

SCADDS/RC-Footing Designer 2007 [Release: 3.01.1001]

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**Limit State Design of Wall Footings for
Axial Load & Uniaxial Bending,
Isolated Flat/Sloped Rectangular/Circular Footings
with or without Pedestals
for Axial Load, Uniaxial & Biaxial Bending,
Combined Rectangular/Trapezoidal Footings
with or without Pedestals
for Axial Load & Uniaxial Bending
in accordance with IS:456-2000 and IS:6403-1973.**

Introduction:-

This Report contains the detailed solution for the given Reinforced Concrete Footing Design problem.

The given Footing is considered for flexural design and the output contains the following portions:

1. Footing Input Data
2. Flexural Design Output for Footing
3. Flexural Design Output for Pedestal, if provided
4. One Way Shear Check Output
5. Two Way Shear Check Output
6. Development Length / Bond Design Output

While detailed design will be carried out for Flexure and Bond, only checks for stresses are made for Shear.

Global Material Data

Concrete Clear Cover	=	50	mm.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Strength of Main Steel	=	415	N/sq.mm.
Main Rod Size-1	=	10	mm.
Main Rod Size-2	=	12	mm.
Yield Strength of Distribution Steel	=	415	N/sq.mm.
Distbn. Rod Size-1	=	10	mm.
Distbn. Rod Size-2	=	12	mm.
Yield Strength of Dowel/Pedestal Steel	=	415	N/sq.mm.
Dowel/Pedestal Rod Size-1	=	12	mm.
Dowel/Pedestal Rod Size-2	=	16	mm.
Factor of Safety for Load	=	1	
Partial Safety Factor for Concrete	=	1.5	
Partial Safety Factor for Steel	=	1.15	
Max. Strain in Concrete	=	0.0035	mm./mm.
Max. Strain in Steel	=	0.0055	mm./mm.
Young's Modulus of Concrete	=	22360.68	N/sq.mm.
Young's Modulus of Steel	=	200000	N/sq.mm.

Bond / Development Length Output

Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Main Steel	=	415	N/sq.mm.
Yield Stress of Secondary Steel	=	415	N/sq.mm.
Yield Stress of Dowel/Pedestal Steel	=	415	N/sq.mm.

As Per IS:456-2000, Clause 26.2.1.1,

Design Bond Stress for Main Rods	=	1.92	N/sq.mm.
Design Bond Stress for Secondary Rods	=	1.92	N/sq.mm.
Design Bond Stress for Dowel/Pedestal Rods	=	1.92	N/sq.mm.

Rods in Tension:-

Main Rod Diameter-1	=	10	mm.
Corresponding Development Length	=	470.117	mm.

Main Rod Diameter-2	=	12	mm.
Corresponding Development Length	=	564.141	mm.

Secondary Rod Diameter-1	=	10	mm.
Corresponding Development Length	=	470.117	mm.

Secondary Rod Diameter-2	=	12	mm.
Corresponding Development Length	=	564.141	mm.

Rods in Compression:-

Dowel/Pedestal Rod Diameter-1	=	12	mm.
Corresponding Development Length	=	564.141	mm.

Dowel/Pedestal Rod Diameter-2	=	16	mm.
Corresponding Development Length	=	752.188	mm.

F02 : Global Input Data (LC No. : 1)

The footing is to be designed as a Combined Footing.

Centre to Centre of Columns	=	3	m.
Width of Column-1	=	230	mm.
Length of Column-1	=	300	mm.
Width of Column-2	=	230	mm.
Length of Column-2	=	300	mm.
Footing Shape	=	Rectangular	
Initial Depth at the Face of Wall/Column	=	300	mm.
Initial Depth at the End	=	300	mm.

The footing is subjected to Axial Load only.

Working Axial Load on Column-1	=	41.186	KN.
Working Moment for Column-1	=	-0.33	KN m.
Working Axial Load on Column-2	=	59.357	KN.
Working Moment for Column-2	=	-0.612	KN m.
Safe Bearing Capacity of Soil	=	150	KN/sq.m.
Factor of Safety for Safe Bearing Capacity	=	1.5	

F02 : Flexure Output (LC No. : 1)

Working Axial Load on Column-1	=	41.186	KN.
Factored Axial Load on Column-1	=	41.186	KN.
Working Axial Load on Column-2	=	59.357	KN.
Factored Axial Load on Column-2	=	59.357	KN.
Percentage Factor for Self Weight of Footing	=	5	%
Factored Self Weight of Footing	=	5.027	KN.
Total Factored Axial Load on Footing	=	105.569	KN.
Working Moment about ZZ for Column-1	=	-0.33	KN m.
Factored Moment about ZZ for Column-1	=	-0.33	KN m.
Working Moment about ZZ for Column-2	=	-0.612	KN m.
Factored Moment about ZZ for Column-2	=	-0.612	KN m.
Ultimate Bearing Capacity of Soil	=	225	KN/sq.m.
Area of Footing Required	=	1.98	sq.m.

Equal Projections were initially assumed from the Column Centres to arrive at the Footing Size.

Width of Footing Required	=	0.6	m.
Length of Footing Required	=	3.3	m.
Width of Footing Provided	=	0.6	m.
Length of Footing Provided	=	3.3	m.
Projection at Left from Column Centre	=	0.15	m.
Projection at Right from Column Centre	=	0.162	m.
Actual Bearing Area Provided	=	1.98	sq.m.
Max. Bearing Pressure at the Base	=	53.318	KN/sq.m.
Min. Bearing Pressure at the Base	=	53.318	KN/sq.m.

Left Cantilever Portion of Column-1:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	0	mm.
Design Bending Moment	=	5.137	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	55.68	mm.
Effective Depth Provided	=	244	mm.

Hence SAFE.

Percentage of Steel Required	=	0.04	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
Area of Steel Provided	=	175.68	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	268.237	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	386.261	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Right Cantilever Portion of Column-2:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	11.637	mm.
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Design Bending Moment	=	8.036	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	69.64	mm.
Effective Depth Provided	=	244	mm.

Hence SAFE.

Percentage of Steel Required	=	0.063	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
Area of Steel Provided	=	175.68	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	268.237	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	386.261	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Middle Portion between Columns 1 & 2:-

Distance of Max. B.M. from Left	=	1201.792	mm.
Design Bending Moment	=	21.99	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	115.2	mm.
Effective Depth Provided	=	244	mm.

Hence SAFE.

Percentage of Steel Required	=	0.177	%
Area of Steel Provided	=	259.26	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	181.763	mm.
Max. Spacing allowed (Rounded off)	=	175	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	261.739	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Reinforcement along the Width:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Column-1	=	185	mm.
Projection of Footing from Column-2	=	185	mm.
Design Bending Moment at Column-1	=	0.001	KN m.
Design Bending Moment at Column-2	=	0.001	KN m.
Maximum Design Bending Moment	=	0.001	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	0.561	mm.
Effective Depth Provided	=	232	mm.

Hence SAFE.

