

ALLOWABLE

ALLOWABLE LOADS FOR THE DESIGN OF ANCHOR BOLTS SHALL BE OBTAINED FROM TABLE-1.

FOR MINOR EQUIPMENT, SUCH AS PUMP OR PACKAGE EQUIPMENT ON SKID, TYPE-L & I BOLT SHOULD BE APPLIED AS MUCH AS PRACTICAL.

THE FORMULA AND VALUES ARE BASED ON THE FOLLOWING CONDITIONS :

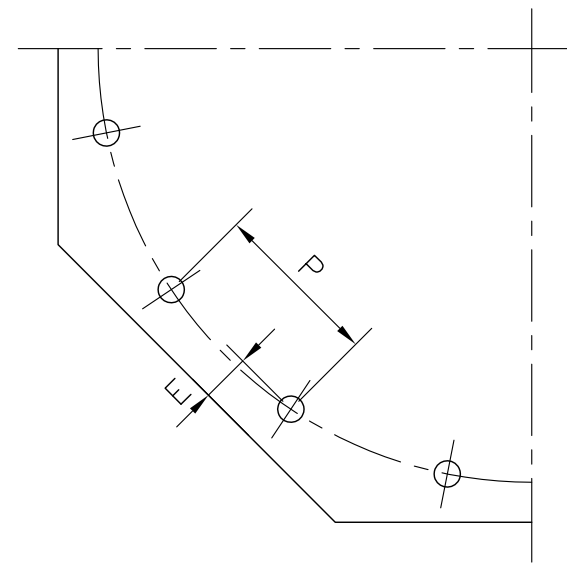
- 3mm OF CORROSION ALLOWANCE ON DIAMETER IS CONSIDERED
- SPECIFIED CONCRETE STRENGTH f'c IS 3000 psi.
- DISTANCE FROM EDGE OF CONCRETE TO BOLT CENTER IS NOT LESS THAN "E" ON THE TABLE AT ANY POINT.
- IN CASE THE EDGE DISTANCE IS LESS THAN "E", THE ALLOWABLE LOAD MUST BE CALCULATED BY FURTHER STUDY.
- BOLT PITCH, "P"(mm) SHALL BE TAKEN AS SHOWN IN FIG.-1.

IN CASE ANCHORS ARE SUBJECTED TO BOTH SHEAR AND TENSION LOAD, THE ANCHORS SHALL BE DESIGNED TO SATISFY THE FOLLOWING CONDITION:

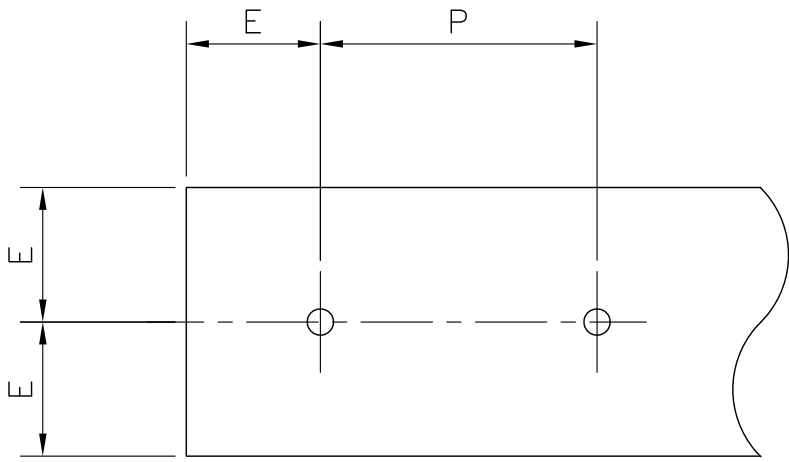
$$\left(\frac{N}{N_a}\right)^2 + \left(\frac{V}{V_a}\right)^2 \leq 1.2$$

WHERE:

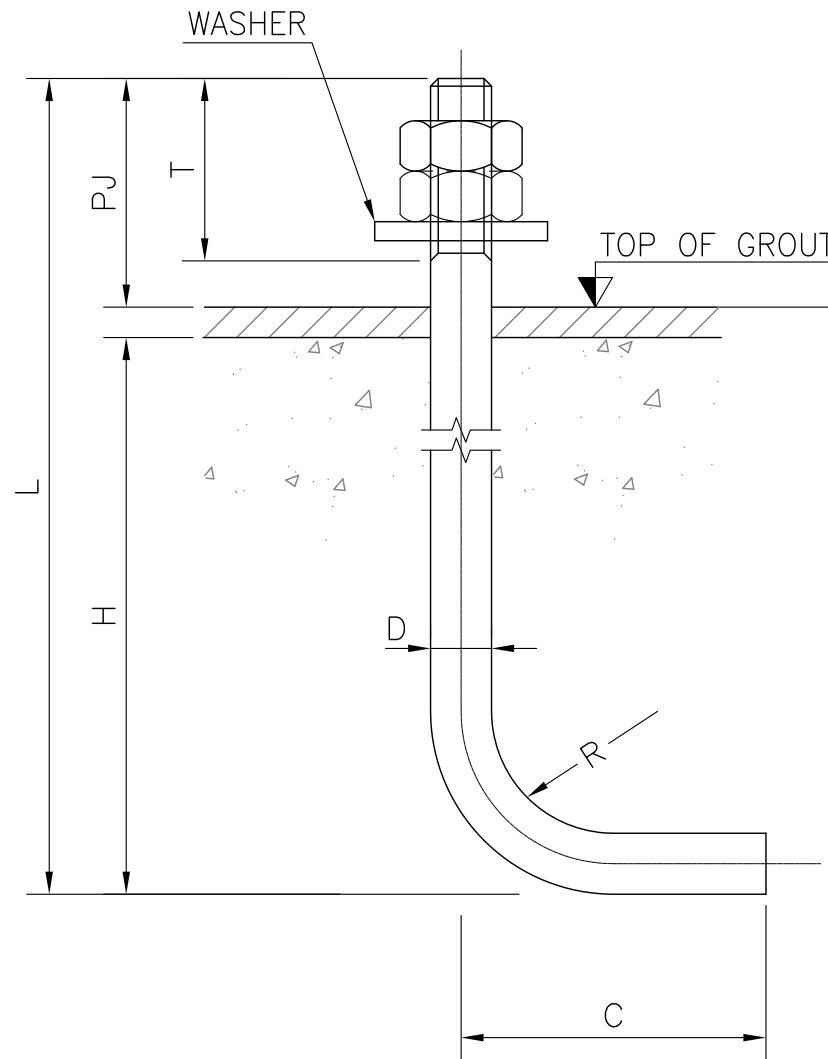
N_a : ALLOWABLE TENSION CAPACITY
V_a : ALLOWABLE SHEAR CAPACITY
N : ACTUAL TENSION LOAD
V : ACTUAL SHEAR LOAD



