CONSULTING Engineering Calculation Sheet							Sheet No.		Rev.
	Consulting	g Calculatio	n Sneet		ivvv	,		1	
ENGINEEKS	Consulting	Ligineers			JXX/	(Ţ	
					Member/Loo	cation			
Job Title Member De	esign - Rein	forced Con	crete Two V	Vay Spanni	Drg.				
Member Design - RC T	wo Way Sp	anning Slal	b		Made by	ΧХ	Date 21	/11/2021	hd.
Material Properties									
Characteristic strength	of concret	e, f _{cu} (≤ 60	N/mm ² ; HS	SC N/A)		3	5 🗸	N/mm ²	ОК
Yield strength of longit	udinal stee	f_v				46	60 🗸	N/mm ²	
Yield strength of shear	link steel.	f _w				46	60 🗸	N/mm ²	
Type of concrete and c	lensity. o.	· yv		Normal	Neight	-	24	kN/m^3	
Slah Parameters									
Sidd Parameters									
Shortor coop (dofined		d number	l (numbor			_	E 000		
		u number,	I _x (number		an	•	5.000	m	01/
Longer span (defined a	as in y) and	i number, i	, (number a	arrec Single Sp	ban		6.000	m 	OK
Slab support condition	s (affects e	ffective bea	am section,	molContinuc	bus		•	ia)	
Panel (affects moment	s for contir	nuous case,		Corner			•		
shear for continuous c	ase and wh	ether inter	ior or edge	beam for b	oth pree	cast	and contin	uous cases))
Overall slab depth, h _{sla}	_{ab} (I/24-I/35	5 s/s; l/34-l	/40 cont)				175	mm	
Cover to all reinforcem	nent, cover	(usually MA	AX(25, φ) in	ternal; 40	externa	I)	30	mm	
Effective depth to sage	ging steel ir	n x, d _{x,s} = h	s _{lab} - cover	- φ _{sx} /2			140	mm	
Effective depth to sage	ging steel ir	$y, d_{y,s} = h$	Islah - COVEr	$-\phi_{sx} - \phi_{sy}/2$			130	mm	
Effective depth to hoge	aina steel ii	$n x_i d_{x_i b} = 1$	lab - cover	- ϕ_{link} - ϕ_{h}	./2		140	mm	
Effective depth to hoge	aina steel ii	$n v_{i} d_{v_{i}} = 1$	lab - cover		φ _{hv} /2		130) mm	
	<u>g</u> g eteet	· // ~y, II ·	-siap coro.	ΨΠΠΚ,Υ ΨΠΣ	x +11y/ —		150		
Sagging steel reinforce	mont diam	otor in v d				10) –	mm	
Sagging steel reinforce	mont nitch	for regista	sx				200		
			$\frac{1}{(1 + 2)}$	x			200	2,	
Sagging steel area pro	vided in x,	$A_{s,prov,x,s} =$	$(\pi.\phi_{sx}^{-}/4)/p$	sx			395	mm ² /m	
Sagging steel reinforce	ement diam	ieter in y, ø	sy .			1()	Imm	
Sagging steel reinforce	ement pitch	for resista	nce in y, p_s	у			200	mm	
Sagging steel area pro	ovided in y,	$A_{s,prov,y,s} =$	$(\pi.\phi_{sy}^{2}/4)/p$	sy		_	393	mm²/m	
Hogging steel reinforce	ement diam	neter in x, ¢	hx			10)	mm	
Hogging steel reinforce	ement pitch	n for resista	nce in x, p _h	ıx			200	mm	
Hogging steel area pro	vided in x,	$A_{s,prov,x,h} =$	$(\pi.\phi_{hx}^{2}/4)/r$	0 _{hx}			393	mm²/m	
Hogging steel reinforce	ement diam	neter in y, ¢	hy			10) –	mm	
Hogging steel reinforce	ement pitch	n for resista	nce in y, p _h	iy			200	mm	
Hogging steel area pro	vided in y,	$A_{s,prov,v,h} =$	$(\pi . \phi_{hy}^2/4)/\mu$	0 _{hv}			393	mm²/m	
Shear link diameter fo	r bending i	1 X, Φ _{link x}				N	one 🔻	mm	
Number of links per m	etre for bei	ndina in x.	n _{link v}				4	/m	
Area provided by all lin	iks ner mel	tre for hence	ling in v A	<u> </u>	, π.h	2/		mm^2/m	
Pitch of links for hendi	na in x S			v,prov,x — Hir	ικ,x•···Ψlinl	к,х /	150		
Shear link diameter for	r hending in	nv h				N	one	mm	
Number of links nor m	atra for bo	nding in y	n			IN		/m	
		rong in y,	ling in			2,		/111	
Area provided by all lif	iks per met	Lie for benc	nng m y, A _s	_{iv,prov,y} = n _{lir}	_{ik,y} .π.φ _{linl}	к,у /		mm /m	
FICH OF IINKS FOR DENDI	ng in y, S _y						150	mm	
						F.()		1	
Siab Loading (Plan L	.oading)			Redistributed	Moments	Lttec		L	
(Internal elev load not	on beam r	nust be che	ескед on efi	rective widt	ns [spa	n/(5	or /.14)]	within slab	aepth)
Live load, LL							2.00	kPa	
Superimposed dead loa	ad, SDL _{plan}						1.20	kPa	
Dead load of slab, DL	= $h_{slab}.\rho_c$						4.20	kPa	
ULS slab loading, $\omega_{ULS,i}$	_{slab} (a.k.a. I	n) = 1.4 (D	L + SDL _{plan}) + 1.6 LL			10.76	kPa	
Beam Loading (Eleva	ation Load	ling)		Elastic Momer	nts Effects				
Superimposed dead lo	ad on y dire	ection beam	n, SDL _{elevix}				0.00	kN/m	
Superimposed dead lo	ad on x dire	ection beam	1, SDL _{elev v}				0.00	kN/m	
								-	

EX OS DE LENS consultants Engineering Laboration Engineering Laboration State juil 1 juil 2 Jab Table Member Design - Reinforced Concrete Two Way Spanning State Owe for XX Tow XY Spanning State Owe for XX Tow XY Spanning State Parameters of Beam Spanning in y Direction (Slab in x Direction) Edge Beam Edge Beam Owe for XX Tow XY Spanning State Parameters of Beam Spanning in y Direction (Slab in x Direction) Edge Beam Edge Beam Owe for XX Tow XY Spanning State State Tributary width for loading on beam, available beam spacing for effective width in cont case) Downstand deput downstand, Dueana = Bakenauðusem Pc 0.81 [W/m Sag moment beam span y, M _{exes} 0.81 [W/m Sag Weith Sag Weith Sag Weith Stear beam spacing (effective width calcs in continuous case) Z.500 mm Sag section type Imm For sagging: compression steel diameter, et.exe, and number 20 20 20 Owe For sagging: compression steel diameter, et.exe, and number 20 20 Common Imm For sagging: compression steel diameter, et.exe, and number 20 20 Common Imm For sagging: compression steel diameter, et.exe, and number 20 20 Comm Imm For saggi	CONSULTING Engineering Calculation Sheet		Job No		Sheet No.		Rev.			
L NA L Job Title Member Design - Reinforced Concrete Two Way Spannip Wemter Action Parameters of Beam Spanning in y Direction (Slab in x Direction) Edge Beam Interior or edge beam 7 Edge Beam Caffects tributary width for loading on beam, available beam spacing for effective width in cont case) 225 mm Downstand depth of beam (excluding slab) spanning in y direction, h _{cbann} , b_cbann) 150 mm Bead load on y direction beam downstand, D _{Lawany} = h _{cbanny} , b _{cbann} /v 0.81 [N/m Sag moment beam span y, M _{x00} 40 [N/m Sga moment beam span y, M _{x00} 53 [N/m Span (for effective width and deflection calcs) 53 [N/m Span (for effective width and deflection calcs) 53 [N/m Sag acction type 1 40 [N/m For sagging: calcular tributary diameter, d _{tributary} , and number 20 [V] 2 For sagging: calcular tributary diameter, d _{tributary} , and number 20 [V] 2 For sagging: compresion steel diameter, d _{tributary} , and number 20 [V] 2 For hogging: tension steel diameter, d _{tributary} , and number 20 [V] 2 For hogging: number of layers of tensile steel, numer, strass 10 [N] 10 [N] For hog		Consulting	y Calculatio Engineers	n Sneet		iVV	·		2	
Image: Control of the member Design - Referred Concrete Two Way Spanning Statut Member Design - Referred Concrete Two Way Spanning Statut Parameters of Beam Spanning in y Direction (Slab in x Direction) Member Design - Referred Concrete Two Way Spanning in y direction (Slab in x Direction) Edge Beam Interior or edge beam ? Edge Beam Edge Beam 2235 mm 2235 mm Vieth of beam (subding sible) spanning in y direction (beam spanning in y direction beam spanning in y direction (beam spanning in y direction) 880 kV/m 2235 mm Sag moment beam spanny (h _{y Spanning}) Base Spanning in y direction (beam spanning in y direction calcs) 880 kV/m 2235 mm Sag moment beam span y, M _{y Spanning} Base Spanning in y direction calcs) 880 kV/m 880 kV/m Sag action type Edde Control of Spanning in y direction calcs) 6.000 m 100 mm Span (for effective width and deflection calcs) Sog section type 20 mm 20 mm 20 mm For sagging: tension steel diameter, h _{x Spanni} and number None 90 mm 20 mm	ENGINEERS	consulting	Linginicers]~~/			<u>z</u>	
Job Title Member Design - Re Two Way Spanning Slab Member Design - RC Two Way Spanning In y Direction (Slab in x Direction) XX No. 21/11/2021 Member Design - RC Two Way Spanning In y Direction (Slab in x Direction) XX No. 21/11/2021 Member Design - RC Two Way Spanning In y Direction (Slab in x Direction) XX No. 21/11/2021 Member Design - RC Two Way Spanning In y Direction (Slab in x Direction) XX No. 21/11/2021 Member Design - RC Two Way Spanning In y Direction, hgam, to the state						Member/Lo	cation			
Member Design - R.C Two Way Spanning Slab Max by XX Not by XX	Job Title Member D	esign - Rein	forced Con	crete Two V	Vay Spanni	Drg.				
