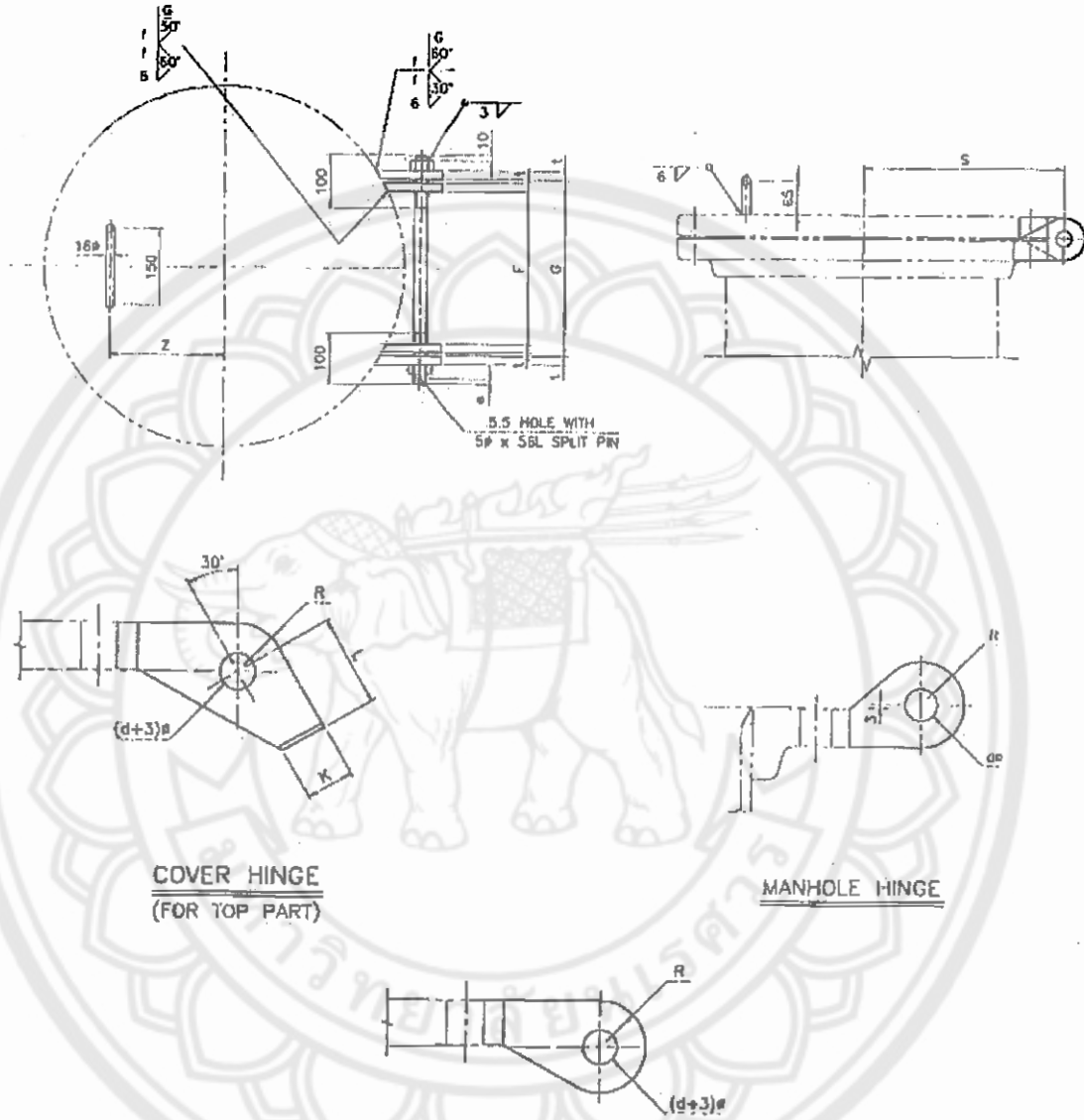




ภาคผนวก ก.
Vessel Standard

มหาวิทยาลัยพระเชตุвр

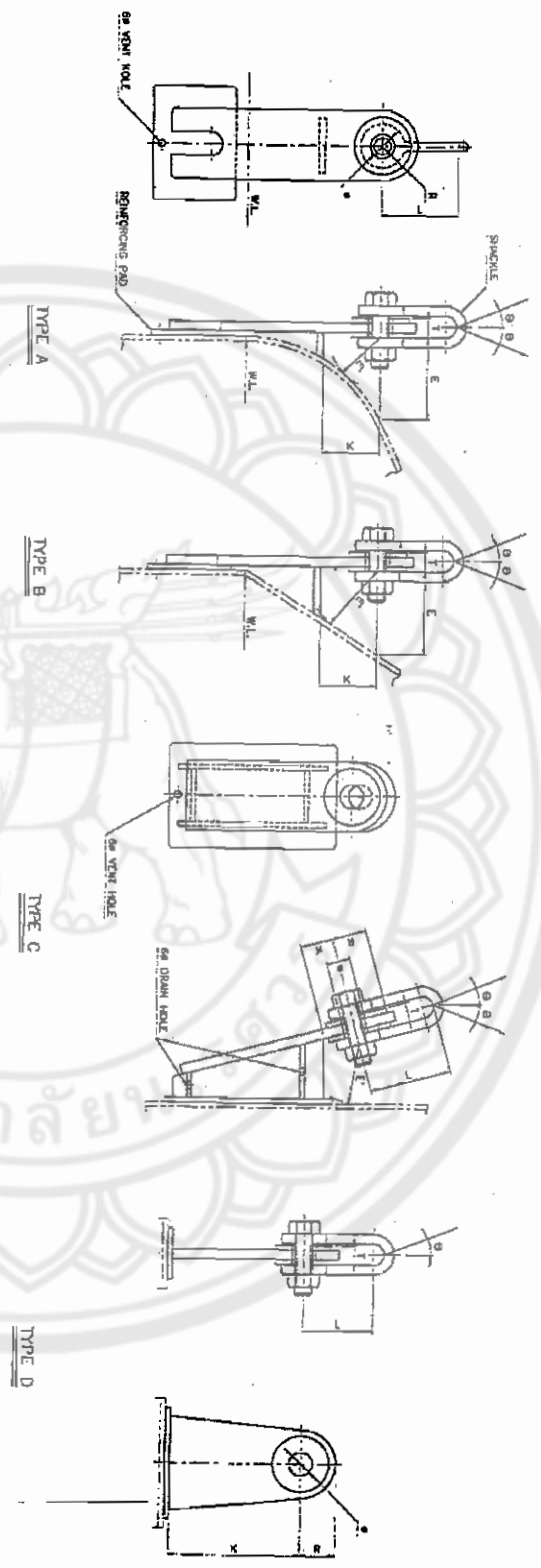


ตารางที่ ก.1 ขนาดอ้างอิงต่างๆของ Man Hole Flange Class 150#

Class	SIZE		S	F	G	t	d	R	K	L	e	f	HINGE BOLT		Z
	DN	NPS											SIZE	LENGTH	
150#	450	15	350	265	312	22	28	40	40	74	10	10	M24	430	200
	500	20	380	300	347	22	28	40	45	76	10	10	M24	465	220
	600	24	440	355	402	22	28	40	50	86	10	10	M24	520	270

ตารางที่ ก.2 ขนาดที่ใช้อ้างอิงในการออกแบบ Lifting Lug

W(TON)	APPLICABLE SHACKLE ST'D					LIFTING LUG DIMENSION						
	ST'D NAME	NOMINAL SIZE	BOLT DIA.	L	W2 (TON)	T Max	R Max	Ø Min.	E Min.	E' Min.	K Min.	
2.3	JIS	SC16	M18	64	1.5	19	30	24	60	55	45	
3.8	JIS	SB20	M24	80	2.5	23	40	30	70	60	50	
7.5	JIS	SB30	M36	120	5.4	33	60	45	90	80	65	
15	JIS	SB40	M48	160	10	45	80	60	115	100	75	
23	JIS	SB50	M56	200	15	55	100	75	135	115	90	
30	JIS	SB60	M64	240	22	65	120	85	150	130	105	





ภาคผนวก ข.

แบบรายละเอียด
(Detail Drawing)

มหาวิทยาลัยบูรพา

DESIGN SPECIFICATION

DESIGN CODE : ASME SEC. VIII DIV. 1 2001 EDITION AND 2003 ADDENDA WITH "U" STAMP
 ADDITIONAL SPECIFICATION : C-001 REV. 1

CONTENTS : INSTRUMENT AIR DENSITY : 11.11 kg/m³
 VESSEL VOLUME : 62.9 m³ CORROSION ALLOWANCE (NT) : 3.0 mm
 FLAMMABLE/EXPLOSIVE/ABRASIVE : NO/NO/NO TOXIC : NO

DESIGN CONDITION : INTERNAL : 12.0 kg/cm²G AT 75 °C
 EXTERNAL : NOT APPLICABLE

OPERATING CONDITION : INTERNAL : 9.0 kg/cm²G AT 45 °C
 EXTERNAL : NOT APPLICABLE

INTERIM TEST PRESSURE : SHOP NEW TEST (HORIZONTAL) : 19.57 kg/cm²G
 SITE NEW TEST (VERTICAL) : 18.97 kg/cm²G

MAXIMUM ALLOWABLE WORKING PRESSURE (SLO & NEW) : 14.80 kg/cm²G AT AMBIENT TEMP.
 MINIMUM ALLOWABLE WORKING PRESSURE (HOT & CORRODED) : 12.40 kg/cm²G AT 75 °C
 MINIMUM DESIGN METAL TEMPERATURE : 0 °C IMPACT TEST : NO
 POSTWELD HEAT TREATMENT : NO HARDNESS TEST : NO
 BASIC WIND SPEED : 35 m/s SEISMIC ZONE : UBC ZONE 0
 INSULATION : NONE FIREPROOFING : NONE mm

RADIOGRAPHIC EXAMINATION

COMPONENT	RADIOGRAPHIC	JOINT EFFICIENCY
SHELL	SPOT	0.85
HEAD (TOP/BOTTOM)	FULL/FULL	1.00/1.00
OPENING NECK MADE FROM PLATE	FULL	1.00

WEIGHT

EMPTY (VESSEL+PT & L/D) : 19032 kg HYDRO. TEST (AT SHOP) : 81720 kg
 CRECTION : 18810 kg HYDRO. TEST (AT SITE) : 81942 kg
 OPERATING (VESSEL+PT & L/D) : 19731 kg

MATERIAL SPECIFICATION

SHELL/HEAD/PAD : SA516 Gr.70 BASE PLATE : SA283 Gr.C
 OPENING FLANGE : SA105 GASKET (EXTERNAL) : NON-ASBESTOS
 OPENING NECK (<= 12") : SA106 Gr. B GASKET (INTERNAL) : N/A
 OPENING NECK (> 12") : SA516 Gr.70 STUD BOLT/NUT (EXTERNAL) : SA193-B7/SA194-2H
 FITTING : N/A BOLT/NUT (INTERNAL) : N/A
 INTERNAL PARTS WELDED TO VESSEL : SA516 Gr.70 FOUNDATION BOLT/INT./AMB./OUT./RI + HOT DIP GALV.
 SKIRT SUPPORT : SA516 Gr.70 EARTH LUG : 304 SS
 OTHERS : SEE DRAWING

SURFACE TREATMENT SPECIFICATION

EXTERIOR :
 1. FOR VESSEL : FOLLOW TO PROCEDURE NO. D1301-BS-002-0 (BASED ON SPEC. NO. X-001)
 2. LADDER, HANDRAIL AND TOP PLATFORM : TO BE HOT DIP GALVANIZED AND FINISHED BY TRAFFIC YELLOW RAL 1023