Percentage of Steel Required	=	0	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
Area of Steel Provided	=	918.72	sq.mm.
Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	282.111	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	406.24	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

As Per IS:456-2000, Clause 26.5.2.1,

Distribution Steel Percentage	=	0.12	%
Area of Distribution Steel Required	=	278.4	sq.mm.
Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	282.111	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	406.24	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Note (1):- The required Spacing of Main Rods will be compared with 300 mm. or 3d (450 mm. or 5d for Dist. Rods) whichever is less. If the required spacing exceeds this limit, the least value will be automatically provided. This is done in accordance with IS:456-2000 Clause 26.3.3.

Note (2):- The required minimum area of reinforcement will be also as per IS:456-2000, Clause 34.5.2, if the Footing Thickness exceeds 1000 mm. This minimum area is 360.0 sq.mm. for each side or face.

Note (3):- The assumed Depth of Footing will be automatically modified so that a SAFE design is arrived at from both flexure as well as Shear considerations.

Note (3):- Spacing of Rods are also controlled by User-defined Increment Value, User-defined Minimum and Maximum Spacing Options, if activated.

F02 : Dowel Bars Output (LC No. : 1)

Factored Axial Load on Column-1	=	41.186	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-1 Section	=	230	mm.
Depth of Column-1 Section	=	300	mm.
Area of Column-1 Section	=	69000	sq.mm.
Width of Footing	=	0.6	m.
Eff. Length of Footing for Column-1	=	0.544	m.
Eff. Area for Column-1	=	326400	sq.mm.
As Per IS:456-2000, Clause 34.4, Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	0.597	N/sq.mm.
As Per IS:456-2000, Clause 34.4.3, Reinforcement is NOT required. However, Minimum Steel is Provided.			
Percentage of Steel Required	=	0.5	%
Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.
Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.
Factored Axial Load on Column-2	=	59.357	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-2 Section	=	230	mm.
Depth of Column-2 Section	=	300	mm.

Area of Column-2 Section	=	69000	sq.mm.
Width of Footing	=	0.6	m.
Eff. Length of Footing for Column-2	=	0.556	m.
Eff. Area for Column-2	=	333382.231	sq.mm.
As Per IS:456-2000, Clause 34.4,			
Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	0.86	N/sq.mm.
As Per IS:456-2000, Clause 34.4.3,			
Reinforcement is NOT required. However, Minimum Steel is Provided.			
Percentage of Steel Required	=	0.5	%
Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.
Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.

*Note :- Calculation for Dowel Rods is only optionally provided.
However, Dowel Rods may not be required in all cases.*

F02 : One Way Shear Output (LC No. : 1)

One Way Shear is considered near the Column carrying the heavier Load.

As Per IS:456-2000, Clause 34.2.4,
the critical section for Shear Force is at a distance equal to the Effective Depth of the Footing, from the Face of the Column.

Design Shear Force about Length	=	7.434	KN.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Depth of Footing at Critical Section	=	244	mm.
Projection of Footing from Critical Section	=	0	mm.
As Per IS:456-2000, Clause 40.1,			
Actual Shear Stress	=	0.051	N/sq.mm.
As Per IS:456-2000, Table 19,			
Design Shear Strength of Concrete	=	0.269	N/sq.mm.

As Per IS:456-2000, Table 20,
 Max. Permissible Shear Stress = 2.794 N/sq.mm.

The section is SAFE in One Way in Shear.

F02 : Punching Shear Output (LC No. : 1)

As Per IS:456-2000, Clause 34.2.4,
 the critical section for Shear Force is at a distance equal to the Half the Effective Depth of the Footing, from the Face of the Column which carries the heavier load.

Length of Periphery at Critical Section = 532 mm.
 Width of Periphery at Critical Section = 462 mm.
 Ratio of Width to Length at Critical Section = 0.868
 Modified Depth of Footing at the Face of Wall = 300 mm.
 Modified Depth of Footing at the End = 300 mm.
 Depth of Footing at Critical Section = 238 mm.
 Design Shear Force = 43.897 KN.

As Per IS:456-2000, Clause 31.6.2.1,
 Actual Shear Stress = 0.093 N/sq.mm.

As Per IS:456-2000, Clause 31.6.3.1,
 Coefficient, ks = 1

Max. Permissible Shear Stress = 1.118 N/sq.mm.

The section is SAFE in Shear.

F02 : Global Input Data (LC No. : 2)

The footing is to be designed as a Combined Footing.

Centre to Centre of Columns = 3 m.
 Width of Column-1 = 230 mm.
 Length of Column-1 = 300 mm.
 Width of Column-2 = 230 mm.
 Length of Column-2 = 300 mm.
 Footing Shape = Rectangular
 Initial Depth at the Face of Wall/Column = 300 mm.
 Initial Depth at the End = 300 mm.

The footing is subjected to Axial Load only.

Working Axial Load on Column-1 = 186.857 KN.
 Working Moment for Column-1 = -2.817 KN m.
 Working Axial Load on Column-2 = 271.203 KN.

Working Moment for Column-2	=	-3.358	KN m.
Safe Bearing Capacity of Soil	=	150	KN/sq.m.
Factor of Safety for Safe Bearing Capacity	=	1.5	

F02 : Flexure Output (LC No. : 2)

Working Axial Load on Column-1	=	186.857	KN.
Factored Axial Load on Column-1	=	186.857	KN.
Working Axial Load on Column-2	=	271.203	KN.
Factored Axial Load on Column-2	=	271.203	KN.
Percentage Factor for Self Weight of Footing	=	5	%
Factored Self Weight of Footing	=	22.903	KN.
Total Factored Axial Load on Footing	=	480.963	KN.
Working Moment about ZZ for Column-1	=	-2.817	KN m.
Factored Moment about ZZ for Column-1	=	-2.817	KN m.
Working Moment about ZZ for Column-2	=	-3.358	KN m.
Factored Moment about ZZ for Column-2	=	-3.358	KN m.
Ultimate Bearing Capacity of Soil	=	225	KN/sq.m.
Area of Footing Required	=	2.175	sq.m.
Equal Projections were initially assumed from the Column Centres to arrive at the Footing Size.			
Width of Footing Required	=	0.6	m.
Length of Footing Required	=	3.625	m.
Width of Footing Provided	=	0.6	m.
Length of Footing Provided	=	3.625	m.
Projection at Left from Column Centre	=	0.277	m.
Projection at Right from Column Centre	=	0.348	m.
Actual Bearing Area Provided	=	2.175	sq.m.
Max. Bearing Pressure at the Base	=	221.132	KN/sq.m.
Min. Bearing Pressure at the Base	=	221.132	KN/sq.m.

Left Cantilever Portion of Column-1:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	126.812	mm.
Design Bending Moment	=	19.336	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.

Effective Depth Required	=	108.026	mm.
Effective Depth Provided	=	244	mm.

Hence SAFE.

Percentage of Steel Required	=	0.155	%
Area of Steel Provided	=	226.894	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	207.691	mm.
Max. Spacing allowed (Rounded off)	=	200	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	299.076	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Right Cantilever Portion of Column-2:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	198.188	mm.
Design Bending Moment	=	28.357	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	130.821	mm.
Effective Depth Provided	=	244	mm.

Hence SAFE.

