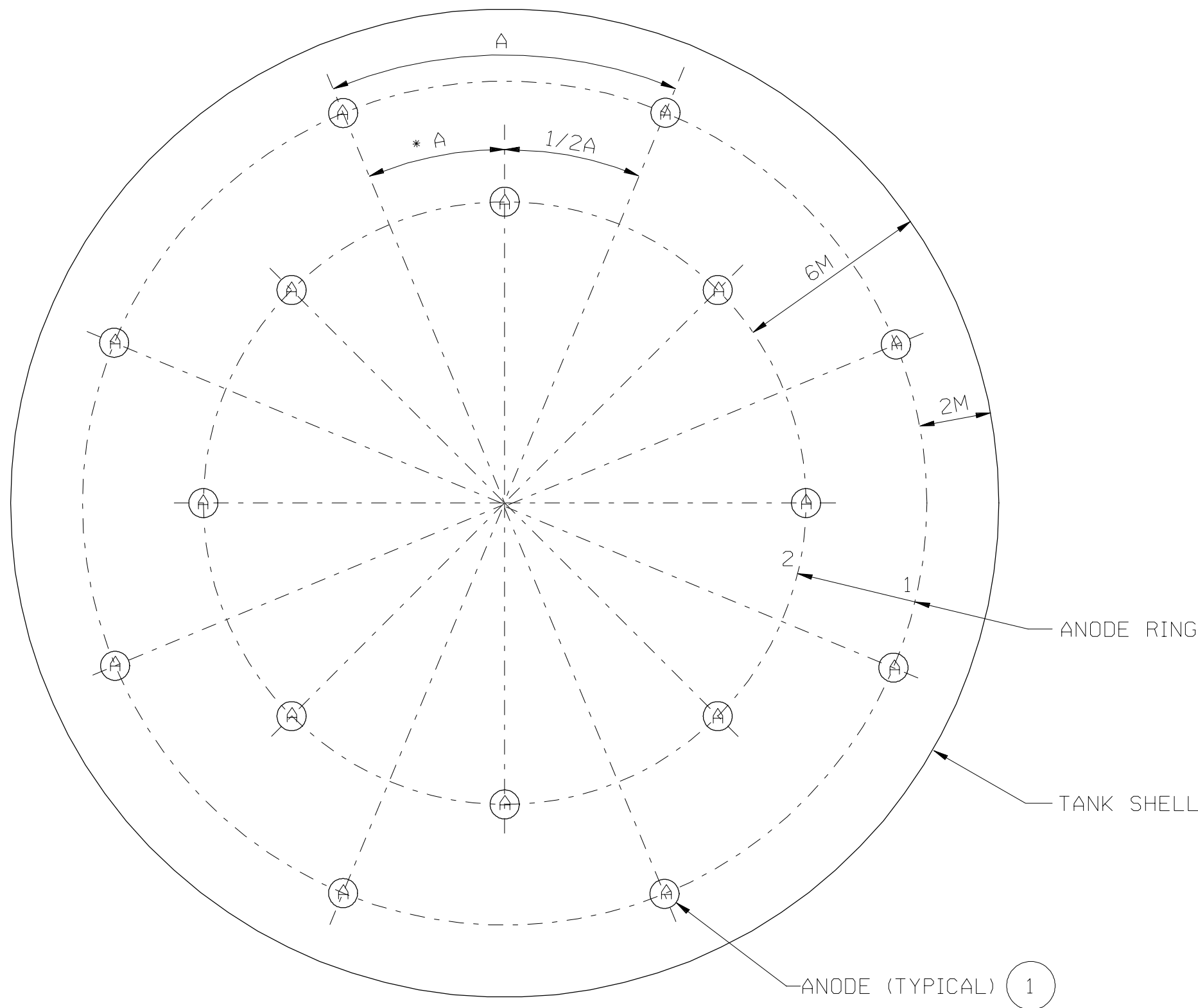
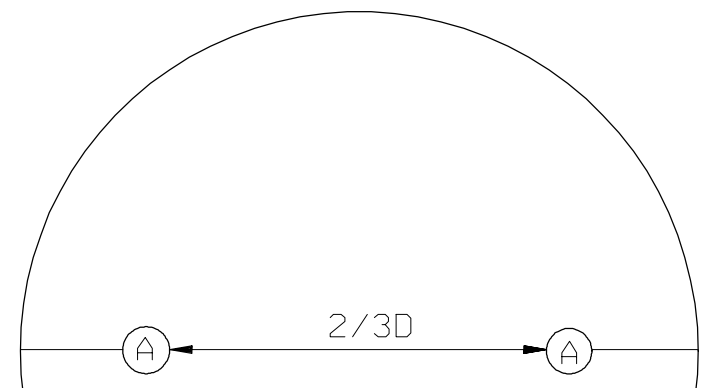