Parameters of Beam Spanning in y Direction (Slab in x Direction) Image: Control of Control o	Member Design - RC	Two Way Sp	anning Slal	b		Made by	XX	Date 21	/11/2021	hd.
Parameters of Beam Spanning in y Direction (Slab in x Direction) image: market in the set of the										
Interior or effective width for loading on beam, available beam spacing for effective width in cont case) Interior or effective width in cont case) Downstand depth of beam (excluding sib) sparning in y direction, housen, spanning in y direction, bouen, spanning in y direction, spanning in y direction, bouen, spanning in y direction, bouen, spanning in y direction, spanning in y	Parameters of Bean	n Spanning	j in y Direc	tion (Slab	in x Direc	tion)				
Interior or edge beam ? Image: Edge Beam										
(affects tributary width for loading on beam, available beam spacing for effective width in cont case) 225 mm Width of beam spanning in y direction, b _{k-bern} , a 150 mm Bead load on y direction beam downstand, Diesen, a 150 mm Sag moment beam span y, M _{x-me} 80 k km Bog moment beam span y, M _{x-me} 60 k km Sag moment beam span y, M _{x-me} 60 k km Span (for effective width and deflection calcs) 6000 m Shear beam span y, M _{x-me} 6000 m Sag section type 6.000 m Sag section type 6.000 m Sag section type 80 k km Overall depth, h _{beenx} (downstand if precast, downstand + slab if cort) 400 mm For sagging: tension steel diameter, $\psi_{r,sagx}$ and number 20 v 2 For sagging: tension steel diameter, $\psi_{r,sagx}$ and number 10 mm 10 mm For hogging: tension steel diameter, $\psi_{r,sagx}$ and number 20 v 2 2 For hogging: tension steel diameter, $\psi_{r,sagx}$ and number 20 v 2 2 For hogging: tension steel diameter, $\psi_{r,sagx}$ and number 20 v 2 2 For hogging: tension steel diameter, $\psi_{r,sagx}$ and number 20 v 2 2	Interior or edge beam	ו?					E	Edge Beam		
Downstand depth of beam (excluding slab) spanning in y direction, h _{abounx} . 125 mm Dead load on y direction, b _{eatom} , in h _{abounx}	(affects tributary widt	h for loadin:	g on beam,	available b	eam spacir	ng for ef	fect	ive width ir	cont case)	
Width of beam spanning in y direction, b _{abam,} and _{b_{abm,} b_{abam,}}	Downstand depth of b	eam (exclu	ding slab) s	panning in	y direction,	, h _{d,beam}	,x	225	mm	
Dead load on y direction beam downstand, DL _{bearn} ≥ h _{2Ubarn} & 0.81 kWm 0.81 kWm Sag amoment beam span y, W _{x,log} 40 kNm Shear beam span y, V _x 53 kN Shear beam span y, V _x 53 kN Span (for effective width and deflection calcs) 5.000 m Sag section type 6.000 m Sag section type 1.5% Hog section type 1.5% Overall depth, h _{soany} , downstand if precast, downstand + slab if cont) 400 mm For sagging: tension steel diameter, $\phi_{x,toag}$, and number 2 For sagging: compression steel diameter, $\phi_{x,toag}$, and number 20 2 For hogging: compression steel diameter, $\phi_{x,toag}$, and number 20 2 For hogging: compression steel diameter, $\phi_{x,toag}$, and number 20 2 For hogging: compression steel diameter, $\phi_{x,toag}$, and number 20 2 For hogging: compression steel diameter, $\phi_{x,toag}$, and number 20 2 For hogging: compression steel diameter, $\phi_{x,toag}$, and number 20 2 For hogging: compression steel diameter, $\phi_{x,toag}$, and number 10 10 For hogging: number of layers of compression steel,	Width of beam spanni	ing in y dire	ction, b _{w,bea}	im,x				150	mm	
Sag moment beam span y, M _{x,hog} show moment beam span y, M _{x,hog} Shear beam span y, M _x Span (for effective width and deflection calcs) Available beam spacing (effective width calcs in continuous case) Sag section type Available beam spacing (effective width calcs in continuous case) Sag section type Available beam spacing (effective width calcs in continuous case) Sag section type Available beam spacing (effective width calcs in continuous case) Sag section type Available beam spacing (effective width calcs in continuous case) Sag section type Available beam spacing (effective width calcs in continuous case) Sag section type Available beam spacing (effective width calcs in continuous case) Sag section type Available beam spacing (effective width calcs in continuous case) Sag section type Available beam spacing (effective width calcs in continuous case) Sag section type Available beam spacing (effective width calcs in continuous case) Sag section type For sagging: tension steel diameter, ϕ_{tasax} and number For hogging: add cover to tensile steel, cover_add, store For sagging: add cover to tensile steel, cover_add, store For sagging: number of layers of tensile steel, naver.tens.et For sagging: number of layers of compression steel, naver.tens.et For hogging: number of layers of compression steel, naver.tens.et For ho	Dead load on y direct	ion beam do	wnstand, D	$DL_{beam,x} = h$	_{d,beam,x} b _{w,bea}	mρc		0.81	kN/m	
Hog moment beam span y, N _x hog. 40 k/km Shear beam span y, V, 53 k/N Span (or effective width and deflection calcs) 6.000 m Available beam spacing (effective width calcs in continuous case) 2.500 m Sag section type 2.500 m Hog section type 2.500 m Overall depth, hueny, downstand if precast, downstand + slab if cont) 400 mm For sagging: tension steel diameter, $\phi_{case,x}$ and number 20 2 For sagging: compression steel diameter, $\phi_{case,x}$ and number 20 2 For sagging: compression steel diameter, $\phi_{case,x}$ and number 20 2 For sagging: compression steel diameter, $\phi_{case,x}$ and number 20 2 For sagging: compression steel diameter, $\phi_{case,x}$ and number 20 2 For sagging: compression steel diameter, $\phi_{case,x}$ and number 20 2 For sagging: compression steel diameter, $\phi_{case,x}$ and number 20 2 For sagging: number of layers of tensile steel, cover _{add,x,comp} = ϕ_{xx} 10 mm For sagging: number of layers of tensile steel, nay-muter, and number 10 1 1 For sagging: number of layers of tensile steel, nay-muter, and number 10 1 <td>Sag moment beam sp</td> <td>an y, M_{x,sag}</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>80</td> <td>kNm</td> <td></td>	Sag moment beam sp	an y, M _{x,sag}						80	kNm	
Shear beam span y, V,	Hog moment beam sp	oan y, M _{x,hog}						40	kNm	
Span (for effective width and deflection calcs) 6.000 m Available beam spacing (effective width calcs in continuous case) 2.500 m Sag section type L - \$/\$ Overall depth, h _{bean,x} (downstand if precast, downstand + slab if cont) 400 mm For sagging: tension steel diameter, $\phi_{tabla,x}$ and number 20 V 2 For sagging: compression steel diameter, $\phi_{tabla,x}$ and number None 0 100 mm For hogging: add cover to compression steel, coverads.c.case 00 100 mm 100 For hogging: compression steel diameter, $\phi_{tabla,x}$ and number None V 2 0 For hogging: add cover to compression steel, coverads.c.case 100 mm 100 mm For hogging: compression steel diameter, $\phi_{tabla,x}$ and number None V 2 0 100 mm For hogging: compression steel diameter, $\phi_{tabla,x}$ and number None V 2 0 100 mm For hogging: number of layers of compression steel, n _{byern,comp,sag} 11 layer(s) 10 10 10 10 10 10 10 10 <td>Shear beam span y, V</td> <td>/_x</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>53</td> <td>kN</td> <td></td>	Shear beam span y, V	/ _x						53	kN	
Span Grow effective width and deflection calcs) 6.000 m Available beam spacing (effective width calcs in continuous case) 2.500 m Available beam spacing (effective width calcs in continuous case) Rect - s/s mm Age section type Rect - s/s mm mm Gorral depth, h _{beam,s} (downstand + slab if cont) 400 mm mm For sagging: tension steel diameter, h _{beam,s} and number 20 V 2 mm For hogging: tension steel diameter, h _{beam,s} and number 20 V 2 mm For hogging: tension steel diameter, h _{beam,s} and number 20 V 2 mm For hogging: compression steel diameter, h _{beam,s} and number 00 V 2 mm For hogging: number of layers of tensile steel, n _{hogen,comp,sag} 110 mm mm mm For sagging: number of layers of tensile steel, n _{hogen,comp,sag} 1 layer(s) mm mm For hogging: number of layers of tensile steel, n _{hogen,comp,sag} 1 layer(s) mm mm For hogging: number of layers of compression steel, n _{hogen,comp,sag}										
Available beam spacing (effective width calcs in continuous case) 2.500 m L - s/s L - s/s L - s/s L - s/s	Span (for effective wi	dth and def	lection calcs	5)				6.000	m	
Sag section type Image: market of the section type Rect - s/s Rect - s/s Year all depth of hears, at (downstand if precast, downstand + slab if cont) 400 mm 100 mm For sagging: compression steel diameter, $\phi_{t,sage, a}$ and number 20 v 2 20 v For sagging: add cover to compression steel, dower_sdox,c.sag = ϕ_{tx} 10 mm 20 v 2 For hogging: tension steel diameter, $\phi_{t,sage, a}$ and number 20 v 2 20 v 20 v For hogging: tension steel diameter, $\phi_{t,sage, a}$ and number 0 10 mm 2 20 v 10 v For hogging: add cover to tensile steel, cover_add,c.t.toog = cover_add,c.c.sag None 0 11 layer(5) 10 v 0 10 v 10 v 0 10 v	Available beam spacir	ng (effective	width calcs	s in continu	ous case)			2.500	m	
Hog section type	Sag section type							L - s/s		
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For sagging: compression steel diameter, $\phi_{c,sag,x}$ and numberNone20 \checkmark 20 2 20 2 20 2 20 <t< td=""><td>Overall depth, h_{beam,x}</td><td>(downstand</td><td>if precast,</td><td>downstand</td><td>+ slab if co</td><td>ont)</td><td></td><td>400</td><td>mm</td><td></td></t<>	Overall depth, h _{beam,x}	(downstand	if precast,	downstand	+ slab if co	ont)		400	mm	