Percentage of Steel Required	=	0.231	%
Area of Steel Provided	=	338.27	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	139.309	mm.
Max. Spacing allowed (Rounded off)	=	125	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	200.605	mm.
Max. Spacing allowed (Rounded off)	=	200	mm.

Middle Portion between Columns 1 & 2:-

Distance of Max. B.M. from Left	=	1201.939	mm.
Design Bending Moment	=	89.25	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.

Effective Depth Required	=	232.087	mm.
Effective Depth Provided	=	244	mm.

Hence SAFE.

Percentage of Steel Required	=	0.838	%
Area of Steel Provided	=	1226.989	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	38.406	mm.
Max. Spacing allowed (Rounded off)	=	25	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	55.305	mm.
Max. Spacing allowed (Rounded off)	=	50	mm.

Reinforcement along the Width:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Column-1	=	185	mm.
Projection of Footing from Column-2	=	185	mm.
Design Bending Moment at Column-1	=	0.004	KN m.
Design Bending Moment at Column-2	=	0.004	KN m.
Maximum Design Bending Moment	=	0.004	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	1.142	mm.
Effective Depth Provided	=	232	mm.

Hence SAFE.

Percentage of Steel Required	=	0	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
Area of Steel Provided	=	1009.2	sq.mm.
Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	282.111	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	406.24	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

As Per IS:456-2000, Clause 26.5.2.1,

Distribution Steel Percentage	=	0.12	%
Area of Distribution Steel Required	=	278.4	sq.mm.
Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	282.111	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	406.24	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Note (1):- The required Spacing of Main Rods will be compared with 300 mm. or 3d (450 mm. or 5d for Dist. Rods) whichever is less. If the required spacing exceeds this limit, the least value will be automatically provided. This is done in accordance with IS:456-2000 Clause 26.3.3.

Note (2):- The required minimum area of reinforcement will be also as per IS:456-2000, Clause 34.5.2, if the Footing Thickness exceeds 1000 mm. This minimum area is 360.0 sq.mm. for each side or face.

Note (3):- The assumed Depth of Footing will be automatically modified so that a SAFE design is arrived at from both flexure as well as Shear considerations.

Note (3):- Spacing of Rods are also controlled by User-defined Increment Value, User-defined Minimum and Maximum Spacing Options, if activated.

F02 : Dowel Bars Output (LC No. : 2)

Factored Axial Load on Column-1	=	186.857	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-1 Section	=	230	mm.
Depth of Column-1 Section	=	300	mm.
Area of Column-1 Section	=	69000	sq.mm.
Width of Footing	=	0.6	m.
Eff. Length of Footing for Column-1	=	0.671	m.
Eff. Area for Column-1	=	402487.137	sq.mm.
As Per IS:456-2000, Clause 34.4,			
Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	2.708	N/sq.mm.

As Per IS:456-2000, Clause 34.4.3,

Reinforcement is NOT required. However, Minimum Steel is Provided.

Percentage of Steel Required	=	0.5	%
Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.
Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.
Factored Axial Load on Column-2	=	271.203	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-2 Section	=	230	mm.
Depth of Column-2 Section	=	300	mm.
Area of Column-2 Section	=	69000	sq.mm.
Width of Footing	=	0.6	m.
Eff. Length of Footing for Column-2	=	0.742	m.
Eff. Area for Column-2	=	445312.863	sq.mm.
As Per IS:456-2000, Clause 34.4,			
Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	3.93	N/sq.mm.
As Per IS:456-2000, Clause 34.4.3,			
Reinforcement is NOT required. However, Minimum Steel is Provided.			
Percentage of Steel Required	=	0.5	%
Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.
Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.

*Note :- Calculation for Dowel Rods is only optionally provided.
However, Dowel Rods may not be required in all cases.*

F02 : One Way Shear Output (LC No. : 2)

One Way Shear is considered near the Column carrying the heavier Load.

As Per IS:456-2000, Clause 34.2.4,

the critical section for Shear Force is at a distance equal to the Effective Depth of the Footing, from the Face of the Column.

Design Shear Force about Length	=	14.808	KN.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Depth of Footing at Critical Section	=	244	mm.
Projection of Footing from Critical Section	=	0	mm.
As Per IS:456-2000, Clause 40.1,			
Actual Shear Stress	=	0.101	N/sq.mm.
As Per IS:456-2000, Table 19,			
Design Shear Strength of Concrete	=	0.364	N/sq.mm.
As Per IS:456-2000, Table 20,			
Max. Permissible Shear Stress	=	2.794	N/sq.mm.

The section is SAFE in One Way in Shear.

F02 : Punching Shear Output (LC No. : 2)

As Per IS:456-2000, Clause 34.2.4,

the critical section for Shear Force is at a distance equal to the Half the Effective Depth of the Footing, from the Face of the Column which carries the heavier load.

Length of Periphery at Critical Section	=	532	mm.
Width of Periphery at Critical Section	=	462	mm.
Ratio of Width to Length at Critical Section	=	0.868	
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Depth of Footing at Critical Section	=	238	mm.
Design Shear Force	=	206.898	KN.
As Per IS:456-2000, Clause 31.6.2.1,			
Actual Shear Stress	=	0.437	N/sq.mm.
As Per IS:456-2000, Clause 31.6.3.1,			
Coefficient, ks	=	1	
Max. Permissible Shear Stress	=	1.118	N/sq.mm.

The section is SAFE in Shear.

F02 : Global Input Data (LC No. : 3)

The footing is to be designed as a Combined Footing.

Centre to Centre of Columns	=	3	m.
Width of Column-1	=	230	mm.
Length of Column-1	=	300	mm.
Width of Column-2	=	230	mm.
Length of Column-2	=	300	mm.
Footing Shape	=	Rectangular	
Initial Depth at the Face of Wall/Column	=	300	mm.
Initial Depth at the End	=	300	mm.
The footing is subjected to Axial Load only.			
Working Axial Load on Column-1	=	48.858	KN.
Working Moment for Column-1	=	-0.078	KN m.
Working Axial Load on Column-2	=	127.208	KN.
Working Moment for Column-2	=	-0.042	KN m.
Safe Bearing Capacity of Soil	=	150	KN/sq.m.
Factor of Safety for Safe Bearing Capacity	=	1.5	

F02 : Flexure Output (LC No. : 3)

Working Axial Load on Column-1	=	48.858	KN.
Factored Axial Load on Column-1	=	48.858	KN.
Working Axial Load on Column-2	=	127.208	KN.
Factored Axial Load on Column-2	=	127.208	KN.
Percentage Factor for Self Weight of Footing	=	5	%
Factored Self Weight of Footing	=	8.803	KN.
Total Factored Axial Load on Footing	=	184.869	KN.
Working Moment about ZZ for Column-1	=	-0.078	KN m.
Factored Moment about ZZ for Column-1	=	-0.078	KN m.
Working Moment about ZZ for Column-2	=	-0.042	KN m.
Factored Moment about ZZ for Column-2	=	-0.042	KN m.
Ultimate Bearing Capacity of Soil	=	225	KN/sq.m.
Area of Footing Required	=	1.98	sq.m.
Equal Projections were initially assumed from the Column Centres to arrive at the Footing Size.			
Width of Footing Required	=	0.6	m.
Length of Footing Required	=	3.3	m.
Width of Footing Provided	=	0.6	m.
Length of Footing Provided	=	3.3	m.
Projection at Left from Column Centre	=	0.15	m.

