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CLIENTE client	AIFC (IBN RUSHD)		IMPIANTO plant	YANBU		Fig. 1 di Sheet 1 of 14			
TITOLO/titre						REV.	0		
WATER TUBE BOILER DATA SHEET						DOC. N. Doc. no. 686-C-270			
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ARABIAN INDUSTRIAL FIBERS CO

[TITLE

PTA AND AROMATICS PLANT PROJECT

ABER

22854

MBER

22854.001-111-Y-001

ENT NUMBER

111-Y-001/002/003

ENT TITLE

BOILER PACKAGE

NUMBER

**APPLIER DOCUMENT
REVIEW**

COMMENTS :

WORK MAY PROCEED

FILE AND RESUBMIT. WORK
MAY PROCEED SUBJECT TO THE
CORPORATION OF THE CHANGES
INDICATED.

REVISE AND RESUBMIT. WORK MAY
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P Seq No		REV
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have been emboldened

	Issued for Purchase	AJS				
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	Issued for IDC	AJS				
DATE	DESCRIPTION	By	Checked By	PROJ ENG	CH ENG	CLIENT
		JOB No.				
		DATA SHEET No				REV
		DS-11	1-Y	-00	1	0
		SHEET	2	OF	14	

Water Tube Boiler Data Sheet

Continuous Rating(MCR) Tonnes/Hr:	280 (1)	Number Required :	Three
Rated Steam at Terminal	-Pressure 42 barg -Tolerance ± 0.5 bar -Temperature 400 °C -Tolerance ± 5 °C	Applicable Specification: Manu Standard subject to approval Altitude above sea level :	10
Rated (Gaseous fuel only)	110% MCR	Sea-air environment :	yes
Duration of peak load	2 Hr/24Hr	Ambient air temperature : Max 50 Design	Min 9°C
Uninterrupted operating period	16000 Hr	Wet bulb design :	°C
Minimum load control range:	25 %MCR to peak load (2)	Wind load design	Refer 22854-SP-000-M-001kN/m ²
Minimum range for steam temp:	25 %MCR to peak load (3)	Earthquake area class	ASCE 7-88, Zone 1
Thermal efficiency at MCR	** 92% (4)	IP code area classification	As agreed during post award meeting
Fuel for above efficiency :	Refer to fuel data	Design code to be used:	ASME I
Maximum allowable temperature of metal:		Plant instr. allowed for use in performance tests:	NO Yes
Minimum in contact with flue gases :	110 °C	Steam quality test equipment:	
Minimum at all loads above :	50 %MCR	- provided by :	supplier
Minimum blowdown capacity :	1 %MCR	- for permanent use :	NO YES
Minimum blowdown capacity :	Yes	- for duration of steam purity tests:	yes NO
Minimum required with one burner out of operation:	No		
Minimum required with other boilers on steam header:	Yes		
Minimum required :	No		
Minimum air bypass required :	No		
Minimum capacity :	-		

SITE ERECTION REQUIREMENTS

Complete erection by supplier	no
Only supervision of erection by supplier:	yes

ADDITIONAL PERFORMANCE TESTS

110% MCR for 2hr: 100% MCR for 72hr: 25% MCR for 8hr

ANALYSIS OF STEAM AND WATER (under continuous operation)

Water	REFER TO 22854-SP-000-D-002	Feed water and condensate	Feed	Condensate
Total dissolved solids	< ppm	Total dissolved solids	< mg/kg	•
pH alkalinity	< mval/kg	Oxygen as O ₂	< mg/kg	•
Silica as SiO ₂	< ppm	Silica as SiO ₂	< mg/kg	•
Phosphate as PO ₄	< mg/kg	Total iron as Fe	< mg/kg	•
pH at 25 °C		Total copper as Cu	< mg/kg	•
Sulphite as Na ₂ SO ₃	<	Total carb dioxide as CO ₂	< mg/kg	•
Conductivity at 20 °C	< µS/cm	Hardness	< mval/kg	•
(See annex 1)		Permanganate No.(KMnO ₄)	< mg/kg	•
Conductivity at 20 °C	< µS/cm	pH at 25 °C	from/to	•
(from condensed saturated steam after strong acid cation exchange and CO ₂ removal)		Oil	< mg/kg	•
Silica as SiO ₂	< 0.3 ppm	Conductivity at 25 °C	< µS/cm	•
Total iron as Fe	< mg/kg	(after strongly acidic cation exchange and CO ₂ removal)	•	•
Total copper as Cu	< mg/kg	Chlorides as Cl	< mg/kg	•
Sodium and Potassium as Na<	mg/kg	Hydrazine	from/to mg/kg	•
Chlorides as Cl	< mg/kg	General condition : clear and colourless		•

As per
ABMA rulesAmerican Boiler
Manufacturing Assn.

- (1) - Excludes steam consumption for FD fan and atomising equipment
- (2) - Manual control range gas firing 10% MCR to peak with upper burner row out of service
- (3) - Minimum steam temp. at 10% MCR load gas firing 380°C
- (4) - Ref. to 27.5°C ambient temp. and 60% Relative humidity

Vendor to advise

Efficiency to be >90% between 70% and 100% MCR

Water Tube Boiler Data Sheet(cont)

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OL REQUIREMENTS AT OUTLET SUPERHEATER

load operation

Max deviation of steam pressure ± 0.5 bar

Max deviation of steam temperature ± 5 °C

on load decrease from 100 to 90 %MCR *

Max deviation of steam pressure : ± 1.5 bar

Max deviation of steam temperature : ± 15 °C

on load increase from 90 to 100 %MCR *

Max deviation of steam pressure : ± 1.5 bar

Max deviation of steam temperature : ± 15 °C

on load decr/incl from 80 to 100 %MCR in min *

Max deviation of steam pressure : ± 1 bar

Max deviation of steam temperature : ± 10 °C

WATER LEVEL IN DRUM *

Level to remain between low and high levels

- At sudden load decrease from 100 to 90 %MCR

- At sudden load increase from 90 to 100 %MCR

- At linear load decr/incl from 80 to 100 %MCR in 1 min

- At feed water temp sudden decrease from 107 to 96 °C

- At feed water temp sudden increase from 107 to 118 °C

UTILITIES

GAS FUEL (s)

	Normal	Design
Heating Value MJ/kg	57.43	
Weight	9.75	
Battery limit barg	3.5	10
Battery limit °C	35	85
%vol		
CO (wt)	2.15	
%wt		
Composition (% vol):	Normal	Backup
Hydrogen	59.3	
Methane	27.56	
C ₂	10.6	
C ₃	0.84	0-100% ***
C ₄	0.15	
C ₅	0.1	
Ethene	1.37	
Propene	0.08	
Inerts N ₂		
CO ₂		

LIQUID FUEL (s)

	Normal	Design
Lower Heating Value MJ/kg	39.4	
Density at 50 °C, kg/m ³	956	
Press at battery limit barg	10.2	15
Temp at battery limit °C	80	150
Water content %wt		
C/H ratio (wt)		10.64
Sulphur %wt		
Ash %wt		
Vanadium %wt		
Viscosity at 50 °C cP		1.4
Molecular weight		132
Inerts %wt		2.18

BOILER FEED WATER

	Normal	Design	Min
Supply pressure at grade barg	62.1	105	(6)
Temperature °C	107	148	102

CONDENSATE

		TURBINE PROCESS[1]	PROCESS[2]
Supply pressure barg	0.81	0.81	0.81
Temperature °C	56	100	148

INJECTION WATER

Supply pressure at grade barg	
Temperature °C	
Type	

COOLING WATER

Supply pressure barg	} Refer
Return pressure barg	} 22854-SP-000-A-002
Temperature °C	}
Max. temp. increase °C	}
Fouling coefficient W/m ² .K	}
Type	}

ELECTRICITY SUPPLY

3'300v - 3 Ph - 60 Hz	V/ph/Hz	Instruments	220v - 60 Hz	V/ph/Hz	} Refer
380v - 3 Ph - 60 Hz	V/ph/Hz	Instruments		VDC	} 22854-SP-000-A-002
					}
					}
Lighting (Service Power)	380v - 3 Ph - 60 Hz				}

Endor *** Back-up fuel to fuel gas system is Propane

See attached fuel data
later

FORCED DRAUGHT FAN

Number : 1 per boiler
Manufacturer : C.B.I. or BOLDROCHI
Main drive : Motor & Steam Turbine
Design capacity per fan: 99.458 kg/s
Design pressure at design point: 71.8 mbar
Design - maker: Later
Design - type : SSS (Electric motor side)

Performance test code : BS 848-Part 1/

INDUCED DRAUGHT FAN

Number : NOT APPLICABLE
Manufacturer :
Main drive :
Design capacity per fan: kg/s
Design pressure at design point: mbar
Design - maker:
Design - type :

Performance test code : BS 848-Part 1/

STACK

Height : 40 m
Inside diameter at top : 3 m
Inlet opening : 15.6 m²
Existing flue gas duty : (100% MCR) 90,558 kg/s
Existing inlet temperature to stack: 188 °C

AVAILABLE START-UP UTILITIES (100% MCR) (g)

Fuel Type : N. 2 FUEL OIL - 5.621 kg/s
HP steam (Net) : 280 t/h
MP steam : 1 t/h
LLP steam for deareator : 25.39 t/h
Boiler feed water : 296.2 t/h (g)
Condensate : 0 t/h
Injection water : 0 t/h
Cooling water (total) : 15.3 t/h
Tool air : } 915 Nm³/h
Instrument air : }
Make-up water : 92.71 t/h
Electric power supply - HV : 1110 (g)
- LV : 10.6 (g)
Electric instr. power - AC/DC : 17.16
Lighting power : 60 (g)

REFERENCE DRAWINGS

ADDITIONAL INFORMATION

Emission Limits (ref: 3% O₂ by volume in dry gas)

	Gas	Fuel Oil
Particulates	43 ng/J	43 ng/J
SO ₂	340 ng/J	340 ng/J
NOx	86 ng/J	130 ng/J

for one boiler
for boiler only (without BFW to Users)
- Intermittent

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Water Tube Boiler Data Sheet(cont)

MAIN DESIGN DATA AT MCR (firing Gas fuel)

at :		N.A.	WATER/STEAM TEMPERATURES	
air inlet/outlet temperatures	27.5	°C	Economiser outlet	168 °C
on auto control	25 ÷ 110	%MCR (10)	Drum	262 °C
umpion (each boiler)	92	%	Primary superheater outlet	394 °C
	4.267	kg/s (11)	Secondary superheater outlet	400 °C
at MCR	8	% stoich.	OPERATING PRESSURES	
quantity	90.558	kg/s	Drum	48.27 barg
n (continious)	1	%MCR	Superheater outlet	43.22 barg
olumb	803	m ³	FD fan outlet	48.9 mbarg
c heat release*	300	kW/ m ²	Furnace	30.0 mbarg
ace heat release	547	kW/ m ²		

	Surface m ²	Average heat transfer kW/ m ²	Flue gas exit temp. °C
rojected surface)	440	165	1'410
	N.A.	-	-
evaporator(incl walls)	413	110	1'111
	2'570	30.2	426
	5'300	4.9	188
	-	-	-

PIPING	MATERIAL	WATER VOL m ³	PITCH mm Long. / Transl.	WALL THKN. mm	FLUE GAS MASS VEL kg/ m ² s
	SA 192	21.4	- / 101	4	1.01
	N.A.	-	-	4	-
perheater	SA213T11	2.9	101 / 101	4	6.71
superheater	SA213T11	0.8	101 / 202	4.5	3.94
evaporator	SA 192	22.5	140 / 101	3.2	10.20
r	SA 210A-1	7.3	102 / 105	3.2	6.60
	N.A.	-	-	-	-

FEETING	MATERIAL	THICKNESS mm	BURNERS
inner casing	Mineral Wool	100	Number : 6
outer casing	Galv Sheet	1.2	Number for MCR : 6
	Mineral Wool	100/150	Maker and type : Macchi Low NOx
			Design capacity : (Gas/Oil) 0.625/0.984 kg/s (12)
			Turndown at max. combustion air quality : 5 : 1

VALVES	
1-Superheater 2- Drum	
type : Later / Spring	
ity acc. to code on drum	33,056 each kg/s
on superheater	22,222 kg/s

SOOT BLOWERS	
Number	Provision only
Maker and type	-

SHOT CLEANING	
Maker and type	N.A.

DESUPERHEATER	
Type	Spraywater (intermediate)

LE LOCAL AND NATIONAL REGULATIONS

include user list of supply of dual burner system. A burner test demonstrating the change-over between fuels is required.

sed on LHV of fuel and including air preheat
al control range gas firing 10% MCR to peak with upper burner row out of service
to Normal gas [1] with 56'456 kJ/kg L.H.V.

ilindatashn111-Y001.MRP

to Normal gas [1] and N.2 fuel Oil

Water Tube Boiler Data Sheet(cont)

DETAILED DESIGN DATA AT MCR (firing AS fuel)

CONSUMPTION FIGURES

on air at 100%MCR	86.292	kg/s
50%MCR	44.828	kg/s
er (include blowdown)	80.912	kg/s
to BFW pumps	3.669	kg/s
to burners for oil atomisation	0.218	kg/s
to Deaerator (each)	7.028	kg/s
water (total)	4.250	kg/s
at air (+ Tool air)	0.325	kg/s
	—	kg/s
ent blowdown(max)	1.611	kg/s
HV 636 LV 70.6		kg/s
at power	8.6	kW
as of boiler the whole package	2000000	kg

FURNACE

local rate of heat absorption	220	kW/m ²
of maximum local heat flux	Side Walls	
pressure at outlet furnace	30.0	mbarg
maximum tube wall temperature	357	°C
parallel loops		
values in tubes exposed to radiation at :		
inlet to water walls - temp of water	251	°C
- velocity of water	0.63	m/s
Outlet of water walls - temp steam/water	262	°C
- steam/water ratio	0.07	wt
- superf. velocity steam	1.3	m/s
- superf. velocity water	0.66	m/s

refractory Tiles (42-44% Al₂O₃)

refractory	89	m ²
of refractory	40	mm

HEAT BALANCE

Heat supplied by fuel	240'830	kW
Heat to steam	221'560	kW
Heat to dry flue gas	12'360	kW
Losses due to moisture in air	3'800	kW (13)
Heat to blowdown	560	kW
Radiation losses	650	kW
Unaccounted losses	1'800	kW

DRUMS

Steam drum	- design pressure	55	barg
	- water content - high level	9.05	tonne
	- low level	6.09	tonne
	- low low level	5.31	tonne
	- length of shell	9	m
	- diameter inside	1'540	mm
	- wall thickness of shell	80	mm
	- hold-up time between low-water alarm and low-water trip	7	s
	- material	SA516-70	
Drum internals	- type	Cyclons + Driers	
	- number	72 + 27	
	- pressure drop	< 0.1	bar

Water drum	- design pressure	55	barg
	- water content	6.57	tonne
	- length of shell	9	m
	- diameter inside	940	mm
	- wall thickness of shell	55	mm
	- material	SA516-70	

SUPERHEATER

PRIMARY

SECONDARY

ECONOMISER

transferred MW	29.47	15.96	Feed water pressure at inlet	49.56	barg
local heat flux kW/m ²	129	156	Pressure drop water side	1.06	bar
max outer tube wall temp °C	485	510	Length of elements	8	m
of max heat absorption	Outlet	Inlet	Height of fins, if applicable	18	mm
			Spacing of fins	8.48	mm
drop steam side bar	2.62	1.56	Number of parallel loops	1	
steam temperature °C	262	324	Headers - outside diameter	273	mm
steam velocity m/s	25.4	37.2	- length	3.8	m
steam temperature °C	394	400	- material	A106-B	
steam pressure barg	45.13	43.22	Calculated min. outer tube wall temp.	113	°C
steam velocity m/s	38.8	45.6	Inlet - water temperature	107	°C
transfer surface m ²	319	94	- water velocity	1.46	m/s
loops (average) m	3.0	3.5	Outlet - water temperature	188	°C
of parallel loops	1	2	- steam/water ratio	0	wt
of tube supports	SS	SS	- superficial water velocity	1.51	m/s
outside diameter mm	406.4	406.4/457.2	- superficial steam velocity	—	m/s
wall thickness mm	26.19	26.19/29.36			
length m	8.8	8.8			
material	SA 106B	SA 106B			

al velocity = (mass flow) divided by (density x free area of tube)

plus loss for hydrogen in fuel

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Water Tube Boiler Data Sheet(cont)

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DOWNCOMERS(see also convective evaporator)

NO EXTERNAL DOWNCOMERS

length m
diameter mm
thickness mm
tube

on ratio 15:1

STEAM TEMPERATURE CONTROL

water spray water
quantity 7.79 kg/s
at MCR 5.19 kg/s

water atomisation - source No
- design quantity - kg/s
condensation - design quantity - kg/s

AIR PREHEATERS N.A.

medium
- air side kg/s
- heating side kg/s

ure air side - at inlet °C
- at outlet °C
ir side - at inlet mbarg
- at outlet mbarg
ure heating side - at inlet °C
- at outlet °C
eating side - at inlet mbarg
- at outlet mbarg
metal temperature °C

CONVECTIVE EVAPORATOR

Steam production 40.3 kg/s
Calculated maximum outer tube wall temp. 281 °C

Riser inlets - superficial velocity of water 0.44 m/s

Riser outlets - steam/water ratio 0.056 wt

Flue gas - pressure in/out 27.7/6.7 mbarg
- temperature in/out 1111/428 °C

Headers - outside diameter } N.A. mm
- wall thickness } mm
- length } m
- material }

AIR DUCTS

Inlet height above grade Approx. 10 m
Length 20 m
Cross sectional area 4.7 m²

FLUE DUCTS

Type of insulation Mineral Wool
Length 5 m
Cross sectional area (eco inlet) 10.6 m²
(stack inlet) 15.6 m²

STACK

Carbon Steel
wall thickness 6 mm
meter at top 3 m
at bottom 6 m
ade 40 m
terial N.A.

of flue gas 90.558 kg/s
ure of flue gas into stack 188 °C
ity of gas 18 m/s

SAFETY VALVES

Superheater - number 1
- set pressure 46 barg
- accumulation pressure +1.4 bar
- blowdown pressure -1.8 bar

Drum - number 2
- set pressure 55/56 barg
- accumulation pressure +1.6 bar
- blowdown pressure -2.2 bar

SOOTBLOWERS (Provisions only)

of operation min
Operating pressure barg
Total steam required kg/s
Total power required kW
Total air - for cooling and sealing kg/s
- for power kg/s

All fans shall have extended shafts and be driven by both an electric motor and a steam turbine. SSS overrun clutches shall be fitted to both shaft extensions.

Burner management system panels, local burner panels, local instrumentation piping and valves and combustion control system will be located in local instrument enclosure local to the boiler. Volt free signals shall be provided to indicate alarm conditions. Provision shall be made to receive an EDS signal from the central DCS system.

Each boiler shall be provided with an individual stack and all necessary ducting.

All galleries, stairs and ladders shall be provided for operation and maintenance.

All services to and from the boiler shall be isolated and controlled where necessary by the supplier.

The packaged unit specification lists recommended suppliers of valves, instruments etc.

A key design sketch of the boiler package shall be supplied. All terminal points shall be fixed at the time of award, no changes will be allowed after contract award.

Burners shall be dual firing low Nox oil and gas burners, complete with pilots, ignitors, and flame monitoring equipment for the fuels listed in the data sheet.

Air intakes shall be suitable for a salt laden and dusty environment. Filters shall be easily cleaned with indicators to show when cleaning is required.

A full list of all utility consumption values shall be submitted.

Two 100% rated deareators shall be supplied as part of the package (refer to D/S 22854-SP-000-D-002).

Two electric motor driven and one back pressure turbine driven boiler feed pumps shall be supplied in compliance with the information listed on the data sheet DS-111-G-001.

Black start shall be by means of fuel oil as detailed on the data sheet.

Static and dynamic foundation loads shall be submitted.

A noise limit of 85dBA shall apply to the package. Both the sound pressure level and power level shall be submitted. No relaxation of this noise limit will be granted. Intermittant noise from for example safety valves are not included in this limit. Intermittant noise level is set at 110dBA.

Inter-connecting pipework between the deareator, boiler feed pumps and the boiler shall be supplied by the buyer. Buyer and seller shall agree the location of the layout within three weeks of the contract award.

All control panels shall be heat soaked for 72hr and then functionally tested.

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Engineering Dept.**AIFC (IBN RUSHD)****PTA and AROMATICS PLANT PRJ.
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WATER TUBE BOILER DATA SHEET

Boiler Expected Performance

FUEL :		NORMAL GAS CASE [1]	NORMAL GAS CASE [1]	NORMAL GAS CASE [1]
PLANT LOAD :		110%	100%	70%
Superheated steam capacity	kg/h	317'500	288'600	192'500
Superheated steam capacity	kg/h	308'000	280'000	186'600
Superheater water flow	kg/h	20'100	18'700	13'900
Temperature at superheater outlet	°C	400	400	400
Temperature at Eco inlet	°C	107	107	107
Efficiency on H.H.V.	%	81.78	82.14	83.19
Efficiency on L.H.V.	%	91.60	92.00	93.18
Oil H.H.V.	kcal/kg	—	—	—
Oil L.H.V.	kcal/kg	—	—	—
Gas H.H.V.	kcal/kg	15'103	15'103	15'103
Gas L.H.V.	kcal/kg	13'484	13'484	13'484
Oil consumption	kg/h	—	—	—
Gas consumption	kg/h	16'973	15'360	10'115
Ambient air temperature	°C	27.5	27.5	27.5
Temperature at burners	°C	27.5	27.5	27.5
Excess air in furnace	%	8	8	8
Moisture content in dry flue gas	% vol.	1.74	1.74	1.74
SO ₂ content in dry flue gas	% vol.	9.37	9.37	9.37
Flue gas flow	kg/h	343'260	310'650	204'570
Flue gas flow	kg/h	360'210	326'000	214'680
Heat released on E.P.R.S.	kcal/hm ²	520'260	470'830	310'050
Heat released on volume	kcal/hm ³	285'100	258'010	169'910
Heat absorption in furnace (on E.P.R.S.)	kcal/hm ²	148'680	141'980	113'300
Flue gas exit temperature	°C	1'438	1'410	1'296
Temperature at superheater outlet	°C	1'144	1'111	982
Temperature at economizer inlet	°C	445	428	369
Temperature at economizer outlet	°C	197	188	158
Water temperature at economizer inlet	°C	107	107	107
Water temperature at economizer outlet	°C	191	188	177
Saturated steam temperature	°C	264	262	258
Steam temperature at Primary SH outlet	°C	393	394	394
Steam temperature at Final SH inlet	°C	326	324	317
Final steam temperature	°C	400	400	400
Pressure at F.D.fan intake	mmH ₂ O	- 48	- 40	- 18
Pressure at F.D.fan delivery	mmH ₂ O	617	489	207
Pressure in furnace	mmH ₂ O	383	306	122
Pressure at superheater outlet	mmH ₂ O	354	283	113
Pressure at boiler outlet	mmH ₂ O	86	69	28
Pressure at economizer outlet	mmH ₂ O	28	23	10
Steam pressure at B.L.	bar g	42.00	42.00	42.00
Final SH outlet pressure	bar g	43.45	43.22	42.64
Primary SH inlet pressure	bar g	48.86	47.75	44.99
Steam drum pressure	bar g	49.48	48.27	45.26
Economizer outlet pressure	bar g	49.71	48.50	45.47
Economizer inlet pressure	bar g	50.98	49.56	46.02
FW pressure at B.L.	bar g	62.10	62.10	62.10

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WATER TUBE BOILER DATA SHEET

Boiler Expected Performance

FUEL :		FUEL OIL	FUEL OIL		
		N.2	N.2		
PLANT LOAD :		100%	70%		
Superheated steam capacity	kg/h	289'700	193'600		
Superheated steam capacity	kg/h	280'000	186'600		
Superheater water flow	kg/h	11'600	9'700		
Temperature at superheater outlet	°C	400	400		
Temperature at Econ inlet	°C	107	107		
HHV	%	86.60	87.73		
Efficiency on LHV	%	92.00	93.21		
HHV	kcal/kg	10'916	10'916		
LHV	kcal/kg	10'275	10'275		
Gas HHV	kcal/kg	—	—		
Gas LHV	kcal/kg	—	—		
Oil consumption	kg/h	20'235	13'346		
Gas consumption	kg/h	—	—		
Intake air temperature	°C	27.5	27.5		
Temperature at burners	°C	27.5	27.5		
Gas air in furnace	%	10	10		
Content in dry flue gas	% vol.	2.01	2.01		
Content in dry flue gas	% vol.	14.18	14.18		
Water flow	kg/h	318'410	210'010		
Gas flow	kg/h	338'640	223'350		
Released on E.P.R.S.	kcal/hm ²	472'630	311'720		
Released on volume	kcal/hm ³	259'000	170'820		
Absorption in furnace (on E.P.R.S.)	kcal/hm ²	156'560	120'580		
Temperature at exit	°C	1'383	1'280		
Temperature at superheater outlet	°C	1'110	989		
Temperature at economizer inlet	°C	442	380		
Temperature at economizer outlet	°C	189	159		
Temperature at economizer inlet	°C	107	107		
Temperature at economizer outlet	°C	188	177		
Superheated steam temperature	°C	262	258		
Temperature at Primary SH outlet	°C	374	377		
Temperature at Final SH inlet	°C	332	325		
Superheated steam temperature	°C	400	400		
Pressure at F.D.fan intake	mmH ₂ O	- 42	- 18		
Pressure at F.D.fan delivery	mmH ₂ O	517	213		
Pressure in furnace	mmH ₂ O	312	124		
Pressure at superheater outlet	mmH ₂ O	289	115		
Pressure at boiler outlet	mmH ₂ O	68	28		
Pressure at economizer outlet	mmH ₂ O	24	11		
Pressure at B.L.	bar g	42.00	42.00		
SH outlet pressure	bar g	43.22	42.64		
Primary SH inlet pressure	bar g	47.75	44.99		
Drum pressure	bar g	48.27	45.26		
Economizer outlet pressure	bar g	48.50	45.47		
Economizer inlet pressure	bar g	49.56	46.02		
Pressure at B.L.	bar g	62.10	62.10		

MACCHI

s.r.l.