For sagging: tension steel diameter, $\phi_{c,aag,x}$ and number 20 ✓ 2 10 For sagging: add cover to compression steel, cover _{add,x,c,tag} = ϕ_{hx} 10 mm 10 For hogging: tension steel diameter, $\phi_{c,bag,x}$ and number 20 ✓ 2 10 For hogging: compression steel diameter, $\phi_{c,bag,x}$ and number 20 ✓ 2 10 10 For hogging: compression steel diameter, $\phi_{c,bag,x}$ and number 10 ✓ 2 250 mm For hogging: compression steel diameter, $\phi_{c,bag,x}$ and number 10 ✓ 2 250 mm For sagging: number of layers of tensile steel, n _{byters,tens,aop} 11 1ayer(s) 11 1ayer(s) For hogging: number of layers of compression steel, n _{byters,tens,bop} 11 1ayer(s) 11 1ayer(s) For hogging: number of layers of compression steel, n _{byters,tens,bop 11 1ayer(s) 11 13 For hogging: number of layers of compression steel, n_{byters,tens,bop 11 1ayer(s) 14 14 For hogging: number of layers of compression steel, n_{byters,tens,bop 11 1ayer(s) 14 14 14 Interest in tho}}}										
For sagging: compression steel diameter, t _{c.sag,x} and number None 0 0 For sagging: add cover to compression steel, cover_add.x.c.sag 10 mm 0 For hogging: tension steel diameter, t _{c.hog,x} and number 20 0 2 For hogging: compression steel diameter, t _{c.hog,x} and number 20 0 0 For hogging: compression steel diameter, t _{c.hog,x} and number None 0 0 Link diameter to tensile steel, cover_add.x.c.sag 10 mm 0 0 For sagging: number of layers of compression steel, n _{layers,comp,cag} 11 layer(s) 1 For sagging: number of layers of compression steel, n _{layers,tomp,cag} 11 layer(s) 1 For hogging: number of layers of compression steel, n _{layers,tomp,cag} 11 layer(s) 1 For hogging: number of layers of compression steel, n _{layers,tomp,tag} 11 layer(s) 1 For hogging: number of layers of compression steel, n _{layers,tomp,tag} 11 layer(s) 1 For hogging: number of layers of compression steel, n _{layers,tomp,tag} 11 layer(s) 1 For hogging: number of layers of compression steel, n _{layers,toms,tag} 11 layer(s) 1<	For sagging: tension s	steel diamet	er, _{¢t,sag,x} a	nd number		20	-	2		
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For hogging: tension steel diameter, $\phi_{t,hog,x}$ and number 20 2 2 For hogging: add cover to tensile steel, coveradd,x,t,hog COVEradd,x,c,sol 10 mm For hogging: compression steel diameter, $\phi_{t,hog,x}$ and number None 0 0 Link diameter $\phi_{mk,xx}$ number and pitch 10 2 250 mm For sagging: number of layers of tensile steel, $n_{layers,comp,sog}$ 1 layer(s) For hogging: number of layers of tensile steel, $n_{layers,comp,sog}$ 1 layer(s) For hogging: number of layers of tensile steel, $n_{layers,comp,log}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,comp,log}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,comp,log}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,comp,log}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,comp,log}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,comp,log}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,comp,log}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,comp,log}$ <	For sagging: add cove	er to compre	ession steel	, cover _{add,x,c}	$c_{sag} = \phi_{hx}$			10	mm	
For hogging: tension steel diameter, $\phi_{c,hog,x}$ and number 20 2 2 For hogging: add cover to tensile steel, coveradd,x,thog 100 mm 100 mm For hogging: compression steel diameter, $\phi_{c,hog,x}$ and number 100 mm 2 250 mm Link diameter $\phi_{ink,xr}$, number and pitch 10 2 250 mm 1 For sagging: number of layers of tensile steel, $n_{iayers,tens,sag}$ 1 1 layer(s) 1 For hogging: number of layers of tensile steel, $n_{iayers,tens,comp,50g}$ 1 layer(s) 10 10 For hogging: number of layers of compression steel, $n_{iayers,tens,comp,50g}$ 1 layer(s) 1 10 10 For hogging: number of layers of compression steel, $n_{iayers,tens,comp,50g}$ 1 layer(s) 1 1 10 10 For hogging: number of layers of compression steel, $n_{iayers,tens,comp,50g}$ 1 layer(s) 1										
For hogging: add cover to tensile steel, cover _{addx,t,bog} = cover _{addx,t,bog} 10 mm For hogging: compression steel diameter, φ _{t,bog,x} and number None 0 2 Link diameter φ _{indx,x} number and pitch 10 2 250 mm For sagging: number of layers of tensile steel, n _{layers,tomp,sag} 1 layer(s) Ratio β _b =1.2 (sagging) or 0.8 (hogging) unless single span or cont 1.0 10 For hogging: number of layers of compression steel, n _{layers,tomp,bag} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,tomp,bag} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,tomp,bag} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,tomp,hag} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,tomp,hag} 1 layer(s) Image: steel stee	For hogging: tension	steel diame	ter, $\phi_{t,hoq,x}$ a	nd number	1	20	▼	2		
For hogging: compression steel diameter, $\phi_{c,hog,x}$ and number None Image: Compression steel and plot in the component of the co	For hogging: add cove	er to tensile	steel, cove	$r_{add,x,t,hog} =$	cover _{add,x,c} ,	saq		10	mm	
Link diameter φ _{inkt,xr} number and pitch 10 2 250 mm For sagging: number of layers of tensile steel, n _{layers,tens,sag} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,tens,sag} 1 layer(s) For hogging: number of layers of tensile steel, n _{layers,tens,bag} 1 layer(s) For hogging: number of layers of tensile steel, n _{layers,tens,bag} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,tens,bag} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,tens,bag} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,tens,bag} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,tens,bag} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,tens,tens,tens,tens,tens,tens,tens,ten}	For hogging: compres	sion steel d	iameter, _{¢c.}	hog, x and nu	mber	None	▼	0		
For sagging: number of layers of tensile steel, $n_{layers,toms,sag}$ Image: layers of tensile steel, $n_{layers,toms,sag}$ Image: layers of layers of compression steel, $n_{layers,toms,sag}$ Image: layers of layers of tensile steel, $n_{layers,toms,sag}$ Image: layers of layers of tensile steel, $n_{layers,toms,sag}$ Image: layers of layers of tensile steel, $n_{layers,toms,tag}$ Image: layers of compression steel, $n_{layers,toms,tag}$ Image: layer of layers of compression steel, $n_{layers,toms,tag}$ Image: layer of layers of com	Link diameter $\phi_{link,x_{\ell}}$ n	umber and	pitch		10 🔻	-	2	250	mm	
For sagging: number of layers of compression steel, $n_{layers,comp,sag}$ 1 layer(s) For sagging: number of layers of compression steel, $n_{layers,comp,sag}$ 1 layer(s) Ratio $p_b=1.2$ (sagging) or 0.8 (hogging) unless single span or cont 1.0 1.0 1.0 For hogging: number of layers of compression steel, $n_{layers,comp,hog}$ 1 layer(s) 1 For hogging: number of layers of compression steel, $n_{layers,comp,hog}$ 1 layer(s) 1 For hogging: number of layers of compression steel, $n_{layers,comp,hog}$ 1 layer(s) 1 For hogging: number of layers of compression steel, $n_{layers,comp,hog}$ 1 layer(s) 1 Image: Im			-							
For saging: number of layers of compression steel, $n_{layers, comp, sig}$ 1 layer(s) Ratio β_b =1.2 (sagging) or 0.8 (hogging) unless single span or cont 1.0 1.0 1.0 For hogging: number of layers of tensile steel, $n_{layers, tens, hog}$ 1 layer(s) 1 For hogging: number of layers of compression steel, $n_{layers, comp, hog}$ 1 layer(s) 1 For hogging: number of layers of compression steel, $n_{layers, comp, hog}$ 1 layer(s) 1 For hogging: number of layers of compression steel, $n_{layers, comp, hog}$ 1 layer(s) 1 For hogging: number of layers of compression steel, $n_{layers, comp, hog}$ 1 layer(s) 1 For hogging: number of layers of compression steel, $n_{layers, comp, hog}$ 1 layer(s) 1 For hogging: number of layers of compression steel, $n_{layers, comp, hog}$ 1 layer(s) 1 For hogging: number of layers of compression steel, $n_{layers, comp, hog}$ 1 1 1 1 For hogging: number of layers of compression steel, $n_{layers, comp, hog}$ 1 1 1 1 1 For hogging: number of layers of compression steel, $n_{layers, comp, hog}$ 1 1 1 1 <td< td=""><td>For sagging: number</td><td>of layers of</td><td>tensile stee</td><td>el, n_{lavers.tens.}</td><td>.sag</td><td></td><td></td><td>1</td><td>layer(s)</td><td></td></td<>	For sagging: number	of layers of	tensile stee	el, n _{lavers.tens.}	.sag			1	layer(s)	
Ratio $\beta_b = 1.2$ (sagging) or 0.8 (hogging) unless single span or cont 1.0 1.0 For hogging: number of layers of tensile steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compression steel, $n_{layers,tens,hog}$ 1 layer(s) For hogging: number of layers of compressitent steel, $n_{layers,tens,hog}$	For sagging: number	of layers of	compressio	on steel, n _{lay}	/ers.comp.sag			1	layer(s)	
For hogging: number of layers of tensile steel, n _{layers,comp,hog} 1 layer(s) For hogging: number of layers of compression steel, n _{layers,comp,hog} 1 layer(s) Image: steel st	Ratio $\beta_{\rm b}$ =1.2 (sagging) or 0.8 (hc	ogging) unle	ess single s	pan or cont		1.0	1.0	, ()	
Solution Important steel Important steel </td <td>For hogging: number</td> <td>of layers of</td> <td>tensile stee</td> <td>el, n_{lavers tens}</td> <td>hoa</td> <td></td> <td>-</td> <td>1</td> <td>laver(s)</td> <td></td>	For hogging: number	of layers of	tensile stee	el, n _{lavers tens}	hoa		-	1	laver(s)	
Job Control	For hogging: number	of layers of	compressio	on steel, n _{la}	vers comp hog			1	layer(s)	
Image: series of the series					, cro,comp,nog					
Image										
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		g Calculatio	in Sheet		iVVV		2	
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					Member/Location			
Job Title Member	Design - Reir	forced Con	crete Two V	Vay Spanni	Drg.			
