input d	ata			output data		
web length	44	cm	bean	n depth h	48	cm
web thickness	1.5	cm	d (ef	fective depth)	45.6	cm
flange length	20	cm	b (ef	fective width)	16	cm
flange thickness	2	cm	m		4.7	cm
D (plate length)	55	cm	n		14.5	cm
B (plate Width)	45	cm		plate calculations	5	
N Normal force	177	ton	plate	Area	2475	cm2
Qx	4	tons				
Qy	1.8	tons				
Q shear force	4.38634244	ton	plate	section area , A1	90	cm2
concrete bearing capacity	77	kg/cm2	plate	inertia , Ix1	30	cm4
tp , plate thickness	2	cm	max	allowable free length without stiffener	6.951648993	cm
steel yield stress	3.6	ton/cm2		moment calculations		
steel ultimate stress	5.2	ton/cm2	Mon	nent /cm , n direction	7.518030303	ton.cm/cm
bolt diameter	10	mm	Mon	nent /cm , m direction	0.789884848	ton.cm/cm
bolts count	2	count	mom	ent , n direction	413.4916667	ton.cm
flange weld thickness	2	cm	mom	ent , m direction	35.54481818	ton.cm
web weld thickness	0.4	cm		stresses calculations		
stiffeners count , m direction	0	stiffenere	Appl	ied concrete stress	0.071515152	ton/cm2
stiffener thickness , m directio	2	cm		rete Bearing safty	safe	
stiffener length , m direction	20	cm	steal	allowable stress 0.72Fy	2.592	ton/cm2
stiffeners count , n direction	2	stiffenere	cente	er of gravity , m direction	1	cm
stiffener thickness , n direction	2	cm	total	inertia , Ix , m direction	30	cm4
stiffener length , n direction	20	cm	Appl	ied steel stress , m direction	1.184827273	ton/Cm1
			cento	er of gravity , n direction	6.789473684	cm
				inertia , Ix , n direction	7428.245614	cm4
			Appl	ied steel stress , n direction	0.055664781	ton/Cm2
			safet		safe	

min stifferer plan length , Lst,min	no stiffeners required	cm	Area bolt	0.785398163	cm
stiffeners length , bst	0	cm	Rsh	2.336559536	ton
stiffeners thickness min , t st,min	0	cm	Rbear	10.608	ton
stiffener thickness , t st	2	cm	R max	2.336559536	ton
	2			4.673119072	+
stiffener weld thickness	_	cm	R max , all bolts		сп
stiffener weld length	0	cm	bolt length	20	сп
Qy applied on stiffeners	15.12545455	ton	safety	safe	сп
Qy per stiffener	#DIV/0!	ton			
qy , shear stress on weld	#DIV/0!	ton/cm2			
f , normal stress due to bending on weld	-1.184827273	ton/cm2			
feq , equivalent stress	#DIV/0!	ton/cm2	pla	te welding	
stiffeners weld safety	#DIV/0!		Fu,weld	1.04	t/on
stiffeners area , A2	0	cm2	flange weld length	73	ОП
stiffeners inertia , lx2	0	cm4	web weld length	84	оп
			FN	0.985523385	t/on
			FQ	0.024422842	t/on
			Feq	0.986430823	t/on
web plan perpendicular stiff	eners , welded on fla	ges	safety	safe	
min stifferer plan length , Lst,min	5.548351007	cm			
stiffeners length het	20	cm			
surreners length , bst					
stiffeners length , bst stiffeners thickness min , t st,min	1.25	cm			
	1.25	cm cm			
stiffeners thickness min , t st,min					
stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness	2	cm			
stiffeners thickness min , t st,min stiffener thickness , t st stiffener weld thickness stiffener weld length	2 2	om om			
stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness	2 2 40	cm cm			
stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Qy applied on stiffeners	2 2 40 57.03333333	om om om ton			
stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Qy applied on stiffeners Qy per stiffener	2 2 40 57.03333333 28.51666667	om om om ton			
stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Qy applied on stiffeners Qy per stiffener qy , shear stress on weld	2 2 40 57.03333333 28.51666667 0.356458333	cm cm cm ton ton			
stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Qy applied on stiffeners Qy per stiffener qy , shear stress on weld f , normal stress due to bending on weld	2 40 57.03333333 28.51666667 0.356458333 0.735361057	om om ton ton ton/om2 ton/om2			
stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Oy applied on stiffeners Oy per stiffener Oy , shear stress on weld f , normal stress due to bending on weld feq , equivalent stress	2 40 57.03333333 28.51666667 0.356458333 0.735361057 0.960178897	om om ton ton ton/om2 ton/om2			

input d	ata		output data		
web length	30	cm	beam depth h	34	cm
web thickness	1	cm	d (effective depth)	32.3	cm
flange length	24	cm	b (effective width)	19.2	cm
flange thickness	2	cm	m	5.85	cm
D (plate length)	44	cm	n	22.4	cm
B (plate Width)	64	cm	plate calculations		
N Normal force	215	ton	plate Area	2816	cm2
Qx	0.5	tons	plate section area , A1	128	cm2
Qy	0	tons	plate inertia , lx1	42.66666667	cm4
Q shear force	0.5	ton	max allowable free length without stiffener	6.727968697	cm
concrete bearing capacity	77	kg/cm2	moment calculations		
tp , plate thickness	2	cm	Moment /cm , n direction	19.15454545	ton.cm/cm
steel yield stress	3.6	ton/cm2	Moment /cm , m direction	1.306434215	ton.cm/cm
steel ultimate stress	5.2	ton/cm2	moment , n direction	842.8	ton.cm
bolt diameter	10	mm	moment , m direction	83.61178977	ton.cm
bolts count	2	count	stresses calculations		
flange weld thickness	2	cm	Applied concrete stress	0.076349432	ton/cm2
web weld thickness	0.4	cm	Concrete Bearing safty	safe	
stiffeners count , m direction	0	stiffenere	steal allowable stress 0.72Fy	2.592	ton/cm2
stiffener thickness , m directio	1.5	cm	center of gravity , m direction	1	cm
stiffener height, m direction	20	cm	total inertia , lx , m direction	42.66666667	cm4
stiffeners count , n direction	2	stiffenere	Applied steel stress , m direction	1.959651323	ton/Cm1
stiffener thickness , n direction	2	cm	center of gravity , n direction	7.882352941	cm
stiffener height , n direction	24	cm	total inertia , Ix , n direction	14950.90196	cm4
			Applied steel stress , n direction	0.056371181	ton/Cm2
			safety	safe	