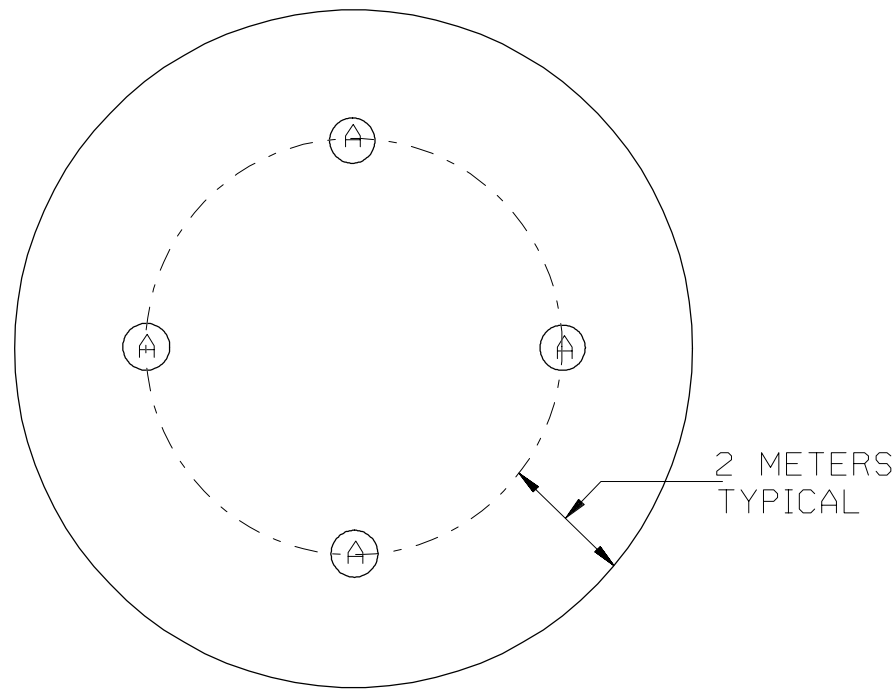
CONED-UP TANK BOTTOM
ANODE ARRANGEMENT



DETAIL 2
TANK DIAMETERS > 20 METERS



DETAIL 3
TANK DIAMETERS < 10 METERS
AND > 1.5 METERS
(SEE NOTES 7, 11, 12, 13 & 15)



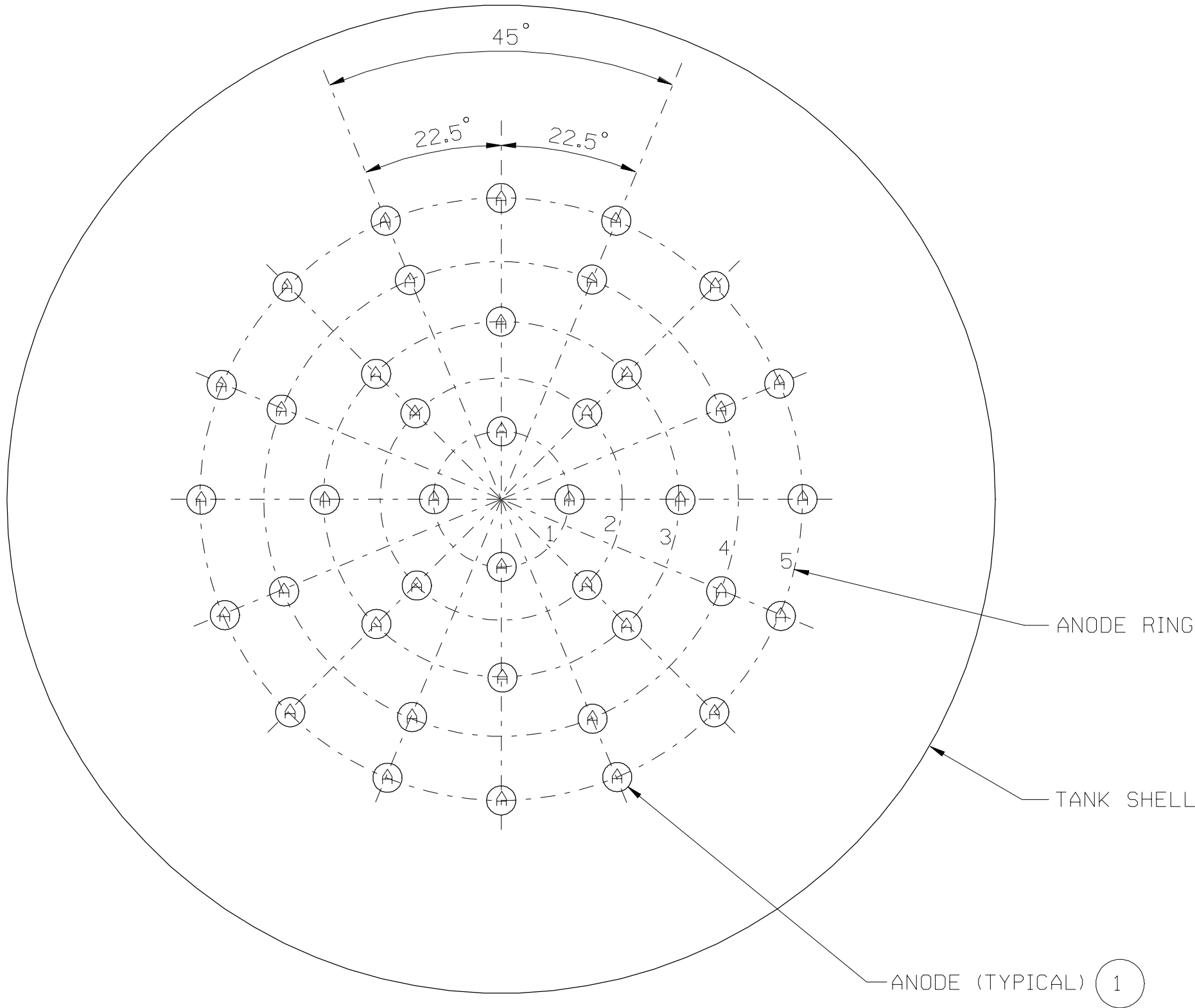
DETAIL 4
TANK DIAMETERS < 20 METERS & > 10 METERS
(SEE NOTES 7, 11, 12, 13 & 14)