Fagnano Olona
Basic Engineering Dept.**AIFC (IBN RUSHD)****PTA and AROMATICS PLANT PRJ.**
YANBU - SAUDI ARABIA

Doc. Nr.

Date

Rev.

Sheet

686-C-270

Jan. 5, 1996

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FUELS DATA**GASEOUS FUELS**NORMAL FUEL NORMAL FUEL NORMAL FUEL BACK-UP
GAS CASE [1] GAS CASE [2] GAS CASE [3] PROPANE

Chemical Analysis

• Hydrogen (H ₂)	56.64 % vol.	59.05 % vol.	60.26 % vol.	-----
• Methane (CH ₄)	28.65 % vol.	27.71 % vol.	27.05 % vol.	-----
• Ethane (C ₂ H ₆)	12.08 % vol.	10.65 % vol.	9.79 % vol.	2.90 % vol.
• Ethene	1.12 % vol.	1.37 % vol.	1.66 % vol.	-----
• Propane (C ₃ H ₈)	1.29 % vol.	0.87 % vol.	0.75 % vol.	94.80 % vol.
• Propene	0.06 % vol.	0.08 % vol.	0.10 % vol.	-----
• Butane (C ₄ H ₁₀)	-----	-----	-----	2.30 % vol.
• i C ₄	0.03 % vol.	0.13 % vol.	0.26 % vol.	-----
• i C ₅	-----	0.01 % vol.	-----	-----
• n C ₆	0.13 % vol.	0.13 % vol.	0.13 % vol.	-----
Total	100 %	100 %	100 %	100 %
• H ₂ S	100 ppm vol	100 ppm vol	100 ppm vol	7 ppm wt
• S	-----	-----	-----	30 ppm wt

• H.H.V. (kJ/kg)	63'235	64'283	64'750	50'408
• H.H.V. (kJ/Nm ³)	29'341	28'220	27'713	98'951
• L.H.V. (kJ/kg)	56'456	57'304	57'690	46'377
• L.H.V. (kJ/Nm ³)	26'195	25'156	24'691	91'038
• M.W.	10.408	9.834	9.599	44.01
• Density (kg/Nm ³)	0.464	0.439	0.428	1.964

FUEL OIL N. 2

• Carbon	86.40 % wt	
• Hydrogen	12.185 % wt	
• Oxygen	0.15 % wt	
• Nitrogen	0.05 % wt	
• CO ₂ & Inerts	0.515 % wt	
• Sulphur	0.70 % wt	
• H.H.V.	10'916 kcal/kg	45'703 kJ/kg
• L.H.V.	10'275 kcal/kg	43'019 kJ/kg
• Specific gravity @ 60 °F	0.865 kg/dm ³	
• Viscosity @ 100 °F	2.68 cSt	

FUELS DATA

C10+ (LIQUID FUEL)

• Paraxylene	(C8H8)	0.00 % mol.
• Metaxylene	(C8H8)	0.00 % mol.
• Orthoxylene	(C8H8)	0.00 % mol.
• Methyl Normal Propyl Benzene	(C10 H14)	0.25 % mol.
• Di-Ethyl Benzene	(C10H14)	1.37 % mol.
• Di-Methyl Ethyl Benzene	(C10H14)	1.27 % mol.
• Tetra-Methyl Benzene	(C10H14)	2.28 % mol.
• C10 Aromatic	(C10H10)	11.66 % mol.
• Naphtalene	(C10H8)	72.78 % mol.
• Tri-Methyl Ethyl Benzene	(C11H16)	0.18 % mol.
• Penta-Methyl Benzene	(C11H16)	0.03 % mol.
• C11 Aromatic	(C11H10)	5.48 % mol.
• C12 + Aromatics	(--)	4.70 % mol.

Total 100 %

• M.W.	132
• RON No. Clear	112
• MON No. Clear	100
• ASTM D86 Distillation (°C)	
• IBP	185
• 10 %	189
• 30 %	191
• 50 %	194
• 70 %	207
• 90 %	210
• EP	259

Net Calorific Value 39'368 kJ/kg 9'403 kcal/kg

FUELS DATA

C6 / C7 LIQUID FUEL

• Hexane	(C ₆ H ₁₄)	6.60 % mol.
• Methyl Cyclo Pentane	(C ₆ H ₁₄)	1.20 % mol.
• Benzene	(C ₆ H ₆)	50.60 % mol.
• Toluene	(C ₇ H ₈)	35.26 % mol.
• Methyl CycloHexane	(C ₇ H ₁₄)	0.92 % mol.
• Octane	(C ₈ H ₁₈)	1.69 % mol.
• Paraxylene	(C ₈ H ₈)	1.21 % mol.
• Metaxylene	(C ₈ H ₈)	2.36 % mol.
• Ethyl-Benzene	(C ₈ H ₁₀)	0.08 % mol.
• O-Xylene	(C ₈ H ₈)	0.08 % mol.
• M.W.		85.5
Net Calorific Value	40'332 kJ/kg	9'633 kcal/kg

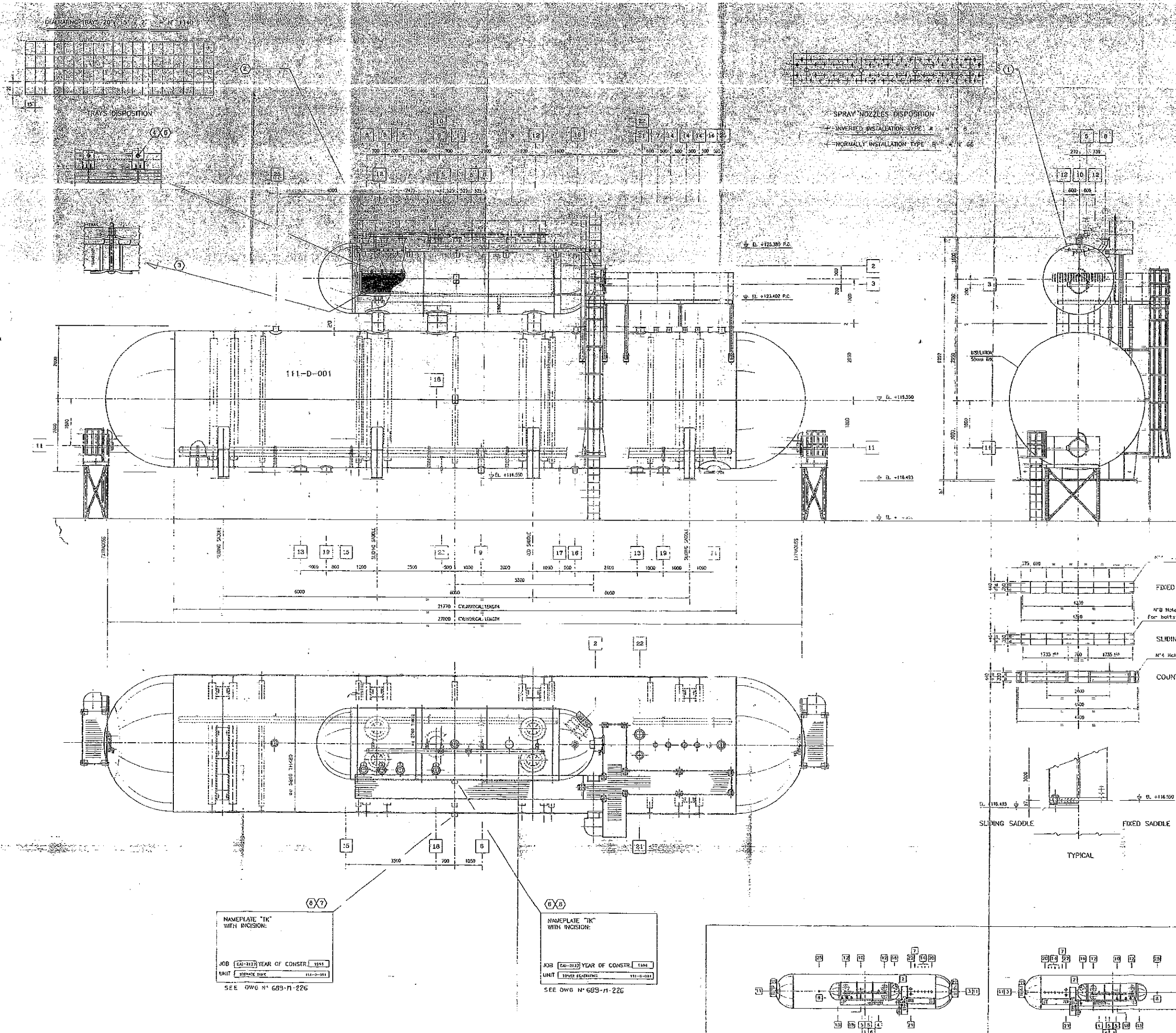
December 11th, 1995 - 1/1

RECOMMENDED STEAM PURITY AT TURBINE INLET

Subject : Arabian Industrial Fibers Company Limited
 PTA & Aromatics Plant Project
 22854-111-Y-001-LAC
 OurJob No. : 686-687-688-689

Conductivity at 25 °C (measured after acid cationic exchanger)		<0.20 μS/cm				
Silica	SiO ₂	<0.020 mg/Kg				
Total iron	Fe	<0.020 mg/Kg				
Sodium	Na	<0.010 mg/Kg				
Total copper	Cu	<0.003 mg/Kg				
CONVERSION TABLE						
	CaCO ₃ , parts per million (p.p.m.)	CaCO ₃ , grains per U.S. gallons	English or Clark's degrees	French degrees	German degrees	Equivalent p/million (e.p.m.)
1 part per million ppm	1.00	0.0583	0.07	0.1	0.056	0.02
1 milligram per liter	1.00	0.0583	0.07	0.1	0.056	0.02
1 grain per U.S. gallon	17.1	1.00	1.2	1.71	0.956	0.342
1 english or Clark's degree	14.3	0.833	1.00	1.43	0.80	0.286
1 french degree	10	0.583	0.7	1.00	0.56	0.2
1 german degree	17.9	1.04	1.24	1.79	1.00	0.357
1 equivalent per million epm	50	2.92	3.50	5	2.80	1.00
e.p.m. = $\frac{\text{p.p.m. of a substance}}{\text{equivalent weight of the same substance}}$						
Equivalent weight = $\frac{\text{Molecular weight}}{\text{Metal valence}}$						

Sht 15 of 15

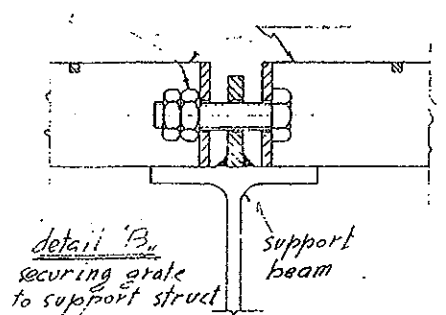


ITEM	SERVICE	TYPE	END RATING	SIZE	N° READ
1	COMPENSATE MAKE-UP INLET	FLANGED	150# RF	8"	1
2	STEAM INLET	S.W. NOZZLE	SD4 20	20"	1
3	MANHOLE (TOWER)	FLANGED	150# RF	20"	1
4	PROCESS CONDENSATE INLET	B.W. NOZZLE	SD4 XS	14"	1
5	VENTS TO ATMOS.	FLANGED	150# RF	6"	2
6	PRESSURE GAUG. CORN. (TOWER)	S.W. NOZZLE	300#	1/2"	1
7	PUMPS BALANCING INLET	FLANGED	150# RF	3"	1
8	SAFETY VALVES	FLANGED	150# RF	1"	3
9	BOILER C. PIPE	B.W. NOZZLE	SD4 12		1
10	DOWNSHOWER	B.W. NOZZLE	SD4 10		1
11	MANHOLE (TANK)	FLANGED	150# RF	2	2
12	EQUALIZER	B.W. NOZZLE	SD4 6	10"	1
13	B.F.W. PUMPS SECTION	FLANGED	150# RF	16	2
14	B.F.W. PUMPS RECIRCULATION	FLANGED	150# RF	4	1
15	LEVEL CONNECTION FOR LBL	S.W. NOZZLE	SD4 XS	4	2
16	EQUALIZING COLUMN CONNEC.	S.W. NOZZLE	SD4 8"		1
17	TANK DRAIN	S.W. NOZZLE	300#	2"	1
18	THERMOMETER CONNECTION (TANK)	NPT NOZZLE	300#	1/2"	1
19	OVERFLOW	FLANGED	150# RF	12	2
20	EQUALIZER (STEAM SIDE)	FLANGED	150# RF	8"	1
21	VACUUM VALVE	FLANGED	15 x 10"	1"	1
22	VACUUM VALVE	FLANGED	150# RF	10"	1
23	ARMED FOR DOWNS	S.W. NOZZLE	300#	2"	1
24	EQUALIZER VESSEL (WATER SIDE)	FLANGED	150# RF	24"	1
25	SPARE CONNECTION	FLANGED	150# RF	5"	1

QTY	DESCRIPTION	QTY	DESCRIPTION	QTY	DESCRIPTION	QTY	DESCRIPTION
8	SCREW #4x40x1 #10T	8	UBI 6107	MSI 304			
2	NAMEPLATE - TANK	1	S2-091/67	MSI 304			
3	NAMEPLATE - TOWER	1	S2-091/67	MSI 304			
4	KASHER #10x30x3	25	UBI 6593	MSI 304			
5	HEXAGONAL NUTS 5/8" TUBIC-28	36	MSI 018.2.2	MSI 304			
6	WASHERS TO SECURE THE FIRST LAYER OF NUTS	36	S2-361	250 304			INSTL. SEE
7	TRUCK 20'x24'x8'	1	S2-360	250 304			20'x24'x8'
8	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
9	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
10	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
11	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
12	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
13	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
14	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
15	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
16	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
17	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
18	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
19	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
20	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
21	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
22	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
23	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
24	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
25	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
26	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
27	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
28	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
29	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
30	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
31	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
32	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
33	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
34	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
35	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
36	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
37	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
38	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
39	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
40	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
41	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
42	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
43	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
44	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
45	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
46	BRIDGE 20'x24'x8'	1	S2-345	MSI 316			20'x24'x8'
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	DESCRIPTION	QTY	DIMENSIONS	MATERIAL	NOTE		

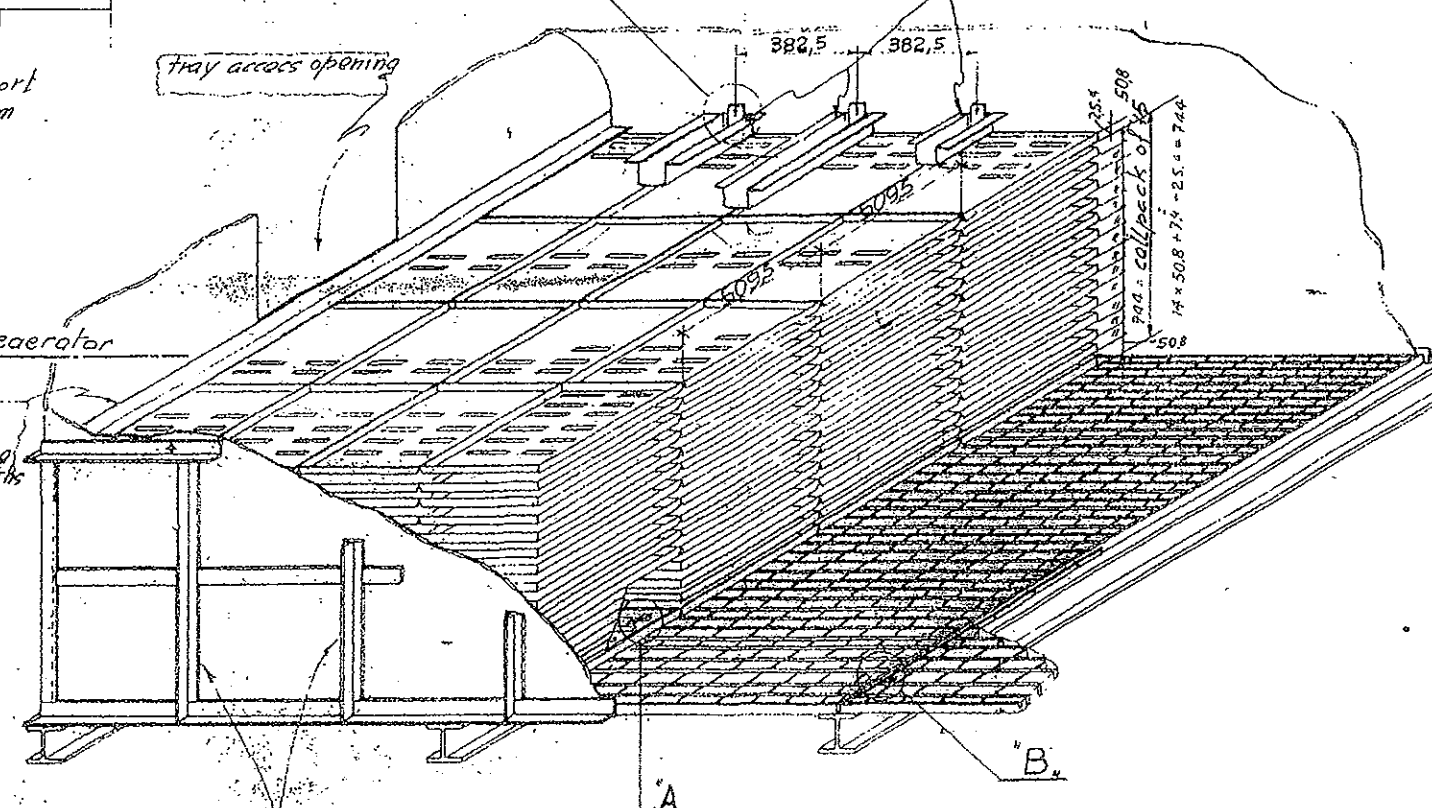
[illegible]

When this nut slightly and lock in with the lock nut - make sure grate rests evenly on supports



horizontal axis deaerator
any sections to be placed at 50 mm intervals by 150 mm after mounting trays and distributor troughs

Tray access opening



STRENGTHENING RIBS

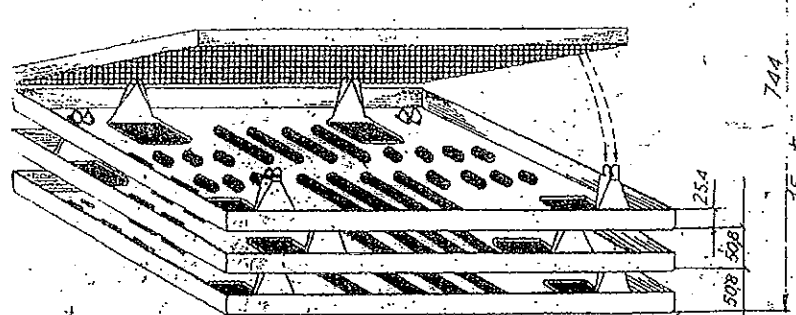


Fig. 1
stacking & locking of trays

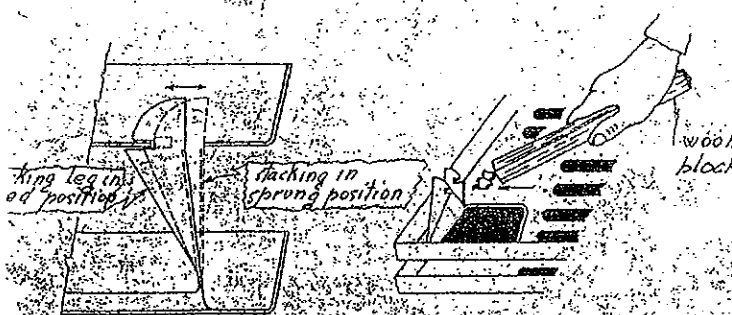
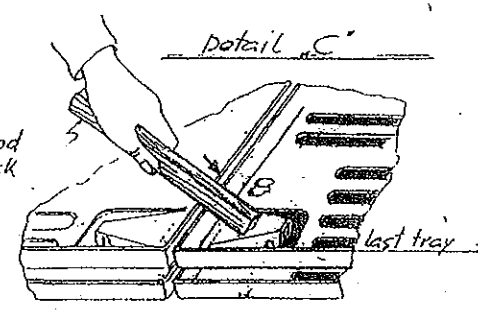
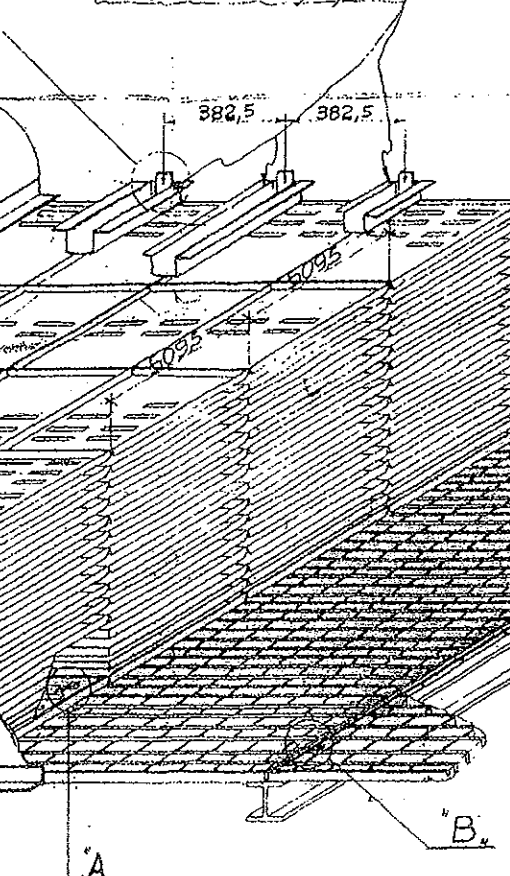
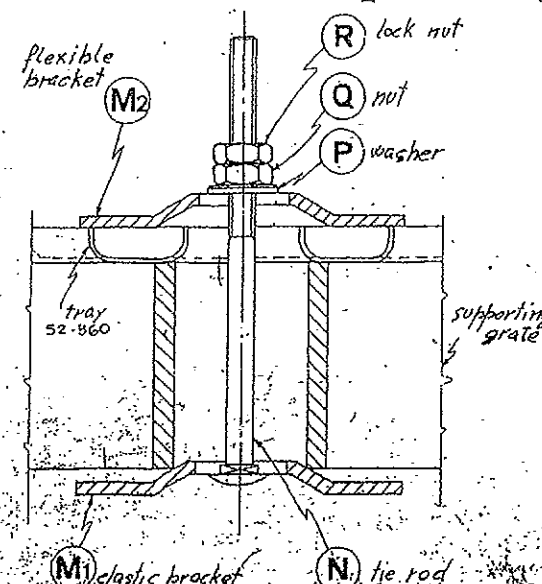


