.26	1.76	2	2	M-16(8.8)	6.99	4.633	SC1,LT,C NA+	12A-NS_+12BE+6+6+6+6	66.24	1	1.75
R14B	SAE	45*45*5	235	64.21	Climb	13.83	-7.943	SC1,LT,C NA+	12A-NS_+12BE+6+6+6+6	57.435	154.416	78.994	0.6	0.6	0.6	100.78	1.13	1.461	2	2	M-16(8.8)	14.8	9.804	SC1,LT,C NA+	12A-NS_-3BE+6-3-3-3	66.24	1	1.75
R14D	SAE	45*45*5	235	59.74	Climb	39.07	-24.121	SC1,LT,C NA+	12A-NS_-3BE+6-3-3-3	61.742	154.416	78.994	0.667	0.667	0.667	93.82	1.07	1.224	2	2	M-16(8.8)	28.36	18.784	SC1,LT,C NA+	12A-NS_+12BE+6+6+6+6	66.24	1	1.75
R15	SAE	45*45*5	235	91.82	Climb	6.92	-2.431	SC1,LM,C NA+	12A-NS_+12BE+6+6-3+6	35.149	154.416	78.994	0.571	0.571	0.571	148.49	1.53	2.261	6	2	M-16(8.8)	3.46	2.295	SC1,LM,C NA+	12A-NS_+12BE+6+6-3+6	66.24	1	1.75
R16	SAE	45*45*5	235	63.68	Climb	4.79	-2.687	SC1,LM,C NA+	12A-NS_+12BE+6+6-3+6	56.064	154.416	78.994	0.563	0.563	0.563	103.04	1.15	1.594	2	2	M-16(8.8)	5.05	3.348	SC1,LM,C NA+	12A-NS_-3BE+6-3-3-3	66.24	1	1.75
R17	SAE	45*45*5	235	58.65	Climb	9.65	-5.843	SC1,LM,C NA+	12A-NS_-3BE+6-3-3-3	60.568	154.416	78.994	0.583	0.583	0.583	95.71	1.09	1.428	2	2	M-16(8.8)	5.56	3.684	SC1,LM,C NA+	12A-NS_+12BE+6+6-3+6	66.24	1	1.75
R18	SAE	45*45*5	235	56.67	Climb	11.08	-6.88	SC1,LM,C NA+	12A-NS_+12BE+6+6-3+6	62.071	154.416	78.994	0.625	0.625	0.625	93.3	1.06	1.299	2	2	M-16(8.8)	19.51	12.926	SC1,LM,C NA+	12A-NS_-3BE+6-3-3-3	66.24	1	1.75
R19	SAE	45*45*5	235	91.78	Climb	17.7	-6.481	SC1,RM,C NA+	12A-NS_+12BE+6+6-3+6	36.623	154.416	78.994	0.571	0.571	0.571	143.46	1.49	2.184	6	2	M-16(8.8)	9.29	6.155	SC1,RM,C NA+	12A-NS_+12BE+6+6+6-3	66.24	1	1.75
R20	SAE	45*45*5	235	63.66	Climb	14.17	-8.211	SC1,RM,C NA+	12A-NS_+12BE+6+6-3-3	57.964	154.416	78.994	0.563	0.563	0.563	99.92	1.12	1.545	2	2	M-16(8.8)	11.82	7.832	SC1,RM,C NA+	12A-NS_+12BE+6+6+6-3	66.24	1	1.75
R21	SAE	45*45*5	235	58.63	Climb	19.52	-12.259	SC1,RM,C NA+	12A-NS_+12BE+6+6+6-3	62.817	154.416	78.994	0.583	0.583	0.583	92.1	1.05	1.374	2	2	M-16(8.8)	20.7	13.715	SC1,RM,C NA+	12A-NS_-3BE+6-3-3-3	66.24	1	1.75
R22	SAE	45*45*5	235	56.65	Climb	43.89	-28.41	SC1,RM,C NA+	12A-NS_-3BE+6-3-3-3	64.729	154.416	78.994	0.625	0.625	0.625	89.01	1.03	1.239	2	2	M-16(8.8)	35.01	23.189	SC1,RM,C NA+	12A-NS_+12BE+6+6+6+6	66.24	1	1.75
R23	SAE	45*45*5	235	76.74	Climb	3.23	-1.408	SC1,RB,C NA+	12A-NS_+9BE+6+6-3+6	43.531	154.416	78.994	0.572	0.572	0.572	126.12	1.35	1.92	2	2	M-16(8.8)	5.71	3.782	SC1,LM,C NA+	12A-NS_+9BE+6+6+6-3	66.24	1	1.75
R24	SAE	45*45*5	235	67.9	Climb	13.04	-6.499	SC1,LM,C NA+	12A-NS_+9BE+6+6+6-3	49.855	154.416	78.994	0.6	0.6	0.6	113.77	1.24	1.65	2	2	M-16(8.8)	3.94	2.608	SC1,RB,C NA+	12A-NS_+9BE+6+6-3+6	66.24	1	1.75
R25	SAE	45*45*5	235	64.58	Climb	12.63	-6.516	SC1,RB,C NA+	12A-NS_+9BE+6+6-3+6	51.571	154.416	78.994	0.667	0.667	0.667	110.7	1.22	1.445	2	2	M-16(8.8)	25.33	16.775	SC1,LM,C NA+	12A-NS_+9BE+6+6+6-3	66.24	1	1.75
R26	SAE	45*45*5	235	76.7	Climb	12.13	-5.639	SC1,RB,C NA+	12A-NS_+0BE+6+6-3-3	46.469	154.416	78.994	0.572	0.572	0.572	120.15	1.3	1.829	2	2	M-16(8.8)	6.72	4.452	SC1,RB,C NA+	12A-NS_+0BE+6-3-3+6	66.24	1	1.75
R26B	SAE	45*45*5	235	67.85	Climb	14.88	-8.042	SC1,LB,C NA+	12A-NS_+0BE+3+6+6-3	54.037	154.416	78.994	0.6	0.6	0.6	106.43	1.18	1.543	2	2	M-16(8.8)	15.15	10.038	SC1,LB,C NA+	12A-NS_+0BE+6+6-3-3	66.24	1	1.75
R26D	SAE	45*45*5	235	64.52	Climb	43.8	-25.028	SC1,LB,C NA+	12A-NS_+0BE+6+6-3-3	57.143	154.416	78.994	0.667	0.667	0.667	101.26	1.13	1.321	2	2	M-16(8.8)	28.87	19.123	SC1,LB,C NA+	12A-NS_+0BE+6+6+6-3	66.24	1	1.75
R28	SAE	45*45*4	235	65.27	Climb	3.16	-1.092	C5-,C NA-	12A-NS_+12BE+6+6-3+6	46.66	77.208	34.56	1	1	1	90.91	1.13	0.8	3	1	M-16(8.8)	3.05	1.011	C5-,C NA-	12A-NS_+12BE+6-3+6+6	33.12	1	1.75
R29	SAE	45*45*4	235	65.27	Climb	9.95	-3.439	SC1,EW,C NA+	12A-NS_-3BE-3+6+6+6	46.66	77.208	34.56	1	1	1	90.91	1.13	0.8	3	1	M-16(8.8)	8.48	2.808	SC1,EW,C NA+	12A-NS_+12BE+6-3+6+6	33.12	1	1.75
R30	SAE	45*45*4	235	65.27	Climb	7.11	-2.458	SC1,EW,C NA+	12A-NS_-3BE-3+6+6-3	46.66	77.208	34.56	1	1	1	90.91	1.13	0.8	3	1	M-16(8.8)	11.26	3.728	SC1,EW,C NA+	12A-NS_+12BE-3+6+6+6	33.12	1	1.75
R31	SAE	45*45*4	235	65.27	Climb	12.34	-4.264	C6-,C BI-	12A-NS_+12BE+6-3-3-3	46.66	77.208	34.56	1	1	1	90.91	1.13	0.8	3	1	M-16(8.8)	22.79	7.547	SC1,EW,C NA+	12A-NS_-3BE+6-3-3+6	33.12	1	1.75
R32	SAE	45*45*4	235	65.27	Climb	13.06	-4.513	C5-,C NA-	12A-NS_+0BE+6+6-3+6	46.66	77.208	34.56	1	1	1	90.91	1.13	0.8	3	1	M-16(8.8)	10.05	3.329	C5-,C NA+	12A-NS_+0BE+6-3+6+6	33.12	1	1.75
R33	SAE	45*45*4	235	75.95	Climb	34.82	-12.034	C5-,C NA-	12A-NS_+9BE+6-3-3+6	40.729	77.208	34.56	1	1	1	106.66	1.24	0.939	3	1	M-16(8.8)	46.72	15.472	C5-,C NA+	12A-NS_+9BE+6-3-3+6	33.12	1	1.75
R34	SAE	45*45*4	355	66.08	Climb	45.17	-14.028	C5-,C NA-	12A-NS_+0BE+6-3+6+6	31.06	77.208	45.12	1	1	1	139.53	1.83	1.228	7	1	M-16(8.8)	35.54	15.368	C5-,C NA+	12A-NS_+0BE+6-3+6+6	43.24	1	1.75
R35	SAE	45*45*4	355	84.77	Climb	43.41	-8.489	C5-,C NA-	12A-NS_+9BE+6+6-3+6	19.556	77.208	45.12	1	1	1	177.96	2.33	1.566	7	1	M-16(8.8)	18.86	8.154	C5-,C NA-	12A-NS_-3BE-3-3+6+6	43.24	1	1.75
R36	SAE	45*45*4	235	86.2	Comp	86.2	-10.434	C5-,C NA+	12A-NS_+9BE+6-3+6+6	12.105	77.208	34.56	1	1	1	226.48	2.41	1.993	7	1	M-16(8.8)	26.83	8.886	C5-,C NA-	12A-NS_-3BE+6+6-3-3	33.12	1	1.75
R37	SAE	45*45*4	235	88.53	Climb	26.71	-9.232	C5-,C NA-	12A-NS_-3BE+6+6-3-3	35.327	77.208	34.56	1	1	1	123	1.35	1.082	3	1	M-16(8.8)	31.29	10.364	C5-,C NA+	12A-NS_+9BE+6-3+6+6	33.12	1	1.75
R38	SAE	45*45*4	355	83.21	Climb	1.75	-0.357	C2,C BI+	12A-NS_+12BE+6+6-3-3	20.432	77.208	45.12	1	1	1	173.95	2.28	1.531	7	1	M-16(8.8)	2.2	0.952	C6-,C BI-	12A-NS_+9BE-3+6+6-3	43.24	1	1.75
R39	SAE	50*50*4	355	94.97	Climb	9.83	-1.41	C5-,C NA-	12A-NS_+0BE+6+6+6+6	14.343	77.208	45.12	1	1	1	220.9	2.89	2.165	7	1	M-16(8.8)	3.08	1.39	C5-,C NA+	12A-NS_+9BE+6-3-3+6	50.76	1	1.75
R40	SAE	45*45*4	235	88.58	Comp	88.58	-13.809	C5-,C NA+	12A-NS_+0BE+6+6-3+6	15.589	77.208	34.56	1	1	1	198.52	2.11	1.747	7	1	M-16(8.8)	38.83	12.86	C5-,C NA-	12A-NS_+0BE+6-3+6+6	33.12	1	1.75
R41	SAE	45*45*4	235	88.53	Climb	43.02	-14.867	C5-,C NA-	12A-NS_+0BE+6-3+6+6	35.327	77.208	34.56	1	1	1	123	1.35	1.082	3	1	M-16(8.8)	50.75	16.809	C5-,C NA+	12A-NS_+0BE+6+6-3+6	33.12	1	1.75
R42	SAE	45*45*4	235	11.91	Comp	11.91	-1.441	C6,C BI+	12A-NS_+12BE+6-3-3-3	12.105	77.208	34.56	1	1	1	226.48	2.41	1.993	7	1	M-16(8.8)	2.84	0.94	C2-,C BI-	12A-NS_+12BE+6-3-3-3	33.12	1	1.75
R43	SAE	45*45*4	355	83.21	Climb	3.63	-0.742	C2,C BI+	12A																			