m direction stiffneres, flanges pla	an perpendicular s	urreners	shear bolts th	readed boits	
min stifferer plan length , bst,min	0	cm	Area bolt	0.785398163	۰
stiffeners height , hst	0	cm	Rsh	2.336559536	to
stiffeners thickness min , t st,min	0	cm	Rbear	10.608	to
stiffener thickness , t st	1.5	cm	R max	2.336559536	to
stiffener weld thickness	1.5	cm	R max , all bolts	4.673119072	to
stiffener weld length	0	cm	bolt length	20	
Qy applied on stiffeners	28.58522727	ton	safety	safe	•
Qy per stiffener	#DIV/0!	ton			
Q y , shear stress on weld	#DIV/0!	ton/cm2			
f , normal stress due to bending on weld	-1.959651323	ton/cm2	-1-4	aldin a	
feq , equivalent stress	#DIV/0!	ton/cm2	plate w	eiding	
stiffeners weld safety	#DIV/0!		Fu,weld	1.04	t/c
stiffeners area , A2	0	cm2	flange weld length	90	٠
stiffeners inertia , 1x2	0	cm4	web weld length	56	-
			stiffeners to plate weld area	42.47050017	0
			FN	0.878015114	t/c
n direction stiffners , web plan ;	perpendicular stiff	eners,	FQ	0.002041896	t/c
welded on f	lages		Feq	0.878022236	t/c
min stifferer plan length , bst,min	13.2720313	cm	safety	safe	
stiffeners height , hst	24	cm			
stiffeners thickness min , t st,min	1.5	cm			
stiffener thickness , t st	2	cm			
stiffener weld thickness	2	cm			
stiffener weld length	48	cm			
Qy applied on stiffeners	75.25	ton			
Qy per stiffener	37.625	ton			
Q γ , shear stress on weld	0.391927083	ton/cm2			
f , normal stress due to bending on weld	0.908570799	ton/cm2			
feq , equivalent stress	1.134161105	ton/cm2			
stiffeners weld safety	safe				
stiffeners area , A2	72	cm2			
stiffeners inertia , 1x2	1728	cm4			

web length 20 cm beam depth h web thickness 1 cm d (effective depth)	24 22.8 20.8	cm cm
web thickness 1 cm d (effective depth)		cm
	20.8	+
flange length 26 cm b (effective width)		cm
flange thickness 2 cm m	13.6	cm
D (plate length) 50 cm n	14.6	cm
B (plate Width) 50 cmplate	e calculations	
N Normal force 180 ton plate Area	2500	cm2
Qx 1 tons plate section area , A1	100	cm2
Qy 12 tons plate inertia , x1	33.33333333	cm4
Q shear force 12.04159458 ton max allowable free length with	hout stiffener 6.92820323	cm
concrete bearing capacity 77 kg/cm2moment	nt calculations	
tp , plate thickness 2 cm Moment /cm , n direction	7.67376	ton.cm/cm
steel yield stress 3.6 ton/cm2 Moment /cm , m direction		ton.cm/cm
steel ultimate stress 5.2 ton/cm2 moment , n direction	383.688	
bolt diameter 16 mm moment, m direction	332.928	ton.cm
bolts count 2 countstresse	es calculations	
flange weld thickness 2 cm Applied concrete stress	0.072	ton/cm2
web weld thickness 0.4 cm Concrete Bearing safty	safe	
stiffeners count , m direction 2 stiffenere steal allowable stress 0.72Fy	2.592	ton/cm2
stiffener thickness , m direction 2 cm center of gravity , m direction	5.475138122	cm
stiffener length , m direction 18 cm total inertia , lx , m direction	5601.971455	cm4
stiffeners count , n direction 2 stiffenere Applied steel stress , m direction	ion 0.863219896	ton/Cm1
stiffener thickness , n direction 2 cm center of gravity , n direction	1.330275229	cm
stiffener length , n direction 6 cm total inertia , lx , n direction	178.9434251	cm4
Applied steel stress , n directio	on 2.144186074	ton/Cm2
safety	safe	

m direction stiffneres, flanges pla	an perpendicular si	irreners	snear boll	ts threaded bolts	
min stifferer plan length , Lst,min	6.07179677	cm	Area bolt	2.010619298	٥
stiffeners height , bst	18	cm	Rsh	9.57054786	to
stiffeners thickness min , t st,min	1.125	cm	Rbear	16.9728	to
stiffener thickness , t st	2	cm	R max	9.57054786	to
stiffener weld thickness	2	cm	R max , all bolts	19.14109572	to
stiffener weld length	36	cm	bolt length	30	
Qy applied on stiffeners	48.96	ton	safety	safe	
Qy per stiffener	24.48	ton			
q y , shear stress on weld	0.34	ton/cm2			
f , normal stress due to bending on weld	0.744358883	ton/cm2	nlat	to welding	
feq , equivalent stress	0.949141795	ton/cm2	plat	te welding	
stiffeners weld safety	safe		Fu,weld	1.04	tl
stiffeners area , A2	40.5	cm2	flange weld length	92.4	
stiffeners inertia , 1x2	546.75	cm4	web weld length	32	
			stiffeners to plate v	29.25949933	٦,
			FN	0.79344264	th
n direction stiffners , web plan	perpendicular stiff	eners,	FQ	0.053079525	th
welded on f	lages		Feq	0.798751232	th
min stifferer plan length , Lst,min	5.07179677	cm	safety	safe	
stiffeners height , bst	6	cm			
stiffeners thickness min , t st,min	0.375	cm			
stiffener thickness , t st	2	cm			
stiffener weld thickness	2	cm			
stiffener weld length	12	cm			
Qy applied on stiffeners	52.56	ton			
Qy per stiffener	26.28	ton			
q y , shear stress on weld	1.095	ton/cm2			
	10.01275882	ton/cm2			
f , normal stress due to bending on weld		ton/cm2			
f , normal stress due to bending on weld feq , equivalent stress	10.19080047				
	unsafe				_
feq , equivalent stress		cm2			
feq , equivalent stress stiffeners weld safety	unsafe	cm2			

Connection B3 (crane column)