Fig. 2
unlocking tray stacking legs

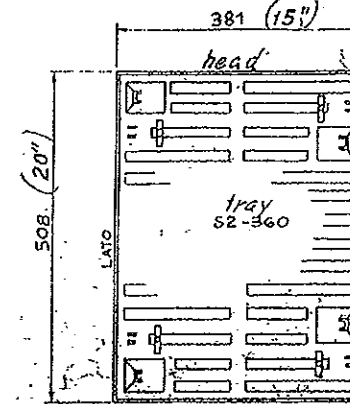
Detail D:
distr trough and clip S2-618 (S2-582 (see fig. 1))
S.S. bolt nut & lock washer - important: slide down tight against trough bottom before tightening.
distributor troughs - S2-617 ed. shown on assy BH



Detail C



DETAIL A



INSTRUCTIONS FOR INSTALLATION OF TRAYS AND ACCESSORIES

- 1) If the grate is not welded to the supporting structure, make sure it is secured as shown in detail "B".
- 2) Fit up the first layer of trays, proceeding as follows: (see detail "A")
Set the tray in 4 positions as close as possible to the stacking legs by inserting bracket (M1) supported by tie rod (N) and turning by 90° so that it lodges between grate supports; insert the second bracket (M2) which must rest above the grate; introduce washer (P) and screwdown the first nut (Q) to the maximum possible extent by hand. Screw the nut by an additional turn with a wrench and lock it in position with the lock nut.
Do not use electric or pneumatic tools for the above operations.
- 3) Introduce trays into the deaerator, through access opening
- 4) The trays must be stacked up on the first row previously secured to the grating, with the stacking legs pointing upward.
Rotate the trays alternately by 180° horizontally, so that the legs of the underlying tray match in position with the slots of the upper tray.
Push tray downward until the legs of the underlying tray are lodged in the slots.
For correct positioning of the stacks consult the assembly drawings relating to the job and which specifies quantity and type of trays to be used.
The present drawing shows a 15 layer stack.
- 5) Complete insertion by bending down stacking legs inwardly on the tray as shown on detail "C".
Mount distribution troughs S2-617 and secure them with brackets S2-618 as shown in detail "D".
Weld the two terminal beams as shown on completion of the last stack of trays.
- 6) To remove trays disengage the stacking legs from the upper cell, using a wood block, as shown in Fig. 2.

OTHER NOTES

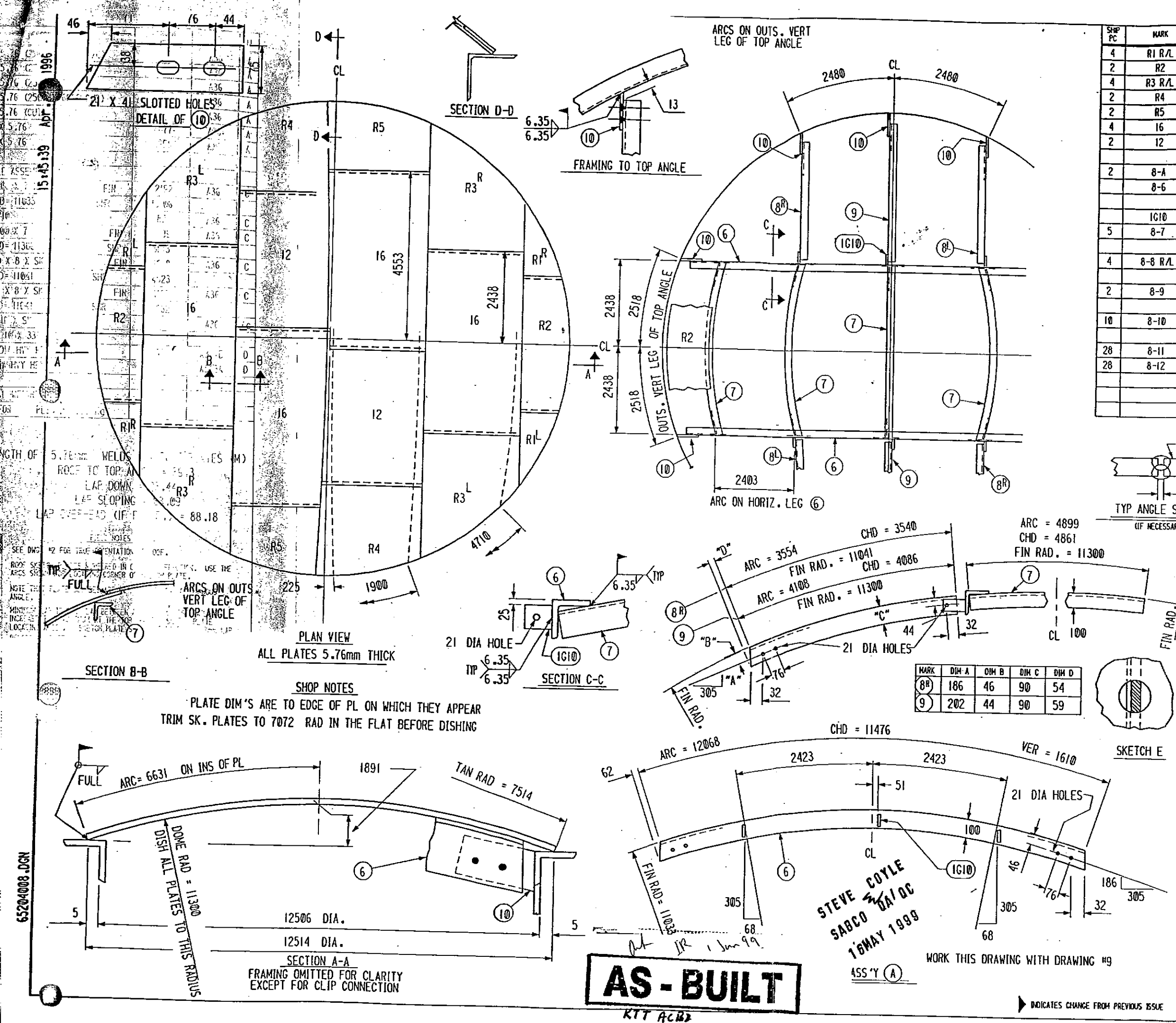
- a) The tray is formed from a single stainless steel plate; these trays are neither riveted nor welded.
- b) Shipment of the trays should be in accordance with drawing S2-360/1, i.e., 15 trays stacked up and packed in a suitable box.
- c) If the crate is 2038 mm. wide, set the trays in 4 rows, adjacent to each other.
If 1528 mm. wide, set the trays in 3 rows, adjacent to each other.

IMPORTANT :

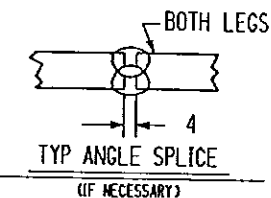
These instructions apply both to horizontal deaerating heaters (as shown on drawing) and vertical type heaters.
The above mentioned instructions have general character.
For the mounting see "Bill of material" of assembly drawing of each deaerator.

TERMOKIMIK CORPORATION			
IMPIANTI E PROCEDIMENTI INDUSTRIALI			
Diag. <i>Quattro</i>	Compiesso: <i>SPRAY-TRAY DEAERATING HEATER</i>		Pezzi N. <i>2</i>
Control			Modif. <i>01</i>
Rep. <i>2</i>	Perfezionato: <i>INSTRUCTIONS FOR INSTALLATION OF TRAYS AND ACCESSORIES</i>		Commiss N.
Data <i>29-01-87</i>	Mod. N. <i>3</i>	Mat. <i>3</i>	Disegno N. <i>52-360/1</i>
Scala <i>1/1</i>	Page <i>1</i>	Trell.	
A termine di legge, ci riserviamo la proprietà di questo nostro disegno con diritto di riprodurlo o di comunicarlo a terzi, comunque per qualsiasi scopo costruttivo.			

CHIAMARE IL PRESENTE ANNULLO IL PRECEDENTE PAR. N° DEL 16-X-84



SHP PC	MARK	ASSM PC	DESCRIPTION	LENGTH MM	SPEC	ID
4	R1 R/L		PL SK X 5.76 (2500 X 6096 C/4)		A36	A
4	R2		PL SK X 5.76 (2500 X 6096)		A36	A
4	R3 R/L		PL SK X 5.76 (2500 X 4077)		A36	A
2	R4		PL SK X 5.76 (2500 X 6096 C/2)		A36	A
2	R5		PL SK X 5.76 (CUTS WITH R2)		A36	A
4	16		PL 2500 X 5.76	4877	A36	A
2	12		PL 2500 X 5.76	3658	A36	A
2	8-A		MAIN ANGLE ASSEMBLY			
	8-6	2	L 100 X 100 X 7 X 5K FIN	12192	A36	C
			FIN ON RAD= 11033 SHR	13106		
	10-10	6	BAR 65 X 10	89	A36	C
5	8-7		L 100 X 100 X 7 FIN	4899	A36	C
			FIN ON RAD= 11300 SHR	5813		
4	8-8 R/L		L 90 X 90 X 8 X 5K FIN	3608	A36	C
			FIN ON RAD= 11041 SHR	4523		
2	8-9		L 90 X 90 X 8 X 5K FIN	4167	A36	C
			FIN ON RAD= 11041 SHR	5082		
10	8-10		BAR 75 X 10 X 5K		A36	Ac
			(BAR 75 X 10 X 338 C/2)			
28	8-11		BOLT 3/4 DIA Hvy HEX	38	A307B	D
28	8-12		NUT 3/4 DIA Hvy HEX		A563A	D
			THEORETICAL WEIGHT OF APPLIED			
			MATERIAL FOR SK. PLS. = 4955 Kg			



LENGTH OF 5.76mm WELDS FOR ROOF PLATES (M)
 ROOF TO TOP ANGLE = 39.3
 LAP DOWN = 23.44
 LAP SLOPING = 63.09
 LAP OVERHEAD (IF REQ'D.) = 88.18

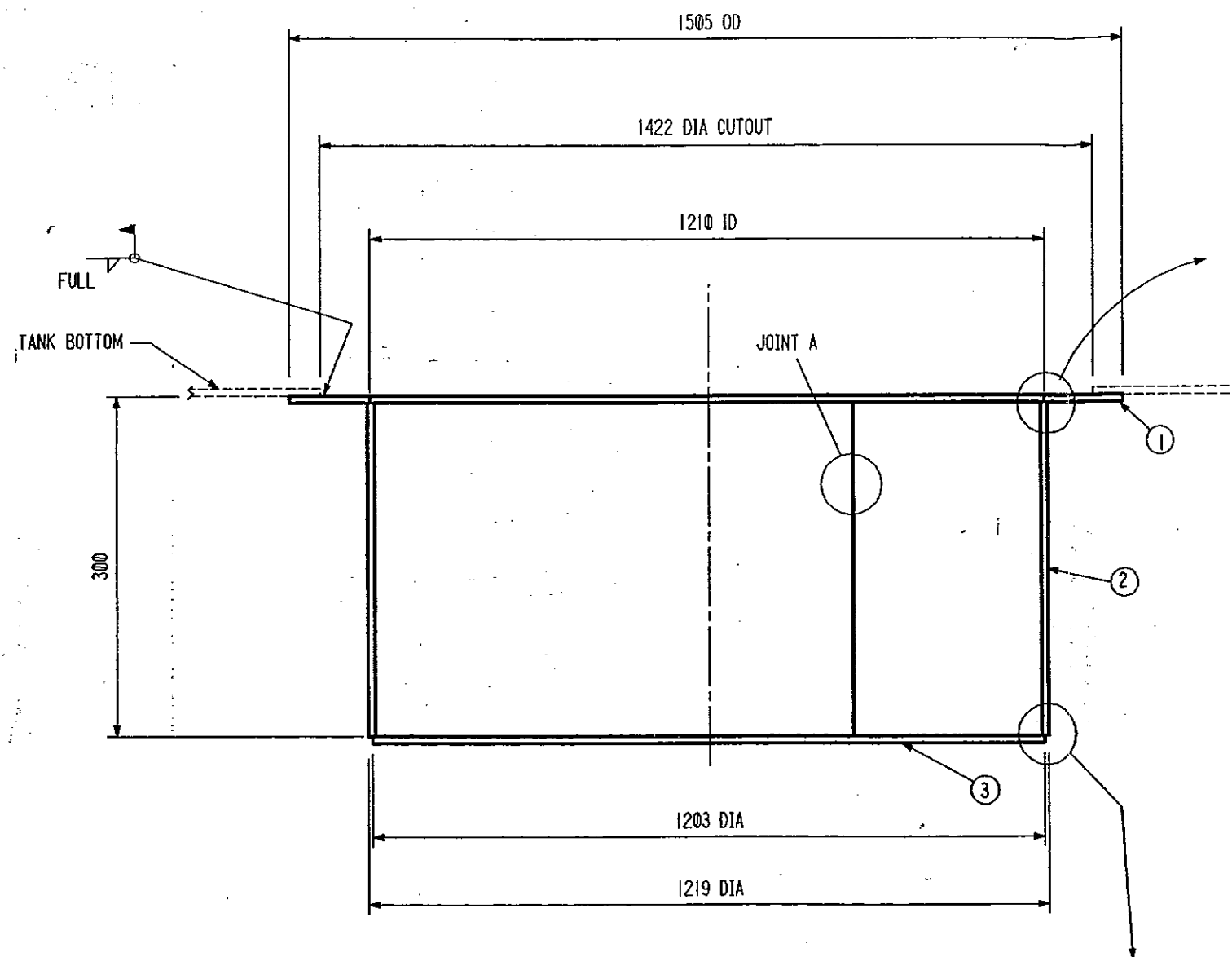
- ### FIELD NOTES
- 1- SEE DWG. #2 FOR TRUE ORIENTATION OF ROOF.
 - 2- ROOF SKETCH PLATES NUMBERED IN ORDER OF ERECTION. USE THE ARCS SHOWN FOR LOCATING CORNER OF SKETCH PLATE.
 - 3- NOTE THAT PLATE COURSES ARE 90° TO THE LONG CONTINUOUS ANGLE.
 - 4- MINIMUM LAP IS 26". LAP BETWEEN ADJACENT COURSES WILL INCREASE TO A MAXIMUM AT THE TOP ANGLE. SKETCH PLATE LOCATING ARCS AND SKETCH PLATE SIZES ARE BASED ON 38mm LAP.
 - 5- BEFORE COMPLETING ERECTION OF FRAMING, 181 KG TOTAL IS THE MAXIMUM PERMISSIBLE CONCENTRATED LOAD ON THE FRAMING.
 - 6- AFTER ROOF PLATES ARE COMPLETELY WELDED, MAKE CUT-OUT AT CENTER FOR VENT. CUT AWAY EXPOSED PORTION OF HORIZONTAL LEG OF ANGLE (AS SHOWN CROSS HATCHED IN SKETCH E) BUT LEAVE VERTICAL LEG OF ANGLE INTACT.

"OWNER WARNING" THE ROOF FRAMING MAY FAIL IF LOADS ARE ATTACHED TO THE FRAMING SUCH AS PAINTER'S RIGGING, HOIST EQUIPMENT OR OTHER TEMPORARY OR PERMANENT EQUIPMENT. THE ROOF FRAMING HAS NOT BEEN DESIGNED TO SUPPORT LOADS OF THIS TYPE. DO NOT USE THE FRAMING FOR THE PURPOSE OF SUPPORTING LOADS SUCH AS PAINTER'S RIGGING, HOIST EQUIPMENT OR OTHER TEMPORARY OR PERMANENT EQUIPMENT.

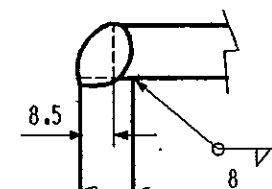
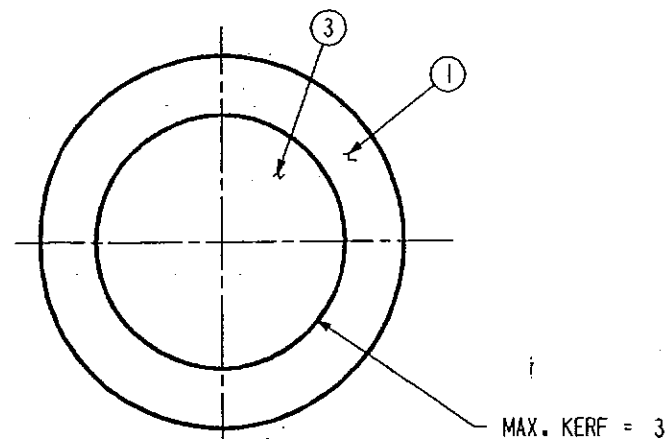
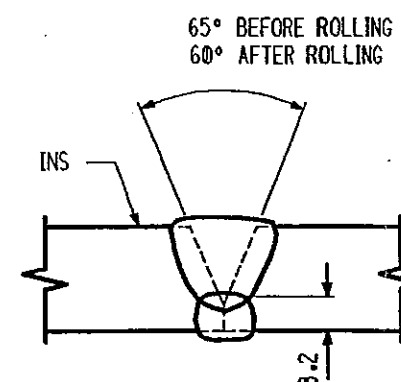
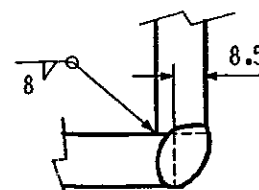
STEAM CONDENSATE STORAGE TANK

BECHTEL LTD CONTRACT No. 22854-LCC-005
(22854-000-F-001)

[illegible]

**-FIELD NOTE-**

BE SURE THAT CONTOUR OF GROUND IS SHAPED TO PROVIDE AS FIRM A SUPPORT FOR THE SUMP AND THE BOTTOM ADJACENT TO THE SUMP AS IS PROVIDED FOR THE REMAINDER OF THE BOTTOM.

**WELD DETAIL****CUTTING SKETCH****JOINT A****WELD DETAIL**

BILLED AND DETAILED FOR (1) TANK -- (1) REQUIRED

STEAM CONDENSATE STORAGE TANK

BECHTEL LTD CONTRACT No. 22854-LCC-005
(22854-000-F-001)

ARABIAN CBI LTD.

(48" DIA.) 1219 DIA. API 650 SUMP
12.5 m DIA. X 12.0 m HIGH SSDRT
IBN RUSHD PTA AND AROMATICS PLANT PROJECT
ARABIAN INDUSTRIAL FIBERS CO. LTD
YANBU, SAUDI ARABIA

ITEM NO 111-F-001
BY ZH CHKD MSG DATE 4/18/96
R L HERBERT
ENGINEERING SUPERVISOR
CONTRACT NO ED 965204
DWG 17 REV 1
SHT 1

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INDICATES CHANGE FROM PREVIOUS ISSUE

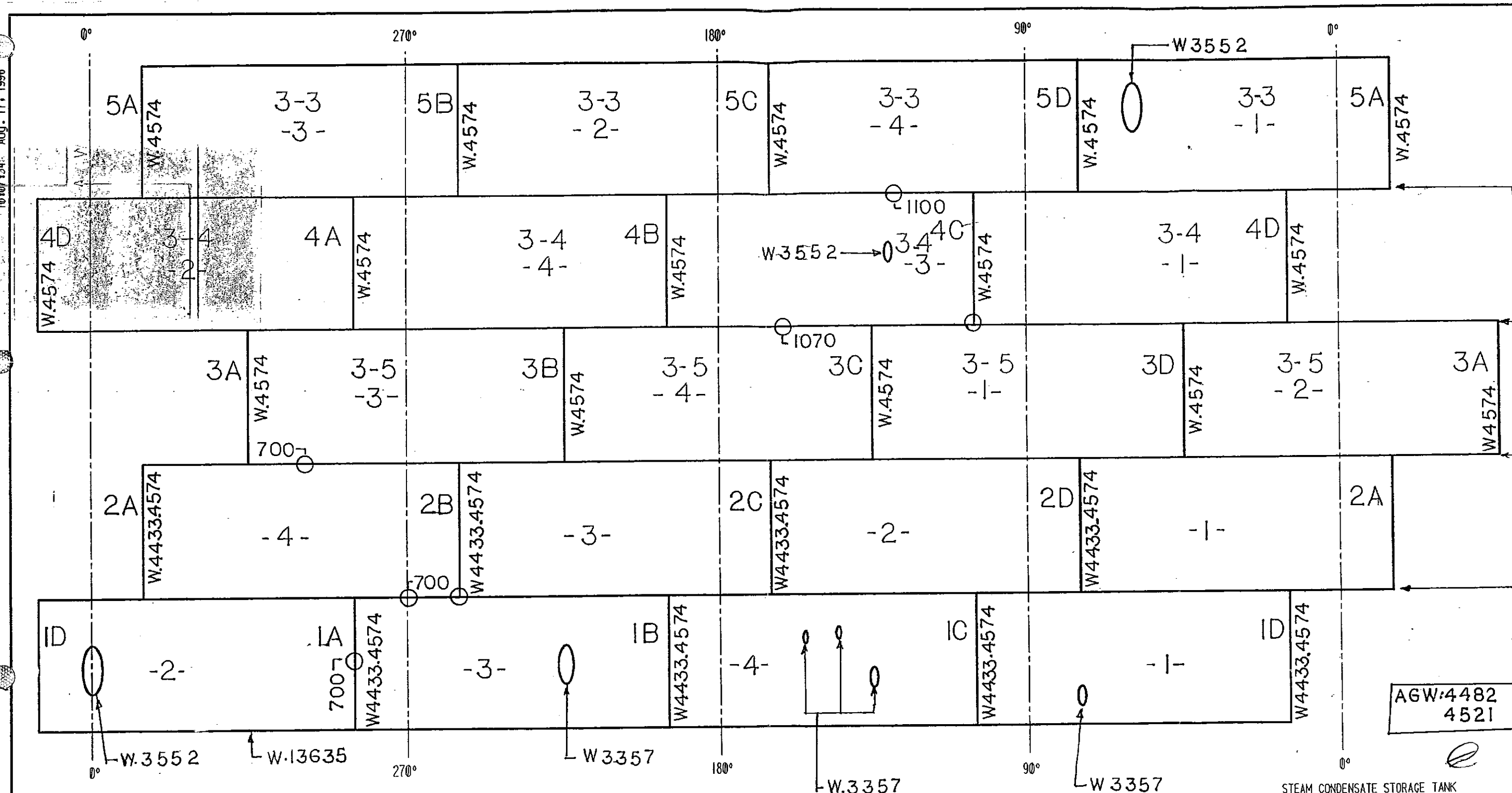
AS - BUILT

KTT ALR

As IR
1 Jun 99

STEVE COYLE
SABED QA/QC
16 MAY 1999

SHP PC	MARK	ASST PC	DESCRIPTION	LENGTH MM	SPEC	D
1	17-A		1219 DIA API 650 SUMP			
	17-1	1	PL 1505 OD x 12.70 x 1210 ID		A36	Ac
	17-2	1	PL 287 x 12.70 ROLL	3790	A36	Ac
	17-3	1	PL 1203 DIA x 12.70		A36	Ac
			(C/N 17-1)			



AGW:4482
4521

STEAM CONDENSATE STORAGE TANK
BECHTEL LTD CONTRACT No. 22854-LCC-005

SHELL STRETCHOUT

(OUTSIDE VIEW)

FOR CONSTRUCTION

FOREMAN:

1. RECORD WELDERS' I.D. ON EACH JOINT.
2. RECORD JOINT ID AND RT INTERVALS (FIRST & LAST FOR 100%) OR LOCATION FOR SPOT RADIOGRAPHS OR PLUGS.