Group Label	Angle Type	Angle Size	Steel Strength (MPa)	Max Usage %	Usage Cont- rol	Max Use In Comp. %	Comp. Force (kN)	Comp. Control Load Case	Comp. Control Model	L/r Capacity (kN)	Comp. Connect. Shear Capacity (kN)	Comp. Connect. Bearing Capacity (kN)	RLX	RLY	RLZ	L/r	KL/r	Length Comp. Member (m)	Curve No.	No. Of Bolts Comp.	Bolt Type Comp.	Max Use In Tens. %	Tension Force (kN)	Tension Control Load Case	Tension Control Model	Net Section Capacity (kN)	No. Of Holes	Hole Diameter (cm)
R54	SAE	45*45*4	355	87.79	Climb	65.78	-12.139	C2,C BI+	12A-NS_+0BE-3-3+6+6	18.455	77.208	45.12	1	1	1	183.4	2.4	1.614	7	1	M-16(8.8)	27.88	12.054	C2-,C BI-	12A-NS_+0BE-3-3+6+6	43.24	1	1.75
R55	SAE	55*55*4	355	82.95	Climb	24.56	-4.176	C1,C NA+	12A-NS_+0BE-3+6+6-3	17.005	77.208	45.12	1	1	1	213.31	2.78	2.282	7	1	M-16(8.8)	11.53	5.201	C5-,C NA-	12A-NS_+9BE+6+6-3-3	59.032	1	1.75
R55A	SAE	65*65*4	355	84.83	Climb	51.32	-7.714	C1-,C NA-	12A-NS_+0BE-3+6+6-3	15.03	77.208	45.12	1	1	1	248.29	3.12	3.228	7	1	M-16(8.8)	17.51	7.899	C1,C NA+	12A-NS_+0BE-3+6+6-3	74.824	1	1.75
R56	SAE	45*45*4	355	88.11	Climb	56.7	-8.632	C6,C BI+	12A-NS_+0BE-3+6+6+6	15.224	77.208	45.12	1	1	1	202.59	2.65	1.783	7	1	M-16(8.8)	13.99	6.05	C6-,C BI-	12A-NS_+0BE-3-3+6+6	43.24	1	1.75
R56A	SAE	45*45*4	355	85.08	Redun	85.08	-17.902	C1,C NA+	12A-NS_+0BE-3-3+6+6	21.04	77.208	45.12	1	1	1	171.31	2.24	1.508	7	1	M-16(8.8)	41.4	17.902	C1,C NA+	12A-NS_+0BE-3-3+6+6	43.24	1	1.75
R57	SAE	60*60*4	355	71.2	Redun	71.2	-18.22	C1,C NA+	12A-NS_+0BE-3-3+6+6	25.588	77.208	45.12	1	1	1	180.68	2.31	2.132	7	1	M-16(8.8)	40.38	18.22	C1,C NA+	12A-NS_+0BE-3-3+6+6	66.552	1	1.75
R58	SAE	50*50*4	235	44.46	Redun	44.46	-5.637	C1,C NA+	12A-NS_+3BE-3-3+6+6	12.679	77.208	34.56	1	1	1	233.9	2.49	2.292	7	1	M-16(8.8)	16.31	5.637	C1,C NA+	12A-NS_+3BE-3-3+6+6	38.88	1	1.75
R59	SAE	45*45*4	235	12.8	Redun	12.8	-2.526	C1,C NA+	12A-NS_+3BE-3-3+6+6	19.734	77.208	34.56	1	1	1	175.28	1.87	1.542	7	1	M-16(8.8)	7.63	2.526	C1,C NA+	12A-NS_+3BE-3-3+6+6	33.12	1	1.75
R60	SAE	50*50*4	355	88.05	Climb	13.59	-2.252	C5-,C NA-	12A-NS_+6BE+6-3+6+6	16.566	77.208	45.12	1	1	1	205.11	2.68	2.01	7	1	M-16(8.8)	5.5	2.48	C5,C NA+	12A-NS_+6BE+6+6-3+6	50.76	1	1.75
R61	SAE	45*45*4	235	84.83	Comp	84.83	-13.778	C5,C NA-	12A-NS_+6BE+6-3-3+6	16.242	77.208	34.56	1	1	1	194.29	2.07	1.71	7	1	M-16(8.8)	37.88	12.545	C5-,C NA-	12A-NS_+6BE+6-3+6+6	33.12	1	1.75
R62	SAE	45*45*4	235	82.15	Climb	36.37	-12.569	C5-,C NA-	12A-NS_+6BE+6-3-3+6	38.128	77.208	34.56	1	1	1	114.21	1.29	1.005	3	1	M-16(8.8)	44.74	14.817	C5,C NA+	12A-NS_+6BE+6-3-3+6	33.12	1	1.75
R63	SAE	60*60*4	235	18.53	Comp	18.53	-2.558	C6,C BI+	12A-NS_+12BE+6-3-3-3	13.807	77.208	34.56	1	1	1	247.08	2.63	2.916	7	1	M-16(8.8)	6.33	2.187	C2-,C BI-	12A-NS_+12BE+6+6-3-3	50.976	1	1.75
R64	SAE	50*50*4	355	93.5	Climb	10.17	-1.503	C2,C BI+	12A-NS_+12BE+6-3-3-3	14.775	77.208	45.12	1	1	1	217.56	2.85	2.132	7	1	M-16(8.8)	3.38	1.527	C2,C BI+	12A-NS_+12BE-3-3+6+6	50.76	1	1.75
R65	SAE	50*50*4	355	85.89	Redun	85.89	-19.185	C1,C NA+	12A-NS_+3BE-3-3+6+6	22.336	77.208	45.12	1	1	1	175.72	2.3	1.722	7	1	M-16(8.8)	42.52	19.185	C1,C NA+	12A-NS_+3BE-3-3+6+6	50.76	1	1.75
R66	SAE	45*45*4	235	70.28	Climb	18.47	-6.382	C1,C NA+	12A-NS_+3BE-3+6+6-3	43.975	77.208	34.56	1	1	1	97.84	1.18	0.861	3	1	M-16(8.8)	16.94	5.609	C1-,C NA-	12A-NS_+3BE-3+6+6-3	33.12	1	1.75
R67	SAE	55*55*4	355	88.65	Climb	87.14	-13.061	C1,C NA+	12A-NS_+3BE-3+6+6-3	14.988	77.208	45.12	1	1	1	227.6	2.96	2.435	7	1	M-16(8.8)	25.36	11.44	C1-,C NA-	12A-NS_+3BE-3+6+6-3	59.032	1	1.75
R68	SAE	45*45*4	355	88.11	Climb	57.53	-8.759	C5,C NA+	12A-NS_+3BE+6-3-3+6	15.224	77.208	45.12	1	1	1	202.59	2.65	1.783	7	1	M-16(8.8)	13.43	5.807	C6-,C BI-	12A-NS_+3BE-3-3+6+6	43.24	1	1.75
R68A	SAE	45*45*4	355	90.28	Redun	90.28	-18.996	C1,C NA+	12A-NS_+3BE-3-3+6+6	21.04	77.208	45.12	1	1	1	171.31	2.24	1.508	7	1	M-16(8.8)	43.93	18.996	C1,C NA+	12A-NS_+3BE-3-3+6+6	43.24	1	1.75
R69	SAE	60*60*4	235	97.48	Climb	3.3	-0.83	C2-,C BI-	12A-NS_+3BE-3-3+6-3	25.155	77.208	34.56	1	1	1	180.68	1.92	2.132	7	1	M-16(8.8)	2.77	0.956	C2,C BI+	12A-NS_+3BE-3-3+6-3	50.976	1	1.75
R70	SAE	60*60*4	235	58.44	Comp	58.44	-18.464	C5-,C NA-	12A-NS_+6BE-3-3+6+6	31.596	77.208	34.56	2	1	1	142.28	1.7	1.302	7	1	M-16(8.8)	52.75	18.231	C5-,C NA-	12A-NS_+6BE+6+6-3-3	50.976	1	1.75
R71	SAE	45*45*4	355	73.78	Climb	50.63	-12.979	C5-,C NA-	12A-NS_+6BE+6-3+6+6	25.635	77.208	45.12	1	1	1	154.47	2.02	1.359	7	1	M-16(8.8)	35.36	15.29	C5,C NA+	12A-NS_+6BE+6-3-3+6	43.24	1	1.75
R71A	SAE	45*45*4	235	31.46	Tens	27.15	-9.03	C5-,C NA-	12A-NS_+6BE-3-3+6+6	33.26	77.208	34.56	1	1	1	130.04	1.4	1.144	3	1	M-16(8.8)	31.46	10.418	C5-,C NA-	12A-NS_+6BE+6+6-3-3	33.12	1	1.75
R71B	SAE	45*45*4	235	55.39	Climb	32.45	-11.215	C5-,C NA-	12A-NS_+6BE+6+6-3-3	50.882	77.208	34.56	1	1	1	77.24	1.06	0.68	3	1	M-16(8.8)	31.02	10.274	C5-,C NA-	12A-NS_+6BE-3-3+6+6	33.12	1	1.75
R72	SAE	55*55*4	355	81.68	Redun	81.68	-19.358	C1,C NA+	12A-NS_+6BE-3-3+6+6	23.701	77.208	45.12	1	1	1	179.67	2.34	1.922	7	1	M-16(8.8)	42.9	19.358	C1,C NA+	12A-NS_+6BE-3-3+6+6	59.032	1	1.75
R73	SAE	45*45*4	235	78.53	Climb	19.52	-6.747	C5,C NA+	12A-NS_+6BE-3+6+6-3	39.824	77.208	34.56	1	1	1	109.23	1.26	0.961	3	1	M-16(8.8)	17.79	5.893	C2-,C BI-	12A-NS_+6BE-3+6+6-3	33.12	1	1.75
R74	SAE	60*60*4	355	86.32	Comp	86.32	-13.793	C5,C NA+	12A-NS_+6BE-3+6+6-3	15.979	77.208	45.12	1	1	1	230.4	2.95	2.719	7	1	M-16(8.8)	25.67	11.584	C1-,C NA-	12A-NS_+6BE-3+6+6-3	66.552	1	1.75
R75	SAE	45*45*4	355	88.12	Climb	49.06	-7.467	C6,C BI+	12A-NS_+6BE-3+6+6+6	15.221	77.208	45.12	1	1	1	202.61	2.65	1.783	7	1	M-16(8.8)	12.15	5.254	C6-,C BI-	12A-NS_+6BE-3-3+6+6	43.24	1	1.75
R76	SAE	45*45*4	355	91.12	Redun	91.12	-19.167	C1,C NA+	12A-NS_+6BE-3-3+6+6	21.035	77.208	45.12	1	1	1	171.34	2.24	1.508	7	1	M-16(8.8)	44.33	19.167	C1,C NA+	12A-NS_+6BE-3-3+6+6	43.24	1	1.75
R77	SAE	60*60*4	235	97.5	Climb	3.13	-0.787	C2-,C BI-	12A-NS_+6BE-3-3+6-3	25.148	77.208	34.56	1	1	1	180.7	1.92	2.132	7	1	M-16(8.8)	2.65	0.916	C2,C BI+	12A-NS_+6BE-3-3+6-3	50.976	1	1.75
R78	SAE	50*50*4	235	47.14	Redun	47.14	-5.589	C1,C NA+	12A-NS_+9BE-3-3+6+6	11.857	77.208	34.56	1	1	1	242.14	2.58	2.373	7	1	M-16(8.8)	16.17	5.589	C1,C NA+	12A-NS_+9BE-3-3+6+6	38.88	1	1.75
R79	SAE	45*45*4	235	16.62	Comp	16.62	-3.252	C6,C BI+	12A-NS_+9BE+6-3+6+6	19.566	77.208	34.56	1	1	1	176.08	1.87	1.55	7	1	M-16(8.8)	10.42	3.45	C6-,C BI-	12A-NS_+9BE+6-3-3+6	33.12	1	1.75
R80	SAE	50*50*4	355	94.39	Climb	17.04	-2.473	C5-,C NA-	12A-NS_+9BE+6-3+6+6	14.512	77.208	45.12	1	1	1	219.58	2.87	2.152	7	1	M-16(8.8)	8.54	3.853	C5,C NA+	12A-NS_+9BE+6+6-3+6	50.76	1	1.75
R81	SAE	45*45*4	235	95.05	Comp	95.05	-14.87	C5,C NA+	12A-NS_+9BE+6-3-3+6	15.644	77.208	34.56	1	1	1	198.15	2.11	1.744	7	1	M-16(8.8)	40.7	13.479	C5-,C NA-	12A-NS_+9BE+6-3+6+6	33.12	1	1.75
R82	SAE	45*45*4	235	87.99	Climb	39.88	-13.783	C5-,C NA-	12A-NS_+9BE+6-3+6+6	35.553	77.208	34.56	1	1	1	122.26	1.35	1.076	3	1	M-16(8.8)	49.23	16.304	C5,C NA+	12A-NS_+9BE+6-3-3+6	33.12	1	1.75
R83	SAE	65*65*4	235	26.18	Comp	26.18	-4.54	C5,C NA+	12A-NS_+9BE-3+6-3-3	17.344	77.208	34.56	1	1	1	229.48	2.43	2.983	7	1	M-16(8.8)	14.34	4.957	C6,C BI+	12A-NS_+9BE-3+6+6+6	57.312	1	1.75
R84	SAE	55*55*4	355	82.95	Climb	30.4	-5.169	C2-,C BI-	12A-NS_+9BE-3-3+6-3	17.005	77.208	45.12	1	1	1	213.31	2.78	2.282	7	1	M-16(8.8)	11.06	4.992	C2,C BI+	12A-NS_+9BE-3-3+6-3	59.032	1	1.75
R85	SAE	50*50*4	235	85.68	Comp	85.68	-11.065	C6,C BI+	12A-NS_+9BE-3-3+6+6	12.914	77.208	34.56	2	1	1	225.72	2.47	1.716	7	1	M-16(8.8)	31.29	10.812	C6-,C BI-	12A-NS_+9BE-3-3+6+6	38.88	1	1.75
R86	SAE	50*50*4	355	98.86	Climb	53.67	-7.129	C5-,C NA-	12A-NS_+9BE+6+6-3+6	13.285	77.208	45.12	1	1	1	229.76	3.01	2.252	7	1	M-16(8.8)	15.98	7.211	C5,C NA+	12A-NS_+9BE+6-3-3+6	50.76	1	1.75
R87	SAE	50*50*4	235	89.05	Comp	89.05	-19.636	C5,C NA+	12A-NS_+9BE+6+6-3+6	22.05	77.208	34.56	1	1	1	175.05	1.86	1.716	7	1	M-16(8.8)	42.63	14.733	C5-,C NA-	12A-NS_+9BE+6+6-3+6	38.88	1	1.75
R88	SAE	45*45*4	235	92.11	Climb	44.44	-15.048	C5-,C NA-	12A-NS_+9BE+6+6-3+6	33.862	77.208	34.56	1	1	1	127.93	1.39	1.126	3	1	M-16(8.8)	57.39	19.006	C5,C NA+	12A-NS_+9BE+6+6-3+6	33.12	1	1.75
R89	SAE	45*45*4	235	47.98	Redun	47.98	-10.083	C1,C NA+	12A-NS_+9BE-3-3+6+6	21.014	77.208	34.56	1	1	1	169.5	1.8	1.492	7	1	M-16(8.8)	30.44	10.083	C1,C NA+	12A-NS_+9BE-3-3+6+6	33.12	1	1.75
R90	SAE	45*45*4	235	92.11	Climb	25.86	-8.756	C5-,C NA-	12A-NS_+9BE+6+6-3-3	33.862	77.208	34.56	1	1	1	127.93	1.39	1.126	3	1	M-16(8.8)	26.76	8.863	C5-,C NA-	12A-NS_+9BE-3-3+6+6	33.12	1	1.75
R91	SAE	60*60*4	235	97.05	Climb	74.64	-18.928																					