Projection at Right from Column Centre	=	0.204	m.
Actual Bearing Area Provided	=	1.98	sq.m.
Max. Bearing Pressure at the Base	=	93.368	KN/sq.m.
Min. Bearing Pressure at the Base	=	93.368	KN/sq.m.

Left Cantilever Portion of Column-1:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	0	mm.
Design Bending Moment	=	5.006	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	54.966	mm.
Effective Depth Provided	=	244	mm.

Hence SAFE.

Percentage of Steel Required	=	0.039	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
Area of Steel Provided	=	175.68	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	268.237	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	386.261	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Right Cantilever Portion of Column-2:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	53.946	mm.
Design Bending Moment	=	15.781	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	97.593	mm.

Effective Depth Provided = 244 mm.

Hence SAFE.

Percentage of Steel Required = 0.126 %

Area of Steel Provided = 184.029 sq.mm.

Dia. of Rod-1 along Length = 10 mm.

Required Spacing of Rods = 256.068 mm.

Max. Spacing allowed (Rounded off) = 250 mm.

Dia. of Rod-2 along Length = 12 mm.

Required Spacing of Rods = 368.738 mm.

Max. Spacing allowed (Rounded off) = 250 mm.

Middle Portion between Columns 1 & 2:-

Distance of Max. B.M. from Left = 765.738 mm.

Design Bending Moment = 15.12 KN m.

Modified Depth of Footing at the Face of Wall = 300 mm.

Modified Depth of Footing at the End = 300 mm.

Effective Depth Required = 95.526 mm.

Effective Depth Provided = 244 mm.

Hence SAFE.

Percentage of Steel Required = 0.12 %

Area of Steel Provided = 176.113 sq.mm.

Dia. of Rod-1 along Length = 10 mm.

Required Spacing of Rods = 267.577 mm.

Max. Spacing allowed (Rounded off) = 250 mm.

Dia. of Rod-2 along Length = 12 mm.

Required Spacing of Rods = 385.311 mm.

Max. Spacing allowed (Rounded off) = 250 mm.

Reinforcement along the Width:-

As Per IS:456-2000, Clause 34.2.3,

the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Column-1 = 185 mm.

Projection of Footing from Column-2 = 185 mm.

Design Bending Moment at Column-1 = 0.002 KN m.

Design Bending Moment at Column-2 = 0.002 KN m.

Maximum Design Bending Moment = 0.002 KN m.

Modified Depth of Footing at the Face of Wall = 300 mm.

Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	0.742	mm.
Effective Depth Provided	=	232	mm.

Hence SAFE.

Percentage of Steel Required	=	0	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
Area of Steel Provided	=	918.72	sq.mm.
Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	282.111	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	406.24	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

As Per IS:456-2000, Clause 26.5.2.1,

Distribution Steel Percentage	=	0.12	%
Area of Distribution Steel Required	=	278.4	sq.mm.
Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	282.111	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	406.24	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Note (1):- The required Spacing of Main Rods will be compared with 300 mm. or 3d (450 mm. or 5d for Dist. Rods) whichever is less. If the required spacing exceeds this limit, the least value will be automatically provided. This is done in accordance with IS:456-2000 Clause 26.3.3.

Note (2):- The required minimum area of reinforcement will be also as per IS:456-2000, Clause 34.5.2, if the Footing Thickness exceeds 1000 mm. This minimum area is 360.0 sq.mm. for each side or face.

Note (3):- The assumed Depth of Footing will be automatically modified so that a SAFE design is arrived at from both flexure as well as Shear considerations.

Note (3):- Spacing of Rods are also controlled by User-defined Increment Value, User-defined Minimum and Maximum Spacing Options, if activated.

F02 : Dowel Bars Output (LC No. : 3)

Factored Axial Load on Column-1	=	48.858	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-1 Section	=	230	mm.
Depth of Column-1 Section	=	300	mm.
Area of Column-1 Section	=	69000	sq.mm.
Width of Footing	=	0.6	m.
Eff. Length of Footing for Column-1	=	0.544	m.
Eff. Area for Column-1	=	326400	sq.mm.
As Per IS:456-2000, Clause 34.4,			
Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	0.708	N/sq.mm.
As Per IS:456-2000, Clause 34.4.3,			
Reinforcement is NOT required. However, Minimum Steel is Provided.			
Percentage of Steel Required	=	0.5	%
Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.
Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.
Factored Axial Load on Column-2	=	127.208	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-2 Section	=	230	mm.
Depth of Column-2 Section	=	300	mm.
Area of Column-2 Section	=	69000	sq.mm.
Width of Footing	=	0.6	m.
Eff. Length of Footing for Column-2	=	0.598	m.
Eff. Area for Column-2	=	358767.41	sq.mm.
As Per IS:456-2000, Clause 34.4,			
Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.

Actual Bearing Stress = 1.844 N/sq.mm.

As Per IS:456-2000, Clause 34.4.3,

Reinforcement is NOT required. However, Minimum Steel is Provided.

Percentage of Steel Required = 0.5 %

Area of Steel Provided = 345 sq.mm.

Pedestal Rod Size-1 = 12 mm.

No. of Rods to be Provided = 3 Nos.

Corresponding Steel Area = 339.292 sq.mm.

Pedestal Rod Size-2 = 16 mm.

No. of Rods to be Provided = 2 Nos.

Corresponding Steel Area = 402.124 sq.mm.

Note :- Calculation for Dowel Rods is only optionally provided.

However, Dowel Rods may not be required in all cases.

F02 : One Way Shear Output (LC No. : 3)

One Way Shear is considered near the Column carrying the heavier Load.

As Per IS:456-2000, Clause 34.2.4,

the critical section for Shear Force is at a distance equal to the Effective Depth of the Footing, from the Face of the Column.

Design Shear Force about Length = 13.018 KN.

Modified Depth of Footing at the Face of Wall = 300 mm.

Modified Depth of Footing at the End = 300 mm.

Depth of Footing at Critical Section = 244 mm.

Projection of Footing from Critical Section = 0 mm.

As Per IS:456-2000, Clause 40.1,

Actual Shear Stress = 0.089 N/sq.mm.

As Per IS:456-2000, Table 19,

Design Shear Strength of Concrete = 0.269 N/sq.mm.

As Per IS:456-2000, Table 20,

Max. Permissible Shear Stress = 2.794 N/sq.mm.

The section is SAFE in One Way in Shear.

F02 : Punching Shear Output (LC No. : 3)

As Per IS:456-2000, Clause 34.2.4,

the critical section for Shear Force is at a distance equal to the Half the Effective Depth of the Footing, from the Face of the Column which carries the heavier load.

Length of Periphery at Critical Section = 532 mm.