Member Design - R	C Two Way Sp	banning Sla	b		Made by XX	Date 21	/11/2021	hd.
Parameters of Bea	am Spanning	g in x Dire	ction (Slab	in y Direc	tion)			
Interior or edge bea	m ?					Edge Beam		
(affects tributary wi	dth for loadin	g on beam,	available b	eam spacir	ng for effect	ive width ir	i cont case)	
Downstand depth of	beam (exclu	ding slab) s	spanning in	x direction	, h _{d,beam,y}	225	mm	
Width of beam span	ning in x dire	ction, b _{w,bea}	am,y			150	mm	
Dead load on x dire	ction beam de	ownstand, [$DL_{beam,y} = h$	_{d,beam,y} b _{w,bea}	mρc	0.81	kN/m	
Sag moment beam	span x, M _{y,sag}					38	kNm	
Hog moment beam	span x, M _{y,hog}	1				59	kNm	
Shear beam span x,	Vy					57	kN	
Span (for effective v	vidth and def	lection calc	s)			5.000	m	
Available beam space	ing (effective	width calc	s in continu	ous case)		3.000	m	
Sag section type					L -	continuous		
Hog section type					Rect -	continuous		
Overall depth, h _{beam}	_y (downstand	l if precast,	downstand	+ slab if c	ont)	400	mm	
For sagging: tensior	n steel diame	ter, $\phi_{t,sag,y}$ a	nd number		20 💌	2		
For sagging: add co	ver to tensior	n steel, cove	er _{add,y,t,sag} =	cover _{add,y,c}	,hog	20	mm	
For sagging: compre	ession steel d	iameter, $\phi_{c,}$	_{sag,y} and nu	mber	None 🗸 🔻	0		
For sagging: add co	ver to compre	ession steel	, cover _{add,y,}	_{c,sag} = cove	r _{add,y,t,hog}	30	mm	
For hogging: tension	n steel diame	ter, _{¢t,hog,y} a	and number		20 🗸	2		
For hogging: add co	ver to tensile	steel, cove	er _{add,y,t,hog} =	$MAX\{\phi_{hx} +$	φ _{hy} , ΜΑΧ(φ	30	mm	
For hogging: compr	ession steel d	liameter, ϕ_{c_i}	_{,hog,y} and nu	ımber	None 🔻	0		
For hogging: add co	ver to compr	ession steel	, cover _{add,y} ,	_{c,hog} = MAX	{0, MAX(φ _t ,	20	mm	
Link diameter $\phi_{link,y}$,	number and	pitch		10 🔻	2	250	mm	
For sagging: numbe	r of layers of	tensile stee	el, n _{layers,tens}	,sag		1	layer(s)	
For sagging: numbe	r of layers of	compressio	on steel, n _{la}	/ers,comp,sag		1	layer(s)	
Ratio β_b =1.2 (sagging	ng) or 0.8 (ho	ogging) unle	ess single s	oan or cont	i 1.0	1.0		
For hogging: number	er of layers of	tensile ste	el, n _{layers,tens}	,hog		1	layer(s)	
For hogging: numbe	er of layers of	compressio	on steel, n _{la}	yers,comp,hog		1	layer(s)	

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	NEEDS	Consulting	y Calculatio Fnaineers	II Sheet		iXXX		1	
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						Member/Location			
Job Title	Member De	esign - Rein	forced Cond	crete Two V	Vay Spanni	Drg.			
Member De	esign - RC 1	Гwo Way Sp	anning Slal	2		Made by XX	Date 21	/11/2021	hd.
Utilisation	n Summary	y (Slab)							
	Item					UT	Remark		
	Sag mome	nt, m _x				63%	OK		
	Sag mome	nt, m _y				74%	OK		
	Hog mome	nt, m ₁				37%	OK		
	Hog mome	ent, m ₂				37%	OK		
	Hog mome	ent, m ₃				83%	OK		
	Hog mome	ent, m_4				0%	OK		
	% Min sag	reinforcem	ent in x			58%	OK		
	% Min sag	reinforcem	ent in y			58%	OK		
	% Min hog	reinforcem	ent 1			58%	UK OK		
	Vo Min hog	reinforcem	ent 2			50%	UK		
	% Min hog	roinforcem	ent 4			20%			
	70 MIN NOG		till 4	in v and v		20% 20/-			
	Shoar dool	an canacity	for bonding			570 2004			
	Shear deci	an canacity	for bending	in v		2070			
	Shear desi	an canacity	for bending	in v and v	combined	42%	OK OK		
		requiremen		y in x anu y	combined	78%	OK OK		
	Total utili	sation nre	cast slab			78%	OK		
	Total utili	sation con	tinuous sla	ab		83%	OK		
	Detailing	requireme	nts			C	OK		
	2000								
Utilisatior	n Summarv	v (Beam)							
						_			
	Automatic	design					All Beams		
		_							
	Item				UT	Detailing	Remark		1
	Beam spa	nning in y	(slab in x)) sagging	88%	ΝΟΤ ΟΚ	NOT OK	Beam y Sag	
	Beam spa	nning in y	(slab in x)) hogging	45%	ΝΟΤ ΟΚ	ΝΟΤ ΟΚ	Beam y Hog	
	Beam spa	nning in x	(slab in y)) sagging	48%	ΝΟΤ ΟΚ	ΝΟΤ ΟΚ	Beam x Sag	
	Beam spa	nning in x	(slab in y)) hogging	65%	ΝΟΤ ΟΚ	ΝΟΤ ΟΚ	Beam x Hog	
Overall U	ilisation S	ummary							
	Overall ut	ilisation					88%		
	Overall de	etailing rec	uirement	5			NOT OK		
	% Sag reir	forcement	in x				0.22	%	
	% Sag reir	forcement	in y				0.22	%	
	% Hog reir	ntorcement	in x				0.22	%	
	% Hog reir	ntorcement	in y			3.	0.22	%	
	Estimated	steel reinfo	rcement qu	antity (130	– 220kg/m) 7. AL	70	kg/m²	
	[7.850.()	ч _{s,prov,x,s} +A	$s, prov, y, s + A_s$	$_{,prov,x,h} + A_{s,\mu}$	$prov, x, h$) / h_s	_{lab}]; NO CU	rtaiiment; l	vo iaps; Lin	κs ignored;
	Estimated	steel reinfo	rcement qu	antity (130	– 220kg/m) 1. Curta:!	monte lana	kg/m [°]	ISTRUCTE
	[11.U . (A	s,prov,x,s +A s,	prov,y,s +A _{s,p}	rov,x,h +A s,pro	ov,x,hJ/Π _{sla}	b J; Curtalli	ment; Laps,	, LIIIKS IGNO	ieu;
	Invote that	steel quant	ity in Kg/m		brained from		<pre>// rebar];</pre>	unite/tene	
	Painforced	concroto m	unicrete, C		units/m ⁻	steer, s	4500	units/tonne	=
	Nennorceu		ateriai COSL	- [c+(est)	ievai yudi	ILJ.SJ.II _{slab}	109	units/m ⁻	
	1								

CON			. Caladati	Charak		Job No.	Sheet No.	Rev.
		Engineerir	ig Calculatio Engineers	on Sheet		ivvv		5
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						Member/Location		
Job Title	Member I	Design - Reii	nforced Con	crete Two	Way Spann	il ^{Drg.}		
Member De	esign - RC	Two Way S	panning Sla	b		Made by XX	Date 21	/11/2021^{Chd.}
Plan Layo	ut							
Multi-Spa	n l _x Multi	-Span l _y Flo	or Plate					
	L	onger Spar	ı, l _y					
		6.0m						
	[<u></u>			<mark></mark>	<mark></mark>	_	
Shorte	er Span, 1	× 4}	_ 	4	- 4 -	- +		
	5.0m					<u>b</u> ird	_	
		4		4	- -}- -	- -}- -		
	[╧┷┷╍			╧┷┷┛	╞──────	_	
		↓	- () -		<u>↓</u>	<u>-</u> ↓		<u> </u>
	[╧╴╴╴╴	┢┛╌╴╴┏		╤┷╧	╤╴╴╴╴┥	<mark>></mark>	<u> </u>
	_	╘	<u>_</u> -+>					<u> </u>
	[╤┛━┷╼┻┏	╶┛━─────	┛━━━┏	╤╍┷╼┛┫	╤┛━────┏		
	ىد	Interior						
	ani els	Edge for S	nan in x Di	rection				
	lev ane	Edge for S	nan in v Dii	rection				
	P. P.	Corner						
		Construc	tion Type		Support	Conditions		
		Continuou	s			Continuous		
		Precast			Simply	/ Supported		
		Number o	of spans in	I _x		Multi-span		
		Number o	of spans in	I _y		Multi-span		
Single-Sp	an I _x Mul	ti-Span l _y F	loor Plate					
	L	onger Spar	n, I _y					
		6.0m						
		<u> </u>			<u></u>	<u></u>		
Shorte	er Span, 1	4	_ 	4	4	4 -		
	5.0m		<u> </u>		<u></u>	╘┓╴╴┍		
		Technology						
	ant Is	Interior	non in			N/A		
	eva	Eage for S	pan in x Dii Seen in x Dii	rection				
	Rel Pa	Corpor	pan in y Dii			N/A		
	-							
l		Construct	tion Type		Sunnort	Conditions		
		Continuou	s			Continuous		
		Precast			Simply	/ Supported		
					r · /			
		Number o	of spans in	I _x		Single-span		
		Number o	of spans in	I_y		Multi-span		

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1. h. Title	Manahan Di	anian Dain	famaad Cam		New Creme	Drg			
Job Title	Member De	esign - Kein	Iforced Con	crete Iwo N	way Spanni	Made by	Date 31	/11/2021	thd
Member D	esign - RC I	wo way Sp	banning Siai	D		XX	21	/11/2021	ing.
