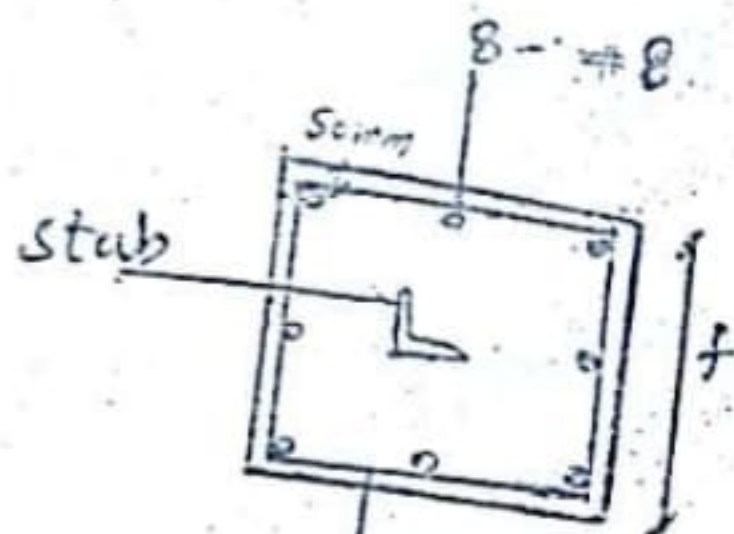
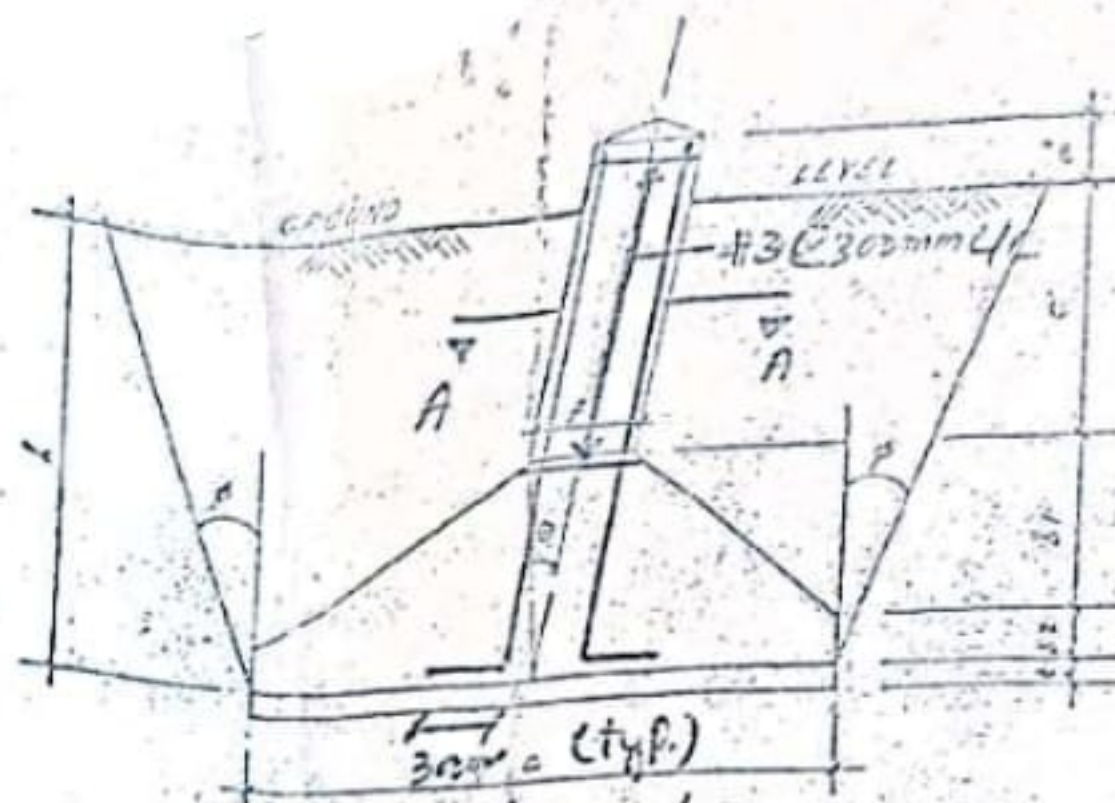


Drg No. PDW/TC-199



#3 @ 300mm c/c

SECTION A-A



NOTES

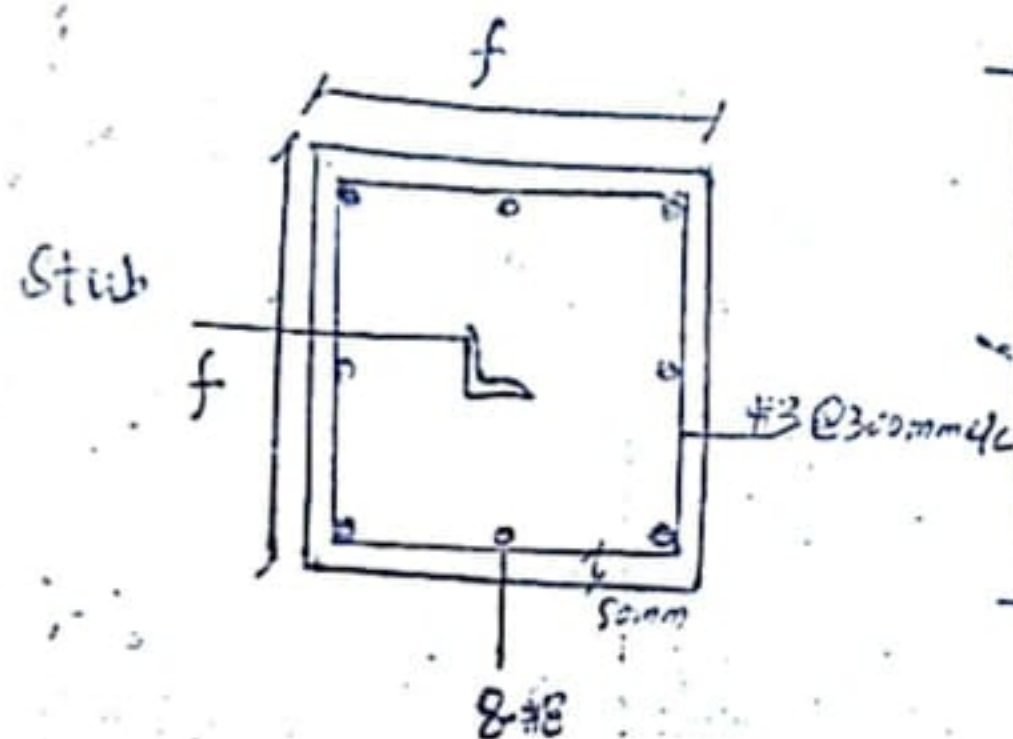
1. ALL CONCRETE SHOULD HAVE MINIMUM CYLINDER COMPRESSIVE STRENGTH OF 25 MPa (3000 PSI) AT 28 DAYS.
2. CONCRETE SHOULD BE VIBRATED WITH A VIBRATOR OF 7000 RPM MAXIMUM.
3. AGGREGATE SHOULD BE WELL GRADED AND MAXIMUM SIZE OF COARSE AGGREGATE SHOULD BE 20mm.
4. CONCRETE SHOULD BE MIXED BY MECHANICAL MEANS.
5. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS.