Group Label	Angle Type	Angle Size	Steel Strength (MPa)	Max Usage %	Usage Cont-rol	Max Use In Comp. %	Comp. Force (kN)	Comp. Control Load Case	Comp. Control Model	L/r Capacity (kN)	Comp. Connect. Shear Capacity (kN)	Comp. Connect. Bearing Capacity (kN)	RLX	RLY	RLZ	L/r	KL/r	Length Comp. Member (m)	Curve No.	No. Of Bolts Comp.	Bolt Type Comp.	Max Use In Tens. %	Tension Force (kN)	Tension Control Load Case	Tension Control Model	Net Section Capacity (kN)	No. Of Holes	Hole Diameter (cm)
R101	SAE	50*50*4	355	94.1	Climb	0	0		12A-NS_-3BE+6+6+6+6	0	0	0	0	0	0	0	0	0	0	0		7.66	3.458	C4-,C BI-	12A-NS_+12BE-3+6+6+6	50.76	1	1.75
R102	SAE	65*65*4	355	79.54	Climb	22.13	-3.753	C4-,C BI-	12A-NS_+12BE-3+6+6+6	16.959	77.208	45.12	1	1	1	233.38	2.94	3.034	7	1	M-16(8.8)	0	0		12A-NS_-3BE+6+6+6+6	0	0	0
R102A	SAE	65*65*5	355	92.88	Climb	0	0		12A-NS_-3BE+6+6+6+6	0	0	0	0	0	0	0	0	0	0	0		5.91	3.335	C4,C BI+	12A-NS_+12BE+6+6-3-3	92.684	1	1.75
R102B	SAE	50*50*4	355	94.1	Climb	2.67	-0.389	C2-,C BI-	12A-NS_+12BE+6-3+6+6	14.597	77.208	45.12	1	1	1	218.91	2.87	2.145	7	1	M-16(8.8)	1	0.451	C6,C BI+	12A-NS_+12BE+6+6+6-3	50.76	1	1.75
R103	SAE	45*45*4	235	74.12	Comp	74.12	-9.331	C6,C BI+	12A-NS_+12BE-3-3+6+6	12.589	77.208	34.56	2	1	1	214.38	2.36	1.458	7	1	M-16(8.8)	36.11	11.959	C6-,C BI-	12A-NS_+12BE-3-3+6+6	33.12	1	1.75
R104	SAE	50*50*4	355	94.1	Climb	31.91	-4.658	C6-,C BI-	12A-NS_+12BE-3-3+6+6	14.597	77.208	45.12	1	1	1	218.91	2.87	2.145	7	1	M-16(8.8)	8.69	3.921	C6,C BI+	12A-NS_+12BE+6-3-3+6	50.76	1	1.75
R105	SAE	45*45*4	235	55.24	Comp	55.24	-9.318	C5-,C NA-	12A-NS_+12BE-3-3+6+6	16.868	77.208	34.56	1	1	1	190.46	2.03	1.676	7	1	M-16(8.8)	23.92	7.923	C5-,C NA-	12A-NS_+12BE+6+6-3-3	33.12	1	1.75
R106	SAE	45*45*4	235	87.72	Climb	28.57	-9.874	C5-,C NA-	12A-NS_+12BE+6+6-3-3	35.666	77.208	34.56	1	1	1	121.9	1.34	1.073	3	1	M-16(8.8)	32.76	10.851	C5-,C NA-	12A-NS_+12BE-3-3+6+6	33.12	1	1.75
R106A	SAE	45*45*4	235	52.05	Comp	52.05	-11.417	C5,C NA+	12A-NS_+12BE+6-3-3+6	21.933	77.208	34.56	1	1	1	165.65	1.76	1.458	7	1	M-16(8.8)	29.33	9.713	C5-,C NA-	12A-NS_+12BE+6+6+6	33.12	1	1.75
R106B	SAE	45*45*4	235	87.72	Climb	36.84	-12.733	C5-,C NA-	12A-NS_+12BE+6-3+6+6	35.666	77.208	34.56	1	1	1	121.9	1.34	1.073	3	1	M-16(8.8)	47.75	15.814	C5,C NA+	12A-NS_+12BE+6-3-3+6	33.12	1	1.75
R107	SAE	70*70*5	235	9.99	Comp	9.99	-2.07	C6,C BI+	12A-NS_+12BE+6-3-3-3	20.723	77.208	43.2	1	1	1	242.91	2.59	3.352	7	1	M-16(8.8)	2.58	1.113	C2,C BI+	12A-NS_+12BE+6-3-3-3	78.192	1	1.75
R108	SAE	65*65*4	355	79.54	Climb	7.82	-1.326	C2-,C BI-	12A-NS_+12BE-3+6+6+6	16.959	77.208	45.12	1	1	1	233.38	2.94	3.034	7	1	M-16(8.8)	3.66	1.652	C6,C BI+	12A-NS_+12BE+6-3-3+6	74.824	1	1.75
R109	SAE	65*65*4	355	71.98	Redun	71.98	-20.459	C1,C NA+	12A-NS_+12BE-3-3+6+6	28.425	77.208	45.12	1	1	1	178.72	2.25	2.323	7	1	M-16(8.8)	48.72	21.984	C6-,C BI-	12A-NS_+12BE+6-3+6+6	74.824	1	1.75
R110	SAE	45*45*4	235	95.08	Climb	22.4	-7.327	C2,C BI+	12A-NS_+12BE+6+6+6-3	32.708	77.208	34.56	1	1	1	132.01	1.41	1.162	3	1	M-16(8.8)	23.19	7.682	C1,C NA+	12A-NS_+12BE+6+6+6+6	33.12	1	1.75
R111	SAE	70*70*5	235	90.91	Climb	74.96	-16.149	C1,C NA+	12A-NS_+12BE+6+6+6+6	21.542	77.208	43.2	1	1	1	238.09	2.54	3.286	7	1	M-16(8.8)	40.33	17.423	C1,C NA+	12A-NS_+12BE+6+6+6+6	78.192	1	1.75
R112	SAE	45*45*4	355	88.1	Climb	68.93	-10.495	C5,C NA+	12A-NS_+12BE+6-3-3+6	15.227	77.208	45.12	1	1	1	202.57	2.65	1.783	7	1	M-16(8.8)	15.2	6.57	C6-,C BI-	12A-NS_+12BE-3-3+6+6	43.24	1	1.75
R113	SAE	45*45*4	355	96.25	Redun	96.25	-20.257	C1,C NA+	12A-NS_+12BE-3-3+6+6	21.045	77.208	45.12	1	1	1	171.29	2.24	1.507	7	1	M-16(8.8)	46.85	20.257	C1,C NA+	12A-NS_+12BE-3-3+6+6	43.24	1	1.75
R114	SAE	60*60*4	235	97.47	Climb	3.64	-0.915	C2-,C BI-	A-NS_+12BE+4.5+4.5+4.5+4.5	25.161	77.208	34.56	1	1	1	180.66	1.92	2.132	7	1	M-16(8.8)	2.88	0.996	C2,C BI+	12A-NS_+12BE-3-3+6-3	50.976	1	1.75
R115	SAE	45*45*4	355	88.11	Climb	26.4	-4.018	C5,C NA+	12A-NS_-3BE+6-3-3-3	15.224	77.208	45.12	1	1	1	202.59	2.65	1.783	7	1	M-16(8.8)	3.63	1.572	C2-,C BI-	12A-NS_+12BE-3+6+6+6	43.24	1	1.75
R116	SAE	45*45*4	235	27.83	Redun	26.67	-9.217	C1,C NA+	12A-NS_+12BE-3-3+6+6	48.241	77.208	34.56	1	1	1	86.92	1.1	0.765	3	1	M-16(8.8)	27.83	9.217	C1,C NA+	12A-NS_+12BE-3-3+6+6	33.12	1	1.75
R117	SAE	45*45*4	355	81.93	Climb	10.69	-2.249	C5,C NA+	12A-NS_-3BE+6-3-3+6	21.039	77.208	45.12	1	1	1	171.32	2.24	1.508	7	1	M-16(8.8)	7.55	3.267	C5,C NA+	12A-NS_-3BE-3+6-3-3	43.24	1	1.75
R118	SAE	65*65*4	355	90.24	Climb	29.9	-8.043	C2,C BI+	12A-NS_+12BE-3+6+6+6	26.902	77.208	45.12	1	0.667	0.667	179.62	2.31	3.502	7	1	M-16(8.8)	16.99	7.666	C2-,C BI-	12A-NS_+12BE-3+6+6+6	74.824	1	1.75
R119	SAE	50*50*4	355	93.5	Climb	61.65	-9.109	C2-,C BI-	12A-NS_+12BE-3+6+6+6	14.775	77.208	45.12	1	1	1	217.56	2.85	2.132	7	1	M-16(8.8)	21.76	9.817	C2,C BI+	12A-NS_+12BE-3+6+6+6	50.76	1	1.75
R120	SAE	45*45*4	235	39.93	Redun	39.93	-5.123	C1,C NA+	12A-NS_+12BE-1.5-1.5-1.5-1.5	12.83	77.208	34.56	1	1	1	219.75	2.34	1.934	7	1	M-16(8.8)	15.47	5.123	C1,C NA+	12A-NS_+12BE-1.5-1.5-1.5-1.5	33.12	1	1.75
R121	SAE	45*45*4	235	9.1	Redun	8.72	-3.015	C1,C NA+	12A-NS_+12BE-1.5-1.5-1.5-1.5	35.669	77.208	34.56	1	1	1	121.88	1.34	1.073	3	1	M-16(8.8)	9.1	3.015	C1,C NA+	12A-NS_+12BE-1.5-1.5-1.5-1.5	33.12	1	1.75
R122	SAE	50*50*4	355	88.05	Climb	6.29	-1.043	C5-,C NA-	12A-NS_-3BE+6-3-3-3	16.566	77.208	45.12	1	1	1	205.11	2.68	2.01	7	1	M-16(8.8)	2.78	1.256	C4-,C BI-	12A-NS_-3BE+6-3-3-3	50.76	1	1.75
R123	SAE	45*45*4	235	27.81	Redun	27.81	-7.235	C1,C NA+	12A-NS_+12BE-1.5-1.5-1.5-1.5	26.016	77.208	34.56	1	1	1	150.99	1.61	1.329	7	1	M-16(8.8)	21.84	7.235	C1,C NA+	12A-NS_+12BE-1.5-1.5-1.5-1.5	33.12	1	1.75
R124	SAE	45*45*4	235	82.15	Climb	15.24	-5.267	C5-,C NA-	12A-NS_+12BE-1.5-1.5-1.5-1.5	38.128	77.208	34.56	1	1	1	114.21	1.29	1.005	3	1	M-16(8.8)	14.54	4.816	C5-,C NA-	12A-NS_+12BE-1.5-1.5-1.5-1.5	33.12	1	1.75
R125	SAE	65*65*4	355	92.05	Climb	19.9	-4.723	C2-,C BI-	12A-NS_+12BE-1.5-1.5-1.5-1.5	23.73	77.208	45.12	1	0.667	0.667	194.22	2.47	3.787	7	1	M-16(8.8)	9.49	4.283	C2-,C BI-	12A-NS_+12BE-1.5-1.5-1.5-1.5	74.824	1	1.75
R126	SAE	50*50*4	355	93.5	Climb	40.48	-5.981	C2-,C BI-	12A-NS_+12BE-1.5-1.5-1.5-1.5	14.775	77.208	45.12	1	1	1	217.56	2.85	2.132	7	1	M-16(8.8)	14.2	6.408	C2,C BI+	12A-NS_+12BE-1.5-1.5-1.5-1.5	50.76	1	1.75
R127	SAE	50*50*4	235	42.65	Redun	42.65	-5.408	C1,C NA+	12A-NS_+12BE+0+0+0+0	12.681	77.208	34.56	1	1	1	233.88	2.49	2.292	7	1	M-16(8.8)	15.65	5.408	C1,C NA+	12A-NS_+12BE+0+0+0+0	38.88	1	1.75
R128	SAE	45*45*4	235	9.98	Redun	9.98	-1.969	C1,C NA+	12A-NS_+12BE+0+0+0+0	19.733	77.208	34.56	1	1	1	175.29	1.87	1.543	7	1	M-16(8.8)	5.94	1.969	C1,C NA+	12A-NS_+12BE+0+0+0+0	33.12	1	1.75
R129	SAE	50*50*4	355	88.05	Climb	4.51	-0.747	C5-,C NA-	12A-NS_-3BE+0+0+0+0	16.566	77.208	45.12	1	1	1	205.11	2.68	2.01	7	1	M-16(8.8)	2.21	0.995	C4,C BI+	12A-NS_+12BE+0+0+0+0	50.76	1	1.75
R130	SAE	45*45*4	235	35.8	Redun	35.8	-5.814	C1,C NA+	12A-NS_+12BE+0+0+0+0	16.242	77.208	34.56	1	1	1	194.29	2.07	1.71	7	1	M-16(8.8)	17.55	5.814	C1,C NA+	12A-NS_+12BE+0+0+0+0	33.12	1	1.75
R131	SAE	45*45*4	235	82.15	Climb	13.22	-4.57	C5-,C NA-	12A-NS_+12BE+0+0+0+0	38.128	77.208	34.56	1	1	1	114.21	1.29	1.005	3	1	M-16(8.8)	8.91	2.951	C5-,C NA-	12A-NS_+3BE+0+0+0+0	33.12	1	1.75
R132	SAE	60*60*4	235	50.56	Comp	50.56	-7.569	C2-,C BI-	12A-NS_+12BE+0+0+0+0	14.972	77.208	34.56	1	0.667	0.667	236.95	2.52	4.194	7	1	M-16(8.8)	20.26	7.002	C2-,C BI-	12A-NS_+12BE+0+0+0+0	50.976	1	1.75
R133	SAE	50*50*4	355	93.5	Climb	58.58	-8.655	C2-,C BI-	12A-NS_+12BE+0+0+0+0	14.775	77.208	45.12	1	1	1	217.56	2.85	2.132	7	1	M-16(8.8)	20.05	9.046	C2,C BI+	12A-NS_+12BE+0+0+0+0	50.76	1	1.75
R137	SAE	50*50*4	235	41.55	Redun	41.55	-5.268	C1,C NA+	A-NS_+12BE+1.5+1.5+1.5+1.5	12.681	77.208	34.56	1	1	1	233.88	2.49	2.292	7	1	M-16(8.8)	15.24	5.268	C1,C NA+	A-NS_+12BE+1.5+1.5+1.5+1.5	38.88	1	1.75
R138	SAE	45*45*4	235	10.5	Redun	10.5	-1.914	C1,C NA+	A-NS_+12BE+1.5+1.5+1.5+1.5	18.228	77.208	34.56	1	1	1	182.82	1.95	1.609	7	1	M-16(8.8)	8.55	2.832	C6-,C BI-	12A-NS_-3BE+1.5+1.5+1.5+1.5	33.12	1	1.75
R139	SAE	50*50*4	355	99.3	Climb	12.81	-1.687	C5-,C NA-	12A-NS_-3BE+1.5+1.5+1.5+1.5	13.173	77.208	45.12	1	1	1	230.75	3.02	2.261	7	1	M-16(8.8)	2.02	0.91	C6,C BI+	12A-NS_-3BE+1.5+1.5+1.5+1.5	50.76	1	1.75
R140	SAE	45*45*4	235	51.65	Redun	51.65	-6.252	C1,C NA+	A-NS_+12BE+1.5+1.5+1.5+1.5	12.105	77.208	34.56	1	1	1	226.48	2.41	1.993	7	1	M-16(8.8)	18.88	6.252	C1,C NA+	A-NS_+12BE+1.5+1.5+1.5+1.5	33.12	1	1.75
R141	SAE	45*45*4	355	81.93	Climb	13.55	-2.85	C6-,C BI-	A-NS_+12BE+1.5+1.5+1.5+1.5	21.039	77.208	45.12	1	1	1	171.32	2.24	1.508</										