WHEN COMPLETE

FOREMAN:

SEND CONSTRUCTION OFFICE ONE
LEGIBLE COPY AND WORK COPIES IF ANY

ARABIAN CBI LTD.

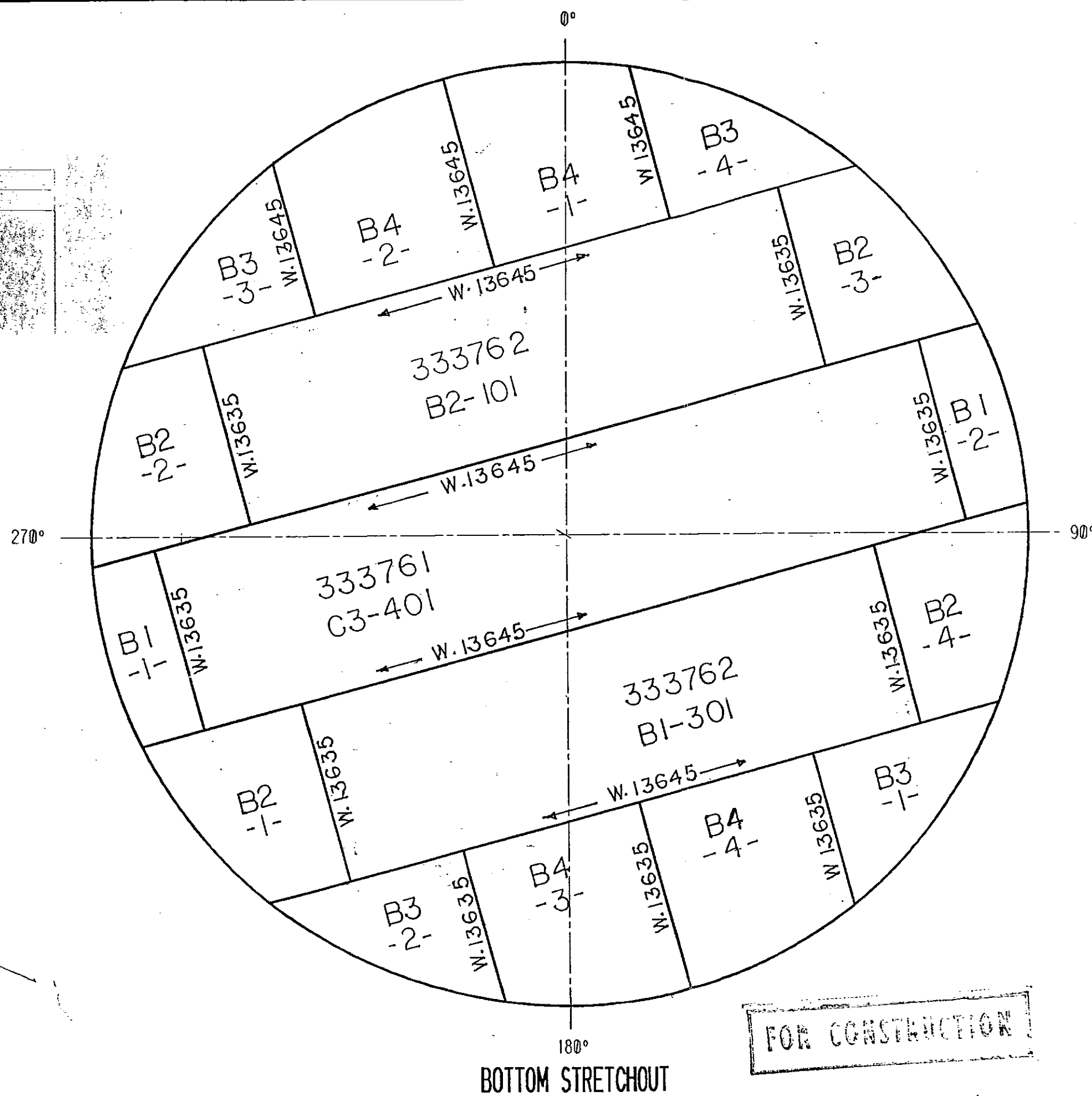
SHELL STRETCHOUT
12.5 m DIA. X 12.0 m HIGH SSDRT
IBN RUSHO PTA AND AROMATICS PLANT PROJECT
ARABIAN INDUSTRIAL FIBERS CO. LTD
YANBU, SAUDI ARABIA

ITEM NO. 111-F-001
BY ZW CHKD RLH DATE 7/9/96
R L HERBERT
ENGINEERING SUPERVISOR

CONTRACT NO. ED 963204
DWG RI REV
SHT 0

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INDICATES CHANGE FROM PREVIOUS ISSUE



BOTTOM STRETCHOUT

NAME OF WELDER	I.D.
E. M. MARTIN	13635

FOREMAN:

1. RECORD WELDERS' I.D. ON EACH JOINT.
2. RECORD JOINT ID AND RT INTERVALS (FIRST & LAST FOR 100%) OR LOCATION FOR SPOT RADIOGRAPHS OR PLUGS.

WHEN COMPLETE

FOREMAN:

SEND CONSTRUCTION OFFICE ONE LEGIBLE COPY AND WORK COPIES IF ANY

STEAM CONDENSATE STORAGE TANK

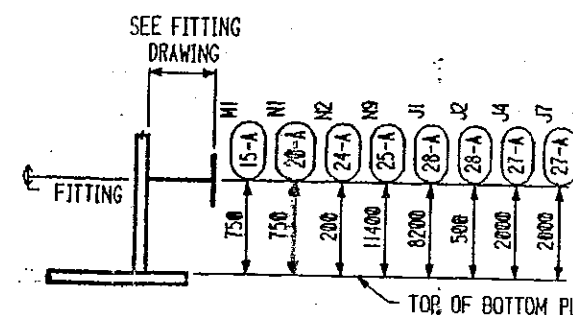
BECHTEL LTD CONTRACT No. 22854-LCC-005

		ARABIAN CBI LTD.	
		BOTTOM STRETCHOUT 12.5 m DIA. X 12.0 m HIGH SSDRT IBN RUSHD PTA AND AROMATICS PLANT PROJECT ARABIAN INDUSTRIAL FIBERS CO. LTD YANBU, SAUDI ARABIA	
ITEM NO. III-F-001 BY ZW CHD R.L.H. DATE 7/9/96 R.L. HERBERT ENGINEERING SUPERVISOR		CONTRACT NO. ED 965204 DWG R2 REV 0	
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TECHNICAL & CONSTRUCTION INFORMATION

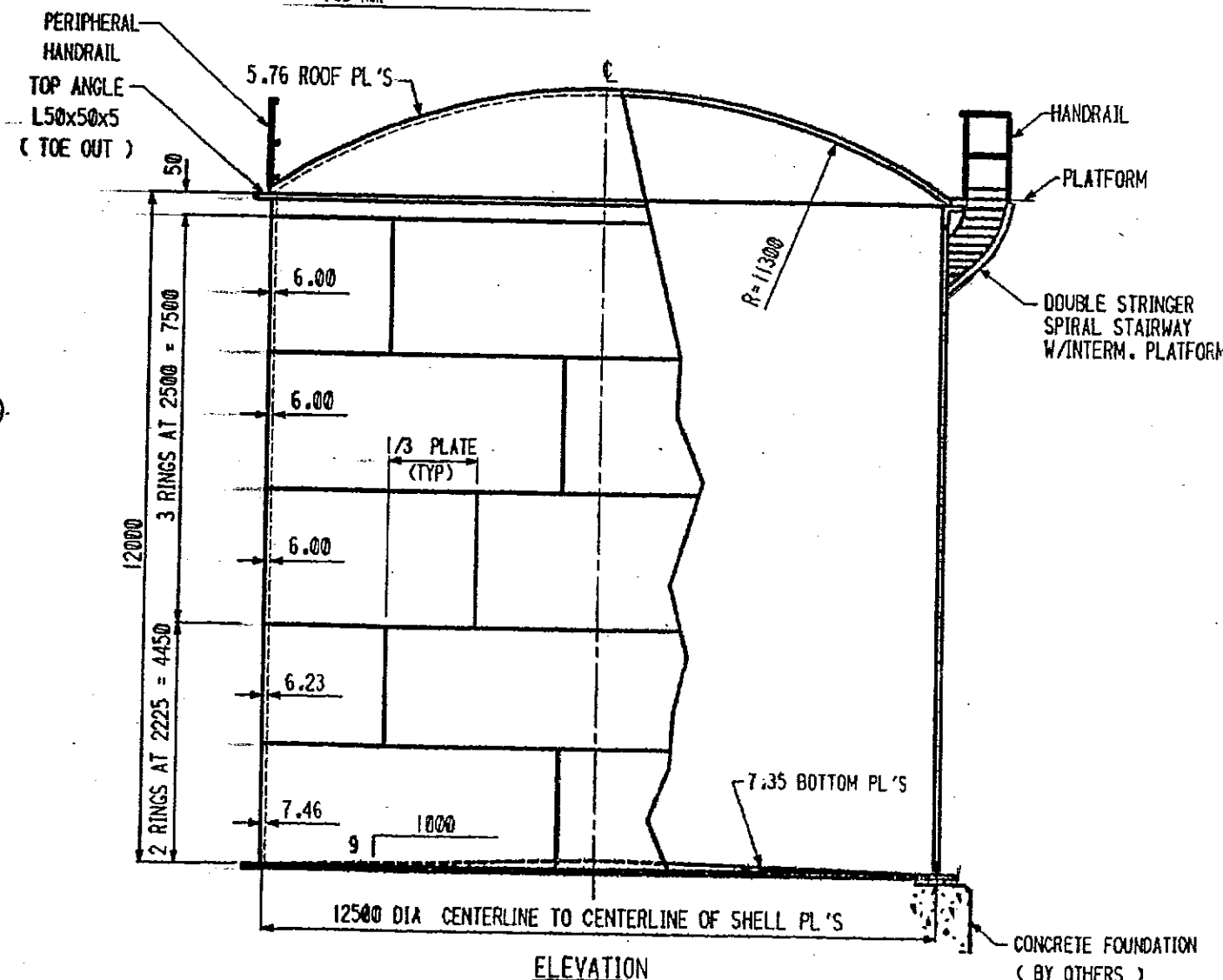
SPECIFICATIONS		MATERIAL SPEC	
API 650-9th ED. (1993/94 ADD.)		APP. A, E & M	
SPECIFIC GRAVITY	1.0	BOTTOM RECT.	A36
SERVICE	STEAM CONDENSATE	BOTTOM SKETCHES	A36
MAX DESIGN METAL TEMP.	110°C	SHELL PLATES	A36
MIN DESIGN METAL TEMP.	17°C	ROOF PLATES	A36
DESIGN PRESSURE	ATMOSPHERIC	STRUCTURAL	A36 / RS+ 37-2
DESIGN VACUUM	ATMOSPHERIC	FLANGES	A105
DESIGN LIQUID LEVEL	12000 mm	NOZZLE NECKS	A106B
DESIGN WIND VELOCITY	140 km/h (PER API 650)	INTERNAL PIPE	A106B
SEISMIC	ZONE I (I=1.0, S=1.0)	INSPECTION - MILL	CTR'S
	PER API 650	SHOP	ACBI
ROOF LIVE LOAD	1.2 KPa	FIELD	ACBI & CUSTOMER
NOMINAL CAPACITY	1472 m ³	SURFACE PREPARATION	YES
PUMP IN RATE	615 m ³ /hr	PAINTING	YES
PUMP OUT RATE	615 m ³ /hr	PHWT	NO
FOUNDATION	BY OTHERS	INSULATION	YES
CONSTRUCTION	BY ARABIAN CBI	MISC.	
EROSION ALLOWANCE		GASKETS	REINZ-AFM37
BOTTOM	1.0 mm	BOLTS & NUTS	A193-B7 & A194-2H
SHELL	1.0 mm	RADIOGRAPHY	PER CODE
ROOF	1.0 mm	JOINT EFFICIENCY	0.85
STRUCTURAL	1.0 mm		

DESIGN DATA		DESIGN FOR PRODUCT		DESIGN FOR TEST		THK. USED	MATERIAL SPECIFICATION	API MAT'L GROUP NO.
RING NO.	CORR. ALLOW. mm	ALLOWABLE STRESS MPa	REQUIRED THK. mm	ALLOWABLE STRESS MPa	REQUIRED THK. mm			
1	1.0	110.89	7.46	123.07	5.82	7.46	A36	I
2	1.0	110.89	6.23	123.07	4.71	6.23	A36	I
3	1.0	110.89	5.00	123.07	3.61	6.00	A36	I
4	1.0	110.89	3.62	123.07	2.36	6.00	A36	I
5	1.0	110.89	2.24	123.07	1.12	6.00	A36	I

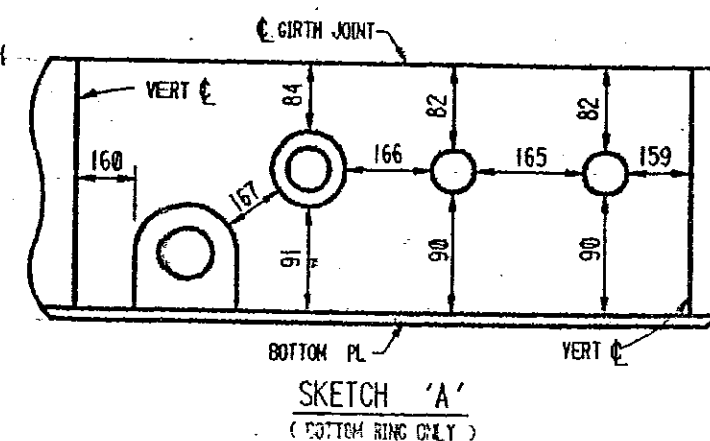


SHELL FITTING ELEVATION

LIST OF FITTINGS					
CUST. MARK	ACBI MARK	QUANT	SIZE	RATING	DESCRIPTION
M2	30-A	1	24"	API	ROOF MANWAY
M1	15-A	1	24"	API	SHELL MANHOLE
N1	20-A	1	16"	150 RF	SHELL NOZZ PUMP SUCTION W/VORTEX BRKR
N2	24-A	1	4"	150 RF	S-ELL NOZZLE DRAIN W/INT.
N3	31-A	1	8"	150 RF	ROOF NOZZLE DEMIN. M/U
N6	32-A	1	8"	150 RF	ROOF NOZZLE MP COND. W/INT.
N7	33-A	1	12"	150 RF	ROOF NOZZLE VENT W/INSECT SCREEN
N8	34-A	1	6"	150 RF	ROOF NOZZLE PUMP SPILLBACK W/INT.
N9	25-A	1	24"	150 RF	SHELL NOZZLE OVERFLOW
N10	36-A	1	24"	150 RF	ROOF NOZZLE DEAERATOR W/INT.
J1	28-A	1	4"	150 RF	SHELL NOZZLE LIC
J2	28-A	1	4"	150 RF	SHELL NOZZLE LT
J4	27-A	1	2"	150 RF	SHELL NOZZLE TI
J7	27-A	1	2"	150 RF	SHELL NOZZLE TI
	17-A	1	48"		SSP
	DWG#18	1			NAMEPLATE
		1			PERIPHERAL HANDRAIL
	DWG#50	1			SPIRAL STAIRWAY
	DWG#29	4			GROUNDING LUG
	DWG#12/13				INSULATION SUPPORTS
		1 SET			CATHODIC PROTECTION (EXT.)



AS - BUILT



GENERAL NOTES:

1. FITTINGS TO BE LOCATED AS SHOWN ON ORIENTATION DRAWING(S). IF LOCATIONS ARE NOT GIVEN, LOCATE IN FIELD TO SUIT CUSTOMER MAINTAINING MINIMUM SPACING SHOWN IN SKETCH 'A'. DIMENSIONS GIVEN ARE FROM EDGE TO EDGE OF REINFORCING PL OR FROM CL OF BUTT WELD TO EDGE OF REINFORCING PL.
2. FLANGE BOLT HOLES TO STRADDLE VERTICAL CENTERLINE FOR SHELL NOZZLES.
3. FLANGE BOLT HOLES TO STRADDLE 0°-180° CENTERLINE FOR ROOF NOZZLES
4. SEE SHEETS 800 & 802 FOR MATERIAL MANAGEMENT

STEAM CONDENSATE STORAGE TANK

BOCHTEL LTD CONTRACT NO. 22354-000-001
(22354-000-001)

ARABIAN CBI LTD.

GENERAL ARRANGEMENT
12.5 m DIA. X 12.0 m HIGH SSORT
IBN RUSHD FEA AND AROMATICS PLANT PROJECT
ARABIAN INDUSTRIAL FIBERS CO. LTD
DAMU, SAUDI ARABIA

ITEM NO. 111-F-001 CONTRACT NO. ED 965204

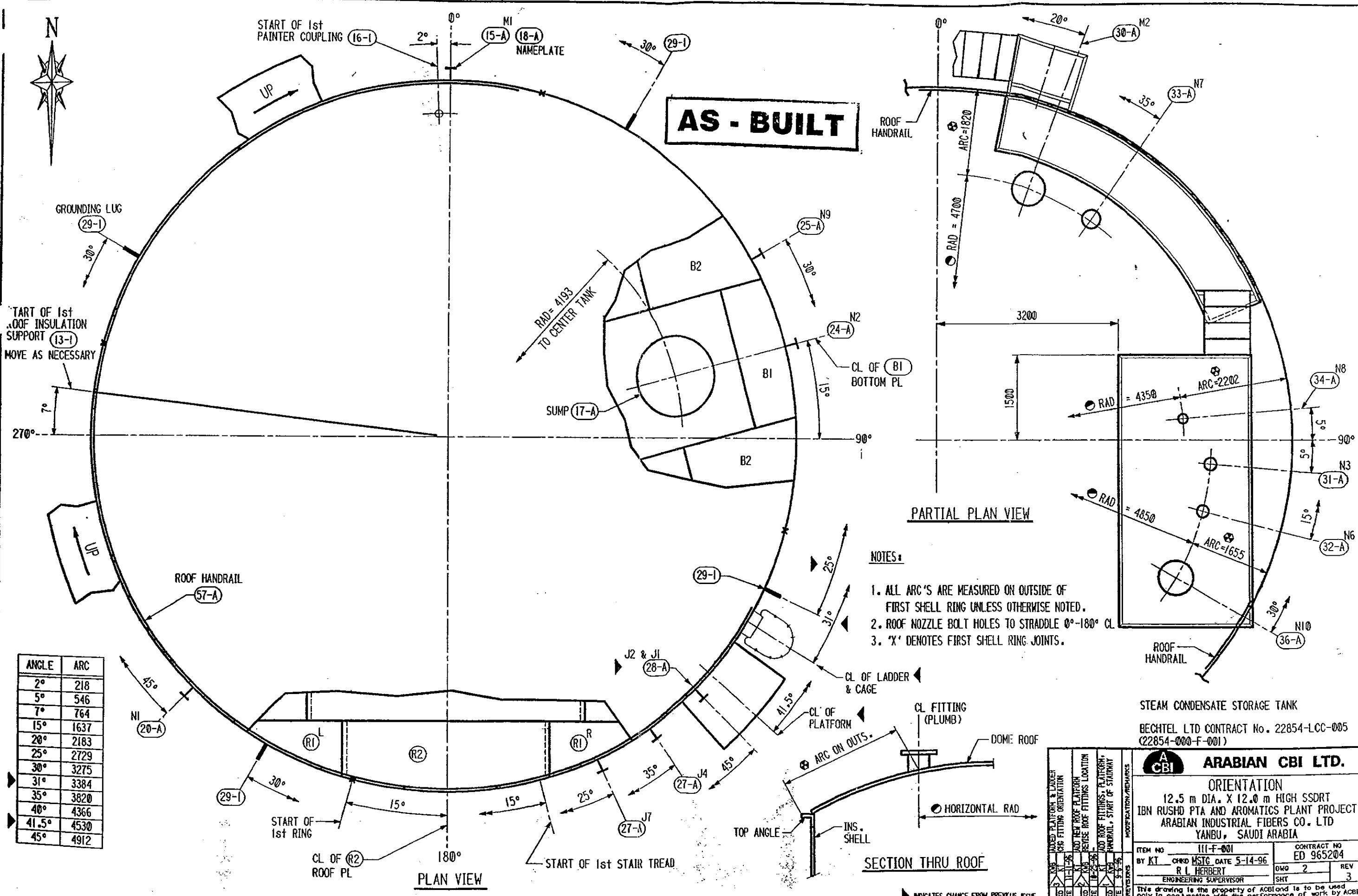
BY KBY CHD 510 DATE 3/15/96
R.L. HERBERT
ENGINEERING SUPERVISOR

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INDICATES CHANGE FROM PREVIOUS ISSUE



AS - BUILT



PARTIAL PLAN VIEW

NOTES:

1. ALL ARC'S ARE MEASURED ON OUTSIDE OF FIRST SHELL RING UNLESS OTHERWISE NOTED.
2. ROOF NOZZLE BOLT HOLES TO STRADDLE 0°-180° CL
3. "X" DENOTES FIRST SHELL RING JOINTS.