Width of Periphery at Critical Section	=	462	mm.
Ratio of Width to Length at Critical Section	=	0.868	
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Depth of Footing at Critical Section	=	238	mm.
Design Shear Force	=	94.076	KN.
As Per IS:456-2000, Clause 31.6.2.1,			
Actual Shear Stress	=	0.199	N/sq.mm.
As Per IS:456-2000, Clause 31.6.3.1,			
Coefficient, ks	=	1	
Max. Permissible Shear Stress	=	1.118	N/sq.mm.

The section is SAFE in Shear.

F02 : Global Input Data (LC No. : 4)

The footing is to be designed as a Combined Footing.

Centre to Centre of Columns	=	3	m.
Width of Column-1	=	230	mm.
Length of Column-1	=	300	mm.
Width of Column-2	=	230	mm.
Length of Column-2	=	300	mm.
Footing Shape	=	Rectangular	
Initial Depth at the Face of Wall/Column	=	300	mm.
Initial Depth at the End	=	300	mm.

The footing is subjected to Axial Load only.

Working Axial Load on Column-1	=	48.081	KN.
Working Moment for Column-1	=	-0.077	KN m.
Working Axial Load on Column-2	=	125.187	KN.
Working Moment for Column-2	=	-0.042	KN m.
Safe Bearing Capacity of Soil	=	150	KN/sq.m.
Factor of Safety for Safe Bearing Capacity	=	1.5	

F02 : Flexure Output (LC No. : 4)

Working Axial Load on Column-1	=	48.081	KN.
Factored Axial Load on Column-1	=	48.081	KN.
Working Axial Load on Column-2	=	125.187	KN.
Factored Axial Load on Column-2	=	125.187	KN.

Percentage Factor for Self Weight of Footing	=	5	%
Factored Self Weight of Footing	=	8.663	KN.
Total Factored Axial Load on Footing	=	181.932	KN.
Working Moment about ZZ for Column-1	=	-0.077	KN m.
Factored Moment about ZZ for Column-1	=	-0.077	KN m.
Working Moment about ZZ for Column-2	=	-0.042	KN m.
Factored Moment about ZZ for Column-2	=	-0.042	KN m.
Ultimate Bearing Capacity of Soil	=	225	KN/sq.m.
Area of Footing Required	=	1.98	sq.m.
Equal Projections were initially assumed from the Column Centres to arrive at the Footing Size.			
Width of Footing Required	=	0.6	m.
Length of Footing Required	=	3.3	m.
Width of Footing Provided	=	0.6	m.
Length of Footing Provided	=	3.3	m.
Projection at Left from Column Centre	=	0.15	m.
Projection at Right from Column Centre	=	0.203	m.
Actual Bearing Area Provided	=	1.98	sq.m.
Max. Bearing Pressure at the Base	=	91.885	KN/sq.m.
Min. Bearing Pressure at the Base	=	91.885	KN/sq.m.

Left Cantilever Portion of Column-1:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	0	mm.
Design Bending Moment	=	4.927	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	54.528	mm.
Effective Depth Provided	=	244	mm.

Hence SAFE.

Percentage of Steel Required	=	0.039	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
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Area of Steel Provided	=	175.68	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	268.237	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	386.261	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Right Cantilever Portion of Column-2:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	53.313	mm.
Design Bending Moment	=	15.542	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	96.851	mm.
Effective Depth Provided	=	244	mm.

Hence SAFE.

Percentage of Steel Required	=	0.124	%
Area of Steel Provided	=	181.166	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	260.114	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	374.564	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Middle Portion between Columns 1 & 2:-

Distance of Max. B.M. from Left	=	765.738	mm.
Design Bending Moment	=	14.88	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	94.764	mm.
Effective Depth Provided	=	244	mm.

Hence SAFE.

Percentage of Steel Required	=	0.118	%
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As Per IS:456-2000, Clause 26.5.2.1,

the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
Area of Steel Provided	=	175.68	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	268.237	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	386.261	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Reinforcement along the Width:-

As Per IS:456-2000, Clause 34.2.3,

the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Column-1	=	185	mm.
Projection of Footing from Column-2	=	185	mm.
Design Bending Moment at Column-1	=	0.001	KN m.
Design Bending Moment at Column-2	=	0.001	KN m.
Maximum Design Bending Moment	=	0.001	KN m.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Effective Depth Required	=	0.736	mm.
Effective Depth Provided	=	232	mm.

Hence SAFE.

Percentage of Steel Required	=	0	%
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As Per IS:456-2000, Clause 26.5.2.1,

the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
Area of Steel Provided	=	918.72	sq.mm.
Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	282.111	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	406.24	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

As Per IS:456-2000, Clause 26.5.2.1,

Distribution Steel Percentage	=	0.12	%
Area of Distribution Steel Required	=	278.4	sq.mm.
Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	282.111	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.
Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	406.24	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Note (1):- The required Spacing of Main Rods will be compared with 300 mm. or 3d (450 mm. or 5d for Dist. Rods) whichever is less. If the required spacing exceeds this limit, the least value will be automatically provided. This is done in accordance with IS:456-2000 Clause 26.3.3.

Note (2):- The required minimum area of reinforcement will be also as per IS:456-2000, Clause 34.5.2, if the Footing Thickness exceeds 1000 mm. This minimum area is 360.0 sq.mm. for each side or face.

Note (3):- The assumed Depth of Footing will be automatically modified so that a SAFE design is arrived at from both flexure as well as Shear considerations.

Note (3):- Spacing of Rods are also controlled by User-defined Increment Value, User-defined Minimum and Maximum Spacing Options, if activated.

F02 : Dowel Bars Output (LC No. : 4)

Factored Axial Load on Column-1	=	48.081	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-1 Section	=	230	mm.
Depth of Column-1 Section	=	300	mm.
Area of Column-1 Section	=	69000	sq.mm.
Width of Footing	=	0.6	m.
Eff. Length of Footing for Column-1	=	0.544	m.
Eff. Area for Column-1	=	326400	sq.mm.
As Per IS:456-2000, Clause 34.4, Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	0.697	N/sq.mm.
As Per IS:456-2000, Clause 34.4.3, Reinforcement is NOT required. However, Minimum Steel is Provided.			
Percentage of Steel Required	=	0.5	%

Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.
Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.
Factored Axial Load on Column-2	=	125.187	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-2 Section	=	230	mm.
Depth of Column-2 Section	=	300	mm.
Area of Column-2 Section	=	69000	sq.mm.
Width of Footing	=	0.6	m.
Eff. Length of Footing for Column-2	=	0.597	m.
Eff. Area for Column-2	=	358387.967	sq.mm.
As Per IS:456-2000, Clause 34.4,			
Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	1.814	N/sq.mm.
As Per IS:456-2000, Clause 34.4.3,			
Reinforcement is NOT required. However, Minimum Steel is Provided.			
Percentage of Steel Required	=	0.5	%
Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.
Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.

*Note :- Calculation for Dowel Rods is only optionally provided.
However, Dowel Rods may not be required in all cases.*

F02 : One Way Shear Output (LC No. : 4)

One Way Shear is considered near the Column carrying the heavier Load.

As Per IS:456-2000, Clause 34.2.4,

the critical section for Shear Force is at a distance equal to the Effective Depth of the Footing, from the Face of the Column.

