

Project LIC OF INDIA, PALLAVARAM, CHENNAI		P.Sabarathan Structural Design Engineer & Chartered Engineer	
Calculations for Detailing as per IS 13920		Divn / Dept. CIVIL/STR Job Nr. / File No. 001/DE001	Sheet No. 1 of 3
Designed by : Er.P.Sabarathan		Date : 25-12-2014 11:22	
Checked&Appd by: Er.P.S		Date : 25-12-2014 00:00	
DETAILING AS PER IS 13920			
1. Zone Classification Zone <input type="text" value="3"/> Input RESULT DETAILING REQUIRED AS PER IS 13920		2. Min Grade of concrete Grade of concrete <input type="text" value="20"/> N/mm ² Number of storeys <input type="text" value="3"/> RESULT 2.1 GRADE OF CONCRETE O.K 2.2 MIN.GRADE OF CONCRETE M20	
3. Steel reinforcement Grade of steel <input type="text" value="500"/> N/mm ² RESULT GRADE OF STEEL OK BUT HAVING ELONGATION MORE THAN 14.5 PERCENT			
1.DESIGN OF FLEXURAL MEMBER (BEAM. SLAB)			
1. Factored Axial Stress Factored axial stress <input type="text" value="2"/> N/mm ² NOT APPLICABLE FOR BAEM		2 Width to Depth Ratio Width, b <input type="text" value="230"/> mm Depth, D <input type="text" value="300"/> mm <input type="text" value="0.77"/> SAFE > 0.3	
3. Width of member check SAFE > 200		4. Clear span of member Span <input type="text" value="4"/> m Depth <input type="text" value="300"/> mm SAFE < 1/4 SPAN	
5. Longitudinal Reinforcement 1. Min. bars throughout the length Bottom <input type="text" value="2"/> Top <input type="text" value="2"/> BOTTOM REINFORCEMENT PROVIDED OK TOP REINFORCEMENT PROVIDED OK		2. Min.tension steel ratio on any face at any section fck <input type="text" value="20"/> N/mm ² fy <input type="text" value="500"/> N/mm ² ρ min <input type="text" value="0.214662526"/> % ρ provided <input type="text" value="0.85"/> % PERCENTAGE OF REINF. PROVIDED OK	
3. Maximum Steel ratio at any section, not exceed ρmax ρmax <input type="text" value="2.5"/> % ρmax provided <input type="text" value="1.5"/> % MAX. PERCENTAGE OF REINF. PROVIDED OK		4. Positive steel at a joint face Positive steel <input type="text" value="1"/> % Negative steel <input type="text" value="2"/> % POSITIVE STEEL OK AT JOINT	
5. Steel at top and bottom face of either joint. Positive steel <input type="text" value="1"/> % Negative steel <input type="text" value="2"/> % Max. Negative steel <input type="text" value="2.5"/> PROVIDED BOTH POSITIVE& NEGATIVE STEEL OK		6. Tension development Length. Diameter <input type="text" value="12"/> mm Stress <input type="text" value="435"/> N/mm ² Bond stress <input type="text" value="1.92"/> Development length required = 10Db <input type="text" value="799.69"/> mm	
7. Internal bars Continuously through the column <input type="text" value="YES"/> INTERNAL BARS ARE CONTINUED THROUGH COLUMN		8. Longitudinal bar Splice Bar to be Spliced or not <input type="text" value="Hoops provided entire length"/> Spacing of hoops at lapping <input type="text" value="150"/> mm Lap length required <input type="text" value="679.69"/> mm Lap shall not be provided a) within a joint <input type="text" value="No"/> b) Within a distance 2d from joint face <input type="text" value="550"/> mm d= 275 c) Not more than 50% of steel spliced <input type="text" value="yes"/> at one section SAFE	
9. Web Reinforcement Clear span <input type="text" value="5"/> m Min. diameter <input type="text" value="6"/> mm Hook extension <input type="text" value="60"/> mm PROVIDE 6mm WITH 10·Db			