INTERIOR : NONE

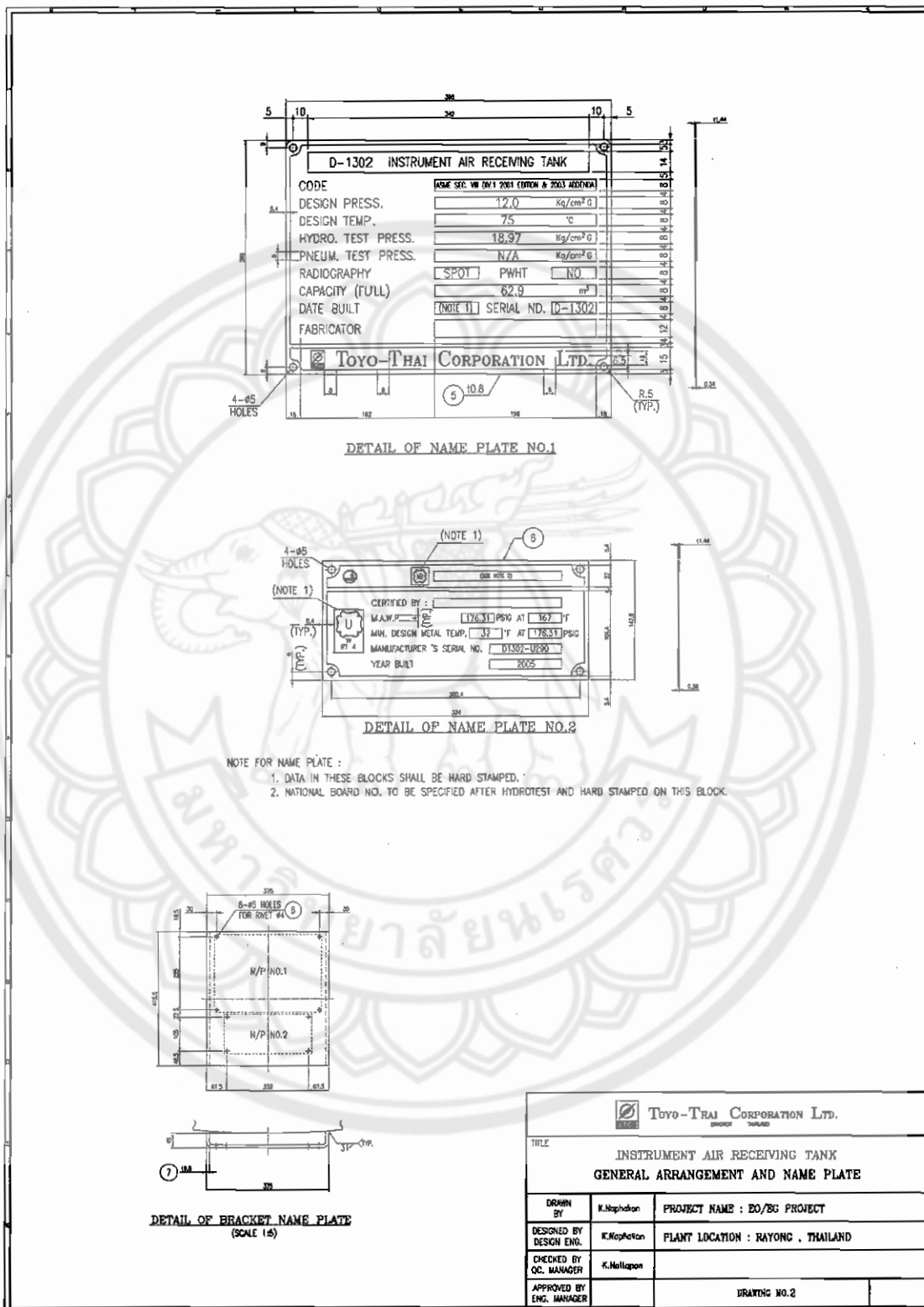
NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK
25	GUSSET	PL. 19	SA516 Gr.70	1
24	GUSSET	PL. 112	SA516 Gr.70	6
23	CLIP	PL. 112	SA516 Gr.70	4
22	CLIP	PL. 19	SA516 Gr.70	1
21	HEX HEAD PLUG	4 1/2" NPT.	OS.	4
20	PAD	PL. 115	SA516 Gr.70	2
19	CHEEK	PL. 115	SA516 Gr.70	4
18	PAD	PL. 115	SA516 Gr.70	2
17	RIB	PL. 120	SA516 Gr.70	2
16	RIB	PL. 120	SA516 Gr.70	4
15	LIFTING LUG	PL. 122	SA516 Gr.70	2
9-14	(DELETED)			
8	RIVET	64	ALUMINUM	B
7	BRACKET	PL. 16.4	SA516 Gr.70	1
6	NAME PLATE NO.2	PL. 10.B	304 SS	1
5	NAME PLATE NO.1	PL. 10.B	304 SS	1
4	HEAD (2:1 ED.)	PL. 122	SA516 Gr.70	2 SETS
3	SHELL	PL. 120	SA516 Gr.70	3 SETS
2	SHELL	PL. 120	SA516 Gr.70	1 SET
1	SHELL	PL. 122	SA516 Gr.70	1 SET

BILL OF MATERIAL

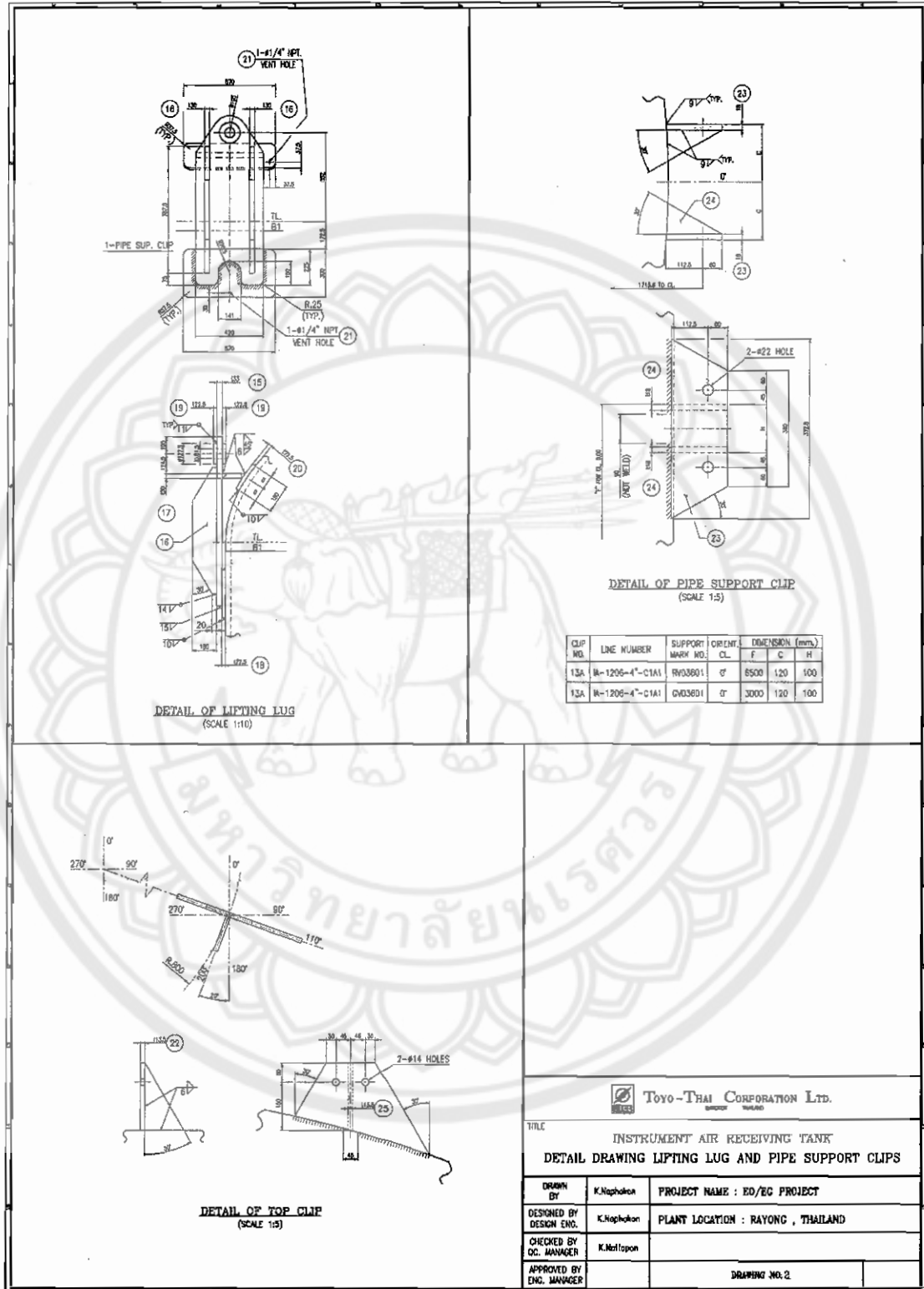
NOZZLE SCHEDULE

MARK	SERVICE	SIZE	Q'TY	NECK SCH. A	FLANGE TYPE	RATING	PROJ. TO CL.	REMARK
N-1	MANHOLE	24"	1	115	SO.RF.	150#	1925	W/H/NGE
N-1	AIR FEED FROM DRYER PACKAGE	4"	1	120	SO.RF.	150#	1925	W/BUFFLE
N-2	PSY CONNECTION	1"	1	-	LWN. RF.	150#	-	SEE DWG.
N-3	AIR OUTLET TO IA HEADER	4"	1	120	SO.RF.	150#	-	SEE DWG.
N-4	PRESSURE GAUGE	1"	1	-	LWN. RF.	150#	1795	-
N-5	DRAIN	1"	1	XXS	SO.RF.	150#	1795	-
N-6	SPARE	2"	1	160	SO.RF.	150#	-	SEE DWG. W/BLIND
SP1-6	SHORT WEAT	2"	5	40	-	-	-	-
ATS-2	ACCESS HOLE	Ø3.508	2	18	-	-	-	-
	SHORT SLEEVE FOR N-5	Ø"	1	40	-	-	-	-

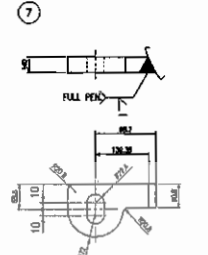
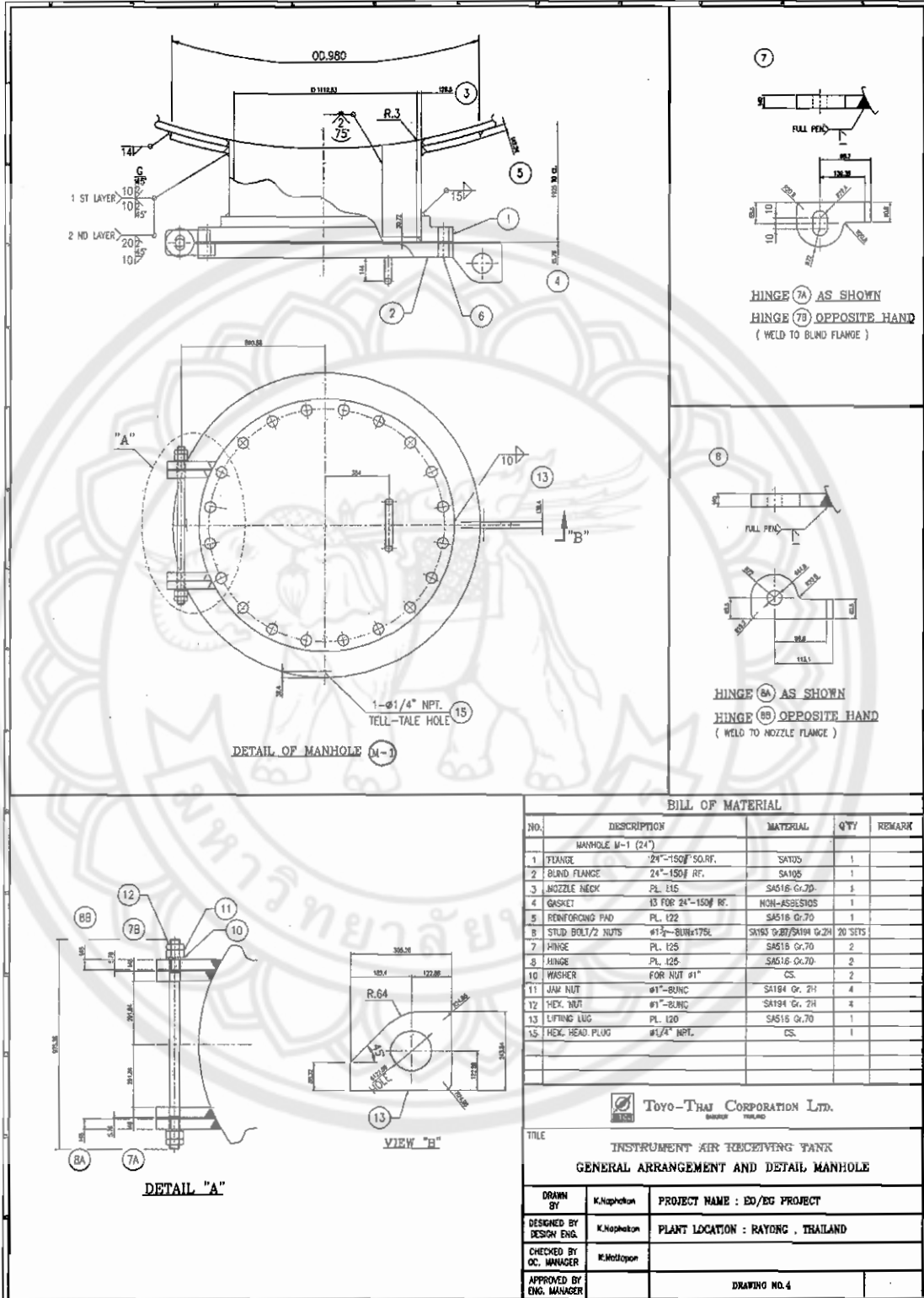
รูปที่ ข.1 แบบรายละเอียดของถังความดัน