TABLE I

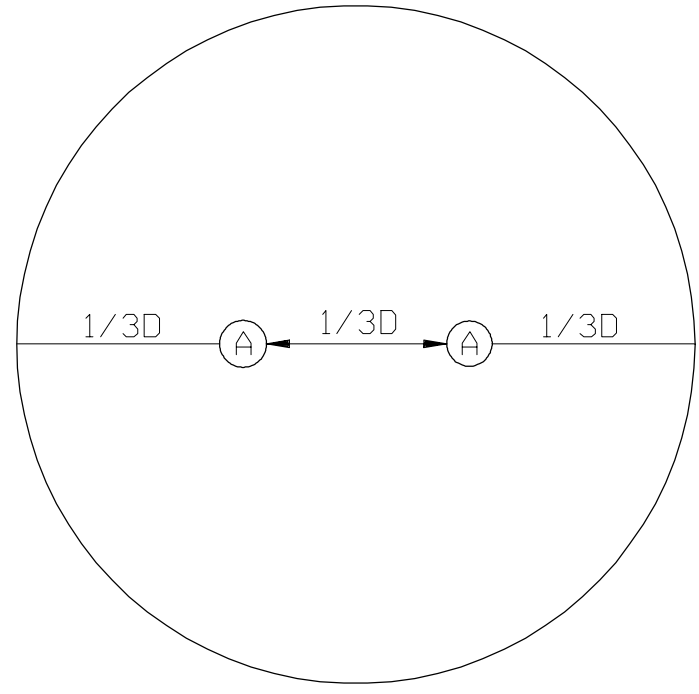
MINIMUM NUMBER OF MAGNESIUM ANODES REQUIRED FOR HYDROCARBON STORAGE TANKS WITH CONED-UP INTERNALLY COATED BOTTOM
(SEE NOTES 5, 6, 8, 9, 10, 11, 12, 13, 14 & 15)

TANK DIAMETER (METERS)	NUMBER OF ANODES IN TWO RINGS SPACED 2 METERS AND 6 METERS FROM TANK SHELL		TOTAL NO. OF ANODES FOR EACH TANKS	ANGLE A
	FIRST RING	SECOND RING		
20 TO < 30	6	0	6	60°
30 TO < 40	8	0	8	45°
40 TO < 50	6	6	12	60°
50 TO < 60	8	8	16	45°
60 TO < 70	9	9	18	40°
70 TO < 80	10	10	20	36°
80 TO < 90	12	12	24	30°
90 TO < 100	14	14	28	25.7°
100 TO < 110	15	15	30	24°
110 TO < 120	16	16	32	22.5°
120 TO < 130	17	17	34	21.2°

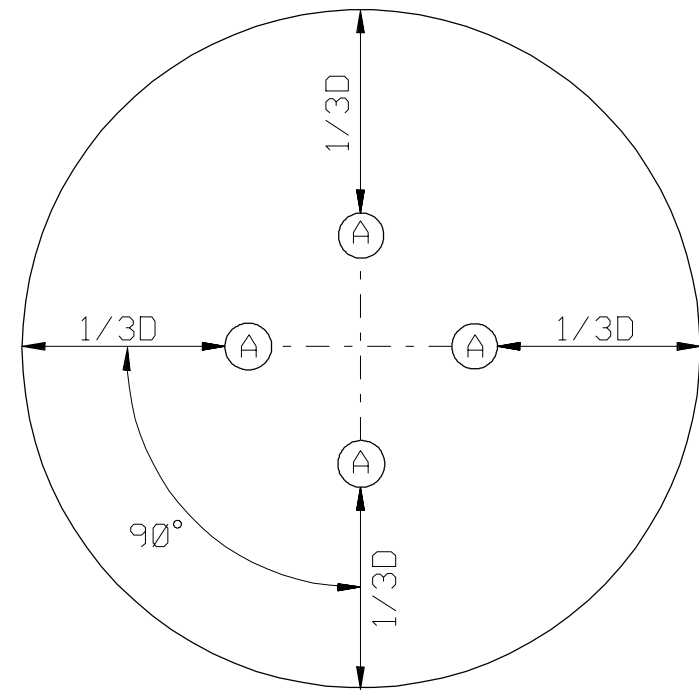
CONED-DOWN TANK BOTTOM
ANODE ARRANGEMENT