M	ט	· ·	U	, L	1	U
input data	ı			output data		
web length	22	cm		beam depth h	26	cm
web thickness	1	cm		d (effective depth)	24.7	cm
flange length	15	cm		b (effective width)	12	cm
flange thickness	2	cm		m	3.65	cm
D (plate length)	32	cm		n	9	cm
B (plate Width)	30	cm		plate calculations	5	
N Normal force	68	ton		plate Area	960	cm2
Q shear force	0	ton		plate section area , A1	60	cm2
concrete bearing capacity	77	kg/cm2		plate inertia , x1	20	cm4
tp , plate thickness	2	cm		max allowable free length without stiffener	6.985026001	cm
steel yield stress	3.6	ton/cm2		moment calculations		
steel ultimate stress	5.2	ton/cm2		Moment /cm , n direction	2.86875	ton.cm/cm
bolt diameter	10	mm		Moment /cm , m direction	0.471838542	ton.cm/cm
bolts count	2	count		moment , n direction	91.8	ton.cm
flange weld thickness	1	cm		moment , m direction	14.15515625	ton.cm
web weld thickness	0.4	cm		stresses calculations		
stiffeners count , m direction	0	stiffenere		Applied concrete stress	0.070833333	ton/cm2
stiffener thickness , m direction	2	cm		Concrete Bearing safty	safe	
stiffener length , m direction	10	cm		steal allowable stress 0.72Fy	2.592	ton/cm2
stiffeners count , n direction	2	stiffenere		center of gravity , m direction	1	cm
stiffener thickness , n direction	2	cm		total inertia , lx , m direction	20	cm4
stiffener length , n direction	4	cm		Applied steel stress , m direction	0.707757813	ton/Cm1
				center of gravity , n direction	1.1875	cm
				total inertia , Ix , n direction	56.41666667	cm4
				Applied steel stress , n direction	1.62717873	ton/Cm2
				safety	safe	

min stifferer plan length , Lst,min	0	cm	Area bolt	0.785398163	СП
	0	cm	Rsh	2.336559536	to
stiffeners height , bst				10.608	+
stiffeners thickness min , t st,min	0	cm	Rbear		to
stiffener thickness , t st	2	cm	R max	2.336559536	to
stiffener weld thickness	2	om	R max , all bolts	4.673119072	to
stiffener weld length	0	cm	bolt length	20	<u> </u>
Qy applied on stiffeners	7.75625	ton	safety	safe	٩
Qy per stiffener	#DIV/0!	ton			
q γ , shear stress on weld	#DIV/0!	ton/cm2			
f , normal stress due to bending on weld	-0.707757813	ton/cm2	nla	to wolding	
feq , equivalent stress	#DIV/0!	ton / cm2	pia	te welding	
stiffeners weld safety	#DIV/0!		Fu,weld	1.04	t/c
stiffeners area , A2	0	cm2	flange weld length	10	٦,
stiffeners inertia , 1x2	0	cm4	web weld length	44	١,
			stiffeners to plate v	3.295833593	١.
			FN	0.744831361	t/c
n direction stiffners , web plan	perpendicular stiffe	eners ,		0.021906805	t/c
n direction stiffners , web plan welded on		eners ,	FQ	0.021906805 0.745797212	tlo
		eners,			+
welded on min stifferer plan length , Lst,min	flages		FQ Feq	0.745797212	+-
welded on min stifferer plan length , Lst,min stiffeners height , bst	flages 0.514973999	cm	FQ Feq	0.745797212	+-
welded on min stifferer plan length , Lst,min	0.514973999 4	cm cm	FQ Feq	0.745797212	+
welded on min stifferer plan length , Lst,min stiffeners height , bst stiffeners thickness min , tst,min stiffener thickness , tst	0.514973999 4 0.25	om om	FQ Feq	0.745797212	+
welded on min stifferer plan length , Lst,min stiffeners height , bst stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness	0.514973999 4 0.25 2	om om om	FQ Feq	0.745797212	+
welded on min stifferer plan length , Lst,min stiffeners height , bst stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length	0.514973999 4 0.25 2 2 8	om om om	FQ Feq	0.745797212	+-
welded on min stifferer plan length , Lst,min stiffeners height , bst stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Qy applied on stiffeners	0.514973999 4 0.25 2	om om om om om	FQ Feq	0.745797212	+
welded on min stifferer plan length , Lst,min stiffeners height , bst stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Oy applied on stiffeners Oy per stiffener	0.514973999 4 0.25 2 2 8 20.4	om om om om om ton	FQ Feq	0.745797212	+
welded on min stifferer plan length , Lst,min stiffeners height , bst stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Qy applied on stiffeners Qy per stiffener qy , shear stress on weld	0.514973999 4 0.25 2 2 8 20.4 10.2	om om om om ton	FQ Feq	0.745797212	+
welded on min stifferer plan length , Lst,min stiffeners height , bst stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Oy applied on stiffeners Oy per stiffener qy , shear stress on weld f , normal stress due to bending on weld	10.2 0.6375 4.576440177	om om om om om ton ton/om2	FQ Feq	0.745797212	+
welded on min stifferer plan length , Lst,min stiffeners height , bst stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Qy applied on stiffeners Qy per stiffener qy , shear stress on weld f , normal stress due to bending on weld feq , equivalent stress	10.514973999 4 0.25 2 2 8 20.4 10.2 0.6375	om om om om om ton ton ton/om2	FQ Feq	0.745797212	+
welded on min stifferer plan length , Lst,min stiffeners height , bst stiffeners thickness min , tst,min stiffener thickness , tst stiffener weld thickness stiffener weld length Oy applied on stiffeners Oy per stiffener qy , shear stress on weld f , normal stress due to bending on weld	flages 0.514973999 4 0.25 2 2 8 20.4 10.2 0.6375 4.576440177 4.707762042	om om om om om ton ton/om2	FQ Feq	0.745797212	+-

Connection B4 (crane column)

2	input data			output data	
3	web length	22	cm	beam depth h 26 cm	n
4	web thickness	1	cm	d (effective depth) 24.7 cm	n
5	flange length	15	cm	b (effective width) 12 cm	n
6	flange thickness	2	cm	m 12.65 cm	n
7	D (plate length)	50	cm	n 19 cm	n
8	B (plate Width)	50	cm	plate calculations	
9	N Normal force	180	ton	plate Area 2500 cm	12
10	Qx	1	tons	plate section area , A1 100 cm	12
11	Qy	0	tons	plate inertia , x1 33.33333333 cm	14
12	Q shear force	1	ton	max allowable free length without stiffener 6.92820323 cm	n
13	concrete bearing capacity	77	kg/cm2	moment calculations	
14	tp , plate thickness	2	cm	Moment /cm , n direction 12.996 ton.cm	n/cm
15	steel yield stress	3.6	ton/cm2	Moment /cm , m direction 5.76081 ton.cm	n/cm
16	steel ultimate stress	5.2	ton/cm2	moment , n direction 649.8 ton.o	cm
17	bolt diameter	10	mm	moment, m direction 288.0405 ton.o	cm
18	bolts count	2	count	stresses calculations	
19	flange weld thickness	2	cm	Applied concrete stress 0.072 ton/c	m2
20	web weld thickness	1	cm	Concrete Bearing safty safe	
21	stiffeners count , m direction	3	stiffenere	steal allowable stress 0.72Fy 2.592 ton/c	m2
22	stiffener thickness , m direction	2	cm	center of gravity , m direction 4.132596685 cm	n
23	stiffener length , m direction	12	cm	total inertia , Ix , m direction 2550.151013 cm	14
24	stiffeners count , n direction	2	stiffenere	Applied steel stress , m direction 1.114526854 ton/C	Cm1
25	stiffener thickness , n direction	2	cm	center of gravity , n direction 1.689655172 cm	n
26	stiffener length , n direction	8	cm	total inertia , lx , n direction 420.8275862 cm	14
27				Applied steel stress , n direction 1.544100295 ton/C	Cm2
28				safety safe	
29					