E- All reinforcing bars shall comply with ASTM A615.

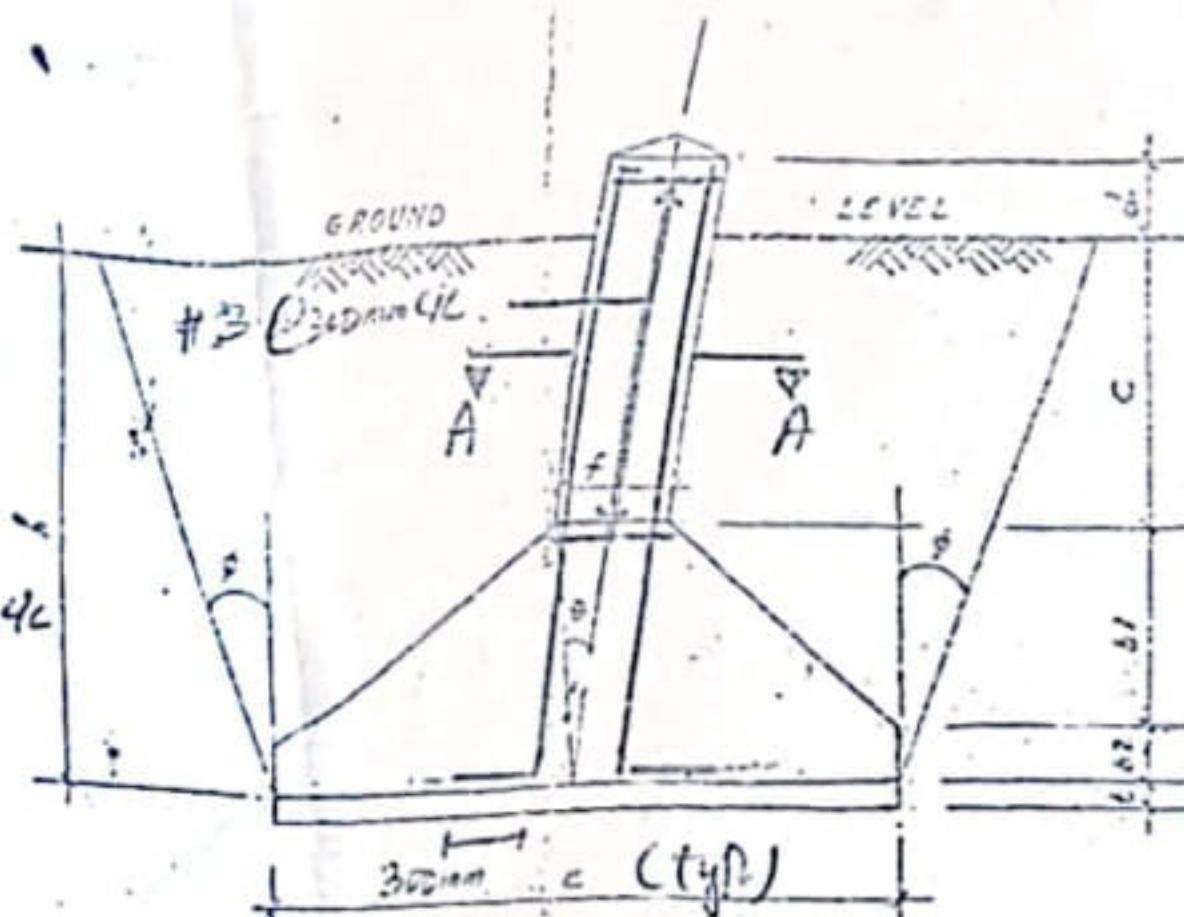
TOWER TYPE	ANGLE OF UPLIFT ϕ	STUB ANGLE θ	DIMENSIONS OF FOOTING IN mm							VOLUME OF CUT m^3	CONCRETE		SOIL		UPLIFT FACTOR	SCARING POLYMER %
			a	b1	b2	c	d	e	f		VOLUME m^3	WEIGHT kN	VOLUME m^3	WEIGHT kN		
ZM-30 WITH 10 EXT.	20	14.95	2500	800	100	2140	150	60	4/6 600	35.11	2.77	6557.44	32.16	5329.26	1.0449	1.1335

MAX UPLIFT = 5715.4 kN
MAX COMPRESSION = 57320.6 kN

PAKISTAN			DESIGN
WATER AND POWER DEVELOPMENT AUTHORITY			DEPARTMENT
DR. H. M. AZHAR SHAH	CHIEF ENGINEER	CHIEF ENGINEER	CHIEF ENGINEER
FOUNDATION OF ZM 30			
TYPE TOWER WITH			
10 EXTENSION			
DATE: 2-2-1981	SCALE: 1/2	DATE: 2-2-1981	
DING IND. PDW/TC-199			



SECTION A-A



NOTES

1. ALL CONCRETE SHOULD HAVE MINIMUM CYLINDER CRUSHING STRENGTH OF 21N/mm^2 (3000 PSI) AT 28 DAYS
2. CONCRETE SHOULD BE VIBRATED WITH A VIBRATOR OF 1000 RPM (MAXIMUM)
3. AGGREGATE SHOULD BE WELL GRADED AND MAXIMUM SIZE OF COARSE AGGREGATE SHOULD BE 20mm
4. CONCRETE SHOULD BE MIXED BY MECHANICAL MEANS
5. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS
6. All reinforcing bars shall comply with ASTM A615.