DETAIL 5
TANK DIAMETERS > 20 METERS



DETAIL 6
TANK DIAMETERS < 10 METERS
AND > 1.5 METERS
(SEE NOTES 7, 11, 12, 13 & 15)



DETAIL 7
TANK DIAMETERS < 20 METERS & > 10 METERS
(SEE NOTES 7, 11, 12, 13 & 14)

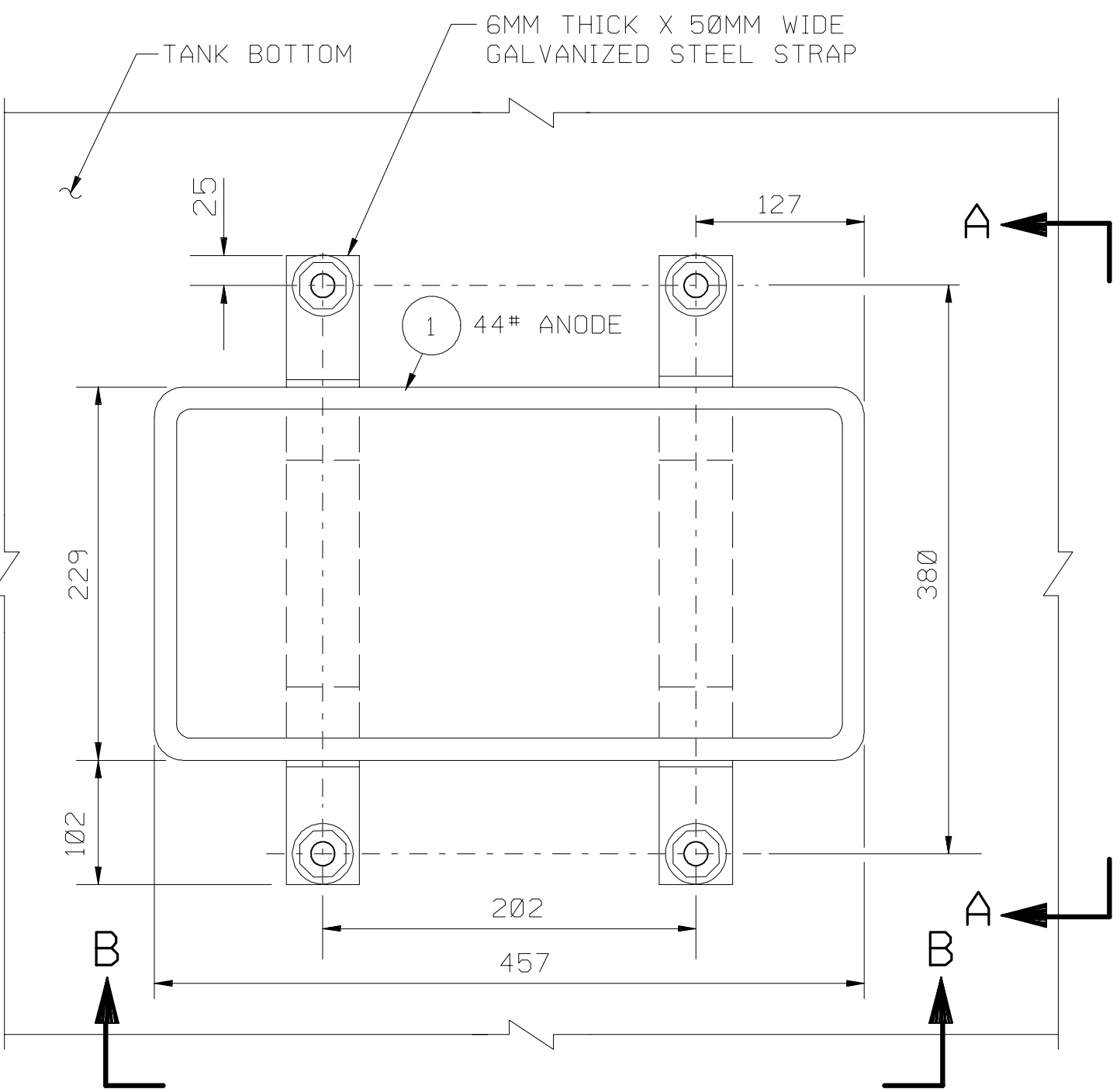
TABLE II

MINIMUM NUMBER OF MAGNESIUM ANODES REQUIRED FOR HYDROCARBON STORAGE TANKS WITH CONED-DOWN INTERNALLY COATED BOTTOM
(SEE NOTES 5, 6, 8, 9, 10, 11, 12, 13, 14 & 15)