SECTION THRU ROOF

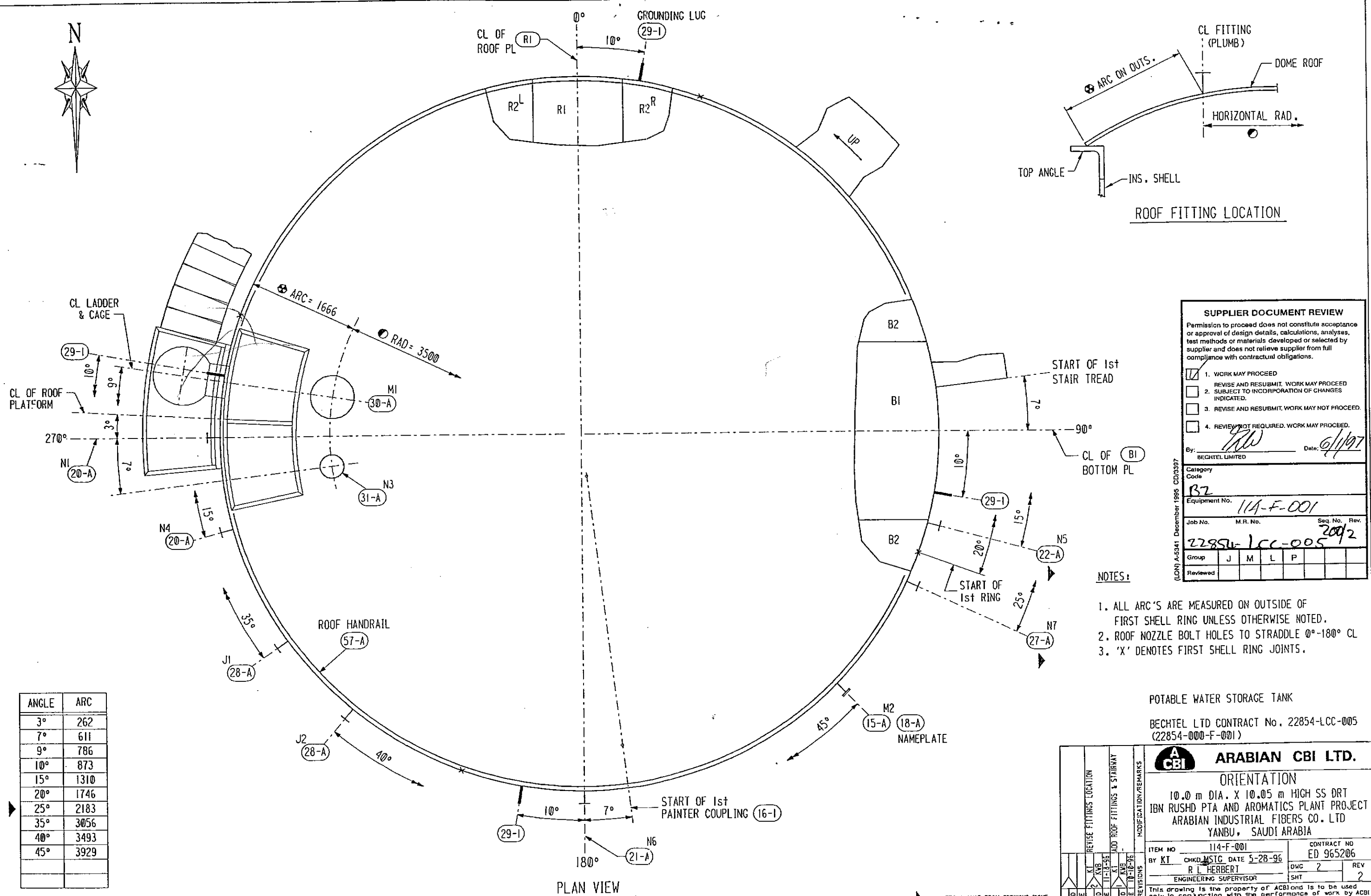
ANGLE	ARC
2°	218
5°	546
7°	764
15°	1637
20°	2183
25°	2729
30°	3275
31°	3384
35°	3820
40°	4366
41.5°	4530
45°	4912

STEAM CONDENSATE STORAGE TANK

BECHTEL LTD CONTRACT No. 22854-LCC-005
(22854-000-F-001)

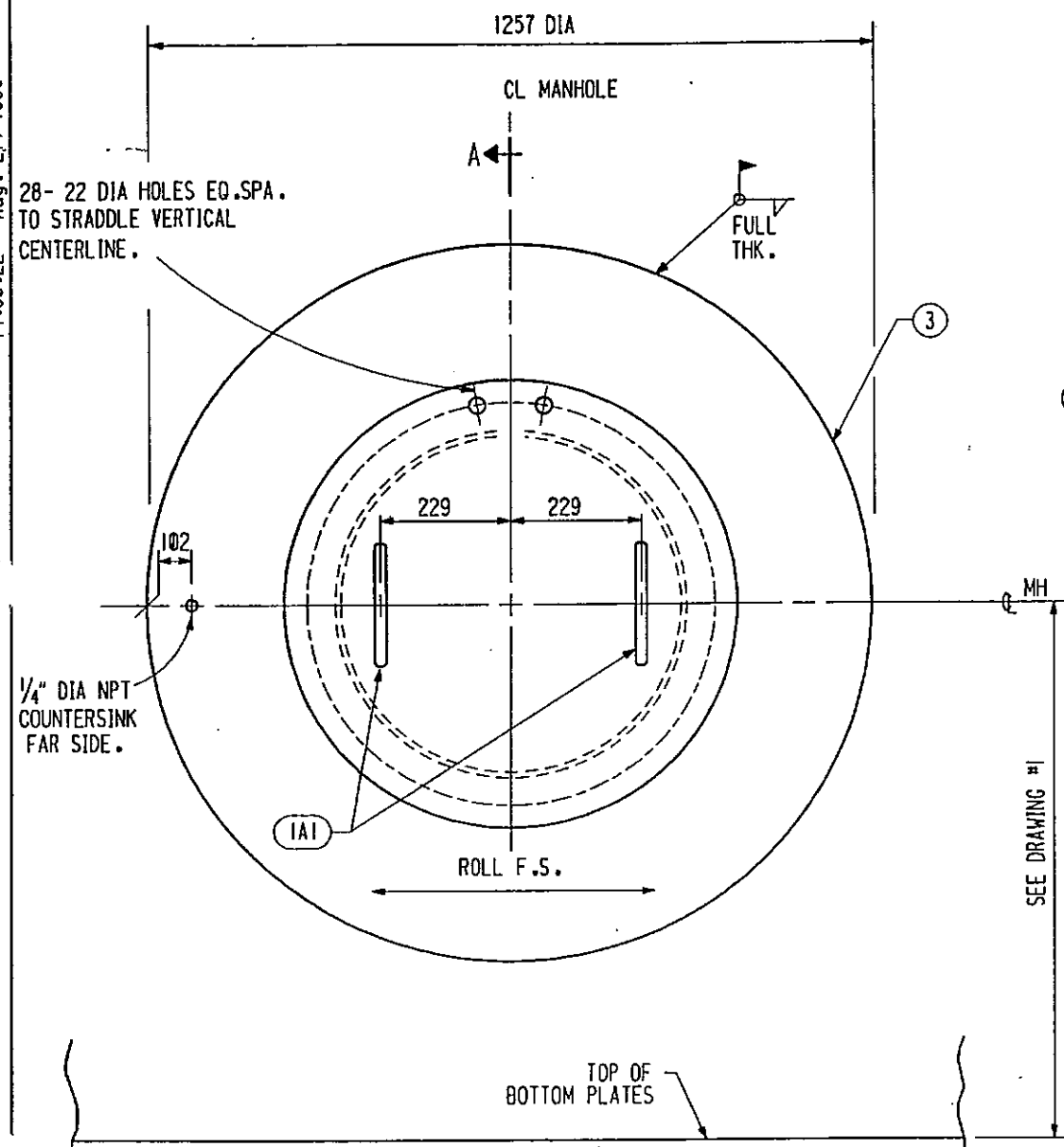
ARABIAN CBI LTD. ORIENTATION 12.5 m DIA. X 12.0 m HIGH SSDRT IBN RUSHD PTA AND AROMATICS PLANT PROJECT ARABIAN INDUSTRIAL FIBERS CO. LTD YANBU, SAUDI ARABIA	
ITEM NO. 111-F-001 BY KT CHD MSHG DATE 5-14-96 R L HERBERT ENGINEERING SUPERVISOR	CONTRACT NO. ED 965204 DWG 2 REV 3 SHEET

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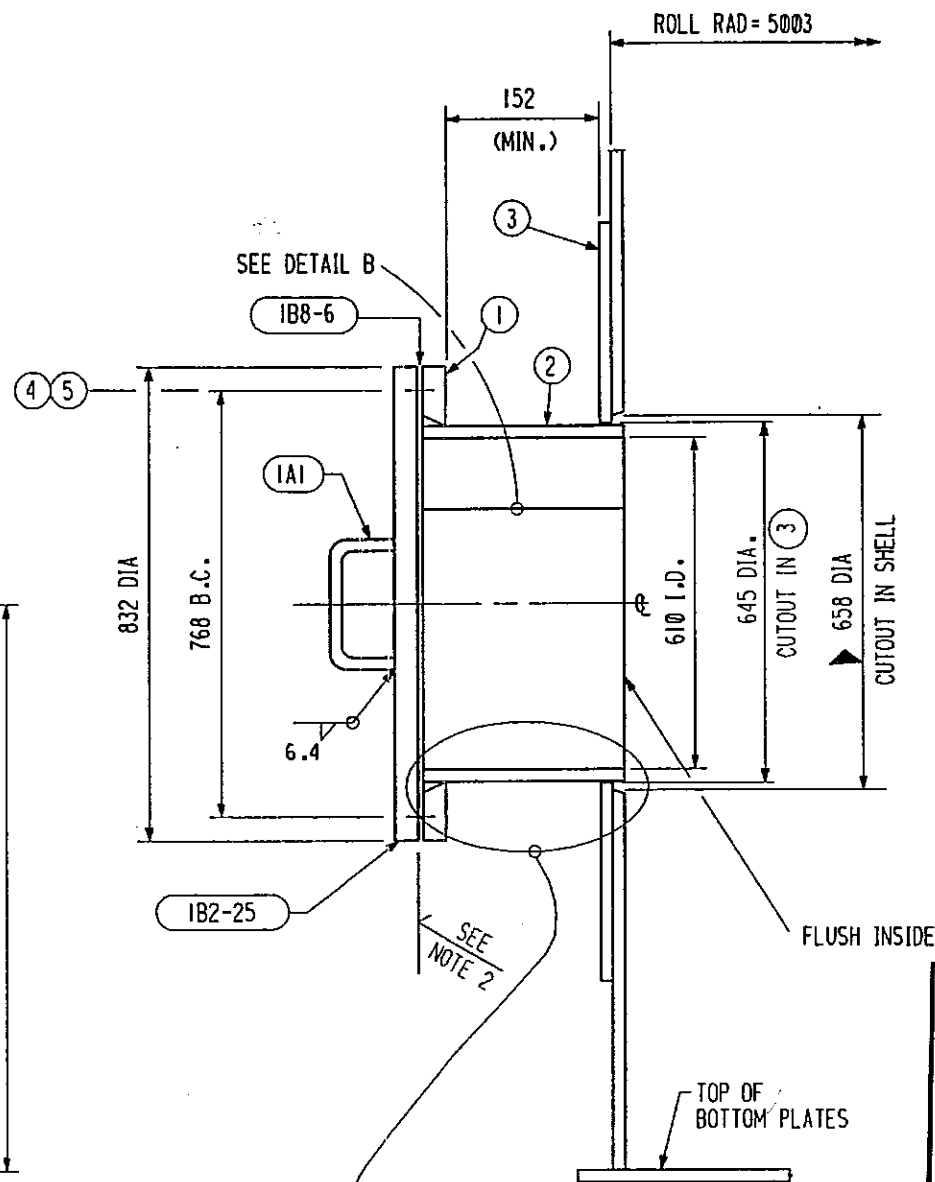
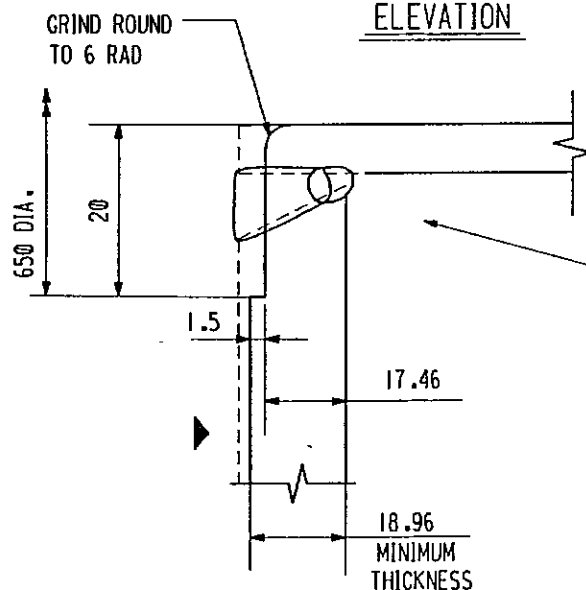


143022 Aug. 21, 1996

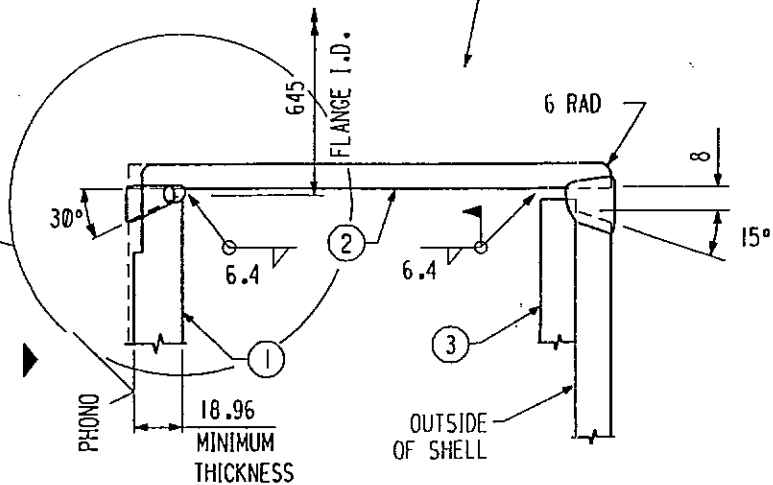
65206015.DGN



ELEVATION



SECTION A-A



- GENERAL NOTES —
1. LEAVE TELLTALE HOLE IN REINFORCING PLATE OPEN AFTER AIR TEST.
 2. FINISH FACE OF COVER, PHONO TO 20.6 THK. LEAVING 585 DIA. ROUGH.

SHIP PC	MARK	ASSEMB PC	DESCRIPTION	LENGTH MM	SPEC	ID
1	15-A		24" DIA. SHELL MANHOLE			
	15-1	1	PL SK X 18.96 (845 X 25 X 845)		A36	A
	15-2	1	PL 250 X 15.88 ROLL	1966	*	A
	1B2-25	1	PL SK X 25 (845 X 845)		A36	A
			BOLT FOR SHIPMENT W/4 BOLTS			
	1A1	2	RODS 5/8 DIA. BENT	304	A36	C
1	15-3		PL SK X 6.00 ROLL (1270 X 1270)		A36	A
1	1B8-6		GASKET 745 O.D. X 3 X 610 I.D.		**	-
30	15-4		STUD 3/4" DIA. TFL	95	A193-B7	C
60	15-5		NUT 3/4" DIA. Hvy HEX		A194-2H	C
			* A36 MOD			
			** REINZ-AFM 37			

SUPPLIER DOCUMENT REVIEW

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by supplier and does not relieve supplier from full compliance with contractual obligations.

☒ 1. WORK MAY PROCEED

☐ 2. REVISE AND RESUBMIT. WORK MAY PROCEED SUBJECT TO INCORPORATION OF CHANGES INDICATED.

☐ 3. REVISE AND RESUBMIT. WORK MAY NOT PROCEED

☐ 4. REVIEW NOT REQUIRED. WORK MAY PROCEED

By: *[Signature]* Date: 12/9/96

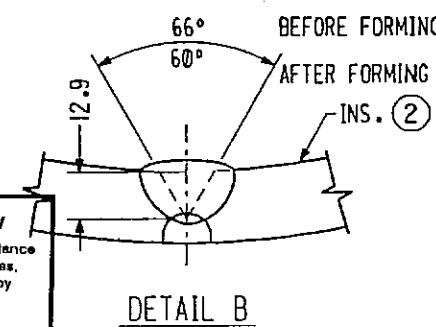
Category Code: F-1

Equipment No. 114-F-001

Job No. 22854-LCC-005-11

Group J M L P

Reviewed



DETAIL B

POTABLE WATER STORAGE TANK

BECHTEL LTD CONTRACT No. 22854-LCC-005 (22854-000-F-001)

ARABIAN CBI LTD.

24" DIA SHELL MANHOLE (M2)
10.0 m DIA. X 10.05 m HIGH SS DRT
IBN RUSHD PTA AND AROMATICS PLANT PROJECT
ARABIAN INDUSTRIAL FIBERS CO. LTD
YANBU, SAUDI ARABIA

ITEM NO 114-F-001
BY ZW CHKD HSTC DATE 5/31/96
R L HERBERT
ENGINEERING SUPERVISOR

CONTRACT NO ED 965206
DWG 15 REV 1
SHT 1

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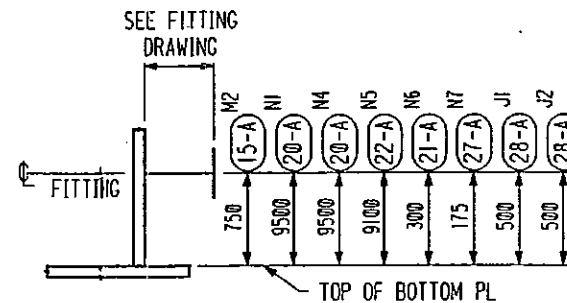
INDICATES CHANGE FROM PREVIOUS ISSUE

TECHNICAL & CONSTRUCTION INFORMATION

SPECIFICATIONS	API 650-9th ED.(1993/94 ADD.)
SPECIFIC GRAVITY	1.00
SERVICE	POTABLE WATER
MAX DESIGN METAL TEMP.	85°C
MIN DESIGN METAL TEMP.	17°C
DESIGN PRESSURE	ATMOSPHERIC
DESIGN VACUUM	ATMOSPHERIC
DESIGN LIQUID LEVEL	10050 mm
DESIGN WIND VELOCITY	140 km/h (PER API 650)
SEISMIC	ZONE I (I=1.0 , S=1.2)
ROOF LIVE LOAD	PER API 650
NOMINAL CAPACITY	1.2 KPa
PUMP IN RATE	789 m ³
PUMP OUT RATE	5 m ³ /hr
FOUNDATION	40 m ³ /hr
CONSTRUCTION	BY OTHERS
CORROSION ALLOWANCE	BY ARABIAN CBI
BOTTOM	1.0 mm
SHELL	1.0 mm
ROOF	1.0 mm
STRUCTURAL	1.0 mm

MATERIAL SPEC	
BOTTOM RECT.	A36
BOTTOM SKETCHES	A36
SHELL PLATES	A36
ROOF PLATES	A36
STRUCTURAL	A36/RS+ 37-2
FLANGES	A105
NOZZLE NECKS	A106B
INTERNAL PIPE	A106B
INSPECTION - MILL	CTR'S
SHOP	ACBI
FIELD	ACBI & CUSTOMER
SURFACE PREPARATION	YES
PAINTING	YES
PWHT	NONE
INSULATION	NONE
MISC.	
GASKETS	REINZ-AMF37
BOLTS & NUTS	A193-B7 & A194-2H
RADIOGRAPHY	PER CODE
JOINT EFFICIENCY	0.85

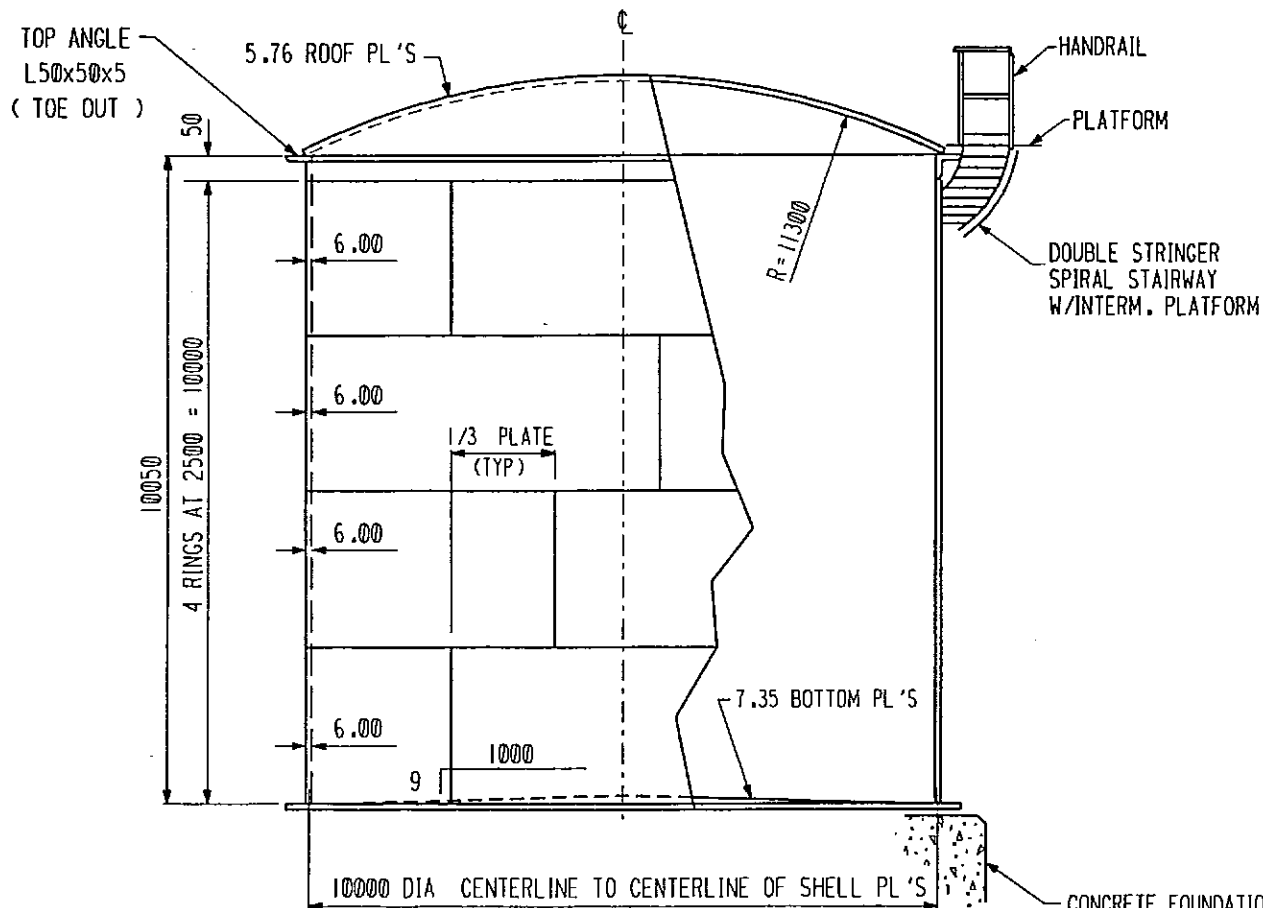
DESIGN DATA								
RING NO.	CORR. ALLOW. mm	DESIGN FOR PRODUCT STRESS MPa	DESIGN FOR TEST STRESS MPa	THK. USED mm	MATERIAL SPECIFICATION	API MAT'L GROUP NO.		
1	1.0	123.07	4.88	123.07	3.88	6.00	A36	1
2	1.0	123.07	3.89	123.07	2.89	6.00	A36	1
3	1.0	123.07	2.89	123.07	1.89	6.00	A36	1
4	1.0	123.07	1.89	123.07	0.89	6.00	A36	1



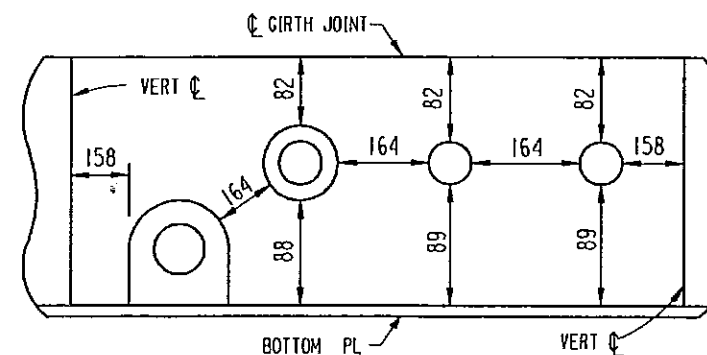
SHELL FITTING ELEVATION

LIST OF FITTINGS

CUST. MARK	ACBI MARK	QUANT	SIZE	RATING	DESCRIPTION
M1	30-A	1	24"	API	ROOF MANWAY
M2	15-A	1	24"	API	SHELL MANHOLE
N1	20-A	1	2"	150 RF	SHELL NOZZLE WATER FILL
N3	31-A	1	12"	150 RF	ROOF NOZZLE VENT W/INSECT SCREEN
N4	20-A	1	2"	150 RF	SHELL NOZZLE PUMP SPILLBACK
N5	22-A	1	4"	150 RF	SHELL NOZZLE WATER OVERFLOW
N6	21-A	1	6"	150 RF	SHELL NOZZLE PUMP SUCTION
N7	27-A	1	2"	150 RF	SHELL NOZZLE DRAIN
J1	28-A	1	4"	150 RF	SHELL NOZZLE LIC
J2	28-A	1	4"	150 RF	SHELL NOZZLE LSLL
DWG#18		1			NAMEPLATE
DWG#50		1			PERIPHERAL HANDRAIL
DWG#29		4			SPIRAL STAIRWAY
					GROUNDING LUG
					CATHODIC PROTECTION (EXT./INT.)



