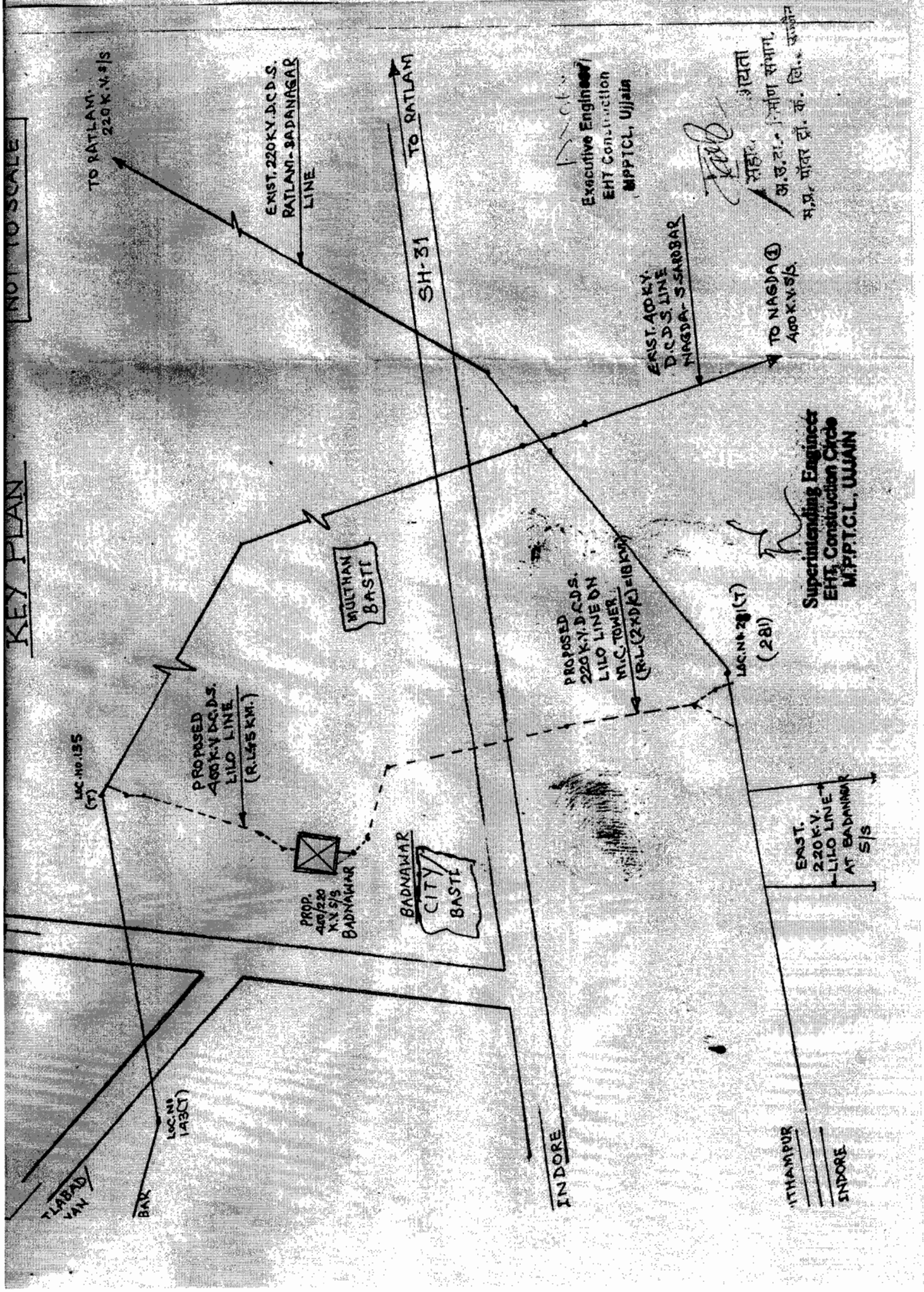


NOT TO SCALE

KEY PLAN



Designed by SAE (INDIA LMTD.)		CODE NO. C-1233	TOWER SPOTTING DATA FOR 400 KV. D/C CIRCUIT LINE FOR SPEC'N PROJECT - TR/699 BINA-BHOPAL				P. NO. 1 OF 1	
APPROVED BY CHIEF ENGINEER (T & P) VIDE HIS LETTER NO. 04-01/12-Z-393/16465 DATED 04/12/90			<u>FD-TYPE TOWERS</u>				- NORMAL SPAN 400 M. - ALL SPANS ARE IN M. - ALL LOAD ARE IN KG.	
SNO.	DESCRIPTION	TOWER TYPE						
		'FD-0'		'FD-30'		'FD-60'		
1.	DEVIATION NOT TO EXCEED	2°		0°-30°		0°-60°/DE		
2.	VERTICAL LOAD OF INDIVIDUAL SPAN	ACTING DOWN		ACTING DOWN(+) / ACTING UPWARD (-)				
3 a.	VERTICAL LOAD LIMITATIONS							
	MAXIMUM WEIGHT SPAN							
	GROUND WIRE	EFFECT OF BOTH SPANS		600	600	600		
		EFFECT OF ONE SPANS		360	360	360		
	CONDUCTOR	EFFECT OF BOTH SPANS		600	600	600		
		EFFECT OF ONE SPANS		360	360	360		
b.	MINIMUM WEIGHT SPAN							
	GROUND WIRE	EFFECT OF BOTH SPANS		200	0	0		
		EFFECT OF ONE SPANS		100	0	0		
	CONDUCTOR	EFFECT OF BOTH SPANS		200	0	0		
		EFFECT OF ONE SPANS		100	0	0		
4.	PERMISSIBLE SUM OF ADJACENT SPANS FOR VARIOUS DEVIATION ANGLES.		2°	800	30°	800	60°	800
			1°	844	29°	883	59°	875
			0°	887	28°	967	58°	951
					27°	1054	57°	1027
					26°	1138	56°	1104
					25.27° & below	1200	55° & below	1181
5.	DESIGN LOAD TENSION	GROUND WIRE	at 0° C & 2/3 FW		1712			
at 32° C & FW			1686					
CONDUCTOR		at 0° C & 2/3 FW		4478				
		at 32° C & FW		4279				

NOTE:- Max individual span for suspension tower not to exceed 500 M.

APPROVED BY



Superintending Engineer (Procurement-II)
O/o Chief Engineer (Procurement)
M.P. Power Transmission Co. Ltd.
Jabalpur (M.P.)

DOUBLE CURCUT TOWER USED IN BHOPAL-AMMA BANSWARI-KATHI-GANDHI, WAGDA-SARDAR SARAYVAR 660 KV LINE.				
FIG-4		FIG-5		
FD-0"	FD-30"	FD-60" DEV.	FD-60" DE.	
45405	45080	45560	45560	
28416	22285	22285	22285	
8000	8000	8250	8250	
8000	8000	8250	8250	
2990	8775	6775	6775	
7450	9000	9300	9300	
8630	8075	8000	8000	
6210	7550	7100	7100	
3900	5310	4900	4900	
10200	13200	16200	16200	
225	225	225	225	

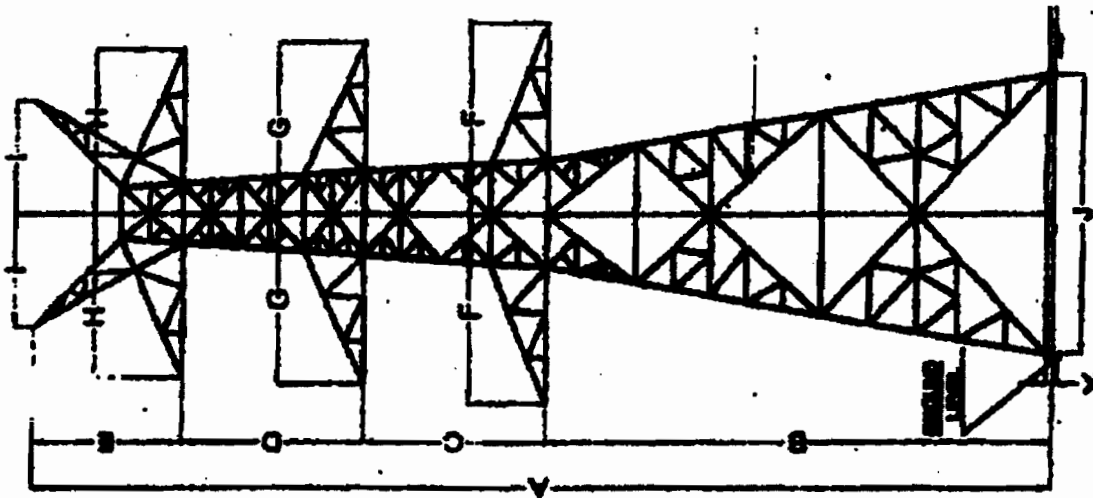


FIGURE-5

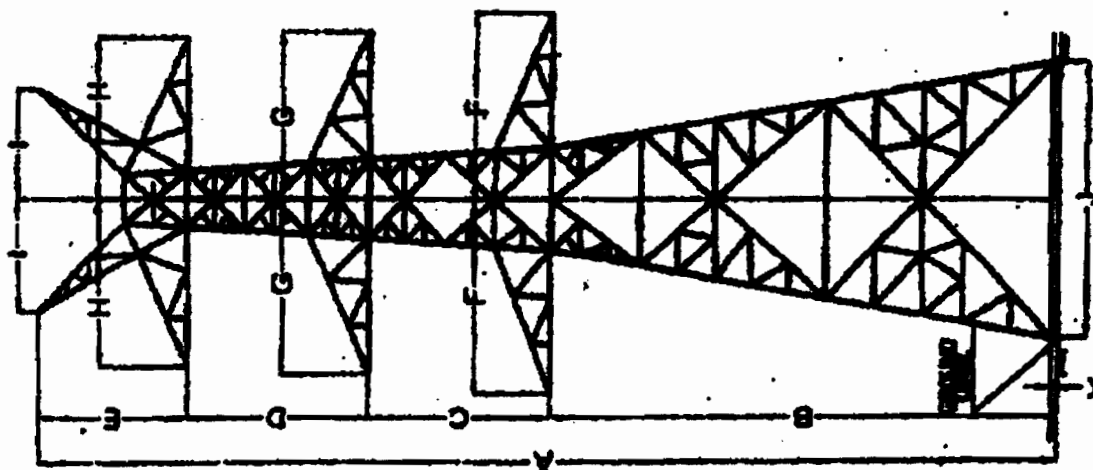


FIGURE-4

Superintending Engineer (Procurement-II)
O/o Chief Engineer (Procurement)
M.P. Power Transmission Co. Ltd.
Jabalpur (M.P.)

[Signature]

SAE

(INDIA) LIMITED

CODE NO.

C-1347

TYPE FOOTING/TOWER

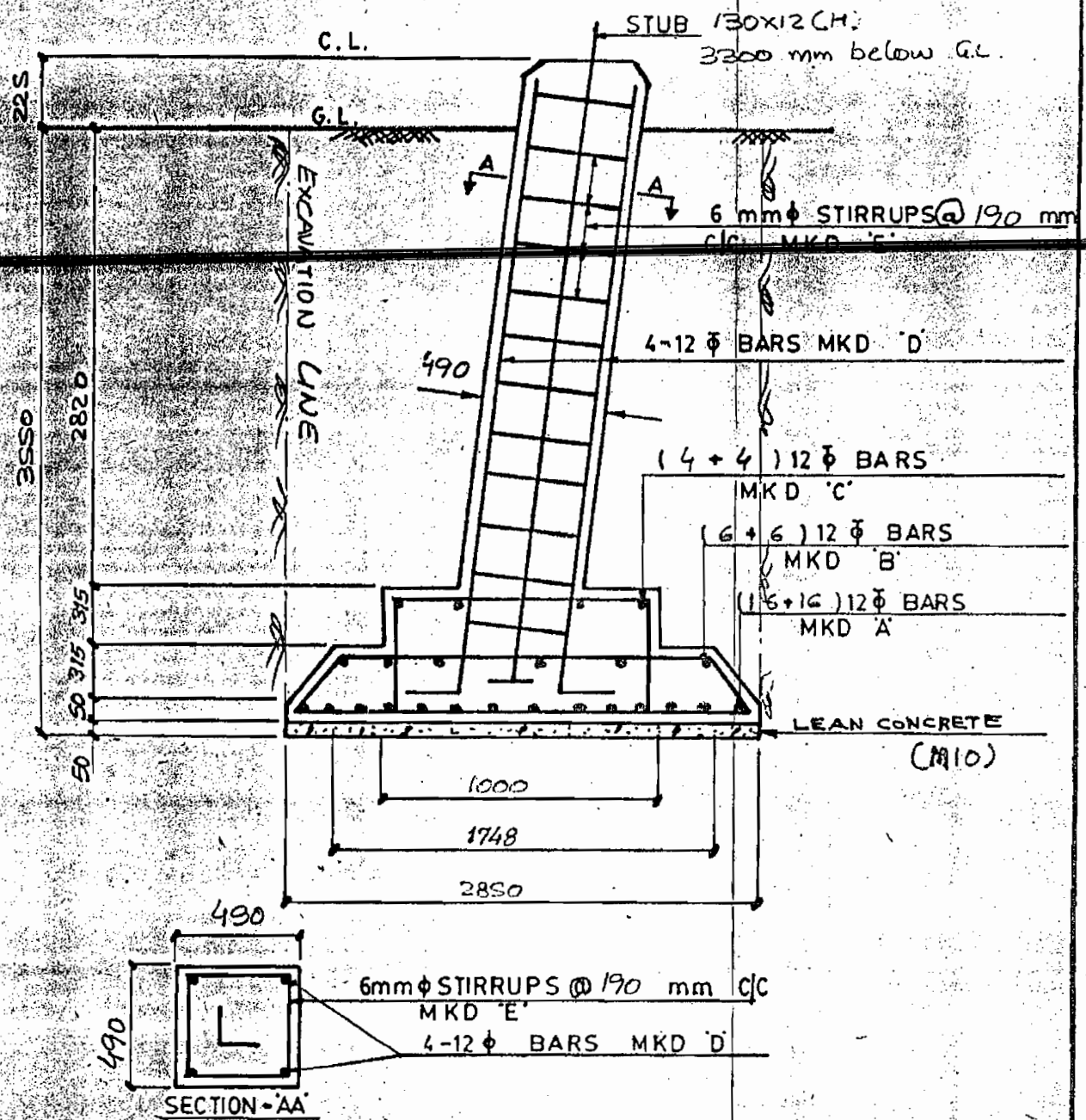
PS TYPE FOUNDATION

DRG. NO.

D-5490a

PAGE

40F13



NOTES :-

1. ALL DIMENSIONS ARE IN MM.
2. CONCRETE COVER = 50mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX. = M15.
4. REINFORCEMENT DEFORMED BARS Fe 415 CONFIRMED IS-1786/IS-1139 AS MAY BE AVAILABLE.

Quantities / Tower :- Excavation Vol. :- 140.90 m³

Revision 'b' - Excavation Volume Revised.

Concrete Vol. :- 12.59 + 1.62 = 14.22 m³

Reinforcement :- 583 kgs

(31)

(24)

SAE

(INDIA) LIMITED

CODE NO.

C-1347

TYPE F00+18/H25 TOWER

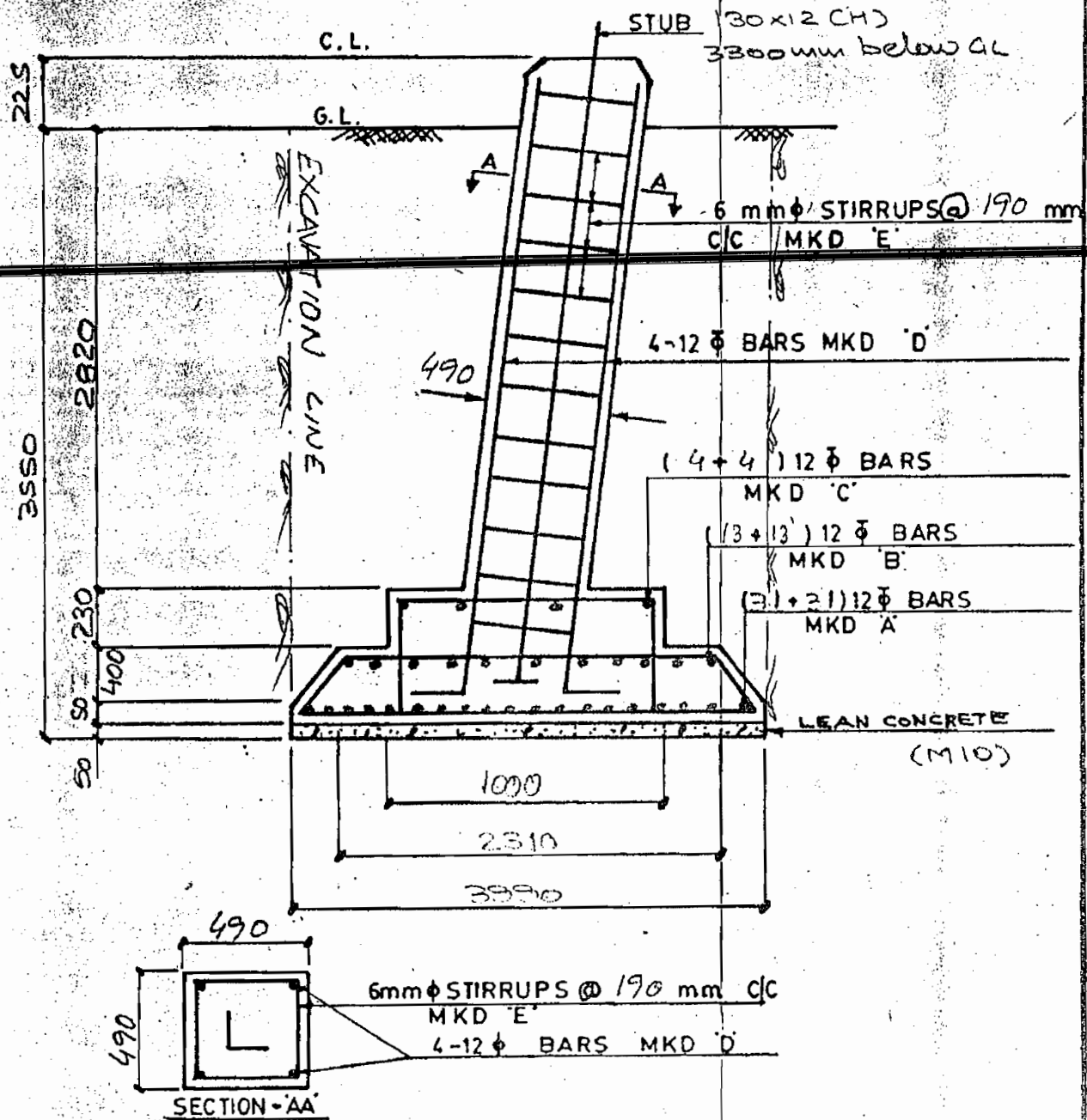
BCL(WET) TYPE FOUNDATION

DRG. NO.

D-5490^a

PAGE

80F13

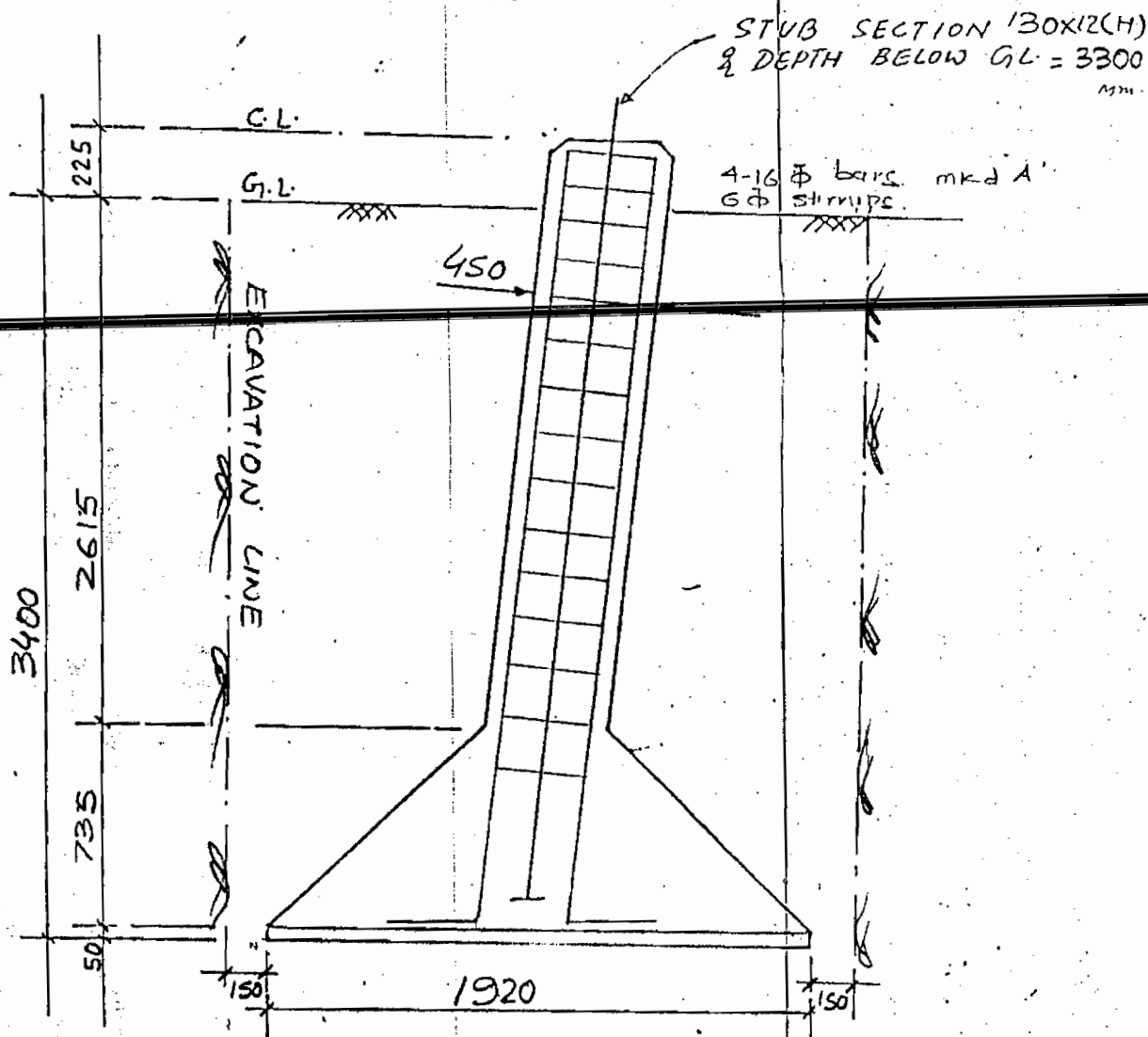


NOTES :-

1. ALL DIMENSIONS ARE IN MM.
2. CONCRETE COVER = 50mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX. = M15.
4. REINFORCEMENT DEFORMED BARS Fe 415 CONFIRMED IS-1786/IS-1139 AS MAY BE AVAILABLE.

Quantities/Tower :- Excavation Vol. :- 225.07 m^3
 Concrete Vol. :- $23.28 \div 3.18 = 26.46 \text{ m}^3$
 Reinforcement :- 002 kgs
 Revision 'b' - Excavation Volume Revised.

FOUNDATION → DRY



NOTES:-

- 1.- ALL DIMENSIONS ARE IN mm.
- 2.- CONCRETE MIX M-15.
- 3.- CONCRETE QTY: - M15: 7.70 m³.
4. EXCAVATION Vol. = 67.03 m³.
5. WEIGHT OF REINFORCEMENT = 127 KG

SRE

(INDIA) LIMITED

CODE NO

C1347

TYPE FDOTB/H2S TOWER

HARD ROCK FOUNDATION

DRG. NO.

D-5174

PAGE

1 OF 3

LOADS ON FOUNDATION (KGS)

NC

BWC

COMPRESSION

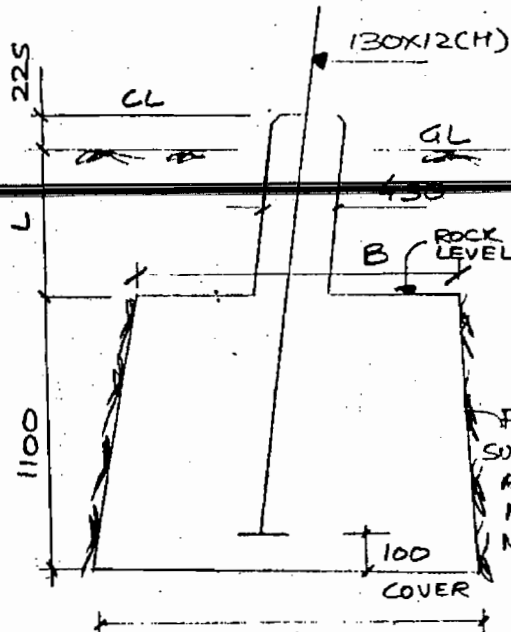
43772

52285

UPLIFT

24545

33135



VOLUME OF CONCRETE (m³)

$$(1.025)^2 \times 1.1 = 1.156$$

$$(0.45)^2 \times 0.225 = 0.046$$

1.202

OVERLOAD OF CONCRETE

$$0.046 \times 2240 = 103$$

$$1.156 \times 800 = 925$$

1028

$$A = 975 \pm 50$$

$$B' = (A - 100 \text{ or } 150) \text{ mm}$$

CHECK FOR BEARING

$$\text{ULTIMATE LOAD NC} = (43772 + 1028) \times 2.2$$

$$= 98560$$

$$\text{BWC} = (52285 + 1028) \times 1.65$$

$$= 87966$$

$$\text{Area of base} = (0.925)^2 = 0.856 \text{ m}^2$$

$$\text{Ultimate bearing Pressure} = \frac{98560}{0.856} = 1,15,140$$

$$< 1,25,000 \text{ kg/m}^2$$

O.K.