TOWER TYPE	ANGLE OF UPLIFT ϕ	STUB ANGLE θ	DIMENSIONS OF FOOTING IN mm							VOLUME OF CUT m^3	CONCRETE		SOIL		UPLIFT FACTOR	BEARING PRESSURE N/m^2
			a	b1	b2	c	d	e	f		VOLUME m^3	HEIGHT m	VOLUME m^3	HEIGHT m		
ZM-60 WITH 10 EXT.	20	17.9	2400	800	100	2100	150	80	4/5 600	33.41	3.24	7455.75	35.20	56292.03	1.0302	1.4725

MAX. UPLIFT = 61631 N

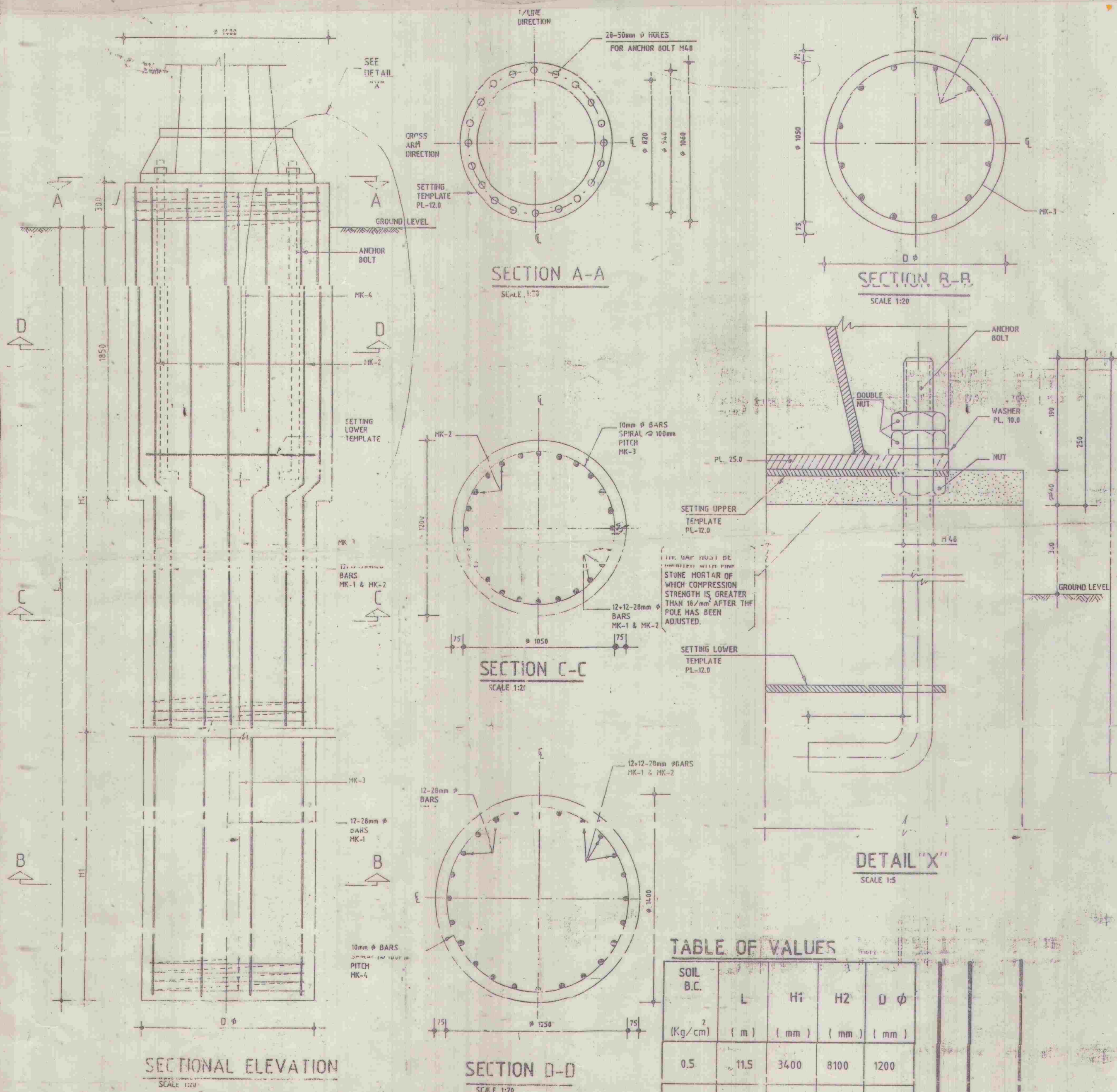
MAX. COMPRESSION = 78715 N

PAKISTAN				DESIGN	
WATER AND POWER DEVELOPMENT AUTHORITY				DEPARTMENT	
DESIGNED	AZHAR IQBAL		FOUNDATION OF ZM 60 TYPE TOWER WITH 10 EXTENSION		
CHECKED	SYDULAH RAJUL				
JUNIOR ENGINEER	MUHAMMAD RAFIQUE				
SENIOR ENGINEER	MUHAMMAD A. RAJUL				
DESIGNED	F. IFTIKHAR HUSSAIN		SCALE ✓	DATE 25-2-17	
CHECKED	TAMM ARIF		DWG. NO. PDW/TC-200		

