الأكاديمية العربية للعلوم والتكنولوجيا والنقل البحري
Arab Academy for Science, Technology & Maritime Transport

Quantity Surveying of Beam and Column Reinforcement

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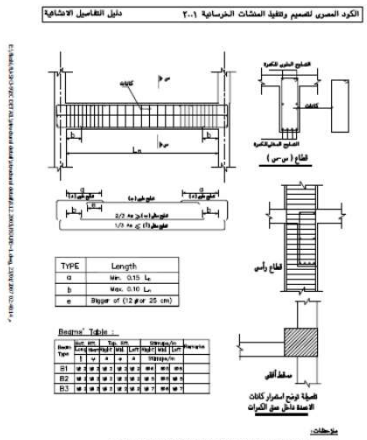
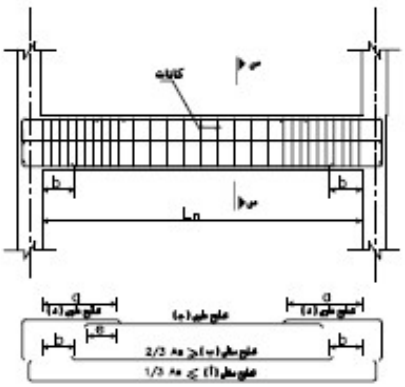
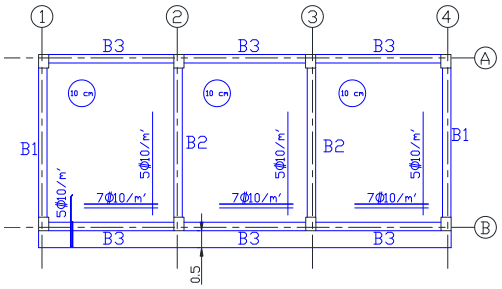
Simple Beam Reinforcement (Code)





TYPE	Length
a	Min. 0.15 L_n
b	Max. 0.10 L_n
e	Bigger of (12 ø or 25 cm)

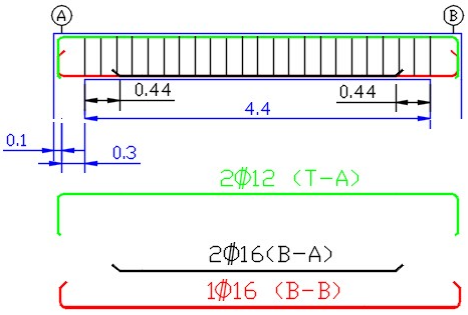
Example



Roof rft.

Beam	Dimensions		Reinforcement				
	W	H	Top End support	Top int. support	Bottom	Hanging	Stirrups
B1	0.25	0.60	2 ϕ12	-	3 ϕ16	2 ϕ12	Φ 8 @20 cm
B2	0.25	0.60	2 ϕ16	-	4 ϕ16	2 ϕ12	Φ 8 @20 cm
B3	0.25	0.60	2 ϕ12	2 ϕ16	2 ϕ16	2 ϕ12	Φ 8 @20 cm

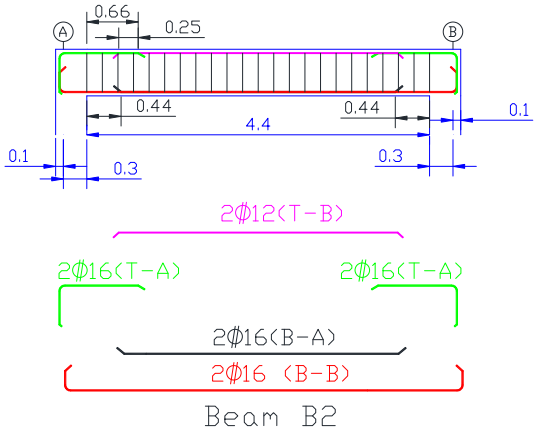
Simple Beam Reinforcement Details B1 (Option 1)



Beam B1

B-A Shape Code SH-1
A = 4.4 – 0.44 – 0.44 = 3.52 m
B-B Shape Code SH-5
A = C = 0.3 m
B = 4.4 + 0.4 + 0.4 – 2 × 0.025 = 5.15 m
T-A Shape code SH-5
A = C = 0.6 – 2 × 0.025 – 0.08 = 0.542 m
Take as 0.54 m
B = 4.4 + 0.4 + 0.4 – 2 × 0.025 = 5.15 m
Stirrups Shape code SH-8
A = 0.6 – 2 × 0.025 = 0.55 m
B = 0.25 – 2 × 0.025 = 0.2 m
N = 4.4/0.2 + 1 = 23 stirrups