Group Label	Angle Type	Angle Size	Steel Strength (MPa)	Max Usage %	Usage Cont- rol	Max Use In Comp. %	Comp. Force (kN)	Comp. Control Load Case	Comp. Control Model	L/r Capacity (kN)	Comp. Connect. Shear Capacity (kN)	Comp. Connect. Bearing Capacity (kN)	RLX	RLY	RLZ	L/r	KL/r	Length Comp. Member (m)	Curve No.	No. Of Bolts Comp.	Bolt Type Comp.	Max Use In Tens. %	Tension Force (kN)	Tension Control Load Case	Tension Control Model	Net Section Capacity (kN)	No. Of Holes	Hole Diameter (cm)
R154	SAE	45*45*4	235	24.42	Redun	24.42	-7.538	C1,C NA+	12A-NS_+12BE+3+3+3+3	30.865	77.208	34.56	1	1	1	137.25	1.46	1.208	7	1	M-16(8.8)	22.76	7.538	C1,C NA+	12A-NS_+12BE+3+3+3+3	33.12	1	1.75
R154A	SAE	45*45*4	235	65.6	Climb	7.67	-2.649	C5-,C NA-	12A-NS_-3BE+3+3+3+3	46.479	77.208	34.56	1	1	1	91.37	1.13	0.804	3	1	M-16(8.8)	1.83	0.607	C1,C NA+	12A-NS_-3BE+3+3+3+3	33.12	1	1.75
R154B	SAE	45*45*4	235	41	Tens	39.54	-13.665	C5-,C NA-	12A-NS_+12BE+3+3+3+3	36.724	77.208	34.56	1	1	1	118.52	1.32	1.043	3	1	M-16(8.8)	41	13.581	C5-,C NA-	12A-NS_+12BE+3+3+3+3	33.12	1	1.75
R155	SAE	45*45*4	235	47.64	Redun	45.65	-15.777	C1,C NA+	12A-NS_+12BE+3+3+3+3	58.638	77.208	34.56	1	1	1	45.68	0.91	0.402	3	1	M-16(8.8)	47.64	15.777	C1,C NA+	12A-NS_+12BE+3+3+3+3	33.12	1	1.75
R156	SAE	50*50*4	355	30.9	Comp	30.9	-2.794	C1,C NA+	12A-NS_+12BE+3+3+3+3	9.043	77.208	45.12	1	0.59	0.59	289.67	3.66	4.403	7	1	M-16(8.8)	6.62	2.987	C1,C NA+	12A-NS_+12BE+3+3+3+3	50.76	1	1.75
R157	SAE	50*50*4	235	18.61	Comp	18.61	-2.407	C1,C NA+	12A-NS_+12BE+3+3+3+3	12.931	77.208	34.56	1	0.64	0.64	225.54	2.47	3.428	7	1	M-16(8.8)	5.68	1.964	C2,C BI+	12A-NS_+12BE+3+3+3+3	38.88	1	1.75
R158	SAE	45*45*4	235	19.17	Comp	19.17	-4.873	C2,C BI+	12A-NS_+12BE+3+3+3+3	25.423	77.208	34.56	1	0.6	0.6	132.66	1.63	1.804	3	1	M-16(8.8)	13.54	4.486	C2-,C BI-	12A-NS_+12BE+3+3+3+3	33.12	1	1.75
R158A	SAE	45*45*4	235	35.58	Comp	35.58	-11.507	C2-,C BI-	12A-NS_+12BE+3+3+3+3	32.341	77.208	34.56	1	0.667	0.667	106.13	1.42	1.401	3	1	M-16(8.8)	34.85	11.543	C2-,C BI-	12A-NS_+12BE+3+3+3+3	33.12	1	1.75
R159	SAE	45*45*4	235	46.29	Climb	31.94	-11.039	C2-,C BI-	12A-NS_+12BE+3+3+3+3	54.118	77.208	34.56	1	1	1	64.61	1	0.569	3	1	M-16(8.8)	32.23	10.675	C2,C BI+	12A-NS_+12BE+3+3+3+3	33.12	1	1.75
R160	SAE	50*50*4	235	46.61	Comp	46.61	-5.909	C6,C BI+	12A-NS_-3BE+4.5+4.5+4.5+4.5	12.679	77.208	34.56	1	1	1	233.9	2.49	2.292	7	1	M-16(8.8)	6.23	2.153	C2,C BI+	12A-NS_-3BE+4.5+4.5+4.5+4.5	38.88	1	1.75
R161	SAE	45*45*4	235	17.07	Comp	17.07	-2.772	C2-,C BI-	2A-NS_+9BE+4.5+4.5+4.5+4.5	16.242	77.208	34.56	1	1	1	194.28	2.07	1.71	7	1	M-16(8.8)	13.17	4.363	C6-,C BI-	12A-NS_-3BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R162	SAE	55*55*4	355	91.54	Climb	15.74	-2.219	C5-,C NA-	12A-NS_-3BE+4.5+4.5+4.5+4.5	14.102	77.208	45.12	1	1	1	234.83	3.06	2.513	7	1	M-16(8.8)	3.05	1.377	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	59.032	1	1.75
R163	SAE	50*50*4	235	51.48	Redun	51.48	-6.217	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	12.075	77.208	34.56	1	1	1	239.88	2.55	2.351	7	1	M-16(8.8)	17.99	6.217	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	38.88	1	1.75
R164	SAE	50*50*4	355	88.05	Climb	26.95	-4.464	C6-,C BI-	1A-NS_+12BE+4.5+4.5+4.5+4.5	16.566	77.208	45.12	1	1	1	205.11	2.68	2.01	7	1	M-16(8.8)	4.45	2.007	C2,C BI+	12A-NS_+0BE+4.5+4.5+4.5+4.5	50.76	1	1.75
R165	SAE	50*50*4	235	47.08	Redun	47.08	-7.812	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	16.592	77.208	34.56	1	1	1	203.37	2.17	1.993	7	1	M-16(8.8)	22.6	7.812	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	38.88	1	1.75
R166	SAE	45*45*4	355	81.93	Climb	17.19	-3.618	C6-,C BI-	1A-NS_+12BE+4.5+4.5+4.5+4.5	21.039	77.208	45.12	1	1	1	171.32	2.24	1.508	7	1	M-16(8.8)	2.84	1.228	C1,C NA+	12A-NS_+9BE+4.5+4.5+4.5+4.5	43.24	1	1.75
R167	SAE	45*45*4	235	39.66	Redun	39.66	-6.441	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	16.242	77.208	34.56	1	1	1	194.29	2.07	1.71	7	1	M-16(8.8)	19.45	6.441	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R168	SAE	45*45*4	235	82.15	Climb	9.88	-3.416	C5-,C NA-	12A-NS_-3BE+4.5+4.5+4.5+4.5	38.128	77.208	34.56	1	1	1	114.21	1.29	1.005	3	1	M-16(8.8)	2.98	0.987	C1,C NA+	12A-NS_-3BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R169	SAE	45*45*4	235	19.63	Redun	19.46	-6.502	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	33.405	77.208	34.56	1	1	1	129.53	1.4	1.14	3	1	M-16(8.8)	19.63	6.502	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R169A	SAE	45*45*4	235	54.6	Climb	8.84	-3.053	C5-,C NA-	12A-NS_-3BE+4.5+4.5+4.5+4.5	51.166	77.208	34.56	1	1	1	76.14	1.05	0.67	3	1	M-16(8.8)	2.57	0.851	C1,C NA+	12A-NS_-3BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R169B	SAE	45*45*4	235	51.67	Comp	51.67	-17.858	C5-,C NA-	1A-NS_+12BE+4.5+4.5+4.5+4.5	37.26	77.208	34.56	1	1	1	116.85	1.31	1.028	3	1	M-16(8.8)	49.26	16.315	C5-,C NA-	1A-NS_+12BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R170	SAE	45*45*4	235	47.07	Redun	45.11	-15.588	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	60.274	77.208	34.56	1	1	1	38.07	0.88	0.335	3	1	M-16(8.8)	47.07	15.588	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R171	SAE	60*60*4	235	22.6	Comp	22.6	-3.111	C6-,C BI-	1A-NS_+12BE+4.5+4.5+4.5+4.5	13.765	77.208	34.56	1	0.571	0.571	244.07	2.64	4.466	7	1	M-16(8.8)	8.96	3.095	C6,C BI+	1A-NS_+12BE+4.5+4.5+4.5+4.5	50.976	1	1.75
R172	SAE	50*50*4	235	20.57	Comp	20.57	-2.43	C6,C BI+	1A-NS_+12BE+4.5+4.5+4.5+4.5	11.814	77.208	34.56	1	0.6	0.6	238.42	2.58	3.624	7	1	M-16(8.8)	6.89	2.382	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	38.88	1	1.75
R173	SAE	45*45*4	235	12.41	Redun	12.41	-2.095	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	16.888	77.208	34.56	1	0.6	0.6	177.65	2.03	2.416	7	1	M-16(8.8)	6.33	2.095	C1,C NA+	1A-NS_+12BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R173A	SAE	45*45*4	235	17.34	Comp	17.34	-4.935	C2-,C BI-	1A-NS_+12BE+4.5+4.5+4.5+4.5	28.462	77.208	34.56	1	0.6	0.6	118.43	1.53	1.611	3	1	M-16(8.8)	13.7	4.536	C2-,C BI-	1A-NS_+12BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R173B	SAE	45*45*4	235	40.92	Tens	38.48	-13.235	C2-,C BI-	1A-NS_+12BE+4.5+4.5+4.5+4.5	34.395	77.208	34.56	1	0.667	0.667	98.67	1.37	1.302	3	1	M-16(8.8)	40.92	13.553	C2-,C BI-	1A-NS_+12BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R174	SAE	45*45*4	235	38.54	Climb	34.95	-12.08	C2-,C BI-	1A-NS_+12BE+4.5+4.5+4.5+4.5	56.758	77.208	34.56	1	1	1	53.84	0.95	0.474	3	1	M-16(8.8)	34.51	11.43	C2,C BI+	1A-NS_+12BE+4.5+4.5+4.5+4.5	33.12	1	1.75
R175	SAE	50*50*4	235	72.21	Comp	72.21	-9.156	C5,C NA+	12A-NS_-3BE-3+6+6-3	12.679	77.208	34.56	1	1	1	233.9	2.49	2.292	7	1	M-16(8.8)	15.48	5.351	C2-,C BI-	12A-NS_-3BE-3+6+6-3	38.88	1	1.75
R176	SAE	45*45*4	235	32.95	Comp	32.95	-5.153	C2-,C BI-	12A-NS_-3BE-3+6+6-3	15.636	77.208	34.56	1	1	1	198.2	2.11	1.744	7	1	M-16(8.8)	20.72	6.862	C5,C NA+	12A-NS_-3BE-3+6+6-3	33.12	1	1.75
R177	SAE	55*55*4	355	94.23	Climb	34.75	-4.638	C5,C NA+	12A-NS_-3BE-3+6+6-3	13.347	77.208	45.12	1	1	1	241.54	3.14	2.584	7	1	M-16(8.8)	8.1	3.656	C1-,C NA-	12A-NS_+12BE-3+6+6-3	59.032	1	1.75
R178	SAE	55*55*4	235	50.89	Comp	50.89	-7.377	C1-,C NA-	12A-NS_+9BE-3+6+6-3	14.496	77.208	34.56	1	1	1	230.13	2.45	2.462	7	1	M-16(8.8)	31.51	10.89	C5,C NA+	12A-NS_+12BE-3+6+6-3	45.216	1	1.75
R179	SAE	50*50*4	355	94.47	Climb	61.77	-8.948	C5,C NA+	12A-NS_+12BE-3+6+6-3	14.487	77.208	45.12	1	1	1	219.77	2.88	2.154	7	1	M-16(8.8)	13.35	6.023	C1-,C NA-	12A-NS_+9BE-3+6+6-3	50.76	1	1.75
R180	SAE	45*45*4	235	77.44	Redun	77.44	-8.176	C1,C NA+	12A-NS_+12BE+6+6-3+6	10.557	77.208	34.56	1	1	1	243.1	2.59	2.139	7	1	M-16(8.8)	25.27	8.369	C6,C BI+	12A-NS_+6BE-3-3+6+6	33.12	1	1.75
R181	SAE	45*45*4	355	93.81	Climb	41.7	-6.783	C5,C NA+	12A-NS_+12BE-3+6+6-3	16.265	77.208	45.12	1	1	1	195.79	2.56	1.723	7	1	M-16(8.8)	9.75	4.214	C1-,C NA-	12A-NS_+9BE-3+6+6-3	43.24	1	1.75
R182	SAE	45*45*4	235	57.97	Redun	57.97	-8.012	C1,C NA+	12A-NS_+12BE+6+6-3+6	13.822	77.208	34.56	1	1	1	211.4	2.25	1.86	7	1	M-16(8.8)	24.19	8.012	C1,C NA+	12A-NS_+12BE+6+6-3+6	33.12	1	1.75
R183	SAE	45*45*4	355	70.09	Climb	21.66	-6.113	C5,C NA+	12A-NS_+12BE-3+6+6-3	28.215	77.208	45.12	1	1	1	146.84	1.92	1.292	7	1	M-16(8.8)	8.33	3.602	C1-,C NA-	12A-NS_+0BE-3+6+6-3	43.24	1	1.75
R184	SAE	45*45*4	235	35.32	Redun	35.32	-6.151	C1,C NA+	12A-NS_+12BE+6+6-3+6	17.415	77.208	34.56	1	1	1	187.28	1.99	1.648	7	1	M-16(8.8)	27.44	9.088	C5,C NA+	12A-NS_+6BE-3+6+6-3	33.12	1	1.75
R185	SAE	45*45*4	235	70.32	Climb	14.63	-5.055	C5,C NA+	12A-NS_+12BE-3+6+6-3	43.955	77.208	34.56	1	1	1	97.9	1.18	0.861	3	1	M-16(8.8)	8.15	2.701	C1-,C NA-	12A-NS_-3BE-3+6+6-3	33.12	1	1.75
R186	SAE	45*45*4	235	18.84	Redun	18.05	-6.239	C1,C NA+	12A-NS_+12BE+6+6-3+6	34.767	77.208	34.56	1	1	1	124.86	1.36	1.099	3	1	M-16(8.8)	18.84	6.239	C1,C NA+	12A-NS_+12BE+6+6-3+6	33.12	1	1.75
R186A	SAE	45*45*4	235	53.43	Redun	51.2	-17.695	C1,C NA+	12A-NS_+12BE+6+6-3+6	53.953	77.208	34.56	1	1	1	65.26	1	0.574	3	1	M-16(8.8)	53.43	17.695	C1,C NA+	12A-NS_+12BE+6+6-3+6	33.12	1	1.75