m direction stiffneres , flanges planter	an perpendicular sc	meners	shear bolts th	ireaded boits	
nin stifferer plan length , bst,min	5.07179677	cm	Area bolt	0.785398163	cm2
tiffeners height , Lst	12	cm	Rsh	2.336559536	tons
stiffeners thickness min , t st,min	0.75	cm	Rbear	10.608	tons
stiffener thickness , t st	2	cm	R max	2.336559536	tons
stiffener weld thickness	2	cm	R max , all bolts	4.673119072	tons
stiffener weld length	24	cm	bolt length	20	cm
Qy applied on stiffeners	45.54	ton	safety	safe	cm
Qy per stiffener	15.18	ton			
្យីy , shear stress on weld	0.31625	ton/cm2			
f , normal stress due to bending on weld	0.888626114	ton/cm2	platau	rolding	
feq , equivalent stress	1.043886276	ton/cm2	plate w	reiding	
stiffeners weld safety	safe		Fu,weld	1.04	t/cm2
stiffeners area , A2	27	cm2	flange weld length	42	cm
tiffeners inertia , 1x2	108	cm4	web weld length	36	cm
			stiffeners to plate weld area	48.57437416	cm2
			FN	1.067777952	t/cm2
n direction stiffners , web plan	perpendicular stiffe	eners,	FQ	0.0059321	t/cm3
welded on f	lages		Feq	1.067827385	t/cm4
nin stifferer plan length , bst,min	10.57179677	cm	safety	unsafe	
stiffeners height , Lst	8	cm			
tiffeners thickness min , t st,min	0.5	cm			
stiffener thickness , t st	2	cm			
stiffener weld thickness	2	cm			
stiffener weld length	16	cm			
Qy applied on stiffeners	68.4	ton			
Qy per stiffener	34.2	ton			
q y , shear stress on weld	1.06875	ton/cm2			
, normal stress due to bending on weld	9.74380531	ton/cm2			
eq , equivalent stress	9.918085581	ton/cm2			
tiffeners weld safety , fillet	unsafe				
stiffeners area , A2	8	cm2			
stiffeners inertia , 1x2	21.33333333	cm4			

			Commecti	OII L) +	1	u
1 2	input	data			plate calculations		
3	web length	68	cm		web length	68	cm
4	web thickness	2	cm		web thickness	2	cm
5	flange length	42	cm		flange length	42	cm
6	flange thickness	2	cm		flange thickness	2	cm
7	C1	5	cm		beam depth h	72	cm
8	D (plate length)	145	cm		C1	5	cm
9	tp , plate thickness	2	cm		C2	14	cm
10	Straining	g actions			D (plate length)	145	cm
11	N Normal force	189	ton		B (plate Width)	70	cm
12	Qx	7.8	ton		tp , plate thickness	2	cm
13	Qy	14	tons		(D - beam depth h) / 2	36.5	cm
14	Q eq	16.03	ton		e	25.3968254	cm
15	M moment	48	m. Ton		stress core	24.1666667	cm
16	stiffi	ners			comp. and tension bolts spacing , h* , spacing bet. C.g. of stiffeners	103.5	cm
17	stiffeners count	5	stiffenere for one flange		Compression force	140.876812	ton
18	stiffener thickness , t st	2	cm		Tension Force	48.1231884	ton
19	stiffener height , h st	24	cm		a (third comp. stress in case of tension existance)	20.75	cm
20	bo	lts			Plate Properties of area calculation	S	
21	bolts rows	2	rows		plate surface Area	10150	cm2
22	bolt diameter	22	mm		plate surface inertia , lx	17783645.83	cm4
23	We	eld			plate section area , A1	140	cm2
24	flange weld thickness	2	cm		plate section center of gravity	1	cm
25	web weld thickness	1	cm		plate section inertia	46.66666667	cm4
26					Applied moment on Plate , due to compression	54.30486278	ton cm
27					tp , plate thickness , required for compression	1.34	cm
28					plate thickness safety , for compression	safe	cm
29					M-section Properties of area calculati	ons	
30					Area	380	cm2
31					center of gravity	9.21052632	cm
32					inertia	26509.8246	cm4
33					moment @ M-sec	2131.07732	ton cm
34 35					shear force @ M-sec	116.77136 1.34967572	tons ton/cm2
36					max normal stress shear stress	0.30729305	ton/cm2
37					combined stress	1.38421587	ton/cm2
38					section safety	safe	safety