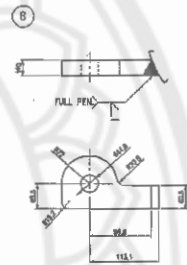
รูปที่ ข.2 แบบรายละเอียด Name plate



รูปที่ ข.3 แบบรายละเอียดของ Lifting Lug และ Pipe support clips



HINGE (7A) AS SHOWN
HINGE (7B) OPPOSITE HAND
(WELD TO BLIND FLANGE)



HINGE (8A) AS SHOWN
HINGE (8B) OPPOSITE HAND
(WELD TO NOZZLE FLANGE)

BILL OF MATERIAL

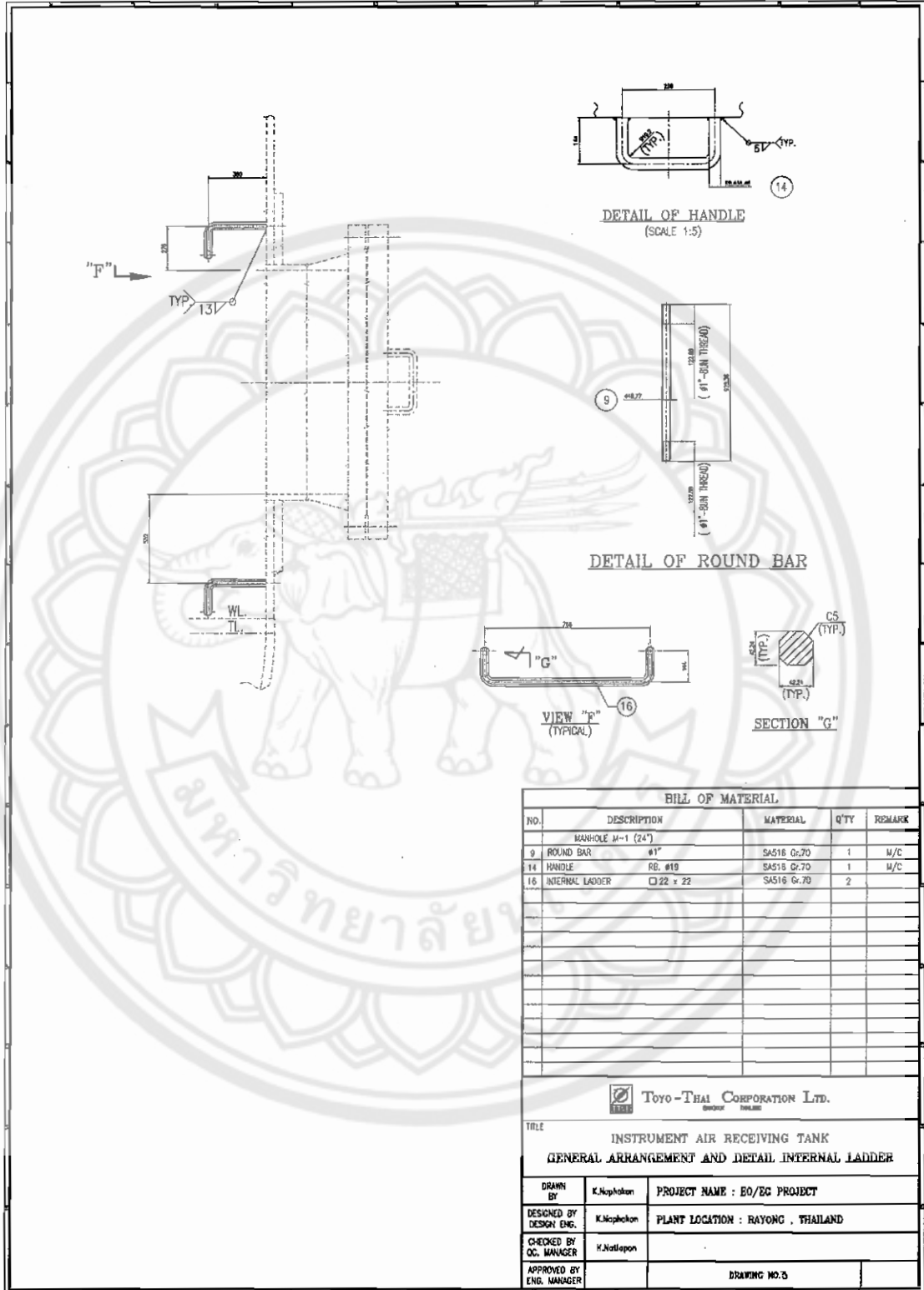
NO.	DESCRIPTION	MATERIAL	QTY	REMARK
MANHOLE M-1 (24")				
1	FLANGE 24"-150# SO.RF.	SA105	1	
2	BLIND FLANGE 24"-150# RF.	SA105	1	
3	NOZZLE NECK PL. 115	SA516 Gr.70	1	
4	GASKET 13 FOR 24"-150# RF.	NON-ASBESTOS	1	
5	REINFORCING PAD PL. 122	SA516 Gr.70	1	
6	STUD BOLT/2 NUTS #1 1/2"-BLIND 175L	SA193 Gr.2H/SA194 Gr.2H	20 SETS	
7	HINGE PL. 125	SA516 Gr.70	2	
8	HINGE PL. 125	SA516 Gr.70	2	
10	WASHER FOR NUT #1"	CS.	2	
11	JAW NUT #1"-BUNC	SA184 Gr. 2H	4	
12	HEX. NUT #1"-BUNC	SA194 Gr. 2H	4	
13	LIFTING LUG PL. 120	SA516 Gr.70	1	
15	HEX. HEAD PLUG #1/4" NPTL.	CS.	1	

TOYO-THAI CORPORATION LTD.
1962-1963

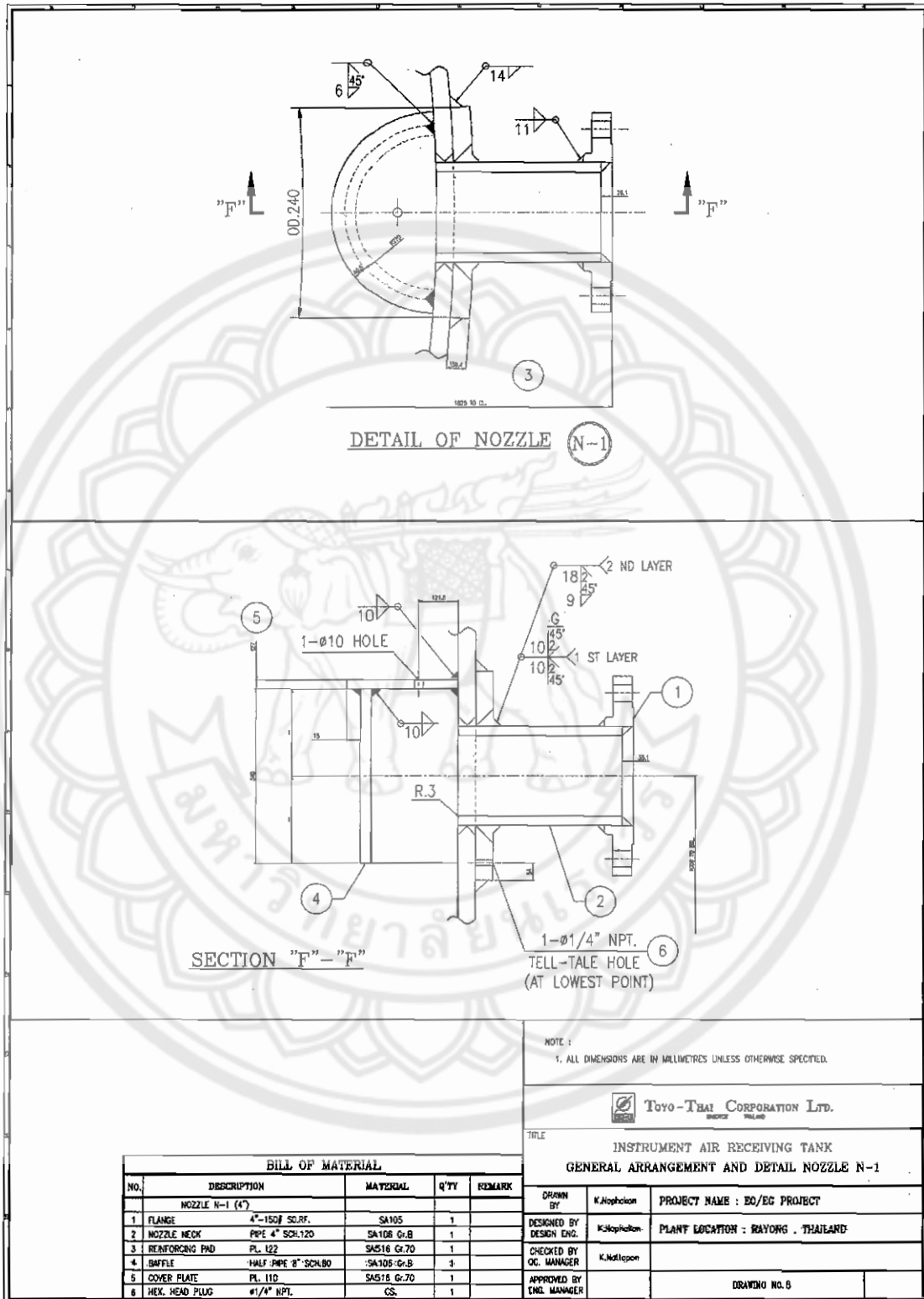
TITLE
INSTRUMENT AIR RECEIVING TANK
GENERAL ARRANGEMENT AND DETAIL MANHOLE

DRAWN BY	K.Naphatun	PROJECT NAME :	ED/EG PROJECT
DESIGNED BY	K.Naphatun	PLANT LOCATION :	RAYONG , THAILAND
CHECKED BY	K.Mollyphon		
APPROVED BY			DRAWING NO.4

