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GENERAL NOTES—CONCRETE WORKS
UNLESS NOTED OTHERWISE:—

- THIS DOCUMENT COVERS THE GENERAL NOTES AND ABBREVIATIONS USED IN THE CONCRETE DRAWINGS FOR STANDBY SRU & ADDITIONAL TANKS PROJECT AT PARADIP REFINERY OF IOCL. THIS DOCUMENT SHALL BE READ IN CONJUNCTION WITH ALL CONCRETE DRAWINGS ISSUED FOR CONSTRUCTION AND WHICH REFER TO THESE NOTES. IN CASE OF CONFLICT BETWEEN THIS DOCUMENT AND THE IFC DRAWINGS, THE LATER SHALL GOVERN.
- ALL DIMENSIONS & BAR DIAMETER ARE IN MILLIMETERS AND LEVELS/ELEVATIONS IN METERS, UNLESS NOTED OTHERWISE.
- DRAWINGS SHALL NOT BE SCALED, ONLY DIMENSIONS SHOWN ON THE DRAWINGS SHALL BE FOLLOWED.
- MIN. 75 mm THICK LEAN CONCRETE MIX 1:4:8 (BY WEIGHT, USING 40mm AND DOWN SIZE GRADE CRUSHED STONE AGGREGATE) EXTENDING 75mm ALL ROUND THE EDGES SHALL BE PROVIDED UNDER ALL RCC FOUNDATIONS.
- HIGHEST POINT OF PAVEMENT (H.P.P.) IS +100.000M WHICH CORRESPONDS TO ELEVATION INDICATED IN DRAWING.
- FOR LIQUID RETAINING STRUCTURES, A LEAN CONCRETE MIX 1:3:6 (BY WEIGHT) SHALL BE USED, WHICH SHALL BE MIN. 100 mm THICK & EXTEND 100 mm ALL ROUND THE EDGES OF BASE SLAB.
- PCC OF GRADE M20 OF MINIMUM 150mm THICKNESS SHALL BE PROVIDED UNDER ALL MASONRY WALL FOUNDATIONS.
- CEMENT USED FOR ALL CONCRETE WORKS BOTH ABOVE AND BELOW GROUND SHALL BE 43 GRADE OR 53 GRADE ORDINARY PORTLAND CEMENT CONFORMING TO IS:8112, AND/OR PORTLAND POZZOLANA CEMENT (PPC, FLY ASH BASED) CONFORMING IS:1489 PART–1, AND/OR PORTLAND POZZOLANA CEMENT (PPC, CALCINED CLAY BASED) CONFORMING TO IS:1489 PART–2, AND PORTLAND SLAC CEMENT (PSC) CONFORMING TO IS:455, AND/OR SULPHATE RESISTING PORTLAND CEMENT (SRC) CONFORMING TO IS:12330.
- ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH SPECIFICATION FOR PLAIN & REINFORCED CEMENT CONCRETE : 080557C–000–JSS–1700–001.
- CONCRETE GRADE SHALL BE OF FOLLOWING CHARACTERISTIC STRENGTH AT 28 DAYS:–
(i) FOUNDATION/SUPER STRUCTURE : GRADE M30.
(ii) PAVING AND GRADE SLAB : GRADE M25/M30.
(iii) UNDERGROUND PITS/LIQUID RETAINING STRUCTURE AND TANKS : GRADE M30.
(v) PILES : GRADE M30 (MIN. CEMENT CONTENT SHALL BE AS PER PILE SPECIFICATION 080557C–000–JSS–1431–001/002).
- CONCRETE MIX DESIGN SHALL CONFORM TO GUIDELINES OF IS: 10262. GRADE OF REINFORCED CONCRETE MENTIONED ON DRAWINGS SHALL BE OF DESIGN MIX QUALITY WITH THE MINIMUM CEMENT CONTENT AND MAXIMUM WATER–CEMENT RATIO CONFORMING TO SPECIFICATIONS GIVEN BELOW: HOWEVER THE MAXIMUM CEMENT CONTENT SHALL NOT EXCEED 450 Kg/m³.
TABLE OF CONCRETE REQUIREMENTS:

TYPE OF CEMENT	GRADE OF CONCRETE	MIN. CEMENT CONTENT (Kg/m ³)	MAX. WATER CEMENT RATIO	MAX. AGG. SIZE
OPC/PPC GRADE 43/53	M30	320	0.45	20 mm
OPC/PPC GRADE 43/53	M20 (PCC)	250	0.55	20 mm
OPC/PPC GRADE 43/53	M25	300	0.50	20 mm

- (*) THE MINIMUM CEMENT CONTENT SHALL BE ADJUSTED FOR AGGREGATES OTHER THAN 20mm NOMINAL MAXIMUM SIZE. THE MINIMUM CEMENT CONTENT IN THE CONCRETE MIX SHALL BE INCREASED BY 40 Kg/m³ AND DECREASED BY 30 Kg/m³ FOR 10mm AND 40mm NOMINAL MAXIMUM SIZE AGGREGATES RESPECTIVELY.

12. MINIMUM NOMINAL COVER TO REINFORCEMENT (INCLUDING LINKS) FOR DIFFERENT MEMBERS SHALL BE AS UNDER:

SLAB (ROOF AND FLOOR CANOPY, CHAJJAS, WAIST SLAB)	FREE FACE	25mm OR DIA OF BAR WHICHEVER IS GREATER
BEAM	ROOF, FLOOR AND LINTEL (TOP, BOTTOM & SIDE)	45mm
COLUMN & PEDESTAL	SUPER STRUCTURE	50mm
	FACE IN CONTACT WITH EARTH	75mm
RETAINING WALL	FACE IN CONTACT WITH EARTH	50mm
BASEMENT & PIT WALL	FREE FACE	45mm OR DIA OF BAR WHICHEVER IS GREATER
LIQUID RETAINING	FACE IN CONTACT WITH LIQUID	50mm
PLINTH BEAM	TOP, BOTTOM & SIDES	75mm
FOUNDATION	TOP, BOTTOM & SIDES	75mm
PILE	SIDES	75mm
	BOTTOM	125mm
	TOP & SIDES	75mm
PILE CAP		

- FOR TRENCH, MINOR FOUNDATION, SUMP, PITS AND PAVING THE MINIMUM CLEAR COVER SHALL BE 25mm.
- REINFORCEMENT STEEL SHALL CONFORM TO IS:1786 & SHALL BE OF FOLLOWING GRADE :–
(i) Fe 500 FOR STIRRUPS REBAR OF DIA. 8 & 10(mm)
(ii) Fe 500D FOR MAIN REBAR OF DIA. 12, 16, 20, 25, 32 & 40(mm).
 - MESH FABRIC REINFORCEMENT SHALL CONFORM TO IS:1566. MESH SIZE SHALL BE 50 mm X 50 mm AND THICKNESS OF WIRE SHALL BE 3 mm.
 - TWO STRANDS OF 18 SWG BLACK SOFT ANNEALED BINDING WIRE SHALL BE USED FOR REINFORCEMENT BARS.
 - BAR BENDING SCHEDULES SHALL BE AS PER IS:2502 & SP:34.
 - HOOKS SHALL BE COMPLETELY SEMICIRCULAR WITH A RADIUS NOT LESS THAN 4 BAR DIAMETER AND NOT MORE THAN 6 BAR DIAMETER, PLUS AN EXTENSION OF ATLEAST 4 BAR DIAMETER AT FREE END. ALL 90 DEGREE BENDS SHALL HAVE A RADIUS OF NOT LESS THAN 4 BAR DIAMETER PLUS AN EXTENSION OF 4 BAR DIAMETER AT FREE END. FOR BENDS OTHER THAN 90 DEGREE, REFER IS: 456 AND SP:34.
 - a) DEVELOPMENT LENGTH OF BAR SHALL BE USED AS GIVEN BELOW:

REINFORCEMENT GRADE	CONCRETE GRADE	DEVELOPMENT LENGTH (L _d) FOR BARS IN TENSION	DEVELOPMENT LENGTH (L) FOR BARS IN COMPRESSION
Fe 500, Fe 500D	M25	49D (**)	40D (**)
	M30	46D (**)	37D (**)

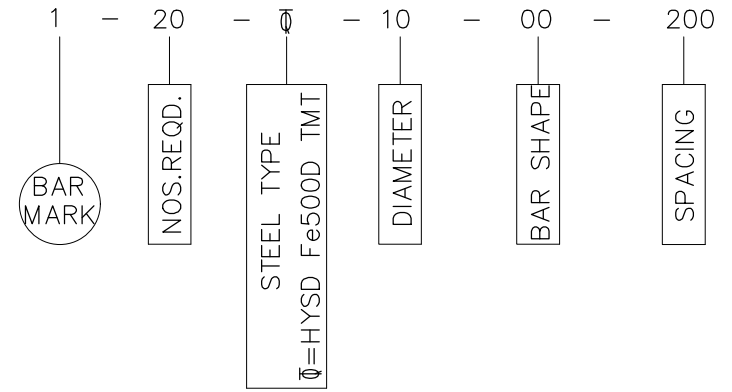
- (**) AS PER CLAUSE 6.2.5 OF IS: 13920 FOR DUCTILE DETAILING REQUIREMENT, AN ADDITION OF 10D SHALL BE MADE TO L_d FOR EXTERNAL JOINT OF BEAM & COLUMN.
- LAP LENGTH OF BARS IN FLEXURAL TENSION SHALL BE L_d OR 30D WHICHEVER IS GREATER.
 - LAP LENGTH OF BARS IN DIRECT TENSION SHALL BE 2L_d OR 30D WHICHEVER IS GREATER.
 - LAP LENGTH OF BARS IN COMPRESSION SHALL BE L_d OR 24D WHICHEVER IS GREATER.
 - WELDED LAP SHALL NOT BE PERMITTED.
- b) WHEN BARS OF TWO DIFFERENT DIA ARE TO BE LAPPED, THE LAP LENGTH SHALL BE BASED ON DIA OF SMALLER BAR.
- c) WHEN LAP OCCURS FOR A TENSION BAR LOCATED AT:
- TOP OF SECTION AS CAST AND THE MINIMUM COVER TO EITHER FACE IS LESS THAN TWICE THE DIAMETER OF THE LAPPED BAR, THE LAP LENGTH SHALL BE INCREASED BY A FACTOR OF 1.4.