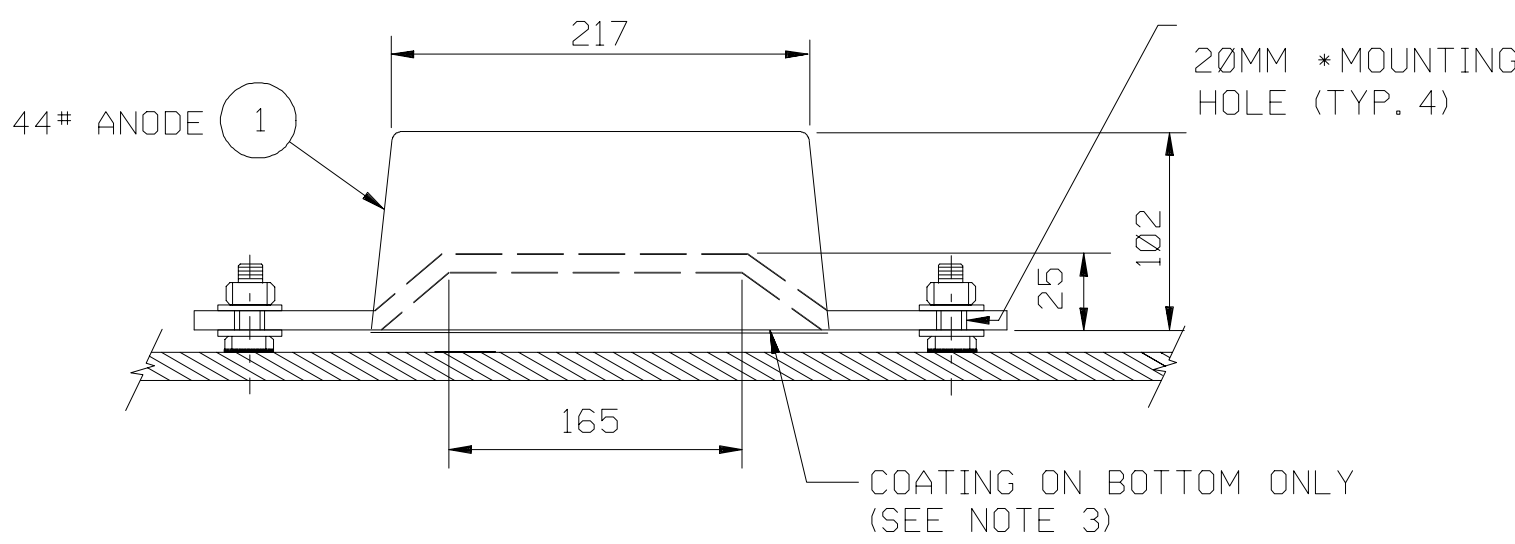
TANK DIAMETER (METERS)	NUMBER OF ANODES IN RINGS WITH CENTERS ALIGNED WITH THE TANK SUMP CENTER AND WITH THE FOLLOWING RING DIAMETERS					TOTAL NO. OF ANODES FOR TANKS
	1ST RING	2ND RING	3RD RING	4TH RING	5TH RING	
20 TO < 40	4	0	0	0	0	4
40 TO < 50	4	4	0	0	0	8
50 TO < 70	4	0	8	0	0	12
70 TO < 90	4	0	8	8	0	20
90 TO 110	4	0	8	8	16	36
RING DIAMETER (METERS)	14	22	30	38	54	

NOTES:

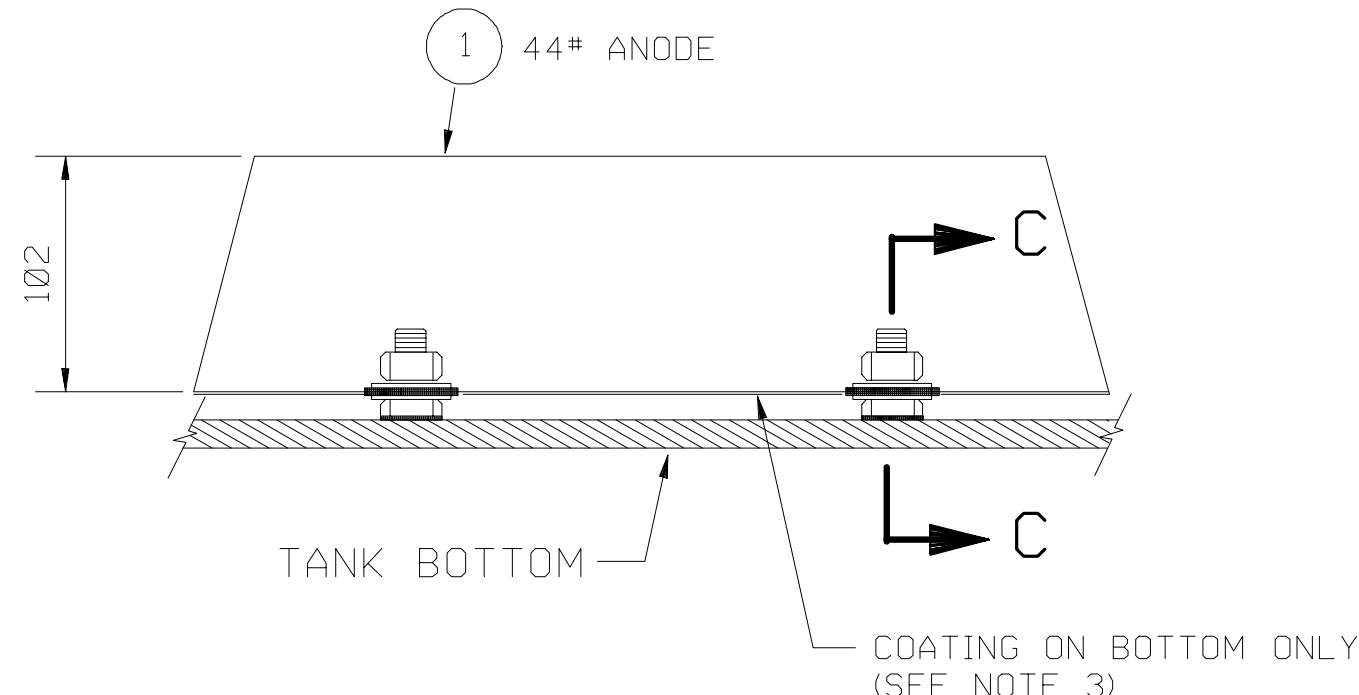
- WELDING OF BOLT HEAD OR WELDING BOSS TO BOTTOM:
 - FILLET WELD
 - WELD PROCEDURE P1-9A
 - PREHEAT OF 250°F
 - INSPECT WELD WITH MAGNETIC PARTICLE OR LIQUID PENETRANT
- COATING REPAIR:
 - REPAIR COATING PER SAES-H-100 SECTION 8.3 AND PARAGRAPH 8.2.7.
 - INSTALL WASHERS AND NUTS ON BOLT BEFORE COATING TO MASK OFF THE BOLT THREADS AND CONTACT SURFACE FOR ANODE STRAP.
 - COAT FILLET WELD AND BOLT HEAD.
- REMOVE ALL PLASTIC COATING FROM ANODE SURFACE BEFORE INSTALLING ANODE EXCEPT FOR THE COATING ON THE BOTTOM OF THE ANODE THAT IS NEXT TO THE TANK BOTTOM.
- ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE INDICATED.
- TANKS WITH SUMPS ARE TO HAVE ONE ADDITIONAL 50 LB. ANODE INSTALLED IN THE BOTTOM OF SUMP. A SMALLER ANODE MAY BE USED IF THE SUMP SIZE DOES NOT ALLOW INSTALLATION OF THE 50 LB. ANODE. SEE DETAIL NO. 1.
- SUMPS SHALL HAVE A MINIMUM OF ONE 50 LB. ANODE INSTALLED PER 140 SQUARE METERS OF SURFACE AREA OR A PORTION THEREOF EXCEPT FOR SMALL SUMPS COVERED IN NOTE 5.
- INSTALL 44 LB. MAGNESIUM ANODES ACCORDING TO DETAIL 3, 4, 6 OR 7 FOR TANKS LESS THAN 20 METERS. MATCH THE TYPE AND SIZE OF TANK TO THE APPROPRIATE DETAIL.
- FOR TANKS WITH DIAMETERS OF 20 METERS OR MORE INSTALL THE 44 LB. MAGNESIUM ANODES ACCORDING TO TABLE I FOR CONED-UP TANKS AND DETAIL 2. ACCORDING TO TABLE II FOR CONED-DOWN TANKS AND DETAIL 5.
- THE QUANTITIES OF ANODES ARE A MINIMUM REQUIREMENT. THE PROPONENT MAY REQUIRE MORE ANODES FOR TANKS THAT HAVE DEMONSTRATED PITTING CORROSION OR DEPLETION OF ANODES IN SIMILAR TANKS OR OPERATIONS.
- DEPRESSIONS OR LOW AREAS IN THE TANK BOTTOM THAT MIGHT COLLECT WATER SHALL ALSO HAVE ONE ANODE PER 140 SQUARE METERS OF SURFACE AREA OR A PORTION THEREOF.
- IF THE PROPONENT HAS EXPERIENCED SHORTER THAN 10 YEAR LIFE WITH MAGNESIUM ANODES, THEN ALUMINUM ANODES MAY BE USED IN PLACE OF THE MAGNESIUM ANODES; HOWEVER, ALUMINUM AND MAGNESIUM ANODES SHALL NOT BE MIXED. THE QUANTITY OF ANODES MUST BE INCREASED WHERE EXPERIENCE HAS SHOWN CORROSION OR SHORT LIFE.
- IF ALUMINUM ANODES ARE USED, THE NUMBER OF ANODES MUST BE INCREASED BY A FACTOR OF 400 % TO DECREASE THE SPACING BETWEEN THE ANODES.
- THE NUMBER AND SIZE OF ALUMINUM MUST BE APPROVED BY THE SUPERVISOR OF CSD/ME&CCD/ CATHODIC PROTECTION AND COATING UNIT.
- FOR TANKS THAT ARE NOT CONED UP OR CONED DOWN IN THE MIDDLE, CONTACT CSD/ME&CCD/ CATHODIC PROTECTION AND COATING UNIT FOR MODIFICATION OF THE DESIGN. THE INTENT OF THE DESIGN IS TO CONCENTRATE THE ANODES AROUND THE LOW SUMP OR DRAIN AREAS WHERE WATER IS MOST LIKELY TO SETTLE OUT OF THE OIL.
- FOR TANKS SMALLER THAN 1.5 METERS DIAMETER OR LARGER THAN THE DIAMETERS SHOWN, CONTACT CSD/ME&CCD/ CATHODIC PROTECTION AND COATING UNIT FOR MODIFICATION OF THE DESIGN.
- ANODES ARE NOT REQUIRED FOR JET FUEL TANKS CONTAINING FILTERED JET FUEL THAT IS CLEAN, WATER FREE AND READY FOR JET ENGINE USE.