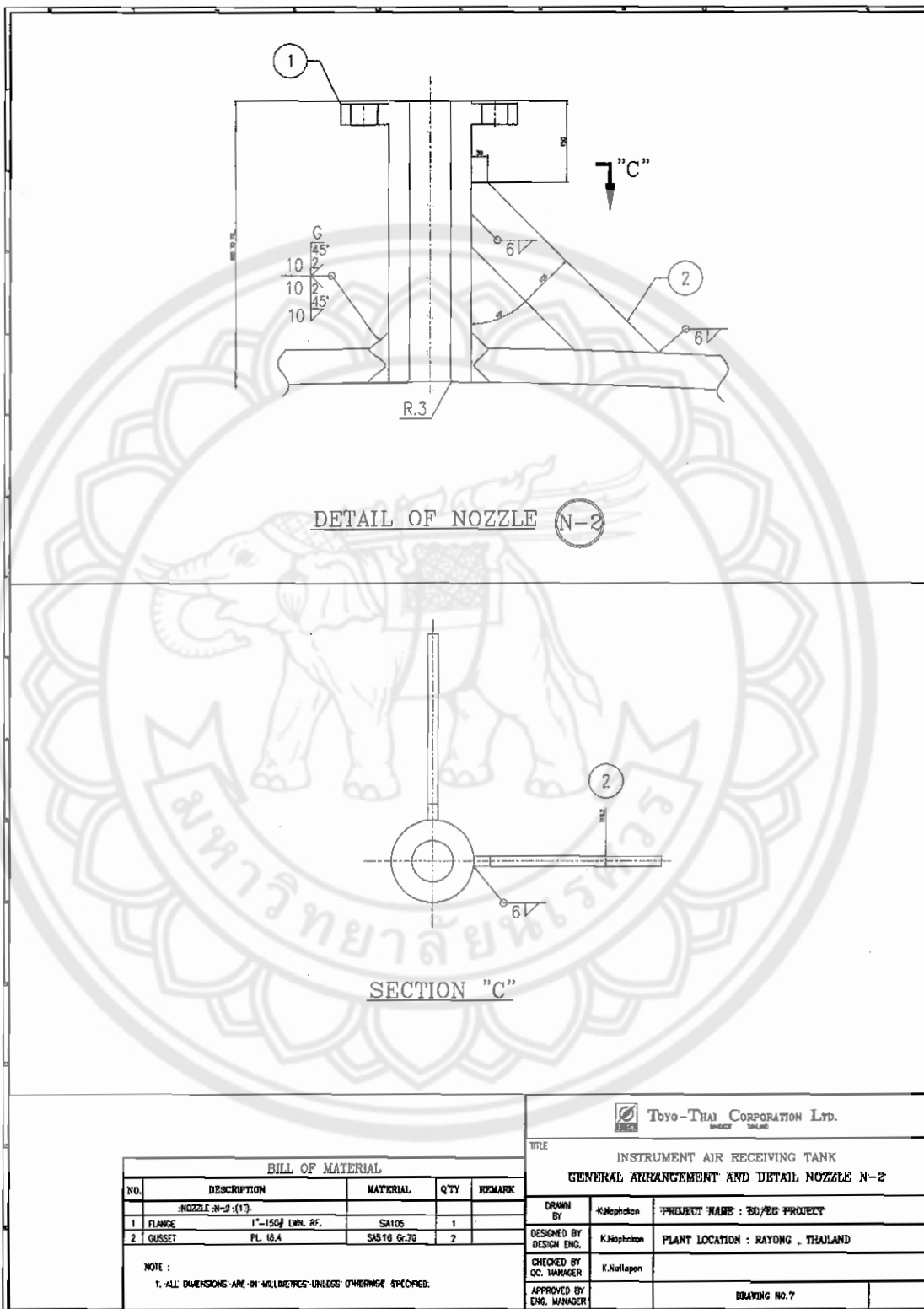
รูปที่ ข.4 แบบรายละเอียดของ M-1 Manhole



รูปที่ ข.5 แบบรายละเอียดของ Internal Ladder

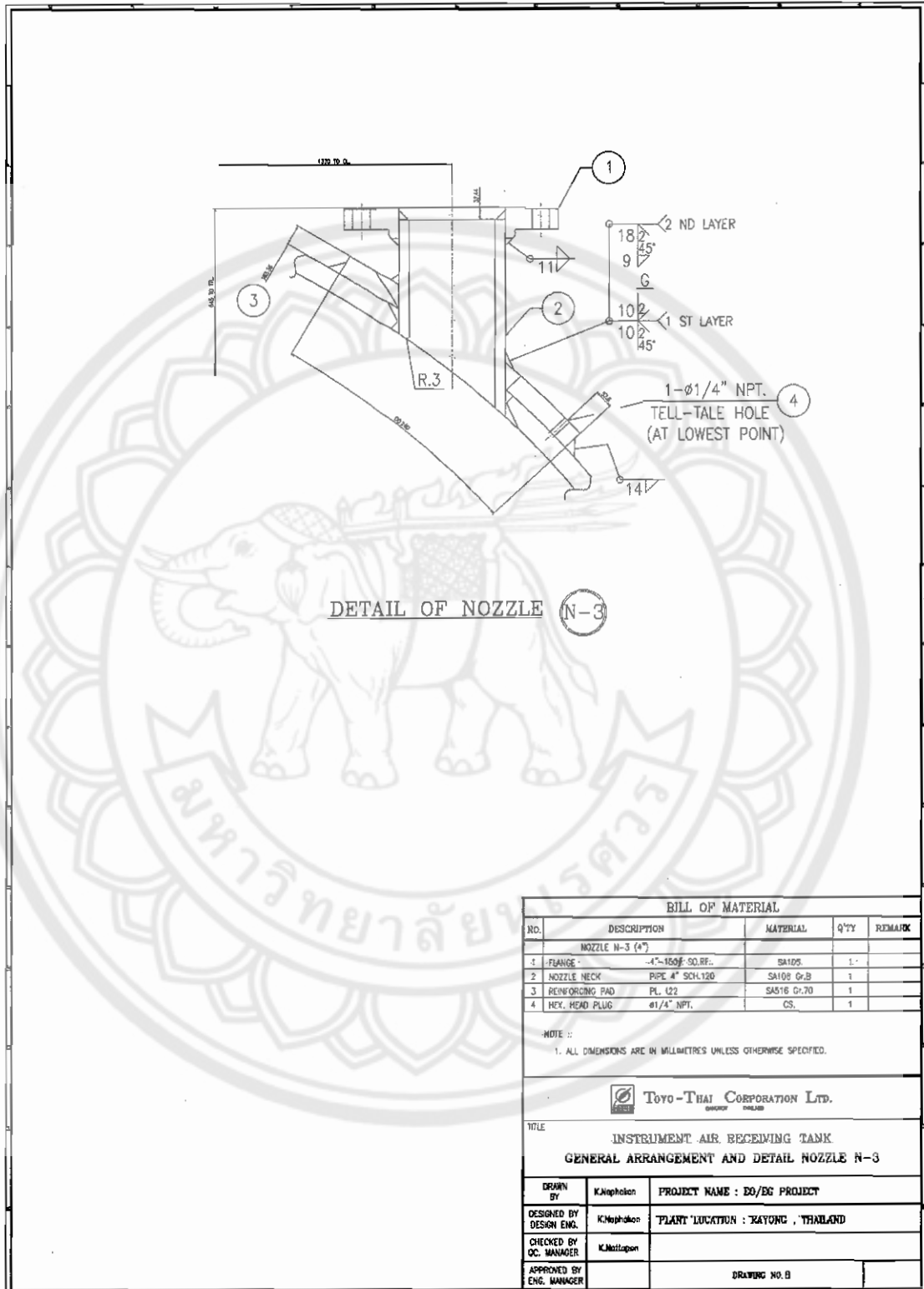


รูปที่ ข.6 แบบรายละเอียดของหัวฉีด N-1 (Air feed from dryer package)

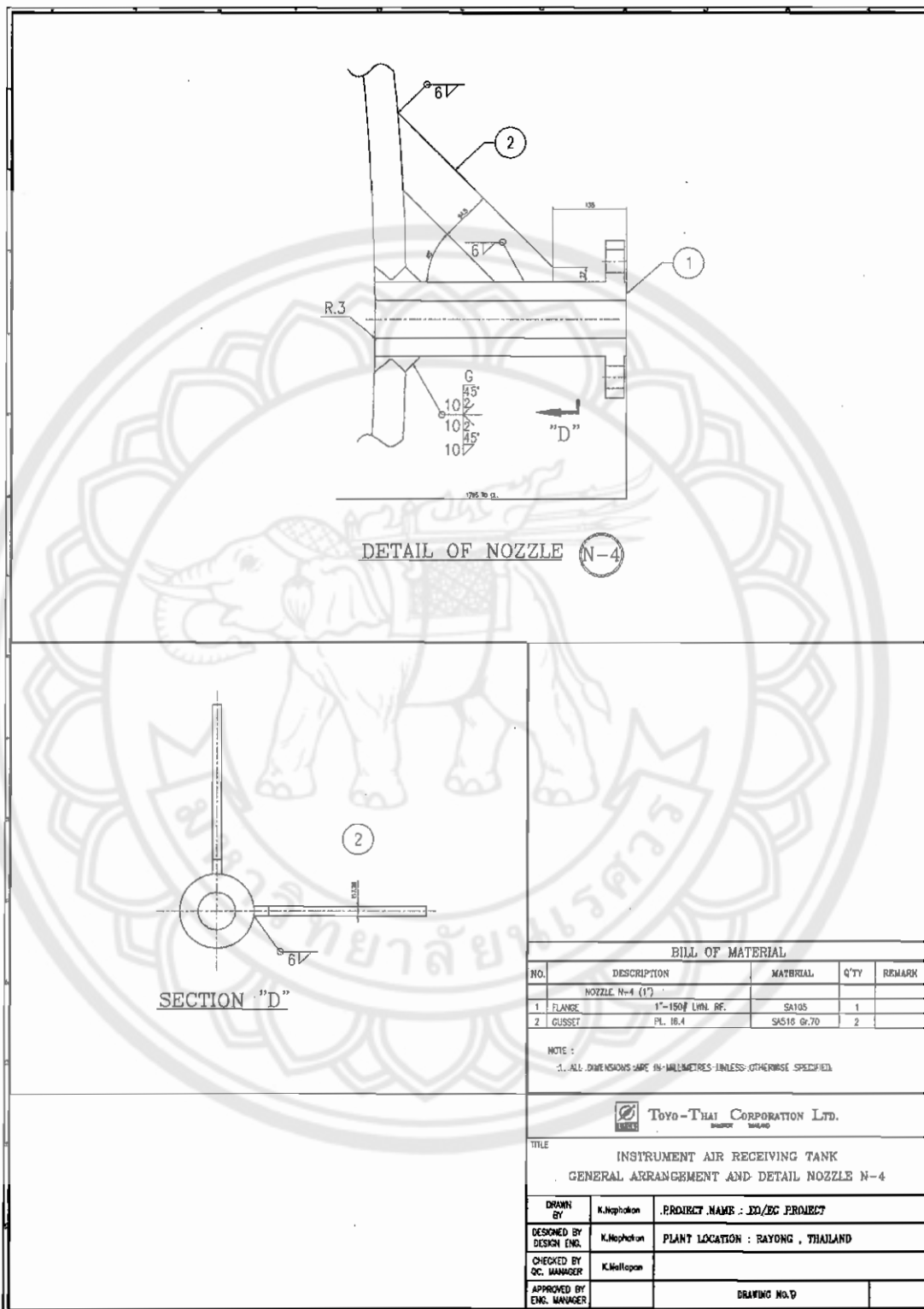


BILL OF MATERIAL					Tbvo-Thai Corporation Ltd. <small>INCORPORATED IN THAILAND</small>		
					TITLE INSTRUMENT AIR RECEIVING TANK GENERAL ARRANGEMENT AND DETAIL NOZZLE N-2		
NO.	DESCRIPTION	MATERIAL	QTY	REMARK	DRAWN BY	K.Naphatan	PROJECT NAME : BO/EG PROPERTY
1	FLANGE NOZZLE N-2 (1)	1"-150# LWR. RF.	1		DESIGNED BY	K.Naphatan	PLANT LOCATION : RAYONG , THAILAND
2	GUSSET	PL. 16.4	2		CHECKED BY	K.Naphatan	
NOTE : 1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.					APPROVED BY		DRAWING NO.7
					ENG. MANAGER		

รูปที่ ข.7 แบบรายละเอียดของหัวฉีด N-2 (RV Connection)



รูปที่ ข.8 แบบรายละเอียดของหัวฉีด N-3 (Air outlet to AI header)



BILL OF MATERIAL

NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK
NOZZLE N-4 (1")				
1	FLANGE	1"-150# LHM. RF.	SA105	1
2	GUSSET	PL. 16.4	SA516 Gr.70	2