Design Shear Force about Length	=	12.811	KN.
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Depth of Footing at Critical Section	=	244	mm.
Projection of Footing from Critical Section	=	0	mm.
As Per IS:456-2000, Clause 40.1, Actual Shear Stress	=	0.088	N/sq.mm.
As Per IS:456-2000, Table 19, Design Shear Strength of Concrete	=	0.269	N/sq.mm.
As Per IS:456-2000, Table 20, Max. Permissible Shear Stress	=	2.794	N/sq.mm.

The section is SAFE in One Way in Shear.

F02 : Punching Shear Output (LC No. : 4)

As Per IS:456-2000, Clause 34.2.4,
the critical section for Shear Force is at a distance equal to the Half the Effective Depth of the Footing, from the Face of the Column which carries the heavier load.

Length of Periphery at Critical Section	=	532	mm.
Width of Periphery at Critical Section	=	462	mm.
Ratio of Width to Length at Critical Section	=	0.868	
Modified Depth of Footing at the Face of Wall	=	300	mm.
Modified Depth of Footing at the End	=	300	mm.
Depth of Footing at Critical Section	=	238	mm.
Design Shear Force	=	92.581	KN.
As Per IS:456-2000, Clause 31.6.2.1, Actual Shear Stress	=	0.196	N/sq.mm.
As Per IS:456-2000, Clause 31.6.3.1, Coefficient, k_s	=	1	
Max. Permissible Shear Stress	=	1.118	N/sq.mm.

The section is SAFE in Shear.

F02 : Global Input Data (LC No. : 5)

The footing is to be designed as a Combined Footing.

Centre to Centre of Columns	=	3	m.
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Width of Column-1	=	230	mm.
Length of Column-1	=	300	mm.
Width of Column-2	=	230	mm.
Length of Column-2	=	300	mm.
Footing Shape	=	Rectangular	
Initial Depth at the Face of Wall/Column	=	300	mm.
Initial Depth at the End	=	300	mm.
The footing is subjected to Axial Load only.			
Working Axial Load on Column-1	=	415.351	KN.
Working Moment for Column-1	=	-4.838	KN m.
Working Axial Load on Column-2	=	686.652	KN.
Working Moment for Column-2	=	-6.018	KN m.
Safe Bearing Capacity of Soil	=	150	KN/sq.m.
Factor of Safety for Safe Bearing Capacity	=	1.5	

F02 : Flexure Output (LC No. : 5)

Working Axial Load on Column-1	=	415.351	KN.
Factored Axial Load on Column-1	=	415.351	KN.
Working Axial Load on Column-2	=	686.652	KN.
Factored Axial Load on Column-2	=	686.652	KN.
Percentage Factor for Self Weight of Footing	=	5	%
Factored Self Weight of Footing	=	55.1	KN.
Total Factored Axial Load on Footing	=	1157.103	KN.
Working Moment about ZZ for Column-1	=	-4.838	KN m.
Factored Moment about ZZ for Column-1	=	-4.838	KN m.
Working Moment about ZZ for Column-2	=	-6.018	KN m.
Factored Moment about ZZ for Column-2	=	-6.018	KN m.
Ultimate Bearing Capacity of Soil	=	225	KN/sq.m.
Area of Footing Required	=	4.675	sq.m.
Equal Projections were initially assumed from the Column Centres to arrive at the Footing Size.			
Width of Footing Required	=	1.1	m.
Length of Footing Required	=	4.25	m.
Width of Footing Provided	=	1.1	m.
Length of Footing Provided	=	4.25	m.
Projection at Left from Column Centre	=	0.546	m.
Projection at Right from Column Centre	=	0.704	m.

Actual Bearing Area Provided	=	4.675	sq.m.
Max. Bearing Pressure at the Base	=	247.509	KN/sq.m.
Min. Bearing Pressure at the Base	=	247.509	KN/sq.m.

Left Cantilever Portion of Column-1:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	396.086	mm.
Design Bending Moment	=	20.34	KN m.
Modified Depth of Footing at the Face of Wall	=	330	mm.
Modified Depth of Footing at the End	=	330	mm.
Effective Depth Required	=	81.827	mm.
Effective Depth Provided	=	274	mm.

Hence SAFE.

Percentage of Steel Required	=	0.069	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
Area of Steel Provided	=	361.68	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	238.868	mm.
Max. Spacing allowed (Rounded off)	=	225	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	343.97	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Right Cantilever Portion of Column-2:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	553.914	mm.
Design Bending Moment	=	39.779	KN m.
Modified Depth of Footing at the Face of Wall	=	330	mm.
Modified Depth of Footing at the End	=	330	mm.
Effective Depth Required	=	114.432	mm.
Effective Depth Provided	=	274	mm.

Hence SAFE.

Percentage of Steel Required	=	0.137	%
Area of Steel Provided	=	414.104	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	208.628	mm.
Max. Spacing allowed (Rounded off)	=	200	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	300.425	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Middle Portion between Columns 1 & 2:-

Distance of Max. B.M. from Left	=	1055.761	mm.
Design Bending Moment	=	110.685	KN m.
Modified Depth of Footing at the Face of Wall	=	330	mm.
Modified Depth of Footing at the End	=	330	mm.
Effective Depth Required	=	190.884	mm.
Effective Depth Provided	=	274	mm.

Hence SAFE.

Percentage of Steel Required	=	0.406	%
Area of Steel Provided	=	1222.258	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	70.684	mm.
Max. Spacing allowed (Rounded off)	=	75	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	101.785	mm.
Max. Spacing allowed (Rounded off)	=	100	mm.

Reinforcement along the Width:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Column-1	=	435	mm.
Projection of Footing from Column-2	=	435	mm.
Design Bending Moment at Column-1	=	0.022	KN m.
Design Bending Moment at Column-2	=	0.022	KN m.
Maximum Design Bending Moment	=	0.022	KN m.
Modified Depth of Footing at the Face of Wall	=	330	mm.
Modified Depth of Footing at the End	=	330	mm.

Effective Depth Required	=	2.842	mm.
Effective Depth Provided	=	262	mm.

Hence SAFE.

Percentage of Steel Required	=	0	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum
to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
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Area of Steel Provided	=	1336.2	sq.mm.
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Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	249.809	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	359.724	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

As Per IS:456-2000, Clause 26.5.2.1,

Distribution Steel Percentage	=	0.12	%
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Area of Distribution Steel Required	=	314.4	sq.mm.
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Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	249.809	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	359.724	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Note (1):- The required Spacing of Main Rods will be compared with 300 mm. or 3d (450 mm. or 5d for Dist. Rods) whichever is less. If the required spacing exceeds this limit, the least value will be automatically provided. This is done in accordance with IS:456-2000 Clause 26.3.3.

Note (2):- The required minimum area of reinforcement will be also as per IS:456-2000, Clause 34.5.2, if the Footing Thickness exceeds 1000 mm. This minimum area is 360.0 sq.mm. for each side or face.

Note (3):- The assumed Depth of Footing will be automatically modified so that a SAFE design is arrived at from both flexure as well as Shear considerations.