D-CROSSARM BOTTOM CHORD CALCULATION

1.1 Upper Crossarm Bottom chord

1.1.1 Loads (kN)

For Top Crossarm		Axial	FoS	Load	Load Case
	Compression	7.4	1.0	7.4	SF2,C NA+
	Climbing	3.0	1.5	4.5	

1.1.2 Material Properties

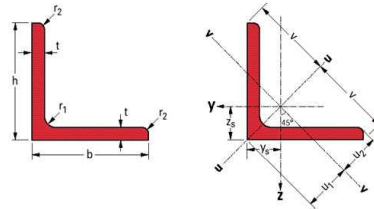
E	210000	N/mm ²	Modulus of Elasticity
Fy	355	N/mm ²	Yield Strength
ε=	0.81		7.3.6.2-EN50341-2012
κσ=	0.43		7.3.6.2-EN50341-2012

1.1.3 Dimensiones

L =	1.628	m	Longest Field of Beam
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1.1.4 Crosssection Properties

Section	L65*65*6	Unit		
b=	65	mm	Width	
h =	65	mm	Height	
t =	6	mm	Thickness	
r _z ,r _y =	1.97	cm	Raius of Gyration z-z, y-y	
r _v =	1.27	cm	Raius of Gyration v-v	
S =	6.21	cm ³	Section Modulus z-z, y-y	
A =	7.53	cm ²	Gross cross-section area	
G=	57.96	N/m	Unit weight	
b/t=	10.8		Width-Thickness ratio	
Class	3		Classification	5.5.2- EN1993-1-1-2005
λ'p	0.58			7.3.6.2-EN50341-2012
ρ	1.00		Reduction factor for effective area	7.3.6.2-EN50341-2012
A _{eff} =	7.53	cm ²	Effective cross-section area	
λ	128.19		Slenderness	J.4.2.2-EN50341-2012
λ ₁	76.41			J.4.2.3-EN50341-2012
λ'	1.68		Non-dimensional slenderness	J.4.2.3-EN50341-2012
λ _{eff}	1.59		Effective non-dimensional slenderness	J.4.2.4-EN50341-2012
α	0.13		Imperfection factor	J.4.1-EN50341-2012
Φ	1.86			
χ	0.36		Reduction factor for relevant buckling mode	J.4.1-EN50341-2012



1.1.5 Moment Capacity

γM0=	1.0		Partial factor for moment resistance	6.1 -EN50341-2012
Mz,ed=	1.85	kN.m	Design bending moment	
Mz,Rd=	2.20	kN.m	Design resistance for bending about z-z axis	6.2.5-EN50341-2012
Status	83.9 %	OK	Usage	

1.1.6 Compression Capacity

γM1=	1.10		Partial factor for buckling resistance	
Ned=	7.4	kN	Compression force	
Nrd=	86.5	kN	Flexural Buckling resistance	
Status	8.5 %	OK	Usage	



1.1.7 Axial Compression & Bending Check

Check	0.92	OK	$\frac{N_{ed}}{N_{rd}} + \frac{M_{z,ed}}{M_{z,Rd}} \leq 1$	Eq 6.2 6.2.1- EN1993-1-1-2005
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2.1 Middle Crossarm Bottom chord

2.1.1 Loads (kN)

For		Axial	FoS	Load	Load Case
Middle	Compression	13.5	1.0	13.5	SF2,C NA+
Crossarm	Climbing	3.0	1.5	4.5	

2.1.2 Material Properties

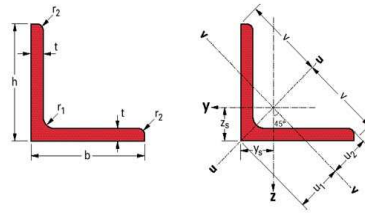
E	210000	N/mm ²	Modulus of Elasticity
Fy	355	N/mm ²	Yield Strength
ε=	0.81		7.3.6.2-EN50341-2012
κσ=	0.43		7.3.6.2-EN50341-2012

2.1.3 Dimensiones

L =	1.689	m	Longest Field of Beam
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2.1.4 Crosssection Properties

Section	L75*75*7	Unit		
b=	75	mm	Width	
h =	75	mm	Height	
t =	7	mm	Thickness	
rz,ry=	2.28	cm	Raius of Gyration z-z, y-y	
rv=	1.45	cm	Raius of Gyration v-v	
S =	9.74	cm ³	Section Modulus z-z, y-y	
A =	10.10	cm ²	Gross cross-section area	
G=	77.86	N/m	Unit weight	
b/t=	10.7		Width-Thickness ratio	
Class	3		Classification	5.5.2- EN1993-1-1-2005
λ'p	0.58			7.3.6.2-EN50341-2012
p	1.00		Reduction factor for effective area	7.3.6.2-EN50341-2012
Aeff=	10.10	cm ²	Effective cross-section area	
λ	116.48		Slenderness	J.4.2.2-EN50341-2012
λ1	76.41			J.4.2.3-EN50341-2012
λ'	1.52		Non-dimensional slenderness	J.4.2.3-EN50341-2012
λeff	1.49		Effective non-dimensional slenderness	J.4.2.4-EN50341-2012
α	0.13		Imperfection factor	J.4.1-EN50341-2012
Φ	1.70			
χ	0.40		Reduction factor for relevant buckling mode	J.4.1-EN50341-2012