Multi-Spa	n I _x Single	-Span I _v Fl	oor Plate						
	Lo	nger Span	, I _y						
		6.0m							
Short	er Span, <mark>T</mark> x	4							
	5.0m		_						
		4							
			<mark>></mark>						4 100
		- () -							4 leg
l									
			<u> </u>						
	s nt	Interior				N/A			
	val	Edge for S	pan in x Dir	rection		N/A			Torsio
	tele Pai	Edge for S	pan in y Dir	rection					
		Corner							
		C			Current C				
		Continuous	топ туре		Support C	Continuous			
		Precast			Simnly	Sunnorted			
									Torsio
		Number o	of spans in	I _x		Multi-span			
		Number o	of spans in	ly	S	Single-span			
									4 leg
Single-Sp	an I _x Singl	e-Span I _y I	Floor Plate	}					
	LO	nger Span	, ly						
		6.UM							
Short	er Snan. fl								
0110110	5.0m -								
	ŧ.,	Interior				N/A			
	var	Edge for S	pan in x Dir	rection		N/A			
	ele Par	Edge for S	pan in y Dir	rection		N/A			
	x _	Corner							
		<u></u>			C				
		Construct	ion Type		Support C	Continuous			
		Precast	>		Simply	Supported			
		1100050			Simply	Supported			
		Number o	of spans in	I _x	S	Single-span			
		Number o	of spans in	l _y	S	Single-span			







CON	CONSULTING Engineering Calculation Sheet							Job No. Sheet No. Rev.			Rev.
	NEED		sulting	g Calculatio	on Sheet		ivv	v	1	0	
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							Member/Lo	ocation			
Job Title	Member	Desigi	n - Rein	forced Con	icrete Two V	Vay Spanni	Drg.				
Member De	esign - RC	Two	Way Sp	anning Sla	ıb		Made by	XX	Date 21	/11/2021	hd.
Structura	l Analysis	s Slat	b Bendi	ing Mome	nts						
	Slab Sin	ply S	Suppor	ted							
	Sag morr	ient ir	ıх		m_{sx}	$= \alpha_{sx} n l_x^2$			23	kNm/m	
	(precast	or sin	gle spal	n) 🔽	0	/1.54					
				0	$\chi_{sx} = \frac{\pi}{2(1)}$	$\frac{y'''x'}{(1-(1-)4)}$			0.084		
					8{1+	$(l_y/l_x)^{-3}$					
	Sag morr	ient ir	ıу		$m_{\rm sy}$	$= \alpha_{sy} n l_{x^2}$			16	kNm/m	
	(precast	or sin	gle spal	n)	d	$(l_{l_{1}})^{2}$					
				0	$x_{sy} = \frac{1}{8(1+1)^2}$	$\frac{y - x^2}{(l / l)^4}$			0.059		
					1,00	(v_y, v_x)					
	Hog mon	nent ir	n x = 0	(precast),	m _{sx} /2 (sing	gle span col	ntinuou	s)	11	kNm/m	
	Hog mon	nent ir	n y = 0	(precast),	m _{sy} /2 (sing	gle span coi	ntinuou	s)	8	kNm/m	
	Slab Cor	ntinuo	ous								
	г	1			,		1		<u> </u>		
			-		^t y						
					\bigcirc (2)		1				
					(3)						
					$\bigcup m_3$				1		
					$\bigcap m_x$						
	(1) <	\supset_{m_1}		\sqrt{m}		m2	\geq	2) ~~		
					0	y	2		-/		
					\cap				1		
					- (`			_	Y		
					m₄√ (4)						
	L _										
	Continuit	y of s	ide (1)					Dis	continuous		
	Continuit	y of s	ide (2)					Dis	continuous		
	Continuit	y of s	ide (3)						Continuous		
	Continuit	y of s	ide (4)					Dis	continuous		
	Number of	of disc	continuo	ous edges,	N _d				3		
	$\beta y = (24)$	+2N	$J_{\rm d} + 1.5$	$N_{\rm d}^2)/1~000$							
				0.10.11	4				0.044		
	$\beta_1 (4/3\beta_y)$	if con	tinuous	s, U it disco	ntinuous)				0.000		
	β ₂ (4/3β _y	IT CON	itinuous	s, U it disco	ntinuous)				0.000		
	$v = \frac{2}{12}$	11	$l_{\mathbf{x}}$	(B + B)	I I R + R V				0.000		
	$r = \bar{9}^{13}$	- 1 (1	$\overline{l_y}$	$(\psi_y + p_y)$	$\sqrt{\psi_y} + p_2$	a			0.339		
	0 (4/20	if and	tin	<u>ר</u> י-י	ntinucuc						
	$\beta_3 (4/3\beta_x)$	IT CON	tinuous		ntinuous)						
	p ₄ (4/3β _x	II CON	unuous	, u ir aisco							
	√1	$y = \sqrt{2}$	$(\beta_x + \beta_2)$	$+\sqrt{\beta_{x}}+$	β_4				0.050		
	Px	if cor	tinucu		ntipuovo)				0.053		
	p ₃ (4/3β _x	if con	tinuous		ntinuous)				0.0/1		
	թ₄ (4/3 β _x		ICHIUOUS	, o ii uisco	nunuous)				0.000		
	Saa				mar	$=\beta_{sx}nl_{s}^{2}$				kNm/m	
					54	0			14		
	sag mon		ıу		m _{sy} :	$= p_{sy} n l_x^2$			12	KINIA/M	
			~ ^	ml ²						LAIm /m-	
		ient, i	$n_1 = \beta_1$	[1]1 _X					0	KINM/M	
	Hog mon	ient, i	$m_2 = \beta_2$	nl _x ⁼					0	KINM/M	
	Hog mon	ient, i	$m_3 = \beta_3$	nl _x =					19	KINM/M	
	Hog mon	ient, i	$m_4 = \beta_4$	nl _x -					0	кмm/m	
										<u> </u>	

				aineerii	ng Ca	lculatio	on S	heet			Jot	o No.	She	et No.		Rev.		
	ENGINEERS Consu				nsulting	g Engi	ineers		incec				jXXX		1	.1		
												Mem	- ber/Locati	on				
10	h Titlo	Mo	mbor D	ocia	in - Poi	nforce	od Con	crot		Way	Cnanni	Drg.	ibeli Looali					
M	ember D		$\frac{1}{10} - RC $	-siy -wo	Way S	nanni	ing Sla	h	LE TWO	way	Spann	Made	eby 🗙	Y Date	21	/11/2021	Çhd.	
1.1		SIC	gii - KC i	WU	way S	pann	ing Sia			_			· ^	^	77	/ 11/ 2021		
										1								
Γ	Table 3.	13	— Bend	ing	g mome	ent co	effici	ents	s for sl	abs s	pannir	ıg i	n two	direc	tions a	t right and	gles,	
						s	imply	-su)	pporte	d on	four si	ides	3					
	l_y/l_x		1.0		1.1		1.2		1.	8	1.4		1	.5	1.75	5 2.0	,	
	α _{sx}		0.062		0.074		0.084		0.093		0.099		0.104		0.113	0.118		
	$\alpha_{\rm sy}$		0.062		0.061		0.059		0.055		0.051		0.046)	0.037	0.029		
ŀſ	Table 3	14	— Bend	ing	g mome	entco	effici	ents	s for re	ectan	gular p	ban	els su	pport	ed on f	our sides v	with	
Η						p	orovisi	ion	for to	sion	at cori	ner	s					
Η	Туре	ofpa	anel and 1 onsidered	non	nents				Shor	t span	coeffici	ents	β_{sx}			Long sp coefficie	oan ents.	
										Valu	es of $l_y/$	<i>l</i> x				β_{sy} for values of	all	
П	Intoric		anala			1.0	1.	ı	1.2	1.3	1.4		1.5	1.75	2.0	, aracs of	·y· *x	
	Negativ	. р е т	ioment a	t		0.031	0.03	7	0.042	0.046	0.05	0	0.053	0.059	0.063	0.032		
Ц	continu	ous	edge	-			0.00				0.00	Ĩ			5.000			
Ц	Positive	mo	oment at	mie	d-span	0.024	0.02	8	0.032	0.035	0.03	7 (0.040	0.044	0.048	3 0.024		
Ц	One sh discont	ort	edge															
Η	Negativ	e m	ioment a	t		0.039	0.04	4	0.048	0.052	0.05	5 (0.058	0.063	0.067	0.037		
	continu	ous	edge															
Η	Positive	m	ment at	mie	d-span	0.029	0.03	3	0.036	0.039	0.04	1 (0.043	0.047	0.050	0.028		
Η	One loi discont	ıg e int	edge 10us															
	Negativ	e m	oment a	t		0.039	0.04	9	0.056	0.062	0.06	8 0	0.073	0.082	0.089	0.037		
	continu	ous	edge						0.0.10						0.00			
	Positive Two ad	iac	ment at	mie	d-span	0.030	0.03	6	0.042	0.047	0.05	1 (J.055	0.062	0.067	0.028		
	discont	inu	ious	es														
	Negativ	e m	oment a	t		0.047	0.05	6	0.063	0.069	0.074	4 (0.078	0.087	0.093	0.045		
-	Positive	m	eage ment at	mie	d-snan	0.036	: 0.04	2	0.047	0.051	0.05	5 0	059	0.065	0.070	0.034		
-	Two sh	ort	edges		a-span	0.000	, 0.04	-	0.047	0.001	0.00	Ť		0.000	0.070	, 0.004		
Η	discont	inı	ious															
	Negativ	e m	ioment a edge	t		0.046	6 0.05	0	0.054	0.057	0.06	0 0	0.062	0.067	0.070) —		
	Positive	mo	ment at	mie	d-span	0.034	0.03	8	0.040	0.043	0.04	5 0	0.047	0.050	0.053	0.034		
Ц	Two lo	ng	edges		-			+				+						
Ц	discont	inu	ious											I		0.045		
μ	continu	e m ous	oment a edge	Ĺ		_	—			<u> </u>	 	-	_	<u> </u>	—	0.045		
Ц	Positive	mo	oment at	mie	d-span	0.034	0.04	6	0.056	0.065	0.07	2 (0.078	0.091	0.100	0.034		
Η	Three of	dg	es Ious (ar	w 1	ong													
Η	edge co	nti	inuous)	le l	ong									I				
Η	Negativ	e m	ioment a	t		0.057	0.06	5	0.071	0.07€	0.08	1 (0.084	0.092	0.098			
Π	Continue	ous	edge	mi	d-mon	0.049	0.04	8	0.059	0.051	0.000		1.065	0.060	0.074	0.044		
	Three	om edø	es	1110	a-span	0.043	, 0.04	.0	0.000	0.007	0.00		7.003	0.009	0.074	. 0.044	— <u> </u> [
\parallel	discont	int	ious (or	ie s	hort													
Ц	edge co	onti	inuous)	t.												0.059		
μ	continu	ous	edge	e.		_		ľ		_	<u> </u>	-	_	_	_	0.008		
Н	Positive	mo	oment at	mie	d-span	0.042	0.05	4	0.063	0.071	0.078	8 (0.084	0.096	0.105	0.044	-	
Н	Four ee	lge	s discor	ntir	uous	0.07			0.0=:	0.00			0.000		0	0.050		
H	Positive	mo	oment at	mie	d-span	0.055	0.06	5	0.074	0.081	0.08	7 (J.092	0.103	0.111	0.056		
ſ	The data f	or s	ingle freel	y su	pported	two-w	ay slabs	s give	en in	-							1	
H	those for	cor	tinuous	ive serie	from an es of sla	abs re	c analys late to	sis, v coll	apse	<u> </u>								
	conditions							-	-									
	Note tha	t 4	edges d	isco	ontinuo	us do	es not	imp	oly pre	cast a	s the e	dge	s are	still pr	evente	d		
	from lifti	ng,	and ade	equ	ate tors	sion p	rovisio	ons a	are ma	de.				_				
								1				1					1	

	CON		Traincarin	. Calculatia	» Chaot			Job No		Sheet	No.		Rev.