Simple Beam Reinforcement Details B2 (Option 1)



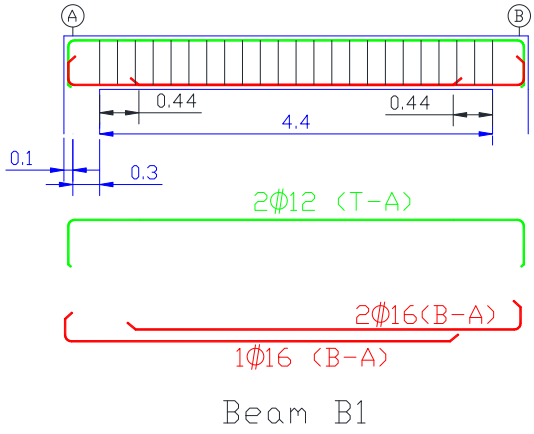
B-A Shape Code SH-1
A = 4.4 – 0.44 – 0.44 = 3.52 m
B-B Shape Code SH-5
A = C = 0.3 m
B = 4.4 + 0.4 + 0.4 – 2 × 0.025 = 5.15 m
T-A Shape code SH-4
A = C = 0.6 – 2 × 0.025 – 0.08 = 0.542 m
Take as 0.54 m
B = 0.66 + 0.4 -0.025 = 1.035 m
T-B Shape Code SH-1
A = 4.4 – 0.66 – 0.66 + 2 × 0.25 = 3.58 m
Stirrups are the same as in B1

Simple Beam Bending List (Option 1)

Bar bending list for Beams and Columns of example building (Option 1)

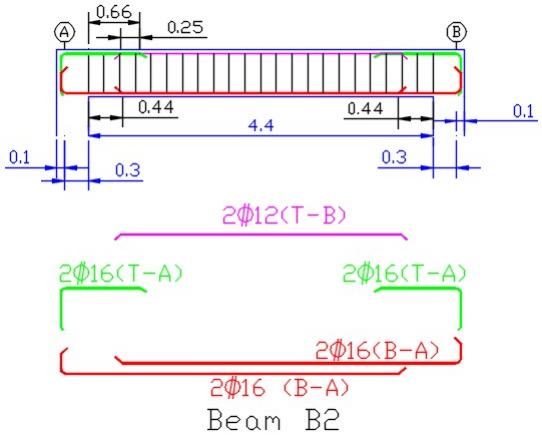
Member	Bar mark	Type & size		No. of members	No. of bars in each member	Total no. of bars	Shape Code	Length (mm)	A Length (mm)	B Length (mm)	C Length (mm)	D Length (mm)	E	Total Length (mm)	Total weight (Kg)
Beam B1	B-A	Φ	16	2	2	4	SH-1	3520						3520	22.25
	B-B	Φ	16	2	1	2	SH-5	300	5150	300				5670	17.92
	T-A	Φ	12	2	2	4	SH-5	540	5150	540				6170	21.92
	Stirrups	ϕ	8	2	23	46	SH-8	550	200					1580	28.64
Beam B2	B-A	Φ	16	2	2	4	SH-1	3520						3520	22.25
	B-B	Φ	16	2	2	4	SH-5	300	5150	300				5670	35.83
	T-A	Φ	16	2	4	8	SH-4	540	1035					1535	19.40
	T-B	Φ	12	2	2	4	SH-1	3580						3580	12.72
	Stirrups	ϕ	8	2	23	46	SH-8	550	200					1580	28.64

Simple Beam Reinforcement Details B1 (Option 2)



B-A Shape Code SH-4
A = 0.3 m
B = 4.4 – 0.44 + 0.4 – 0.025 = 4.335 m
T-A Shape code SH-5
A = C = 0.6 – 2 × 0.025 – 0.08 = 0.542 m
Take as 0.54 m
B = 4.4 + 0.4 + 0.4 – 2 × 0.025 = 5.15 m
Stirrups Shape code SH-8
A = 0.6 – 2 × 0.025 = 0.55 m
B = 0.25 – 2 × 0.025 = 0.2 m
N = 4.4/0.2 + 1 = 23 stirrups