NOTES: 1. Value of 'L' depends on site conditions

2. Concrete volume & Excavation volume indicated is exclusive of required for length 'L' which shall be added extra.
3. Slab to be cut from bottom. Holes to be drilled for all cleats & cold galvanising paint to be applied at site.
4. Before concreting pit is to be cleaned of the sides of powder work, and then cleaned with water, taking precaution that concrete gets pierced into hard rock core on all the 4 sides and the bottom.
5. Excavation in rock to be done by blasting so as to provide a funnel shape in the foundation.
6. For check of side thrust refer design of normal dry foundation (Dry-D).
7. This foundation is to be used in rock without fissures/cracks & faults, where chisling is not possible.
8. After final excavation by blasting the top width of rock level shall be at least 100 mm less than bottom width of foundation.
Small variation due to this is ignored.
9. Solid hard rock surface cleaned for dust & made wet with concrete slurry before concreting.

SAE

(INDIA) LIMITED

CODE NO.

C-1347

TYPE F00+18/25 TOWER

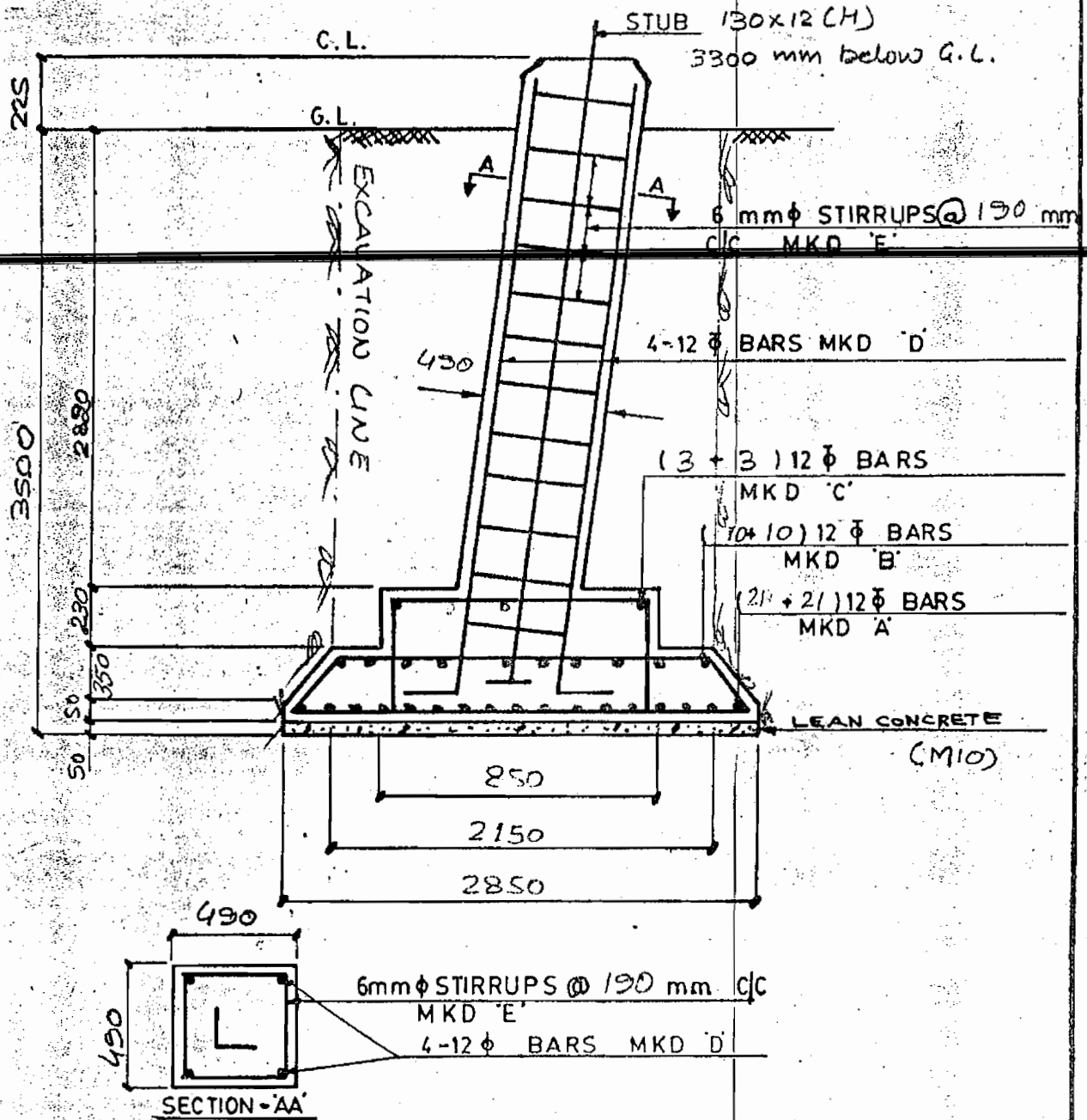
WFR TYPE FOUNDATION

DRG. NO.

D-5490a

PAGE

12 OF 13



NOTES :-

1. ALL DIMENSIONS ARE IN MM.
2. CONCRETE COVER = 50mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX. = M15.
4. REINFORCEMENT DEFORMED BARS Fe 415 CONFIRMED IS-1786/IS-1139 AS MAY BE AVAILABLE.

Quantities/Power :- Excavation Vol. :- 68.45 m³
Concrete Vol. :- 14.02 - 1.62 = 15.65 m³
Reinforcement :- 565 kgs.

(INDIA) LIMITED

CODE: NA

C-1347

TYPE F00718 /+25 TOWER

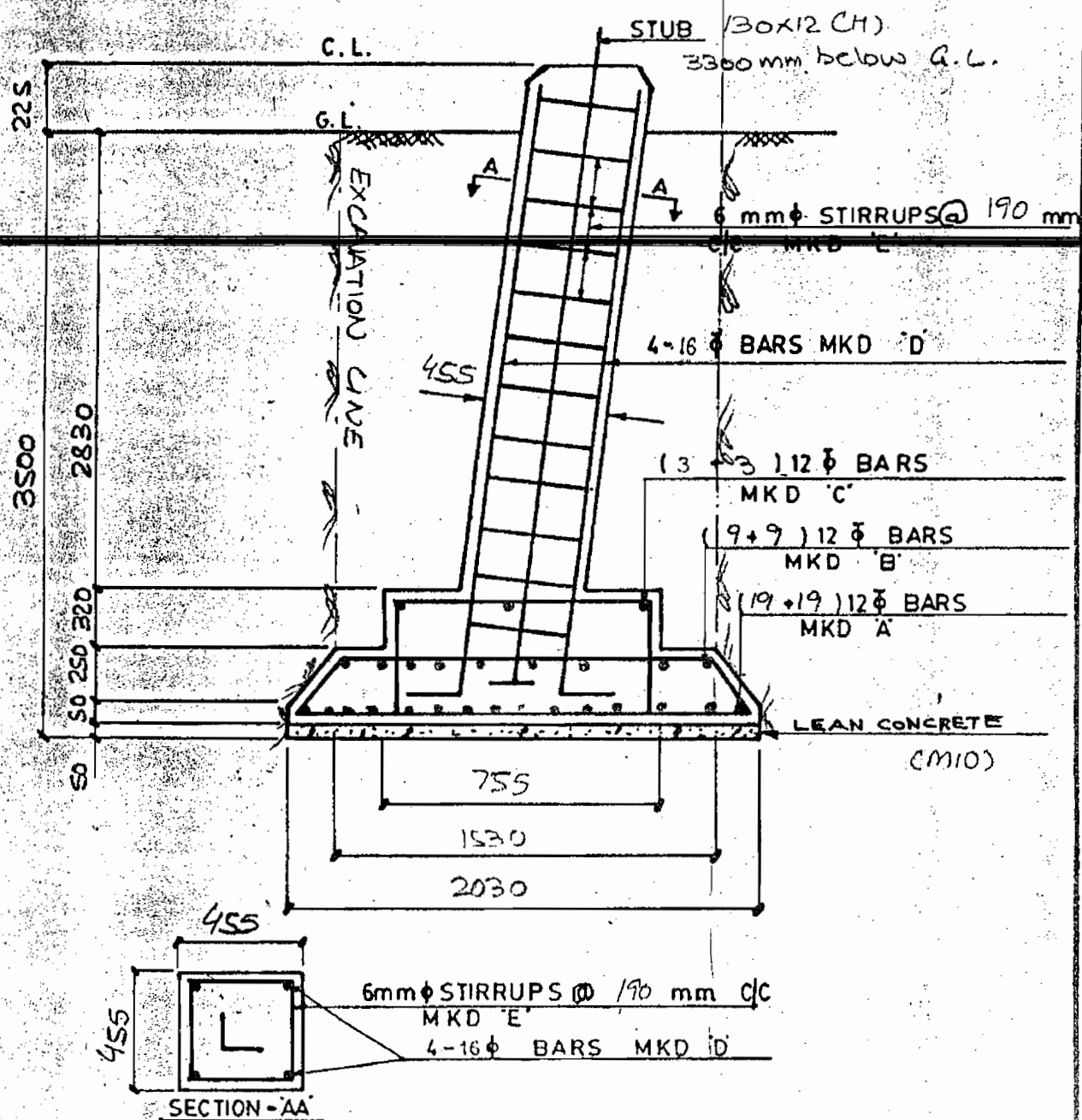
DEF TYPE FOUNDATION

DRG. NO.

D-5490

PAGE

10 OF 13



NOTES :-

1. ALL DIMENSIONS ARE IN MM.
2. CONCRETE COVER = 50mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX. = M15.

4 REINFORCEMENT DEFORMED BARS Fe 415 CONFIRMED 15-1786/15-1139 AS
MAY BE AVAILABLE.

Quantities/Tower:- Excavation Vol:- 34.33 m^3
 $723 + 0.82 = 8.10 \text{ m}^3$

Concrete vol. :- $7.27 + 0.82 = 8.09 \text{ m}^3$

Reinforced : (S15) 561

37

(40)

ORDER BY:	CHECK BY:	MOD		3	dt.	C	dt.	dt.
DATE	DATE	F		4	dt.	D	dt.	dt.

SAE

(INDIA) LIMITED

CODE NO.

C-1347

TYPE FDO+18+2STOWER

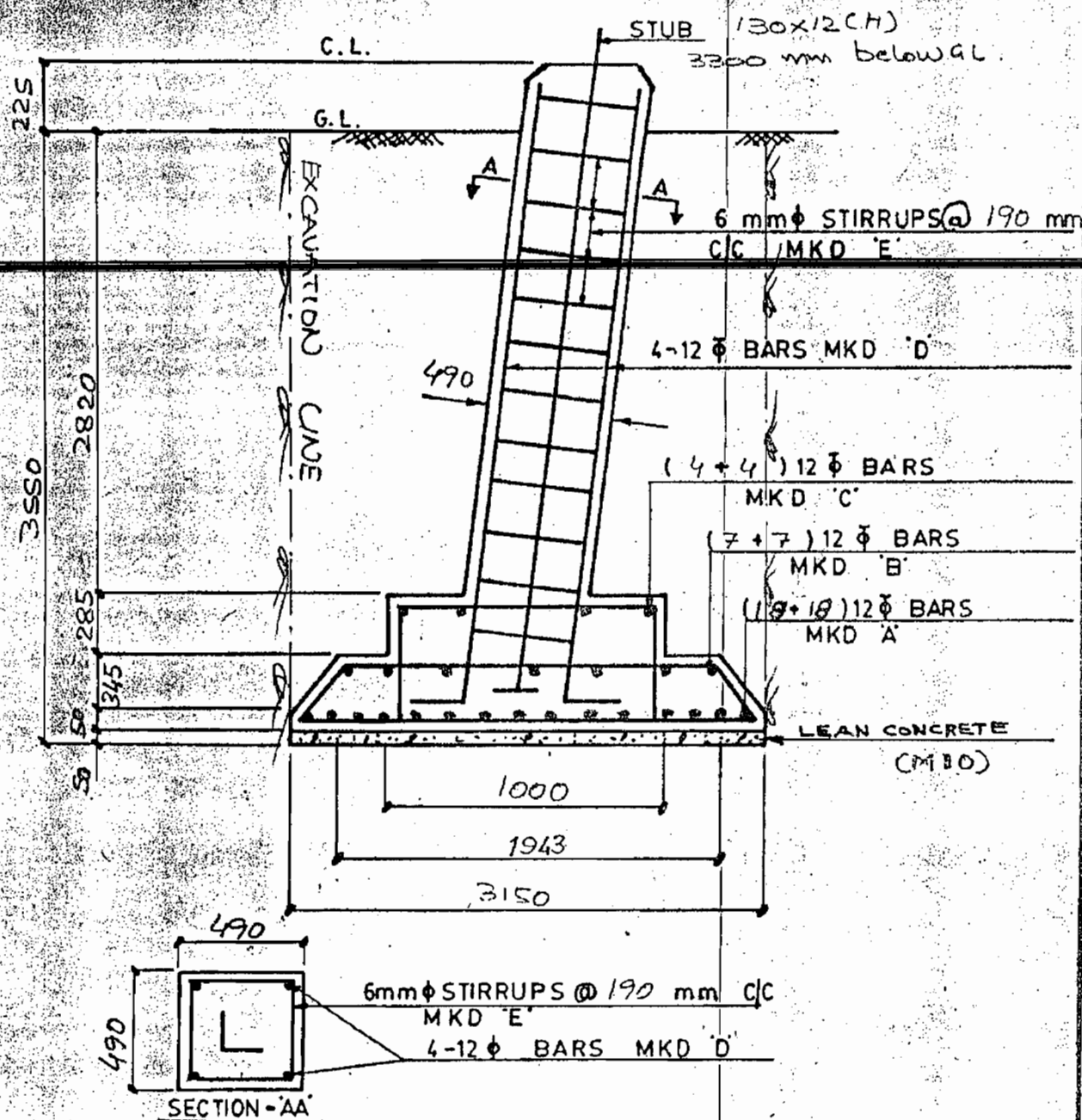
FS TYPE FOUNDATION

DRG. NO.

D-5490a

PAGE

60F13



NOTES:-

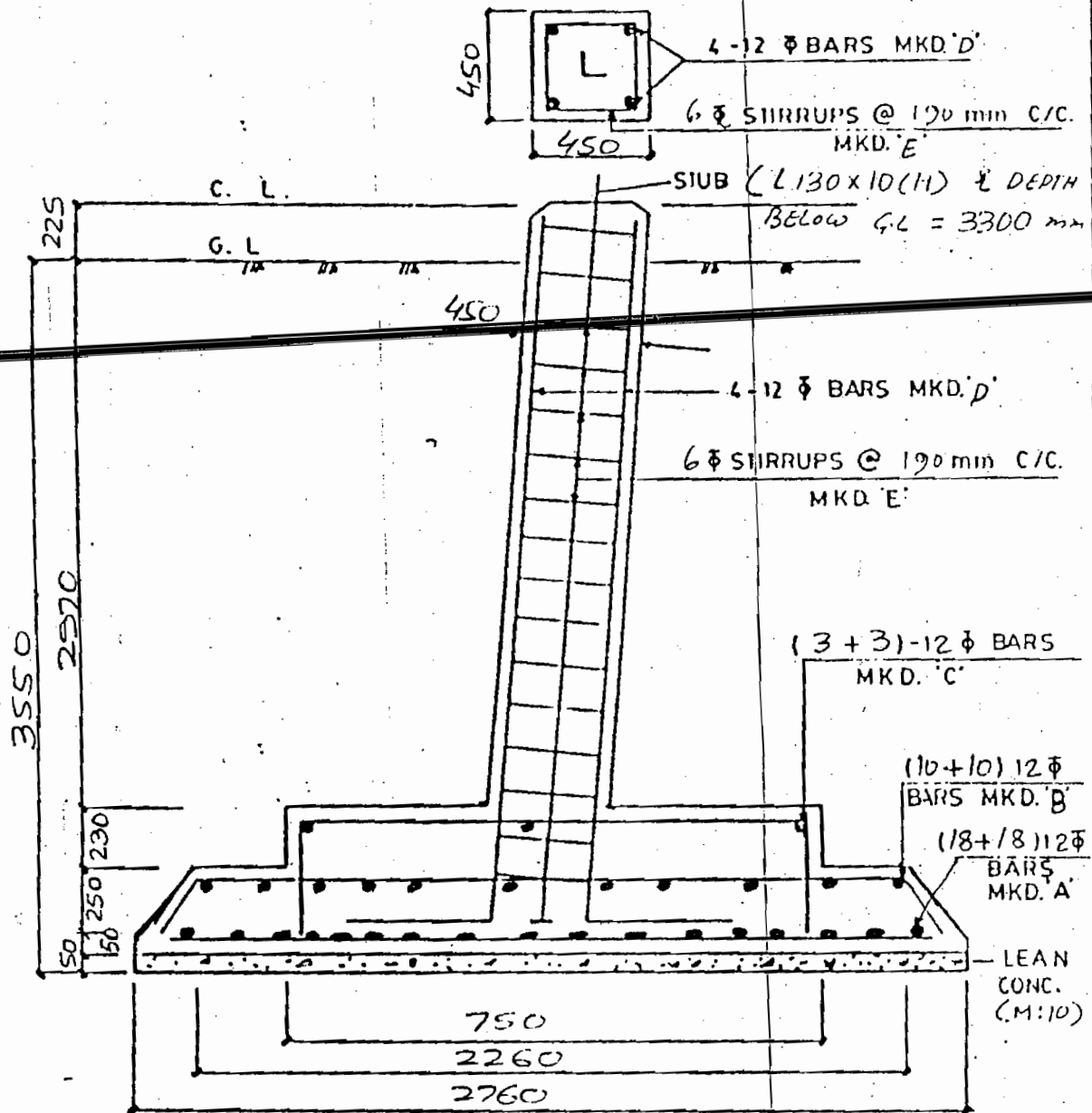
1. ALL DIMENSIONS ARE IN MM.
2. CONCRETE COVER = 50mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX. = M15.
4. REINFORCEMENT DEFORMED BARS Fe 415 CONFIRMED IS-1786/IS-1139 AS MAY BE AVAILABLE.

Quantities / tower :-
 Excavation Vol. :- 169.02 m^3
 Concrete Vol. :- $15.16 + 1.98 = 17.15 \text{ m}^3$
 Reinforcement :- 631 kgs

Revision 'b' - Excavation Volume revised.

33

50



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFORMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.
5. CONCRETE QTY : M10 10.95 (M15) 7. EXCAVATION VOL. = 74.75 m³.
6. REINFORCEMENT QTY :- 658 kg 12.47 m³.

LAE

(INDIA) LIMITED

CODE NO.

C1347

TYPE FDD ± 0 TOWER

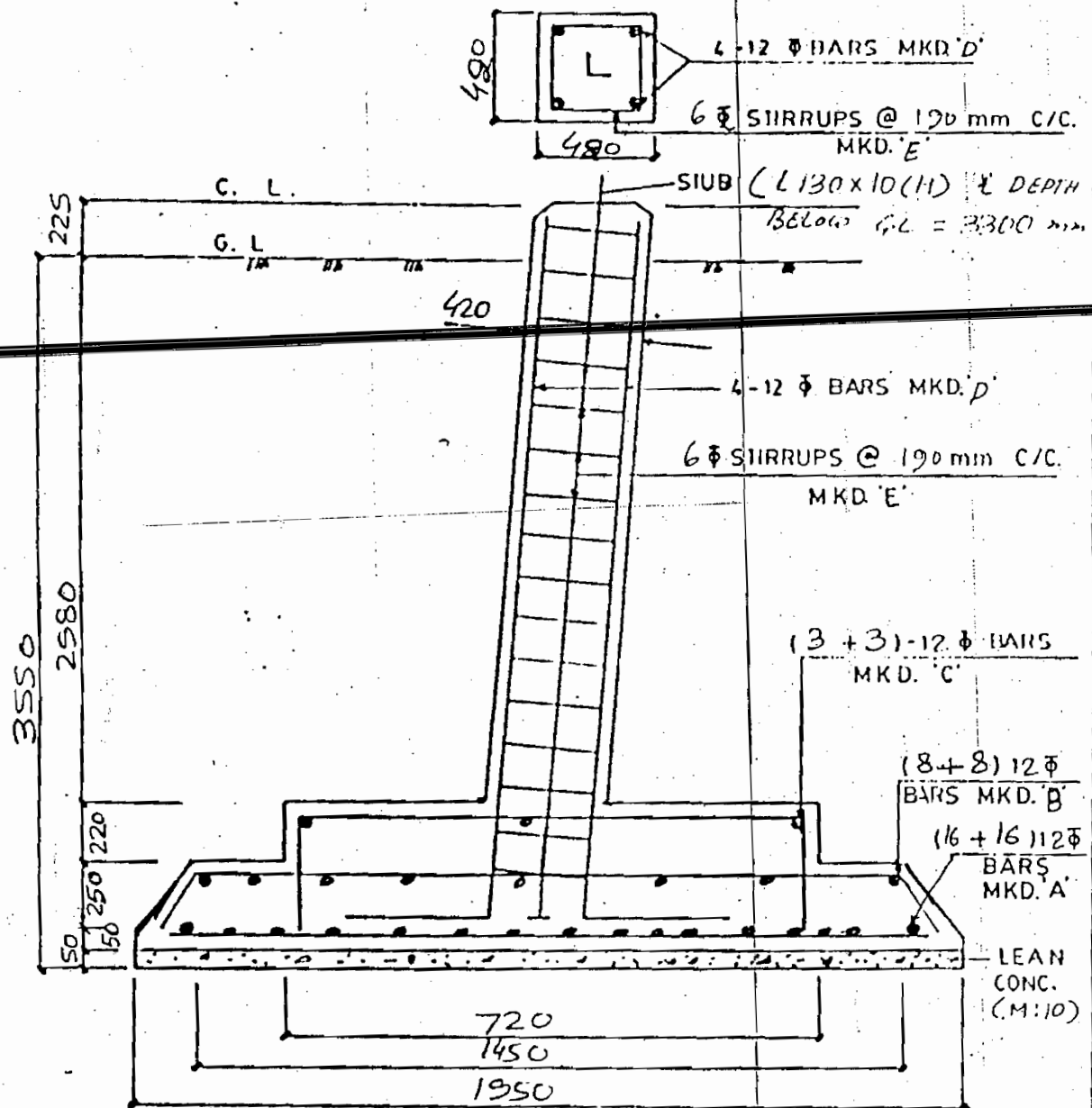
DFR FOUNDATION

DRG NO.

D-5383

PAGE

8 OF 13



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFORMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

5. CONCRETE QTY : 6.35 (M15) 7. EXCAVATION VOL. = 31.34 m³.
 0.76 (M10)
 6. REINFORCEMENT QTY : 439 kg 7.15 m³.

(9)

(6)

SAE

(INDIA) LIMITED

CODE NO.

C1347

TYPE FDO ± 0 TOWER

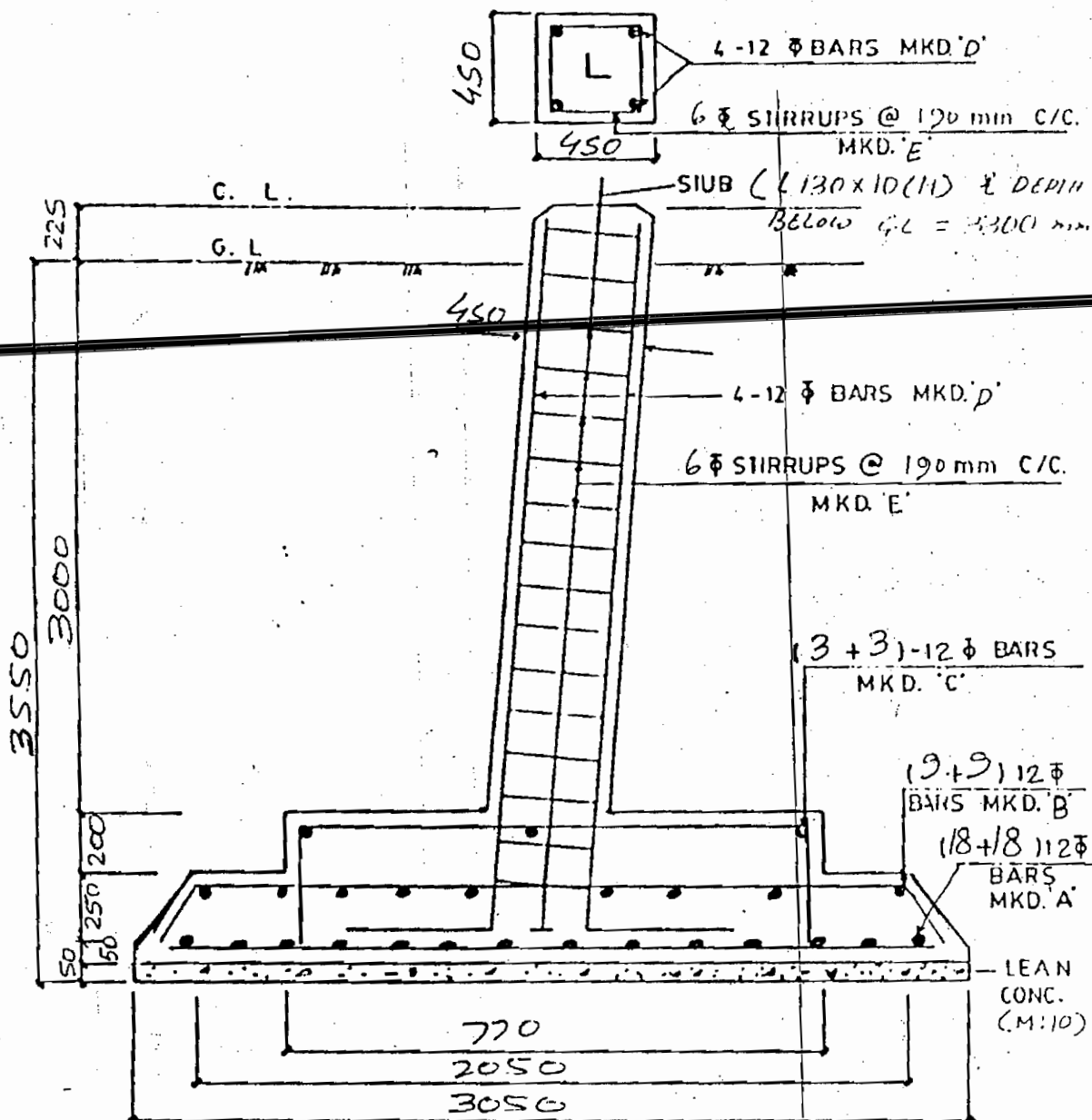
FS FOUNDATION

DRG NO.