- CORNER OF SECTION AND THE MINIMUM COVER TO EITHER FACE IS LESS THAN TWICE THE DIAMETER OF THE LAPPED BAR OR WHERE THE CLEAR DISTANCE BETWEEN ADJACENT LAPS IS LESS THAN 75 mm OR 6 TIMES THE DIAMETER OF LAPPED BAR, WHICHEVER IS GREATER, THE LAP LENGTH SHOULD BE INCREASED BY A FACTOR OF 1.4. WHERE BOTH CONDITION (i) & (ii) APPLY, THE LAP LENGTH SHOULD BE INCREASED BY A FACTOR OF 2.0.
- WELDING OF REINFORCEMENT SHALL BE CARRIED OUT ONLY AFTER OBTAINING THE WRITTEN APPROVAL OF ENGINEER-IN–CHARGE & CARRIED IN ACCORDANCE WITH IS:2751 & IS:9417. IN CASE CUT LENGTHS OF BARS AS PER BBS ARE GREATER THAN AVAILABLE LENGTHS, LAPS MAY BE PROVIDED WITH PRIOR APPROVAL OF THE ENGINEER-IN–CHARGE. SUCH LAPS SHALL BE STAGGERED AND SUBJECT TO THE FOLLOWING PROVISION:–
(i) IN BEAMS & SLABS, LAPS SHALL BE LOCATED NEAR CENTER OF SPAN FOR TOP BARS, & NEAR 1/3 OF SPAN FOR BOTTOM BARS CONFORMING TO IS: 13920.
(ii) NOT MORE THAN 50% OF TOTAL NUMBER OF BARS SHALL BE LAPPED AT A PARTICULAR SECTION AND NOT MORE THAN ONE LAP SHALL BE PROVIDED FOR A BAR IN ONE SPAN.
 - COLUMN REINFORCEMENT BARS SHALL BE JOGGLED AT CHANGE OF SECTIONS WITH A MAXIMUM SLOPE OF 1 HORIZONTAL TO 6 VERTICAL.
 - AT BEAM/COLUMN JUNCTIONS, BEAM BARS, IF IN CONFLICT WITH COLUMN BARS, SHALL BE GRADUALLY BENT AND PLACED CLEAR OF COLUMN BARS AFTER GETTING APPROVAL OF ENGINEER-IN–CHARGE. COLUMN BARS SHALL NOT BE BENT TO ACCOMMODATE BEAM BARS. MAIN BARS, LINKS OR STIRRUPS MAY BE JOGGLED/LOCALLY ADJUSTED AT SITE TO ACCOMMODATE POCKETS/ANCHOR BOLTS/INSERT PLATES ETC. WITH THE APPROVAL OF ENGINEER-IN–CHARGE.
 - MINIMUM & MAXIMUM BAR SPACING SHALL BE 75 & 300 mm RESPECTIVELY. BAR SPACING SHALL BE PROVIDED IN MULTIPLES OF 25 mm UNLESS NOTED OTHERWISE ON THE DRAWING.
 - CHAIR / SPACER BARS AT LEAST OF DIAMETER OF THE MAIN BARS TO BE USED AT SUITABLE INTERVALS WHEREVER REQUIRED FOR MULTI LAYER REQUIREMENT OF REINFORCEMENT AS PER DIRECTION OF ENGINEER-IN–CHARGE.
 - POURING SEQUENCE OF CONCRETE SHALL BE AS PER DIRECTION OF THE ENGINEER-IN–CHARGE UNLESS NOTED OTHERWISE ON DRAWING.