ELEVATION



SKETCH 'A'
(BOTTOM RING ONLY)

GENERAL NOTES:

- FITTINGS TO BE LOCATED AS SHOWN ON ORIENTATION DRAWING(S). IF LOCATIONS ARE NOT GIVEN, LOCATE IN FIELD TO SUIT CUSTOMER MAINTAINING MINIMUM SPACING SHOWN IN SKETCH 'A'. DIMENSIONS GIVEN ARE FROM EDGE TO EDGE OF REINFORCING PL OR FROM CL OF BUTT WELD TO EDGE OF REINFORCING PL.
- FLANGE BOLT HOLES TO STRADDLE VERTICAL CENTERLINE FOR SHELL NOZZLES.
- FLANGE BOLT HOLES TO STRADDLE 0°-180° CENTERLINE FOR ROOF NOZZLES.
- SEE SHEETS 800 & 802 FOR MATERIAL MANAGEMENT.

SUPPLIER DOCUMENT REVIEW

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by supplier and does not relieve supplier from full compliance with contractual obligations.

- ☒ 1. WORK MAY PROCEED
- ☐ 2. REVISE AND RESUBMIT. WORK MAY PROCEED
- ☐ 3. SUBJECT TO INCORPORATION OF CHANGES INDICATED.
- ☐ 4. REVIEW NOT REQUIRED. WORK MAY PROCEED.

By: *[Signature]* Date: 12/9/96

BECHTEL LIMITED

Category Code

Equipment No. 114-F-001

Job No. M.R. No. Seq. No. Rev.

22854-LCC-005-17/2

Group J M L P

Reviewed

100% A-3341 December 1995 CD/3397

POTABLE WATER STORAGE TANK

BECHTEL LTD CONTRACT No. 22854-LCC-005

(22854-000-F-001)

ARABIAN CBI LTD.

GENERAL ARRANGEMENT

10.0 m DIA. X 10.05 m HIGH SS DRT

IBN RUSHD PTA AND AROMATICS PLANT PROJECT

ARABIAN INDUSTRIAL FIBERS CO. LTD

YANBU, SAUDI ARABIA

ITEM NO 114-F-001

CONTRACT NO ED 965206

BY Key CHKD HSTC DATE 3/15/96

R L HERBERT

ENGINEERING SUPERVISOR

DWG 1 REV 2

SHT

This drawing is the property of ACBI and is to be used

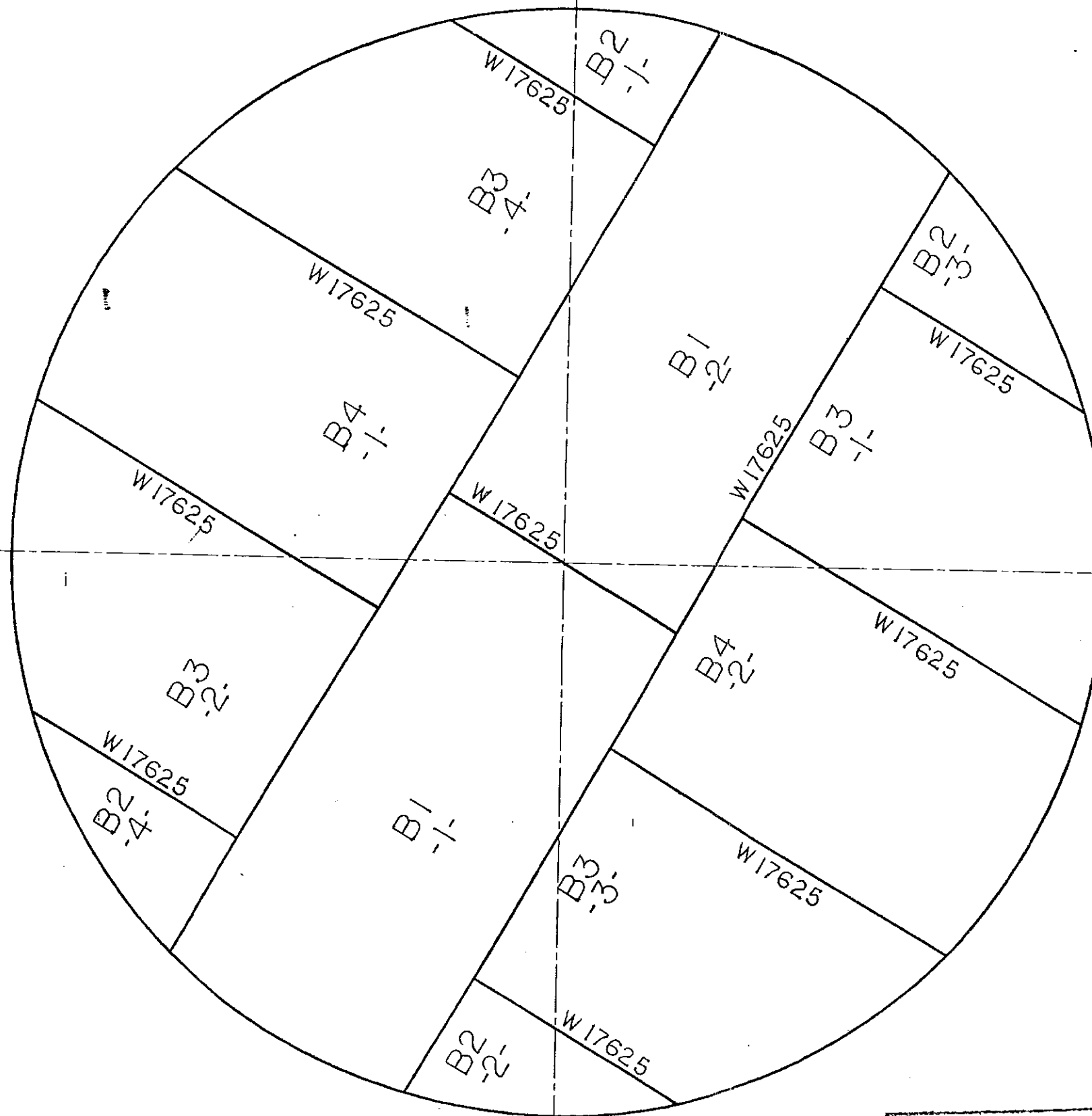
only in conjunction with the performance of work by ACBI.

Reproduction in whole or in part is expressly forbidden.

INDICATES CHANGE FROM PREVIOUS ISSUE



270°



180°
BOTTOM STRETCHOUT

FOR CONSTRUCTION

INDICATES CHANGE FROM PREVIOUS ISSUE

NAME OF WELDER	I.D.
J. H. PRTEL	17625

FOREMAN:

1. RECORD WELDERS' I.D. ON EACH JOINT.
2. RECORD JOINT ID AND RT INTERVALS (FIRST & LAST FOR 100%) OR LOCATION FOR SPOT RADIOGRAPHS OR PLUGS.

WHEN COMPLETE

FOREMAN:

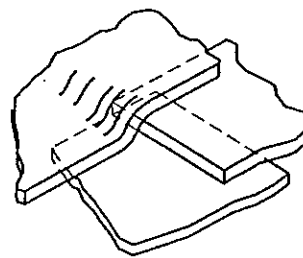
SEND CONSTRUCTION OFFICE ONE LEGIBLE COPY AND WORK COPIES IF ANY

N. A. UNIAHON
SARCO

CAUSTIC STORAGE TANK

BECHTEL LTD CONTRACT No. 22854-LCC-005

ARABIAN CBI LTD.		BOTTOM STRETCHOUT 10.0 m DIA. X 13.0 m HIGH SSRT IBN RUSHD PTA AND AROMATICS PLANT PROJECT ARABIAN INDUSTRIAL FIBERS CO. LTD YANBU, SAUDI ARABIA	
		ITEM NO. 124-F-001 BY ZW CHKD RLH DATE 7/8/96 R. L. HERBERT ENGINEERING SUPERVISOR	CONTRACT NO. ED 965203 DWG. R2 REV. 0
This drawing is the property of ACBI and is to be used only in conjunction with the performance of work by ACBI. Reproduction in whole or in part is expressly forbidden.		REVISIONS NO. DATE 1 7/8/96 2 7/8/96 3 7/8/96 4 7/8/96 5 7/8/96 6 7/8/96 7 7/8/96 8 7/8/96 9 7/8/96 10 7/8/96	



EQUAL
FILL

A 3D perspective drawing of a rectangular block resting on a base. The base has a rectangular cutout on its right side. The block is positioned such that its right edge is aligned with the left edge of the cutout.

AS-BUILT

KTГ ALBA

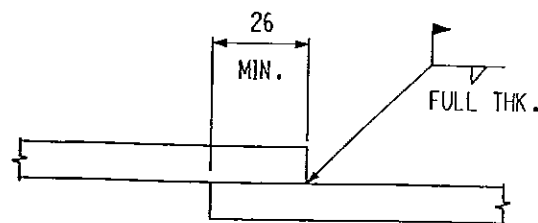
STEVE COYLE
SABCO QA/QC
16 MAY 1999

— SYMMETRICAL ABOUT CL

WORK THIS DRAWING WITH DRAWING #6

CAUSTIC STORAGE TANK

BECHTEL LTD CONTRACT No. 22854-LCC-005
(22854-000-F-001)



TYP SECTION THRU LAP

HALF PLAN OF BOTTOM

ALL LAPS 26 MM
46 METERS OF 7.35 LAP WELD
DIMENSIONS ARE TO EDGE OF PLATE
ON WHICH THEY APPEAR

BURN & TAN RAD = 5094

**A
CBI** **ARABIAN CBI LTD.**

BOTTOM ASSEMBLY

10.0M DIA. X 13.0M HIGH SSDRT
IBN RUSHD PTA AND AROMATICS PLANT PROJECT
ARABIAN INDUSTRIAL FIBERS CO. LTD
YANBU, SAUDI ARABIA

ITEM NO	124-F-001	CONTRACT NO	
BY	MSG CHKD	DATE	4-12-96
		ED	965203

R L HERBERT
ENGINEERING SUPERVISOR

DWG	5	REV	
SHT		0	

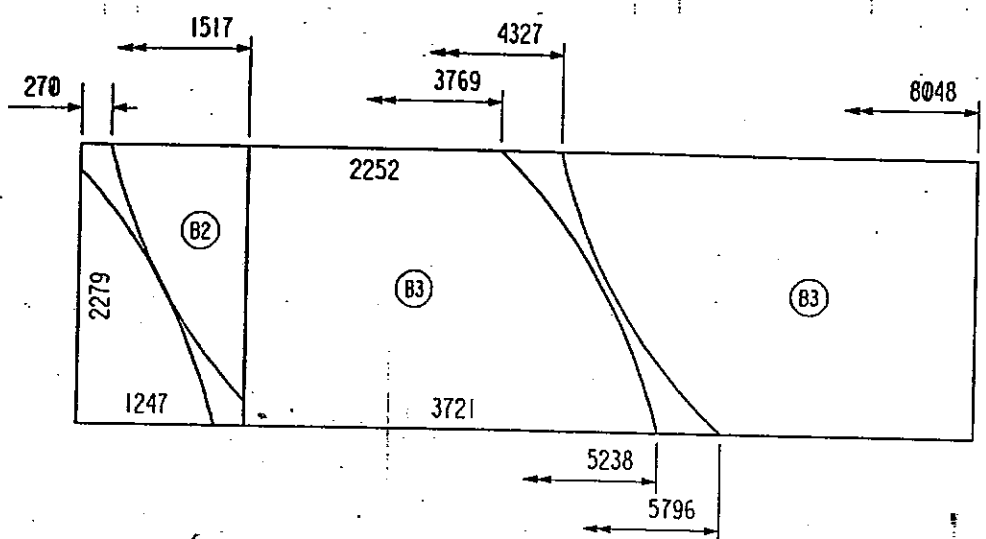
drawing is the property
in conjunction with the
production in whole or in

Blond Is to be used
rformance of work by AD
s excessively forbidden

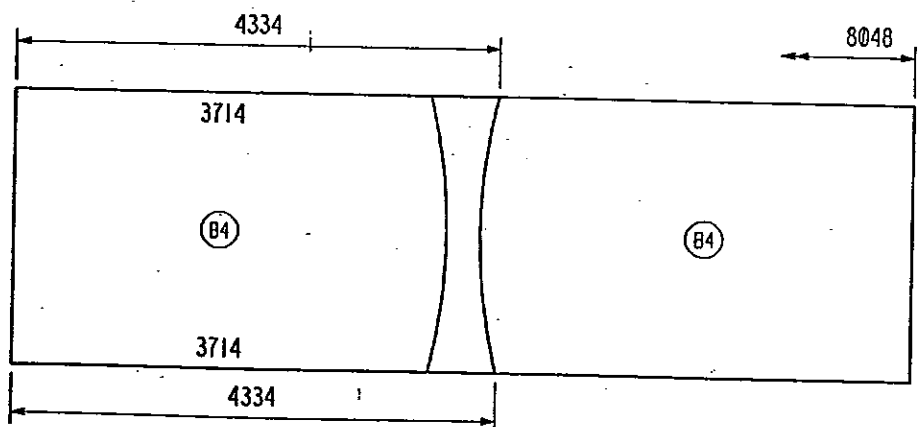
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► INDICATES CHANGE FROM PREVIOUS ISSUE

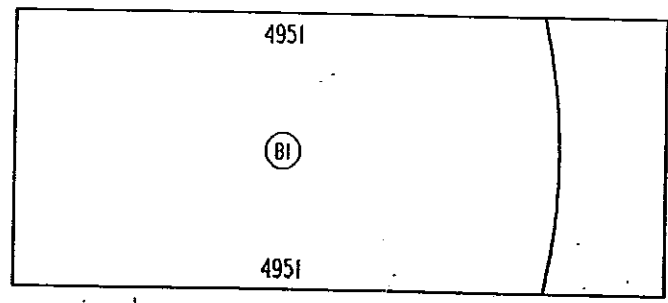
14:59:15 Apr 13 1996



(80) (2) REQUIRED



(80) (1) REQUIRED



(61) (2) REQUIRED

WORK THIS DRAWING WITH DRAWING #5
BURN RAD = 5094

SHIP PC	MARK	ASSN PC	DESCRIPTION	LENGTH MM	SPEC	ID
			--SKETCHES--			
2	B1		PL-SK X 7.35		A36	A
4	B2		PL-SK X 7.35		A36	A
4	B3		PL-SK X 7.35		A36	A
2	B4		PL-SK X 7.35		A36	A

THEORETICAL WT OF APPLIED MATERIAL
FOR CUTTING SKETCHES = 5241
TOTAL MATERIAL REQUIRED FOR SKETCHES
(3) - PL-2500 X 7.35 X 8048
(2) - PL-2500 X 7.35 X 6096

STEVE COYLE
SABCO QA/QC
16 MAY 1999

IR
1 Jun 99

AS-BUILT
RTT ACIB

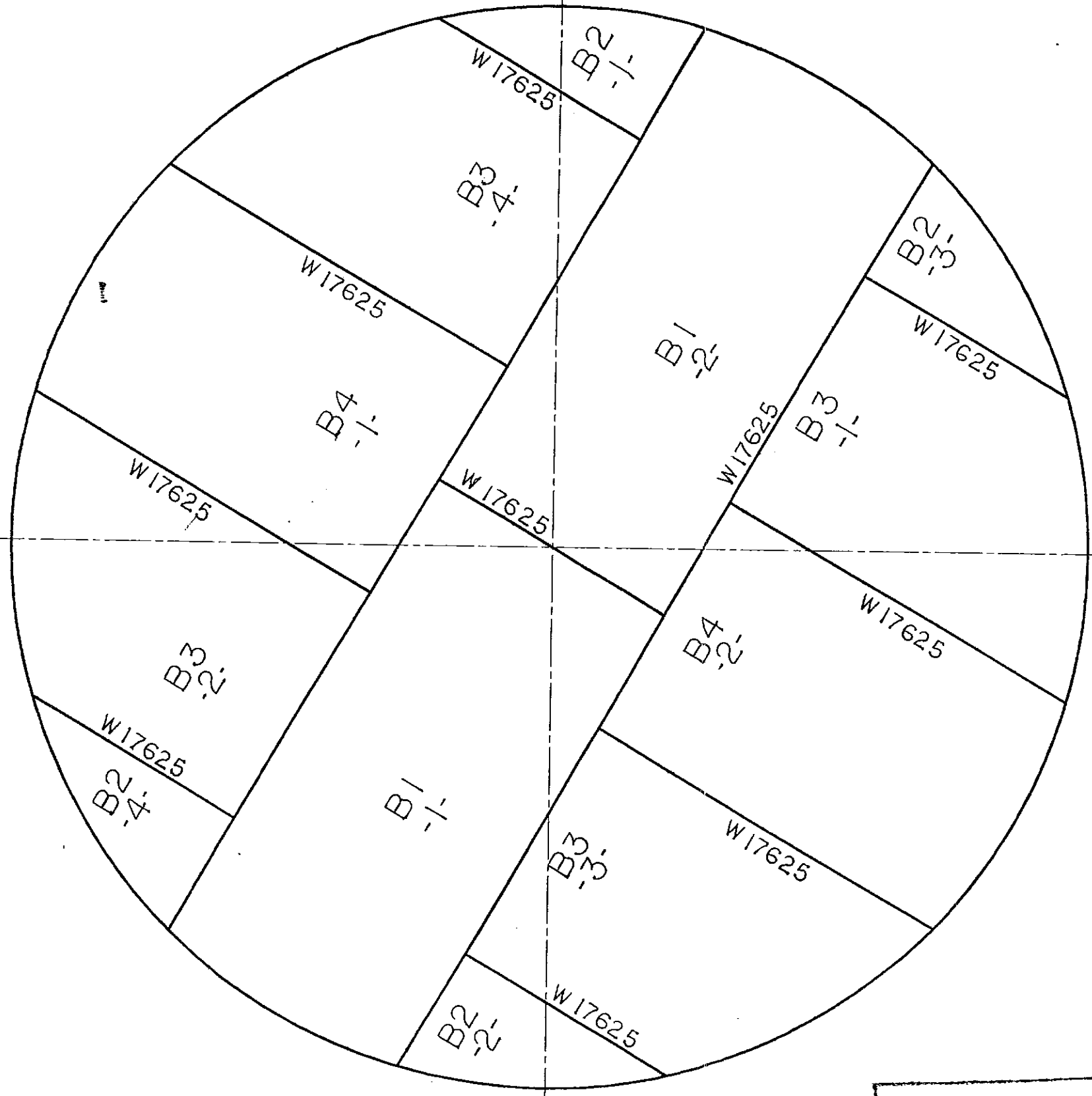
CAUSTIC STORAGE TANK
BECHTEL LTD CONTRACT No. 22854-LCC-005
(22854-000-F-001)

A CBI		ARABIAN CBI LTD.	
BOTTOM SKETCHES			
10.0M DIA. X 13.0M HIGH SSDRT IBN RUSHD PTA AND AROMATICS PLANT PROJECT ARABIAN INDUSTRIAL FIBERS CO. LTD YANBU, SAUDI ARABIA			
ITEM NO. 124-F-001		CONTRACT NO. ED 965203	
BY MSTG CHKD KWB DATE 4-12-96		DNG 6 REV 0	
R L HERBERT		SMT	
ENGINEERING SUPERVISOR			
This drawing is the property of ACBI and is to be used only in conjunction with the performance of work by ACBI. Reproduction in whole or in part is expressly forbidden.			

INDICATES CHANGE FROM PREVIOUS ISSUE



270°



180°

BOTTOM STRETCHOUT

FOR CONSTRUCTION

NAME OF WELDER	I.D.
J. H. PATEL	17625

FOREMAN:

1. RECORD WELDERS' I.D. ON EACH JOINT.
2. RECORD JOINT ID AND RT INTERVALS (FIRST & LAST FOR 100%) OR LOCATION FOR SPOT RADIOGRAPHS OR PLUGS.

WHEN COMPLETE
FOREMAN: SEND CONSTRUCTION OFFICE ONE LEGIBLE COPY AND WORK COPIES IF ANY

N. A. UNIAHON
SARCO

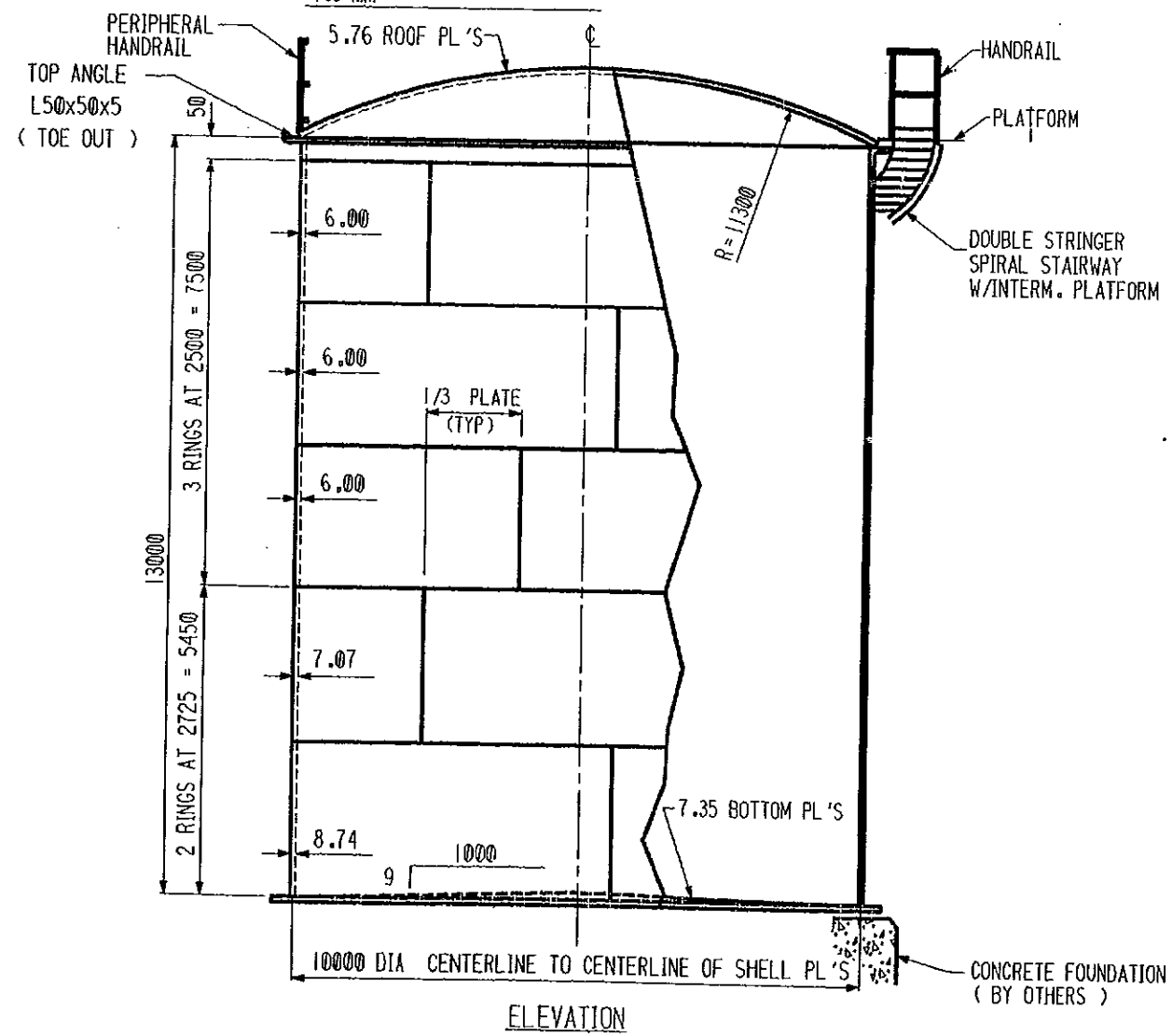
CAUSTIC STORAGE TANK
BECHTEL LTD CONTRACT No. 22854-LCC-005

ARABIAN CBI LTD.	
BOTTOM STRETCHOUT	
10.0 m DIA. X 13.0 m HIGH SSDRT IBN RUSHD PTA AND AROMATICS PLANT PROJECT ARABIAN INDUSTRIAL FIBERS CO. LTD YANBU, SAUDI ARABIA	
ITEM NO 124-F-001	CONTRACT NO ED 965203
BY ZW CHKD RLH DATE 7/8/96	DWG R2 REV 0
R L HERBERT ENGINEERING SUPERVISOR	SHT
This drawing is the property of ACBI and is to be used only in conjunction with the performance of work by ACBI. Reproduction in whole or in part is expressly forbidden.	