NOTES ADDED

REVISIONS

DATE



BAR BENDING SCHEDULE

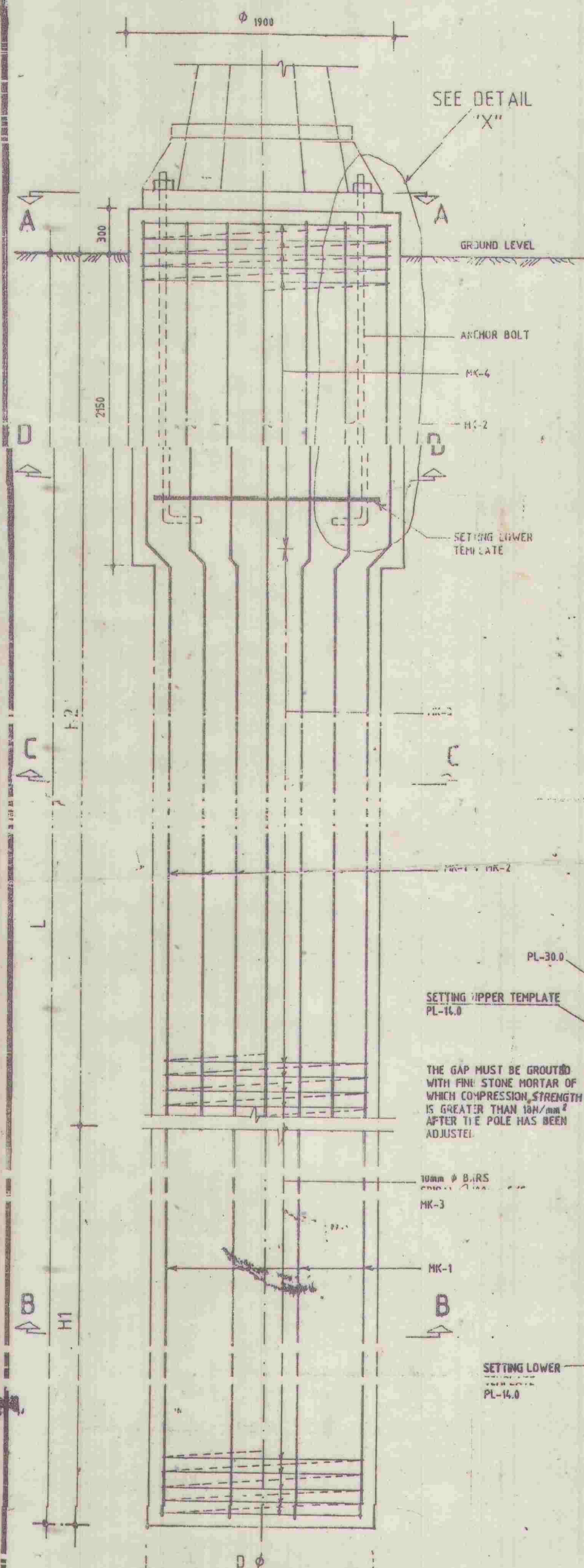
MK	DIA OF BAR (mm)	LENGTH OF BAR (mm)	NO. OF BARS	TOTAL LENGTH OF BARS (m)	SHAPE OF BAR	S.B.C. (Kg/cm ²)
1	28	11700	12	140.4	1975 9575	0.5
		9700	12	116.4	1975 7575	1.0
2	28	8375	12	100.5	1975 6250	0.5
		6975	12	83.7	1975 4850	1.0
3	10	3630	90	355.7	330 R 525	0.5
		3630	70	283.1	330 R 625	1.0
4	10	4320	22	95.04	395 R 625	0.5 & 1.0

NOTES.

- 1- ALL CONCRETE SHOULD HAVE MINIMUM CYLINDER CRUSHING STRENGTH OF 28 N/mm² AT 28 DAYS.
- 2- REINFORCEMENT SHOULD BE BILLET STEEL INTERMEDIATE GRADE DEFORMED BARS WITH MINIMUM YIELD STRENGTH OF 281 N/mm² CONFORMING TO ASTM-A-615.
- 3- CONCRETE SHOULD BE MIXED BY MECHANICAL MEANS.
- 4- CONCRETE SHOULD BE VIBRATED WITH A VIBRATOR OF 7000 RPM MAXIMUM.
- 5- AGGREGATE SHOULD BE WELL GRADED AND MAXIMUM SIZE OF COARSE AGGREGATE SHOULD BE 20mm CONFORMING TO ASTM C-33.
- 6- COARSE SAND SHOULD BE FREE FROM SILT AND DUST.
- 7- MINIMUM CLEAR COVER OF 75mm SHOULD BE PROVIDED WHERE NOT SHOWN.
- 8- BAR SPIRALS SHOULD BE WELDED ELECTRICALLY.
- 9- REINFORCEMENT BARS SHALL BE BENT RADially INWARD WHEN PROVIDED LAP IN PILES.
- 10- SPLICES SHOULD BE AVOIDED AS FAR AS POSSIBLE.
- 11- IF UNAVOIDABLE, OVERLAP SHOULD BE OF MINIMUM 40 TIMES BAR DIAMETER AND LOCATION OF SPLICES SHOULD BE STAGGERED.
- 12- DRILLING OF BORE HOLES AND DRIVING OF PILES SHOULD BE CARRIED OUT BY STANDARD METHODS.
- 13- CONTROL OF AXIAL ALIGNMENT SHOULD BE STRICTLY OBSERVED/VERIFIED.
- 14- CONSTRUCTION METHOD SHOULD ENSURE THAT THE PILE HOLE IS PROPERLY LOCATED IN PLUMB THE SOIL ADJACENT TO THE HOLE SHOULD NOT BE UNDOULY DISTURBED AND A CLEAR HOLE OF SPECIFIED DIMENSIONS SHOULD BE PROVIDED FOR THE ENTIRE LENGTH. CONCRETE OF SPECIFIED STRENGTH AND DIMENSION SHOULD BE POURED CONTINUOUSLY IN A MANNER TO AVOID SEGREGATION.
- 15- THE INSTALLATION OF PILES SHOULD BE PERFORMED IN SUCH A MANNER SO AS TO ENSURE THE STRUCTURAL INTEGRITY AND TO ACCOMPLISH THE DESIRED MAXIMUM POSSIBLE INTERACTION WITH THE SOIL SO THAT THE PILES MAY ADEQUATELY FULFIL ITS PURPOSE.
- 16- PILE HOLE SHOULD BE INSPECTED BEFORE POURING OF CONCRETE TO ENSURE THAT IT HAS NOT BEEN CLOSED IN OR PARTIALLY FILLED BY SOIL MOVEMENTS OR PRESSURE.
- 17- POTABLE WATER SHOULD BE USED FOR ALL CONCRETING AND CURING.
- 18- FOR FIRST 28 DAYS THE CONCRETE ABOVE N.S.L. SHOULD BE KEPT UNDER CONTINUOUS WET BURLAPS OR APPLY CURING MEMBRANE.
- 19- ALL MATERIAL AND WORKMANSHIP SHOULD BE ACCORDING TO STANDARD SPECIFICATIONS AS LAID DOWN IN WAPDA C.S.R. LATEST EDITION.
- 20- IF THE DRAWING IS FELT SILENT OR ANY CONFUSION ARISES IN DRAWING, THE MATTER SHOULD BE REFERRED BACK TO DESIGN NTDC.
- 21- ALL ACTIVITIES OF EXECUTION OF CONSTRUCTION WORKS SHOULD BE CARRIED OUT UNDER THE SUPERVISION OF EXECUTIVE ENGINEER INCHARGE STRICTLY IN ACCORDANCE WITH THE DESIGN/DRAWING.
- 22- IT IS TO BE ENSURED THAT THE TEMPLATE BEING USED AT THE TIME OF CONCRETING OF THE BOLTS IS MATCHING WITH THE POLE TO BE ERECTED (SR. NOS. OF BOLTS AND TEMPLATE SHOULD BE SAME).
- 23- IN CASE OF UNFAVORABLE SOIL CONDITIONS WHERE SPECIAL PROTECTIONS ARE REQUIRED OR IF LOCATION FALLS WITHIN MULLAH BED OR AT THE EDGE OF MULLAH BED IT SHOULD BE REFERRED BACK TO DESIGN NTDC.
- 24- THIS DRAWING/DOCUMENT IS THE PROPERTY OF DESIGN NTDC, ANY PART THEREOF OR WHOLE CANNOT BE REPRODUCED ELECTRONICALLY OR OTHERWISE OR BECOME A PART OF ANY RETRIEVAL SYSTEM WITHOUT PRIOR PERMISSION OF DESIGN NTDC.
- 25- THIS DRAWING/DOCUMENT CAN ONLY BE USED FOR THE SPECIFIC PURPOSE/ SITUATION/ LOCATION FOR WHICH IT HAS BEEN APPROVED/ ISSUED.
- 26- ALL DIMENSIONS ARE GIVEN IN MILLIMETERS.