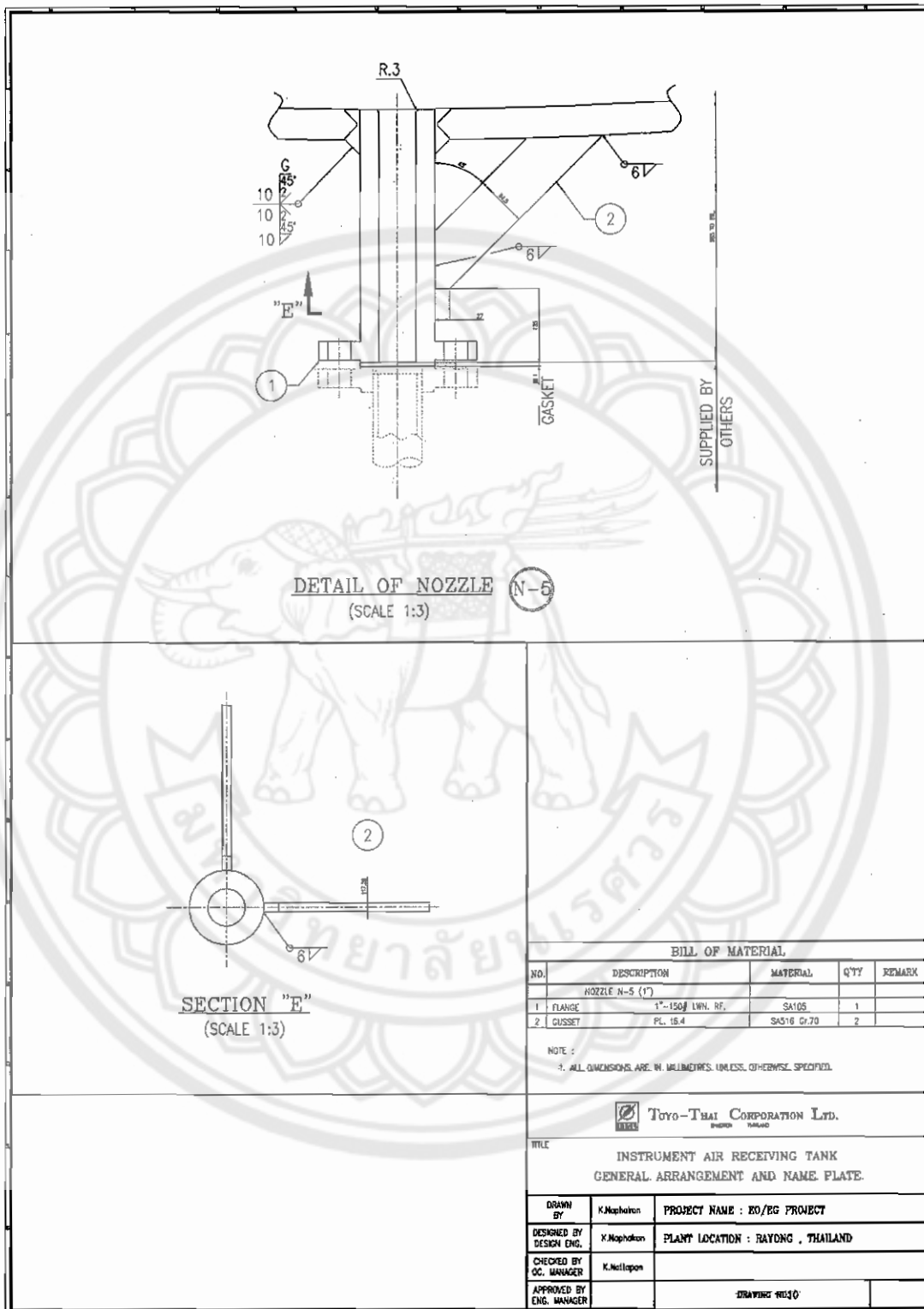
NOTE :
 1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.


Toyo-THAI CORPORATION LTD.
INCORPORATED IN THAILAND

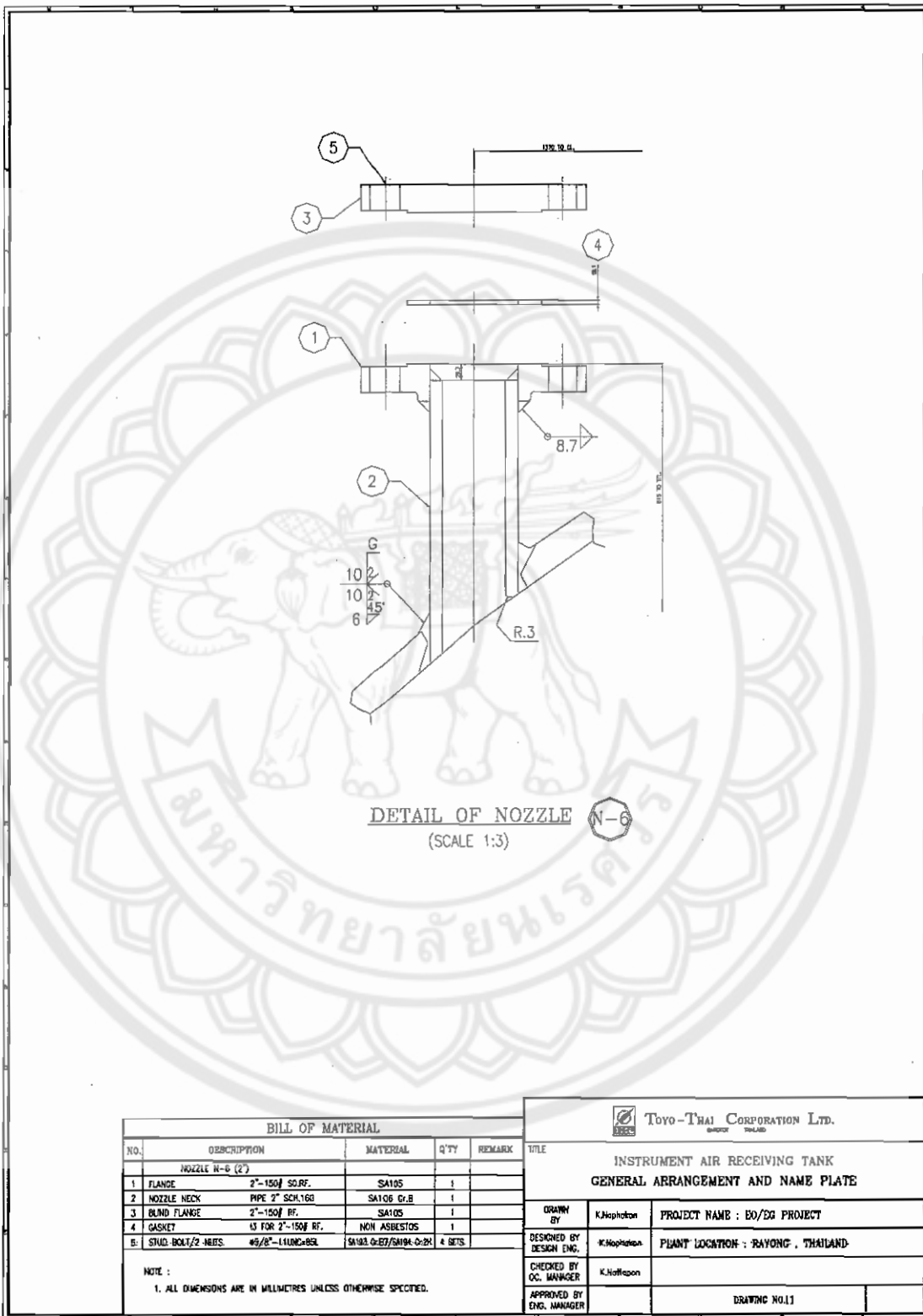
TITLE
 INSTRUMENT AIR RECEIVING TANK
 GENERAL ARRANGEMENT AND DETAIL NOZZLE N-4

DRAWN BY	K.Nophakon	PROJECT NAME	ED/EC PROJECT
DESIGNED BY	K.Nophakon	PLANT LOCATION	RAYONG, THAILAND
CHECKED BY	K.Mellopan		
APPROVED BY		DRAWING NO. D	

รูปที่ ข.9 แบบรายละเอียดของหัวฉีด N-4 (Pressure Gauge)



รูปที่ ข.10 แบบรายละเอียดของหัวฉีด N-5 (Drain)



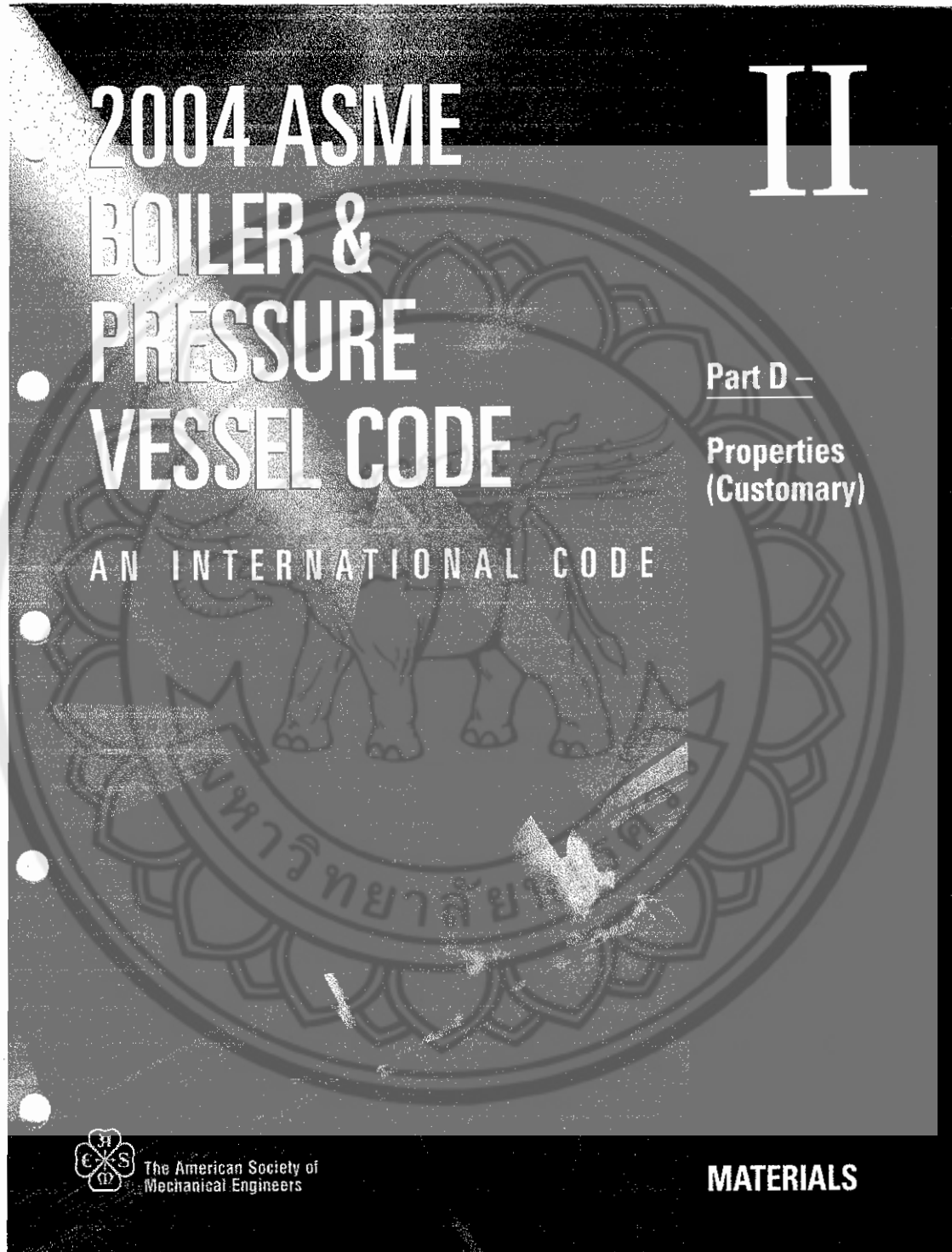
รูปที่ ข.11 แบบรายละเอียดของหัวฉีด N-6 (Spare)



ภาคผนวก ค.

American Society of Mechanical Engineers Section II Part D

มหาวิทยาลัยพระนคร



รูปที่ ก.1 American Society of Mechanical Engineers Section II Part D

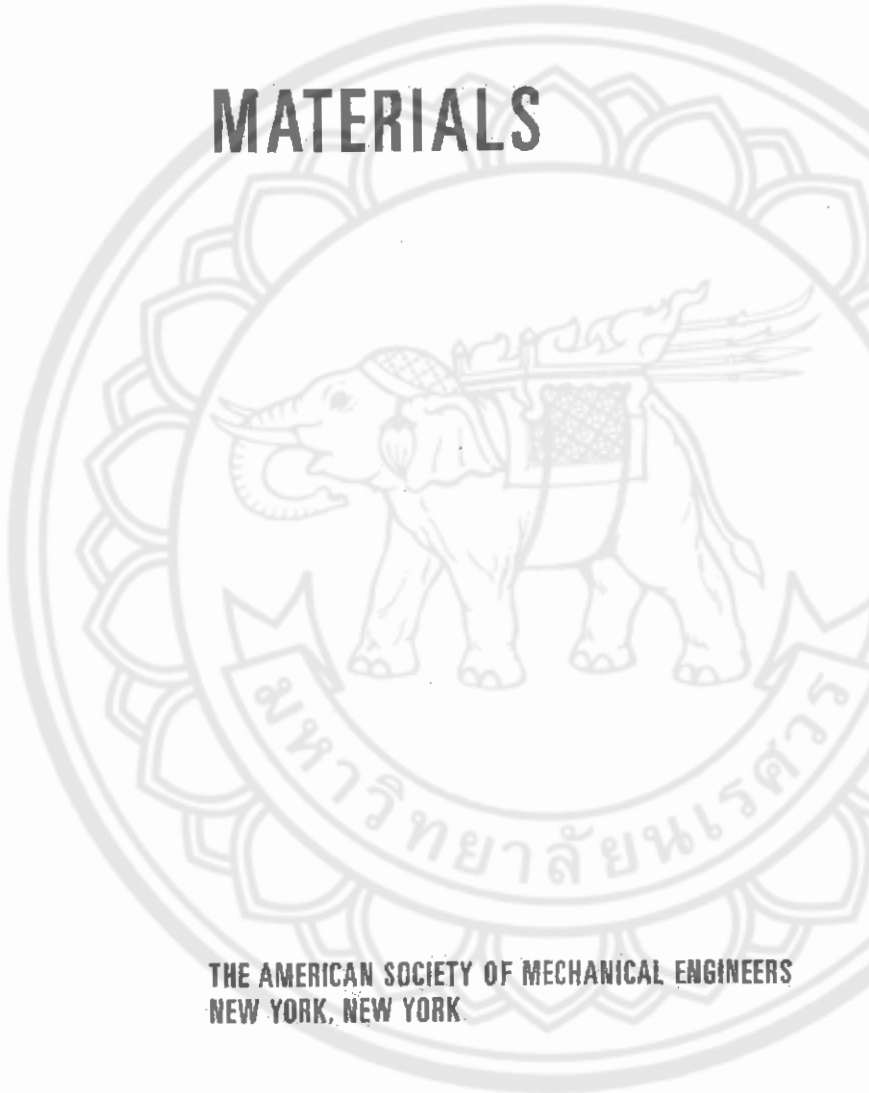
ASME BOILER AND PRESSURE VESSEL CODE
AN INTERNATIONAL CODE



MATERIALS

Part D –

Properties
(Customary)



THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
NEW YORK, NEW YORK

2004 Edition
July 1, 2004

ASME BOILER AND
PRESSURE VESSEL
COMMITTEE
SUBCOMMITTEE
ON MATERIALS

รูปที่ ก.2 American Society of Mechanical Engineers Section II Part D

Date of Issuance: July 1, 2004
(Includes All Addenda dated July, 2003 and earlier)

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รูปที่ ก.3 American Society of Mechanical Engineers Section II Part D

2004 SECTION II

TABLE 1A (CONT'D)
SECTION I; SECTION III, CLASS 2 AND 3; * SECTION VIII, DIVISION 1; AND SECTION XII
MAXIMUM ALLOWABLE STRESS VALUES S FOR FERROUS MATERIALS
 (*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/UNS No.	Class/Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Carbon steel	Wld. pipe	SA-53	E/B	K03005	...	...	1	1
2	Carbon steel	Wld. pipe	SA-53	E/B	K03005	...	...	1	1
3	Carbon steel	Smls. pipe	SA-53	S/B	K03005	...	...	1	1
4	Carbon steel	Smls. pipe	SA-53	S/B	K03005	...	...	1	1
5	Carbon steel	Smls. pipe	SA-106	B	K03006	...	...	1	1
6	Carbon steel	Wld. pipe	SA-135	B	...	...	...	1	1
7	Carbon steel	Smls. & wld. fittings	SA-234	WPB	K03006	...	...	1	1
8	Carbon steel	Smls. & wld. pipe	SA-333	a	K03006	...	...	1	1
9	Carbon steel	Smls. & wld. tube	SA-334	a	K03006	...	...	1	1
10	Carbon steel	Wld. tube	SA-334	b	K03006	...	...	1	1
11	Carbon steel	Forged pipe	SA-369	F-PB	K03006	...	...	1	1
12	Carbon steel	Forgings	SA-372	A	K03002	...	...	1	1
13	Carbon steel	Sheet	SA-414	D	K02505	...	...	1	1
14	Carbon steel	Smls. & wld. fittings	SA-420	WPL6	...	...	...	1	1
15	Carbon steel	Smls. pipe	SA-524	I	K02104	...	...	1	1
16	Carbon steel	Bar	SA-696	B735	K03504	...	...	1	1
17	Carbon steel	Bar	SA-696	B	K03200	...	...	1	1
18	Carbon steel	Forgings	SA-727	...	K02506	...	...	1	1
19	Carbon steel	Wld. tube	SA-178	C	K03503	...	...	1	1
20	Carbon steel	Wld. tube	SA-178	C	K03503	...	...	1	1
21	Carbon steel	Wld. tube	SA-178	C	K03503	...	...	1	1
22	Carbon steel	Smls. tube	SA-210	A-1	K02707	...	...	1	1
23	Carbon steel	Smls. tube	SA-556	B7	K02707	...	...	1	1
24	Carbon steel	Wld. tube	SA-557	B2	K03007	...	...	1	1
25	Carbon steel	Plate, bar	SA/CSA-640 21	38W	...	...	...	1	1
26	Carbon steel	Plate	SA/AS 1548	7-430	...	...	5/4	1	2
27	Carbon steel	Plate	SA/EN 10028-2	F295GH	...	...	>4	1	2
28	Carbon steel	Bar	SA-675	65	...	...	...	1	1
29	Carbon steel	Castings	SA-357	LC6	K03004	...	...	1	1
30	Carbon steel	Plate	SA-414	65	K02806	...	...	1	1
31	Carbon steel	Plate	SA-414	65	K02405	...	...	1	1
32	Carbon steel	Wld. pipe	SA-106	C105	K0284	...	...	1	1
33	Carbon steel	Wld. pipe	SA-106	C105	K0241	...	...	1	1
34	Carbon steel	Wld. pipe	SA-106	B6	K0284	...	...	1	1
35	Carbon steel	Wld. pipe	SA-106	D65	K0241	...	...	1	1
36	Carbon steel	Steel	SA-414	E	K0270	...	...	1	1
37	Carbon steel	Plate	SA-667	B	K02205	...	...	1	1
38	Carbon steel	Plate	SA-637	...	K12437	1	2 1/2 x 15 4	1	2
39	Carbon steel	Wld. pipe	SA-691	CM5H 70	K12437	...	2 1/2 x 15 4	1	2

รูปที่ ก.4 American Society of Mechanical Engineers Section II Part D

PART D — PROPERTIES (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, CLASS 2 AND 3; * SECTION VIII, DIVISION 1; AND SECTION XII
MAXIMUM ALLOWABLE STRESS VALUES S FOR FERROUS MATERIALS
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	60	35	900	300 (Cl. 3 only)	NP	NP	CS-2	G10, S1, T1, W12, W13
2	60	35	900	NP	900	650	CS-2	G3, G10, G24, G35, S1, T1, W6
3	60	35	900	300 (Cl. 3 only)	NP	NP	CS-2	G10, S1, T1
4	60	35	NP	700 (SPT)	900	650	CS-2	G10, G35, T1
5	60	35	1000	700	1000	650	CS-2	G10, S1, T1
6	60	35	NP	NP	900	650	CS-2	G24, G35, T1, W6
7	60	35	3000	700	1000	650	CS-2	G10, S1, T1
8	60	35	NP	700	1000	650	CS-2	G10, T1, W12, W14
9	60	35	NP	700	650	650	CS-2	T1, W12, W14
10	60	35	NP	NP	650	650	CS-2	G24, W6
11	60	35	1000	NP	NP	NP	CS-2	G10, S1, T1
12	60	35	NP	NP	650	650	CS-2	...
13	60	35	NP	NP	900	650	CS-2	G10, G35, T1
14	60	35	NP	700	850	650	CS-2	G10, T1, W14
15	60	35	NP	NP	1000	650	CS-2	G10, T1
16	60	35	NP	700	1000	650	CS-2	G10, G22, T1
17	60	35	NP	700	NP	NP	CS-2	T1
18	60	36	NP	700	1000	650	CS-2	G10, G22, T1
19	60	37	1000	NP	NP	NP	CS-2	G4, G10, S1, T2
20	60	37	1000	700	NP	NP	CS-2	G10, S1, T1, W13
21	60	37	1000	NP	1000	650	CS-2	G3, G10, G24, G35, S1, T2, W6
22	60	37	1000	700	1000	650	CS-2	G10, S1, T1
23	60	37	NP	NP	1000	650	CS-2	G10, T1
24	60	37	NP	NP	1000	650	CS-2	G24, G35, T1, W6
25	60	38	NP	NP	650	650	CS-2	G35
26	62.5	...	1000	NP	1000	NP	CS-2	G10, G37, S1, T1
27	64	34	0-0	NP	1000	650	CS-2	G10, S1, T2
28	65	32.5	650	650 (Cl. 3 only)	1000	650	CS-2	G10, G15, G22, G35, S1, T2
29	65	35	NP	700	650	650	CS-2	G1, G17
30	65	35	1000	700	1000	650	CS-2	G10, S1, T2
31	65	35	850	700	1000	650	CS-2	G10, S1, T2
32	65	35	NP	700	NP	NP	CS-2	S6, W10, W12
33	65	35	NP	700	NP	NP	CS-2	S6, W10, W12
34	65	35	NP	700	NP	NP	CS-2	S6, W10, W12
35	65	35	NP	700	NP	NP	CS-2	S6, W10, W12
36	65	38	NP	NP	90	650	CS-2	G10, G35, T1
37	65	40	NP	NP	70	650	CS-2	T1
38	65	45	NP	700	65	650	CS-2	T1
39	65	45	NP	700	NP	NP	CS-2	G26, T1, W10, W12

2014 SECTION II

TABLE 1A (CONT'D)
SECTION I; SECTION III, CLASS 2 AND 3; * SECTION VIII, DIVISION 1; AND SECTION XII
MAXIMUM ALLOWABLE STRESS VALUES FOR FERROUS MATERIALS
(* See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
2	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	13.3	11.1	9.2	7.4	5.0
3	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
4	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
5	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
6	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	13.3	11.1	9.2	7.4	5.0
7	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
8	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
9	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	...	...	...	...
10	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	...	...	...	...	...
11	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
12	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	...	...	...	...	...
13	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
14	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	...
15	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
16	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
17	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	...	...	...	...
18	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
19	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
20	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
21	14.6	...	14.6	...	14.6	14.6	14.6	14.6	14.6	13.3	11.1	9.2	7.4	5.0
22	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
23	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
24	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	13.3	11.1	9.2	7.4	5.0
25	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	...	...	...	...	...
26	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	16.9	13.9	11.4	8.7	5.9
27	18.3	18.3	18.3	18.3	18.3	18.3	18.3	17.4	16.8	16.2	13.9	11.4	8.7	5.9
28	18.6	18.6	18.6	18.6	18.6	18.6	17.7	16.6	16.1	15.5	13.9	11.4	8.7	5.0
29	18.6	18.6	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	...	...	...	...
30	18.6	18.6	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	13.9	11.4	8.7	5.9
31	18.6	18.6	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	13.9	11.4	8.7	5.9
32	18.6	...	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	...	...	...	...
33	18.6	...	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	...	...	...	...
34	18.6	...	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	...	...	...	...
35	18.6	...	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	...	...	...	...
36	18.6	18.6	18.6	...	18.6	18.6	18.6	18.6	18.6	16.9	13.9	11.4	8.7	5.9
37	18.6	18.6	18.6	...	18.6	18.6	18.6	18.6	18.6	16.9	...	...	...	...
38	18.6	...	18.6	...	18.6	18.6	18.6	18.6	18.6	16.9	...	...	...	...
39	18.6	...	18.6	...	18.6	18.6	18.6	18.6	18.6	16.9	...	...	...	...