D-5389

PAGE

6 OF 13



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139, AS MAY BE AVAILABLE.

5- CONCRETE QTY : 11.53 (M15) 7. EXCAVATION VOL. = 1327 m³.
1.86 (M10)

6- REINFORCEMENT QTY : 689 kg 13.33 m³.
158.36

Revision 'a' - Excavation Volume Revised.

SAE

(INDIA) LIMITED

CODE NO

C1347

TYPE FDD ± 0 TOWER

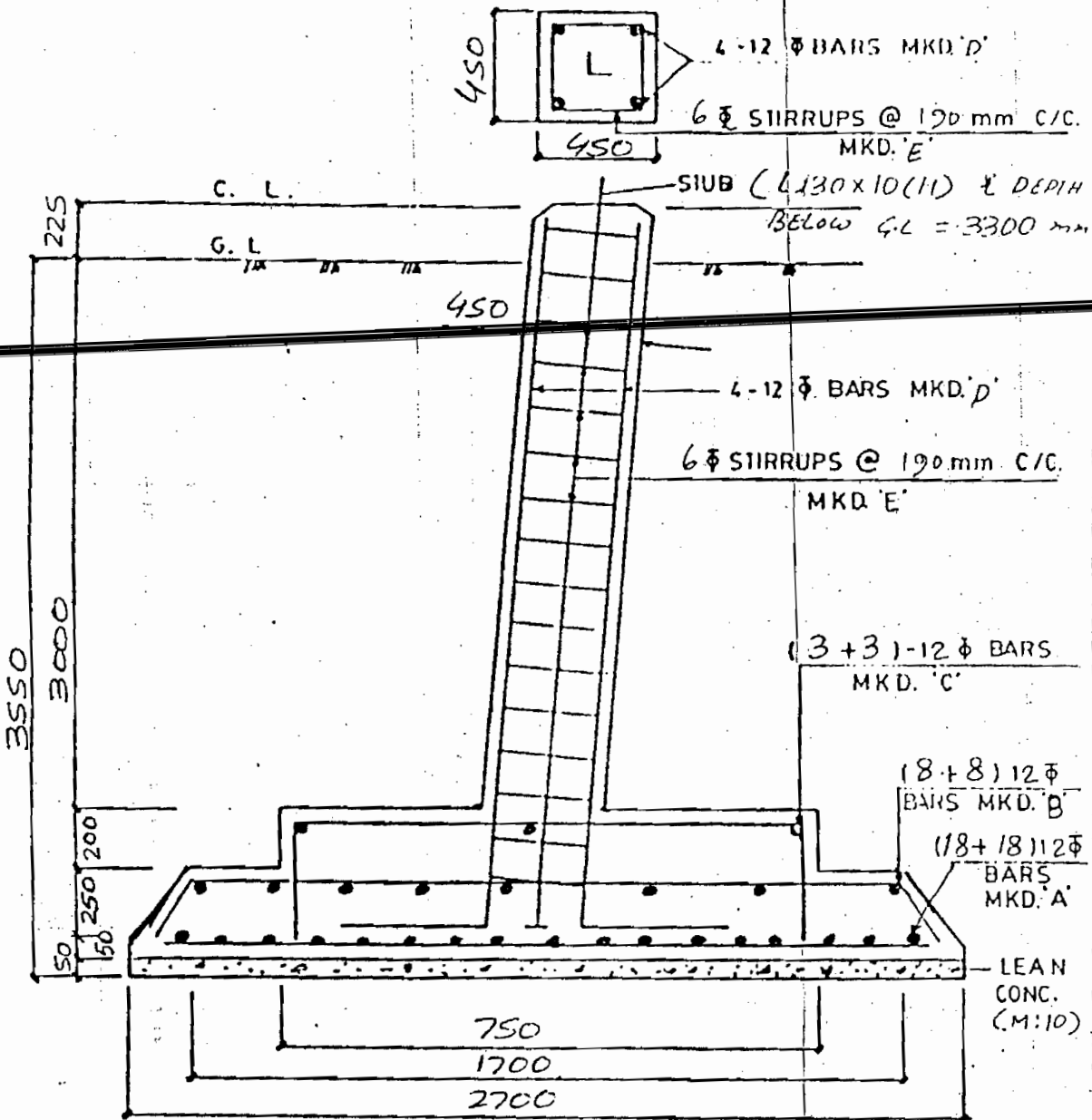
PS FOUNDATION

DRG NO

D-5389

PAGE

4 OF 13



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

5- CONCRETE QTY :

9.44 (MIS) 7. EXCAVATION VOL.
1.46 (M10)

= 103.52 m³.

6- REINFORCEMENT QTY .. 603 kg

127.80

Revision 'a' - Excavation Volume Revised.

SAE

(INDIA) LIMITED

CODE NO.

C1347

TYPE FDO±0 TOWER

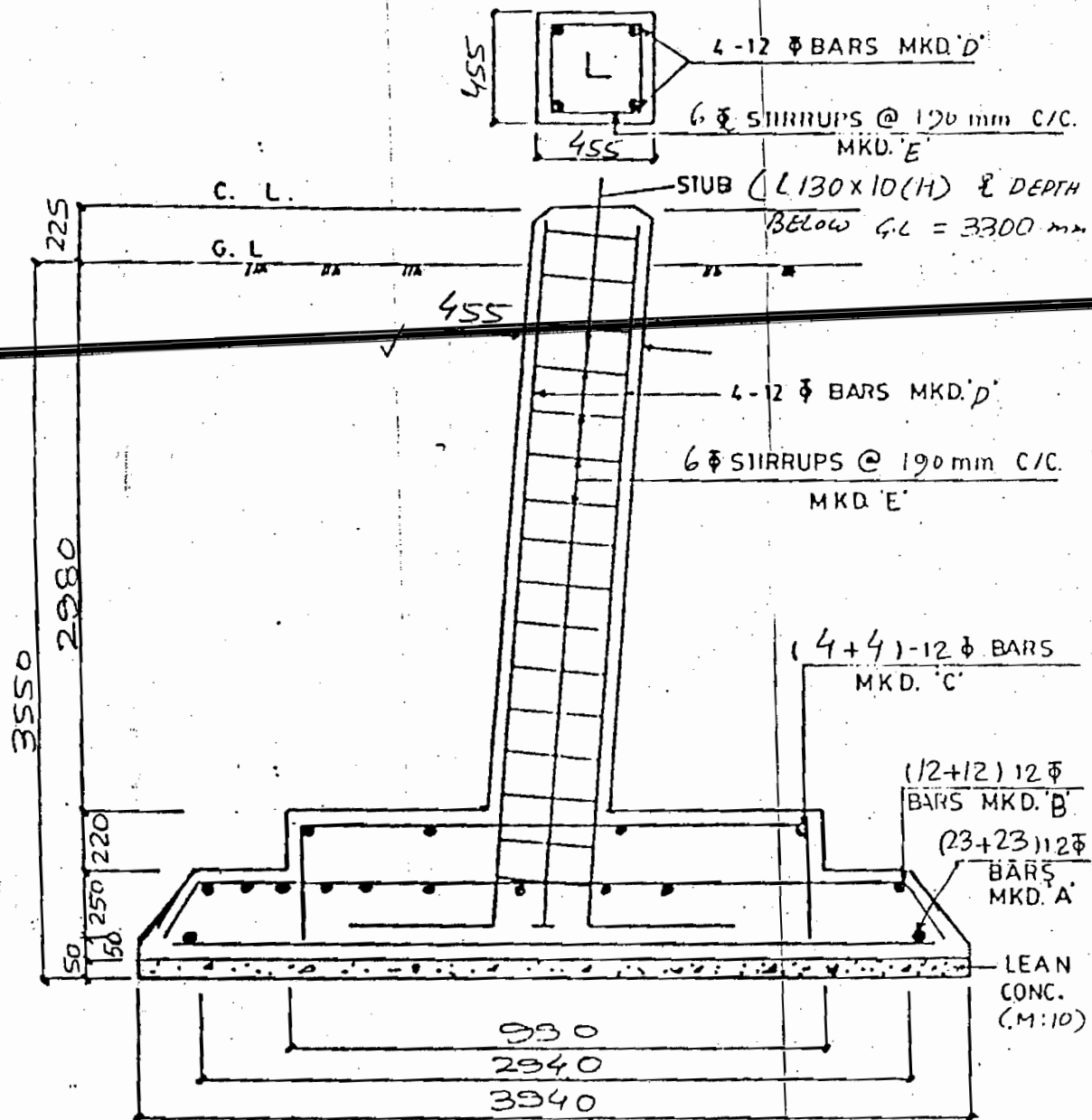
BC(WET) FOUNDATION

DRG NO.

D-5389

PAGE

12 OF 13



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT-DE ARMED BARS Fe 415 CONFORMING TO IS-178/IS-1139 AS BE AVAILABLE.

5. CONCRETE QTY :

18.54 (MIS) 7.
3.10 (M10)

6. REINFORCEMENT QTY : 1055 kg

21.64 m³.

EXCAVATION VOL.

= 220.44 m³.

255.28

Revision 'a' - Excavation volume revised.

LAE

(INDIA) LIMITED

CODE NO.

C1347

TYPE-DO $\pm$ 0 TOWER

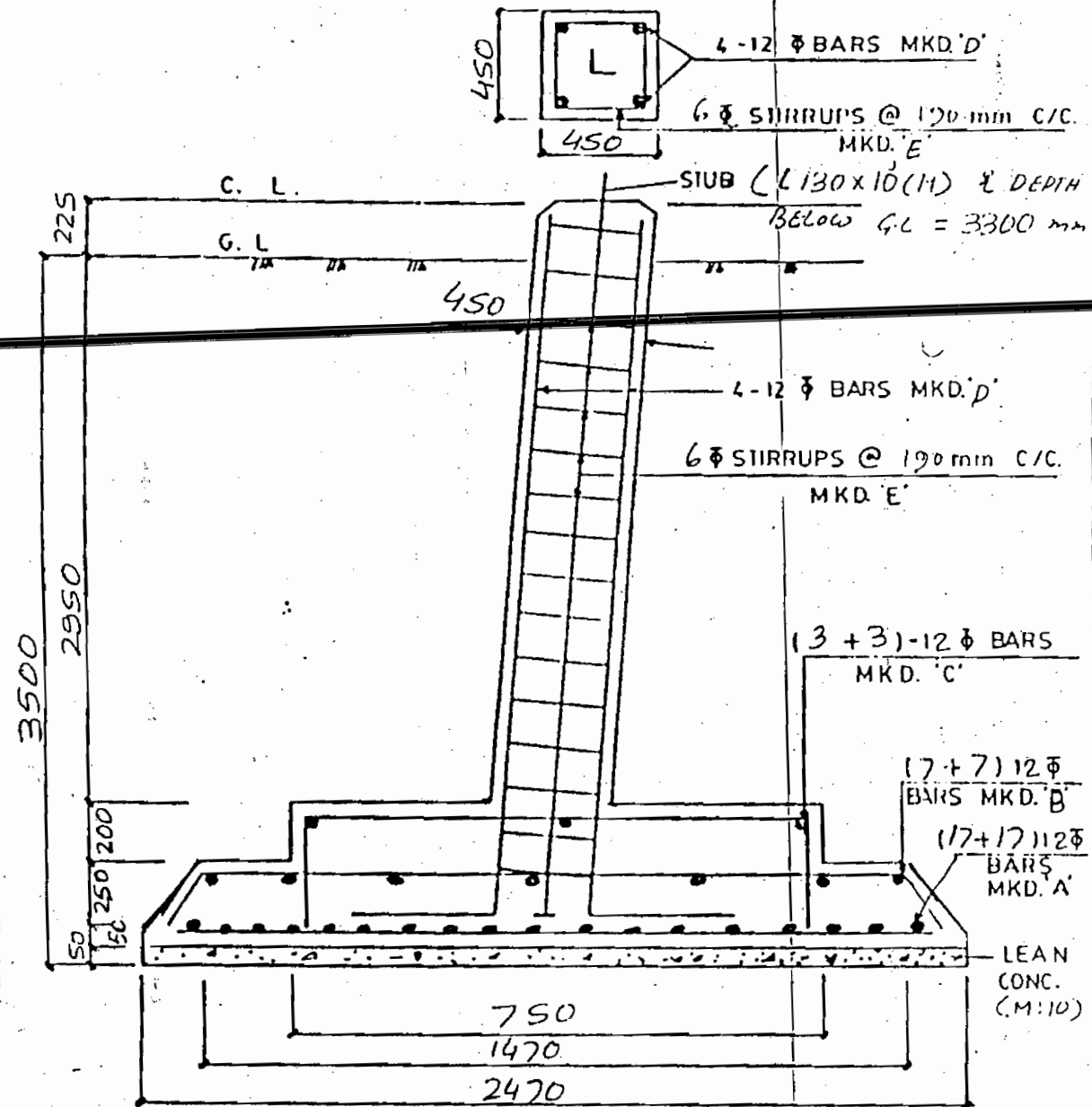
WET FOUNDATION

DRG NO.

D-5389

PAGE

2 OF 13



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

5. CONCRETE QTY : M10 - 1.22
M15 - 8.21

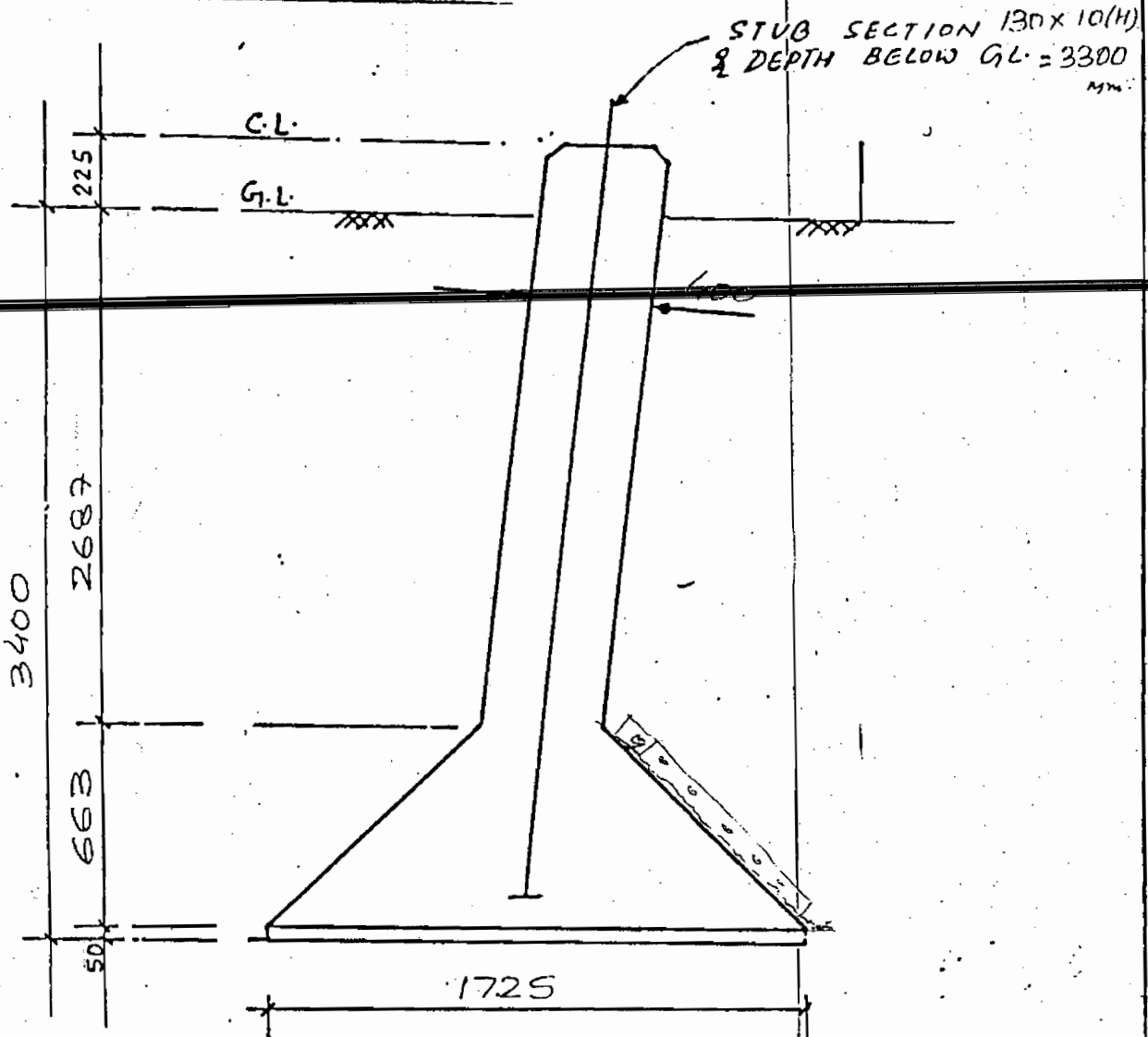
6. REINFORCEMENT QTY : 525 Kg

7. EXCAVATION VOL.

85.41 m³
107.42.

Revision 'a' - Excavation volume revised.

FOUNDATION → DRY

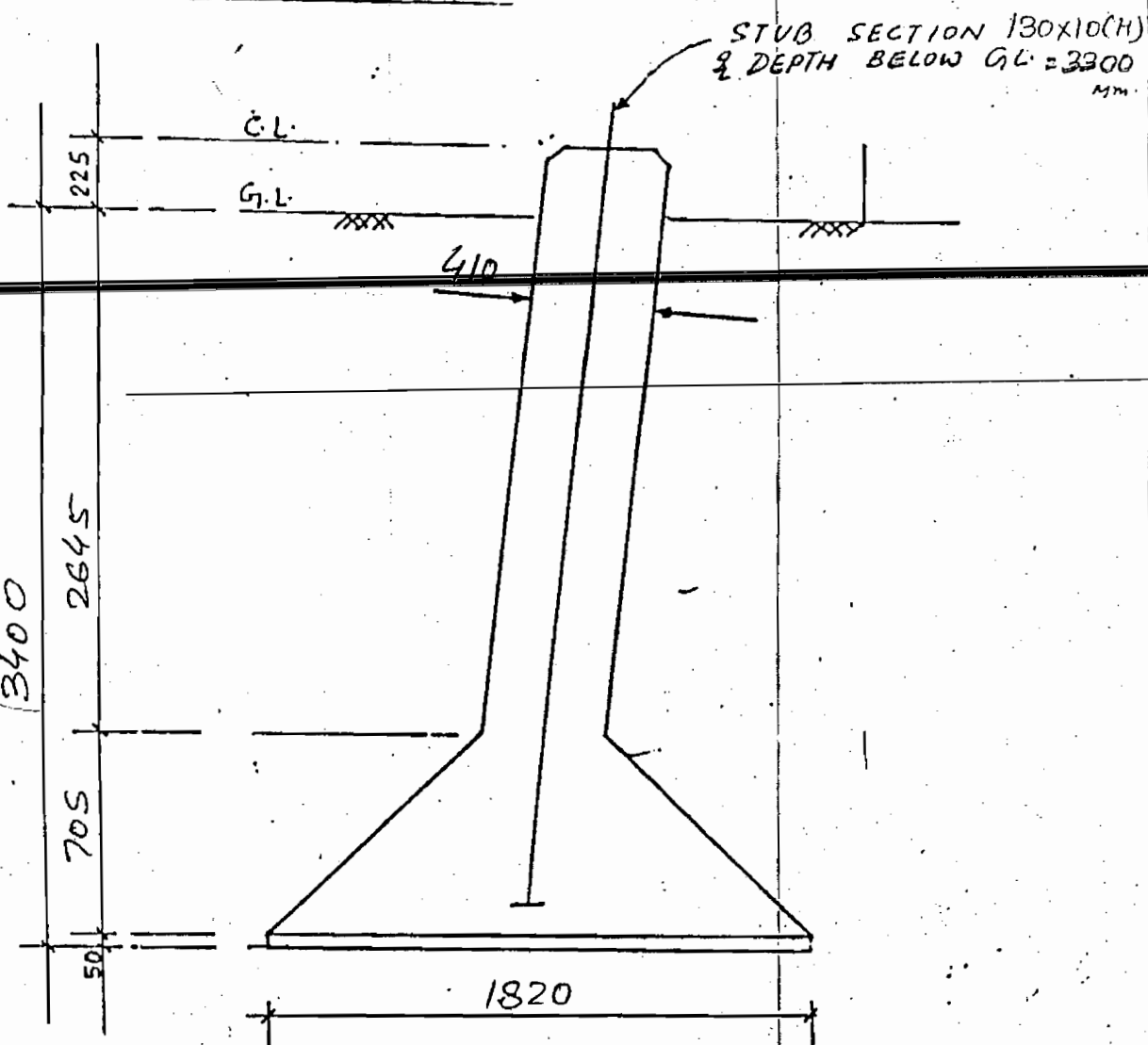


NOTES:-

- 1.- ALL DIMENSIONS ARE IN mm.
- 2.- CONCRETE MIX M-15.
- 3.- CONCRETE QTY: - M15: 5.84 m³.
4. EXCAVATION VOL. = 40.47 m³.

862.5

FOUNDATION → DRY



NOTES:-

1. - ALL DIMENSIONS ARE IN mm.
2. - CONCRETE MIX M-15.
3. - CONCRETE QTY: - : M15. : 6.57 m³.
4. EXCAVATION VOL. = 45.05 m³.

SAE

(INDIA) LIMITED

CODE NO.

C1347

TYPE FDO-3/4/10 TOWER

PS FOUNDATION

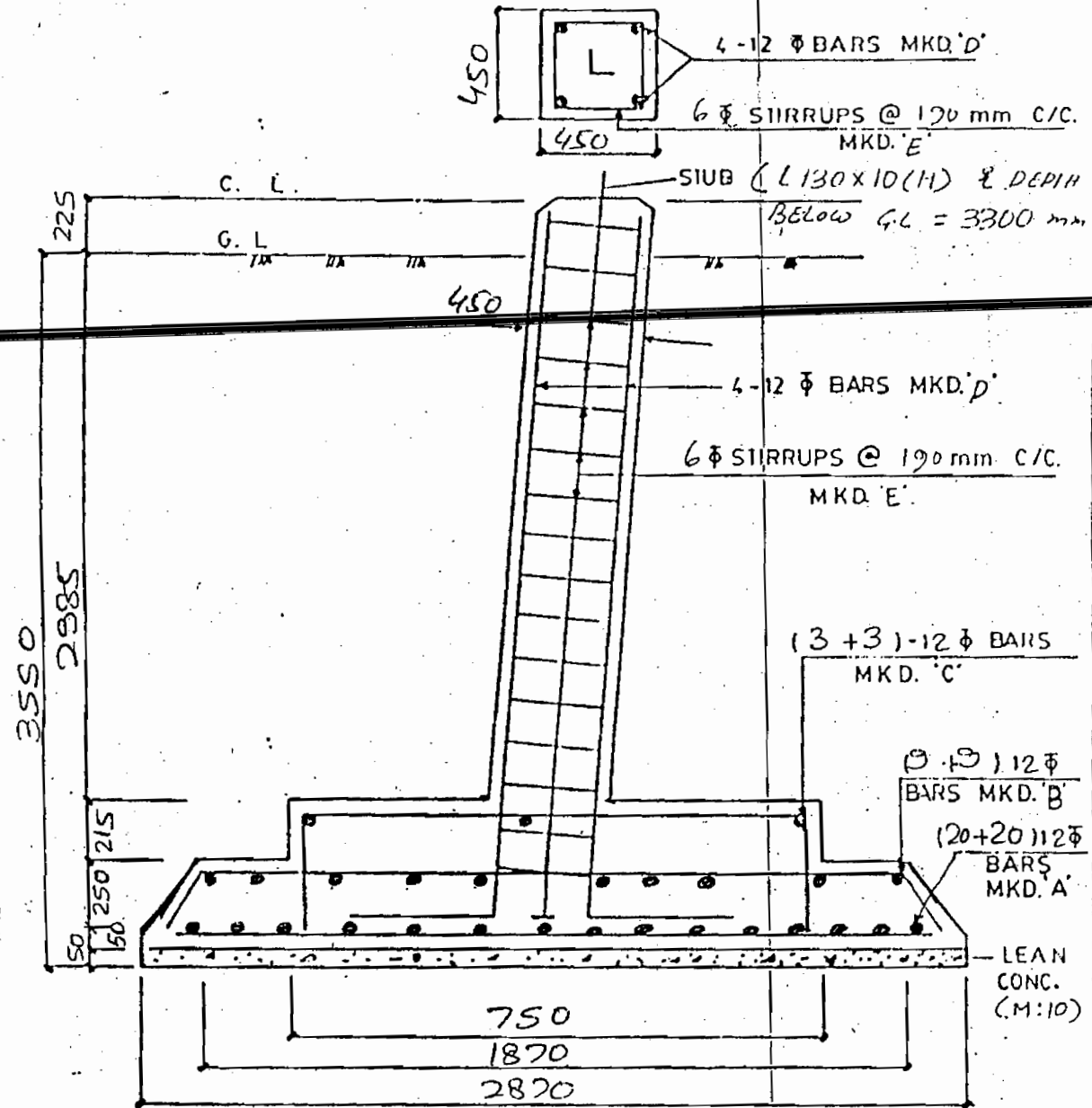
DRG NO.