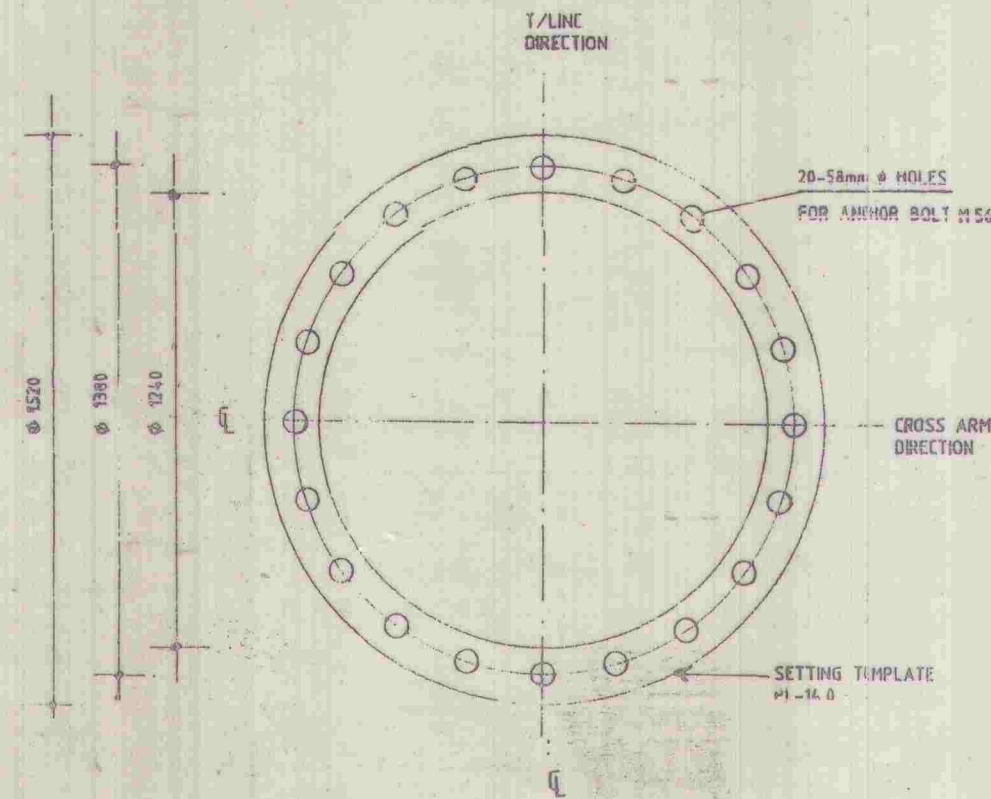
NATIONAL TRANSMISSION AND DESPATCH COMPANY				DESIGN NTDC
DRAWN	MUHAMMAD SHAFIQUE			
CHECKED	SH. SHAHID MEHMOOD			
ASSISTANT MANAGER				
MANAGER	AZIZ DURRANI			
MANAGER	MUHAMMAD RAFIQ			
CHIEF ENGINEER	NAZAR ABBAS			
SCALE AS SHOWN		DATE: 30-09-2010		
DWG. NO. / PDW/TC-892				

PDW/TC-892



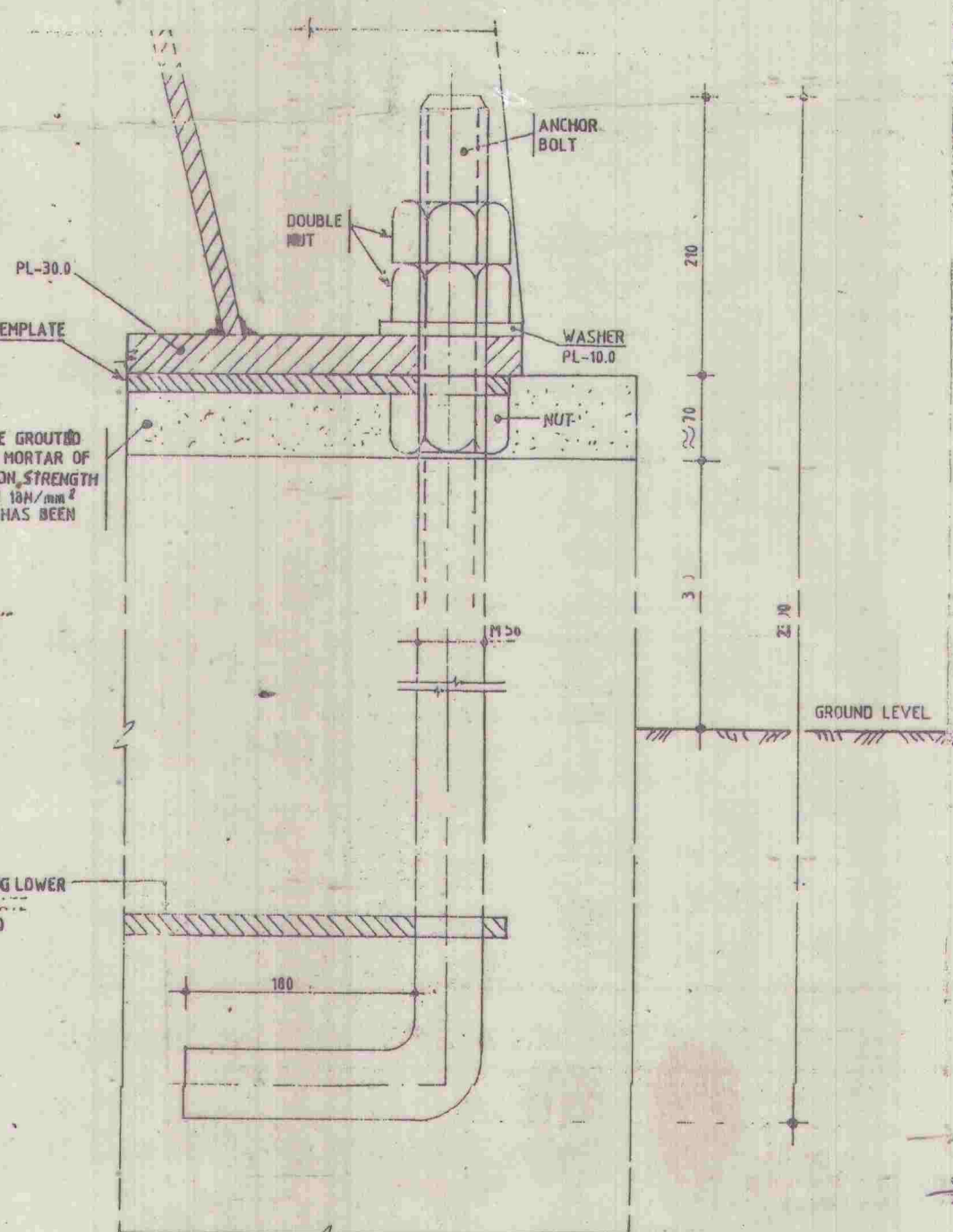
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SCALE:- 1:30