PART D — PROPERTIES (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, CLASS 2 AND 3; * SECTION VIII, DIVISION 1; AND SECTION XII
MAXIMUM ALLOWABLE STRESS VALUES S FOR FERROUS MATERIALS
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
8	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
16	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
19	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...	...	...
20	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
21	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...	...	...
22	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
23	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
24	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
27	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
28	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
31	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

รูปที่ ก.7 American Society of Mechanical Engineers Section II Part D

2004 SECTION II

TABLE 1A (CONT'D)
SECTION I; SECTION III, CLASS 2 AND 3; * SECTION VIII, DIVISION 1; AND SECTION XII
MAXIMUM ALLOWABLE STRESS VALUES *S* FOR FERROUS MATERIALS
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Designation/UNS No.	Class/Condition/Temper.	Size/Thickness, in.	P-No.	Group No.
04 1	Carbon steel	Plate	SA/AS 1548	7-460	...	...	≤ 6	1	2
2	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...	2 1/4 < t ≤ 4	1	1
3	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...	≤ 2 1/4	1	1
4	Carbon steel	Plate	SA-495	...	K03300	...	0.58 < t ≤ 3/4	1	2
5	Carbon steel	Bar	SA-675	70	...	...	...	1	2
6	Carbon steel	Forgings	SA-105	...	K03504	...	...	1	2
7	Carbon steel	Forgings	SA-181	...	K03502	70	...	1	2
8	Carbon steel	Castings	SA-216	WCB	J03002	...	...	1	2
9	Carbon steel	Forgings	SA-266	2	K03506	...	...	1	2
10	Carbon steel	Forgings	SA-266	4	K03017	...	...	1	2
04 11	Carbon steel	Forgings	SA-350	LF2	K03011	1	...	1	2
04 12	Carbon steel	Forgings	SA-350	LF2	K03011	2	...	1	2
13	Carbon steel	Forgings	SA-508	1A	K13502	...	...	1	2
14	Carbon steel	Forgings	SA-508	1A	K13502	...	...	1	2
15	Carbon steel	Forgings	SA-541	1	K03506	...	...	1	2
16	Carbon steel	Forgings	SA-541	1A	K03506	...	...	1	2
17	Carbon steel	Cast pipe	SA-660	WCB	J03003	...	...	1	2
04 18	Carbon steel	Forgings	SA-765	II	K03047	...	...	1	2
19	Carbon steel	Plate	SA-515	70	K03101	...	...	1	2
20	Carbon steel	Plate	SA-515	70	K02700	...	...	1	2
21	Carbon steel	Plate	SA/JIS G3118	SGV480	...	...	...	1	2
22	Carbon steel	Wld. pipe	SA-671	CB70	K03101	...	...	1	2
23	Carbon steel	Wld. pipe	SA-671	CC70	K02700	...	...	1	2
24	Carbon steel	Wld. pipe	SA-672	B70	K03101	...	...	1	2
25	Carbon steel	Wld. pipe	SA-672	C70	K02700	...	...	1	2
26	Carbon steel	Smls. pipe	SA-106	C	K03501	...	...	1	2
27	Carbon steel	Wld. tube	SA-178	D	...	...	...	1	2
28	Carbon steel	Wld. tube	SA-178	D	...	...	...	1	2
29	Carbon steel	Wld. tube	SA-178	D	...	...	...	1	2
30	Carbon steel	Smls. tube	SA-210	C	K03501	...	...	1	2
31	Carbon steel	Castings	SA-216	WCC	J12501	...	...	1	2
32	Carbon steel	Smls. & wld. fittings	SA-234	WPC	J13501	...	...	1	2
33	Carbon steel	Castings	SA-352	ICC	J2505	...	...	1	2
34	Carbon steel	Castings	SA-487	16	A	...	...	1	2
35	Carbon steel	Plate	SA-537	...	L2437	3	4 < t ≤ 11	1	3
36	Carbon steel	Smls. tube	SA-556	C7	K03006	...	...	1	2
37	Carbon steel	Wld. tube	SA-557	C2	K03505	...	...	1	2
38	Carbon steel	Cast pipe	SA-660	WCC	J02505	...	...	1	2
39	Carbon steel	Bar	SA-695	B740	K03504	...	...	1	2
40	Carbon steel	Bar	SA-696	C	K03200	...	...	1	2

PART D — PROPERTIES (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, CLASS 2 AND 3; SECTION VIII, DIVISION 1; AND SECTION XII
MAXIMUM ALLOWABLE STRESS VALUES FOR FERROUS MATERIALS
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	66.5	...	1000	NP	1000	NP	CS-2	G10, G37, S1, T1
2	66.5	37.5	850	NP	1000	650	CS-2	G10, S1, T1
3	66.5	...	850	NP	1000	650	CS-2	G10, G37, S1, T1
4	70	35	NP	400 (Cl. 3 only)	650	650	CS-2	...
5	70	35	850	650 (Cl. 3 only)	1000	650	CS-2	G10, G15, G22, G35, S1, T2
6	70	36	1000	700	1000	650	CS-2	G10, G35, S1, T2
7	70	36	1000	700	1000	650	CS-2	G10, G35, S1, T2
8	70	36	1000	700	1000	650	CS-2	G1, G10, G17, S1, T2
9	70	36	1000	700	1000	650	CS-2	G10, S1, T2
10	70	36	NP	NP	1000	650	CS-2	G10, T2
11	70	36	NP	700	1000	650	CS-2	G10, T2
12	70	36	NP	700	1000	650	CS-2	G10, T2
13	70	36	NP	700	1000	650	CS-2	G10, T2
14	70	36	NP	700	1000	650	CS-2	G10, T2
15	70	36	NP	700	1000	650	CS-2	G10, T2
16	70	36	NP	700	1000	650	CS-2	G10, T2
17	70	36	1000	700	NP	NP	CS-2	G1, G10, G17, S1, T2
18	70	36	NP	NP	1000	650	CS-2	G10, T2
19	70	38	1000	700	1000	650	CS-2	G10, S1, T2
20	70	38	850	700	1000	650	CS-2	G10, S1, T2
21	70	38	850	NP	NP	NP	CS-2	G10, S1, T2
22	70	38	NP	700	NP	NP	CS-2	S5, W10, W12
23	70	38	NP	700	NP	NP	CS-2	S6, W10, W12
24	70	38	NP	700	NP	NP	CS-2	S5, W10, W12
25	70	38	NP	700	NP	NP	CS-2	S6, W10, W12
26	70	40	1000	700	1000	650	CS-2	G10, S1, T1
27	70	40	1000	NP	NP	NP	CS-2	G10, S1, T1, W13
28	70	40	1000	NP	NP	NP	CS-2	G4, G10, S1, T4
29	70	40	1000	NP	NP	NP	CS-2	G3, G10, S1, T2
30	70	40	1000	NP	1000	650	CS-2	G10, S1, T1
31	70	40	1000	700	1000	650	CS-2	G1, G10, G17, S1, T1
32	70	40	800	700	800	650	CS-2	G10, T1, W14
33	70	40	NP	700	NP	NP	CS-2	G17, T1
34	70	40	NP	700	NP	NP	CS-2	...
35	70	40	NP	NI	700	650	CS-2	G21, G23, W11
36	70	40	NP	N	800	650	CS-2	G10, T1
37	70	40	NP	N	1000	650	CS-2	G24, G35, T2, W6
38	70	40	1000	700	NP	NP	CS-2	G1, G10, G17, S1, T1
39	70	40	NP	700	800	650	CS-2	G10, T1
40	70	40	NP	700	NP	NP	CS-2	T1

SECTION II

TABLE 1A (CONT'D)
SECTION I; SECTION III, CLASS 2 AND 3; SECTION VIII, DIVISION 1; AND SECTION XII
MAXIMUM ALLOWABLE STRESS VALUES S FOR FERROUS MATERIALS
 (* See Maximum Temperature Limits for Restrictions on Class)

		Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
Line No.		-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
04	1	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	18.9	18.9	11.4	8.7	5.9
	2	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	18.5	18.9	18.9	11.4	8.7	5.9
	3	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	16.9	18.9	11.4	8.7	5.9
	4	20.0	20.0	20.0	20.0	20.0	19.9	19.0	17.9	17.3	...	...	...	...	...
	5	20.0	20.0	20.0	20.0	20.0	19.9	19.0	17.9	17.3	16.7	14.8	12.0	9.3	6.7
	6	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
	7	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
	8	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
	9	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
	10	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
04	11	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
04	12	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
	13	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
	14	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
	15	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
	16	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
	17	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
04	18	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
	19	20.0	20.0	20.0	20.0	20.0	20.0	19.4	18.8	18.1	14.8	12.0	9.3	6.7	...
	20	20.0	20.0	20.0	20.0	20.0	20.0	19.4	18.8	18.1	14.8	12.0	9.3	6.7	...
	21	20.0	20.0	20.0	20.0	20.0	20.0	19.4	18.8	18.1	14.8	12.0	9.3	...	...
	22	20.0	20.0	20.0	20.0	20.0	20.0	19.4	18.8	18.1	...	...	...	...	...
	23	20.0	20.0	20.0	20.0	20.0	20.0	19.4	18.8	18.1	...	...	...	...	...
	24	20.0	20.0	20.0	20.0	20.0	20.0	19.4	18.8	18.1	...	...	...	...	...
	25	20.0	20.0	20.0	20.0	20.0	20.0	19.4	18.8	18.1	...	...	...	...	...
	26	20.0	20.0	20.0	20.0	20.0	20.0	19.8	18.3	14.8	14.8	12.0	9.3	6.7	...
	27	20.0	20.0	20.0	20.0	20.0	20.0	19.8	18.3	14.8	14.8	12.0	9.3	6.7	...
	28	20.0	20.0	20.0	20.0	20.0	20.0	19.8	18.3	14.8	14.8	12.0	9.3	6.7	...
	29	17.0	17.0	17.0	17.0	17.0	17.0	14.0	16.8	15.5	12.0	10.0	7.9	5.7	...
	30	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	9.3	6.7	...
	31	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	9.3	6.7	...
	32	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	...	...	...
	33	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	18.3	...	...	...	...	...
	34	20.0	19.9	19.9	18.8	18.1	17.9	17.9	17.9	17.9	17.9	...	...	...	...
	35	20.0	20.0	20.0	19.7	19.5	18.9	18.0	18.0	18.0	17.2	...	...	...	...
	36	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.2	18.3	14.8	12.0	...	...	...
	37	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.5	15.5	12.0	10.2	7.9	5.7	...
	38	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	9.3	6.7	...
	39	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	...	...	...
	40	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	18.3	...	...	...	...	...

รูปที่ ๓.10 American Society of Mechanical Engineers Section II Part D

PART D — PROPERTIES (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, CLASS 2 AND 3;* SECTION VIII, DIVISION 1; AND SECTION XII
MAXIMUM ALLOWABLE STRESS VALUES S FOR FERROUS MATERIALS
 (*See Maximum Temperature Limits for Restrictions on Class)

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, *F, Not Exceeding

Line No.	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	
1	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...	04
2	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
3	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
6	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
7	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
8	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
9	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
10	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
11	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...	04
12	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...	04
13	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
14	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
15	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
16	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
17	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
18	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...	04
19	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
20	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	4.0	2.5	
27	4.0	2.5	
28	3.4	2.1	
29	3.4	2.1	
30	4.0	2.5	
31	4.0	2.5	
32	
33	
34	
35	
36	
37	3.4	2.1	
38	4.0	2.5	
39	
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รูปที่ ก.11 American Society of Mechanical Engineers Section II Part D

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ภาคผนวก ง.

Material Comparison Table

มหาวิทยาลัยพระนคร

ตารางที่ ง.1 รายละเอียดของวัสดุที่ใช้ในการออกแบบถังความดัน

	<p>บริษัท โตโย-ไทย คอร์ปอเรชั่น TOYO - THAI CORPORATION LTD. BANGKOK THAILAND</p>	<p>Material Comparison Table</p>
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MATERIAL	ASTM Specification	JIS Specification	DIN Specification
Carbon Steel			
A106 Seamless carbon steel pipe for high-temperature service	Gr. A	G 3456 STPT370	17175 St 35.8
	Gr. B	G 3456 STPT410	17175 St 45.8
	Gr. C	G 3456 STPT480	SEW610 17Mn4
		G 3455 STS480	SEW610 St 45.8
A516 Pressure vessel plate, Carbon steel, for moderate and lower-temperature service	Gr.60	G 3106 SM400B	17135 ASt41
	Gr.65	G 3115 SPV235	
	Gr.65	G 3106 SM400B	17135 ASt45
	Gr.70	G 3115 SPV235	
	Gr.70	G 3106 SM400B	17135 ASt52
A105 Forging, carbon steel, for piping components		G 3201 SF440A	171200 c22N
		G 3202 SFVC2A	Vdtuv364 c22.3
		G 3203 SF490A	SEW550 20Mn5

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ตารางที่ ง.1 ตารางท่อ (Pipe Schedules) Dimension and weights welded and seamless carbon steel pipe

Nominal Pipe size	D.O. mm.	Schedule 10		Schedule 20		Schedule 30		Schedule Standard		Schedule 40		Schedule 60		Schedule Strong		Schedule 80		Schedule 100		Schedule 120		Schedule 140		Schedule 160		Double Extra Strong							
		Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT				
1/8	6	10.3																															
1/4	8	13.7																															
3/8	10	17.1																															
1/2	15	21.3																															
3/4	20	26.7																															
1	25	33.4																															
1 1/4	32	42.2																															
1 1/2	40	48.3																															
2	50	60.3																															
2 1/2	65	73.0																															
3	80	88.9																															
3 1/2	90	101.5																															
4	100	114.3																															
5	125	141.3																															
6	150	168.3																															
8	200	219.1																															
10	250	273.1																															
12	300	323.9																															
14	350	359.6																															
16	400	406.4																															
18	450	457.2																															
20	500	508.0																															
22	550	558.9																															

NOTE:
Wall = Wall Thickness in Millimeter
WT = Weights in Kilogram per meter

ตารางที่ ง.2 ตารางท่อ (Pipe Schedules) (ต่อ)

Nominal Pipe size	D.O. mm.	Schedule 10		Schedule 20		Schedule 30		Schedule Standard		Schedule 40		Schedule 60		Schedule Strong		Schedule 80		Schedule 100		Schedule 120		Schedule 140		Schedule 160		Double Extra Strong															
		in.	mm.	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT	Wall	WT												
24	600	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7				
26	650	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7		
28	700	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7
30	750	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7
32	800	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7
34	850	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7
36	900	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7
38	950	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7
40	1000	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7
42	1050	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7
44	1100	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7
46	1150	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7
48	1200	7.9	127.4	7.9	127.4	7.9	127.4	9.5	152.9	9.5	152.9	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7	12.7	202.7

Wall = Wall Thickness in Millimeter

WT = Weights in Kilogram per meter

NOTE.