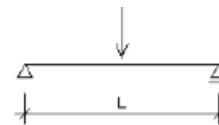


2.1.5 Moment Capacity

γM0=	1.0		Partial factor for moment resistance	6.1 -EN50341-2012
Mz,ed=	1.93	kN.m	Design bending moment	
Mz,Rd=	3.46	kN.m	Design resistance for bending about z-z axis	6.2.5-EN50341-2012
Status	55.8 %	OK	Usage	

2.1.6 Compression Capacity

γM1=	1.10		Partial factor for buckling resistance	
Ned=	13.5	kN	Compression force	
Nrd=	130.3	kN	Flexural Buckling resistance	
Status	10.4 %	OK	Usage	



2.1.7 Axial Compression & Bending Check

Check	0.66	OK	$\frac{N_{ed}}{N_{rd}} + \frac{M_{z,ed}}{M_{z,Rd}} \leq 1$	Eq 6.2 6.2.1- EN1993-1-1-2005
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3.1 Lower Crossarm Bottom chord

3.1.1 Loads (kN)

For Lower Crossarm		Axial	FoS	Load	Load Case
	Compression	8.5	1.0	8.5	SF2,C NA+
	Climbing	3.0	1.5	4.5	

3.1.2 Material Properties

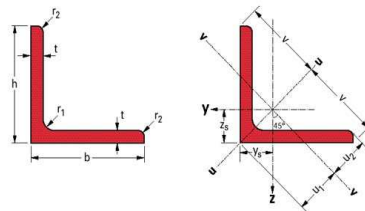
E	210000	N/mm ²	Modulus of Elasticity
Fy	355	N/mm ²	Yield Strength
ε=	0.81		7.3.6.2-EN50341-2012
κσ=	0.43		7.3.6.2-EN50341-2012

3.1.3 Dimensiones

L =	1.79	m	Longest Field of Beam
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3.1.4 Crosssection Properties

Section	L70*70*6	Unit		
b=	70	mm	Width	
h =	70	mm	Height	
t =	6	mm	Thickness	
rz,ry=	2.13	cm	Raius of Gyration z-z, y-y	
rv=	1.37	cm	Raius of Gyration v-v	
S =	7.27	cm ³	Section Modulus z-z, y-y	
A =	8.13	cm ²	Gross cross-section area	
G=	62.57	N/m	Unit weight	
b/t=	11.7		Width-Thickness ratio	
Class	3		Classification	5.5.2- EN1993-1-1-2005
λ'p	0.64			7.3.6.2-EN50341-2012
p	1.00		Reduction factor for effective area	7.3.6.2-EN50341-2012
Aeff=	8.13	cm ²	Effective cross-section area	
λ	130.66		Slenderness	J.4.2.2-EN50341-2012
λ1	76.41			J.4.2.3-EN50341-2012
λ'	1.71		Non-dimensional slenderness	J.4.2.3-EN50341-2012
λeff	1.61		Effective non-dimensional slenderness	J.4.2.4-EN50341-2012
α	0.13		Imperfection Factor	J.4.1-EN50341-2012
Φ	1.89			
χ	0.35		Reduction factor for relevant buckling mode	J.4.1-EN50341-2012

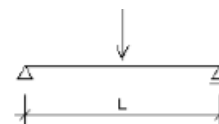


3.1.5 Moment Capacity

γM0=	1.0		Partial factor for moment resistance	6.1 -EN50341-2012
Mz,ed=	2.04	kN.m	Design bending moment	
Mz,Rd =	2.58	kN.m	Design resistance for bending about z-z axis	6.2.5-EN50341-2012
Status	79.0 %	OK	Usage	

3.1.6 Compression Capacity

γM1=	1.10		Partial factor for buckling resistance	
Ned=	8.5	kN	Compression force	
Nrd=	91.2	kN	Flexural Buckling resistance	
Status	9.3 %	OK	Usage	



3.1.7 Axial Compression & Bending Check

Check	0.88	OK	$\frac{N_{ed}}{N_{rd}} + \frac{M_{z,ed}}{M_{z,Rd}} \leq 1$	Eq 6.2 6.2.1- EN1993-1-1-2005
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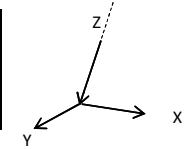
E-FOUNDATION REACTIONS

Factored Maximum Foundation Reactions

+12 Body Extension

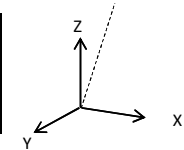
• Maximum Reactions in Leg Direction

Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	879.11	74.55	76.56	C6,C BI+	12A-NS_+12BE-3+6+6+6
Uplift	-690.94	70.58	72.33	C6-,C BI-	12A-NS_+12BE-3+6+6+6
Max. Transverse	785.52	79.42	79.92	C2,C BI+	12A-NS_+12BE-3+6+6+6
Max. Longitudinal	785.52	79.42	79.92	C2,C BI+	12A-NS_+12BE-3+6+6+6



• Maximum Reactions in Global direction

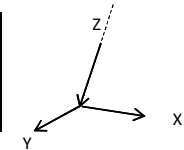
Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	-841.38	193.80	195.80	C6,C BI+	12A-NS_+12BE-3+6+6+6
Uplift	663.64	132.19	113.09	C5,C NA+	12A-NS_+12BE+6+6-3-3
Max. Transverse	-841.38	193.80	195.80	C6,C BI+	12A-NS_+12BE-3+6+6+6
Max. Longitudinal	-841.38	193.80	195.80	C6,C BI+	12A-NS_+12BE-3+6+6+6



+9 Body Extension

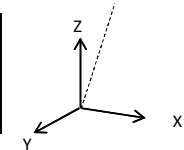
• Maximum Reactions in Leg Direction

Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	818.83	36.69	25.79	C5,C NA+	12A-NS_+9BE+6+6-3-3
Uplift	-662.91	31.25	21.48	C5,C NA+	12A-NS_+9BE+6+6-3-3
Max. Transverse	722.39	70.87	72.41	C2,C BI+	12A-NS_+9BE-3+6+6+6
Max. Longitudinal	722.39	70.87	72.41	C2,C BI+	12A-NS_+9BE-3+6+6+6



• Maximum Reactions in Global direction

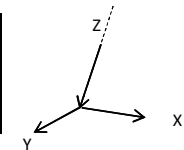
Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	-794.35	149.27	138.37	C5,C NA+	12A-NS_+9BE+6+6-3-3
Uplift	642.80	122.35	112.58	C5,C NA+	12A-NS_+9BE+6+6-3-3
Max. Transverse	-782.75	176.55	181.70	C6,C BI+	12A-NS_+9BE-3+6+6+6
Max. Longitudinal	-782.75	176.55	181.70	C6,C BI+	12A-NS_+9BE-3+6+6+6



+6 Body Extension

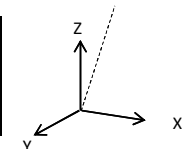
• Maximum Reactions in Leg Direction

Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	799.45	31.30	20.25	C5-,C NA-	12A-NS_+6BE+6+6-3-3
Uplift	-654.30	24.98	16.15	C5-,C NA-	12A-NS_+6BE+6+6-3-3
Max. Transverse	677.79	56.78	57.75	C2,C BI+	12A-NS_+6BE-3+6+6+6
Max. Longitudinal	677.79	56.78	57.75	C2,C BI+	12A-NS_+6BE-3+6+6+6



• Maximum Reactions in Global direction

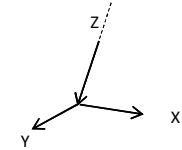
Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	-776.84	141.40	130.34	C5,C NA+	12A-NS_+6BE+6+6-3-3
Uplift	635.94	115.10	106.27	C5-,C NA-	12A-NS_+6BE+6+6-3-3
Max. Transverse	-744.85	158.54	161.97	C6,C BI+	12A-NS_+6BE-3+6+6+6
Max. Longitudinal	-744.85	158.54	161.97	C6,C BI+	12A-NS_+6BE-3+6+6+6



+3 Body Extension

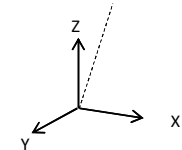
- Maximum Reactions in Leg Direction

Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	790.86	28.84	19.45	C5,C NA-	12A-NS_+3BE+6+6-3-3
Uplift	-654.03	24.63	15.45	C5,C NA-	12A-NS_+3BE+6+6-3-3
Max. Transverse	644.89	50.11	50.68	C2,C BI+	12A-NS_+3BE-3+6+6+6
Max. Longitudinal	644.89	50.11	50.68	C2,C BI+	12A-NS_+3BE-3+6+6+6



- Maximum Reactions in Global direction

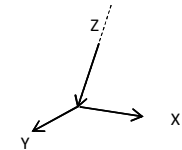
Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	-768.85	137.80	128.41	C5,C NA+	12A-NS_+3BE+6+6-3-3
Uplift	635.81	114.74	105.56	C5,C NA+	12A-NS_+3BE+6+6-3-3
Max. Transverse	-716.24	148.37	150.73	C6,C BI+	12A-NS_+3BE-3+6+6+6
Max. Longitudinal	-716.24	148.37	150.73	C6,C BI+	12A-NS_+3BE-3+6+6+6



+0 Body Extension

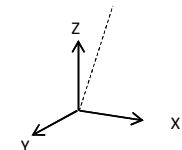
- Maximum Reactions in Leg Direction

Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	749.65	24.12	27.27	C5,C NA-	12A-NS_+0BE+6+6-3-3
Uplift	-622.66	18.80	23.14	C5,C NA-	12A-NS_+0BE+6+6-3-3
Max. Transverse	588.17	49.17	51.13	C2,C BI+	12A-NS_+0BE-3+6+6+6
Max. Longitudinal	686.65	44.61	51.28	C6,C BI+	12A-NS_+0BE-3+6+6+6



- Maximum Reactions in Global direction

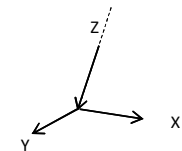
Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	-728.03	127.30	130.45	C5,C NA+	12A-NS_+0BE+6+6-3-3
Uplift	604.80	104.52	108.85	C5,C NA+	12A-NS_+0BE+6+6-3-3
Max. Transverse	-660.19	138.17	144.85	C6,C BI+	12A-NS_+0BE-3+6+6+6
Max. Longitudinal	-660.19	138.17	144.85	C6,C BI+	12A-NS_+0BE-3+6+6+6



-3 Body Extension

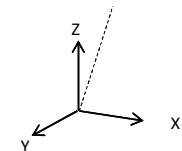
- Maximum Reactions in Leg Direction

Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	762.51	18.24	21.79	C5,C NA+	12A-NS_-3BE+6+6-3-3
Uplift	-646.95	17.48	19.85	C5,C NA-	12A-NS_-3BE+6+6-3-3
Max. Transverse	556.77	47.60	48.94	C2,C BI+	12A-NS_-3BE-3+6+6+6
Max. Longitudinal	556.77	47.60	48.94	C2,C BI+	12A-NS_-3BE-3+6+6+6



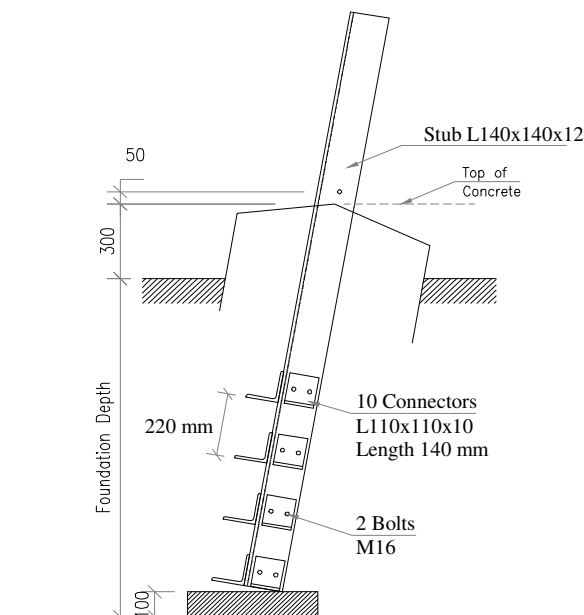
- Maximum Reactions in Global direction

Case	Axial (kN)	Transversal (kN)	Longitudinal (kN)	Load Case	Model
Compression	-742.18	123.43	126.98	C5,C NA+	12A-NS_-3BE+6+6-3-3
Uplift	629.25	106.66	109.03	C5,C NA+	12A-NS_-3BE+6+6-3-3
Max. Transverse	-634.89	132.28	137.23	C6,C BI+	12A-NS_-3BE-3+6+6+6
Max. Longitudinal	-634.89	132.28	137.23	C6,C BI+	12A-NS_-3BE-3+6+6+6