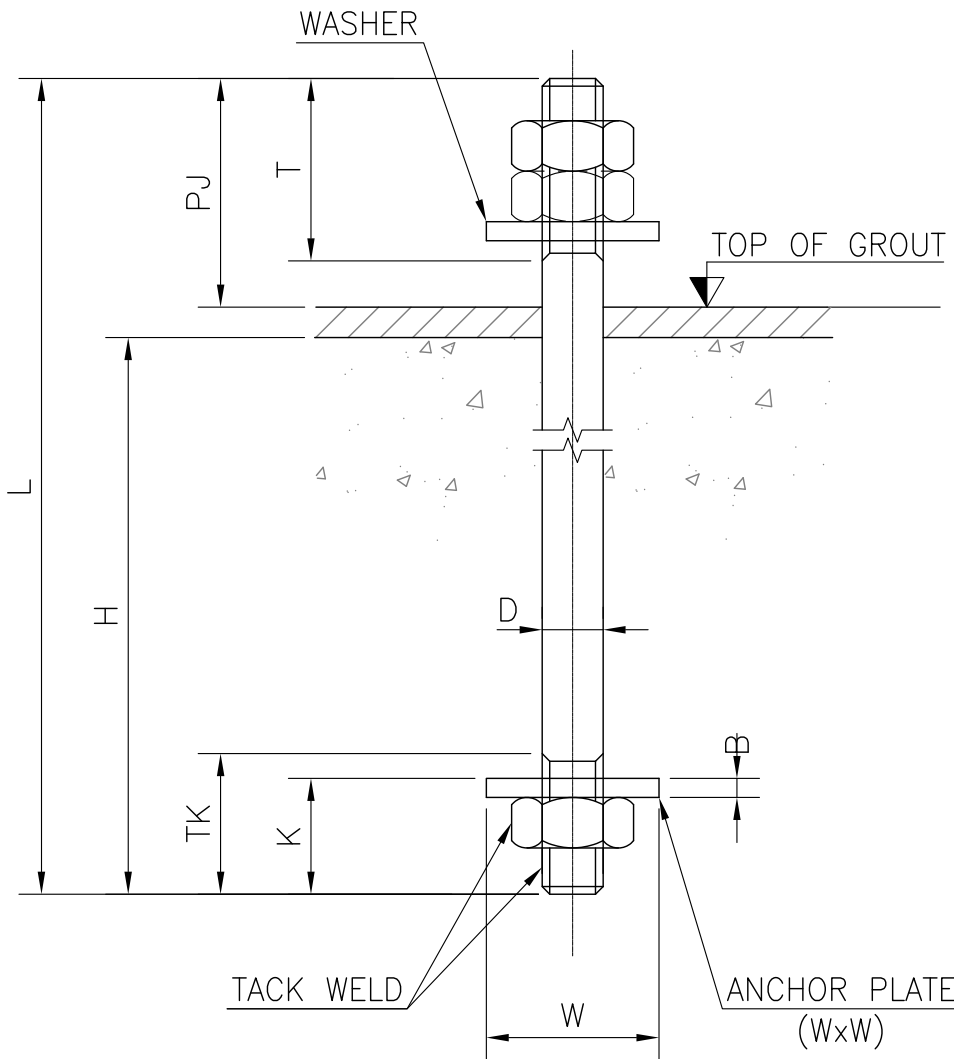
TYPE 1 FOUNDATION
(FOR VERTICAL VESSELS)



TYPE 2 FOUNDATION
(FOR HORIZONTAL VESSELS OR HEAT EXCHANGERS)



TYPE L
N.T.S.



TYPE I
N.T.S.

FIG.-1 : TYPICAL ANCHOR BOLT LAYOUT

BOLT TYPE	NOMINAL DIAMETER D (mm)	E(MIN.) (mm)	P(MIN.) (mm)	ALLOWABLE LOAD IN KN			
				SHEAR	TENSION FOR TYPE-1 FOUNDATION	TENSION FOR TYPE-2 FOUNDATION	
TYPE L	12	115	115	5.0	10.0	10.0	
	16	115	115	6.1	15.0	15.0	
	20	115	115	10.0	19.5	19.5	
	25	127	127	20.2	33.8	33.8	
	32	145	159	34.4	43.2	43.2	
	36	155	191	52.0	50.6	50.6	
	44	165	222	72.2	61.0	61.0	
	50	175	254	96.9	70.1	70.1	
TYPE I	12	115	115	5.0	10.0	10.0	
	16	115	115	6.1	15.0	15.0	
	20	115	115	10.0	19.5	19.5	
	25	127	127	20.2	40.4	40.4	
	32	145	159	34.4	68.9	0.132 x P - 31.1 ; BUT NOT LARGER THAN 68.9	
	36	155	191	52.0	104.0	0.141 x P - 34.3 ; BUT NOT LARGER THAN 104.0	
	43	165	222	72.2	144.3	0.150 x P - 36.5 ; BUT NOT LARGER THAN 144.3	
	50	175	254	96.9	193.9	0.159 x P - 39.6 ; BUT NOT LARGER THAN 193.9	
	57	185	286	110.0	1.033 x P - 57.1 ; BUT NOT LARGER THAN 256.4	0.168 x P - 36.5 ; BUT NOT LARGER THAN 256.4	
	63	195	318	122.3	1.166 x P - 75.5 ; BUT NOT LARGER THAN 319.6	0.177 x P - 34.6 ; BUT NOT LARGER THAN 319.6	
	75	215	381	148.6	1.399 x P - 110.1 ; BUT NOT LARGER THAN 486.6	0.196 x P - 35.8 ; BUT NOT LARGER THAN 481.1	