Simple Beam Reinforcement Details B2 (Option 2)

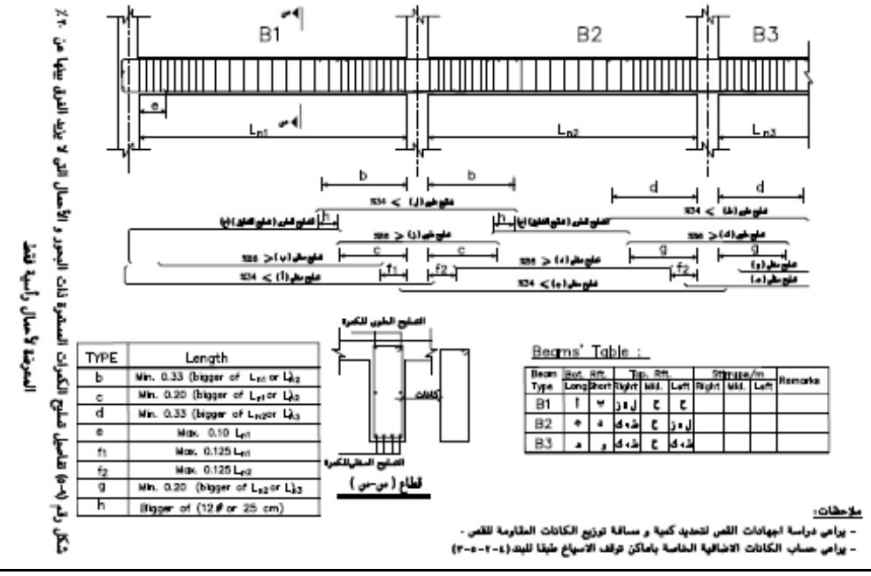


B-A Shape Code SH-4
A = 0.3 m
B = 4.4 – 0.44 + 0.4 – 0.025 = 4.335 m
T-A Shape code SH-4
A = C = 0.6 – 2 × 0.025 – 0.08 = 0.542 m
Take as 0.54 m
B = 0.66 + 0.4 -0.025 = 1.035 m
T-B Shape Code SH-1
A = 4.4 – 0.66 – 0.66 + 2 × 0.25 = 3.58 m
Stirrups are the same as in B1

Simple Beam Bending List (Option 2)

Bar bending list for Beams and Columns of example building (Option 2)														
Member	Bar mark	Type & size		No. of members	No. of bars in each member	Total no. of bars	Shape Code	Length (mm)	A Length (mm)	B Length (mm)	C Length (mm)	D Length (mm)	E Total Length (mm)	Total weight (Kg)
Beam B1	B-A	ф	16	2	3	6	SH-4	300	4335				4595	43.56
	T-A	ф	12	2	2	4	SH-5	540	5150	540			6170	21.92
	Stirrups	ϕ	8	2	23	46	SH-8	550	200				1580	28.64
Beam B2	B-A	ф	16	2	4	8	SH-4	300	4335				4595	58.08
	T-A	ф	16	2	4	8	SH-4	540	1035				1535	19.40
	T-B	ф	12	2	2	4	SH-1	3580					3580	12.72
	Stirrups	ϕ	8	2	23	46	SH-8	550	200				1580	28.64

Continues Beam Reinforcement (Code)



TYPE	Length
b	Min. 0.33 (bigger of L_{n1} or L_{n2})
c	Min. 0.20 (bigger of L_{n1} or L_{n2})
d	Min. 0.33 (bigger of L_{n2} or L_{n3})
e	Max. 0.10 L_{n1}
f_1	Max. 0.125 L_{n1}
f_2	Max. 0.125 L_{n2}
g	Min. 0.20 (bigger of L_{n2} or L_{n3})
h	(Bigger of 12ϕ or 25 cm)

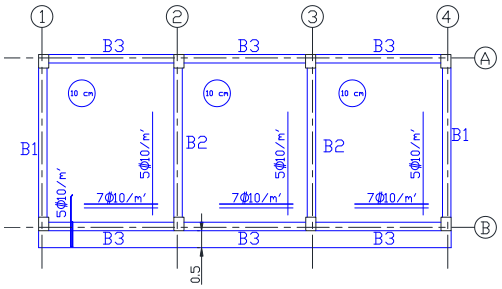
Beams' Table :