 - ALL CONCRETE SURFACES TO RECEIVE FLOOR FINISH SHALL BE FINISHED ROUGH.
 - THE MINIMUM GROUT THICKNESS SHALL BE 30 mm AND MAXIMUM THICKNESS 50 mm. GROUT SHALL BE CHAMFERED AT A SLOPE OF 1:1 FROM THE EDGE OF BASE PLATE TO THE TOP OF FINISHED CONCRETE.
 - CONSTRUCTION JOINTS, OTHER THAN THOSE SHOWN ON IFC DRAWINGS, MAY BE PROVIDED BY THE CONTRACTOR ONLY WITH PRIOR APPROVAL OF THE ENGINEER-IN–CHARGE. CONSTRUCTION JOINTS SHALL BE STAGGERED.
 - CONCRETE STRUCTURES SHALL NOT BE USED FOR ANY TYPE OF ERECTION WORK WITHOUT AUTHORIZATION FROM THE ENGINEER-IN–CHARGE.
 - ALL ANCHOR BOLTS SHALL BE PROPERLY FIXED IN POSITION WITH THE HELP OF SUITABLE TEMPLATES AND TO LEVELS SHOWN IN RESPECTIVE IFC DRAWINGS PRIOR TO POURING OF CONCRETE IN FOOTINGS / RAFTS & PEDESTALS. NO POCKETS SHALL BE LEFT FOR FIXING THEM SUBSEQUENTLY, UNLESS OTHERWISE SHOWN ON IFC DRAWINGS. ALL ANCHOR BOLTS SHALL BE PROVIDED WITH ADDITIONAL LOCK NUT.
 - INSERT PLATES SHALL BE OF STRUCTURAL STEEL QUALITY CONFORMING TO IS: 2062 GRADE E 250 BO/BR.
 - ALL INSERTS/EMBEDDED PARTS SHALL BE PROPERLY SECURED IN POSITION BEFORE CONCRETING, IF REQUIRED, WELDING TO BE DONE. ALL EXPOSED PARTS OF EMBEDDED ITEM SHALL BE GIVEN ONE COAT OF RED OXIDE PAINT.
 - MINIMUM DISTANCE FROM THE CENTERLINE OF FOUNDATION/ANCHOR BOLT TO EDGE OF PEDESTAL SHALL BE THE MAXIMUM OF THE FOLLOWING:
(i) CLEAR DISTANCE FROM THE EDGE OF THE BASE PLATE/BASE FRAME TO THE OUTER EDGE OF THE PEDESTAL SHALL BE MINIMUM 50 mm.
(ii) CLEAR DISTANCE FROM THE FACE OF POCKET TO THE OUTER EDGE OF THE PEDESTAL SHALL BE MINIMUM 75 mm.
(iii) CLEAR DISTANCE FROM THE EDGE OF THE SLEEVE OR ANCHOR PLATE TO THE EDGE OF PEDESTAL SHALL BE MINIMUM 75 mm.
 - THE CONTRACTOR SHALL MAKE ALLOWANCE FOR DEFLECTION, SHRINKAGE & SETTLEMENT OF FORM WORK IN ADDITION TO THE ALLOWANCE FOR DEAD LOAD DEFLECTION. HAND RAIL SHALL NOT BE PROVIDED UNTILL THE FORM WORK IS REMOVED.
 - FORMWORK MAY BE OF TIMBER, PLYWOOD OR STEEL.
 - THE NORMAL DURATION OF TIME FOR REMOVAL OF FORM WORK SHALL BE AS UNDER:

WALLS, COLUMNS & VERTICAL FACES OF STRUCTURAL MEMBERS	24 TO 48 HOURS
SLABS (PROPS LEFT UNDER)	3 DAYS
BEAM SOFFITS (PROPS LEFT UNDER)	7 DAYS
REMOVAL OF PROPS UNDER SLABS SPANNING UPTO 4.5M	7 DAYS
REMOVAL OF PROPS UNDER SLABS SPANNING OVER 4.5M	14 DAYS
REMOVAL OF PROPS UNDER BEAMS/ARCHES SPANNING UPTO 6M	14 DAYS
REMOVAL OF PROPS UNDER BEAMS/ARCHES SPANNING OVER 6M	21 DAYS
CANTILEVER	14 DAYS (MINIMUM)

38. THE STANDARD DIMENSIONS OF CHAMFER AND FILLETS, UNLESS OTHERWISE DETAILED OR SPECIFIED SHALL BE 25 mm X 50 mm. FOR HEAVIER WORK, THE DIMENSION MAY BE 40 mm x 50 mm.

39. KINK IN REINFORCEMENT IF REQUIRED SHALL NOT HAVE A SLOPE OF MORE THAN 1:6.



40. REINFORCEMENT SHALL BE DETAILED FOR DUCTILITY REQUIREMENTS CONFORMING TO IS:13920.

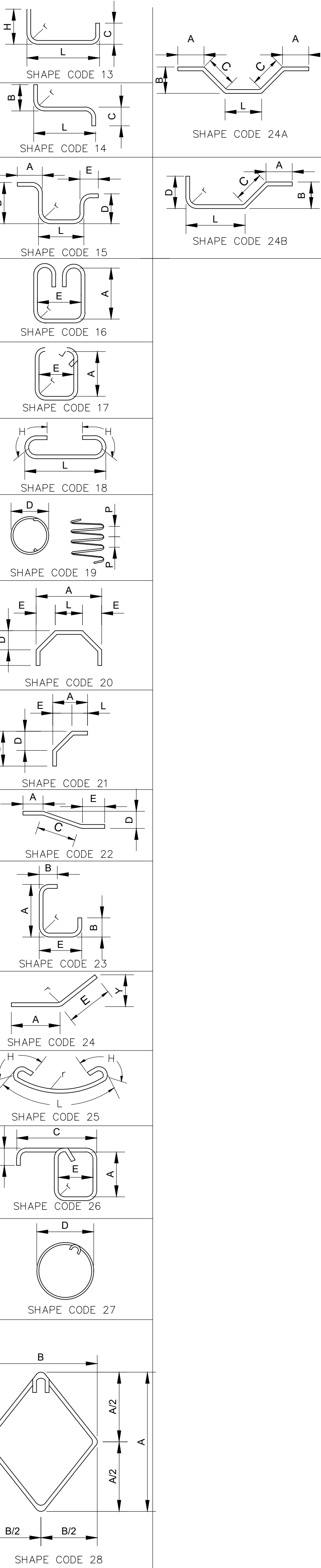
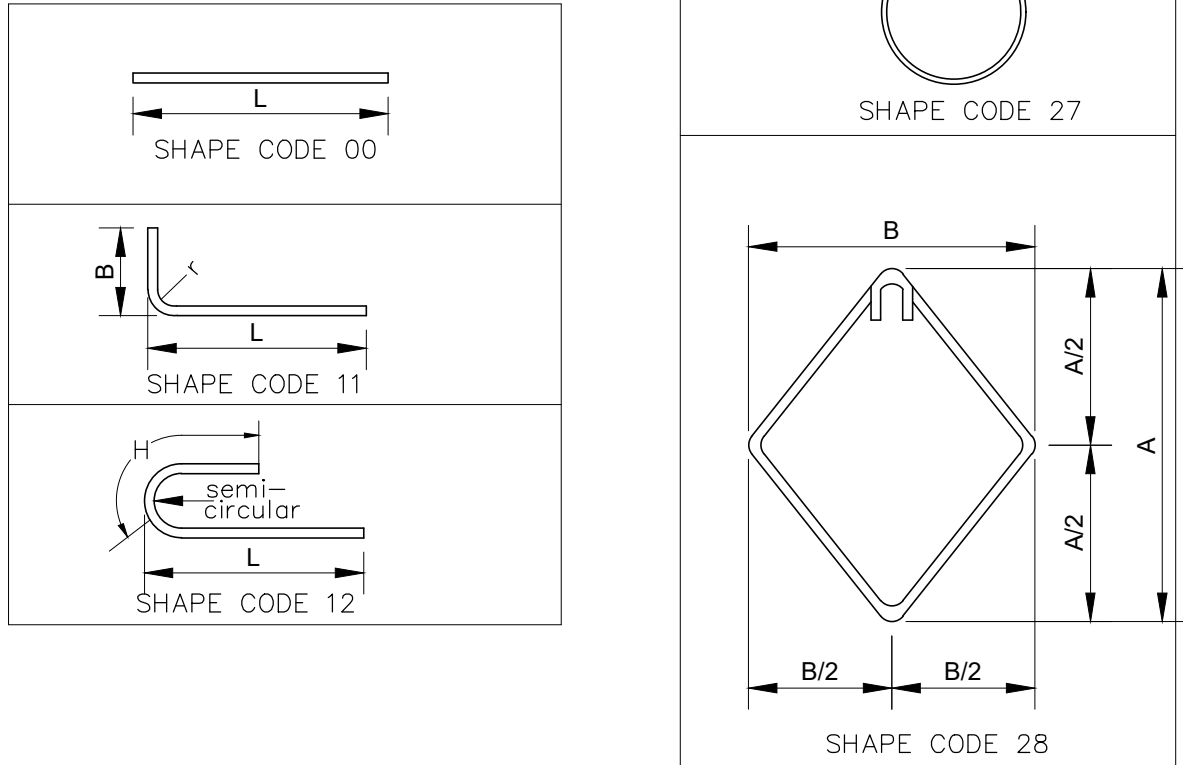
SYMBOLS/LEGEND