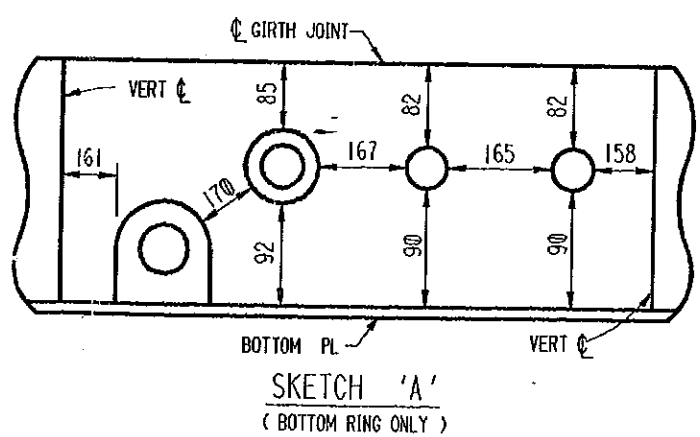
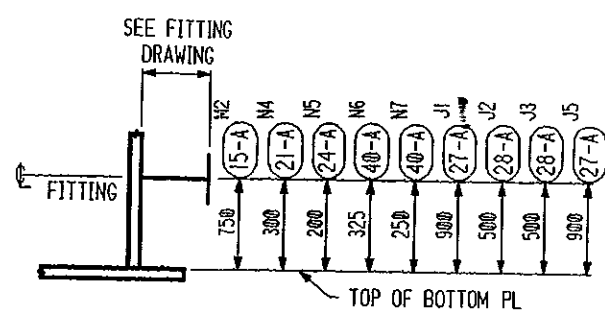
INDICATES CHANGE FROM PREVIOUS ISSUE

TECHNICAL & CONSTRUCTION INFORMATION

SPECIFICATIONS	API 650-9th ED. (1993/94 ADD.)	MATERIAL SPEC
SPECIFIC GRAVITY	APP. A & E	BOTTOM RECT. — A36
SERVICE	50% CAUSTIC	BOTTOM SKETCHES — A36
MAX DESIGN METAL TEMP.	85°C	SHELL PLATES — A36
MIN DESIGN METAL TEMP.	17°C	ROOF PLATES — A36
DESIGN PRESSURE	ATMOSPHERIC	STRUCTURAL — A36 / RS+ 37-2
DESIGN VACUUM	ATMOSPHERIC	FLANGES — A105
DESIGN LIQUID LEVEL	13000 mm	NOZZLE NECKS — A106B
DESIGN WIND VELOCITY	140 km/h (PER API 650)	INTERNAL PIPE — A106B; MONEL
SEISMIC	ZONE I (I=1.25, S=1.2)	INSPECTION - MILL — CTR'S
	PER API 650	SHOP — ACBI
ROOF LIVE LOAD	1.2 KPa	FIELD — ACBI & CUSTOMER
NOMINAL CAPACITY	1018 m ³	SURFACE PREPARATION — YES
PUMP IN RATE	50 m ³ /hr	PAINTING — YES
PUMP OUT RATE	21 m ³ /hr	PWHT — YES (FIELD)
FOUNDATION	BY OTHERS	INSULATION — YES
CONSTRUCTION	BY ARABIAN CBI	MISC.
ERROSTION ALLOWANCE		BOLT & NUTS — A193-B7 & A194-2H
BOTTOM	1.0 mm	GASKETS — REINZ-AMF34
SHELL	1.0 mm	RADIOGRAPHY — PER CODE
ROOF	1.0 mm	JOINT EFFICIENCY — 0.85
STRUCTURAL	1.0 mm	



DESIGN DATA								
RING NO.	CORR. ALLOW. mm	DESIGN FOR PRODUCT SC=1.53 ALLOWABLE STRESS MPa	REQUIRED THK. mm	DESIGN FOR TEST SC=1.0 ALLOWABLE STRESS MPa	REQUIRED THK. mm	THK. USED mm	MATERIAL SPECIFICATION	API MAT'L GROUP NO.
1	1.0	123.07	8.74	123.07	5.06	8.74	A36	1
2	1.0	123.07	7.07	123.07	3.97	7.07	A36	1
3	1.0	123.07	5.41	123.07	2.89	6.00	A36	1
4	1.0	123.07	3.89	123.07	1.89	6.00	A36	1
5	1.0	123.07	2.37	123.07	0.89	6.00	A36	1



- GENERAL NOTES:**
- FITTINGS TO BE LOCATED AS SHOWN ON ORIENTATION DRAWING(S). IF LOCATIONS ARE NOT GIVEN, LOCATE IN FIELD TO SUIT CUSTOMER MAINTAINING MINIMUM SPACING SHOWN IN SKETCH 'A'. DIMENSIONS GIVEN ARE FROM EDGE TO EDGE OF REINFORCING PL OR FROM CL OF BUTT WELD TO EDGE OF REINFORCING PL.
 - FLANGE BOLT HOLES TO STRADDLE VERTICAL CENTERLINE FOR SHELL NOZZLES.
 - FLANGE BOLT HOLES TO STRADDLE 0°-180° CENTERLINE FOR ROOF NOZZLES.
 - SEE SHEETS 800 & 802 FOR MATERIAL MANAGEMENT.

LIST OF FITTINGS					
CUST. MARK	ACBI MARK	QUANT	SIZE	RATING	DESCRIPTION
M1	30-A	1	24"	API	ROOF MANWAY
M2	15-A	1	24"	API	SHELL MANHOLE
N1	32-A	1	3"	150 RF	ROOF NOZZLE CAUSTIC FILL
N2	33-A	1	2"	150 RF	ROOF NOZZLE PUMP SPILLBACK
N3	31-A	1	12"	150 RF	ROOF NOZZLE VENT W/INSECT SCREEN
N4	21-A	1	6"	150 RF	SHELL NOZZLE PUMP SUCTION
N5	24-A	1	4"	150 RF	SHELL NOZZLE DRAIN W/INT.
N6	40-A	1	8"/2"	150 RF	SHELL NOZZLE STEAM COIL INLET
N7	40-A	1	8"/2"	150 RF	SHELL NOZZLE STEAM COIL OUTLET
J1	27-A	1	2"	150 RF	SHELL NOZZLE TIC
J2	28-A	1	4"	150 RF	SHELL NOZZLE LT
J3	28-A	1	4"	150 RF	SHELL NOZZLE LSL /LSHH
J5	27-A	1	2"	150 RF	SHELL NOZZLE TI
DWG#18		1			NAMEPLATE
		1			PERIPHERAL HANDRAIL
DWG#50		1			SPIRAL STAIRWAY
DWG#29	4				GROUNDING LUG
DWG#41					HEATER COIL
17-A	1	48"			SUMP
DWG#12-13					INSULATION SUPPORT
					ROOF PLATFORM
		1 SET			CATHODIC PROTECTION (EXT.)

Int
IR
1 Jun 99

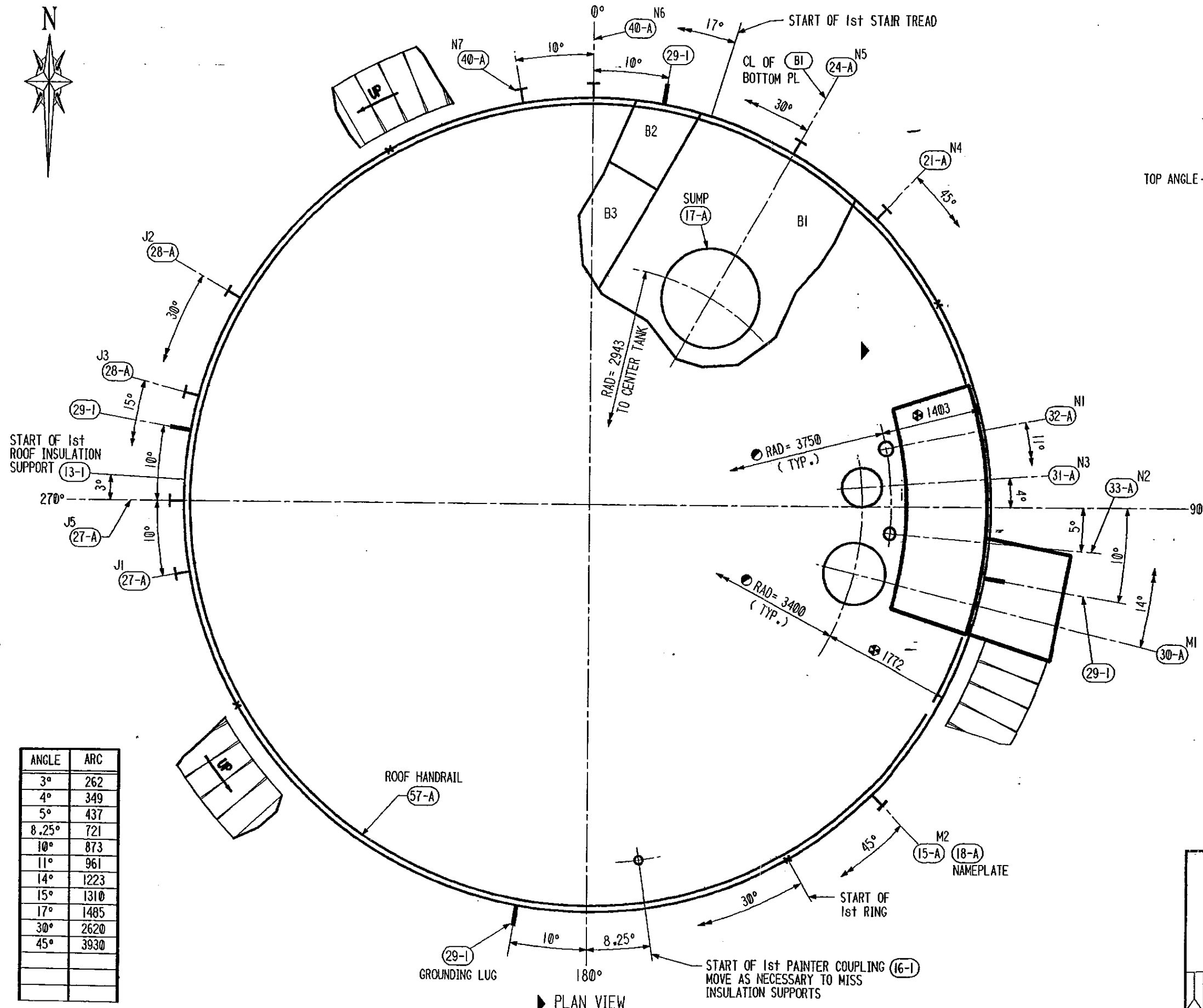
STEVE COYLE
SABCO QA/QC
16 MAY 1999

AS-BUILT
RTT ACBI

CAUSTIC STORAGE TANK
BECHTEL LTD CONTRACT No. 22854-LCC-005
(22854-000-F-001)

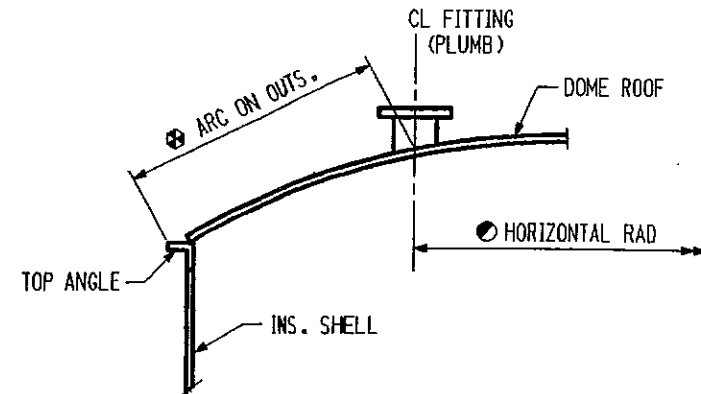
ARABIAN CBI LTD.			
GENERAL ARRANGEMENT			
10.0 m DIA. X 13.0 m HIGH SSRT			
IBN RUSHD PTA AND AROMATICS PLANT PROJECT			
ARABIAN INDUSTRIAL FIBERS CO. LTD			
YANBU, SAUDI ARABIA			
ITEM NO	124-F-001	CONTRACT NO	ED 965203
BY	Key CHD MSG DATE 3-15-96	DWG	1
	R L HERBERT	REV	5
ENGINEERING SUPERVISOR		SHT	
This drawing is the property of ACBI and is to be used only in conjunction with the performance of work by ACBI. Reproduction in whole or in part is expressly forbidden.			

INDICATES CHANGE FROM PREVIOUS ISSUE



PLAN VIEW

INDICATES CHANGE FROM PREVIOUS ISSUE



SECTION THRU ROOF

IR
1 Jun 99

STEVE COYLE
SABCO QA/QC
1 MAY 1999

AS-BUILT
KTT ACB

NOTES:

1. ALL ARC'S ARE MEASURED ON OUTSIDE OF FIRST SHELL RING UNLESS OTHERWISE NOTED.
2. ROOF NOZZLE BOLT HOLES TO STRADDLE 0°-180° CL
3. 'X' DENOTES FIRST SHELL RING JOINTS.

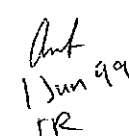
CAUSTIC STORAGE TANK

BECHTEL LTD CONTRACT No. 22854-LCC-005
(22854-000-F-001)

ANGLE	ARC
3°	262
4°	349
5°	437
8.25°	721
10°	873
11°	961
14°	1223
15°	1310
17°	1485
30°	2620
45°	3930

ARABIAN CBI LTD. ORIENTATION 10.0 m DIA. X 13.0 m HIGH SSRT IBN RUSHD, PTA AND AROMATICS PLANT PROJECT ARABIAN INDUSTRIAL FIBERS CO. LTD YANBU, SAUDI ARABIA	
ITEM NO 124-F-001 BY KT CHKD M5TG DATE 5-14-96 R L HERBERT ENGINEERING SUPERVISOR	CONTRACT NO ED 965203 DWG 2 REV 2
This drawing is the property of ACBL and is to be used only in conjunction with the performance of work by ACBL. Reproduction in whole or in part is expressly forbidden.	

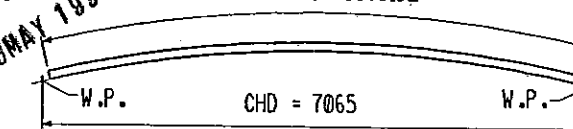
65203003.DGN



AS - BUILT
KIT 4-22

STEVE COYLE
SABCO QA/QC
10 MAY 1990

ARC = 7859 ON OUTSIDE



(CL JOINT TO CL JOINT)

TYP SHELL PLATE #1 DETAIL

GENERAL NOTES :

1. BILLED PLATE LENGTHS ARE FINISHED 2 MM SHORTER THAN THEORETICAL LENGTH.
2. SHOP PUNCH MARK INSIDE TOP EDGE OF PLATES 2617 MM FROM EACH END.

CAUSTIC STORAGE TANK

BECHTEL LTD CONTRACT No. 22854-LCC-005
(22854-000-F-001)



ARABIAN CBI LTD.

SHELL SECTION

IBN RUSHD PTA AND AROMATICS PLANT PROJECT
ARABIAN INDUSTRIAL FIBERS CO. LTD
YANBU, SAUDI ARABIA

ITEM NO	124-F-001
---------	-----------

BY Key CHKD 3/26/96 DATE 3/26/96

R L HERBERT
ENGINEERING SUPERVISOR

CONTRACT NO

ED 965203

WGC	3	RE
HT		0

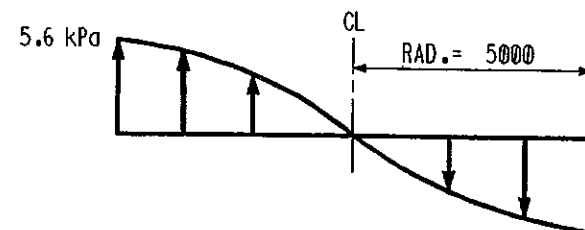
REVISION	ENGINEERING SUPERVISOR	SAT	1
	This drawing is the property of ACBI and is to be used only in conjunction with the performance of work by ACBI. Reproduction in whole or in part is expressly forbidden.		

NOTES:

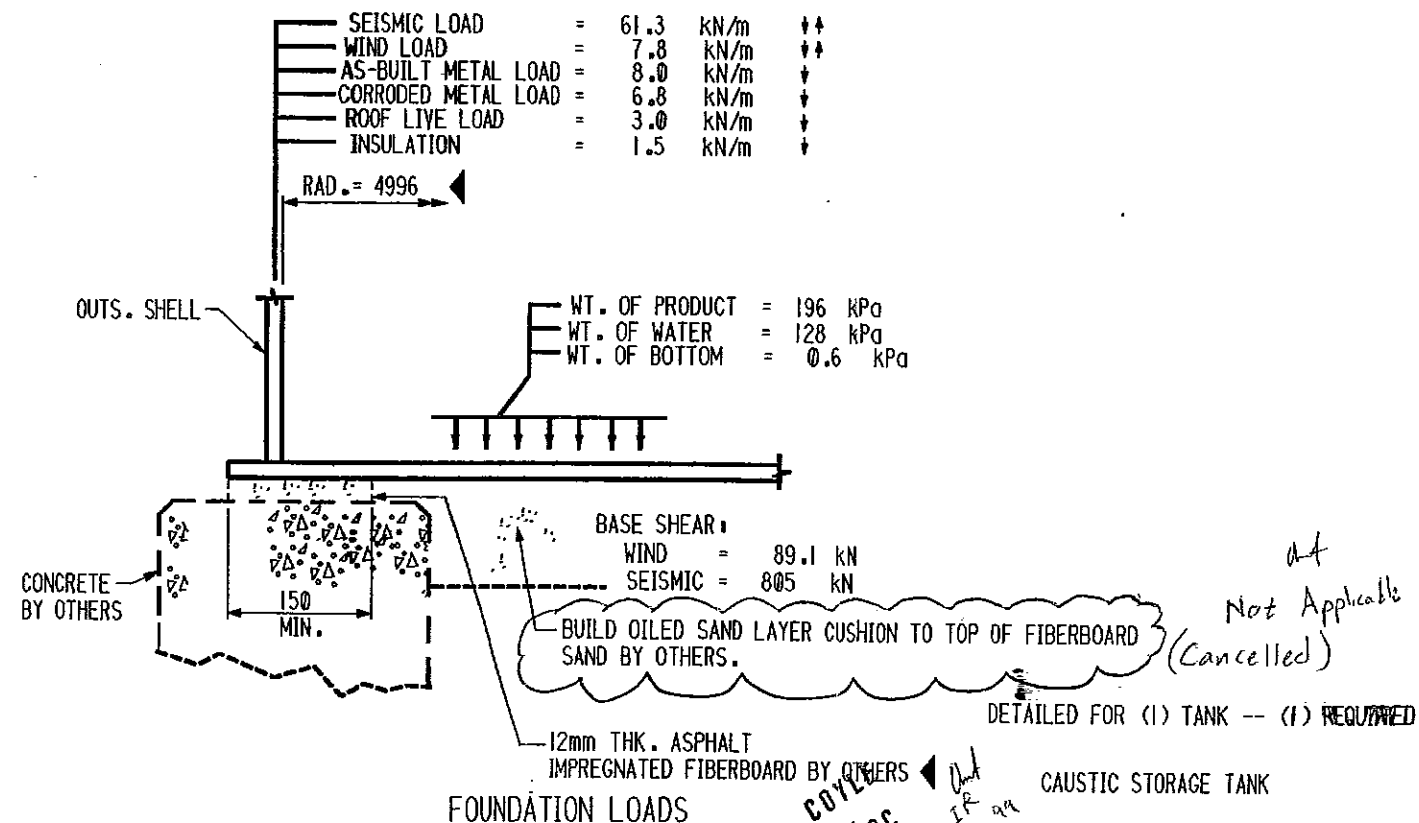
1. FOUNDATION LOADS DO NOT INCLUDE WEIGHT OF LINING OR CUSTOMER EQUIP.
2. THE MAXIMUM COMBINATION OF FOUNDATION LOADS SHOULD BE USED FOR DESIGN OF FOUNDATION, TANK ANCHORAGE, CHECKING BEARING STRESSES ON THE FOUNDATION AND FOR DESIGN OF PIPE VAULTS, IF ANY, BENEATH THE TANK SHELL.
3. THE FOLLOWING OVERTURNING MOMENTS SHOULD BE USED FOR CHECKING OVERALL FOUNDATION STABILITY AND SOIL BEARING PRESSURES.
 WIND RINGWALL FOUNDATION MOMENT = 609 kN-m
 SEISMIC RINGWALL FOUNDATION MOMENT = 4820 kN-m
 SEISMIC SLAB MOMENT = 5360 kN-m
4. DESIGN DATA FOR FOUNDATION LOADS :
 PRODUCT DESIGN SPECIFIC GR. = 1.530
 WIND = 140 Km/H
 SEISMIC = ZONE: I, S: 1.200, I: 1.250, Z: 0.075
 ROOF LIVE LOAD = 1.2 kPa

FOUNDATION:

1. TOP OF FOUNDATION SHALL BE LEVEL WITHIN ± 3 mm WITHIN ANY 9200 mm ARC AND ± 6 mm AROUND ENTIRE RING.
2. THE MINIMUM REQUIRED COMPRESSIVE STRENGTH OF THE CONCRETE f'_c , SHALL BE 20.7 MPa IN 28 DAYS.