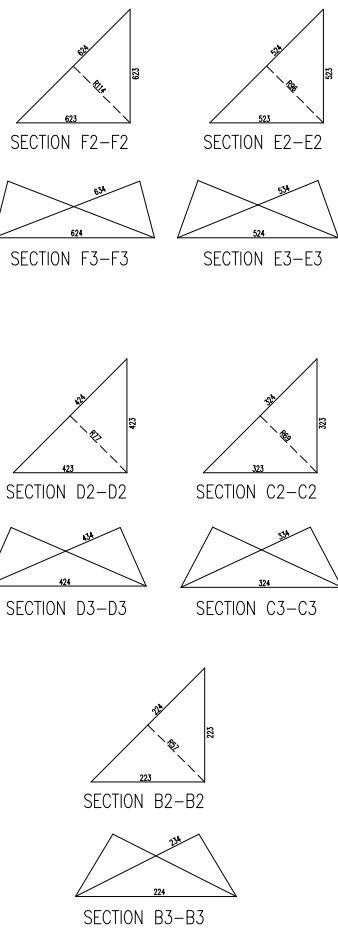
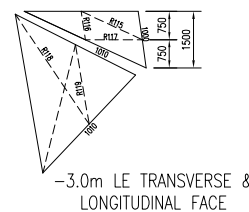
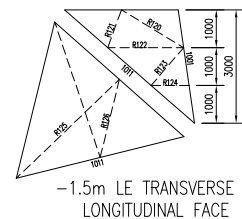
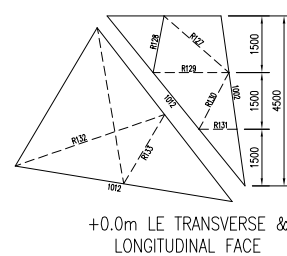
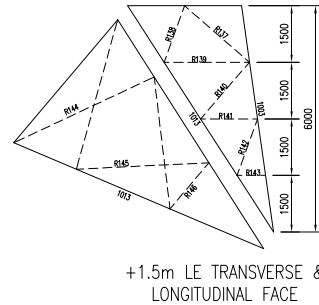
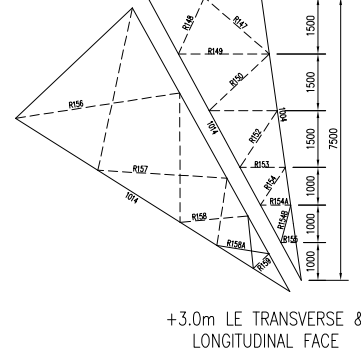
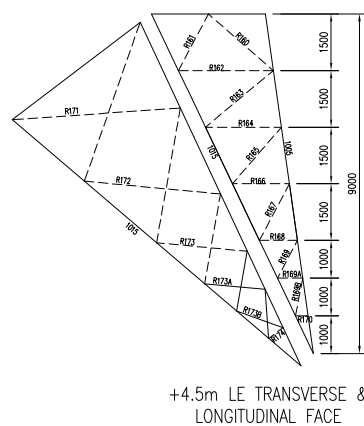
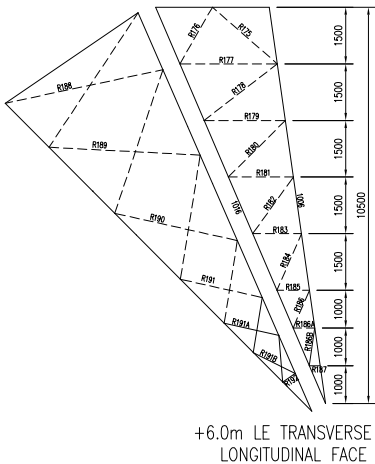
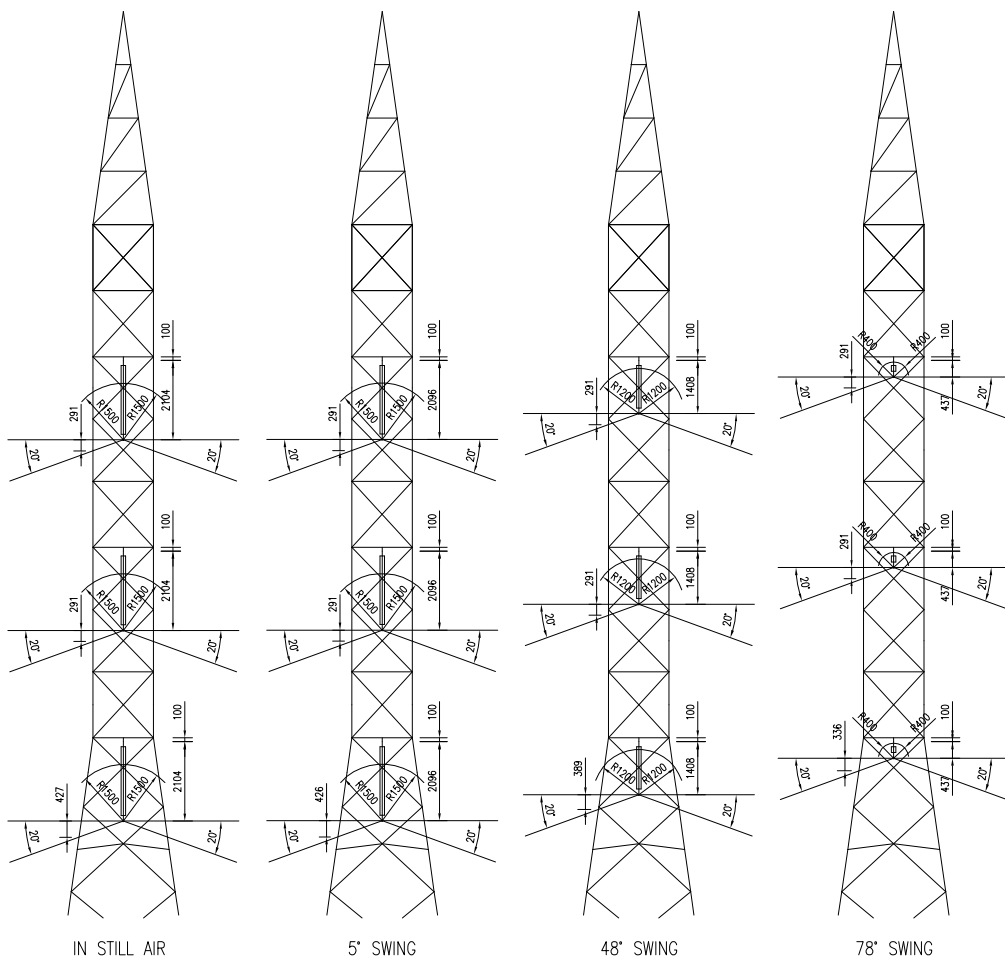


F-STUB DESIGN

MATERIAL PROPERTIES	Concrete: C20/25					$f_{cd} = f_{ck}/\gamma_c$ EN 50341-1:2012 (7.6.4) EN 1992-1-1 Eq (3.15)
	Characteristic Compressive Strength	f_{ck}	MPa	20.0		
	Partial Material Factor:	γ_c		1.5		
	Maximum Allowable Design Stress	f_{cd}	MPa	13.3		
	Steel : S355J2					
	Yield Strength	f_y	MPa	355.0		
	Bolts : ISO 898-1 Class 8.8 (Shear through unthreaded portion)					
TOWER REACTIONS ON LEG DIRECTION	Tensile Strength :		f_{ub}	MPa	800.0	
	MAX COMPRESSION	AXIAL	P	kN	967.0	Axial force for compression & uplift are increased 10 % as per B 2.5.3.4 "Employer's Requirement"
		SHEAR	V	kN	106.9	
	MAX UPLIFT	AXIAL	P	kN	760.0	
		SHEAR	V	kN	101.1	
ANGLES	STUB		Size of Ang.	L140x140x12		
			w	mm	140	w : width of stub angle
			t	mm	12	t : thickness of stub angle
			A_g	cm ²	32.40	A_g : Gross area of stub angle
			n		2.6	n: Number of holes
			Ø	mm	17.5	Ø: Diameter of Holes
			A_n	cm ²	26.94	A_n : Net area of stub angle at the plane of the intersection with concrete
			L	mm	1090	L: Minimum Stub Length in Concrete
	ANGLE SHEAR CONNECTOR	SECTION	Size of Ang.	L110x110x10		
			w	mm	110	w : width of angle shear connector leg
			t	mm	10	t : thickness of angle shear connector
			b	mm	140.0	b : length of angle shear connector
			r	mm	13.0	r : radius of fillet
		NUMBER	#		10	
MIN STUB ANGLE AREA	Compression plus Shear:		A_a	cm ²	31.25	$A_a = \frac{P}{F_y} + \frac{V}{0.75F_y}$ ASCE 10-15 Eq (7.4-1)
	Tension plus Shear:		A_a	cm ²	25.21	
SHEAR CONNECTORS	ANGLES		x	mm	47.3	$x = t \left[\frac{F_y}{1.19f_{cd}} \right]^{1/2}$ ASCE 10-15 Eq (7.6-3)
		Capacity of one Angle Shear Connector	P	kN	103.6	$P = 1.19f_{cd}b(t + r + x/2)$ ASCE 10-15 Eq (7.6-2)
		Total Capacity of Connectors	P	kN	1036.3	
	BOLTS	Diameter	Ø	mm	16	
		Number	#		20	
		Shear Capacity of one Bolt	$F_{V,Rd}$	kN	77.21	$P = 0.6f_{ub}A/\gamma_{M2}$ Table J.3. EN50341-1:2012
CHECKS SUMMARY	STUB ANGLE (COMPRESSION + SHEAR)		cm ²	32.40	> 31.25	OK
	STUB ANGLE (TENSION + SHEAR)		cm ²	26.94	> 25.21	OK
	ANGLE SHEAR CONNECTOR		kN	1036.3	> 967.0	OK
	CONNECTION BOLTS		kN	1544.2	> 967.0	OK



Note:
This drawing is illustrative. For more details see Assembly drawings.



Group Label	Angle Type	Angle Size	Material	Bolts
1	SAE	80°80'6	S355	6 M-16(8.8)*
1A	SAE	80°80'6	S355	6 M-16(8.8)*
2	SAE	80°80'6	S355	6 M-16(8.8)*
3	SAE	80°80'6	S355	6 M-16(8.8)*
4	SAE	110°110'10	S355	8 M-16(8.8)*
5	SAE	110°110'10	S355	8 M-16(8.8)*
6	SAE	110°110'10	S355	8 M-16(8.8)*
7	SAE	110°110'10	S355	8 M-16(8.8)*
8	SAE	120°120'10	S355	10 M-16(8.8)*
9	SAE	120°120'10	S355	8 M-16(8.8)*
10	SAE	120°120'10	S355	8 M-16(8.8)*
11	SAE	130°130'10	S355	8 M-16(8.8)*
12	SAE	130°130'10	S355	8 M-16(8.8)*
13T	SAE	45°45'5	S235	2 M-16(8.8)
13L	SAE	45°45'5	S235	2 M-16(8.8)
13AT	SAE	45°45'5	S355	2 M-16(8.8)
13AL	SAE	45°45'5	S235	2 M-16(8.8)
14T	SAE	45°45'5	S355	2 M-16(8.8)
14L	SAE	45°45'5	S355	2 M-16(8.8)
15T	SAE	45°45'5	S235	2 M-16(8.8)
15L	SAE	45°45'5	S355	2 M-16(8.8)
16T	SAE	50°50'5	S355	2 M-16(8.8)
17T	SAE	60°60'5	S355	2 M-16(8.8)
17L	SAE	50°50'5	S355	2 M-16(8.8)
18T	SAE	55°55'5	S355	2 M-16(8.8)
18L	SAE	55°55'5	S355	2 M-16(8.8)
19T	SAE	70°70'5	S355	2 M-16(8.8)
19L	SAE	90°90'6	S355	3 M-16(8.8)
20T	SAE	65°65'5	S355	2 M-16(8.8)
20L	SAE	70°70'5	S355	2 M-16(8.8)
21T	SAE	55°55'5	S355	2 M-16(8.8)
21L	SAE	55°55'5	S355	2 M-16(8.8)
22T	SAE	75°75'6	S235	2 M-16(8.8)
22L	SAE	75°75'6	S235	2 M-16(8.8)
23T	SAE	70°70'5	S235	2 M-16(8.8)
23L	SAE	70°70'5	S235	2 M-16(8.8)
24T	SAE	65°65'5	S235	2 M-16(8.8)
24L	SAE	65°65'5	S235	2 M-16(8.8)
25T	SAE	50°50'5	S235	2 M-16(8.8)
25L	SAE	50°50'5	S235	2 M-16(8.8)
25AT	SAE	50°50'5	S235	2 M-16(8.8)
25AL	SAE	50°50'5	S235	2 M-16(8.8)
26T	SAE	50°50'5	S235	2 M-16(8.8)
26L	SAE	50°50'5	S235	2 M-16(8.8)
27T	SAE	50°50'5	S235	2 M-16(8.8)
27L	SAE	50°50'5	S235	2 M-16(8.8)
28T	SAE	65°65'5	S235	2 M-16(8.8)
28L	SAE	55°55'5	S235	2 M-16(8.8)
29T	SAE	55°55'5	S235	2 M-16(8.8)