2.DESIGN OF FLEXURAL SHEAR

Clear Span	5 m	Clear Span	5 m
$V_a^{D+L} = V_b^{D+L} = 1.2(D+L)/L/2$	90 kN	$V_a^{D+L} = V_b^{D+L} = 1.2(D+L)/L/2$	90 kN
SWAY TO RIGHT		SWAY TO LEFT	
Mu limit (Positive)	139 kNm	Mu limit (Negative)	240 kNm
Mu limit (Negative)	139 kNm	Mu limit (Positive)	69 kNm
V_{u_s}	12.16 kN	V_{u_s}	3.48 kN
V_{u_c}	167.84 kN	V_{u_c}	176.52 kN
DESIGN SHEAR FORCE			
V_{u_s}	12.16 kN		
V_{u_c}	176.52 kN		
SPACING OF STIRRUPS			
at either end over 2d dist. from face of support		Diameter of stirrups	
d/2	68.75 mm		8 mm
8*Smallest long. Bar	80 mm	Smallest longitudinal bar	
Minimum	100 mm		10.00 mm
Maximum d/2	137.5 mm	Provided spacing	
			180.00 mm
Upto 2d dist. from face	68.75 mm		
Max. Spacing of vert. hoops	137.5 mm		

3.DESIGN OF COLUMN

1. Factored Axial Stress		2. Min. Dimensions	
<u>Factored axial stress</u>		Min dimension	
Axial Load	140 kN		200 mm
Column, Breadth, B	230 mm	Span of beam c/c	6 m
Depth, D	300 mm	Span of column	3 m
Fact. axial stress	2.02899 N/mm ²	(unsupported length)	
		Min sizes of column	300 mm
		Min sizes of column	200 mm
			Max. value should be taken
THIS. CL. IS APPLICABLE > 0.1 f _{ck}			
3. Ratio of C/s		4. Longitudinal Reinforcement	
<u>Ratio of C/s</u>		<u>Longitudinal bar Splice</u>	
Column, Breadth, B	230 mm	Bar to be Spliced or not	Hoops provided entire length
Depth, D	300 mm	Spacing of hoops at lapping	150 mm
Fact. axial stress	0.77	Lap length required	679.69 mm
	SIZES ARE OK NOT LESS THAN 0.4	Lap shall not be provided	
		a) within a joint	no
		b) Not more than 50% of steel spliced at one section	yes
			SAFE
5. Transverse Reinforcement			
<u>Transverse Reinforcement</u>			
Rectangular hoops	8 mm		
	80 mm		
	80 mm + 135 degree hook		
<u>Cross tie requirement</u>			
Parallel leg dist.	200		
	NO CROSS TIE REQUIRED		

4. DESIGN OF FLEXURAL SHEAR FOR COLUMN

Height of Storey Hs **3.5** m

Mu limit (Positive) **25** kNm **Beam moment capacity**
 Mu limit (Negative) **139** kNm **Beam moment capacity**

Vu **65.6** kN

DESIGN SHEAR FORCE
 Vu **65.6** kN

5. SPECIAL CONFINING REINFORCEMENT

1. COLUMN

1.1. Spec con. Reinf. from each joint face

Larger lateral dimension 300 mm
 1/6th of clear span 583.33 mm
 450 mm
 583.33 mm

1.2. Spacing of hoops

1/4 th min. member dimensio 57.5 mm
 Minimum 75 mm
 Maximum 100 mm

Spacing of hoop shall not exceed
 57.5 mm

1.3. Area of cross section ,Ash

For Rectangular

Ash = 0.18 x S x h x (fck/fy) x (Ag/Ak -1.0)
 S = 57.5 mm
 h = 220 mm
 Ak = 188 mm²
 A_{sh} = 86.73 mm²
 A_{sh provided} = 113.097 mm²

should not >300mm
 Longitudinal 16
 bar

Provide **12** mm diameter
 SAFE

1.3.1. Area of cross section ,Ash

For Circular Diameter 300 mm

Ash = 0.09 x S x Dk x (fck/fy) x (Ag/Ak -1.0)
 S = 57.5 mm
 Dk = 188 mm
 Ak = 27759.11 mm²
 Ag = 70685.83 mm²
 A_{sh} = 60.18 mm²
 A_{sh provided} = 113.10 mm²

Provide **12** mm diameter
 SAFE

1.4. At foundation level

Confining shall extent upto 300 mm below column foundation joint **yes**
 CONFINING REINF. PROVIDED UPTO 300MM