D-5390

PAGE

4 OF 13

(21)



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

5- CONCRETE QTY : 10.43 (MIS) 7.

1.65 (M10)

6- REINFORCEMENT QTY : 634 kg 12.08 m^3

EXCAVATION VOL. = 116.96 m^3

142.69

18

Revision 'a' - Excavation volume revised.

(18)

CHECK BY:	DATE:
DATE:	DATE:

SAE

(INDIA) LIMITED

CODE NO.

C1347

TYPE FDO-13/16 TOWER

WET FOUNDATION

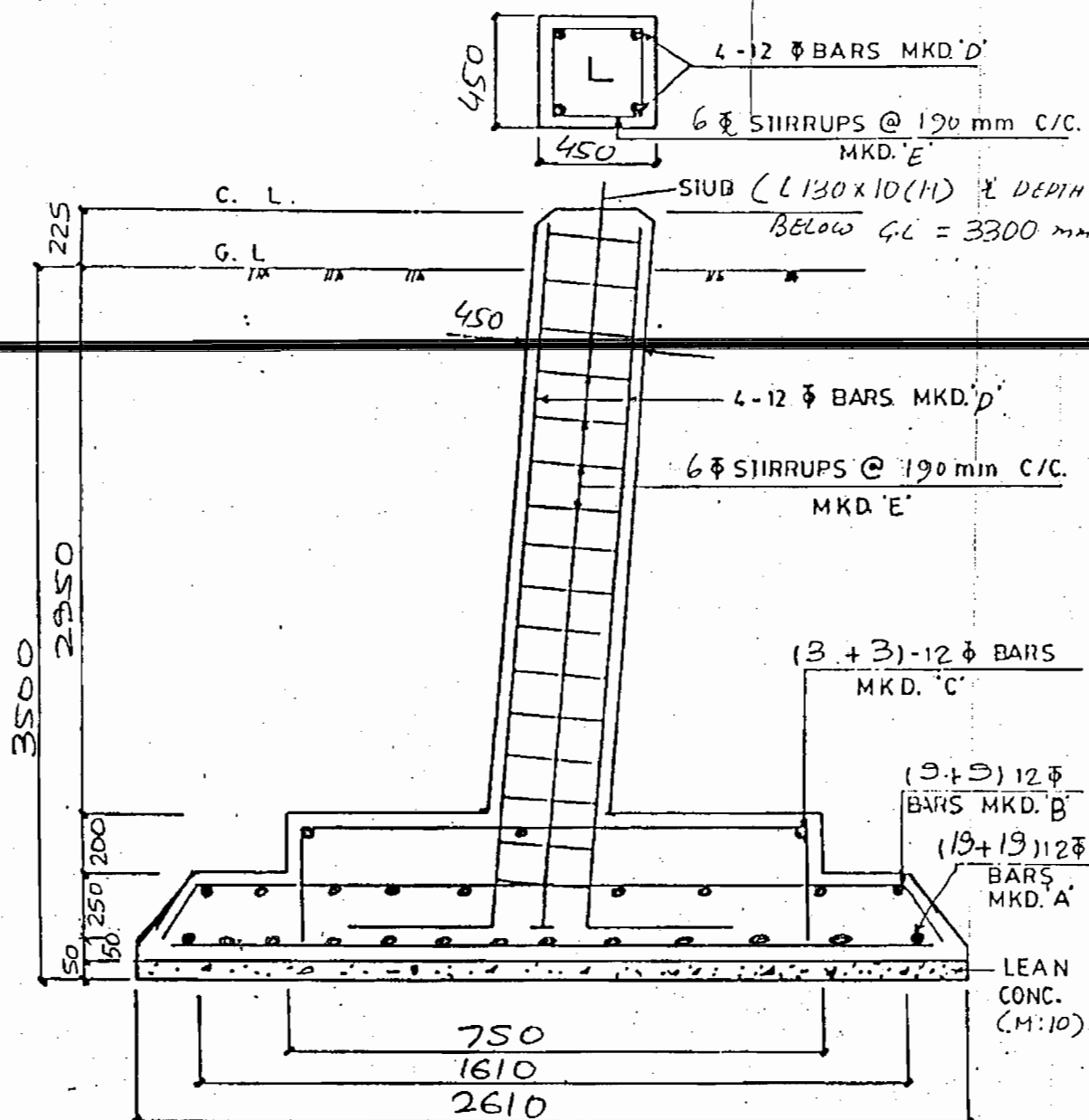
DRG NO.

D-5390

PAGE

20/13

(17)



NOTES:-

- 1- ALL DIMENSIONS ARE IN mm.
- 2- CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
- 3- CONCRETE MIX M15. UNLESS OTHERWISE STATED.
- 4- REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

5- CONCRETE QTY :

8.92 (M15)
1.36 (M10)

7. EXCAVATION VOL.
= 25.37 m³.

6- REINFORCEMENT QTY :- 622 kg

10.28 m³.

118.55

Revision 'a' - Excavation Volume Revised

16

SAE

(INDIA) LIMITED

CODE NO

C-1233

FOUNDATION IN HARD ROCK
TYPE FDO + 3 / FDO + 6 / FDO + 10

ARG. NO.

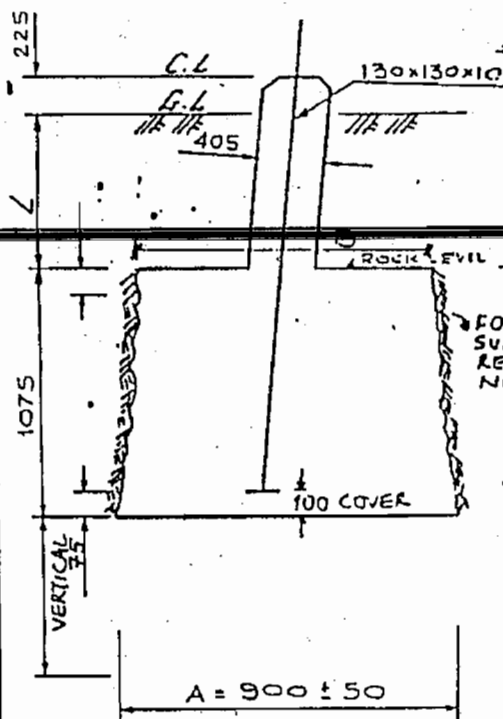
D-3532

PAGE

2 OF 3

ASSM. $\left\{ \begin{array}{l} C = 39705 \text{ kgs.} \\ U = 26406 \text{ kgs.} \end{array} \right.$

ASSM. $\left\{ \begin{array}{l} C = 47334 \text{ kgs.} \\ U = 34128 \text{ kgs.} \end{array} \right.$



VOLUME OF CONCRETE (m³)

$$\begin{aligned} 0.95 \times 0.95 \times 1.075 &= 0.970 \\ 0.405 \times 0.405 \times 0.225 &= 0.037 \\ \hline &1.007 \end{aligned}$$

OVERLOAD OF CONCRETE (kgs)

$$\begin{aligned} 0.037 \times 2240 &= 83 \\ 0.97 \times 800 &= 776 \\ \hline &859 \end{aligned}$$

BEARING

N.C

B.W.C

Load from tower (kg) 39705 47334

Overload of concrete (kg) 859 859

ULTIMATE LOAD
Area of base (m²) = $0.85 \times 0.85 = 0.723 \text{ m}^2$

Ultimate bearing pressure (kg/m²)
= $\frac{89241}{0.723} = 123432 < 125000 \text{ kg/m}^2$

UPLIFT

NC

BWC

Maximum uplift (kg) = 26406 34128

Ultimate uplift (kg) = 58093 56311

Uplift resisted by stub (kg) BY BOND
 $4 \times 13 \times 97.5 \times 15 = 76050$

Uplift resisted by stub cleat (kg)
= 101626 IN SHEARING
= 39936 IN BEARING
Total resistance to uplift (kg) = 76050 + 39936
= 115986 > 58093

QUANTITY/TOWER

CONCRETE = 4.03 m³

EXCAVATION = 3.88 m³

SURFACE AREA OF CONTACT BETWEEN ROCK & FDN.

$$= 4 \times \frac{85+75}{2} \times 107.5 = 34400 \text{ cm}^2$$

∴ FRICTIONAL FORCE DEVELOPED BETWEEN ROCK & FDN.
@ $1 \text{ kg/cm}^2 = 34400 \times 1 = 34400 \text{ KG} > 34128 \text{ KG}$

(35)

SAE

(INDIA) LIMITED

CODE NO.

C1347

TYPE FDO13/H/10 TOWER

5FR FOUNDATION

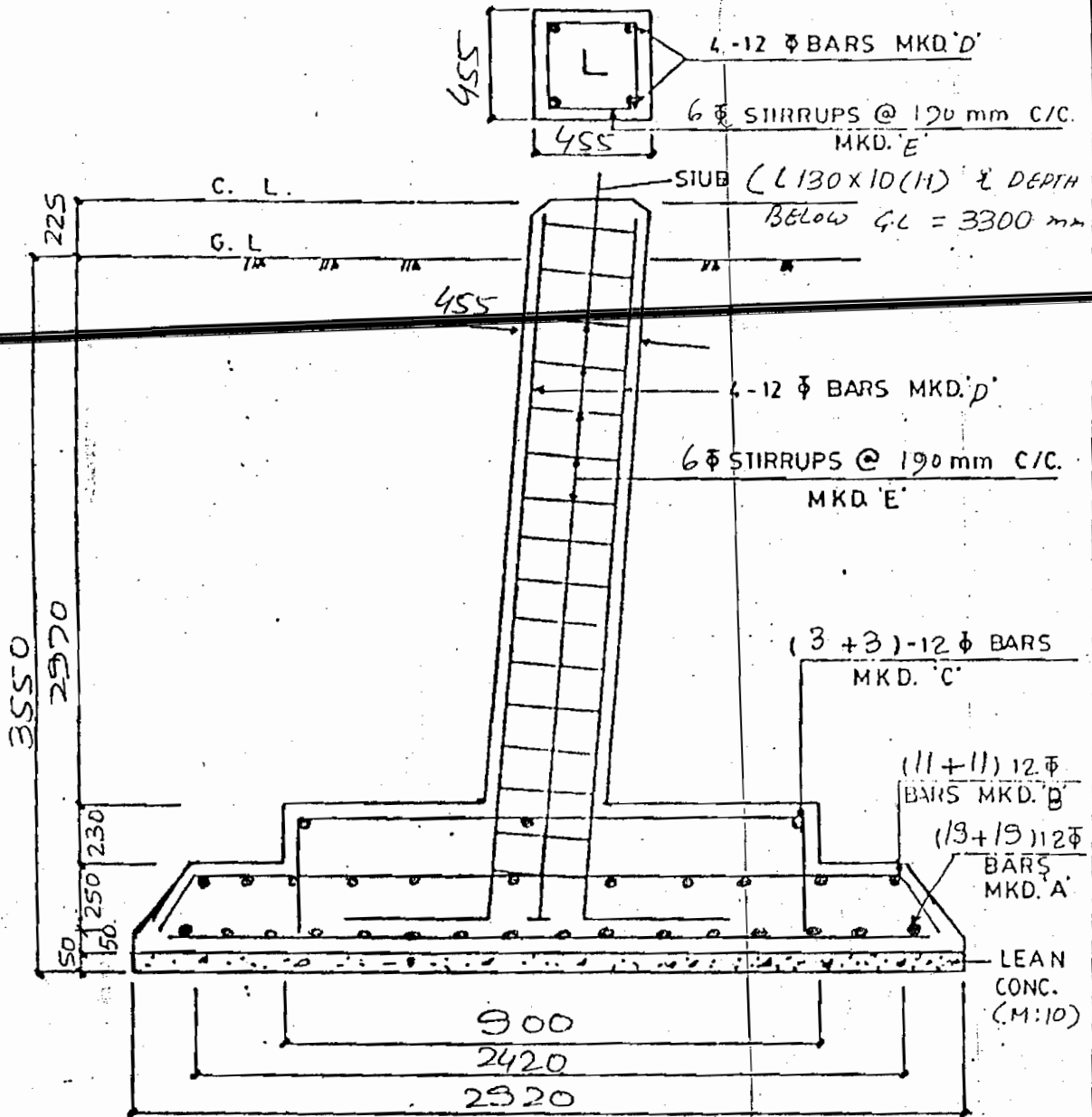
DRG NO.

D-5390

PAGE

10 OF 13

29



NOTES:-

- 1- ALL DIMENSIONS ARE IN mm.
- 2- CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
- 3- CONCRETE MIX M15. UNLESS OTHERWISE STATED.
- 4- REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

5- CONCRETE QTY : M10 - 1.71
M15 - 12.25

6- REINFORCEMENT QTY : 735 kg 13.95 m³.

7. EXCAVATION VOL. = 8.52 m³.

SAE

(INDIA) LIMITED

CODE NO.

C1347

TYPE FOUNDATION TOWER

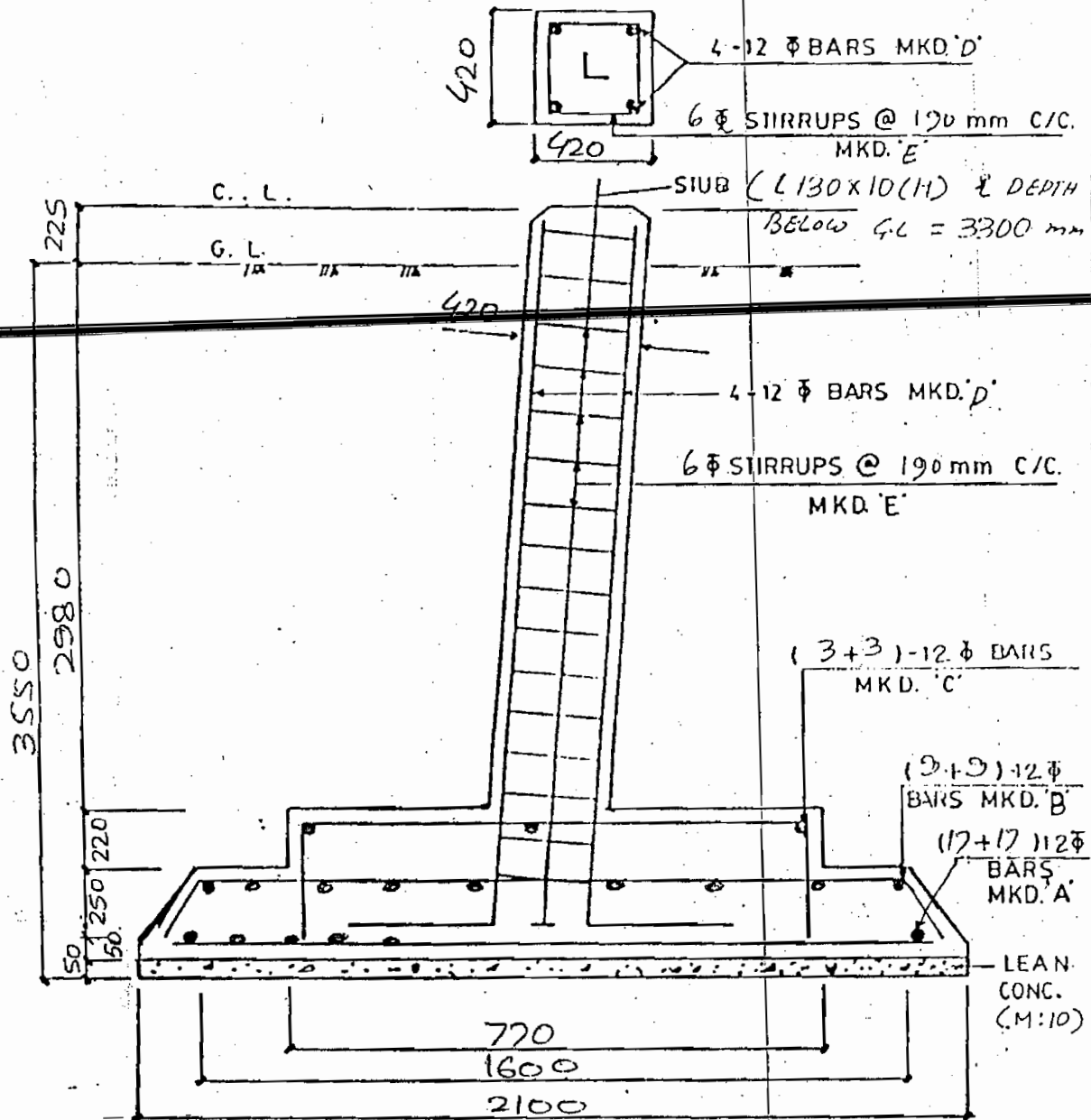
DER FOUNDATION

DRG NO

D-5390

PAGE

8 OF 13



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

5- CONCRETE QTY : M10 - 0.88
M15 - 2.11

6- REINFORCEMENT QTY : 495 kg. 7.99 m³.

7. EXCAVATION VOL. = 37.98 m³.

SAE

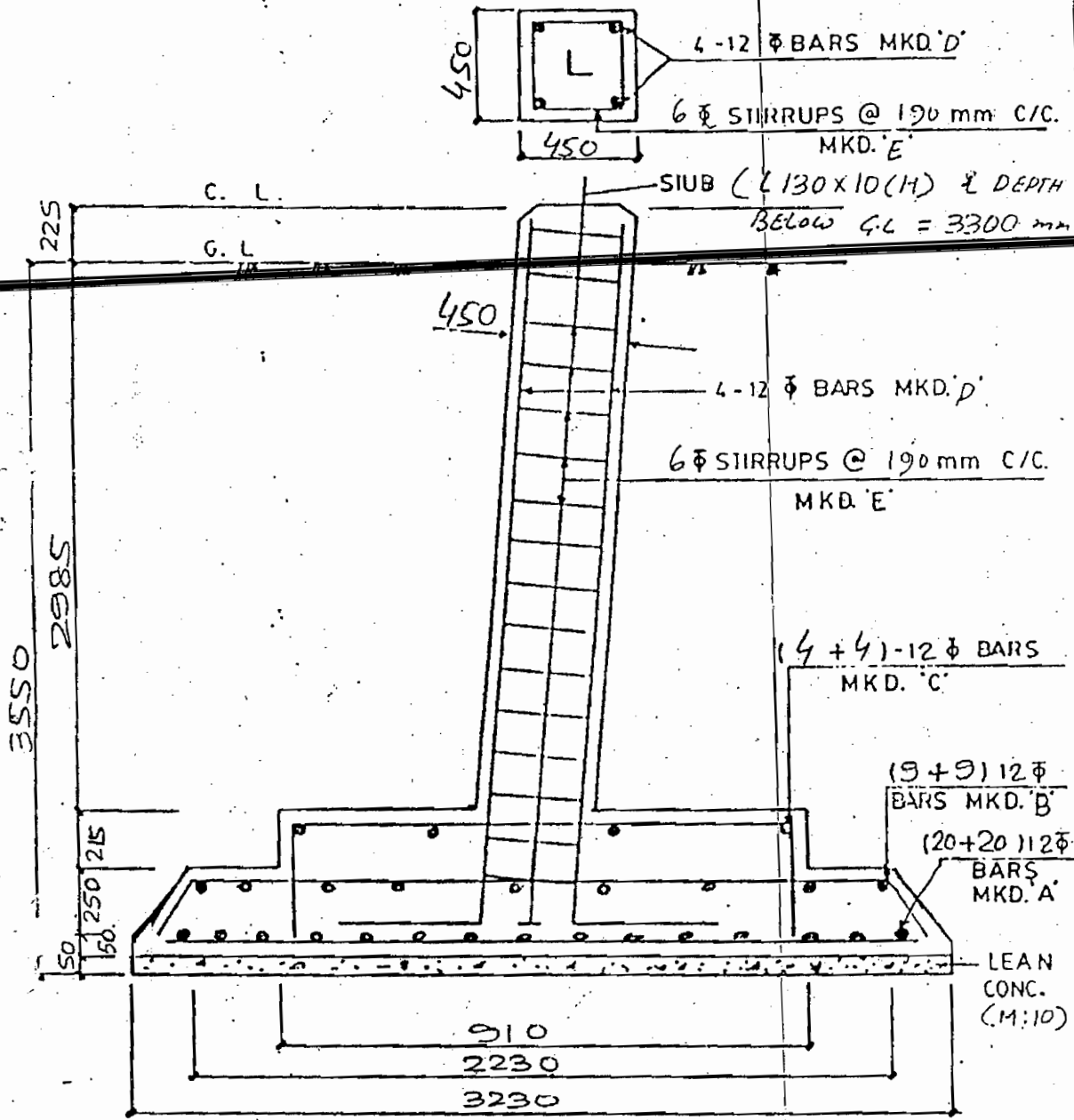
(INDIA) LIMITED

CODE NO.
C1347

TYPE **FDO13/H10 TOWER**
FS FOUNDATION

DRG NO.
D-5390

PAGE
6 OF 13

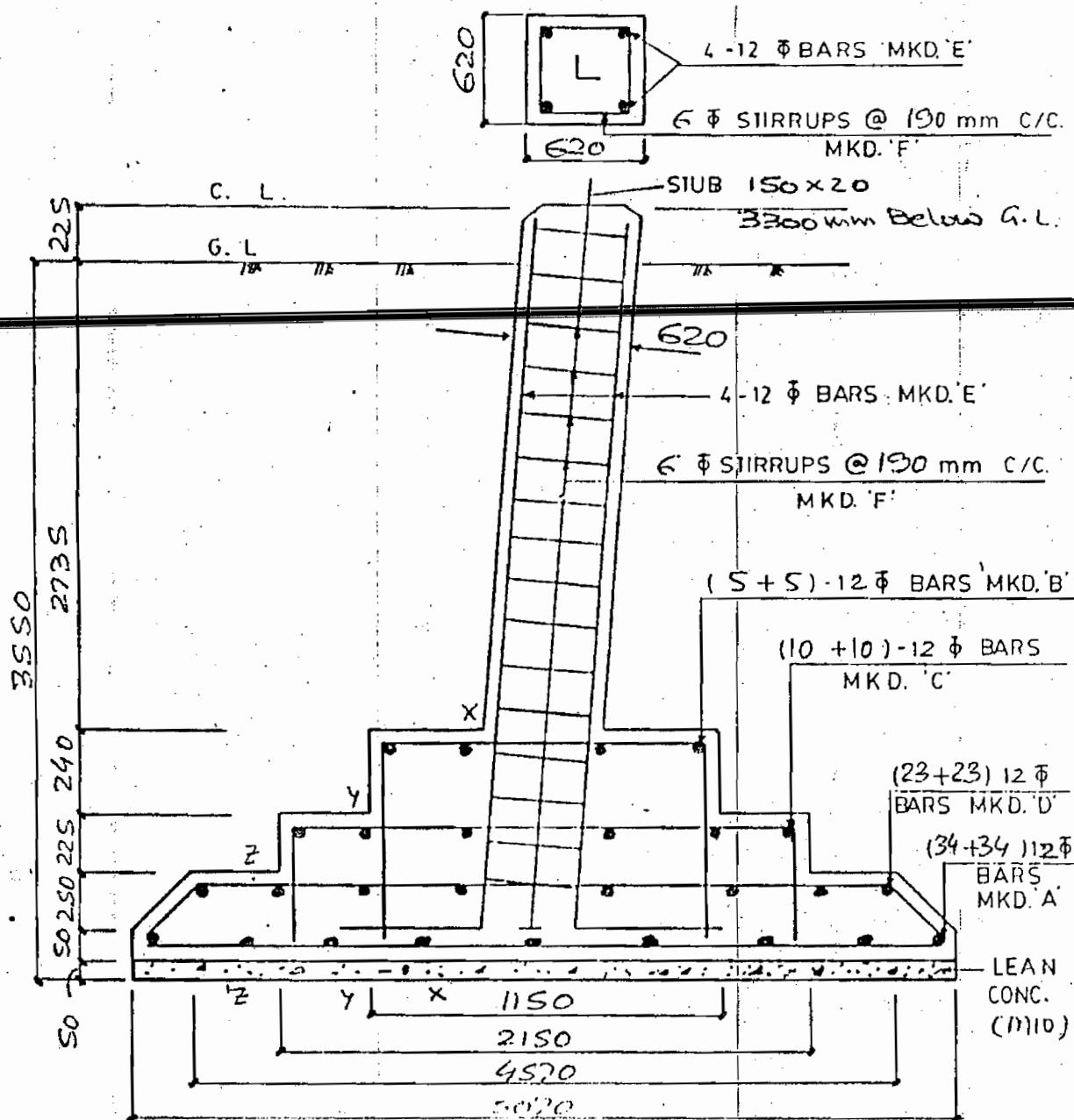


NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFORMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

5- CONCRETE QTY : 12.94 (M15) 7. EXCAVATION VOL. = 148.15 m³.
2.03 (M10)
6- REINFORCEMENT QTY : 784 kg. 15.02 m³. 176.95

Revision 'a' - Excavation Volume Revised.