MAX. PRESSURE DISTRIBUTION FROM HYDRODYNAMIC
SEISMIC LOADS ACTING ON TANK BOTTOM



AS - BUILT

KTT ACB

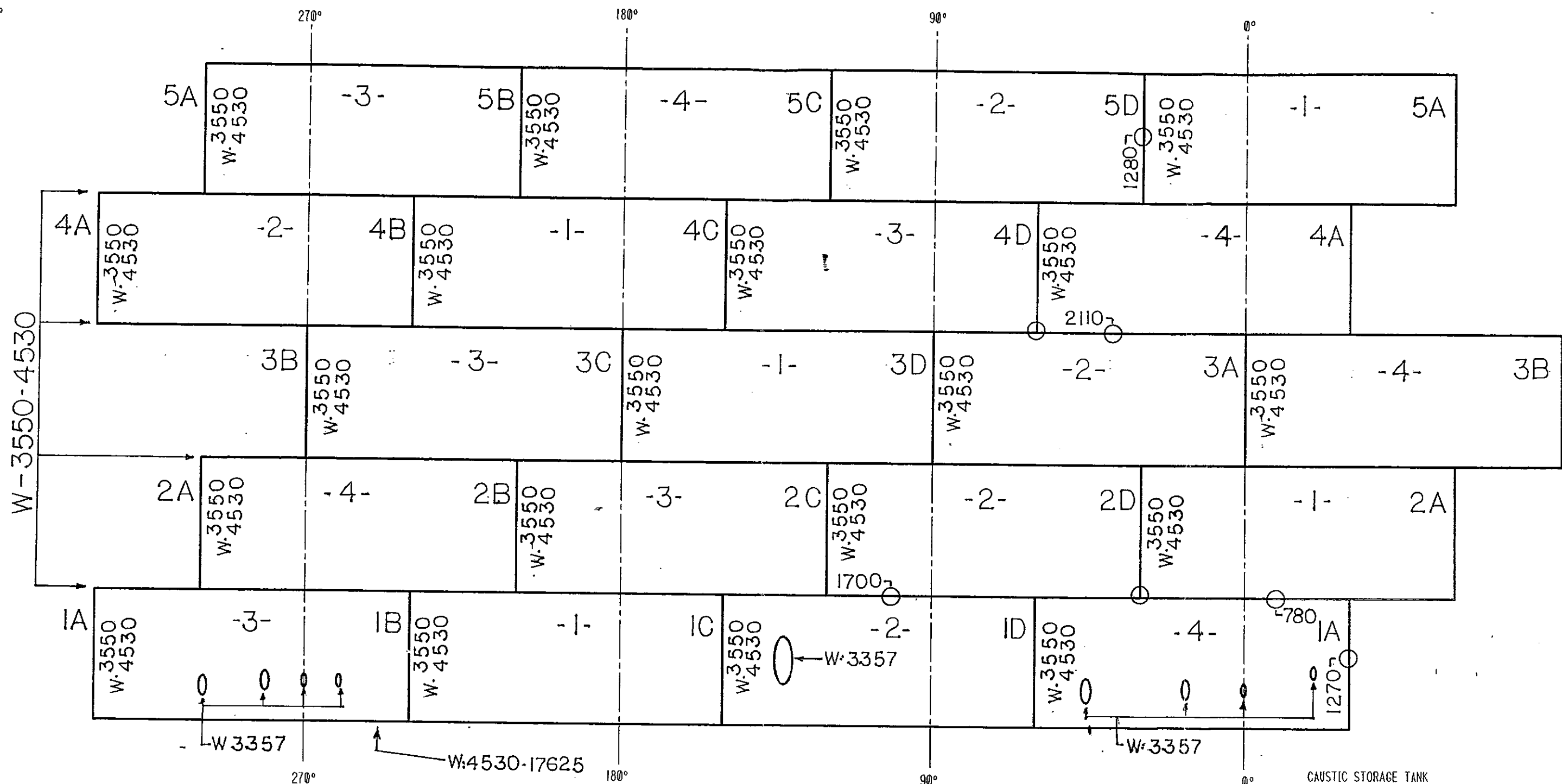
ARABIAN CBI LTD.

FOUNDATION LOADING
10.0M DIA. X 13.0M HIGH SSDRT
IBN RUSHD PTA AND AROMATICS PLANT PROJECT
ARABIAN INDUSTRIAL FIBERS CO. LTD
YANBU, SAUDI ARABIA

ITEM NO. 124-F-001
BY KT CHKD MSIG DATE 3/15/96
R L HERBERT
ENGINEERING SUPERVISOR
CONTRACT NO. 22854-LCC-005
ED 965203
DWG FI REV 4

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INDICATES CHANGE FROM PREVIOUS ISSUE



CAUSTIC STORAGE TANK

BECHTEL LTD CONTRACT No. 22854-LCC-005

SHELL STRETCHOUT

(OUTSIDE VIEW)

FOR CONSTRUCTION

FOREMAN:

1. RECORD WELDERS' I.D. ON EACH JOINT.
2. RECORD JOINT ID AND RT INTERVALS (FIRST & LAST FOR 100%) OR LOCATION FOR SPOT RADIOGRAPHS OR PLUGS.

NAME OF WELDER	I.D.	NAME OF WELDER	I.D.
		N. AHMED	3357
		M. KHAN	3550
		H. MIR	4530
		J.H. PATEL	17625

WHEN COMPLETE

FOREMAN:

SEND CONSTRUCTION OFFICE ONE
LEGIBLE COPY AND WORK COPIES IF ANY

N.A. UMANIA
19/08/96
INDICATES CHANGE FROM PREVIOUS ISSUE

ARABIAN CBI LTD.	
SHELL STRETCHOUT 10.0 m DIA. X 13.0 m HIGH SSDRT IBN RUSHD PTA AND AROMATICS PLANT PROJECT ARABIAN INDUSTRIAL FIBERS CO. LTD YANBU, SAUDI ARABIA	
ITEM NO. 124-F-001	CONTRACT NO. ED 965203
BY ZH CHKO RLH DATE 7/8/96	DWG RI REV
R L HERBERT	SHT
ENGINEERING SUPERVISOR	
This drawing is the property of ACBI and is to be used only in conjunction with the performance of work by ACBI. Reproduction in whole or in part is expressly forbidden.	

API 650-9th ED. (1993/94 ADD.)

PERIPHERAL HANDRAIL

TOP ANGLE L50x50x5 (TOE OUT)

5.76 ROOF PL'S

50

13000

3 RINGS AT 2500 = 7500

6.00

6.00

1/3 PLATE (TYP)

6.00

7.07

8.74

1000

9

7.35 BOTTOM PL'S

10000 DIA CENTERLINE TO CENTERLINE OF SHELL PL'S

HANDRAIL

PLATFORM

DOUBLE STRINGER SPIRAL STAIRWAY W/INTERM. PLATFORM

CONCRETE FOUNDATION (BY OTHERS)

ELEVATION

$R = 11300$

DESIGN DATA								
RING NO.	CORR. ALLOW. mm	DESIGN FOR PRODUCT SC = 1.53		DESIGN FOR TEST SC = 1.0		THK. USED mm	MATERIAL SPECIFICATION	AP. MAT. CROK NO.
		ALLOWABLE STRESS MPa	REQUIRED THK. mm	ALLOWABLE STRESS MPa	REQUIRED THK. mm			
1	1.0	123.07	8.74	123.07	5.06	8.74	A36	I
2	1.0	123.07	7.07	123.07	3.97	7.07	A36	I
3	1.0	123.07	5.41	123.07	2.89	6.00	A36	I
4	1.0	123.07	3.89	123.07	1.89	6.00	A36	I
5	1.0	123.07	2.37	123.07	0.89	6.00	A36	I



1. FITTINGS TO BE LOCATED AS SHOWN ON ORIENTATION DRAWING(S) , IF LOCATIONS ARE NOT GIVEN, LOCATE IN FIELD TO SUIT CUSTOMER MAINTAINING MINIMUM SPACING SHOWN IN SKETCH 'A'. DIMENSIONS GIVEN ARE FROM EDGE TO EDGE OF REINFORCING PL OR FROM CL OF BUTT WELD TO EDGE OF REINFORCING PL.
2. FLANGE BOLT HOLES TO STRADDLE VERTICAL CENTERLINE FOR SHELL NOZZLES.
3. FLANGE BOLT HOLES TO STRADDLE 0°-180° CENTERLINE FOR ROOF NOZZLES.
4. SEE SHEETS 800 & 802 FOR MATERIAL MANAGEMENT.

CUST. MARK	ACBI MARK	QUANT	SIZE	RATING	DESCRIPTION
M1	30-A	1	24"	API	ROOF MANWAY
M2	15-A	1	24"	API	SHELL MANHOLE
N1	32-A	1	3"	150 RF	ROOF NOZZLE CAUSTIC FILL
N2	33-A	1	2"	150 RF	ROOF NOZZLE PUMP SPILLBACK
N3	31-A	1	12"	150 RF	ROOF NOZZLE VENT W/INSECT SCREE
N4	21-A	1	6"	150 RF	SHELL NOZZLE PUMP SUCTION
N5	24-A	1	4"	150 RF	SHELL NOZZLE DRAIN W/INT.
N6	40-A	1	8"/2"	150 RF	SHELL NOZZLE STEAM COIL INLET
N7	40-A	1	8"/2"	150 RF	SHELL NOZZLE STEAM COIL OUTLET
J1	27-A	1	2"	150 RF	SHELL NOZZLE TIC
J2	28-A	1	4"	150 RF	SHELL NOZZLE LT
J3	28-A	1	4"	150 RF	SHELL NOZZLE LSL L /LSHH
J5	27-A	1	2"	150 RF	SHELL NOZZLE TI
	DWG#18	1			NAMEPLATE
		1			PERIPHERAL HANDRAIL
	DWG#50	1			SPIRAL STAIRWAY
	DWG#29	4			GROUNDING LUG
	DWG#41				HEATER COIL
	17-A	1	48"		SUMP
	DWG#12-13				INSULATION SUPPORT
					ROOF PLATFORM
		1 SET			CATHODIC PROTECTION (EXT.)

AS - BUILT

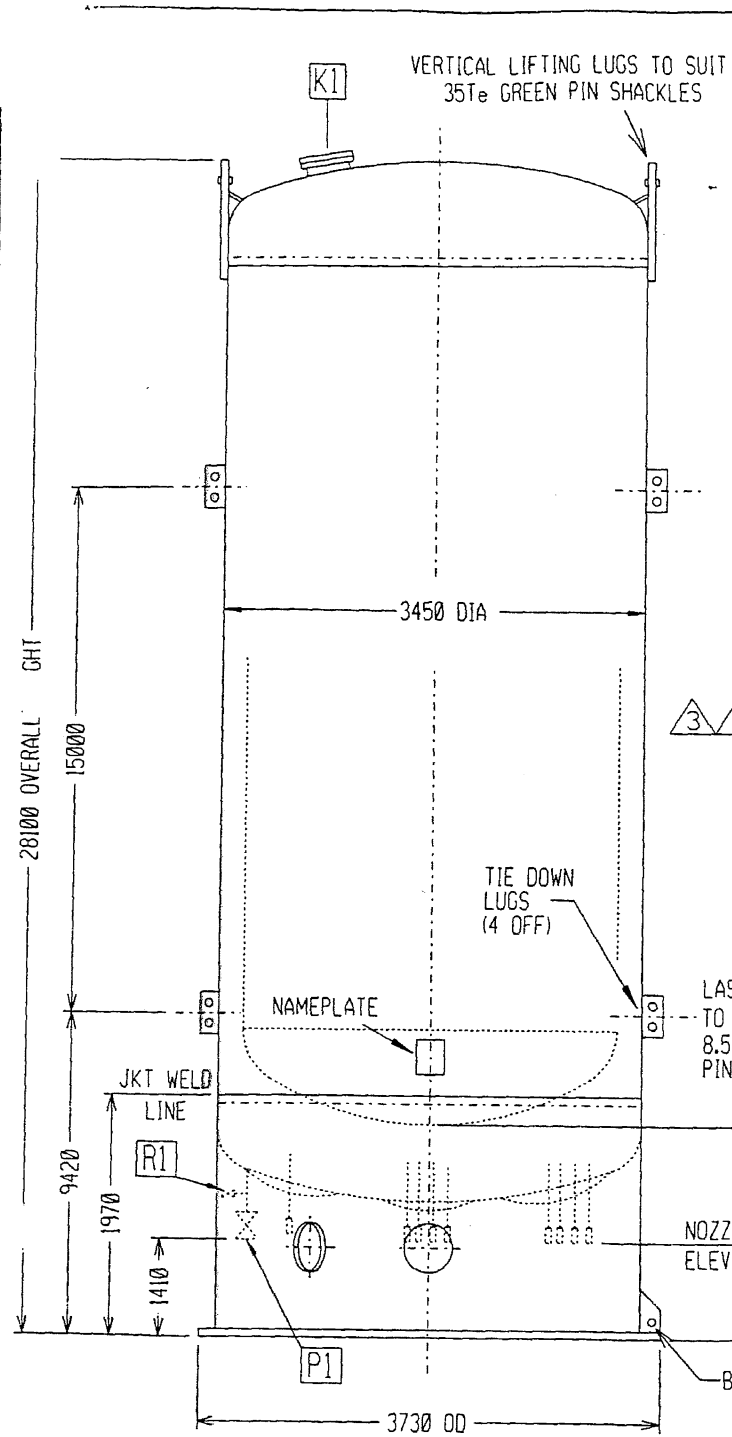
BECHTEL LTD CONTRACT No. 22854-LCC-005
(22854-000-F-001)

GENERAL ARRANGEMENT
10.0 m DIA. X 13.0 m HIGH SSORT
IBN RUSHD PTA AND AROMATICS PLANT PROJECT
ARABIAN INDUSTRIAL FIBERS CO. LTD
YANBU, SAUDI ARABIA

DWG 1 SHT	REV 5
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▶ INDICATES CHANGE FROM PREVIOUS ISSUE

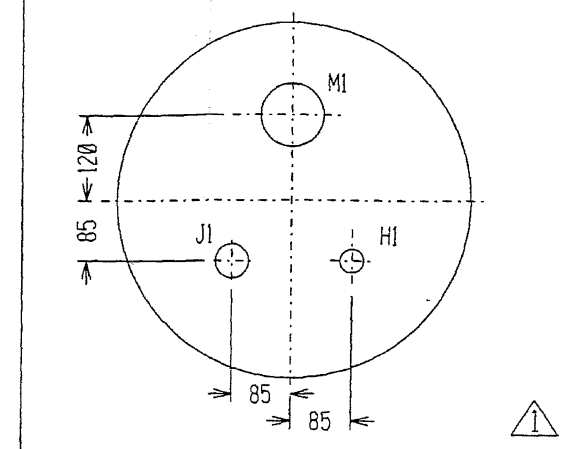
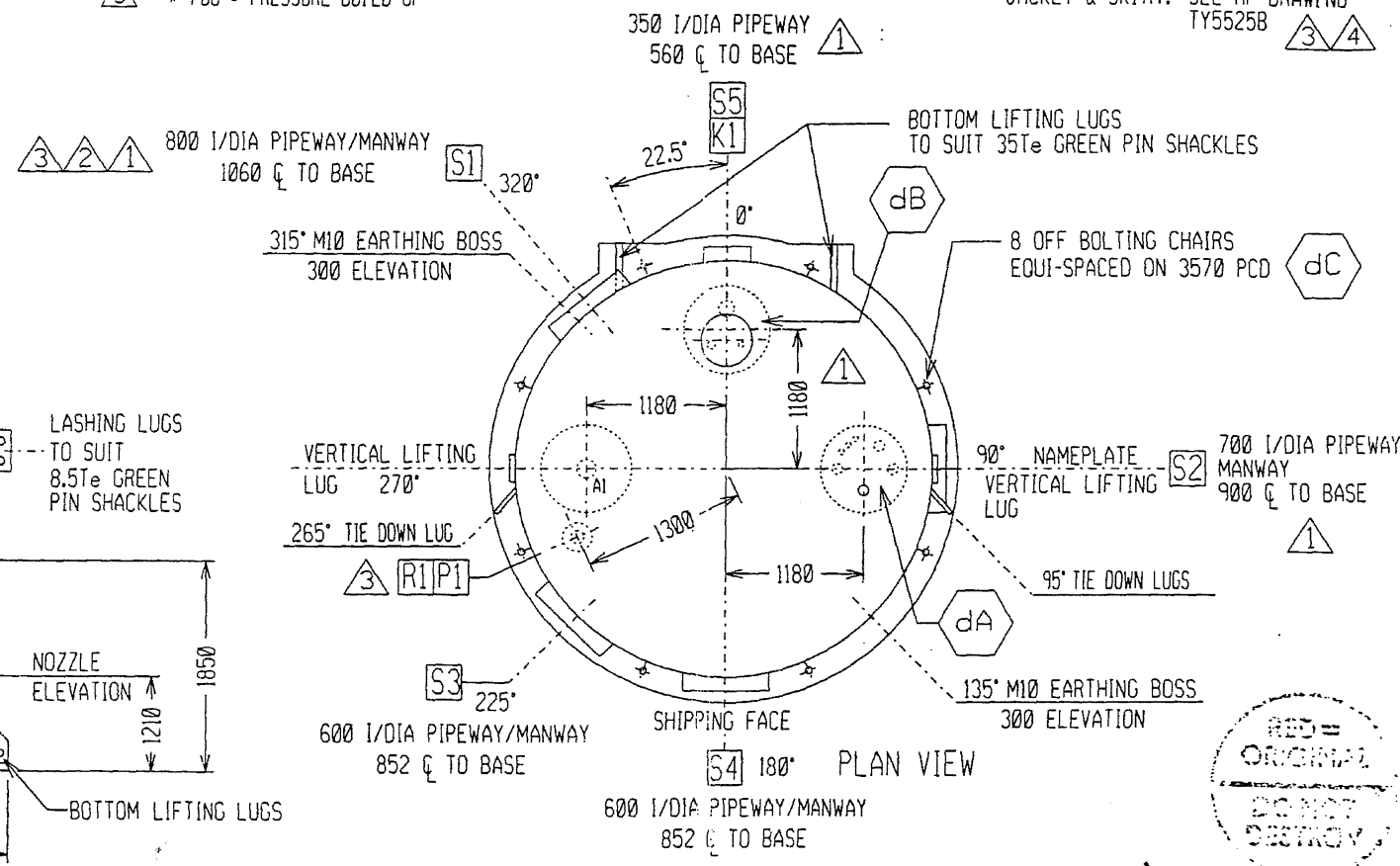


NOZZLE	SIZE	SERVICE	END CONNECTION
A1	3" NB	LIQUID WITHDRAWAL	BW FOR 3" NB SCH40S PIPE
B1	1.1/2" NB	BOTTOM FILL/PBU FEED *	SW FOR 1.1/2" NB PIPE
C1	2" NB	TOP FILL/PBU RETURN *	BW FOR 2" NB SCH10S PIPE
D1	2" NB	VAPOUR VENT	BW FOR 2" NB SCH10S PIPE
E1	1/2" OD	TRYCOCK	SW FOR 1/2" NB PIPE
F1	1/2" OD	UPPER LIQUID LEVEL	SW FOR 1/2" NB PIPE
G1	1/2" OD	LOWER LIQUID LEVEL	SW FOR 1/2" NB PIPE
H1	1" NB	PUMP THERMOSYPHON	SW FOR 1" NB PIPE
J1	1.1/2" NB	PUMP RECYCLE INLET	SW FOR 1.1/2" NB PIPE
K1	6" NB	OUTER TANK EMERGENCY VENT	TO ATMOSPHERE
L1	2" NB	VAPOUR VENT	BW FOR 2" NB SCH10S PIPE
M1	3" NB	LIQUID WITHDRAWAL	BW FOR 3" NB SCH40S PIPE
P1	1.1/2" NB	EVACUATION VALVE CONNECTION	150# ANSI FLANGE
R1		VACUUM GAUGE CONNECTION	KF FLANGE DIN28403

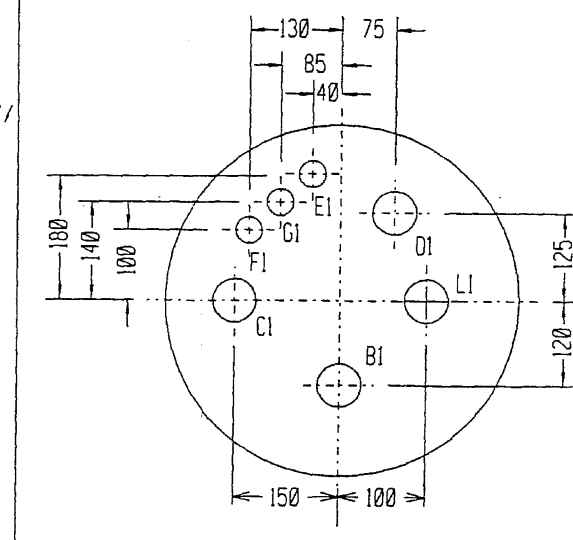
* PBU = PRESSURE BUILD-UP

- NOTES**
- ALL OPEN CONNECTIONS TO BE SUITABLY BLANKED AGAINST THE WEATHER AND TO MAINTAIN CLEANLINESS.
 - ALL DIMENSIONS ARE APPROXIMATE AND ARE MM UNLESS OTHERWISE STATED.
 - EXTERNAL TREATMENT - PRIMER: AIR PRODUCTS STANDARD M03. TOP COAT: AIR PRODUCTS STANDARD M04. FINISH COLOUR: WHITE.
 - FOR SHIPPING & LIFTING COMPLY WITH DRAWING TY5526C.
 - TANK TO BE PRESSURISED FOR SHIPPING USING CLEAN DRY AIR TO 0.4 BAR.
 - FOR JACKET DRAWING SEE TY5525B.
 - MATERIALS:
PRESSURE VESSEL: SEE AP DRAWING TY5523B
PIPING: ASTM A312 TP304L
JACKET & SKIRT: SEE AP DRAWING TY5525B

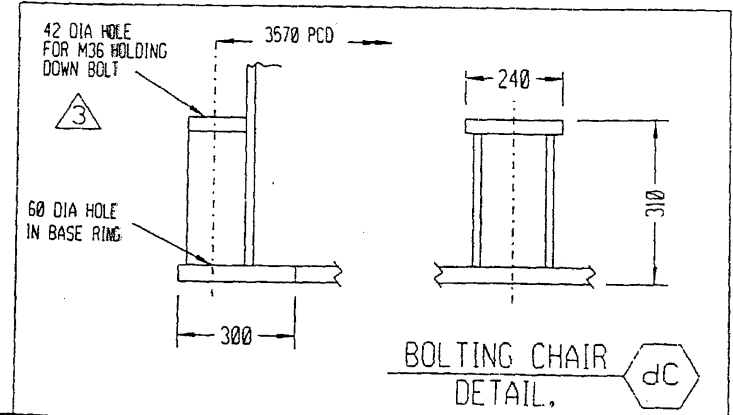
TOTAL WEIGHT OF TANK IN KG	
TANK EMPTY	56000
97% FULL OF LIN	198700
MAXIMUM SHEAR FORCE DUE TO SEISMIC LOADING	100.51 KN
WIND LOADING	49.83 KN
MAX. OVERTURNING MOMENT DUE TO SEISMIC LOADING	1882.85 KN-M
WIND LOADING	700.07 KN-M



PENETRATION PLATE DETAILS. VIEW ON INSIDE.



PENETRATION PLATE DETAILS. VIEW ON INSIDE.



REV	DESCRIPTION	DATE	DRAWN	APPD
4	NOTE 7: PV WAS 92% Ni STEEL, JKT AND SKIRT WERE C/STL.	26.11.96	DRT	BGD
3	SEE ECN 1472	21.08.96	DRT	BGD
2	PIPEWAY S1 WAS AT 330°.	26.07.96	DRT	BGD
1	180°, 225° & 270° DB PEN PLATE ROTATED 180° ABOUT TANK CENTRE. PROJECT BLOCK ADDED. MANWAYS WERE 600 ID, 552 EL, AT 0°, 90°.	20.06.96	DRT	BGD
0	ORIGINAL ISSUE	24.05.96	DRT	M.E.

EQUIPMENT TAG: 109-D-001/2/3

PROJECT : NITROGEN GENERATOR PACKAGE
FOR PTA & AROMATICS PLANT PROJECT
P. ORDER NO. : 22854-109-Y-001-LAC
CLIENT : A.I.F.C., YANBU, SAUDI ARABIA

GENERAL ARRANGEMENT FOR 182KL VERTICAL LIQUID NITROGEN STORAGE TANK FOR AIFC

SCALE : N.T.S.	ORG. No	SHEET 1 OF 1
DRAWN: <i>[Signature]</i>	TY5521D/04	
APPD: M. Evans	PROJECT No. C1265	
DATE : 24.05.96		