stiffeners calculati	ons		flanges and web v	veiding	
stiffeners count	5	stiffenere	Fu,weld	1.04	t/cm
stiffeners spacing , center to center	9	cm	flange weld length	50	cm
stiffeners clear spacing , X	7	cm	web weld length	128	cm
stiffener thickness , t st	2	cm	stiffeners to plate weld area	252	cmi
stiffener height , hst	24	cm	weld area	480	cmi
•	31.5	cm			cm
stiffeners length , b st			weld inertia	496726.5417	
buckling check b st / t st	15.75	buckling	FN	0.893823942	t/cr
buckling safety	safe	safety	FQ	0.033395833	t/cr
section M , weld of stiffeners and pla	te section calculatio	ns	Feq	0.895693634	t/cr
stiffener weld length = hst - Sw	22	cm	safety	safe	
stiffener weld thickness , sw	2	cm			
area	580	cm2			
center of gravity	10.10344828	cm	T Di D		
inertia	33087.12644	cm2	Top Plate Des	ign	
fn , normal stress on weld	0.89504981	ton/cm2	plate width	29.1	cr
qy , shear stress on Weld	0.201329931	ton/cm2	moment on plate	27.06929348	ton
feq , equivalent stress	0.960580755	ton / cm2	plate thickness required	1.63	cr
	safe	safety			
shear bolts threaded bolts ,	Anchor bolts				
shear bolts threaded bolts ,	Anchor bolts	All bolts			
bolts count construction condition , 3D , edge and flange spacing	Anchor bolts 8 safe	All bolts safety	Resistance Stre	≥sses	
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing	Anchor bolts 8 safe safe	All bolts safety safety			
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt	8 safe safe 3.801327111	All bolts safety	Resistance Stre	3.6	_
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing	Anchor bolts 8 safe safe	All bolts safety safety			+-
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt	8 safe safe 3.801327111	All bolts safety safety cm2	steel yield stress	3.6	ton
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh	8 safe safe 3.801327111 4.071221336	All bolts safety safety cm2 tons	steel yield stress steel ultimate stress	3.6 5.2	ton
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear	8 safe safe 3.801327111 4.071221336 23.3376	All bolts safety safety cm2 tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy	3.6 5.2 2.088	ton,
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356	All bolts safety safety cm2 tons tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy	3.6 5.2 2.088 2.592	ton,
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551	All bolts safety safety cm2 tons tons tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy	3.6 5.2 2.088 2.592	ton,
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551 1.037221431	All bolts safety safety cm2 tons tons tons tons tons tons tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy	3.6 5.2 2.088 2.592	ton,
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safety	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551 1.037221431 unsafe	All bolts safety safety cm2 tons tons tons tons tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy	3.6 5.2 2.088 2.592	ton,
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safetybolts length	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551 1.037221431 unsafe	All bolts safety safety cm2 tons tons tons tons tons safety	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy	3.6 5.2 2.088 2.592 77	ton,
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safetybolts length bold stress for concrete	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551 1.037221431 unsafe	All bolts safety safety cm2 tons tons tons tons tons safety	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress	3.6 5.2 2.088 2.592 77	ton,
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safetybolts length bold stress for concrete required bolt length	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551 1.037221431 unsafe 9 50	All bolts safety safety cm2 tons tons tons tons tons tons cons tons cons tons tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress have tension?	3.6 5.2 2.088 2.592 77	ton, ton, ton, kg/
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safetybold stress for concrete required bolt length Area washer plate	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551 1.037221431 unsafe 9 50 37.73015355	All bolts safety safety cm2 tons tons tons tons tons safety	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress have tension? max stress (concrete stress)	3.6 5.2 2.088 2.592 77 77	ton, ton, ton, kg/
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safetybolts length bold stress for concrete required bolt length Area washer plate washer plate length	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551 1.037221431 unsafe 9 50 37.73015355 6.14	All bolts safety cm2 tons tons tons tons tons tons cons tons cons cons cons cons cons cons cons c	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress have tension? max stress (concrete stress) stress on concrete @ stiffeners edge	3.6 5.2 2.088 2.592 77 77 sses have tension 0.064659466 0.059465935	ton, ton, kg/
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safetybolts length bold stress for concrete required bolt length Area washer plate washer plate length moment on washer plate	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551 1.037221431 unsafe 9 50 37.73015355 6.14 2.227952111	All bolts safety cm2 tons tons tons tons tons cons cons cons cons cons cons cons c	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stres have tension ? max stress (concrete stress) stress on concrete @ stiffeners edge stress on concrete @ bolt	3.6 5.2 2.088 2.592 77 77 sses have tension 0.064659466 0.059465935 0.043106311	ton, ton, ton, kg/
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safetybolts length bold stress for concrete required bolt length Area washer plate washer plate length moment on washer plate	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551 1.037221431 unsafe 9 50 37.73015355 6.14	All bolts safety cm2 tons tons tons tons tons cons cons tons tons tons tons tons tons tons t	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress have tension? max stress (concrete stress) stress on concrete @ stiffeners edge	3.6 5.2 2.088 2.592 77 77 sses have tension 0.064659466 0.059465935 0.043106311 0.026746687	ton/ ton/ ton/ kg/
shear bolts threaded bolts , bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safety	8 safe safe 3.801327111 4.071221336 23.3376 4.071221336 2.00375 6.746595356 6.015398551 1.037221431 unsafe 9 50 37.73015355 6.14 2.227952111	All bolts safety cm2 tons tons tons tons tons cons cons tons tons tons tons tons tons tons t	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stres have tension? max stress (concrete stress) stress on concrete @ stiffeners edge stress on concrete @ bolt stress concrete @ flange	3.6 5.2 2.088 2.592 77 77 sses have tension 0.064659466 0.059465935 0.043106311	ton/ ton/ ton/ ton/ kg/d

1 2	input	data			plate calculations		
3	web length	50	cm		web length	50	cm
4	web thickness	1.5	cm		web thickness	1.5	cm
5	flange length	24	cm		flange length	24	cm
6	flange thickness	2	cm		flange thickness	2	cm
7	C1	5	cm		beam depth h	54	cm
8	D (plate length)	120	cm		C1	5	cm
9	tp , plate thickness	2	em		C2	8	cm
10	Straining	actions			D (plate length)	120	cm
11	N Normal force	56	ton		B (plate Width)	40	cm
12	Qx	7.5	ton		tp , plate thickness	2	cm
13	Qy	4	tons		(D - beam depth h) / 2	33	cm
14	Q eq	8.5	ton		e	87.5	cm
15	M moment	49	m. Ton		stress core	20	cm
16	stiffi	ners			comp. and tension bolts spacing , h* , spacing bet. C.g. of stiffeners	82	cm
17	stiffeners count	3	stiffenere		Compression force	87.7560976	ton
18	stiffener thickness , t st	2	cm		Tension Force	31.7560976	ton
19	stiffener height , h st	22	cm		a (third comp. stress in case of tension existance)	19	cm
20	bo	lts			Plate Properties of area calculation	S	
21	bolts rows	3	rows		plate surface Area	4800	cm2
22	bolt diameter	22	mm		plate surface inertia , lx	5760000	cm4
23	we	eld			plate section area , A1	80	cm2
24	flange weld thickness	2	cm		plate section center of gravity	1	cm
25	web weld thickness	1	cm		plate section inertia	26.66666667	cm4
26	stiffeners to plate weld thickness	1	cm		Applied moment on Plate , due to compression	36.80137979	ton cm
27					tp , plate thickness , required for compression	1.46	cm
28					plate thickness safety , for compression	safe	cm
29					M-section Properties of area calculati	ons	
30					Area	212	cm2
31					center of gravity	8.47169811	cm
32					inertia	11958.761	cm4
33				<u> </u>	moment @ M-sec	1191.27079	ton om
34 35					shear force @ M-sec max normal stress	72.1982298 1.54685025	tons ton/cm2
36					shear stress	0.34055769	ton/cm2
37					combined stress	1.58389559	ton/cm2
38					section safety	safe	safety