*Double Shear

Group Label	Angle Type	Angle Size	Material	Bolts
29L	SAE	70°70'5	S355	2 M-16(8.8)
30T	SAE	55°55'5	S235	2 M-16(8.8)
30L	SAE	55°55'5	S235	2 M-16(8.8)
31	SAE	45°45'5	S235	2 M-16(8.8)
32	SAE	45°45'5	S235	2 M-16(8.8)
33	SAE	45°45'5	S235	2 M-16(8.8)
34	SAE	45°45'5	S235	2 M-16(8.8)
35	SAE	65°65'5	S355	2 M-16(8.8)
36	SAE	50°50'5	S355	2 M-16(8.8)
51	SAE	75°75'6	S355	4 M-16(8.8)
52	SAE	60°60'6	S355	3 M-16(8.8)
53	SAE	65°65'6	S355	3 M-16(8.8)
54	SAE	60°60'6	S355	3 M-16(8.8)
55	SAE	75°75'7	S355	3 M-16(8.8)
56	SAE	60°60'6	S355	3 M-16(8.8)
57	SAE	70°70'6	S355	3 M-16(8.8)
58	DAE	80°80'8	S355	2 M-16(8.8)
59	DAE	80°80'8	S355	2 M-16(8.8)
60	DAE	80°80'8	S355	2 M-16(8.8)
61	DAE	70°70'6	S355	4 M-16(8.8)
101	SAE	130°130'10	S355	8 M-16(8.8)*
111	SAE	75°75'5	S235	2 M-16(8.8)
121	SAE	80°80'6	S355	2 M-16(8.8)
122	SAE	80°80'6	S355	2 M-16(8.8)
201	SAE	130°130'10	S355	8 M-16(8.8)*
202	SAE	130°130'10	S355	8 M-16(8.8)*
211	SAE	80°80'6	S235	2 M-16(8.8)
221	SAE	65°65'5	S355	2 M-16(8.8)
222	SAE	60°60'5	S235	1 M-16(8.8)
223	SAE	65°65'5	S235	2 M-16(8.8)
224	SAE	80°80'6	S235	2 M-16(8.8)
231	DAE	50°50'5	S355	2 M-16(8.8)*
232	SAE	65°65'5	S355	2 M-16(8.8)
233	SAE	50°50'4	S235	1 M-16(8.8)
234	SAE	65°65'4	S355	1 M-16(8.8)
301	SAE	130°130'10	S355	8 M-16(8.8)*
302	SAE	130°130'10	S355	8 M-16(8.8)*
311	SAE	70°70'5	S355	2 M-16(8.8)
321	SAE	65°65'5	S355	2 M-16(8.8)
322	SAE	65°65'5	S355	1 M-16(8.8)
323	SAE	65°65'5	S235	2 M-16(8.8)
324	SAE	80°80'6	S235	2 M-16(8.8)
331	DAE	50°50'5	S355	2 M-16(8.8)*
332	SAE	60°60'5	S355	2 M-16(8.8)
333	SAE	50°50'4	S235	1 M-16(8.8)
334	SAE	65°65'4	S355	1 M-16(8.8)
401	SAE	130°130'10	S355	8 M-16(8.8)*
402	SAE	130°130'10	S355	8 M-16(8.8)*
411	SAE	90°90'6	S235	2 M-16(8.8)
421	SAE	70°70'5	S355	2 M-16(8.8)

*Double Shear

Group Label	Angle Type	Angle Size	Material	Bolts
422	SAE	70°70'5	S355	1 M-16(8.8)
423	SAE	65°65'5	S235	2 M-16(8.8)
424	SAE	80°80'6	S235	2 M-16(8.8)
431	DAE	60°60'5	S355	2 M-16(8.8)*
432	SAE	60°60'5	S355	2 M-16(8.8)
433	SAE	50°50'4	S235	1 M-16(8.8)
434	SAE	65°65'4	S355	1 M-16(8.8)
501	SAE	130°130'10	S355	8 M-16(8.8)*
502	SAE	130°130'11	S355	8 M-16(8.8)*
503	SAE	130°130'11	S355	8 M-16(8.8)*
511	SAE	75°75'5	S235	2 M-16(8.8)
512	SAE	110°110'6	S235	2 M-16(8.8)
521	SAE	80°80'6	S355	2 M-16(8.8)
522	SAE	80°80'6	S355	1 M-16(8.8)
523	SAE	65°65'5	S235	2 M-16(8.8)
524	SAE	80°80'6	S235	2 M-16(8.8)
531	DAE	65°65'5	S355	2 M-16(8.8)*
532	SAE	75°75'5	S355	2 M-16(8.8)
533	SAE	50°50'4	S235	1 M-16(8.8)
534	SAE	65°65'4	S355	1 M-16(8.8)
601	SAE	130°130'10	S355	8 M-16(8.8)*
602	SAE	130°130'10	S355	8 M-16(8.8)*
603	SAE	130°130'11	S355	8 M-16(8.8)*
611	SAE	110°110'6	S235	2 M-16(8.8)
612	SAE	80°80'6	S235	2 M-16(8.8)
621	SAE	80°80'6	S355	2 M-16(8.8)
622	SAE	70°70'5	S355	1 M-16(8.8)
623	SAE	65°65'5	S235	2 M-16(8.8)
624	SAE	80°80'6	S235	2 M-16(8.8)
625	SAE	90°90'6	S355	2 M-16(8.8)
626	SAE	75°75'6	S355	1 M-16(8.8)
631	DAE	75°75'5	S355	2 M-16(8.8)*
632	SAE	65°65'4	S355	2 M-16(8.8)
633	SAE	50°50'4	S235	1 M-16(8.8)
634	SAE	65°65'5	S355	1 M-16(8.8)
1000	SAE	130°130'11	S355	8 M-16(8.8)*
1001	SAE	130°130'11	S355	8 M-16(8.8)*
1002	SAE	130°130'11	S355	8 M-16(8.8)*
1003	SAE	130°130'11	S355	8 M-16(8.8)*
1004	SAE	130°130'11	S355	8 M-16(8.8)*
1005	SAE	130°130'11	S355	8 M-16(8.8)*
1006	SAE	130°130'11	S355	8 M-16(8.8)*
1010	SAE	75°75'6	S355	3 M-16(8.8)
1011	SAE	75°75'6	S355	3 M-16(8.8)
1012	SAE	80°80'6	S355	3 M-16(8.8)
1013	SAE	75°75'6	S355	3 M-16(8.8)
1014	SAE	80°80'6	S355	3 M-16(8.8)
1015	SAE	80°80'6	S355	3 M-16(8.8)
1016	SAE	90°90'6	S355	3 M-16(8.8)

*Double Shear

Group Label	Angle Type	Angle Size	Material	Bolts
R1A	SAE	45°45'5	S235	2 M-16(8.8)
R1B	SAE	45°45'5	S235	2 M-16(8.8)
R1C	SAE	45°45'5	S235	2 M-16(8.8)
R1D	SAE	45°45'5	S235	2 M-16(8.8)
R2A	SAE	45°45'4	S235	1 M-16(8.8)
R2B	SAE	45°45'4	S235	1 M-16(8.8)
R3A	SAE	45°45'4	S235	1 M-16(8.8)
R3B	SAE	45°45'4	S235	1 M-16(8.8)
R4A	SAE	45°45'4	S235	1 M-16(8.8)
R4B	SAE	45°45'4	S235	1 M-16(8.8)
R5	SAE	45°45'4	S355	1 M-16(8.8)
R6	SAE	45°45'4	S235	1 M-16(8.8)
R7	SAE	45°45'4	S235	1 M-16(8.8)
R8	SAE	45°45'4	S235	1 M-16(8.8)
R9	SAE	45°45'4	S355	1 M-16(8.8)
R10	SAE	45°45'4	S235	1 M-16(8.8)
R11	SAE	45°45'4	S355	1 M-16(8.8)
R12	SAE	45°45'4	S235	1 M-16(8.8)
R13	SAE	45°45'5	S235	2 M-16(8.8)
R13B	SAE	45°45'5	S235	2 M-16(8.8)
R13D	SAE	45°45'5	S235	2 M-16(8.8)
R14	SAE	45°45'5	S235	2 M-16(8.8)
R14B	SAE	45°45'5	S235	2 M-16(8.8)
R14D	SAE	45°45'5	S235	2 M-16(8.8)
R15	SAE	45°45'5	S235	2 M-16(8.8)
R16	SAE	45°45'5	S235	2 M-16(8.8)
R17	SAE	45°45'5	S235	2 M-16(8.8)
R18	SAE	45°45'5	S235	2 M-16(8.8)
R19	SAE	45°45'5	S235	2 M-16(8.8)
R20	SAE	45°45'5	S235	2 M-16(8.8)
R21	SAE	45°45'5	S235	2 M-16(8.8)
R22	SAE	45°45'5	S235	2 M-16(8.8)
R23	SAE	45°45'5	S235	2 M-16(8.8)
R24	SAE	45°45'5	S235	2 M-16(8.8)
R25	SAE	45°45'5	S235	2 M-16(8.8)
R26	SAE	45°45'5	S235	2 M-16(8.8)
R26B	SAE	45°45'5	S235	2 M-16(8.8)
R26D	SAE	45°45'5	S235	2 M-16(8.8)
R28	SAE	45°45'4	S235	1 M-16(8.8)
R29	SAE	45°45'4	S235	1 M-16(8.8)
R30	SAE	45°45'4	S235	1 M-16(8.8)
R31	SAE	45°45'4	S235	1 M-16(8.8)
R32	SAE	45°45'4	S235	1 M-16(8.8)
R33	SAE	45°45'4	S235	1 M-16(8.8)
R34	SAE	45°45'4	S355	1 M-16(8.8)
R35	SAE	45°45'4	S355	1 M-16(8.8)
R36	SAE	45°45'4	S235	1 M-16(8.8)
R37	SAE	45°45'4	S235	1 M-16(8.8)
R38	SAE	45°45'4	S355	1 M-16(8.8)
R39	SAE	50°50'4	S355	1 M-16(8.8)
R40	SAE	45°45'4	S235	1 M-16(8.8)
R41	SAE	45°45'4	S235	1 M-16(8.8)
R42	SAE	45°45'4	S235	1 M-16(8.8)
R43	SAE	45°45'4	S355	1 M-16(8.8)
R44	SAE	50°50'4	S235	1 M-16(8.8)
R44A	SAE	45°45'4	S235	1 M-16(8.8)
R45	SAE	45°45'4	S235	1 M-16(8.8)
R45A	SAE	45°45'4	S235	1 M-16(8.8)
R46	SAE	55°55'4	S355	1 M-16(8.8)
R47	SAE	65°65'4	S355	1 M-16(8.8)
R48	SAE	60°60'4	S355	1 M-16(8.8)
R49	SAE	45°45'4	S235	1 M-16(8.8)
R50	SAE	45°45'4	S235	1 M-16(8.8)
R51	SAE	45°45'4	S235	1 M-16(8.8)
R52	SAE	55°55'4	S355	1 M-16(8.8)
R53	SAE	55°55'4	S235	1 M-16(8.8)
R54	SAE	45°45'4	S355	1 M-16(8.8)
R55	SAE	55°55'4	S355	1 M-16(8.8)
R55A	SAE	65°65'4	S355	1 M-16(8.8)
R56	SAE	45°45'4	S355	1 M-16(8.8)
R56A	SAE	45°45'4	S355	1 M-16(8.8)
R57	SAE	60°60'4	S355	1 M-16(8.8)
R58	SAE	50°50'4	S235	1 M-16(8.8)
R59	SAE	45°45'4	S235	1 M-16(8.8)
R60	SAE	50°50'4	S355	1 M-16(8.8)