		NEED		J Calculatio Engineers	n Sneet			ivvv	/		1	r	
	ENGI	NEEK	Consulting	Lingineers]~~/	`		T	Ζ	
								Member/Loo	cation				
Jo	b Title	Member D)esign - Rein	forced Con	crete Two	o Way	Spanniı	Drg.					
Μ	ember De	esign - RC	Two Way Sp	anning Slal	b			Made by	XX	Date	21	/11/2021	hd.
S	tructura	Analysis	Slab Shear	Forces									
		Slab											
		<u> </u>						- 6	_			1.51/	
		Shear for	ce for bendin	g in direction	on of spa	n x	083	$x = p_{vx}n$	x		1/	kN/m	
			Coofficient	в						0	210		
			Coemcient	PVX						0	.310		
		Shear for	e for hendin	a in directi	on of sna	n v	21	$=\beta n$	1		18	kN/m	
				g in an eeu			~s	y pyyn	*x				
			Coefficient	β						0	.330		
				1.9									
F		Note that	for edge and	l corner pa	nels, the	shear	force h	as been	cal	culated	d for	the	
		less critica	al discontinue	ous part of	the pane	l inste	ad of th	e conti	nuol	us part	t beca	ause	
		the SDL w	vill be more o	critical here	due to e	xterna	ıl claddi	ng.					
<u> </u>		Beam				_							
L													
			on beam spa	inning in y	(slab in x	(), ω _{bea}	$m_{,x} = v_s$	x			1/	kN/m	
		SIAD UDL	on beam spa	inning in x	(siad in y	'), ω _{bea}	$m,y = v_s$	У			18	KN/M	
		IIIS hear	snanning v	(A) in a l	= F თ.	+1.4	SDL .	+1 4D	Ι.		1.8	kN/m	
-		ULS beam	i spanning y,	WullS,beam,x	$= F \omega_{\text{beam}}$	+1.4	SDL _{elev} ,	.+1 4D	∟bear		19	kN/m	
-		(Factor F:	Interior bea	ms have g	ot two sla	bs spa	annina ($\frac{1}{2}$ onto the	-bear		17		
		hence F =	2 whilst edd	jes beams	have only	one s	lab her	nce F =	1)				
				·					,				
Γ		Та	ble 3.5 — De	sign ultim	ate bend	ing mo	oments	and sh	ear	forces	i		
		A	t outer suppor	t Near mic	ddle of	At first	interior	At n	iddl	e of	A	t interior]
Ц	Moment	0		0.09Fl	-	0.11Fl	port	0.07Fl		puits	-0.08	3FT _ 0.083F	/
Ц	Shear	0.	45F	0.08Fl	0	.6F _	0.125Fl	0.05	FI ^{#PL}		0.55I	9	Π
Н	NOTE 1 F	is the effective is the total de	Note elast	ic moment	effects. #	PL No	te allov	vance h	as I	heen n	nade	in this tabl	
Н	No redistri	bution of the :	n pattern loa	ding factor	1.2;	foi	r 20% n	noment	red	listribu	ition;		
-		Sag mom	ent beam sp	an v M	= coeff (80	kNm	
⊢		Hoa mom	ent beam sn	any, Myhaa	= coeff.	.~ULS,De	aiii,x • 'y/ am v • I') _v			40	kNm	
⊢		Shear bea	im span v, V	x = coeff.(a)	ULS.beam v	. I _v)	,× • • ¥.	, y			53	kN	
F				X									
		Sag mom	ent beam sp	an x, M _{y,sag}	= coeff.(ω _{ULS,be}	_{am,y} . I _x)) _x			38	kNm	
		Hog mom	ent beam sp	an x, M _{y,hog}	= coeff.	(ω _{ULS,be}	am,y Ix)l _x			59	kNm	
L		Shear bea	im span x, V	y = coeff.(a)	OULS,beam,y	. l _x)					57	kN	
L										<u> </u>			
L		Note that	the coefficie	nts above a	are appro	priate	to the p	banel as	s fol	lows.			
⊢		Totoric	Sag y	HOG Y	Shear y		ag x	HOG .	x 2	Shea	ir X 50		
⊢		Edge in v	0.050	0.003	0.550	0	080	0.08. 0 12	5 5	0.5	00 00		
-		Edge in v	0.080	0.125	0.600	0	.050	0.08	3	0.5	50		
⊢		Corner	0.080	0.125	0.600	0	.080	0.12	5	0.6	00		
F	S	ingle Span	0.125	0.063	0.500	0	.125	0.06	3	0.5	00		
F		- /											
		Note that	the beams a	re always o	continuou	ıs (unle	ess sing	le span) sii	nce ma	onolit	hic with col	lumns,
		but the sl	ab can be co	ntinuous (u	inless sin	gle spa	an) or p	orecast.					
<u> </u>													
L													

	CON	SULTING	Engin	ooring	Calculatio	n Shaat			Job	No.	Sheet No	0.		Rev.	
	ENGI	NEERS	Consu	iltina Ei	naineers	II SHEEL			i)	xxx		13			
	LIGI				- <u>j</u>				^ر ۱			15			
									Membe	er/Location					
J	ob Title	Member De	esign -	Reinfo	rced Con	crete Tw	o Way S	panni	Drg.		Data			la al	
Ν	lember De	esign - RC 1	wo Wa	ay Spa	nning Sla)			Made L	^{yy} XX	Date	21/11/2	2021	ma.	
_															
_		Shoar For		officio	nte for S		upporte		h						
-		Silear Fui		enicie	115 101 3	mpry S		su Sia							
		These have	- been	taken	to be the	same as	the cor	ntinuo	us sla	ab with	all 4 edd	les			
		having the	same	continu	uitv, i.e. o	ontinuol	us or dis	contin	uous	, as the	e coeffici	ents			
		are the sar	ne in e	either c	ase.					,					
		Shear For	ce Co	efficie	nts for C	ontinuo	us Slab								
ŀr	Table 3.1	5 _ Shear	force	coeffic	iont for	niform	ly loade	d roo	tana	ularn	anole eu	nnorted	on fe	r	
H	rable 5.1	5 – Snear	lorce	sides	with pro	vision	for tors	ion at	cori	ners	aneis suj	pporteu	on it	,u1	
H	Type of p	oanel and loc	ation				$\beta_{\rm vx}$ for va	lues of	l _y /l _x				β_{vy}	r –	
H				1.0	1.1	1.2	1.3	1.4	4	1.5	1.75	2.0	1		
H	Four ed	ges contin	uous		0.00	0.00					0.40				
Η	Continuo One sho	us edge rt edge		0.33	0.36	0.39	0.41	0.43).45	0.48	0.50	0.33	— -	
Η	disconti	nuous													
Η	Continuo	us edge		0.36	0.39	0.42	0.44	0.45	0).47	0.50	0.52	0.36		
Η	Discontin	uous edge				<u> </u>					—	—	0.24	-	
Η	disconti	g eage nuous													
Π	Continuo	us edge		0.36	0.40	0.44	0.47	0.49	0	0.51	0.55	0.59	0.36		
Π	Discontin	uous edge		0.24	0.27	0.29	0.31	0.32	0).34	0.36	0.38	—		
	Two adj disconti	acent edge nuous	s												
Ц	Continuo	us edge		0.40	0.44	0.47	0.50	0.52	- 0).54	0.57	0.60	0.40		
	Discontin	uous edge		0.26	0.29	0.31	0.33	0.34	0).35	0.38	0.40	0.26		
H	Two sho	rt edges nuous													
H	Continuo	us edge		0.40	0.43	0.45	0.47	0.48	- 0).49	0.52	0.54	_		
Н	Discontin	uous edge			_	_	—	—	-		—		0.26		
Н	Two lon	g edges												╶┤┟	
H	Continuo	us edge			_	_	_	_	_		_		0.40		
Н	Discontin	uous edge		0.26	0.30	0.33	0.36	0.38	- 0	0.40	0.44	0.47	_		
	Three ec	lges													
	(one lon	g edge													
	disconti	nuous)										0.00			
	Continuo	us edge		0.45	0.48	0.51	0.53	0.55).57	0.60	0.63			
ļ	Three eq	lges		0.00	0.02	0.04	0.00	0.30	-		0.39	0.41	0.29	L	
H	disconti	nuous													
H	disconti	nuous)													
H	Continuo	us edge				—	—	_	-				0.45		
Η	Discontin	uous edge		0.29	0.33	0.36	0.38	0.40	0).42	0.45	0.48	0.30	ŀ	
Η	disconti	ges nuous													
	Discontin	uous edge		0.33	0.36	0.39	0.41	0.43	0).45	0.48	0.50	0.33		
┞┺															
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CON	SULTING	Enginoorin	a Calculatio	n Shoot		Job No.	Sheet No.		Rev.
	NFFRS	Consulting	y Calculatio Fnaineers	II Sheet		iXXX	1	4	
LINGI		consulting	Engineers			JYYY			
						Member/Location			
Job Title	Member De	esign - Rein	forced Con	crete Two V	Vay Spanni	Drg.			