	CONCRETE		CONSTRUCTION JOINT
	BLINDING		CONSTRUCTION JOINT WITH WATER STOP
	GRADE/EARTH IN SECTION		LEVEL MARK – IN PLAN
	GRADE/EARTH IN SLOPE		LEVEL MARK – IN ELEVATION
	WELL GRADED AND COMPACTED SAND/SOIL		GRADE/EARTH
	ISOLATION OR FILLER MATERIAL		FENCE
	POCKET OR RECESS		SPAN DIRECTION
	OPENING IN SLAB		HANDRAIL

ABBREVIATIONS

AB	ANCHOR BOLT
A/G	ABOVE GROUND
BBS	BAR BENDING SCHEDULE
BOC	BOTTOM OF CONCRETE
BOF	BOTTOM OF FOUNDATION
BCD	BOLT CIRCLE DIAMETER
B/W	BOTH WAYS
BF	BOTH FACES
CL	CENTER LINE
C/C	CENTER TO CENTER
COL	COLUMN
'D' OR 'DIA' OR 'Ø'	DIAMETER
DET	DETAIL
DWG	DRAWING
EL	ELEVATION
EQ	EQUAL
EGL	EXISTING GROUND LEVEL
FDN	FOUNDATION
FF	FAR FACE
FFL	FINISHED FLOOR LEVEL
FGL	FINISHED GRADE LEVEL
FS	FIXED SUPPORT
GA	GENERAL ARRANGEMENT
HPP	HIGHEST PAVING POINT
IFC	ISSUED FOR CONSTRUCTION
IFR	ISSUED FOR REVIEW
IP	INSERT PLATE
IL	INVERT LEVEL
ID	INSIDE DIAMETER
L	STRUCTURAL ANGLE
L _d	DEVELOPMENT LENGTH
LPP	LOWEST PAVING POINT
LVL	LEVEL
M	METER
MKD	MARKED
mm	MILLIMETER
MS	MILD STEEL
MSL	MEAN SEA LEVEL
MT	METRIC TONNE
NF	NEAR FACE
NGL	NATURAL GROUND LEVEL
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
PC	POCKET
PLT	PLATE
PCD	PITCH CIRCLE DIAMETER
PED	PEDESTAL
QTY	QUANTITY
R	RADIUS
R/F	REINFORCEMENT BAR
REV	REVISION OR REVISED
RL	REDUCED LEVEL
SBC	SAFE BEARING CAPACITY
SCH	SCHEDULE
STD	STANDARD
SYM	SYMMETRICAL
SS	SLIDING SUPPORT
SQ	SQUARE
⌀	HYSD TMT REINF. BARS GRADE Fe 500D
TYP	TYPICAL
THK	THICK
TOC	TOP OF CONCRETE
TOG	TOP OF GROUT
TOP	TOP OF PLATE
TOR	TOP OF RAIL
T&B	TOP AND BOTTOM
UNO	UNLESS NOTED OTHERWISE
U/G	UNDER GROUND
U/S	UNDERSIDE
⊙	AT THE RATE
Ⓢ	RE–BAR MARK

SHAPE CODES (REFER SP: 34)



REFERENCE DRAWING

TITLE	DRAWING NO.
ABBREVIATIONS, LEGENDS AND SYMBOLS FOR GENERAL CIVIL WORKS	080557C–000–STC–1490–001
GENERAL NOTES FOR STRUCTURAL STEEL WORKS	080557C–000–DW–1802–001

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