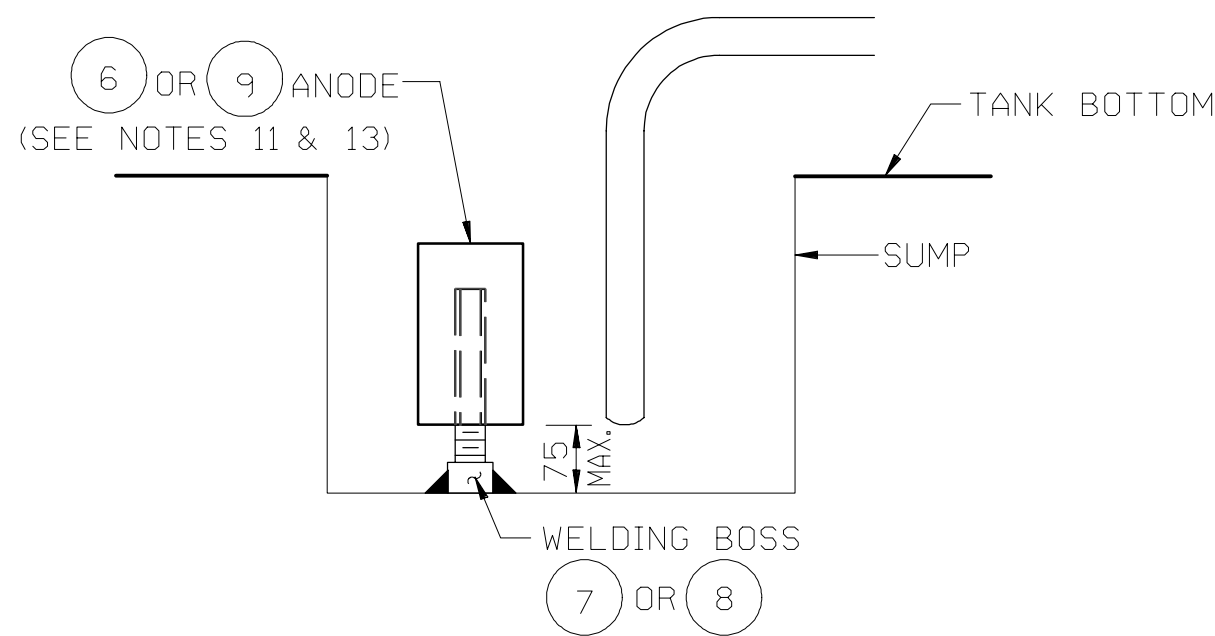
PLAN



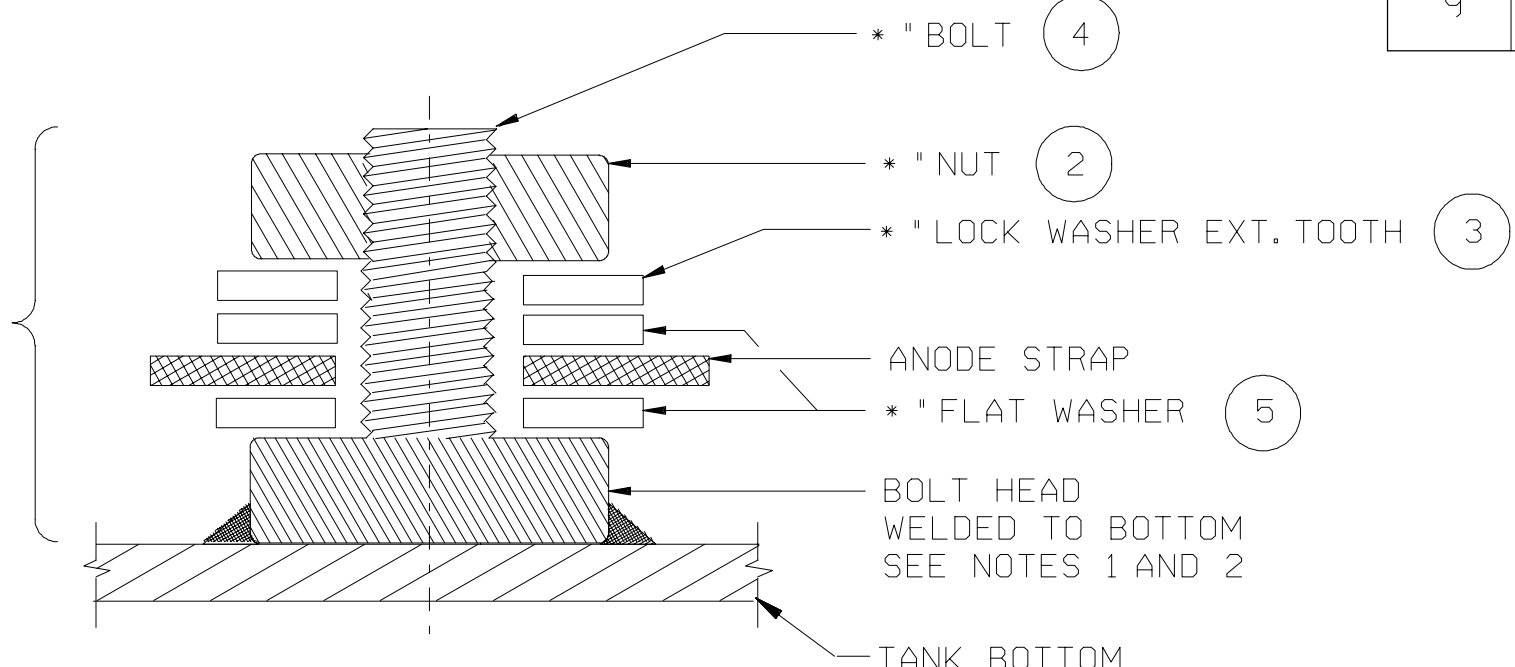
VIEW A-A



VIEW B-B



DETAIL 1
SUMP INSTALLATION
(SEE NOTES 1, 2, 5, 6, 11, 12 & 13)



SECTION C-C

ALL SURFACES MUST BE CLEANED TO BRIGHT METAL BEFORE INSTALLATION OF THE ANODE

MATERIAL LIST		
CODE	AMS NUMBER	DESCRIPTION
1	17-851-623	ANODE, 20 KG. (44 LB.) MAGNESIUM
2	10-579-017	* 1- 11 THD. HEXAGONAL NUT STEEL
3	10-826-454	* LOCKWASHER EXT. TOOTH, SHAKEPROOF STL.
4	10-206-472	* BOLT
5	10-887-848	* FLAT WASHER
6	17-851-661	50 LB. (22.7 KG.) MAGNESIUM ANODE
7	02-455-404	* WELDING BOSS
8	02-455-408	1" WELDING BOSS
9	17-851-070	47 LB. (21.4 KG.) GALV. III ALUMINUM ANODE

DRAWING RESPONSIBILITY :
CATHODIC PROTECTION STANDARDS COMMITTEE

REV.	DATE	BY	JO/EWO	DESCRIPTION	CHKD.	CERT.	APPD.