Member De	esign - RC 1	Гwo Way Sp	anning Slal	b		Made by XX	Date 21	/11/2021	hd.
Slab Mom	ent Desig	า							
Sag mome	nt, m _x						14	kNm/m	
Sag mome	nt, m _y						16	kNm/m	
Hog mome	ent, m ₁						8	kNm/m	
Hog mome	ent, m ₂						8	kNm/m	
Hog mome	ent, m ₃						19	kNm/m	
Hog mome	nt, m ₄						0	kNm/m	
				۲ I				М	
Ensure sin	gly reinforce	ed $K = M$	$l/bd^2 f_{cu} =$	= d {0.5 + √	$0.25 - \frac{\pi}{0.9}$]} z <=0.	95d $A_{s} = \overline{(}$	$(0.95f_{})z$	
						.,		, y ,	
		K' =	0.156 K'	= 0.402(β _b	– 0.4) – 0.1	$8(\beta_{b} - 0.4)^{2}$	2		
		K'	K	Z	A _s	A _{s,prov}	UT		
Sag mome	nt, m _x	0.156	0.021	133	246	393	63%		ОК
Sag mome	nt, m _y	0.156	0.027	124	292	393	74%		ОК
Hog mome	ent, m ₁	0.156	0.013	124	146	393	37%		ОК
Hog mome	ent, m ₂	0.156	0.013	124	146	393	37%		ОК
Hog mome	ent, m ₃	0.132	0.028	133	327	393	83%		ОК
Hog mome	ent, m ₄	0.132	0.000	133	0	393	0%		ОК
Note unles	s precast o	r single spa	n whereby	$\beta_b = 1.00$	and K' = 0.	156, K' cal	culated		
with $\beta_b =$	1.20 (sagg	ing) or 0.80) (hogging),	, however k	$𝔅' for β_b ≥$	0.90 trunc	ated at 0.15	56.	
If $K > K'$, t	hen UT = 9	99%. Note	that A_s and	d A _{s.prov} ab	ove are in l	units of mn	n²/m.		
Note that A	A _{s,prov} is rea	ally specified	d for the m	iddle strip.					
% Min sag	reinforcem	ent in x (>=	= 0.0024bh	G250; >=	0.0013bh (G460)	0.22	%	
% Min sag	reinforcem	ent in x util	isation				58%		ОК
% Min sag	reinforcem	ent in y (>=	= 0.0024bh	G250; >=	0.0013bh (G460)	0.22	%	
% Min sag	reinforcem	ent in y util	isation				58%		ОК
% Min hog	reinforcem	ent 1 (>= (0.0024bh G	250; >= 0	0013bh G4	60)	0.22	%	
% Min hog	reinforcem	ent 1 utilisa	ation				58%		ОК
% Min hog	reinforcem	ent 2 (>= (0.0024bh G	250; >= 0	0013bh G4	60)	0.22	%	
% Min hog	reinforcem	ent 2 utilisa	ation				58%		ОК
% Min hog	reinforcem	ent 3 (>= (0.0024bh G	250; >= 0	0013bh G4	60)	0.22	%	
% Min hog	reinforcem	ent 3 utilisa	ation				58%		ОК
% Min hog	reinforcem	ent 4 (>= (0.0024bh G	250; >= 0	0013bh G4	60)	0.22	%	
% Min hog	reinforcem	ent 4 utilisa	ation				58%		ОК

CON	SUI TING	Enginoorin	a Calculatio	n Shoot		Job No.	Sheet No.		Rev.
ENGI	NEERS	Consulting	Enaineers	II Sheet		iXXX	1	5	
ERGI	NEEKS	concurring	Linginicero			JAAA		.5	
						Member/Location			-
Job Title	Member D	esign - Rein	forced Con	crete Two V	Vay Spanni	Drg.			
Member D	esign - RC ⁻	Two Way Sp	anning Slal	0		Made by XX	Date 21	/11/2021	hd.
Slab Shea	r Design f	or Bending	j in x						
Ultimate sl	near stress	for bending	in x, v _{ult,x} =	$v_{sx}/bd_{x,h}$ (<	0.8f _{cu} ^{0.5} &	5N/mm²)	0.12	N/mm²	
Ultimate sl	near stress	for bending	in x utilisa	tion			3%		OK
								2	
Design she	ar stress fo	or bending ii	n x, $V_{d,x} = v_{s}$	/bd _{x,h}			0.12	N/mm ²	
(Conservat	ively, shea	r capacity e	nhancemer	it by eithe	r calculatin	ig v _d at d f	rom suppor	tand	
comparing	against un	enhanced v	c as clause	3.4.5.10 B	58110 or		v _d at supp	ort and	
comparing	against en	hanced v _c v	within 2d of	the suppor	t as clause	3.4.5.8 BS	8110 ignor	ed;)	
Area of ter	isile steel re	einforcemer	it provided,	A _{s,prov,x,h}			393	mm²/m	
$\rho_{\rm W} = 100 A_{\rm g}$	s,prov,x,h/bd _{x,l}	h	- () 1/4			. 1/4	0.28	%	
$v_{c,x} = (0.7)$	9/1.25)(ρ _w f	_{cu} /25) ^{1/3} (40	0/d_{x,h})^{1/4}; ρ	_w <3; f _{cu} <40); (400/d _{x,r}) ^{1/4} >0.67	0.60	N/mm²	
Check v _{d,>}	$x < v_{c,x}$ for	no links					VALID		
	Concrete s	hear capaci	ty v _{c,x} .(bd _{x,}	h)			84	kN/m	
<u>.</u>									
Check v _{c,x}	$< v_{d,x} < 0$	$-4 + v_{c,x}$ to	r nominal	links			N/A	2	
	Provide no		such that A	$_{\rm sv}$ / S > 0.4	$D/(0.95f_{yv})$	1.e. A _{sv} / S	0.92	mm²/mm/	m
	Concrete a	ind nominal	links shear	capacity (C	$0.4 + v_{c,x}$.(bd _{x,h})	140	kN/m	
Check v _{d,>}	, > 0.4 + v	r _{c,x} for desi	gn links)//0.0		1.0	N/A	2	
	Provide sh	ear links A _s	$\frac{1}{1}$ / S > b(v _d	$\frac{1}{(0.9)}$	5f _{yv}) i.e. A _s	\sqrt{S}	0.92	mm²/mm/	m I
	Concrete a	ind design li	nks shear o	capacity (A _s ,	$v, prov, x/S_x).($	0.95f _{yv}).d _{x,l}	r 84	kN/m	
								2.	
Area provid	ded by all li	nks per me	tre, A _{sv,prov,x}	(0	mm²/m	
Tried A _{sv,pr}	_{ov,x} / S _x vall	ue aa fan handi		a a bi a m			0.00	mm ⁻ /mm/	m
Design sne	ar resistan	ce for benai	ng in x utili	sation			20%		OK
Clab Char	r Docier f	or Bonding	- 1						
Siab Shea	ir Design f	or Benaing	jin y						
l litimata al		for bonding			0.5 0	$EN(mm^2)$	0.14	NI /	
Ultimate si		for bonding	in y, v _{ult,y} =	tion	0.01 _{cu} &	514/11111)	20/-	N/ MM	OK
olumate si	lear stress		ili y utilisa				3%0		UK
Decian cha	ar stross fo	 		/bd .			0 1/	N/mm^2	
(Conservat	tively chea	r canacity e	nhancemer	nt by eithe	r calculatio	av. atdf	rom sunnor	t and	
comparing	anainst un	enhanced v	as clause	3 4 5 10 B	58110 or	calculating	v , at sunn	ort and	
comparing	against en	hanced v	<u>c</u> us clause within 2d of	the suppor	t as clause	3 4 5 8 BS	$\frac{v_d}{2}$ at supp	ort und od:)	
Area of ter	sile steel r	einforcemer	nt provided			5. 1.5.0 25	202	mm^2/m	
$n_{\rm m} = 100$ A	/hd.			's,prov,y,n			0.30	%	
$V_{} = (0.7)$	9/1.25)(o f	/25) ^{1/3} (40	$0/d_{11})^{1/4}$	<3.f <40): (400/d .) ^{1/4} >0.67	0.50	N/mm^2	
$v_{c,y} = (0.7)$	5/1.25/(P _W)	cu/23) (40	0/u_{y,h}) , p	w \ J, I _{cu} \ + (σ, (400/α _{γ,} ,) >0.07	0.03	11/11111	
Check v	< v for	no links							
• d,y	Concrete s	hear canaci	ty y(hd	,)				kN/m	
			-, - _{C,y} -(Suy,	7					
Check v.	< v ₄ < 0	.4 + v fo	r nominal	links			N/A		
	Provide no	minal links	such that A		b/(0.95f)	i.e. A., / S	0.92	mm ² /mm/	I m
	Concrete a	ind nominal	links shear	capacity (C	$(1.4 + v_{a,a})$	bd _{v h})	134	kN/m	
				, , (0	- c,y / (y,117			
Check Val	, > 0.4 + v	, or design	gn links				N/A		
· - u,)	Provide sh	ear links A	/ S > b(v ₄	v-v _{cv})/(0.9	5f _{vv}) i.e. A ₋	, / S >	0.92	mm ² /mm/	г m
	Concrete a	ind design li	nks shear o	capacity (A	v.prov.v/S).(0.95f _{vv}).d.,	82	kN/m	
					· , p· • , j · • , j · • , • • • • • • • • • • • • • • • • •	, , y , y ,			
Area provi	ded by all li	nks per met	tre, A _{sy provision}	,			0	mm²/m	
Tried Asy.pr	, _{ov,v} / S _v valu	ue	57/07/9				0.00	mm ² /mm/	m
Design she	ar resistan	ce for bendi	ng in y utili	sation			22%	,,	OK

CONSULTING Engineering Calculation Shoot						Job No.		Sheet No.		Rev.	
CONSULTING Engineering Calculation Sheet			ivvv		4						
ENGINEE											
							Member/Location				
Job Title Memb	ber De	esign - Rein	forced Con	crete Two V	Vay Spanni	Drg.		I			
Member Desian -	- RC 1	Two Way Sr	anning Sla	h	- / - [Made by	xx	Date 21	/11/2021	hd.	