NOTES:-

1. ALL DIMENSIONS ARE IN mm
2. CONCRETE COVER = 50 mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Qty./Tower:- Excavation Vol :- 300.86 m^3
 Concrete Vol. :- $38.38 + 5.14 = 43.52 \text{ m}^3$
 Reinforcement :- 2429 kgs

Revision:- Excavation volume revised.

SAE

(INDIA) LIMITED

CODE NO.

CB42

TYPE FD30±0 TOWER

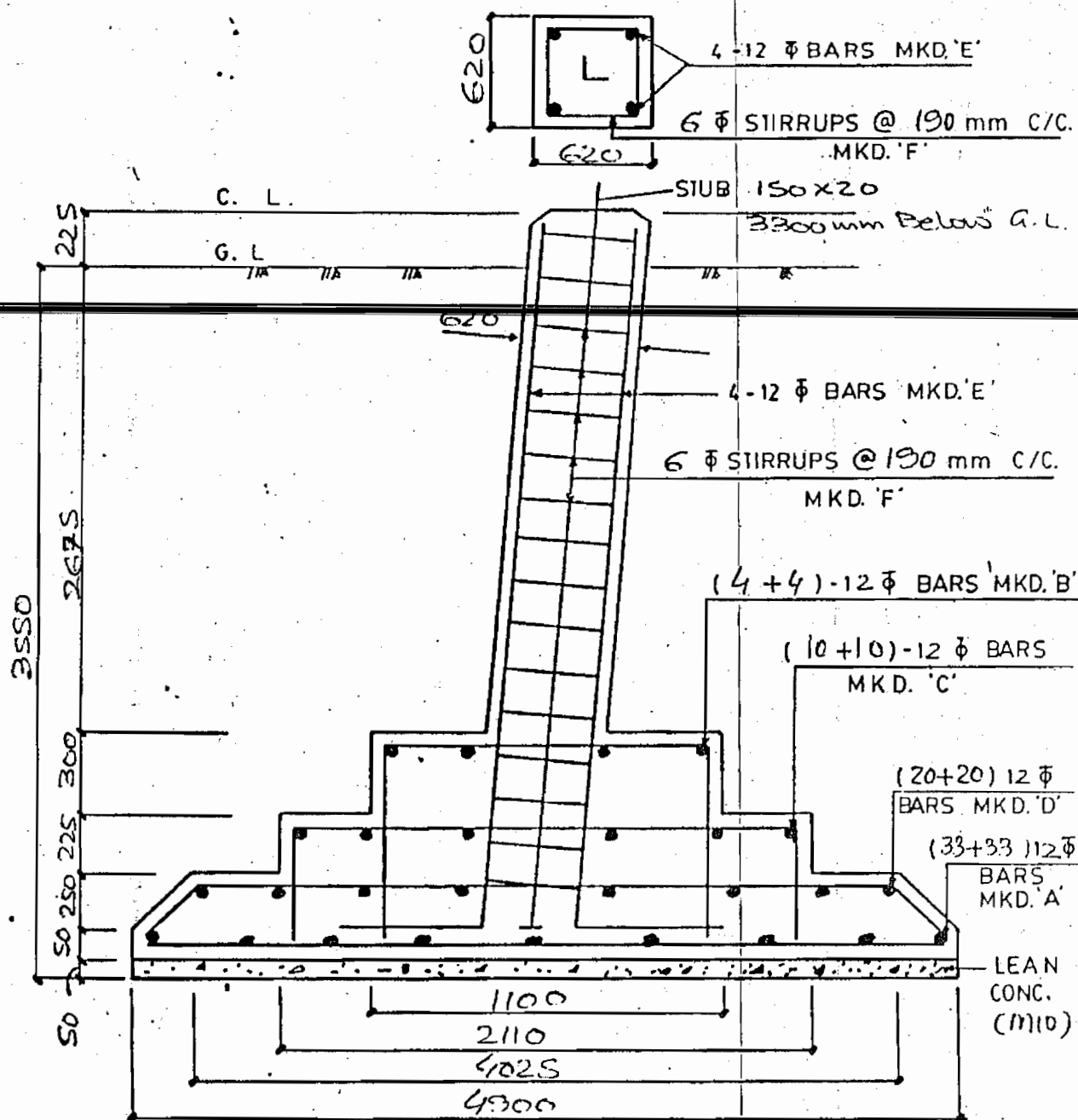
FS TYPE FOUNDATION

DRG. NO.

D-3300A

PAGE

7 OF 10



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Qty./Tower:- Excavation Vol.:- 34.7 m^3
 Concrete Vol.:- $34.7 + 4.8 = 39.5 \text{ m}^3$
 Reinforcement:- 2195 kgs
 Revision 'b' - Excavation volume revised.

56

SAE

(INDIA) LIMITED

CODE NO.

CB42

TYPE FD20±0 TOWER

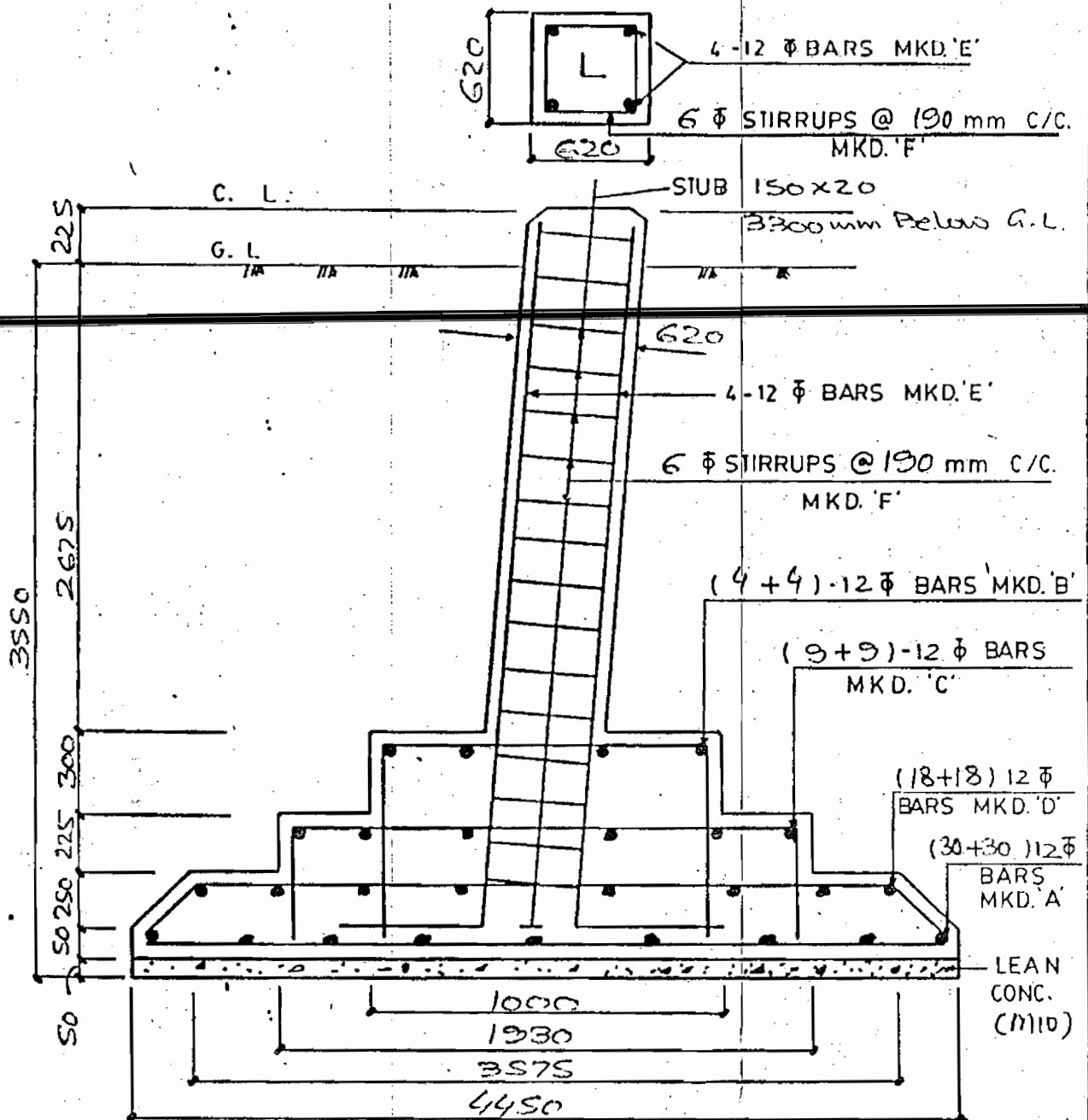
PS TYPE FOUNDATION

DRG. NO.

D-3279a

PAGE

5 OF 10



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Qty./Tower:- Excavation Vol :- 281.2 m^3 - 320.39
 Concrete Vol. :- $29.14 + 3.96 = 33.1 \text{ m}^3$
 Reinforcement :- 1834 Kgs

Revision 'B' - Excavation Volume revised.

58

SAE

(INDIA) LIMITED

CODE NO.

C1342

TYPE F030+0 TOWER

B.C. (WET) TYPE FOUNDATION

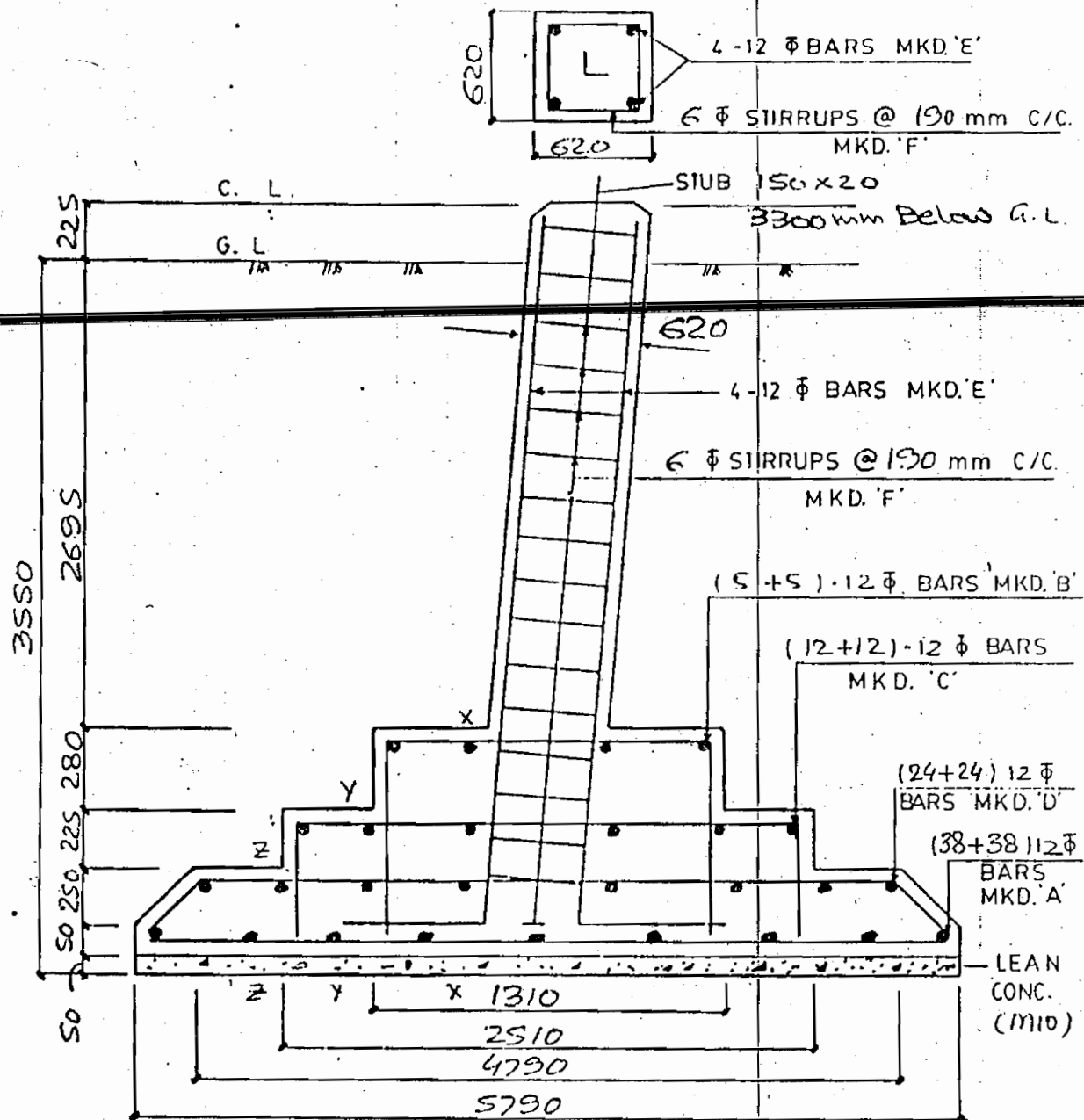
DRG. NO.

D-5381

PAGE

1 OF 1

68



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHER WISE STATED.
3. CONCRETE MIX M.15.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Qty./Tower:-
 Excavation Vol. :- 476.04 m^3
 Concrete Vol. :- $46.85 + 6.7 = 53.56 \text{ m}^3$
 Reinforcement :- 2995 kgs

Revision 'a' - Excavation volume revised

13

51

SAE

(INDIA) LIMITED

CODE NO.

CP42

TYPE FD30±0 TOWER

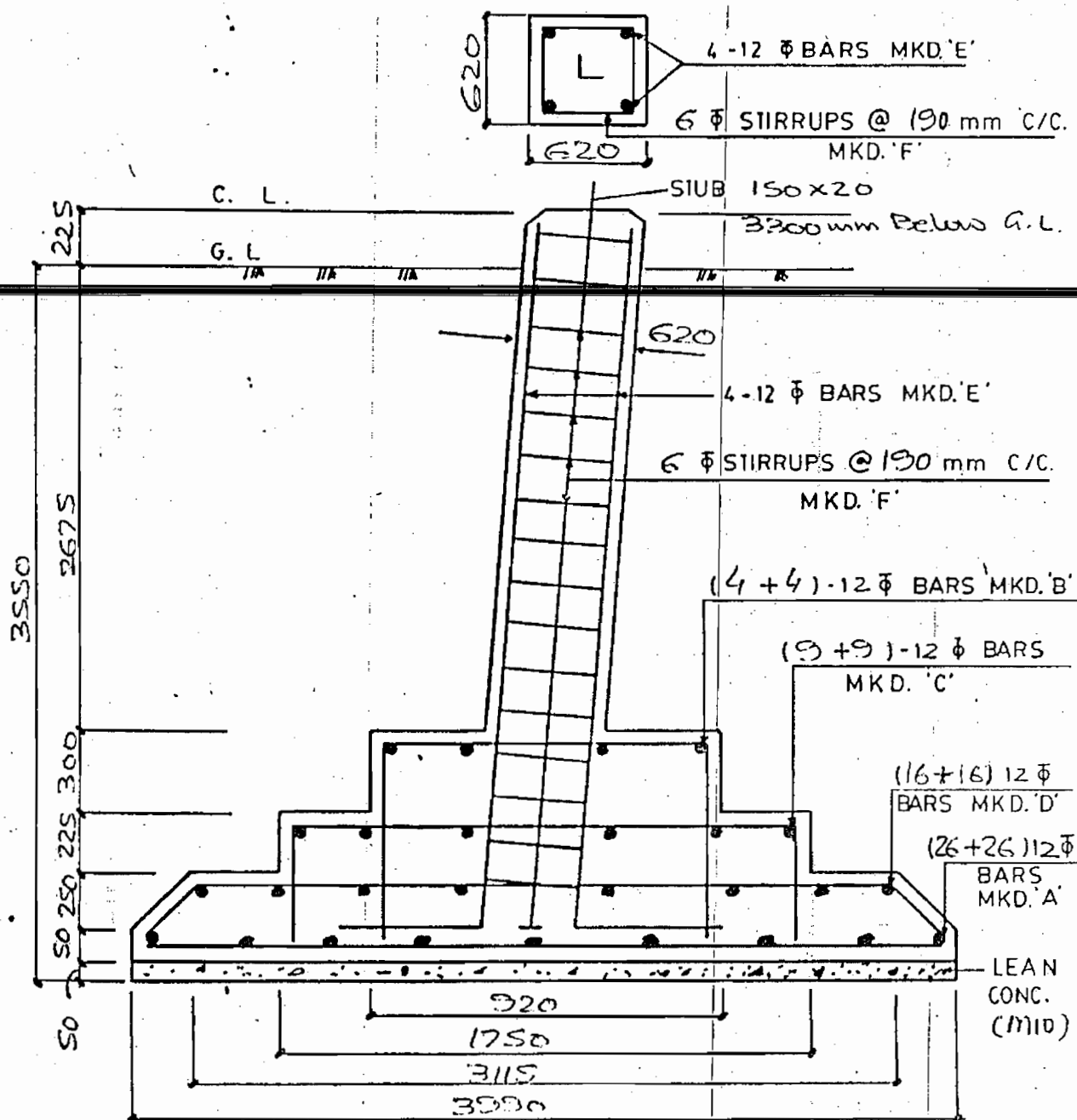
WET TYPE FOUNDATION

DRG. NO.

D-3298a

PAGE

3 OF 10



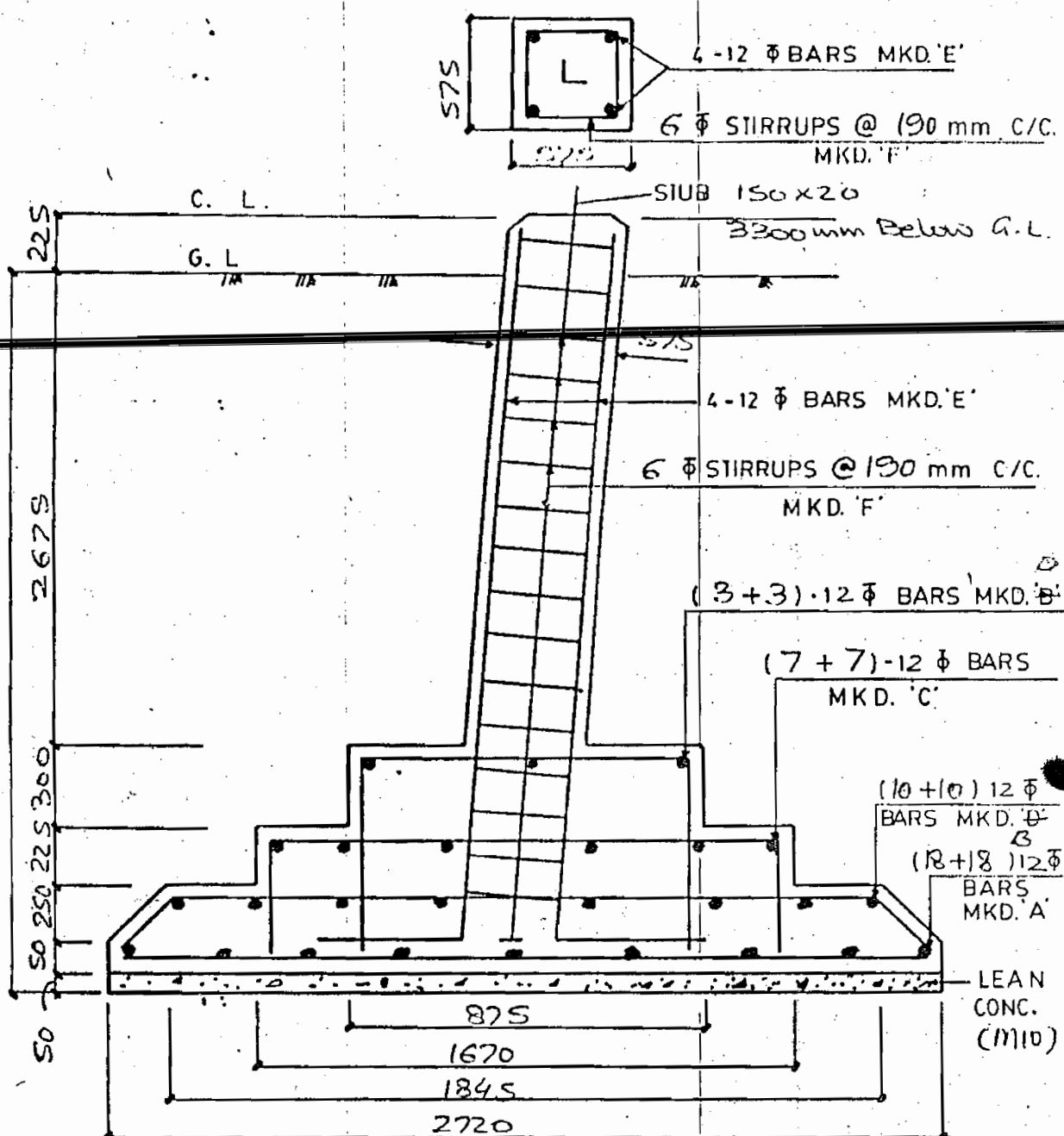
NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT- DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Qty./Tower:- Excavation Vol :- 226.07 m^3
 Concrete Vol :- $24.1 + 3.18 = 27.28 \text{ m}^3$
 Reinforcement :- 1496 ton

Revision 'b' - Excavation volume revised.

50





(INDIA) LIMITED

CODE NO.

CB42

TYPE FD30+3/10 TOWER

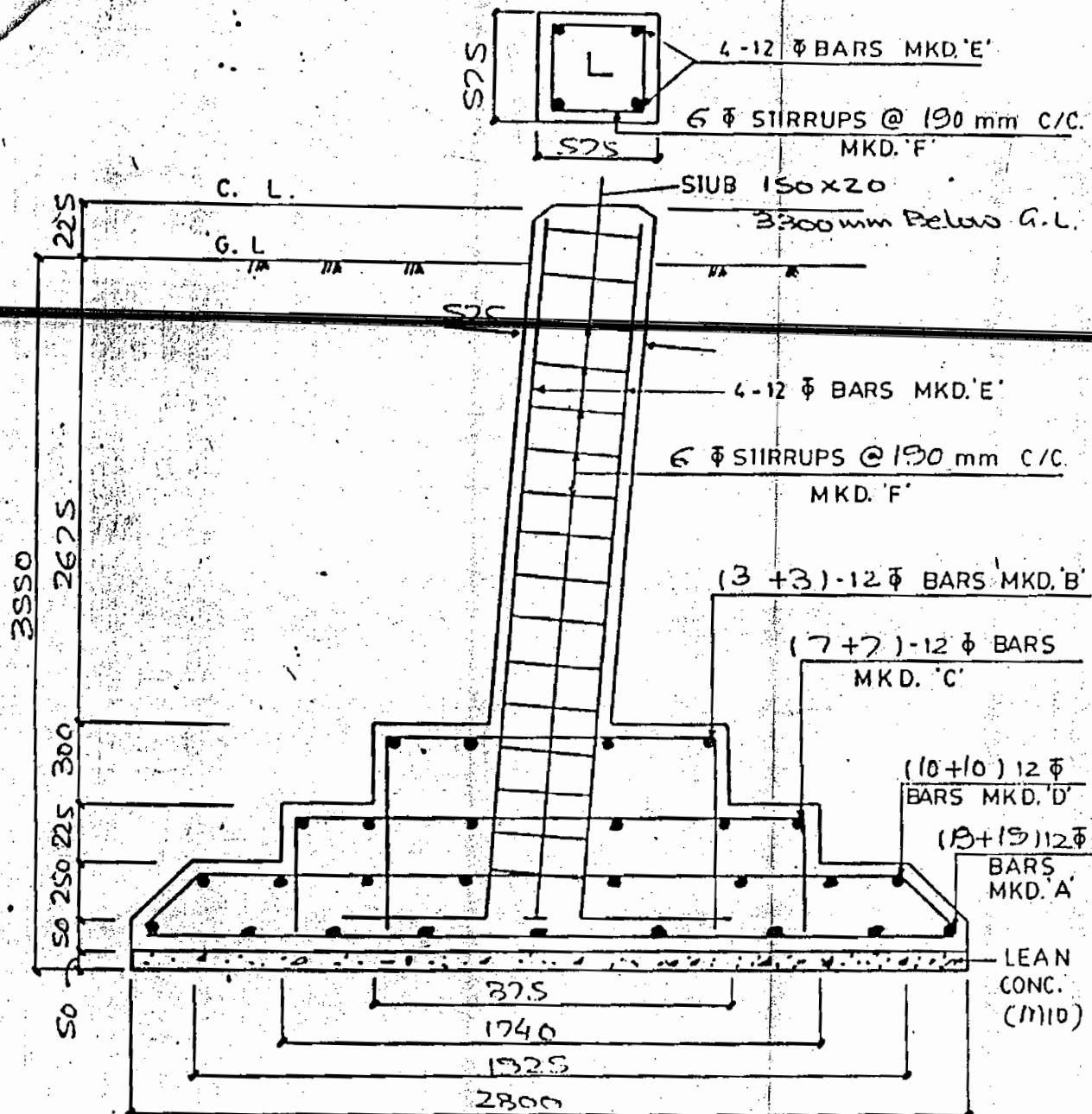
DRY TYPE FOUNDATION

DRG. NO.