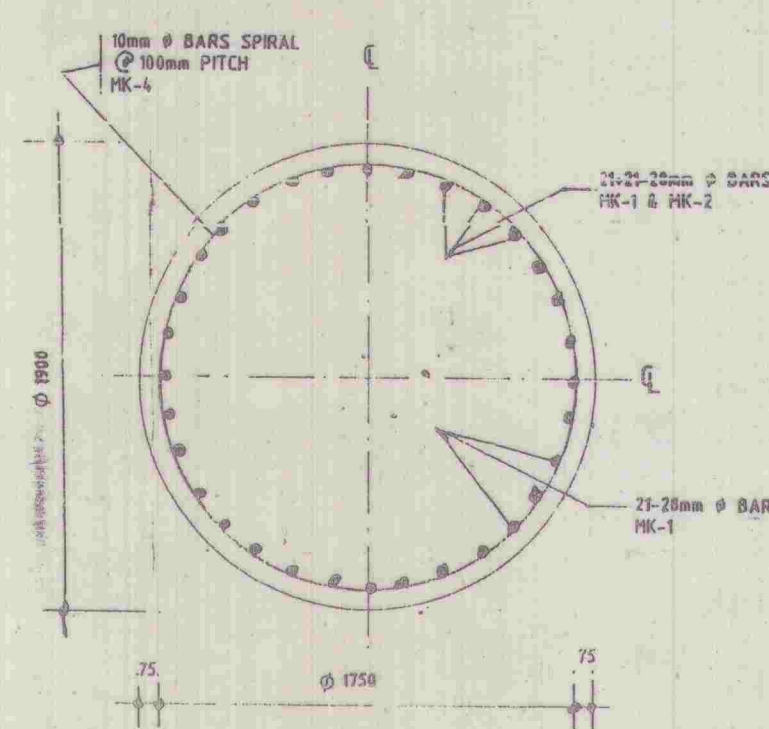
SECTION A-A

SCALE:- 1:20



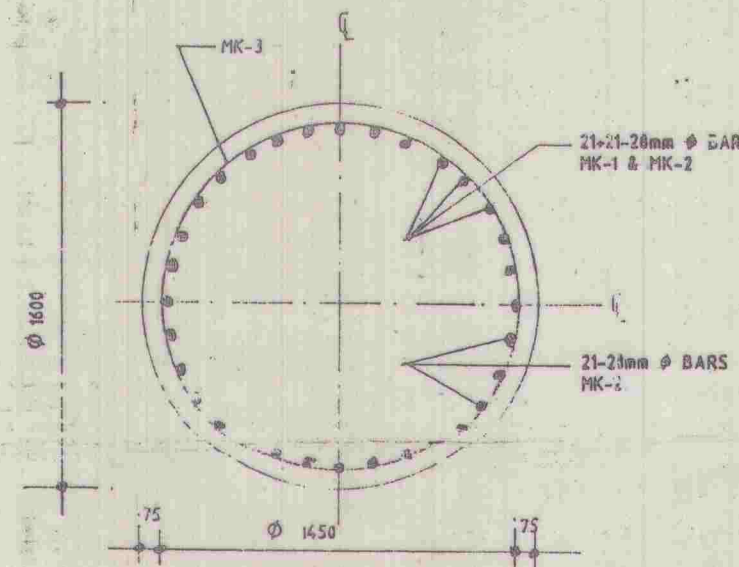
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SCALE:- 1:5



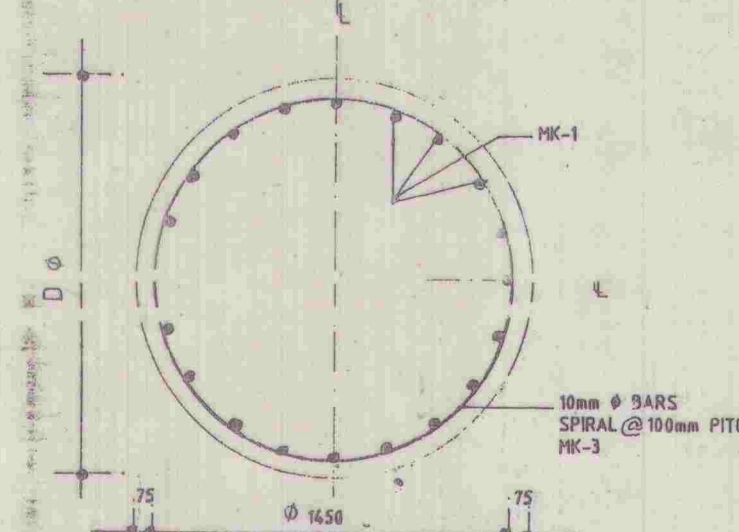
SECTION D-D

SCALE:- 1:30



SECTION C-C

SCALE:- 1:30



SECTION B-B

SCALE:- 1:30

TABLE OF VALUES

SOIL B.C.	L	H1	H2	D φ
(Kg/cm ²)	(m)	(mm)	(mm)	(mm)
0.5	14.5	4300	10200	1600
1.0	13.0	3900	9100	1600