Beam Type	Bot. Rft. Long.	Bot. Rft. Short	Top. Rft. Right	Top. Rft. Mid.	Top. Rft. Left	Stirrups/m Right	Stirrups/m Mid.	Stirrups/m Left	Remarks
B1	f	ب	ل و ز	ج	ج				
B2	ه	ه	ش، ك	ج	ل و ز				
B3	د	و	ه	ج	ش، ك				

ملاحظات:
- يراعى دراسة الجهادات القص لتحديد كمية و مسافة توزيع الكانات المقاومة للقص -
- يراعى حساب الكانات الاضافية الخاصة بأماكن توقف الاسياخ طبقا للبند (٤-٢-٥-٣)

شكل رقم (٤-٩) تفاصيل ضلوع الكمرات المستمرة ذات البحور و الأحمال التي لا يزيد الفرق بينها عن ٢٠٪ المعرضة لأحمال رأسية فقط

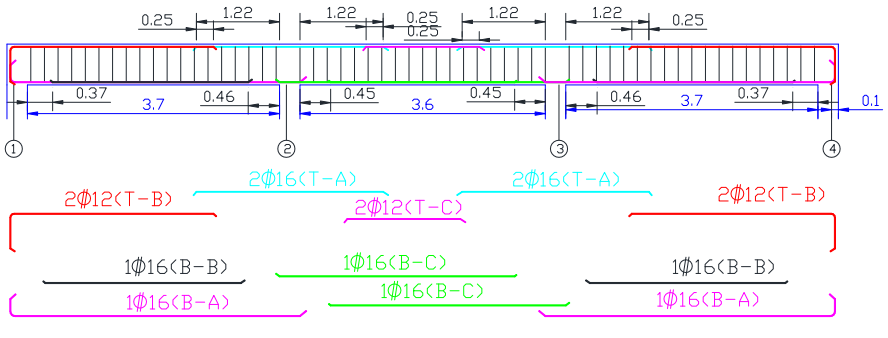
Example



Roof rft.

Beam	Dimensions		Reinforcement				
	W	H	Top End support	Top int. support	Bottom	Hanging	Stirrups
B1	0.25	0.60	2 Φ12	-	3 Φ16	2 Φ12	Φ 8 @20 cm
B2	0.25	0.60	2 Φ16	-	4 Φ16	2 Φ12	Φ 8 @20 cm
B3	0.25	0.60	2 Φ12	2 Φ16	2 Φ16	2 Φ12	Φ 8 @20 cm

Continues Beam Reinforcement Details



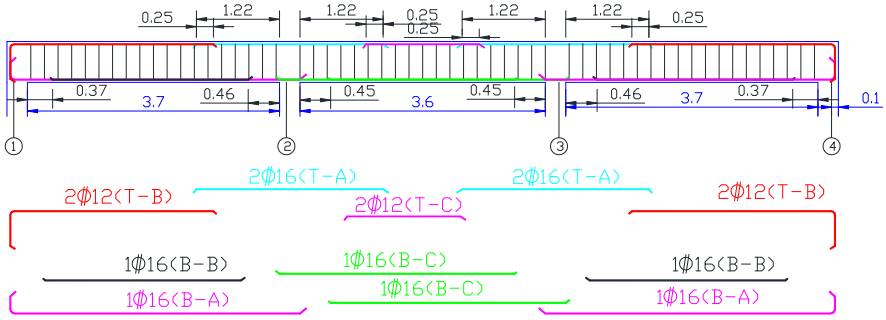
Beam B3

B-A Shape code SH-4 A = 0.3 m
B = 3.7 + 0.3 + 0.3 – 0.025 = 4.275 m

B-B Shape code SH-1 A = 3.7 – 0.37 – 0.46 = 2.87 m

B-B Shape code SH-1 A = 3.6 + 0.3 – 0.45 = 3.45 m

Continues Beam Reinforcement Details



Beam B3

T-A Shape code SH-1 A = 1.22 + 1.22 + 0.3 = 2.74 m

T-B Shape code SH-4 A = 0.6 – 2 × 0.025 – 0.08 = 0.542 m (Take as 0.54)