06	JUL-99	EDSD		REVISED NOTES, PLAN, VIEW AA & BB AND SECTION CC			
05	MAY-97	MSM		GENERAL REVISION AND CHANGED DWG. SHT. SIZE FROM "C" TO "A".	ORIG. SIGNED	ORIG. SIGNED	ORIG. SIGNED
04	JAN-93	ESSD	DTT	GENERAL REVISION.	ORIG. SIGNED	ORIG. SIGNED	ORIG. SIGNED
03	JUN-85	RLO		REDRAWN FOR CLARITY.	ORIG. SIGNED	ORIG. SIGNED	ORIG. SIGNED

SAUDI ARABIAN OIL COMPANY

DRAWN BY _____ CHECKED BY _____ SCALE: _____ NONE
DATE STARTED _____ DATE COMPLETED _____
OPRG. DEPT. _____ ENG. DEPT. _____
APP'D. FOR CONST. _____

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIAL, UNTIL CERTIFIED AND DATED

CATHODIC PROTECTION
CRUDE AND PRODUCT TANK BOTTOM
INTERNAL GALVANIC ANODE INSTALLATION

STD. DWG. METRIC

PLANT NO.	INDEX	DRAWING NUMBER	SHT. NO.	REV. NO.
990	X	AA-036762	001	06