				5			////		/ /		
Detailing Pequi	irom	ante	-								
Detailing Requi											
All detailing requ	ireme	ents met ?						ОК			
Max sagging stee	el reir	forcement	pitch in x (·	<3d _{x,s} , <75	0mm)			200	mm	ΟΚ	
Max sagging stee	el reir	forcement	pitch in y (·	<3d _{y,s} , <75	0mm)			200	mm	ΟΚ	
Max hogging stee	el reir	nforcement	pitch in x (<3d _{x,h} , <75	50mm)			200	mm	ОК	
Max hogging stee	el reir	nforcement	pitch in y (<3d _{v.h} , <75	50mm)			200	mm	ОК	
					_						
Maximum	pitch (of bars:(Not	ation as for [BS 8110)							
		%A,⁄	bh	Maximu	m Pitch (mr	n)					
	1	0.5	-1	200							
Ma	in bar	s: 0.5 o	rless	300							
l		1.0 o	r more	150		——					
Max as selected	al		nitek in s					202		0//	
max sagging stee	ei reir	norcement	pitch in x					200	កាកា	OK	
Max sagging stee	el reir	itorcement	pitch in y					200	mm	OK	
Max hogging stee	el reir	nforcement	pitch in x					200	mm	ОК	
Max hogging stee	el reir	nforcement	pitch in y					200	mm	ОК	
Min sagging stee	l rein	forcement p	oitch in x (>	⊳75mm+ _{∳sx}	, >100mm-	+φ _{sx} if ٦	40)	200	mm	ΟΚ	
Min sagging stee	l rein	forcement p	oitch in y (>	>75mm+∳ _{sy}	, >100mm·	+φ _{sy} if Τ	40)	200	mm	ОК	
Min hogging stee	el rein	forcement	pitch in x (>	$>75mm+\phi_{hx}$, >100mm	$+\phi_{hx}$ if	T40)	200	mm	ОК	
Min hogaing stee	el rein	forcement	pitch in v (>	>75mm+oh	, >100mm	+ dby if	, T40)	200	mm	ОК	
Note an allowand	re ha	s heen mad	e for lans ir	the min n	itch hv incr	easina	the d	riteria by t	he har dian	neter	
						cusing					
% Max sag roinf	orcom	ont in v (~	-0.04 bb)					0.22	0/2	OK	
% Max sag reinfo	orcom	$\frac{1}{2} = \frac{1}{2} = \frac{1}$	= 0.04bh					0.22	70 0/	OK	
% Max bag reinf	JICEI		-0.04011					0.22	70 0/	OK	
% Max nog reinio	orcen							0.22	%	OK	
% Max hog reinf	orcen	hent y (<=	0.04bh)					0.22	%	ОК	
	_				<u> </u>						
Sagging steel rei	nforc	ement diam	ieter in x, 🖗	_{sx} (>=6mm	1)			10	mm	ΟΚ	
Sagging steel rei	nforc	ement diam	ieter in y, ø	_{sy} (>=6mm	1)			10	mm	ОК	
Hogging steel rei	inforc	ement dian	neter in x, ¢	o _{hx} (>=6mm	ר)			10	mm	ΟΚ	
Hogging steel rei	inforc	ement diam	neter in y, ¢	_{hy} (>=6mm	ו)			10	mm	ОК	
			<u> </u>								
		l		I <u></u>	l	L		I	l		

CONSULTING ENGINEERS		Enginoprin	a Calculatio	n Chaot		Job No.	Sheet No.	Rev.	
		Consulting	y Calculatio Fngineers	II Sheet		iXXX	1	7	
ENGI		concurring	Engineero		1	JVVV	17		
						Member/Location			
Job Title	Member De	esign - Rein	forced Cond	crete Two \	Vay Spannii	Drg.			
Member De	esign - RC 1	⁻wo Way Sp	anning Slat	0	1	Made by XX	Date 21	/11/2021	ind.
Deflection	Critoria								
Deflection	i Criteria								
Snan in v									
Span, x							5.000	m	
Span, x / e	effective de	oth, d _{x.s} rati	0				35.7		
Basic span	/ effective	depth ratio	criteria (20	precast or	single spar	n; 23 edge;	23.0		
Multiplier C	1,span more or l	ess than 10m			Include	-	1.00		
Modificatio	n factor for	tension C_2							
	$m_x/bd_{x,s}^2$						0.73	N/mm ²	
	$2f_yA_z$	reg 1	(L		2	
	$J_{5} = \frac{1}{3A_{5}}$	$\overline{\beta}_{b}$	(β _b =1.2 un	less precas	t or single s	span)	160	N/mm [∠]	
	Modification	0.55 + -	$(477 - f_{s})$	_ ≤ 2.0			2.00		
	mounicatio	12	$(0.9 + \frac{M}{bd^2})$	ē) —			2.00		
Modified sr	an / effecti	ve denth ra	tio criteria				46.0		
riounicu sp							-1010		
Deflection	utilisation						78%		ОК
Span in y									
Note that t	he deflectio	on check is	performed o	only for the	e shorter dir	ection.			



CONSULTING E N G I N E E R S		Engineerin	a Calculatio	n Sheet		Job No.	Sheet No.	Rev.		
		Consulting	Engineers	II Sheet		iXXX	19			
						Mombor/Logation	mber/location			
						Drg				
Job Title	Member De	esign - Rein	forced Con	crete Iwo V	vay Spanni	Made by	Date 31	/11/2021	bd	
Member De	esign - RC I	i wo way Sr	banning Siai	0			21	/11/2021		
Beam Sec	tion Innut	Descripti	n n							
Deam Sec										
Α.	Beam									
			Depth		Width		Sag Section	on		
	Continuou	JS	slab + dow	instand	b _w		T - continu	ous		
	Precast		downstand	1	b _w		Rect - cont	tinuous		
В.	Beam at E	Edge of Sla	b Span							
			.				<u> </u>			
	0		Depth		Width		Sag Section	on		
	Drococt	us I	slad + dow	nstand	D _w		L - CONTINU	ous		
	riccast		auvviistallu		v w			inaous		
ļ										
					<u> </u>					

CONSULTING Engineering Calculation Sheet							Jo	b No.	Sheet No.				Rev.	
I	ENGINEERS Consulting Engineers				S				jXXX	20				
								Men	nber/Location					
Job	Title	Member D) esign - Re	einforced Co	onc	crete Two W	ay Spanni	Drg.		<u> </u>				
Mer	mber D	esign - RC	Two Way	Spanning S	lat	0		Mad	le by XX	Date	21	/11/20) 21 ⁽	Chd.
Тур	pical Ir	itial Span	/ Effecti	ve Depth	Ra	tios								
- []		Tabl	e 3 Span,	/effective	de	epth ratios	for initial	des	sign of s	labs			\square	
┨┝								_			-	4 -1 -1-	╢─	
			One	e-way spannii	ng		Iwo-	way	spanning		HIC	ad sidd	⊫	
٥ŀ	Impor		moly	continuous	Г	cantilever	simply		contin	IOUS			1	
	load	sup	ported	00111110003		Connicron	supporte	d						
ΗL	kN/m	1 ²											⊢	
H	5.0		23	30		11	30		39			28	⊩	
┨┝		_			+								╢─	
	10.0	,	21	27		10	2/		35			25		
╠╧	Flat a	lah dasian a	hould be be	acad on the l	L.	our onen dim	ension Eco		orior roc	ala 95	0/ ~ 5	the matin	-	
q	uoted in	Table 3 sho	uld be used	lased on the l	ωn	ger span dim	ension, POI	ex(enor pari	cis, 00	70 OI 1	are ratios	'	
Fe	or ribbed	i slabs, 85%	of the ratio	os quoted in	Tał	ole 3 should b	e used.							
Sc	pan-to-	depth ratio	os for two-	way spann	ine	z slabs			span is	in the	rang	e 4 to 1	2 m	1
	mpose	d load.	1:1 pane	1		,	2:1 0	oan	el (basec	l on s	horte	r span)		
	Q _k (kN/	/m²)	Single sr	an	М	ultiple span	Sing	ا م ا	nan	м	ultio	e span		
-	2.5		34		30	accipie spari	30		pan	3/	4 1	e sparr		
H	5.0		32		37		28			32	>			
	7.5		30		35		26			30	-)			
	10.0		28		34		25			20	ý A			
	10.0		20		24		25	1			, 			4
H	Table 1:													
	Span/de	epth ratios	for insitu	concrete										
s	slabs (fr	om Reynol	ds's Reinfo	orced										
	oonerei	e Designer	STIANODO											
HL	Sla	h tuno	5 kN/m	² 10 kN/m	1 ²									
H	Sia	b type	load	load	a									
HF	Cimple	ourported	_		٦									
	on	e-way	27	24										
	Simple	eupported	+	-	\neg									
	tw	o-way	30	27				-						
	Con	tinuous			\neg			-						
	on	e-way	34	30										
	Con	tinuous			Η									
	tw	o-way	44	40										
$H \vdash$					\neg									
H	Car	ntilever	11	10				-						
Ľ					\neg									
	Fla	it slab	30	27										
						┛───		-						
								<u> </u>						
								-						

CONSULTING Engineering Calculation Sheet					Job No.		Sheet No.		Rev.	
ENGI	NEERS	Consulting	Engineers	II Sheet		iXXX	ſ	2	21	
2						Mambar/Lasati			-	
						Member/Locati	on			
Job Title	Member D	esign - Rein	forced Con	crete Iwo V	Vay Spanni	Dig. Made by	24	Date a	111 (2024)	Ibd
Member De	esign - RC	lwo Way Sp	banning Sla	0			X	²¹	/11/2021	na.
Two Way	Enonning	Dibbod Sla	h (Waffle	Slah)						
Two way	Spanning	Ridded Sia	ib (waffie	Slad j						
 The two way spann The din The de The de The de The min 	o way span ning solid sl mensions c esign of the ment and s nimum ste	ning ribbed ab; of the two w e two way chear coeffic c el reinforc	slab is ben ay spanning spanning ri cients as pe cement is a	eficial for it g ribbed sla ibbed slab r the two w rs per the ou	s lighter v b is as per is as per t ay spanning ne way spa	veight co the one w he one w g solid sla nning ribb	vay vay vb; bec	pared to th spanning spanning slab;	e equivaler ribbed slab, ribbed slab)t two
							-			
							+			
							+			
							+			
							+			
							-			
							+			