B = 3.7 – 1.22 + 0.3 – 0.025 + 0.25 = 3.005 m

T-C Shape code SH-1 A = 3.6 – 1.22 – 1.22 + 2 × 0.25 = 1.66 m

Stirrup dimensions as simple beams

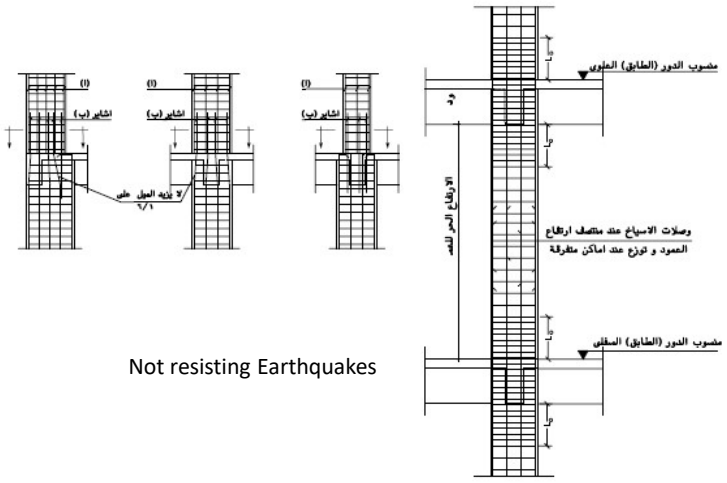
N edge spans = 3.7/0.2 +1 = 19.5 stirrups Take 19

N middle span = 3.6/0.2 +1 = 19 stirrups

Continues Beam Bending List

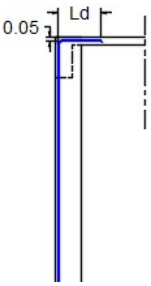
Member	Bar mark	Type & size		No. of members	No. of bars in each member	Total no. of bars	Shape Code	Length (mm)	A Length (mm)	B Length (mm)	C Length (mm)	D Length (mm)	E	Total Length (mm)	Total weight (Kg)
Beam B3	B-A	Φ	16	2	2	4	SH-4	300	4275					4535	28.66
	B-B	Φ	16	2	2	4	SH-1	2870						2870	18.14
	B-C	Φ	16	2	2	4	SH-1	3450						3450	21.80
	T-A	Φ	16	2	4	8	SH-1	2740						2740	34.63
	T-B	Φ	12	2	4	8	SH-4	540	3005					3515	24.97
	T-C	Φ	12	2	2	4	SH-1	1660						1660	5.90
	Stirrups	ϕ	8	2	57	114	SH-8	550	200					1580	70.97

Columns (Code)



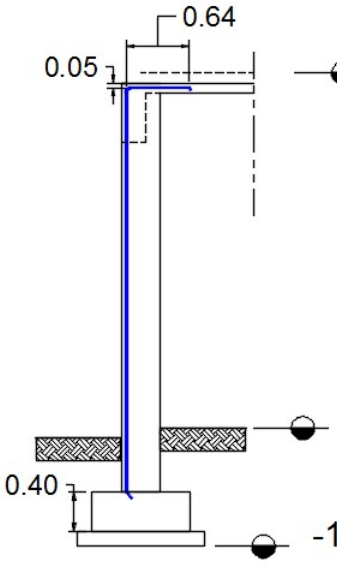
Not resisting Earthquakes

Resisting earthquakes



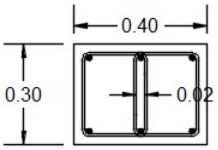
Last roof

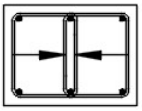
Columns Example



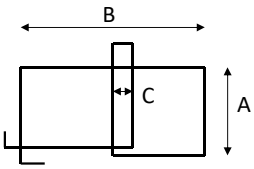
Longitudinal Bars
Shape code SH-4
A = Ld = 40ϕ = 40 × 0.016 = 0.64 m
B = 3.7 + 1.1 – 0.15 – 0.4 – 0.1 - 0.05 = 4.1 m

Column Stirrups

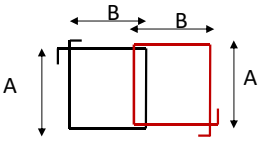




Diameter of bar + 3-5 mm tolerance



Option I (one stirrup)
Shape Code SH-21
A= 0.3 – 2 × 0.025 = 0.25 m
B = 0.4 – 2 × 0.025 = 0.35 m
C = 0.02 + 2 × 0.08 = 0.036 m
L= 2(B+C+10ϕ)+4A-9ϕ-4.5r
Number of stirrups = 4.1/0.2 + 1 = 21.5 take 21 stirrups