D-3304A

PAGE

1 OF 10



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT- DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Qty./Tower:- Excavation Vol:- 136.46 m³ - 136.46
 Concrete Vol:- $14.69 + 1.57 = 16.26$ m³
 Reinforcement:- 830 kgs

Revision 'b' - Excavation volume revised.

(24)

(89)

HE

(INDIA) LIMITED

CODE NO.

CB42

TYPE FD30+10 TOWER

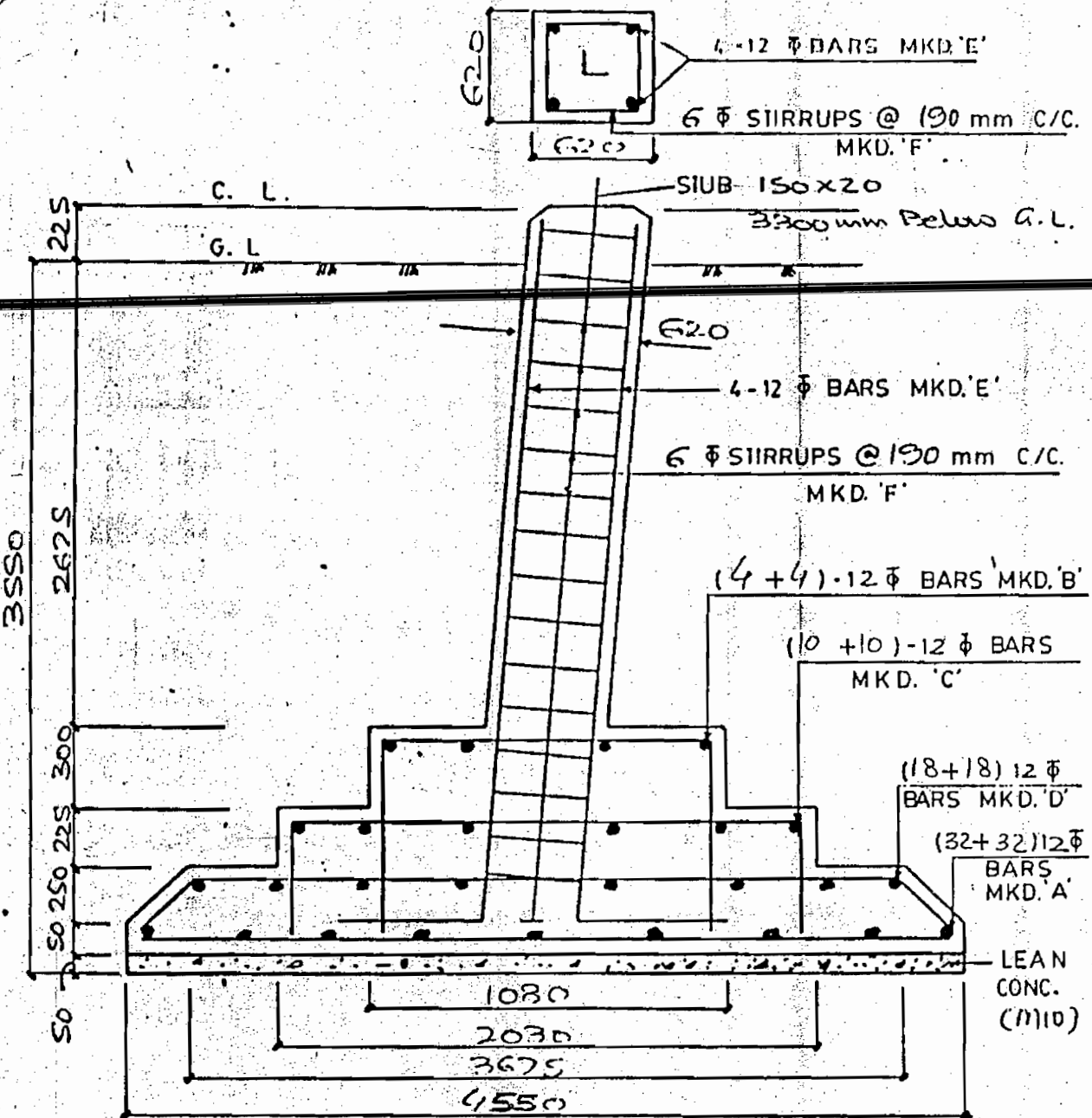
PS TYPE FOUNDATION

DRG NO.

D-3306A

PAGE

5 OF 10



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE. 334.02

Qty./Tower:- Excavation Vol :- 223.98 m^3
 Concrete Vol :- $30.68 + 4.14 = 34.82 \text{ m}^3$
 Reinforcement :- 1960 kg

Revision 'b' - Excavation Volume revised

(28)

78



(INDIA) LIMITED

CODE NO.

CB47

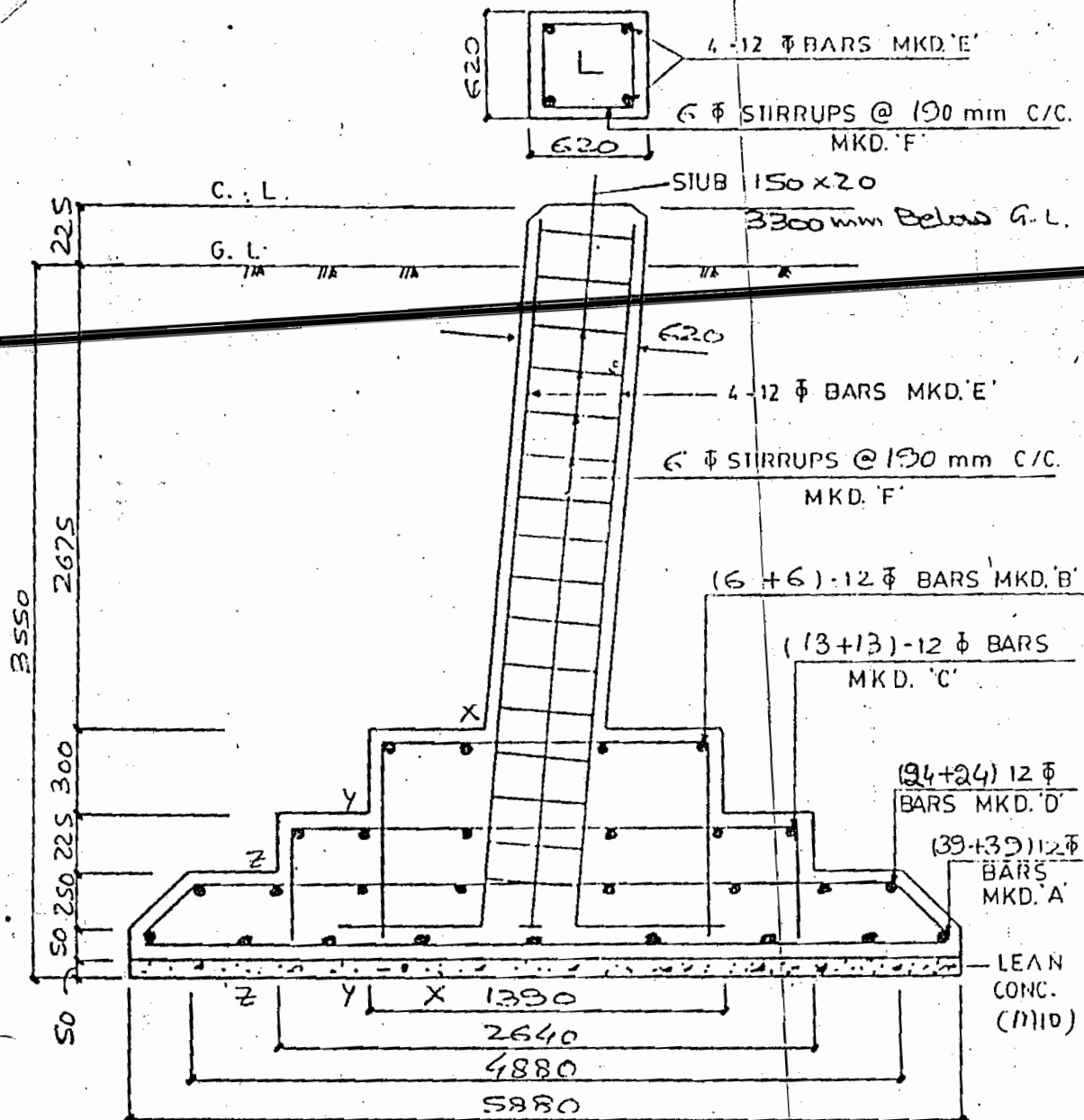
TYPE F130+3/110 TOWER

DRG. NO.

D-5383

PAGE

1 OF 4



NOTES:-

1. ALL DIMENSIONS ARE IN mm
2. CONCRETE COVER = 50 mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Qty./Tower:- Excavation Vol:- 490.96 m^3
 Concrete Vol:- $48.99 + 6.91 = 55.9 \text{ m}^3$
 Reinforcement:- 3135 Kgs

Revision:- Excavation Volume revised.



(INDIA) LIMITED

CODE NO.

CB42

TYPE FD30+10 TOWER

WET TYPE FOUNDATION

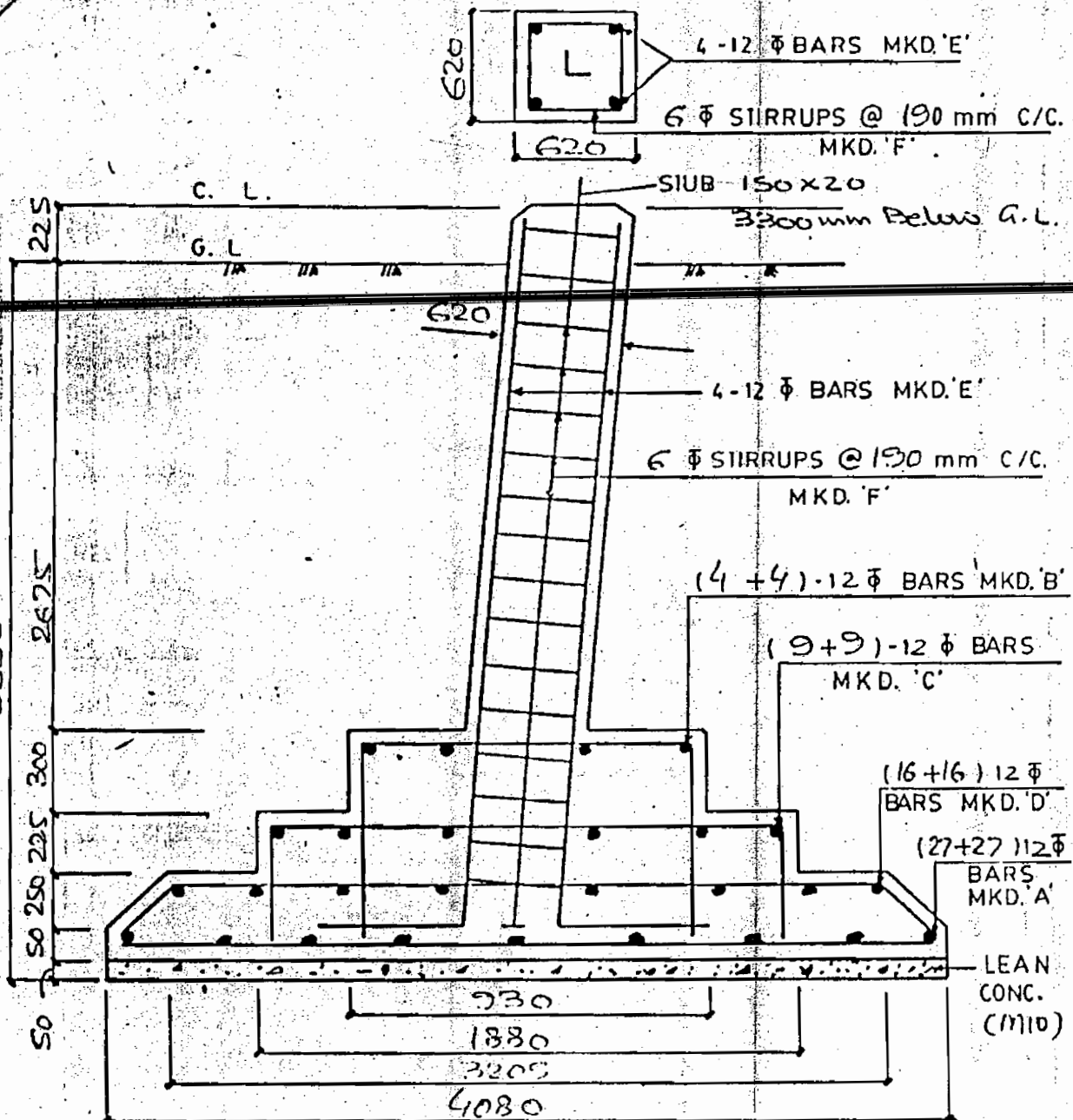
DRG. NO.

D-330SA

PAGE

30 OF 10

73



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Rty./Tower:- Excavation Vol:- $236.38 \text{ m}^3 - 272.42$
 Concrete Vol:- $25.34 + 3.33 = 28.67 \text{ m}^3$
 Reinforcement:- 1560 kgs

Revision 'b' - Excavation Volume revised.

26

80

SAE

(INDIA) LIMITED

CODE NO

C-1233

HARD ROCK FOUNDATION
TYPE FD 30±0/±3/±6/10

DRG. NO.

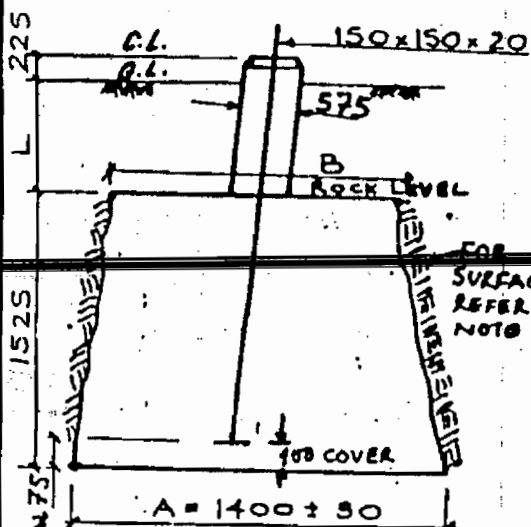
D-3533

PAGE

1 OF 2

ASSM: NC { C 74500 KGS.
U 53900 KGS

ASSM: BWC { C 89600 KGS.
U 68950 KGS.



VOL. OF CONCRETE: (CU.M.)

$$1.450 \times 1.450 \times 1.525 = 3.206$$

$$0.575 \times 0.575 \times 0.225 = 0.074$$

$$3.280$$

WT. OF CONCRETE: (KGS)

$$0.074 \times 2240 = 166$$

$$3.206 \times 800 = 2565$$

$$2731$$

BEARING

NC

B.N.C.

LOAD FROM TOWER (KG) = 74500

89600

OVERLOAD OF CONCRETE:

2731

2731

TOTAL LOAD (KG) = 77231

92331

ULTIMATE LOAD (KG) = 169908

152346

AREA OF BASE = 1.8225 m²

ULTIMATE BEARING PRESSURE

169908

= 93228

1.8225 < 125000 kg/m²PERMISSIBLE ULT. BEARING STRESS = 125000 kg/m²

UPLIFT:

NC

BWC

MAX. UPLIFT (KG) =

53900

68950

Ultimate uplift (KG) =

118580

113768

SIZE OF STUB = 150x150x20

SAFE BOND OFFERED BY STUB = 4x15x142.5x15 = 128250 KG.

RESISTANCE OFFERED BY CLEATS IN SHEARING = 2x12x2.01x3160 = 152438 KG

BOND OFFERED BY STUB CLEATS IN BEARING = 12x16x0.8x5280 = 79872 KG

TOTAL RESISTANCE TO UPLIFT (KG) = 128250 + 79872 = 208122 > 118580 KG

SURFACE AREA OF CONTACT BETWEEN ROCK & FDN.

$$= 4 \times \frac{135+125}{2} \times 142.5 = 74100 \text{ cm}^2$$

∴ FRICTIONAL FORCE DEVELOPED BETWEEN ROCK & FDN. AT 1 KG/cm²

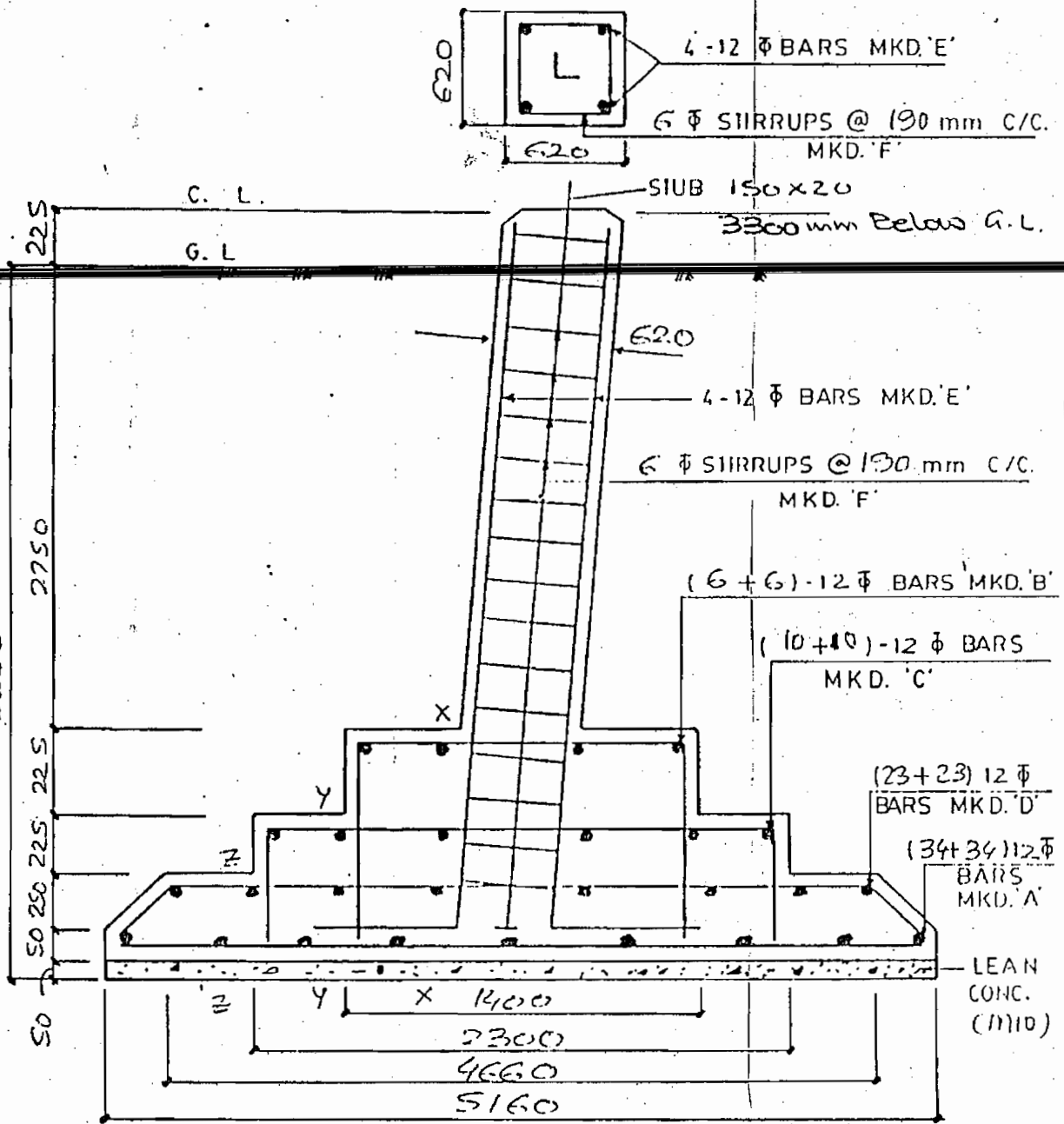
$$= 74100 \times 1 = 74100 \text{ KG} > 68950 \text{ KG.}$$

QUANTITY/TOWER

CONCRETE = 13.12 m³EXCAVATION = 12.82 m³

86

 (INDIA) LIMITED	CODE NO. C1342	TYPE FOUNDATION SFR TYPE FOUNDATION	DRG. NO. D-5386	PAGE 4 OF 4
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NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT- DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Qty./Tower:- Excavation Vol :- 312.74 m^3
 Concrete Vol. :- $40.55 + 5.93 = 46.48 \text{ m}^3$
 Reinforcement :- 2.503 kgs

71

22



(INDIA) LIMITED

CODE NO.

C1342

TYPE FD 30+10 TOWER

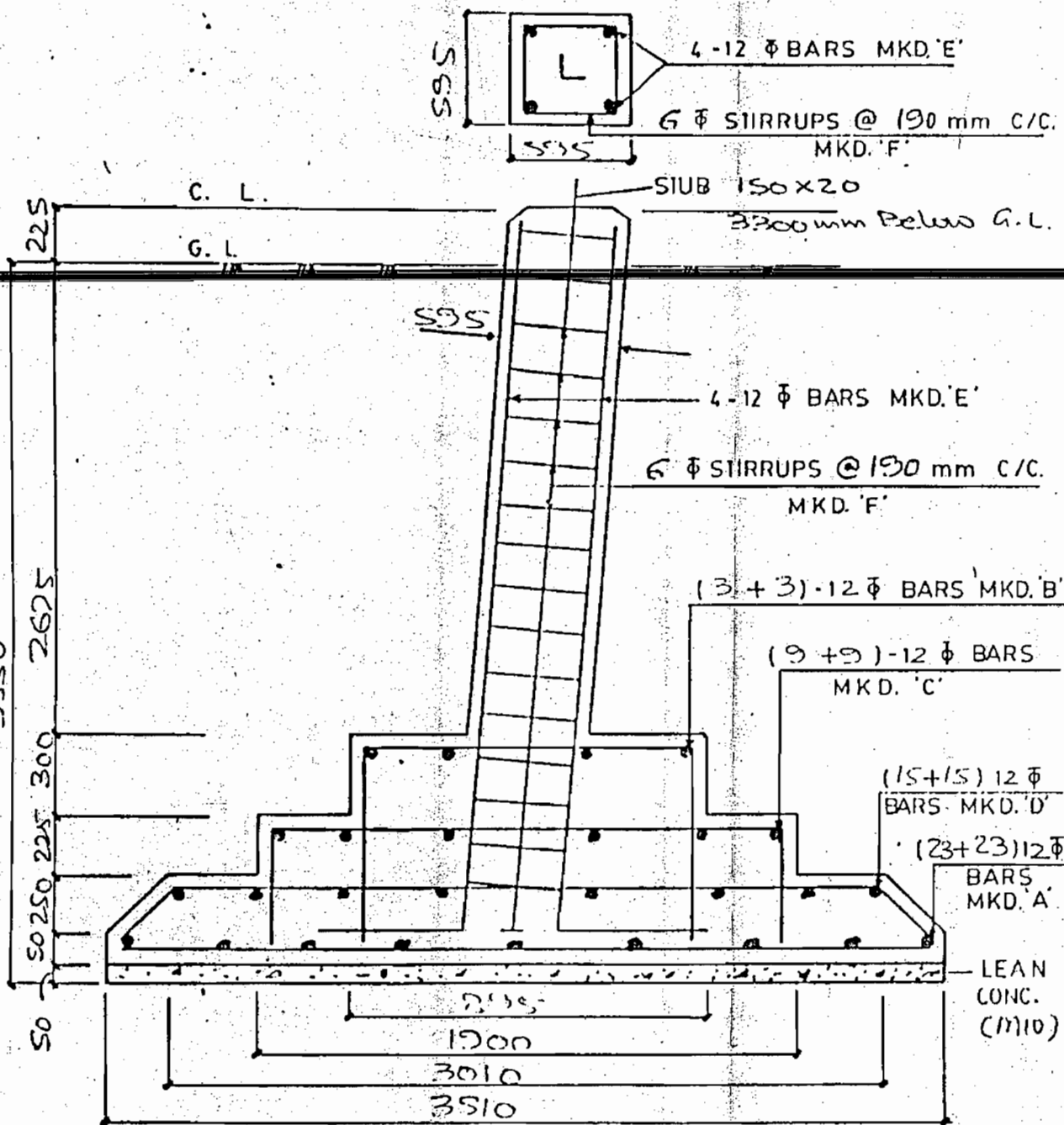
DER TYPE FOUNDATION

DRG. NO.