TABLE-1 : ALLOWABLE LOAD ON ANCHOR BOLTS

BOLT TYPE	NOMINAL DIAMETER D (mm)	DIMENSIONS (mm)									
		T	P _J max.	L	C	R	K	TK	W	B	H
TYPE L	12	110	100	500	90	40	-	-	-	-	400
	16	100	100	700	100	40	-	-	-	-	600
	20	110	85	420	90	40	-	-	-	-	310
	25	135	110	545	115	50	-	-	-	-	410
	32	150	125	675	145	65	-	-	-	-	525
	36	165	140	780	170	75	-	-	-	-	615
	43	180	155	925	200	90	-	-	-	-	745
	50	195	170	1050	230	100	-	-	-	-	855
TYPE I	12	110	100	500	-	-	-	-	-	-	500
	16	100	100	700	-	-	-	-	-	-	700
	20	110	85	420	-	-	-	-	-	-	310
	25	135	110	545	-	-	90	135	75	15	410
	32	150	125	675	-	-	110	150	100	20	525
	36	165	140	780	-	-	140	165	115	20	615
	43	180	155	925	-	-	150	180	135	25	745
	50	195	170	1050	-	-	165	195	150	30	855
	57	210	185	1120	-	-	175	210	190	50	910
	63	220	195	1250	-	-	195	220	220	58	1030
	75	255	230	1500	-	-	230	255	260	69	1245

NOTES:

- MATERIAL
BOLTS : ASTM A307 GRADE C
DIMENSION : ANSI B 18.2.1 HEAVY HEX BOLT
NUT : ASTM A563 GRADE A
DIMENSION : ANSI B 18.2.2 HEAVY HEX NUT
WASHERS : ASTM F436 OR EQUIVALENT
ANCHOR PLATE : BS EN 10025 S275 OR ASTM A36
- THREADING OF BOLTS AND NUTS
THREADING SHALL BE THE UNIFIED COARSE THREADS IN ACCORDANCE WITH THE TOLERANCE CLASSES OF THREADS SHALL BE CLASS 2A FOR BOLTS A 8 PITCH THREAD SERIES SHALL BE USED ON BOLTS AND NUTS OVER 1 INCH.
- ANCHOR PLATE HOLE
ANCHOR PLATE HOLE DIAMETERS SHALL BE 3mm LARGER THAN THE NOMINAL
- GALVANIZING
ALL MATERIALS SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH BS EN ISO 1461 OR ASTM A153 CLASS C.

AS BUILT

FO	26-04-2018	AS BUILT	MSL	MSH	SMM
REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHECKED	APPR.
CLIENT:  OIL & GAS DEVELOPMENT COMPANY LTD. OGDCL HOUSE TOWER-B, FIRST FLOOR F-6/6, BLUE AREA, JINNAH AVENUE ISLAMABAD PAKISTAN FAX : +92-051-2623033, PHONE : +92-051-9209859					
CONSULTANT:  Zishan Engineers (Pvt.) Ltd. An ISO 9001-2008 certified company 47/F Block 6, PECHS, Karachi-Pakistan Tel: (92-21) 3439045-46 & 34310161-54, Fax: (92-21) 34533430 & 34510156 E-Mail: contact@zishanengineers.com Website: www.zishanengineers.com			DWG. NO. 165-4-CSTD-008 REV. FO		
PROJECT : KPD-TAY INTEGRATED DEVELOPMENT PROJECT PHASE-II			JOB NO. 165-4		
TITLE : STANDARD DRAWING OF ANCHOR BOLTS FOR EQUIPMENT			SIZE	SCALE	SHEET
			A1	N.T.S.	1

DESCRIPTION	DWG. NO.
REFERENCE DRAWINGS	