Option II (two stirrups)
Shape Code SH-8
A= 0.3 – 2 × 0.025 = 0.25 m
B = 0.2 – 0.025 + 0.01 + 0.008 = 0.193 m take = 0.195 m
Number of stirrups = 21 × 2 = 42 stirrups

Bending list of Beams & Columns (Option 1)

Bar bending list for Beams and Columns of example building (Option 1)

Member	Bar mark	Type & size		No. of members	No. of bars in each member	Total no. of bars	Shape Code	Length (mm)	A Length (mm)	B Length (mm)	C Length (mm)	D Length (mm)	E	Total Length (mm)	Total weight (Kg)
Beam B1	B-A	⌀	16	2	2	4	SH-1	3520						3520	22.25
	B-B	⌀	16	2	1	2	SH-5	300	5150	300				5670	17.92
	T-A	⌀	12	2	2	4	SH-5	540	5150	540				6170	21.92
	Stirrups	ϕ	8	2	23	46	SH-8	550	200					1580	28.64
Beam B2	B-A	⌀	16	2	2	4	SH-1	3520						3520	22.25
	B-B	⌀	16	2	2	4	SH-5	300	5150	300				5670	35.83
	T-A	⌀	16	2	4	8	SH-4	540	1035					1535	19.40
	T-B	⌀	12	2	2	4	SH-1	3580						3580	12.72
	Stirrups	ϕ	8	2	23	46	SH-8	550	200					1580	28.64
Beam B3	B-A	⌀	16	2	2	4	SH-4	300	4275					4535	28.66
	B-B	⌀	16	2	2	4	SH-1	2870						2870	18.14
	B-C	⌀	16	2	2	4	SH-1	3450						3450	21.80
	T-A	⌀	16	2	4	8	SH-1	2740						2740	34.63
	T-B	⌀	12	2	4	8	SH-4	540	3005					3515	24.97
	T-C	⌀	12	2	2	4	SH-1	1660						1660	5.90
	Stirrups	ϕ	8	2	57	114	SH-8	550	200					1580	70.97
Columns	Main	⌀	16	8	6	48	SH-4	640	4100					4700	356.45
	Stirrups	ϕ	8	8	21	168	SH-21	350	250	36				1788	118.35
													Total weight		889.42

Bending list of Beams & Columns (Option 2)

Bar bending list for Beams and Columns of example building (Option 2)

Member	Bar mark	Type & size		No. of members	No. of bars in each member	Total no. of bars	Shape Code	Length A (mm)	Length B (mm)	Length C (mm)	Length D (mm)	Length E	Total Length (mm)	Total weight (Kg)
Beam B1	B-A	Φ	16	2	3	6	SH-4	300	4335				4595	43.56
	T-A	Φ	12	2	2	4	SH-5	540	5150	540			6170	21.92
	Stirrups	ϕ	8	2	23	46	SH-8	550	200				1580	28.64
Beam B2	B-A	Φ	16	2	4	8	SH-4	300	4335				4595	58.08
	T-A	Φ	16	2	4	8	SH-4	540	1035				1535	19.40
	T-B	Φ	12	2	2	4	SH-1	3580					3580	12.72
	Stirrups	ϕ	8	2	23	46	SH-8	550	200				1580	28.64
Beam B3	B-A	Φ	16	2	2	4	SH-4	300	4275				4535	28.66
	B-B	Φ	16	2	2	4	SH-1	2870					2870	18.14
	B-C	Φ	16	2	2	4	SH-1	3450					3450	21.80
	T-A	Φ	16	2	4	8	SH-1	2740					2740	34.63
	T-B	Φ	12	2	4	8	SH-4	540	3005				3515	24.97
	T-C	Φ	12	2	2	4	SH-1	1660					1660	5.90
	Stirrups	ϕ	8	2	57	114	SH-8	550	200				1580	70.97
Columns	Main	Φ	16	8	6	48	SH-4	640	4100				4700	356.45
	Stirrups	ϕ	8	8	42	336	SH-8	250	195				970	128.41
												Total weight		**859.32**