Note (3):- Spacing of Rods are also controlled by User-defined Increment Value, User-defined Minimum and Maximum Spacing Options, if activated.

F02 : Dowel Bars Output (LC No. : 5)

Factored Axial Load on Column-1	=	415.351	KN.
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Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-1 Section	=	230	mm.
Depth of Column-1 Section	=	300	mm.
Area of Column-1 Section	=	69000	sq.mm.
Width of Footing	=	1.1	m.
Eff. Length of Footing for Column-1	=	0.848	m.
Eff. Area for Column-1	=	932800	sq.mm.
As Per IS:456-2000, Clause 34.4,			
Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	6.02	N/sq.mm.
As Per IS:456-2000, Clause 34.4.3,			
Reinforcement is NOT required. However, Minimum Steel is Provided.			
Percentage of Steel Required	=	0.5	%
Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.
Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.
Factored Axial Load on Column-2	=	686.652	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-2 Section	=	230	mm.
Depth of Column-2 Section	=	300	mm.
Area of Column-2 Section	=	69000	sq.mm.
Width of Footing	=	1.1	m.
Eff. Length of Footing for Column-2	=	0.848	m.
Eff. Area for Column-2	=	932800	sq.mm.
As Per IS:456-2000, Clause 34.4,			
Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	9.951	N/sq.mm.

As Per IS:456-2000, Clause 34.4.3,

Reinforcement is NOT required. However, Minimum Steel is Provided.

Percentage of Steel Required	=	0.5	%
Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.
Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.

*Note :- Calculation for Dowel Rods is only optionally provided.
However, Dowel Rods may not be required in all cases.*

F02 : One Way Shear Output (LC No. : 5)

One Way Shear is considered near the Column carrying the heavier Load.

As Per IS:456-2000, Clause 34.2.4,

the critical section for Shear Force is at a distance equal to the Effective Depth of the Footing, from the Face of the Column.

Design Shear Force about Length	=	72.58	KN.
Modified Depth of Footing at the Face of Wall	=	330	mm.
Modified Depth of Footing at the End	=	330	mm.
Depth of Footing at Critical Section	=	274	mm.
Projection of Footing from Critical Section	=	279.914	mm.

As Per IS:456-2000, Clause 40.1,

Actual Shear Stress = 0.241 N/sq.mm.

As Per IS:456-2000, Table 19,

Design Shear Strength of Concrete = 0.282 N/sq.mm.

As Per IS:456-2000, Table 20,

Max. Permissible Shear Stress = 2.794 N/sq.mm.

The section is SAFE in One Way in Shear.

F02 : Punching Shear Output (LC No. : 5)**As Per IS:456-2000, Clause 34.2.4,**

the critical section for Shear Force is at a distance equal to the Half the Effective Depth of the Footing, from the Face of the Column which carries the heavier load.

Length of Periphery at Critical Section	=	562	mm.
Width of Periphery at Critical Section	=	492	mm.

Ratio of Width to Length at Critical Section	=	0.875	
Modified Depth of Footing at the Face of Wall	=	330	mm.
Modified Depth of Footing at the End	=	330	mm.
Depth of Footing at Critical Section	=	268	mm.
Design Shear Force	=	601.67	KN.
As Per IS:456-2000, Clause 31.6.2.1,			
Actual Shear Stress	=	1.065	N/sq.mm.
As Per IS:456-2000, Clause 31.6.3.1,			
Coefficient, ks	=	1	
Max. Permissible Shear Stress	=	1.118	N/sq.mm.

The section is SAFE in Shear.

F02 : Global Input Data (LC No. : 6)

The footing is to be designed as a Combined Footing.

Centre to Centre of Columns	=	3	m.
Width of Column-1	=	230	mm.
Length of Column-1	=	300	mm.
Width of Column-2	=	230	mm.
Length of Column-2	=	300	mm.
Footing Shape	=	Rectangular	
Initial Depth at the Face of Wall/Column	=	300	mm.
Initial Depth at the End	=	300	mm.

The footing is subjected to Axial Load only.

Working Axial Load on Column-1	=	487.473	KN.
Working Moment for Column-1	=	-4.954	KN m.
Working Axial Load on Column-2	=	874.433	KN.
Working Moment for Column-2	=	-6.08	KN m.
Safe Bearing Capacity of Soil	=	150	KN/sq.m.
Factor of Safety for Safe Bearing Capacity	=	1.5	

F02 : Flexure Output (LC No. : 6)

Working Axial Load on Column-1	=	487.473	KN.
Factored Axial Load on Column-1	=	487.473	KN.
Working Axial Load on Column-2	=	874.433	KN.
Factored Axial Load on Column-2	=	874.433	KN.
Percentage Factor for Self Weight of Footing	=	5	%

Factored Self Weight of Footing	=	68.095	KN.
Total Factored Axial Load on Footing	=	1430.001	KN.
Working Moment about ZZ for Column-1	=	-4.954	KN m.
Factored Moment about ZZ for Column-1	=	-4.954	KN m.
Working Moment about ZZ for Column-2	=	-6.08	KN m.
Factored Moment about ZZ for Column-2	=	-6.08	KN m.
Ultimate Bearing Capacity of Soil	=	225	KN/sq.m.
Area of Footing Required	=	5.706	sq.m.

Equal Projections were initially assumed from the Column Centres to arrive at the Footing Size.

Width of Footing Required	=	1.275	m.
Length of Footing Required	=	4.475	m.
Width of Footing Provided	=	1.275	m.
Length of Footing Provided	=	4.475	m.
Projection at Left from Column Centre	=	0.637	m.
Projection at Right from Column Centre	=	0.838	m.
Actual Bearing Area Provided	=	5.706	sq.m.
Max. Bearing Pressure at the Base	=	250.63	KN/sq.m.
Min. Bearing Pressure at the Base	=	250.63	KN/sq.m.

Left Cantilever Portion of Column-1:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	486.572	mm.
Design Bending Moment	=	38.428	KN m.
Modified Depth of Footing at the Face of Wall	=	370	mm.
Modified Depth of Footing at the End	=	370	mm.
Effective Depth Required	=	104.47	mm.
Effective Depth Provided	=	314	mm.

Hence SAFE.

Percentage of Steel Required	=	0.086	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
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Area of Steel Provided	=	480.42	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	208.439	mm.
Max. Spacing allowed (Rounded off)	=	200	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	300.152	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Right Cantilever Portion of Column-2:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Critical Section	=	688.428	mm.
Design Bending Moment	=	72.117	KN m.
Modified Depth of Footing at the Face of Wall	=	370	mm.
Modified Depth of Footing at the End	=	370	mm.
Effective Depth Required	=	143.115	mm.
Effective Depth Provided	=	314	mm.

Hence SAFE.

Percentage of Steel Required	=	0.165	%
Area of Steel Provided	=	658.95	sq.mm.
Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	151.966	mm.
Max. Spacing allowed (Rounded off)	=	150	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	218.832	mm.
Max. Spacing allowed (Rounded off)	=	200	mm.