stiffeners calculation					
stiffeners count	3	stiffenere	Fu,weld	1.04	t/cm2
stiffeners spacing , center to center	9	cm	flange weld length	26.5	cm
stiffeners clear spacing , X	7	cm	web weld length	92	cm
stiffener thickness , t st	2	cm	stiffeners to plate weld area	312	cm2
stiffener height , h st	22	cm	weld area	457	cm2
stiffeners length , bst	28	cm	weld inertia	311583.6667	cm3
-	14	buckling		0.767308933	t/cm2
buckling check bst / tst		_	FN		t/cm3
buckling safety	safe	safety	FQ	0.018599562	+ -
section M , weld of stiffeners and plat			Feq	0.767984915	t/cm4
stiffener weld length = h st - Sw	20	cm	safety	safe	
stiffener weld thickness , sw	2	cm			
area	320	cm2			
center of gravity	9.25	cm	Town Divining		
inertia	15286.66667	cm2	Top Plate Des	sign	
fn , normal stress on weld	0.993591535	ton/cm2	plate width	25.6	cm
qy, shear stress on Weld	0.225619468	ton/cm2	moment on plate	35.72560976	ton cr
feq , equivalent stress	1.067678122	ton / cm2	plate thickness required	2	cm
stiffeners weld safety	safe	safety	plate tilickiless required	2	Citi
shear bolts threaded bolts , A	nchor bolts				
	nchor bolts	All bolts			
shear bolts threaded bolts , A bolts count construction condition , 3D , edge and flange spacing		All bolts safety	Desistance Stre		
bolts count construction condition , 3D , edge and flange spacing	6		Resistance Stre	sses	
bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing	6 safe	safety	Resistance Stre	esses 3.6	ton/cm
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt	6 safe safe	safety safety			+
bolts count	6 safe safe 3.801327111	safety safety cm2	steel yield stress	3.6	ton/cm
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh	6 safe safe 3.801327111 4.071221336	safety safety cm2 tons	steel yield stress steel ultimate stress	3.6 5.2	ton/cm
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear	6 safe safe 3.801327111 4.071221336 23.3376	safety safety cm2 tons tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy	3.6 5.2 2.088	ton/cm
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction condition cond	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336	safety safety cm2 tons tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy	3.6 5.2 2.088 2.592	ton/cm
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction condition , 3D , edge and flange spacing construction allowable construction and flange spacing construction and flange spacing construction condition , 3D , edge and flange spacing construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction condition conditi	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667	safety safety cm2 tons tons tons tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy	3.6 5.2 2.088 2.592	ton/cm
bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667 6.746595356	safety safety cm2 tons tons tons tons tons tons tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy	3.6 5.2 2.088 2.592	ton/cm
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction , 3D , stiffeners spacing construction condition , 3D , stiffeners spacing condition condition , 3D , stiffeners spacing condition	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667 6.746595356 5.292682927 0.736519103 safe	safety safety cm2 tons tons tons tons tons tons	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy	3.6 5.2 2.088 2.592	ton/cm
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction construction , 3D , stiffeners spacing construction condition , 3D , stiffeners spacing construction condition , 3D , stiffeners spacing construction , 3D , stiffeners spacing construction condition , 3D , stiffeners spacing condition condition , 3D , stiffeners spacing condition conditi	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667 6.746595356 5.292682927 0.736519103 safe	safety safety cm2 tons tons tons tons tons safety	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy	3.6 5.2 2.088 2.592 77	ton/cm ton/cm
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction condition , 3D , stiffeners spacing condition , 3D , stiffeners spacing condition co	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667 6.746595356 5.292682927 0.736519103 safe	safety safety cm2 tons tons tons tons tons safety	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress	3.6 5.2 2.088 2.592 77	ton/cm
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction , 3D , stiffeners spacing construction , 3D , stiffeners spacing construction condition , 3D , edge and flange spacing construction , 3D , stiffeners spacing construction condition , 3D , stiffeners spacing condition co	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667 6.746595356 5.292682927 0.736519103 safe 9 50	safety safety cm2 tons tons tons tons tons safety	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress have tension?	3.6 5.2 2.088 2.592 77	ton/cm ton/cm ton/cm kg/cm2
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction condition , 3D , stiffeners spacing condition condition , 3D , stiffeners spacing condition condi	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667 6.746595356 5.292682927 0.736519103 safe	safety safety cm2 tons tons tons tons tons safety kg/cm2 cm	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress	3.6 5.2 2.088 2.592 77	ton/cm ton/cm ton/cm kg/cm2
bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safety	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667 6.746595356 5.292682927 0.736519103 safe 9 50 28.34423636	safety safety cm2 tons tons tons tons tons tons cons tons cons cons cons cons safety	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress have tension? max stress (concrete stress)	3.6 5.2 2.088 2.592 77 ses have tension 0.076979033	ton/cm ton/cm ton/cm kg/cm2
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction , 3D , stiffeners construction , 3D , stiffene	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667 6.746595356 5.292682927 0.736519103 safe 9 50 28.34423636 5.32	safety safety cm2 tons tons tons tons tons tons cons tons cons cons cons cons cons cons cons c	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress have tension? max stress (concrete stress) stress on concrete @ stiffeners edge	3.6 5.2 2.088 2.592 77 **********************************	ton/cm ton/cm ton/cm kg/cm2
bolts count construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing Area bolt Rsh Rbear R max Q per Bolt Tension allowable Tension per bolt circular equation bolt straining actions safety bold stress for concrete required bolt length Area washer plate washer plate length	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667 6.746595356 5.292682927 0.736519103 safe 9 50 28.34423636 5.32 1.449224392	safety safety cm2 tons tons tons tons tons tons cons tons tons tons tons tons tons tons t	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress have tension ? max stress (concrete stress) stress on concrete @ stiffeners edge stress on concrete @ bolt stress concrete @ flange average Concrete stress (max , @bolt)	3.6 5.2 2.088 2.592 77 **********************************	ton/cm ton/cm ton/cm kg/cm2 t/cm2
construction condition , 3D , edge and flange spacing construction condition , 3D , stiffeners spacing construction , 3D , stiffeners construction , 3D , stiffene	6 safe safe 3.801327111 4.071221336 23.3376 4.071221336 1.416666667 6.746595356 5.292682927 0.736519103 safe 9 50 28.34423636 5.32 1.449224392	safety safety cm2 tons tons tons tons tons tons cons tons tons tons tons tons tons tons t	steel yield stress steel ultimate stress plate section allowable stress 0.58Fy plate section allowable stress 0.72Fy concrete bearing capacity Applied Stress have tension? max stress (concrete stress) stress on concrete @ stiffeners edge stress on concrete @ bolt stress concrete @ flange	3.6 5.2 2.088 2.592 77 77 ses have tension 0.076979033 0.070226486 0.051319355 0.032412224	ton/cmi ton/cmi ton/cmi ton/cmi ton/cmi ton/cmi tycm2 t/cm2 t/cm2 t/cm2 t/cm2 t/cm2