D-3809A

PAGE

9 OF 10



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Qty./Tower:- Excavation Vol:- 131.55 m³
 Concrete Vol:- 21.43 + 2.46 = 23.89 m³
 Reinforcement:- 1251 kgs

32

74



(INDIA) LIMITED

CODE NO.

CB42

TYPE FD 20+10 TOWER

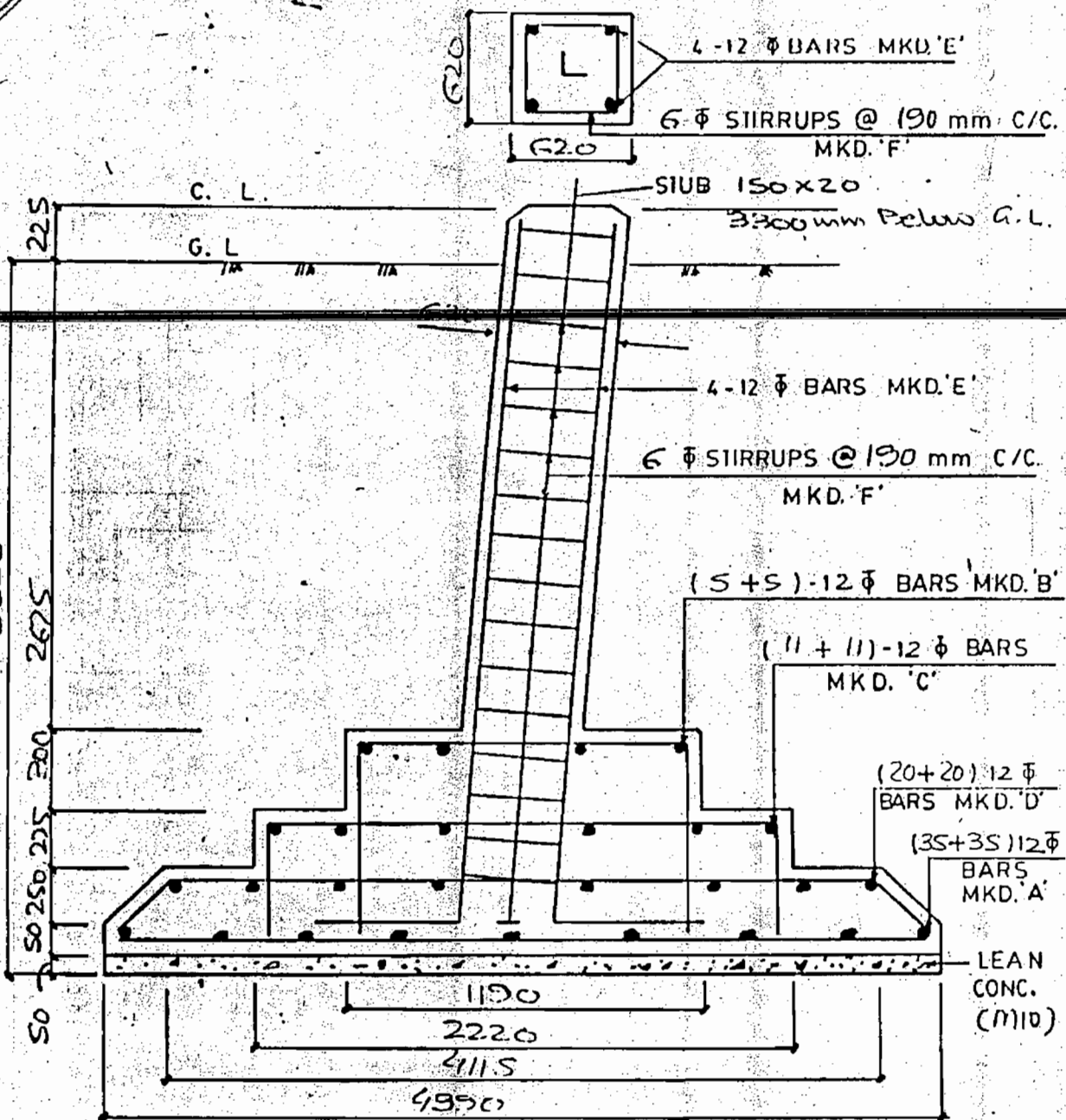
F. TYPE FOUNDATION

DRG. NO.

D-3307A

PAGE

7 OF 10



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Qty./Tower:- Excavation Vol:- 353.38 m^3
 Concrete Vol:- $36.36 + 4.98 = 41.34 \text{ m}^3$
 Reinforcement:- 2348 nos

Revision 'b' - Excavation Volume revised.

30

76

HE

(INDIA) LIMITED

CODE NO.

C1347

TYPE FD 60 TOWER

±0

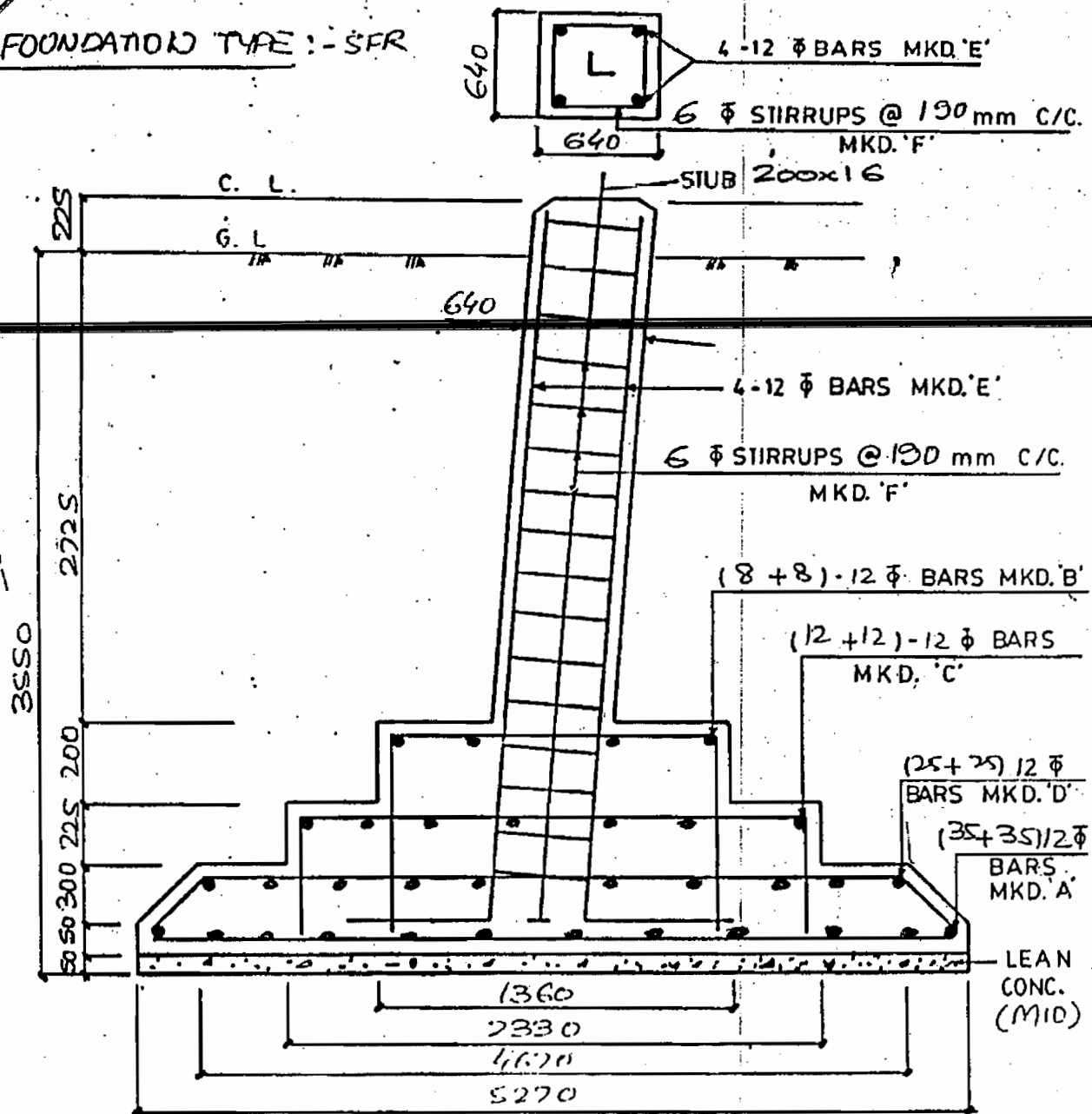
DRG. NO.

D-5350

PAGE

3 OF 4

FOUNDATION TYPE :- SFR



NOTES:-

- 1- ALL DIMENSIONS ARE IN mm.
- 2- CONCRETE COVER $\geq$ 50 mm. UNLESS OTHERWISE STATED.
- 3- CONCRETE MIX M15. UNLESS OTHERWISE STATED
- 4- REINFORCEMENT- DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

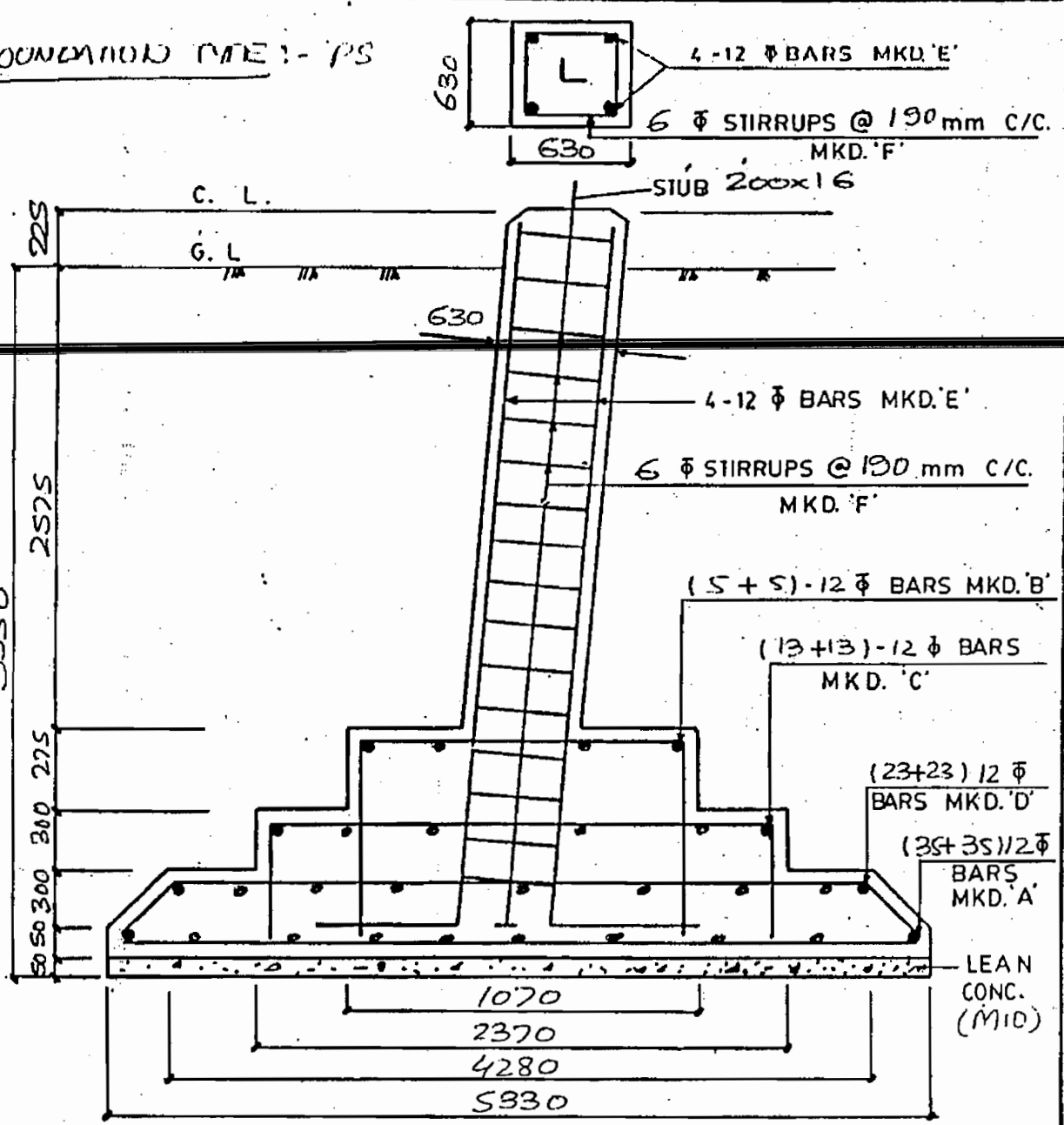
EXCAVATION VOL:- 315.58 m³CONCRETE VOL:- 46.43 + 5.55 = 51.98 m³

REINFORCEMENT :- 2761 Kgs

(96)

SAE (INDIA) LIMITED	CODE NO.	TYPE FD 60 TOWER	DRG. NO.	PAGE
	C1347	± 0	D-3318a	50F10

FOUNDATION ME:- PS



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
 2. CONCRETE COVER $\pm$ 50 mm. UNLESS OTHER WISE STATED.
 3. CONCRETE MIX M15. UNLESS OTHER WISE STATED
 4. REINFORCEMENT- DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.
- EXCAVATION VOL:- 408.41 m^3 - 450.10 m^3
- CONCRETE VOL:- $45.94 + 5.68 = 51.62 \text{ m}^3$
- REINFORCEMENT :- 2682 Kgs

Revision 'b' - Excavation Vol. revised

CHECK BY:	DATE
PREP BY:	DATE

Qty./ Tower

91

SAE

(INDIA) LIMITED

CODE NO.

C1347

TYPE FD 60 TOWER

± 0

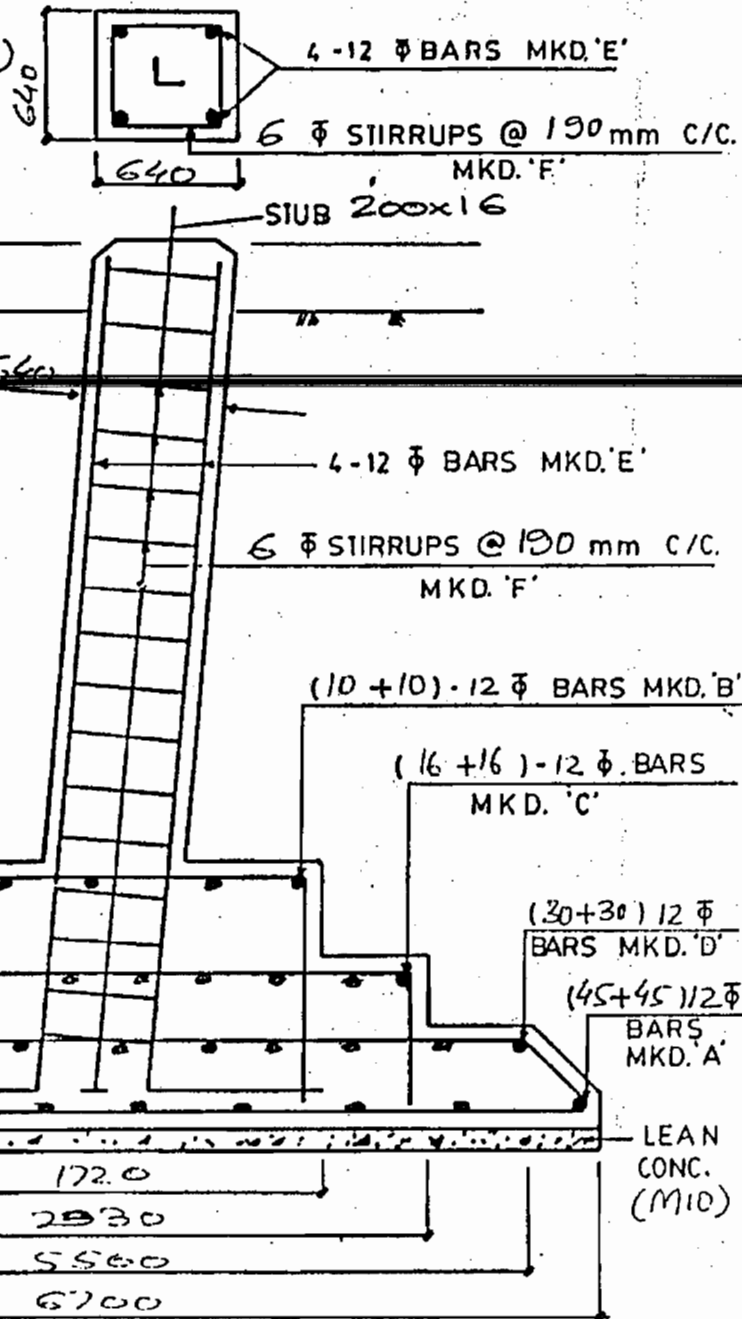
DRG. NO.

D-S397

PAGE

1 OF 4

FOUNDATION TYPE :- B.C. (WET)

**NOTES:-**

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15. UNLESS OTHER WISE STATED
4. REINFORCEMENT - DEFORMED BARS Fe-415 CONFIRMING TO

IS-178/IS-1139 AS MAY BE AVAILABLE.

EXCAVATION VOL. :- ~~632.44~~ m^3 :- 695.80 m^3 CONCRETE VOL. :- 68.96 + 8.98 = 77.93 m^3

REINFORCEMENT :- 4291 Kgs

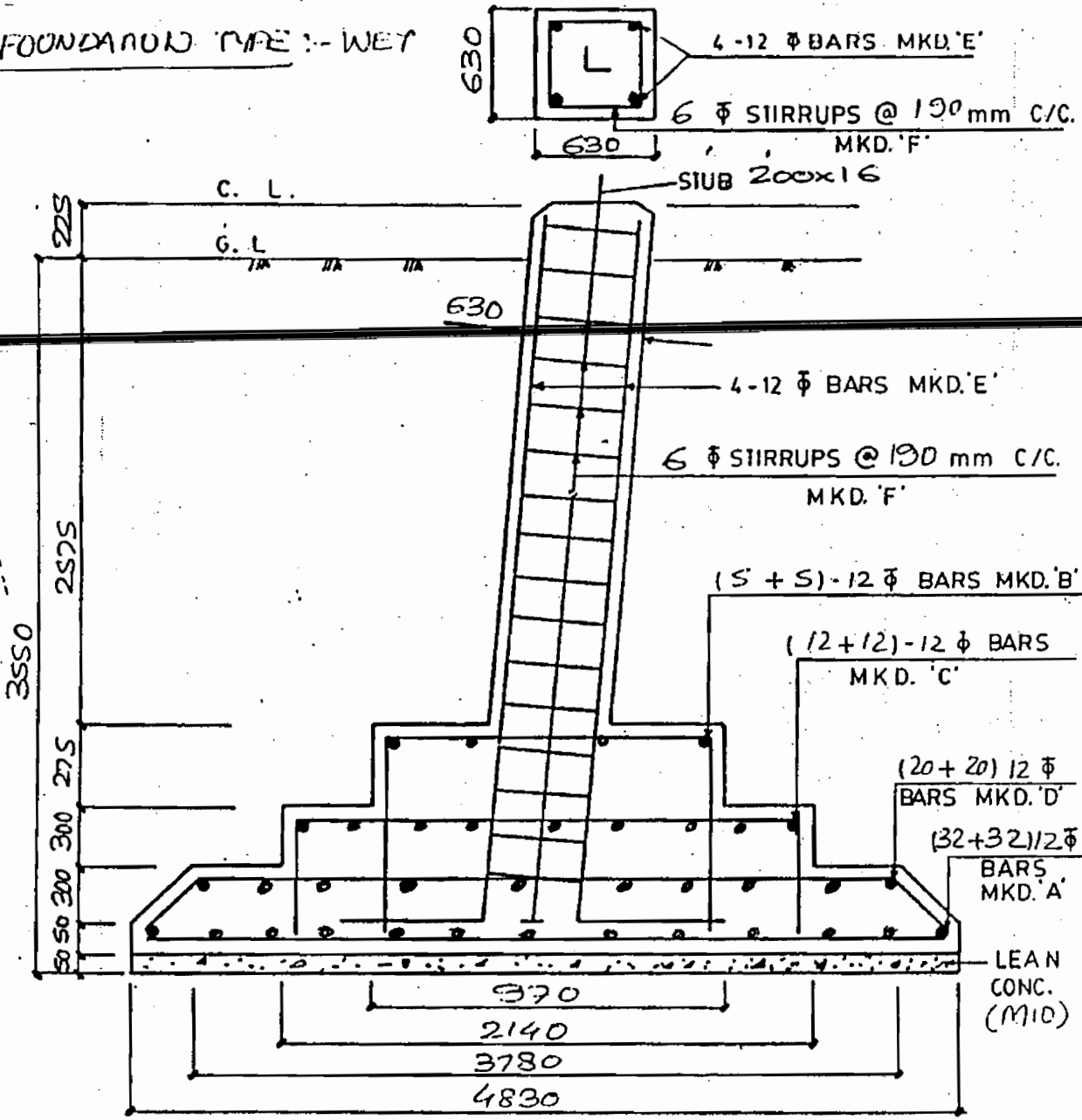
Rev. 'a' - Excavation Vol. Revised

93

(88)

SAE (INDIA) LIMITED	CODE NO.	TYPE FD 60 TOWER	DRG. NO.	PAGE
	C1347	± 0	D-3317a	3 OF 10

FOUNDATION TYPE :- WET



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO

IS-178/IS-1139 AS MAY BE AVAILABLE.

EXCAVATION VOL :- $(33 \times 27) m^3 = 373.70 m^3$

CONCRETE VOL :- $37.99 + 4.67 = 42.66 m^3$

REINFORCEMENT :- 2224 Kgs

Revision 'b' - Excavation Vol. Revised

95

SAE

(INDIA) LIMITED

CODE NO.

C1347

TYPE FD 60 TOWER

± 0

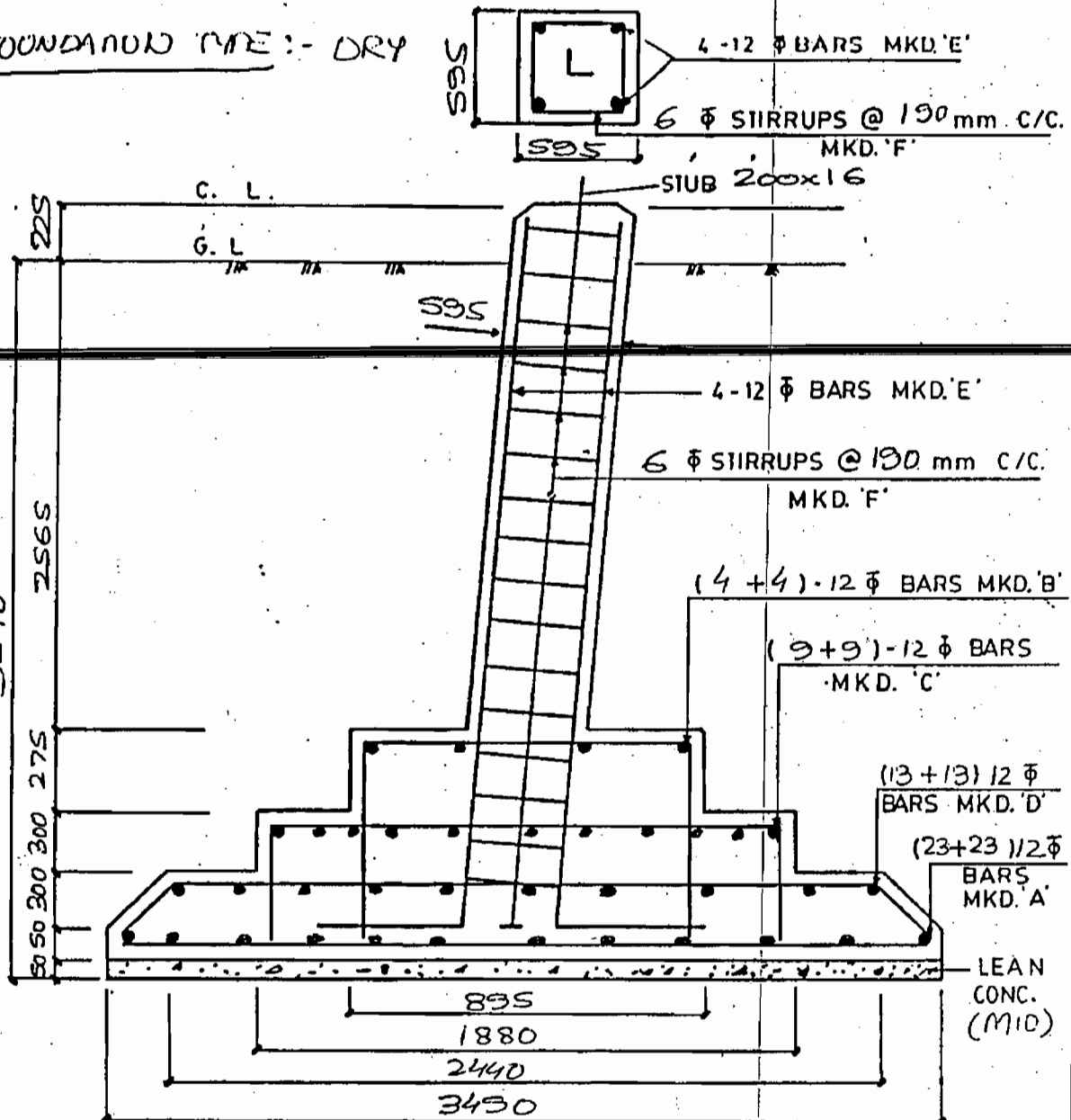
DRG. NO.