BAR BENDING SCHEDULE

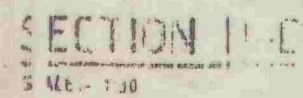
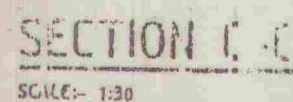
MK #	DIA. OF BAR (mm)	LENGTH OF BAR (mm)	NO. OF BARS	TOTAL LENGTH OF BARS (m)	SHAPE OF BAR	S.B.C. (Kg/cm ²)
1	28	14750	21	309.8	2275 10775	0.5
2	28	13250	21	278.3	2275 10775	1.0
3	10	5010	125	626.3	455 R 725	0.5
4	10	5010	110	551.1	455 R 725	1.0
5	10	6050	25	151.3	550 R 875	0.5 & 1.0

NOTES

- ALL CONCRETE SHOULD HAVE MINIMUM CYLINDER CRUSHING STRENGTH OF 28N/mm² AT 28 DAYS.
- REINFORCEMENT SHOULD BE BILLET STEEL INTERMEDIATE GRADE DEFORMED BARS WITH MINIMUM YIELD STRENGTH OF 28N/mm² CONFORMING TO ASTM A-615.
- CONCRETE SHOULD BE MIXED MECHANICALLY.
- CONCRETE SHOULD BE VIBRATED WITH A VIBRATOR OF 7000 RPM MAXIMUM.
- AGGREGATE SHOULD BE WELL GRADED AND MAXIMUM SIZE OF COARSE AGGREGATE SHOULD BE 20mm CONFORMING TO ASTM C-33.
- COARSE SAND SHOULD BE FREE FROM SILT AND DUST.
- MINIMUM CLEAR COVER OF 75mm SHOULD BE PROVIDED WHERE NOT SHOWN.
- BAR SPIRALS SHOULD BE WELDED ELECTRICALLY.
- REINFORCEMENT BARS SHALL BE BENT RADially INWARD WHEN PROVIDED LAP IN PILES.
- SPLICES SHOULD BE AVOIDED AS FAR AS POSSIBLE.
- IF UNAVOIDABLE, OVERLAP SHOULD BE OF MINIMUM 40 TIMES BAR DIAMETER AND LOCATION OF SPLICES SHOULD BE STAGGERED.
- DRILLING OF BORE HOLES AND DRIVING OF PILES SHOULD BE CARRIED OUT BY STANDARD METHODS.
- CONTROL OF AXIAL ALIGNMENT SHOULD BE STRICTLY OBSERVED/VERIFIED.
- CONSTRUCTION METHOD SHOULD ENSURE THAT THE PILE HOLE IS PROPERLY LOCATED IN PLUMB, THE SOIL ADJACENT TO THE HOLE SHOULD NOT BE UNDULY DISTURBED AND A CLEAN HOLE OF SPECIFIED DIMENSIONS SHOULD BE PROVIDED FOR THE ENTIRE LENGTH. CONCRETE OF SPECIFIED STRENGTH AND DIMENSION SHOULD BE POURED CONTINUOUSLY IN A MANNER TO AVOID SEGREGATION.
- IF INSTALLATION OF PILES SHOULD BE DESIGNED IN SUCH A MANNER SO AS TO ENSURE THE STRUCTURAL INTEGRITY AND TO ACCOMPLISH THE DESIRED DRAINAGE.
- PILE HOLE SHOULD BE INSPECTED BEFORE POURING OF CONCRETE TO ENSURE THAT IT HAS NOT BEEN CLOSED IN OR PARTIALLY FILLED BY SOIL MOVEMENTS OR PRESSURE.
- POTABLE WATER SHOULD BE USED FOR ALL CONCRETING AND CURING.
- FOR FIRST 28 DAYS THE CONCRETE ABOVE N.S.L. SHOULD BE KEPT UNDER CONTINUOUS WET BURLAPS OR APPLY CURING MEMBRANE.
- ALL MATERIAL AND WORKMANSHIP SHOULD BE ACCORDING TO STANDARD SPECIFICATIONS AS LAID DOWN IN WAPDA C.S.R. LATEST EDITION.
- IF THE DRAWING IS SILENT OR ANY CONFUSION ARISES IN DRAWING, THE MATTER SHOULD BE REFERRED BACK TO DESIGN NTDC.
- ALL ACTIVITIES OF EXECUTION OF CONSTRUCTION WORKS SHOULD BE CARRIED OUT UNDER THE SUPERVISION OF EXECUTIVE ENGINEER INCHARGE STRICTLY IN ACCORDANCE WITH THE DESIGN/DRAWING.
- IT IS TO BE ENSURED THAT THE TEMPLATE BEING USED AT THE TIME OF CONCRETING OF THE BOLTS IS MATCHING WITH THE POLE TO BE ERECTED (SR. NOS. OF POLES AND TEMPLATE SHOULD BE SAME).
- IN CASE OF UNFAVORABLE SOIL CONDITIONS WHERE SPECIAL PROTECTIONS ARE REQUIRED OR IF LOCATION FALLS WITHIN NULLAH BED OR AT THE EDGE OF NULLAH IT SHOULD BE REFERRED BACK TO DESIGN NTDC.
- WHOLE CANNOT BE REPRODUCED REPRODUCED OR OTHERWISE OR PART THEREOF OR OF ANY RETRIEVAL SYSTEM WITHOUT PRIOR PERMISSION OF DESIGN NTDC.
- THIS DRAWING/DRAWING CAN ONLY BE USED FOR THE SPECIFIC PURPOSE/SITUATION/LOCATION FOR WHICH IT HAS BEEN APPROVED/ISSUED.
- ALL DIMENSIONS ARE GIVEN IN MILLIMETERS.