Connection M1 and M2

1 2	Pry	ing force calcula	tions		welding			
3	w	10	cm	inverse prop.	steel ultimate stress	5.2	t/cm2	
4	a	6	cm	inverse prop.	allowable stress	1.04	t/cm2	
5	b	4	cm	direct prop.	Q	5	t	
6	As	4.59	cm2	direct prop.	Mx	30	tm	
7	tp	2	cm	inverse prop.	flange	20	cm	
8	Text,b	24	tons		flange thickness	2	cm	
9	Text,act	12.660198	tons		web	60	cm	
10	P	3.96212297	tons		web thickness	1	cm	
11	P%		0.312959005		web weld length	58	cm	
12	total applied	16.622321	tons		web weld thicnkess	0.4	cm	
13	tension req.	21.10033	tons	pass	flange upper weld length	20	cm	
14	ten+prying req.	20.7779012	tons	pass	flange lower weld length	17	cm	
15	. , , , , ,				flange weld thickness	1.1	cm	
16					lx	91723.5	cm 3	
17					A (axial stress)	1.01719	t/cm2	pass
18					B (axial stress)	0.98121	t/cm2	pass
19					web (shear stress)	0.10776	t/cm2	pass
20					B (combined stress)	0.9988	t/cm2	pass

Q	5	t	-	training actions								
М	30	tm	,	danning actions	bolt yield stress	9	t/cm2					
lx	9878400000	mm4		Plate inertia								
Y mm	stress t/cm2	w cm	h cm	applied force t	force / 0.6 t	bolt Diam.	T bolt	ratio	is safe	n	ps	Qall
420	0.12755102	10	11.5	12.66019801	21.10033001	24	22.23041227	0.949165	pass	6	8.89216	22.968
305	0.092626336	10	8.5	6.776147959	11.29357993	20	15.4377863	0.731554	pass	4	6.17511	13.858
220	0.066812439	10	22	7.349368319	12.2489472	20	15.4377863	0.793439	pass	4	6.17511	12.941
		Q	all	21.2423939	tons	pass						
			iges eld	1.1	cm							
		web	weld	0.4	cm							

Connection M3 and M4

w a b As tp Text,b Text,act		15.4 7.72	3.75 6 4 4.59 2 377863 895592	cm cm cm2 cm	inverse prop. direct prop. direct prop. inverse prop.		steel ultimat allowable Q Mx flange	stress		5.2 1.04 5 30	t/cm2 t/cm2 t t	
b As tp Text,b		15.4 7.72	4 1.59 2 377863	cm cm2 cm	direct prop.		Q Mx			5 30	t	
As tp Text,b Text,act		15.4 7.72	1.59 2 377863	cm2 cm	direct prop.		Mx			30		
tp Text,b Text,act		15.4 7.72	<mark>2</mark> 377863	cm 3 tons							tm	
Text,b Text,act		7.72	377863	3 tons	inverse prop.		flange					
Text,act		7.72						2		24	cm	
,			895592				flange thic	kness		2	cm	
		2.42		2 tons			web			70	cm	
P			870412	2 tons			web thick	ness		1	cm	
P%				0.314234437			web weld	ength		68	cm	
otal appl	ied	10.	15766	tons			web weld th	icnkess		0.4	cm	
ension re	·q.	12.8	815932	2 tons	pass		flange upper w	eld length		24	cm	
en+pryin	g req.	12.6	970751	1 tons	pass		flange lower w	eld length		21	cm	
							flange weld t	hickness		0.8	cm	
							lx			114692	cm 3	
							A (axial st	ress)		0.93642	t/cm2	pass
							B (axial st			0.9155	t/cm2	pass
							web (shear B (combined			0.09191	t/cm2 t/cm2	pass
							D (combine	011 2007		0.52527	cy ciri.	puss
Q	5	t										
M	30	tm	str	raining actions	bolt yield stress	9	t/cm2					
lx	1730000000	mm4	1	Plate inertia								
Y mm	stress t/cm2	w cm	h cm	applied force t	force / 0.6 t	bolt Diam.	T bolt	ratio	is safe	n	ps	Qall
470	0.08150289	8.75	12.5	7.728955925	12.88159321	20	15.4377863	0.83442	pass	6	6.17511	18.50119
345	0.05982659	15	10.5	7.988800578	13.31466763	20	15.4377863	0.862473	pass	4	6.17511	11.91838
240	0.041618497	15	24	7.49132948	12.48554913	20	15.4377863	0.808766	pass	4	6.17511	12.71433
				Qall	43.133901	tons	pass					
									<u> </u>			

Flanges weld

web weld

8.0

0.4

cm

cm

	Prying force calcula	ations		weld	ing		
w	6.5	cm	inverse prop.	steel ultimate stress	5.2	t/cm2	
a	6	cm	inverse prop.	allowable stress	1.04	t/cm2	
b	4	cm	direct prop.	Q	1.5	t	
As	4.59	cm2	direct prop.	Mx	10	tm	
tp	2	cm	inverse prop.	flange	120	cm	
Text,b	15.4377863	tons		flange thickness	2	cm	
Text,act	7.73620605	tons		web	65	cm	
P	2.44879137	tons		web thickness	1	cm	
P%		0.316536471		web weld length	63	cm	
total applied	10.1849974	tons		web weld thicnkess	0.4	cm	
tension req.	12.8936768	tons	pass	flange upper weld length	120	cm	
ten+prying req.	12.7312468	tons	pass	flange lower weld length	117	cm	
				flange weld thickness	0.4	cm	
				lx	229799	cm 3	
				A (axial stress)	0.14317	t/cm2	pass
				B (axial stress)	0.14143	t/cm2	pass
				web (shear stress)	0.02976	t/cm2	pass
				B (combined stress)	0.15053	t/cm2	pass