D-3316a

PAGE

1 OF 10

FOUNDATION TYPE :- DRY

**NOTES:-**

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER $\approx$ 50 mm. UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15. UNLESS OTHER WISE STATED
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

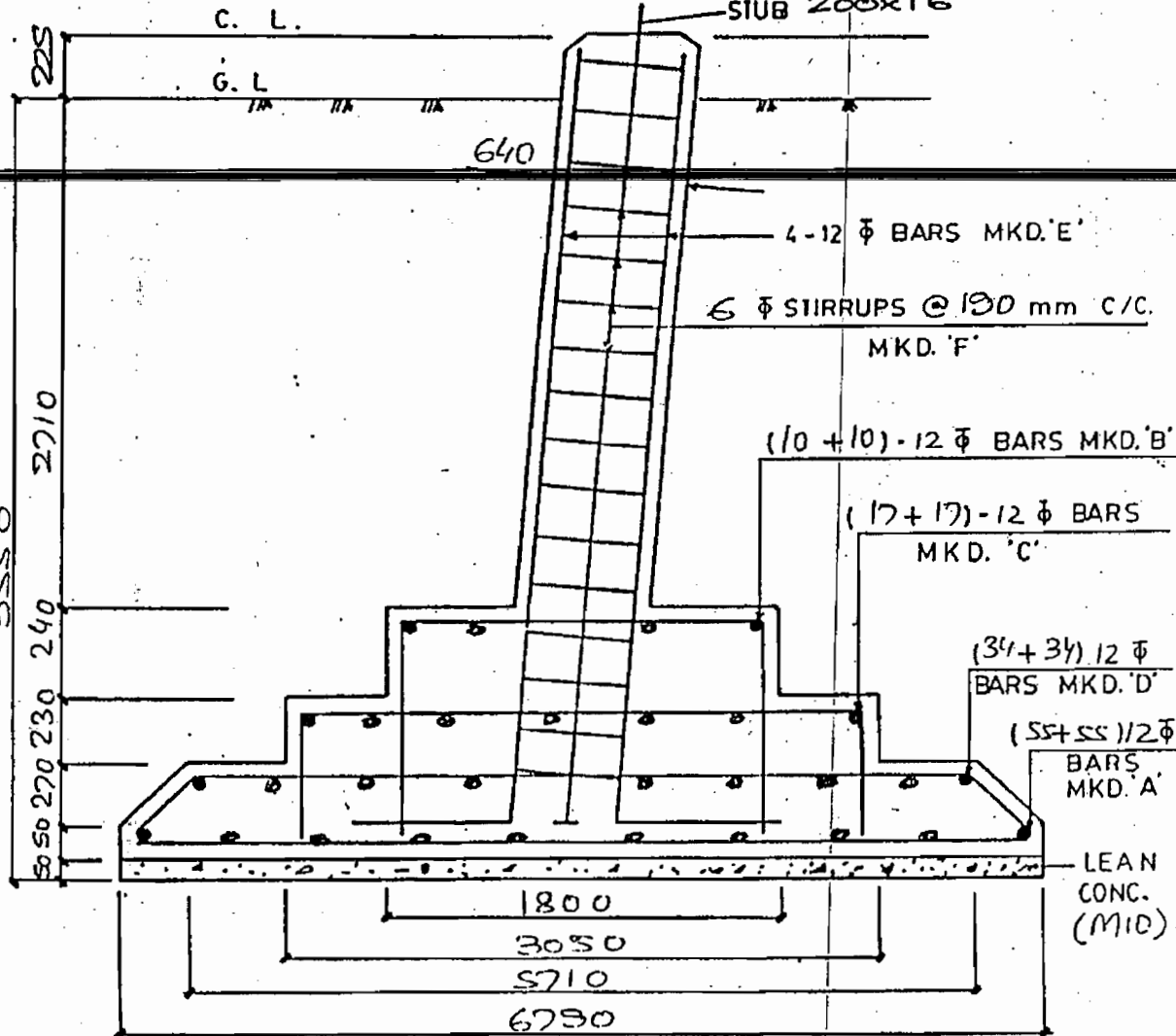
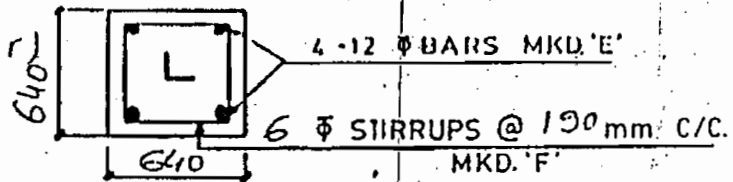
EXCAVATION VOL :- 172.47 m^3 - 203.40 m^3 CONCRETE VOL :- $22.17 + 2.44 = 24.61 \text{ m}^3$

REINFORCEMENT :- 1230 Kgs

Revision 'b' - Excavation Volume Rev

97

FOUNDATION (M.E.) :- BOWER



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15. UNLESS OTHER WISE STATED
4. REINFORCEMENT- DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

EXCAVATION VOL :- ~~654.68 m³~~ :- 713.81 m³

CONCRETE VOL :- 6793 + 9.22 = 77.21 m³

REINFORCEMENT :- 504.5 Kg-s

Revision 'a' - Excavation vol. revised 19



(INDIA) LIMITED

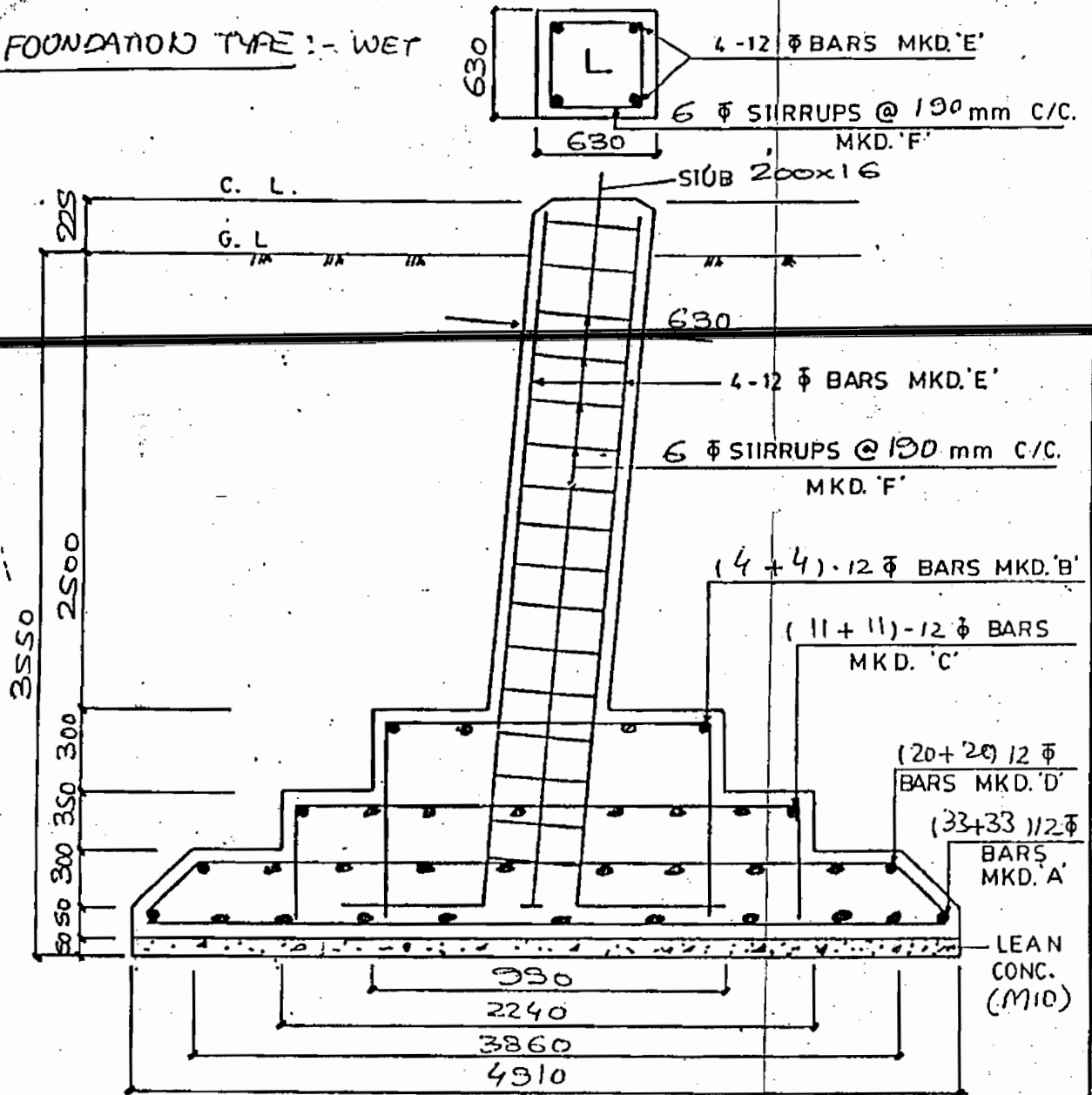
CODE NO.
C1347

TYPE FD 60 TOWER
+3/+6/+10

DRG. NO.
D-3324a

PAGE
3 OF 10

FOUNDATION TYPE :- WET



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15. UNLESS OTHER WISE STATED
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

EXCAVATION VOL :- 342.34 m^3 - 385.45 m^3
 CONCRETE VOL :- $40.53 + 4.82 = 45.35 \text{ m}^3$

REINFORCEMENT :- 2268 Kgs

Revision 'B' - Excavation Vol. corrected

PREP. BY:	CHECK. BY:	DATE

Qty./ Tower

10/11

RAE

(INDIA) LIMITED

CODEN NO.

C-1233

TYPE FD 6010 5/6/10 TOWER
HARD ROCK FDN.

DRG. NO

D-3534

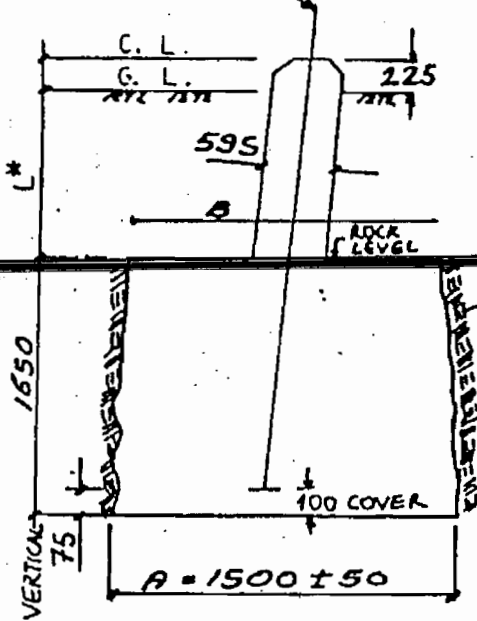
PAGE

1 OF 2

ASSM NC. { - 96100 KGS
+ 72150 KGS

ASSM-BWC { - 104200 KGS
+ 80300 KGS

STUB - L 200 x 200 x 16



VOLUME OF CONCRETE (m³)

$$1.55 \times 1.55 \times 1.65 = 3.9640$$

$$0.595 \times 0.595 \times 0.225 = 0.080$$

$$1.044$$

OVER LOAD OF CONCRETE (KGS)

$$0.080 \times 2210 = 179$$

$$3.9640 \times 800 = 3171$$

$$3350$$

BEARING

NC BWC

LOAD FROM TOWER (KG) 96100 104200

OVER LOAD OF CONCRETE (KG) 3350 3350

99450 107550

ULTIMATE LOAD = 218790 177458

AREA OF BASE (m²) = 1.450 x 1.450 = 2.1025 m²

ULTIMATE BEARING PRESSURE (KG / M²)

$$= \frac{218790}{2.1025} = 104062 \text{ kg/m}^2$$

$$< 125000 \text{ kg/m}^2$$

UPLIFT

MAXIMUM UPLIFT = 72150 80300

ULTIMATE UPLIFT (kg) 158730 132495

RESISTANCE OFFERED BY 24 (OS) BOLTS (kg)

IN SHEARING = 24 x 24 x 2.01 x 3160 = 304877 kg

IN BEARING = 24 x 1.6 x 1.0 x 5200 = 199680 kg

BOND OFFERED BY STUB (kg)

$$4 \times 20 \times 155.0 \times 16 = 186000 \text{ KG}$$

RESISTANCE TO UPLIFT BY STUB = 199680 + 186000 = 385680 > 158730 KG.

SURFACE AREA OF CONTACT BETWEEN ROCK &

$$\text{FOUNDATION} = 4 \times \frac{145 + 135}{2} \times 165 = 92400 \text{ cm}^2$$

FRICTIONAL FORCE DEVELOPED BETWEEN

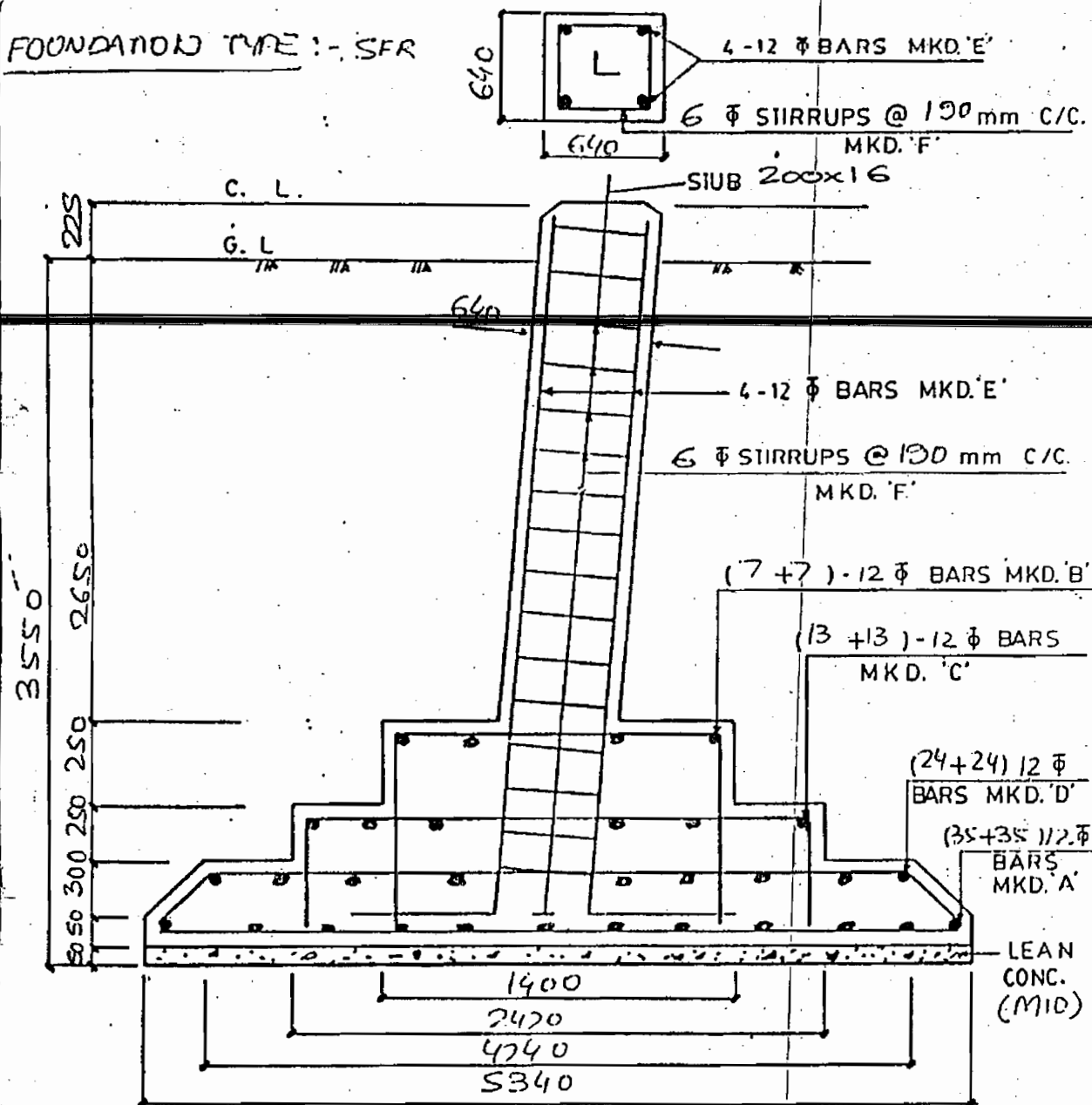
$$\text{ROCK & FOUN. @ } 1 \text{ kg/cm}^2 = 92400 > 80300 \text{ kg}$$

QUANTITY/TOWER

CONCRETE = 16.18 m³

EXCAVATION = 15.86 m³

FOUNDATION TYPE :- SFR



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHER WISE STATED.
3. CONCRETE MIX M15. UNLESS OTHER WISE STATED
4. REINFORCEMENT-DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

EXCAVATION VOL:- 325.02 m³

CONCRETE VOL:- 48.33 + 5.70 = 54.7 m³

REINFORCEMENT :- 2783 Kgs.



(INDIA) LIMITED

CODE NO.

C1347

TYPE FD 60 TOWER

+3/+6/+10

DRG. NO.

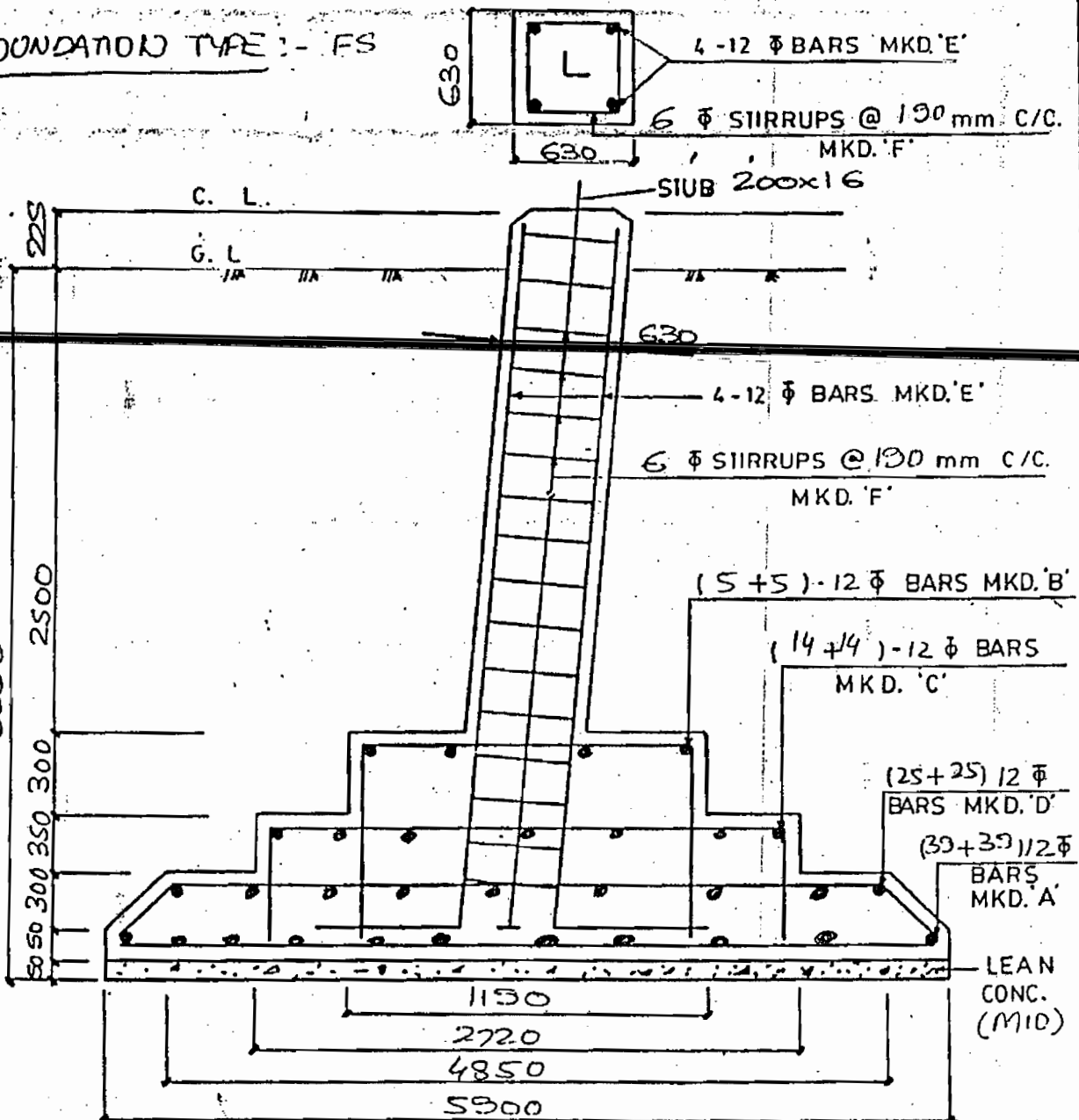
D-3326a

PAGE

7 OF 6

1107

FOUNDATION TYPE :- FS



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. CONCRETE COVER = 50 mm. UNLESS OTHERWISE STATED.
3. CONCRETE MIX M15. UNLESS OTHERWISE STATED.
4. REINFORCEMENT- DEFORMED BARS Fe-415 CONFIRMING TO IS-178/IS-1139 AS MAY BE AVAILABLE.

Excavation VOL: - 494.30 m^3 - 545.85 m^3

CONCRETE VOL: - $58.12 + 6.96 = 65.08 \text{ m}^3$

REINFORCEMENT :- 3245 Kgs

Revision 'b' - Excavation Vol. revised 16

CHECK BY:

DATE

PREP BY:

DATE

Qty./ Tower

1178

MADHYA PRADESH POWER TRANSMISSION COMPANY LIMITED

BILL OF MATERIAL FOR 400KV FD0 TYPE TOWER

S.No.	Particulars	Unit Weight of HT	Unit Weight of MS	Unit Weight of Bolts & Nuts	Total Weight in Kgs.	BOM No.
1	Stub & Cleats (Up to 10M)	325.68	56.64	5.03	387.35	BOM/FD0 STUBS & CLEATS UPTO 10M/1
2	Stub Setting Template (Up to 10M)	-	1257.84	26.69	1284.53	BOM/FD0 SST UPTO 10M/2
3	Stub & Cleats (18 & 25M)	389.44	56.64	5.03	451.11	BOM/FD0 STUBS & CLEATS 18M & 25M/1A
4	Stub Setting Template (18 & 25M)	-	1632.96	38.14	1671.10	BOM/FD0 SST 18M & 25M/2A
5	Super structure	2917.28	5943.06	309.43	9169.77	BOM/FD0/3
6	+3M Extensions	260.04	1201.56	58.19	1519.79	BOM/FD0+3M/4
7	+6M Extensions	499.92	1861.76	74.81	2436.49	BOM/FD0+6M/5
8	+10M Extensions	839.84	2776.96	115.63	3732.43	BOM/FD0+10M/6
9	+18M Extensions	1729.96	6026.48	208.85	7965.29	BOM/FD0+18M/7
10	+25M Extensions	2396.80	10094.40	322.38	12813.58	BOM/FD0+25M/8

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MADHYA PRADESH POWER TRANSMISSION COMPANY LIMITED

BILL OF MATERIAL FOR 400KV FD30 TYPE TOWER

S.No.	Particulars	Unit Weight of HT	Unit Weight of MS	Unit Weight of Bolts & Nuts	Total Weight in Kgs.	BOM No.
1	Stub & Cleats	755.68	131.88	8.30	895.86	BOM/FD30 STUBS & CLEATS /9
2	Stub Setting Template	-	2784.04	44.60	2828.64	BOM/FD30 SST /10
3	Super structure	8922.76	8660.00	700.81	18283.57	BOM/FD30/11
4	+3M Extensions	645.48	2474.32	93.15	3212.95	BOM/FD30 +3M/12
5	+6M Extensions	1192.52	3607.16	112.45	4912.13	BOM/FD30 +6M/13
6	+10M Extensions	2020.40	4573.44	164.21	6758.05	BOM/FD30 +10M/14

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BILL OF MATERIAL FOR 400KV FD60 TYPE TOWER

S.No.	Particulars	Unit Weight of HT	Unit Weight of MS	Unit Weight of Bolts & Nuts	Total Weight in Kgs.	BOM No.
1	Stub & Cleats	836.92	258.40	16.60	1111.92	BOM/FD60 STUBS & CLEATS /15
2	Stub Setting Template	-	4101.92	73.29	4175.21	BOM/FD60 SST /16
3	Super structure for Dead End Tower	11824.60	9828.58	769.75	22422.93	BOM/FD60/DE AD END/17A
4	Super structure for Deviation Tower	11095.68	10714.11	782.00	22591.79	BOM/FD60/DE VIATION/17B
5	+6M Extensions	1342.08	5073.56	181.44	6597.08	BOM/FD60 +6M EXTENSIONS/1 8
6	+10M Extensions	2275.80	6689.00	290.59	9255.39	BOM/FD60 +10M EXTENSIONS/1 9

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