Middle Portion between Columns 1 & 2:-

Distance of Max. B.M. from Left	=	965.183	mm.
Design Bending Moment	=	85.048	KN m.
Modified Depth of Footing at the Face of Wall	=	370	mm.
Modified Depth of Footing at the End	=	370	mm.
Effective Depth Required	=	155.417	mm.
Effective Depth Provided	=	314	mm.

Hence SAFE.

Percentage of Steel Required	=	0.195	%
Area of Steel Provided	=	782.278	sq.mm.

Dia. of Rod-1 along Length	=	10	mm.
Required Spacing of Rods	=	128.009	mm.
Max. Spacing allowed (Rounded off)	=	125	mm.
Dia. of Rod-2 along Length	=	12	mm.
Required Spacing of Rods	=	184.332	mm.
Max. Spacing allowed (Rounded off)	=	175	mm.

Reinforcement along the Width:-

As Per IS:456-2000, Clause 34.2.3,
the critical section for Bending Moment is at the Face of the Column.

Projection of Footing from Column-1	=	522.5	mm.
Projection of Footing from Column-2	=	522.5	mm.
Design Bending Moment at Column-1	=	0.033	KN m.
Design Bending Moment at Column-2	=	0.033	KN m.
Maximum Design Bending Moment	=	0.033	KN m.
Modified Depth of Footing at the Face of Wall	=	370	mm.
Modified Depth of Footing at the End	=	370	mm.
Effective Depth Required	=	3.435	mm.
Effective Depth Provided	=	302	mm.

Hence SAFE.

Percentage of Steel Required	=	0	%
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As Per IS:456-2000, Clause 26.5.2.1,
the required percentage of Steel is less than the Minimum to be provided. Hence, Minimum Steel is provided.

Percentage of Main Steel Provided	=	0.12	%
Area of Steel Provided	=	1621.74	sq.mm.
Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	216.721	mm.
Max. Spacing allowed (Rounded off)	=	200	mm.
Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	312.079	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

As Per IS:456-2000, Clause 26.5.2.1,

Distribution Steel Percentage	=	0.12	%
Area of Distribution Steel Required	=	362.4	sq.mm.
Dia. of Rod-1 along Width	=	10	mm.
Required Spacing of Rods	=	216.721	mm.
Max. Spacing allowed (Rounded off)	=	200	mm.

Dia. of Rod-2 along Width	=	12	mm.
Required Spacing of Rods	=	312.079	mm.
Max. Spacing allowed (Rounded off)	=	250	mm.

Note (1):- The required Spacing of Main Rods will be compared with 300 mm. or 3d (450 mm. or 5d for Dist. Rods) whichever is less. If the required spacing exceeds this limit, the least value will be automatically provided. This is done in accordance with IS:456-2000 Clause 26.3.3.

Note (2):- The required minimum area of reinforcement will be also as per IS:456-2000, Clause 34.5.2, if the Footing Thickness exceeds 1000 mm. This minimum area is 360.0 sq.mm. for each side or face.

Note (3):- The assumed Depth of Footing will be automatically modified so that a SAFE design is arrived at from both flexure as well as Shear considerations.

Note (3):- Spacing of Rods are also controlled by User-defined Increment Value, User-defined Minimum and Maximum Spacing Options, if activated.

F02 : Dowel Bars Output (LC No. : 6)

Factored Axial Load on Column-1	=	487.473	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-1 Section	=	230	mm.
Depth of Column-1 Section	=	300	mm.
Area of Column-1 Section	=	69000	sq.mm.
Width of Footing	=	1.275	m.
Eff. Length of Footing for Column-1	=	0.928	m.
Eff. Area for Column-1	=	1183200	sq.mm.
As Per IS:456-2000, Clause 34.4,			
Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	7.065	N/sq.mm.
As Per IS:456-2000, Clause 34.4.3,			
Reinforcement is NOT required. However, Minimum Steel is Provided.			
Percentage of Steel Required	=	0.5	%
Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.

Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.
Factored Axial Load on Column-2	=	874.433	KN.
Char. Comp. Strength of Concrete	=	20	N/sq.mm.
Yield Stress of Pedestal Steel	=	415	N/sq.mm.
Width of Column-2 Section	=	230	mm.
Depth of Column-2 Section	=	300	mm.
Area of Column-2 Section	=	69000	sq.mm.
Width of Footing	=	1.275	m.
Eff. Length of Footing for Column-2	=	0.928	m.
Eff. Area for Column-2	=	1183200	sq.mm.
As Per IS:456-2000, Clause 34.4,			
Basic Permissible Bearing Stress	=	9	N/sq.mm.
Max. Bearing Stress based on Area Ratio	=	18	N/sq.mm.
Actual Bearing Stress	=	12.673	N/sq.mm.
As Per IS:456-2000, Clause 34.4.3,			
Reinforcement is NOT required. However, Minimum Steel is Provided.			
Percentage of Steel Required	=	0.5	%
Area of Steel Provided	=	345	sq.mm.
Pedestal Rod Size-1	=	12	mm.
No. of Rods to be Provided	=	3	Nos.
Corresponding Steel Area	=	339.292	sq.mm.
Pedestal Rod Size-2	=	16	mm.
No. of Rods to be Provided	=	2	Nos.
Corresponding Steel Area	=	402.124	sq.mm.

*Note :- Calculation for Dowel Rods is only optionally provided.
However, Dowel Rods may not be required in all cases.*

F02 : One Way Shear Output (LC No. : 6)

One Way Shear is considered near the Column carrying the heavier Load.

As Per IS:456-2000, Clause 34.2.4,
the critical section for Shear Force is at a distance equal to the Effective Depth of the Footing, from the Face of the Column.

Design Shear Force about Length	=	113.952	KN.
Modified Depth of Footing at the Face of Wall	=	370	mm.
Modified Depth of Footing at the End	=	370	mm.

Depth of Footing at Critical Section	=	314	mm.
Projection of Footing from Critical Section	=	374.428	mm.
As Per IS:456-2000, Clause 40.1, Actual Shear Stress	=	0.285	N/sq.mm.
As Per IS:456-2000, Table 19, Design Shear Strength of Concrete	=	0.301	N/sq.mm.
As Per IS:456-2000, Table 20, Max. Permissible Shear Stress	=	2.794	N/sq.mm.

The section is SAFE in One Way in Shear.

F02 : Punching Shear Output (LC No. : 6)

As Per IS:456-2000, Clause 34.2.4,
the critical section for Shear Force is at a distance equal to the Half the Effective Depth of the Footing, from the Face of the Column which carries the heavier load.

Length of Periphery at Critical Section	=	602	mm.
Width of Periphery at Critical Section	=	532	mm.
Ratio of Width to Length at Critical Section	=	0.884	
Modified Depth of Footing at the Face of Wall	=	370	mm.
Modified Depth of Footing at the End	=	370	mm.
Depth of Footing at Critical Section	=	308	mm.
Design Shear Force	=	772.052	KN.
As Per IS:456-2000, Clause 31.6.2.1, Actual Shear Stress	=	1.105	N/sq.mm.
As Per IS:456-2000, Clause 31.6.3.1, Coefficient, ks	=	1	
Max. Permissible Shear Stress	=	1.118	N/sq.mm.

The section is SAFE in Shear.