ตาราง ข.1 ตารางคุณสมบัติของ Gasket แต่ละประเภท

Kind of Gasket	Valquastyle No.	Material	Bubble range		Chemical resistance	Sealability	Required flange surface finish (μm)	Application	
			Temp.($^{\circ}\text{C}$)	Press.(kg/cm ²)				Pipe	Heat exchanger Vessel
- Rubber sheet gasket	2010(NBR)	NBR	-30 ~ +120	5	Fair				
	2010(CR)	CR	-30 ~ +120	5	Fair				
	2010(EPDM)	EPDM	-40 ~ +150	5	Fair	Good	100 Rmax	P	N R
	4010	FPM	-15 ~ +200	5	Good				
	5010	Q	-60 ~ +200	5	Fair				
- Compressed Asbestos fiber (CAF)	1500	Asbestos							
	1501	&	-100~+300	35	Fair	Fair	25 Rmax	P	P P
	930, etc.	Rubber							
- Compressed Non-asbestos fiber(CFS)	6500	Inorganic fiber&	-50~+250	30	Fair				
	6501	Rubber	-50~+300	30	Fair	Fair	25 Rmax	R	N R
	6405	Rubber	-50~+200	30	Fair				
- PTFE Sheet gasket	7010	PTFE	-50~+100	10	Fair	Fair			
	7020	Filled	-200~+200	40	Excellent	Good	25 Rmax	P	P P
	7026	PTFE	-200~+200	40	Good	Good			
- PTFE envelope gasket	7030series	PTFE							
	7031series	&	-50~+150	30	Excellent	Good	25 Rmax	P	N P
	7035series	CAF, etc..							
- Spiral wound gasket	590series	Asbestos	-200~+600	200	Good	Good			
	6590series	Graphite	-200~+500	300	Excellent	Excellent	25 Rmax	P	P P
	7590series	PTFE	-253~+300	200	Excellent	Good			
	8590series	Non-As	-200~+500	200	Good	Good			
- Metal jacketed asbestos filled fasket	510series	Metal &	Depend on material	70	Depend on material	Fair	6.3 Rmax	N	P R
	520series	Asbestos							
	6510series								
	6520series								

Note:

P = Popular

R = Rare

N = Not use.

ตารางที่ ๑.๒ ตารางคุณสมบัติของ Gasket แต่ละประเภท (ต่อ)

Kind of Gasket	Valquastyle No.	Material	Bubble range		Chemical resistance	Sealability	Required flange surface finish (μm)	Application		
			Temp.	Press.				Pipe	Heat exchanger	Vessel
- Flat metal gasket	560series	Metal	Depend on material	140	Depend on material	Fair	6.3 Rmax	N	P	R
- Serrated metal gasket	540series	Metal	Depend on material	140	Depend on material	Fair	6.3 Rmax	N	P	R
- Ring joint gasket	550series	Matal	Depend on material	140	Depend on material	Fair	3.2 Rmax	P	N	P

Note : P = Popular

R = Rare

N = Not use.


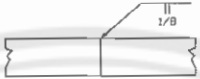
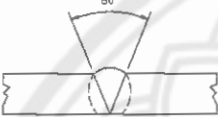

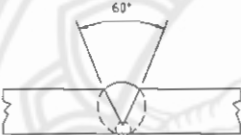



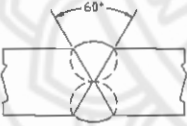
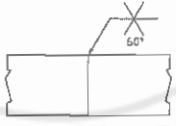


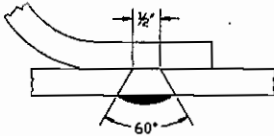
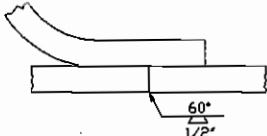

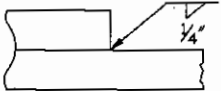


ภาคผนวก ช.

Weld Symbol

มหาวิทยาลัยสุรินทร์

ตารางที่ ข.1 สัญลักษณ์ของรอยเชื่อมแบบต่างๆ

APPLICATION OF WELDING SYMBOLS		
WELD	SYMBOL	MEANING OF SYMBOL
		Symbol indicates square groove weld on arrow side. Root gap 1/8 in.
		Symbol indicates V groove weld with an angle of 60 degrees on arrow side
		Symbol indicates V groove weld with angle of 60 degrees on arrow side and bead-type back weld on other side.
		Symbol indicates 1/2 in. V groove weld
		Symbol indicates V groove weld on arrow side and on other side with an angle of 60 degree
		Symbol indicates V groove weld on arrow side and other side with a root opening of 1/8
		Symbol indicates plug weld of 1/2 in. diameter and with an angle of 60 degree
		Symbol indicates 1/4 in fillet weld

ตารางที่ ข.1 สัญลักษณ์ของรอยเชื่อมแบบต่างๆ (ต่อ)

APPLICATION OF WELDING SYMBOLS		
WELD	SYMBOL	MEANING OF SYMBOL
		Symbol indicates 3/8 in. fillet weld on arrow side and 1/4 in. fillet weld on other side.
		Symbol indicates bevel groove with an angle of 60 degree, 3/8 fillet weld on arrow side and bead-type back weld.
		Symbol indicates 1/4 in. fillet weld on arrow side and bevel groove weld on other side grind flush on other side.
		Symbol indicates bevel groove and 3/8 in fillet weld on arrow side bevel groove and 1/4 fillet weld on other side
		Symbol indicates weld all around 1/4 in fillet weld.
		Symbol indicates 1/4 in. fillet weld on arrow side and 3/8 in. fillet weld on other side.

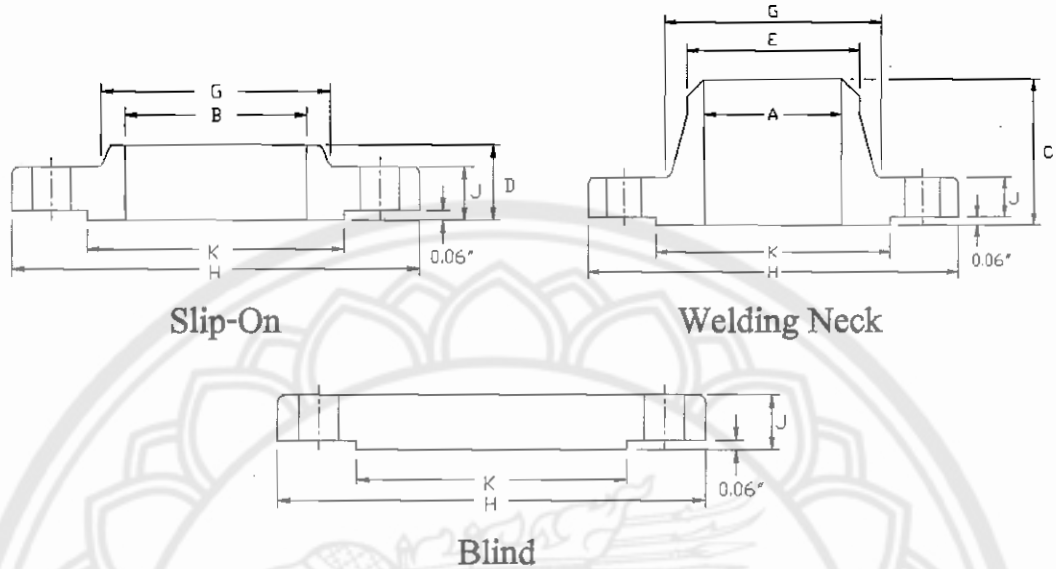


ภาคผนวก ข.

Type of Flange

มหาวิทยาลัยสุรินทร์

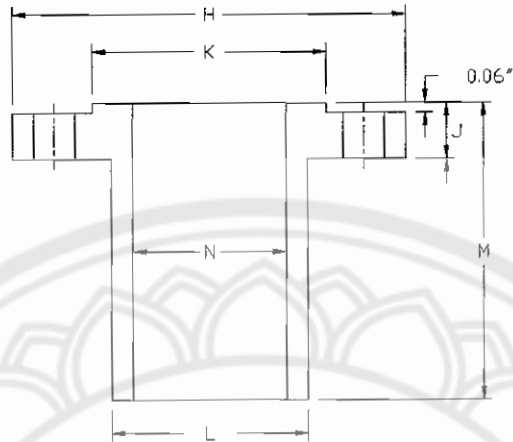
Class 150 Flange



ANSI Standard ANSI B.16.5

Nom. Pipe Size	A	B	C	D	E	G	H	J	K
1/2	0.62	0.88	1.88	0.62	0.84	1.19	3.50	0.44	1.38
3/4	0.82	1.09	2.06	0.62	1.05	1.50	3.88	0.50	1.69
1	1.05	1.36	2.19	0.69	1.32	1.94	4.25	0.56	2.00
1 1/4	1.38	1.70	2.25	0.81	1.66	2.31	4.62	0.62	2.50
1 1/2	1.61	1.95	2.44	0.88	1.90	2.56	5.00	0.69	2.88
2	2.07	2.44	2.50	1.00	2.38	3.06	6.00	0.75	3.62
2 1/2	2.47	2.94	2.75	1.12	2.88	3.56	7.00	0.88	4.12
3	3.07	3.57	2.75	1.19	3.50	4.25	7.50	0.94	5.00
3 1/2	3.55	4.07	2.81	1.25	4.00	4.81	8.50	0.94	5.50
4	4.03	4.57	3.00	1.31	4.50	5.31	9.00	0.94	6.19
5	5.05	5.66	3.50	1.44	5.56	6.44	10.00	0.94	7.31
6	6.07	6.72	3.50	1.56	6.63	7.56	11.00	1.00	8.50
8	7.98	8.72	4.00	1.75	8.63	9.69	13.50	1.12	10.62
10	10.02	10.88	4.00	1.94	10.57	12.00	16.00	1.19	12.75
12	12.00	12.8	4.50	2.19	12.57	14.38	19.00	1.25	15.00
14	13.25	14.14	5.00	3.12	14.00	15.75	21.00	1.38	16.25
16	15.25	16.16	5.00	3.44	16.00	18.00	23.50	1.44	18.50
18	17.25	18.18	5.50	3.81	18.00	19.88	25.00	1.56	21.00
20	19.25	20.20	5.69	4.06	20.00	22.00	27.50	1.69	23.00
24	23.25	24.25	6.00	4.38	24.00	26.12	32.00	1.88	27.25

Class 150 Flange (Long Welding Neck)



ตารางที่ ๗.2 Standard ANSI B.16.5

O.D. Of R.F.	No. of Holes	Dia m. Of Bolts	Bolt Circle	Length of Bolts		Outside Diameter L	Length M	Diameter of Bore N	Nominal Pipe Size
				1/16 R.F.	Ring Joint				
1	4	0.5	2.37	2.50	---				1/2
1	4	0.5	2.75	2.50	---				3/4
2	4	0.5	3.12	2.75	3.25	2			1
2.50	4	0.5	3.50	2.75	3.25	2.37			1 1/4
2.87	4	0.5	3.87	3.00	3.50	2.62			1 1/2
3.62	4	0.62	4.75	3.25	3.75	3.25	9		2
4.12	4	0.62	5.50	3.25	4.00	3.75			2 1/2
5	4	0.62	6.00	3.75	4.25	4.25			3
5.50	8	0.62	7.00	3.75	4.25	4.87			3 1/2
6.18	8	0.62	7.50	3.75	4.25	5.50			4
7.31	8	0.75	8.50	4.00	4.50	6.50			5
8.5	8	0.75	9.50	4.00	4.50	7.75	12		6
10.62	8	0.75	11.75	4.25	4.75	9.75			8
12.75	12	0.87	14.25	4.75	5.25	12.00			10
15	12	0.87	17.00	4.75	5.25	14.75			12
16.25	12	1.00	18.75	5.25	5.75	16.00			14
18.50	16	1.00	21.25	5.50	6.00	18.00	10-14		16
21	16	1.12	22.75	6.00	6.50	20.00			18
23	20	1.12	25.00	6.25	6.75	22.00			20

Same as nominal pipe size