	Q	1.5	t		training actions	bolt yield stress	9	t/cm2					
	M	10	tm		tranning actions	plate width	120	mm					
	lx	2621440000	mm4		Plate inertia	plate length	640	mm					
١	/ mm	stress t/cm2	w cm	h cm	applied force t	force / 0.6 t	bolt Diam.	T bolt	ratio	is safe	n	ps	Qall
	320	0.122070313	6.5	12	7.736206055	12.89367676	20	15.4377863	0.835202	pass	4	6.17511	12.32253
	200	0.076293945	6.5	20	4.959106445	8.265177409	16	9.880183232	0.836541	pass	4	3.95207	7.873723
						Q	all	20.196251	tons	pass			
						Elange	s weld	0.4	cm				
						Fiange	3 WEIU	0.4	CIII				
						web	weld	0.4	cm				

	Prying force calcula	tions		wel	ding		
w	10	cm	inverse prop.	steel ultimate stress	5.2	t/cm2	
a	0	cm	inverse prop.	allowable stress	1.04	t/cm2	
b	0	cm	direct prop.	Q	1	t	
As	4.59	cm2	direct prop.	Mx	5	tm	
tp	2	cm	inverse prop.	flange	200	cm	
Text,b	22.2304123	tons		flange thickness	2	cm	
Text,act	11.0294118	tons		web	25	cm	
P	#DIV/0!	tons		web thickness	1	cm	
P%		#DIV/0!		web weld length	23	cm	
total applied	#DIV/0!	tons		web weld thicnkess	0.4	cm	
tension req.	18.3823529	tons	pass	flange upper weld length	200	cm	
ten+prying req.	#DIV/0!	tons	#DIV/0!	flange lower weld length	197	cm	
				flange weld thickness	0.4	cm	
				lx	59076.1	cm 3	
				A (axial stress)	0.10918	t/cm2	pass
				B (axial stress)	0.1058	t/cm2	pass
				web (shear stress)	0.05435	t/cm2	pass
				B (combined stress)	0.14161	t/cm2	pass

Q	1	t	st	training actions	bolt yield stress	9	t/cm2					
M	5	tm		adming decions	plate width	200	mm					
lx	655066666.7	mm4		Plate inertia	plate length	340	mm					
Y mm	stress t/cm2	w cm	h cm	applied force t	force / 0.6 t	bolt Diam.	T bolt	ratio	is safe	n	ps	Qall
170	0.129757785	10	17	11.02941176	18.38235294	24	22.23041227	0.826901	pass	4	8.89216	17.9216
		Q	all	17.9216008	tons	pass						
		Flan		0.4	cm							
		web	weld	0.4	cm							

Connection M7 (All Mezanen Beams for first floor)

		P	rying f	orce cal	culations							we	elding				
w				0	cm	invers	se prop.			steel ı	ultimate s	tress	5	.2	t/cm2		
а				0	cm	invers	se prop.			allo	wable str	ess	1.	04	t/cm2		
b				0	cm	direc	t prop.				Q		8	.5	t		
As				4.59	cm2	direc	t prop.				Mx			0	tm		
tp				0	cm	invers	se prop.				flange			0	cm		
Text,b			9.	8801832	23 tons					flan	ge thickno	ess		0	cm		
											web		2	9	cm		
										we	b thickne	ss		1	cm		
										web	weld len	gth	2	27	cm		
										web v	veld thicr	ıkess	0	.4	cm		
									fla	nge u	per weld	length		0	cm		
									fla	nge lo	wer weld	length	-	3	cm		
									1	lange	weld thic	kness		0	cm		
											lx		13:	12.2	cm 3		
											axial stres	•		0	t/cm2	pass	
											axial stres	-		0	t/cm2	pass	
											(shear str nbined st			9352	t/cm2 t/cm2	pass pass	
Q	8.5	t	straini	ng actions	bolt yield stress	9	t/cm2										
lx	0	mm4	Plat	e inertia	plate length	0	mm										
	ess t/cr				force / 0.6 t				is safe	n	ps	shear p	lans	Qal	l all	owable shear ra	tio
0	0	0	0	0	0	16	9.88018	0	pass	3	3.95207		1	11.856	522		100
		Bolt	s Qall	11.86	tons	pass	ratio	71.69233	%								
		Flange	es weld	0	cm												
		_															
		web	weld	0.4	cm												
		No	otes		hear in calcula angle , it is the												

Connection M8 (Mezanen Beam connection for Management floor)

Pry	ing force calcula	ations		we	lding		
w	0	cm	inverse prop.	steel ultimate stress	5.2	t/cm2	
a	0	cm	inverse prop.	allowable stress	1.04	t/cm2	
b	0	cm	direct prop.	Q	10.5	t	
As	4.59	cm2	direct prop.	Mx	0	tm	
tp	0	cm	inverse prop.	flange	0	cm	
Text,b	9.88018323	tons		flange thickness	0	cm	
				web	29	cm	
				web thickness	1	cm	
				web weld length	27	cm	
				web weld thicnkess	0.4	cm	
				flange upper weld length	0	cm	
				flange lower weld length	-3	cm	
				flange weld thickness	0	cm	
				lx	1312.2	cm 3	
				A (axial stress)	0	t/cm2	pass
				B (axial stress)	0	t/cm2	pass
				web (shear stress)	0.48611	t/cm2	pass
				B (combined stress)	0	t/cm2	pass

Q	10.5	t		training actions	bolt yield stress	9	t/cm2							
M	0	tm	,	duning decions	plate width	0	mm							
lx	0	mm4		Plate inertia	plate length	0	mm							
Y mı	n stress t/cm2	w cm	h cm	applied force t	force / 0.6 t	bolt Diam.	T bolt	ratio	is safe	n	ps	shear plans	Qall	allowable shear ratio
0	0	0	0	0	0	16	9.880183232	0	pass	3	3.95207	1	11.85622	100
		Bolts	G Qall	11.8562199	tons	pass	ratio	88.56111	%					
		Flan		0	cm									
		web	weld	0.4	cm									
		No	tes	the shear in		s the applied		ne angle	e , it is					

Stair Carriage Connection

Hinged – roller connection

Shear force = 2.5 tons

use bearing bolts connection for UBN200 and weld for beam B3 or B4

Weld calculations:

use weld thickness = S_W = 0.4 cm weld length = L_{eff} = shear force / (0.2 x F_u x S_W) = 2.5 / (1.04 * 0.4) = 6 cm

actual length = L_{act} = L_{eff} + $2x S_W$ = 7 cm

Bolts calculations:

use Bearing Bolts M12 10.9

 $R_{sh} = 3.14 \times 1.2^2 \times 0.25 \times 10.9 \times 0.2 = 2.47 \text{ tons}$

 $R_{bearing} = D x t x 0.6 x F_u = 1.2 x 1 x 0.6 x 5.2 = 3.74 tons$

 $R_{max} = 2.47 tons$

Use 2 Bolts M12, 10.9

Use angle 60 x 60 x 6