NATIONAL TRANSMISSION AND DEPARTCH COMPANY				NESIGN NTDC	
DRAWN	RIAZ AHMAD	Checked	SH. SHAHID MEHMOOD	FOUNDATION FOR "SP-D" TYPE 132KV D/C POLE NINGBO LIAOYUAN LIGHTING CO. LTD. CHINA DRAWING NO. SP-D-00.	
CHECKED	SH. SHAHID MEHMOOD	ASSISTANT			
DEPUTY MANAGER	A. Z. K. DURRANI	MANAGER	MUHAMMAD RAFOO	SCALE:- AS SHOWN	DATED:- 30-09-2010
MANAGER T/LINE	MUHAMMAD RAFOO	ENGINEER	HAZAR ABBAS	DWG.NO. PDW/TC- 893	

PDW/TC:893



SOIL H.C	H1	H2	D. 6
(g/cm ³)	(mm)	(mm)	(mm)
0.5	19.0 21.4	5700 13200 15100	1100
1.0	17.0	5100	1100

1-	01-12-21
NO.	DATE

CONCRETE EXPOSED AND
REINFORCED

- 1- ALL CONCRETE SHOULD HAVE MINIMUM CYLINDER CRUSHING STRENGTH OF 28 N/mm² AT 28 DAYS.
- 2- REINFORCEMENT SHOULD BE BILLET STEEL / INTERMEDIATE GRADE / DEFORMED BARS WITH MINIMUM YIELD STRENGTH OF 281 N/mm² CONFORMING TO ASTM-A-615.
- 3- CONCRETE SHOULD BE MIXED BY MECHANICAL MEANS.
- 4- CONCRETE SHOULD BE VIBRATED WITH A VIBRATOR OF 7000 RPM MAXIMUM.
- 5- AGGREGATE SHOULD BE WELL GRADED AND: MAXIMUM SIZE OF COARSE AGGREGATE SHOULD BE 20mm CONFORMING TO ASTM C-33.
- 6- COARSE SAND SHOULD BE FREE FROM SILT AND DUST.
- 7- MINIMUM CLEAR COVER OF 75mm SHOULD BE PROVIDED WHERE NOT SHOWN.
- 8- BAR SPIRALS SHOULD BE WELDED ELECTRICALLY.
- 9- REINFORCEMENT BARS SHALL BE BENT RADIALLY INWARD WHEN PROVIDED LAP IN PILES.
- 10- SPLICES SHOULD BE AVOIDED AS FAR AS POSSIBLE.
- 11- IF UNAVOIDABLE, OVERLAP SHOULD BE OF MINIMUM 40 TIMES BAR DIAMETER AND LOCATION OF SPLICES SHOULD BE STAGGERED.
- 12- DRILLING OF BORE HOLES AND DRIVING OF PILES SHOULD BE CARRIED OUT BY STANDARD METHODS.
- 13- CONTROL IF AXIAL ALIGNMENT SHOULD BE STRICTLY OBSERVED / VERIFIED.
- 14- CONSTRUCTION METHOD SHOULD ENSURE THAT THE PILE HOLE IS PROPERLY LOCATED IN PLUMB, THE SOIL ADJACENT TO THE HOLE SHOULD NOT BE UNNECESSARILY DISTURBED AND A CLEAN BED OF COMPACTED CRUSHED SOIL SHOULD BE PROVIDED FOR THE ENTIRE LENGTH. CONCRETE OF SPECIFIED STRENGTH AND DIMENSION SHOULD BE POURED CONTINUOUSLY IN A MANNER TO AVOID SEGREGATION.
- 15- THE INSTALLATION OF PILES SHOULD BE PERFORMED IN SUCH A MANNER SO AS TO ENSURE THE STRUCTURAL INTEGRITY AND TO ACCOMPLISH THE DESIRED MAXIMUM POSSIBLE INTERACTION WITH THE SOIL SO THAT THE PILES MAY ADEQUATELY FULFIL ITS PURPOSE.
- 16- PILE HOLE SHOULD BE INSPECTED BEFORE POURING OF CONCRETE TO ENSURE THAT IT HAS NOT BEEN CLOSED IN OR PARTIALLY FILLED BY SOIL MOVEMENTS OR PRESSURE.
- 17- POTABLE WATER SHOULD BE USED FOR ALL CONCRETING AND CURING.
- 18- FOR FIRST 28 DAYS THE CONCRETE ABOVE G.L. SHOULD BE KEPT UNDER CONTINUOUS WET BURLAPS OR APPLY CURING MEMBRANE.
- 19- ALL MATERIAL AND WORKMANSHIP SHOULD BE ACCORDING TO STANDARD SPECIFICATIONS AS LAID DOWN IN WAPDA C.S.R. LATEST EDITION.
- 20- IF THE DRIVING IS F.L.T. SILENT OR ANY CESSION ARISES IN DRIVING, THE MATTER SHOULD BE REFERRED BACK TO DESIGN NTOC.
- 21- ALL ACTIVITIES OF EXECUTION OF CONSTRUCTION WORKS SHOULD BE CARRIED OUT UNDER THE SUPERVISION OF EXECUTIVE ENGINEER IN CHARGE STRICTLY IN ACCORDANCE WITH THE DESIGN / DRAWING.
- 22- IT IS TO BE ENSURED THAT THE TEMPLATE, IF USED AT THE TIME OF CONCRETING OF THE BOLT, IS MATCHING WITH THE PILE TO BE ERECTED (I.E. NO. OF POLES AND TEMPLATE SHOULD BE SAME).
- 23- IN CASE OF UNFAVORABLE SOIL CONDITIONS WHERE SPECIAL PROTECTIONS ARE REQUIRED OR IF LOCATION FALLS WITHIN A LAY BED OR AT THE EDGE OF MULLAH IT SHOULD BE REFERRED BACK TO DESIGN NTOC.
- 24- THIS DRAWING / DOCUMENT IS THE PROPERTY OF: DESIGN NTOC, ANY PART THEREOF OR WHOLE CANNOT BE REPRODUCED ELECTRICALLY OR OTHERWISE OR BECOME A PART OF ANY RETRIEVAL SYSTEM WITHOUT PRIOR PERMISSION OF DESIGN NTOC.
- 25- THIS DRAWING / DOCUMENT CAN ONLY BE USED FOR THE SPECIFIC PURPOSE / SITUATION / LOCATION FOR WHICH IT HAS BEEN APPROVED / ISSUED.
- 26- ALL DIMENSIONS ARE GIVEN IN MILLIMETERS.

NATIONAL TRANSMISSION AND DISTRIBUTION COMPANY		DESIGN NTJC
DRAWN BY 15 G. DAR	APPROVED BY [Signature]	FOUNDATION FOR "SP-G" TYPE 132KV D/C POLE
CHECKED BY S. Y. HAMMO F. B. JOEL	[Signature]	
ASSISTANT MANAGER		
DEPUTY MANAGER	A. E. K. DURRANI	
MANAGER T. LONE	M. HAI MAD RAO	
CLERK H. ZAFAR AGHA		
ENGINEER		

PDN/TC-894